

# Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan

Lincoln County, Cities, and Special Districts of:  
Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport, Yachats,  
Central Lincoln PUD, Lincoln County School District, and  
Seal Rock Water District



Photo Credit: Gary Halvorson, Oregon State Archives

Effective:

December 29, 2020 through December 28, 2025

Prepared for:

Lincoln County  
Planning and Development and Emergency Management

Prepared by:

University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience



This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

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**FEMA**

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Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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**FEMA**

January 8, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Chair Jacobson:

On December 29, 2020, the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Hazard Mitigation Plan as a multi-jurisdictional local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance (HMA) grants projects through December 29, 2025, through your state:

City of Newport | Lincoln County | Lincoln County School District | City of Siletz

FEMA individually evaluates all application requests for funding according to the specific eligibility requirements of the applicable program. Though a specific mitigation activity or project identified in the plan may meet the eligibility requirements, it may not automatically receive approval for FEMA funding under any of the aforementioned programs.

Approved mitigation plans may be eligible for points under the National Flood Insurance Program's Community Rating System (CRS). For additional information regarding the CRS, please visit: [www.fema.gov/national-flood-insurance-program-community-rating-system](http://www.fema.gov/national-flood-insurance-program-community-rating-system) or contact your local floodplain manager. Over the next five years, we encourage your communities to follow the plan's schedule for monitoring and updating, and to develop further mitigation actions. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at (503) 378-2911, who locally coordinates and administers these efforts.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

Enclosure

cc: Amie Bashant, Oregon Office of Emergency Management

EG:vl



FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

**BEFORE THE BOARD OF COMMISSIONERS  
FOR LINCOLN COUNTY, OREGON**

In the Matter of )  
 )  
*Adopting Updates to the Lincoln County* )  
*Multi-Jurisdictional Natural Hazards* ) **RESOLUTION # 20-21-12D**  
*Mitigation Plan* )

**WHEREAS**, Lincoln County recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan (NHMP) is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* (NHMP) was adopted by the Lincoln County Board of Commissioners with Resolution #15-02-09 on September 2, 2015; and

**WHEREAS**, Lincoln County fully participated in the FEMA prescribed mitigation planning process to prepare this Natural Hazards Mitigation Plan; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

**WHEREAS**, the NHMP is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an ongoing cycle of development and revision to improve its effectiveness; and

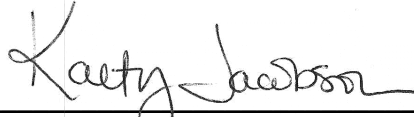
**WHEREAS**, Lincoln County adopts the NHMP and directs the Board of Commissioners to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

**NOW, THEREFORE, IT IS HEREBY RESOLVED AND ORDERED AS FOLLOWS:**

1. That Lincoln County adopts *the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan. The Plan is incorporated herein by this reference as if fully set forth.
2. That a copy of this Adoption Resolution be submitted to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.
3. That copies of this Adoption Resolution be provided to Onno Husing, Planning and Development Director for distribution to other participating government entities; Virginia Demaris, Emergency Manager and Wayne Belmont, County Counsel.

DATED this 21st day of December, 2020

LINCOLN COUNTY BOARD OF COMMISSIONERS



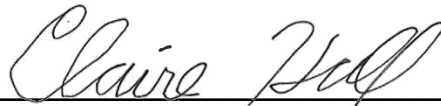
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Kaety Jacobson, *Chair*



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Doug Hunt, *Commissioner*



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Claire Hall, *Commissioner*

# SPECIAL THANKS & ACKNOWLEDGEMENTS

Lincoln County developed this Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP) through a regional partnership funded by the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP) Grant No. HMGP-DR-4328-OR-5-P. This updated NHMP is a collaboration between Lincoln County and the Cities of Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport, and Yachats and the special districts of Central Lincoln PUD, Lincoln County School District, and Seal Rock Water District. Planning process, plan templates, and plan development support provided by the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE).

Special thanks to Jen Demaris, Lincoln County Emergency Manager and John O'Leary, Associate Planner, for their vision, passion, and positive outlook throughout the plan update process.

## Steering Committee

- *Convener*, Jen Demaris, Emergency Manager, Lincoln County
- *Convener*, Onno Husing, Planning Director, Lincoln County
- Steve Hodge, County Engineer, Lincoln County
- Roy Kinion, Public Works Director, Lincoln County
- John O'Leary, Associate Planner, Lincoln County
- Rachel Cotton, Planner, Newport
- Adam Denlinger, General Manager, Seal Rock Water District
- Dave Eshleman, Public Works Administrator, Siletz
- Sue Graves, Safety Coordinator, Lincoln County School District
- Jerry Kemp, City Manager, Waldport
- Larry Lewis, Planner (contract), Depoe Bay/Waldport
- Gail Malcolm, Project Manager, Central Lincoln PUD
- Regina Martinez, EM Coordinator, Newport
- Ken Murphy, Emergency Manager, Lincoln City
- Justin Peterson, Planner (contract), Toledo, Waldport, Yachats
- Lindsey Sehmel, Planning Director, Lincoln City
- Derrick Tokos, Planning Director, Newport
- Brad Wynn, Operations Lead, Seal Rock Water District

## Guests

- Meghan Dalton, Oregon Climate Change Research Institute
- Ryan Fish, Planning/Emergency Management, USCG-North Bend
- Alan Freudenthal, Oregon State Parks
- Laura Gabel, Coastal Field Geologist, DOGAMI

- Eli Grove, Emergency Preparedness Coordinator Trainee, Confederated Tribes of Siletz Indians
- Lisa Phipps, North Coast Regional Representative, DLCD
- Meg Reed, Coastal Shores Specialist, DLCD
- Hui Rodomsky, South Coast Regional Representative, DLCD
- Katherine Stanton, Applied Anthropology, OSU
- Jenna Tilt, Assistant Professor (Sr. Research), OSU
- Matt Williams, Geohazards Analyst, DOGAMI

## **Institute for Policy Research and Engagement Team**

- Michael Howard, OPDR Director
- Emerson Hoagland, Research Assistant
- Curtis Thomas, Research Assistant
- Conrad Hock, Resource Assistance for Rural Environments

## **Additional Thanks:**

To the Department of Geology and Mineral Industries for assistance with hazard data; the Department of Land Conservation and Development staff in the hazards for flood data, mapping and process support; to the Oregon Office of Emergency Management for grant administration and process support.

## **About the Institute for Policy Research and Engagement**

The Institute for Policy Research and Engagement (IPRE), a research center affiliated with the School of Planning, Public Policy and Management at the University of Oregon, is an interdisciplinary organization that assists Oregon communities by providing planning and technical assistance to help solve local issues and improve the quality of life for Oregon residents. The role of the IPRE is to link the skills, expertise and innovation of higher education with the transportation, economic development and environmental needs of communities and regions in the State of Oregon, thereby providing service to Oregon and learning opportunities to the students involved.

## **About the Oregon Partnership for Disaster Resilience**

The Oregon Partnership for Disaster Resilience (OPDR) is a coalition of public, private and professional organizations working collectively toward the mission of creating a disaster-resilient and sustainable state. Developed and coordinated by the Institute for Policy Research and Engagement at the University of Oregon, the OPDR employs a service-learning model to increase community capacity and enhance disaster safety and resilience statewide.

## **NHMP Template Disclaimer**

This NHMP is based in part on a plan template developed by the Oregon Partnership for Disaster Resilience. The template is structured to address the requirements contained in 44 CFR 201.6; where language is applicable to communities throughout Oregon, OPDR encourages the use of standardized language. As part of this regional planning initiative, OPDR provided copies of the plan templates to communities for use in developing or updating their hazards mitigation plans. OPDR hereby authorizes the use of all content and language provided to Lincoln County in the plan template.



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# PLAN SUMMARY

Lincoln County updated this Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP) to prepare for the long-term effects resulting from hazards. It is impossible to predict exactly when these hazards will occur, or the extent to which they will affect the community. However, with careful planning and collaboration among public agencies, private sector organizations and citizens within the community, it is possible to create a resilient community that will benefit from long-term recovery planning efforts.

FEMA defines mitigation as “. . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk.” Said another way, hazard mitigation is a method of permanently reducing or alleviating the losses of life, property and injuries resulting from hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances, projects, such as seismic retrofits to critical facilities; and education and outreach to targeted audiences, such as non-English speaking residents or the elderly. Hazard mitigation is the responsibility of the “Whole Community.” FEMA defines Whole Community as, “private and nonprofit sectors, including businesses, faith-based and disability organizations and the public, in conjunction with the participation of local, tribal, state, territorial and Federal governmental partners.”

*44 CFR 201.6 – The local mitigation plan is the representation of the jurisdiction’s commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. . . .*

## Why Develop this Mitigation Plan?

The Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201 require that jurisdictions maintain an approved NHMP in order to receive FEMA Hazard Mitigation Assistance (HMA) funds for mitigation projects. To that end, Lincoln County is involved in a broad range of hazard and emergency management planning activities. Local and federal approval of this NHMP ensures that the County and listed jurisdictions will (1) remain eligible for pre- and post-disaster mitigation project grants and (2) promote local mechanisms to accomplish risk reduction strategies.

*44 CFR 201.6(a)(1) – A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants . . .*

**What is Mitigation?**

“Any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.”

- U.S. Federal Emergency Management Agency

## Who Participated in Developing the Plan?

The Lincoln County NHMP is the result of a collaborative effort between the County, cities, special districts, citizens, public agencies, non-profit organizations, the private sector and regional organizations. County, city, and special district Steering Committees guided the NHMP development process.

For a list of specific County steering committee participants, refer to the acknowledgements section above. The update process included representatives from the following jurisdictions and agencies: Lincoln County, Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport, Yachats, Central Lincoln PUD, Lincoln County School District, Seal Rock Water District, Department of Land Conservation and Development, Department of Geology and Mineral Industries, U.S. Coast Guard – Newport Station, Confederated Tribes of Siletz Indians, Oregon Climate Change Research Institute, and Oregon State University.

The Lincoln County Emergency Manager and Planning and Development Director convened the planning process and will take the lead in implementing, maintaining and updating the plan. Each of the participating cities and special districts have also named a local convener

*44 CFR 201.6(c)(1) – Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.*

who is responsible for implementing, maintaining and updating their Jurisdictional Addendum (see addenda for specific names and positions). Lincoln County is dedicated to directly involving the public in the continual review and update of the NHMP. The County achieves this through systematic engagement of a wide variety of active groups, organizations or committees, public and private infrastructure partners, watershed and neighborhood

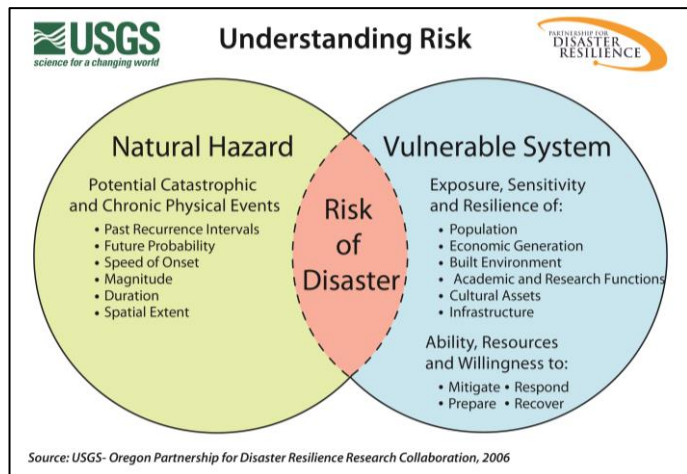
groups and numerous others. Although members of the steering committee represent the public to some extent, the public will continue to provide feedback about the NHMP throughout the implementation and maintenance period.

## How Does this NHMP Reduce Risk?

The NHMP is a tool for Lincoln County to use to mitigate the impacts of natural hazards by identifying resources, information, and strategies for risk reduction. It is also intended to guide and coordinate mitigation activities throughout the County. A risk assessment consists of three phases: hazard identification, vulnerability assessment and risk analysis, as illustrated in Figure PS-1.

By identifying and understanding the relationship between hazards, vulnerable systems and existing capacity,

Figure PS-1 Understanding Risk



Lincoln County is better equipped to identify and implement actions aimed at reducing the overall risk to hazards.

## What is Lincoln County’s Overall Risk to Hazards?

Lincoln County reviewed and updated the risk assessment to evaluate the probability of each hazard as well as the vulnerability of the community to that hazard. Table PS-1 summarizes hazard probability and vulnerability as determined by the County steering committee (for more information see Volume I, Section 2).

*44 CFR 201.6(c)(2) – A Risk Assessment that provides the factual basis for activities proposed in the strategy . . .*

**Table PS-1 Hazard Analysis Matrix – Lincoln County**

Hazard	Maximum		Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability			
Windstorm	20	50	100	70	Top Tier
Winter Storm (Snow/Ice)	18	35	90	70	
Landslide	20	40	80	70	
Earthquake (Cascadia)	10	50	100	49	
Wildfire	20	25	90	70	
Tsunami (Local)	2	40	100	49	
Flood (Riverine)	20	30	60	70	Middle Tier
Flood (Coastal)	20	30	40	70	
Drought	20	25	40	70	
Coastal Erosion	20	15	30	70	
Tornado	8	10	30	56	Bottom Tier
Tsunami (Distant)	10	15	40	35	
Earthquake (Crustal)	10	20	40	21	
Volcanic Event	2	5	40	7	

Source: Lincoln County NHMP Steering Committee (2020)

## What is the NHMP’s Mission?

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community’s environment or priorities change.

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## What are the NHMP Goals?

Mitigation plan goals are more specific statements of direction that Lincoln County residents, and public and private partners can use to plan their work to reduce the risk from natural hazards and to identify if it is successful. These statements of direction form a bridge between the broad mission statement and particular action items. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

*44 CFR 201.6(c)(3)(i) – A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Public participation was a key aspect in developing the plan goals. Meetings with the project steering committee, stakeholder interviews and public workshops all served as methods to obtain input and priorities in developing goals for reducing risk and preventing loss for natural hazards in Lincoln County.

All the plan goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available. Below is a list of the re-confirmed plan goals:

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## How are the Action Items Organized?

The action items are organized within an action matrix included within Section 3, Mitigation Strategy.

Data collection, research and the public participation process resulted in the development of the action items. The Action Item Matrix portrays the plan framework and identifies linkages between the plan goals and actions. The matrix documents the title of each action along with, the coordinating organization, timeline and the NHMP goals addressed. City and special district specific action items are included in Volume II, Jurisdictional Addenda.

*44 CFR 201.6(c)(3)(ii) – A section that identifies and analyzes a comprehensive range of specific mitigation actions . . .*

## Comprehensive Action Plan

Action items are detailed recommendations for activities that local departments, citizens, and others could engage in to reduce risk. The Steering Committee will prioritize the following actions to focus their attention, and resource availability, upon an achievable set of high leverage activities over the next five-years.

*44 CFR 201.6(c)(3)(iii) – An action plan describing how the actions . . . will be prioritized, implemented and administered . . .*

*44 CFR 201.6(c)(4) – A plan maintenance process . . .*

- **Multi-Hazard #6:** Integrate the NHMP into County and City comprehensive plans.
- **Multi-Hazard #7:** Prepare long-term catastrophic recovery plan.
- **Multi-Hazard #8:** Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
- **Coastal Erosion #2:** Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
- **Earthquake #1:** Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
- **Earthquake #2:** Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
- **Earthquake #3:** Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
- **Tsunami #1:** Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami inundation zone and likely to be impacted by tsunami.
- **Landslide #3:** Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
- **Severe Weather #2:** Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.

- **Wildfire #1:** Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

The implementation and maintenance section (Section 4) details the formal process that will ensure that the Lincoln County NHMP remains an active and relevant document. The Lincoln County Emergency Manager and Planning and Community Development Director are the designated conveners (NHMP Conveners) and are responsible for overseeing the review and implementation processes (see jurisdictional addenda for city and special district conveners). The NHMP maintenance process includes a schedule for monitoring and evaluating the NHMP semi-annually and revising the NHMP every five years. This section also describes how the communities will integrate public participation throughout the implementation and maintenance process.

The accomplishment of the NHMP goals and actions depends upon regular steering committee participation and adequate support from County, city, and special district leadership. Comprehensive familiarity with this NHMP will result in the efficient and effective implementation of appropriate mitigation activities and a reduction in the risk and the potential for loss from future natural hazard events.

## NHMP Adoption

Once the NHMP is locally reviewed and deemed complete the NHMP Convener (or their designee) submits it to the State Hazard Mitigation Officer at the Oregon Office of Emergency Management (OEM). OEM reviews the NHMP and submits it to FEMA Region X for pre-approval. This review will address the federal criteria outlined in [44 CFR Part 201.6](#).

Once pre-approved by FEMA, the County, cities, and special districts may formally adopt it via resolution.

The Lincoln County NHMP Convener will be responsible for ensuring local adoption of the NHMP and providing the support necessary to ensure NHMP implementation. Once the resolution is executed at the local level and documentation is provided to FEMA, the NHMP will be formally approved by FEMA and the County, participating cities, and special districts will regain eligibility for Hazard Mitigation Assistance (HMA) grant programs

The steering committees for Lincoln County and participating cities and special districts each met to review the NHMP update process and their governing bodies adopted the NHMP as shown below and in Volume II.

*44 CFR 201.6(c)(5) – Documentation that the plan has been formally adopted by the governing body of the jurisdiction . . .*

*44 CFR 201.6(d) – Plan review [process] . . .*

## County Date of Adoption and Approval

Lincoln County adopted the NHMP on **December 21, 2020**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020**. With approval of this NHMP, the County is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act’s hazard mitigation project grants through **December 28, 2025**.

*For the date of adoption for each participating city or special district see Volume II.*



# **Volume I: Basic Plan**

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# SECTION I: INTRODUCTION

This section provides a general introduction to natural hazard mitigation planning in Lincoln County. In addition, it addresses the planning process requirements contained in 44 CFR 201.6(b) thereby meeting the planning process documentation requirement contained in 44 CFR 201.6(c)(1). The section concludes with a general description of how the NHMP is organized.

## What is Natural Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) defines mitigation as “. . . the effort to reduce loss of life and property by lessening the impact of disasters . . . through risk analysis, which results in information that provides a foundation for mitigation activities that reduce risk.”<sup>1</sup> Said another way, natural hazard mitigation is a method of permanently reducing or alleviating the losses of life, property and injuries resulting from natural hazards through long and short-term strategies. Example strategies include policy changes, such as updated ordinances, projects, seismic retrofits to critical facilities and education and outreach to targeted audiences, such as Spanish speaking residents or the elderly. Natural hazard mitigation is the responsibility of the “Whole Community”; individuals, private businesses and industries, state and local governments and the federal government.

Engaging in mitigation activities provides jurisdictions (counties, cities, special districts, etc.) with many benefits, including reduced loss of life, property, essential services, critical facilities and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

## Why Develop a Mitigation Plan?

Lincoln County updated this Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP) to reduce future loss of life and damage to property resulting from natural hazards. It is impossible to predict exactly when natural hazard events will occur, or the extent to which they will affect community assets. However, with careful planning and collaboration among public agencies, private sector organizations and citizens within the community, it is possible to minimize the losses that can result from natural hazards.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K) and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption and federal approval of this NHMP ensures that the County and listed cities will remain eligible for pre- and post-disaster mitigation project grants.

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<sup>1</sup> FEMA, *What is Mitigation?* <http://www.fema.gov/what-mitigation>

## What Federal Requirements Does This NHMP Address?

DMA2K is the latest federal legislation addressing mitigation planning. It reinforces the importance of mitigation planning and emphasizes planning for natural hazards before they occur. As such, this Act established the Pre-Disaster Mitigation (PDM) grant program and new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act specifically addresses mitigation planning at the state and local levels. State and local jurisdictions must have approved mitigation plans in place in order to qualify to receive post-disaster HMGP funds. Mitigation plans must demonstrate that State and local jurisdictions' proposed mitigation measures are based on a sound planning process that accounts for the risk to people, local jurisdictions, and the State.

Chapter 44 Code of Federal Regulations (CFR), section 201.6, also requires a local government to have an approved NHMP in order to receive HMGP project grants.<sup>2</sup> Pursuant of Chapter 44 CFR, the NHMP planning processes shall include opportunity for the public to comment on the NHMP during review and the updated NHMP shall include documentation of the public planning process used to develop the NHMP.<sup>3</sup> The NHMP update must also contain a risk assessment, mitigation strategy and a NHMP maintenance process that has been formally adopted by the governing body of the jurisdiction.<sup>4</sup> Lastly, the NHMP must be submitted to the Oregon Office of Emergency Management (OEM) for initial review and then sent to FEMA for federal approval.<sup>5</sup> Additionally, a recent change in the way OEM administers the Emergency Management Performance Grant (EMPG), which helps fund local emergency management programs, also requires a FEMA-approved NHMP.

## What is the Policy Framework for Natural Hazards Planning in Oregon?

Planning for natural hazards is an integral element of Oregon's statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and implementing ordinances that are required to comply with the statewide planning goals. The challenge faced by state and local governments is to keep this network of local plans coordinated in response to the changing conditions and needs of Oregon communities.

Statewide land use planning Goal 7: Areas Subject to Natural Hazards calls for local plans to include inventories, policies and ordinances to guide development in or away from hazard areas. Goal 7, along with other land use planning goals, has helped to reduce losses from natural hazards. Through risk identification and the recommendation of risk-reduction actions, this NHMP aligns with the goals of the jurisdiction's Comprehensive Plan and helps each jurisdiction meet the requirements of statewide land use planning Goal 7.

The primary responsibility for the development and implementation of risk reduction strategies and policies lies with local jurisdictions. However, additional resources exist at the state and federal levels. Some of the key agencies in this area include OEM, Oregon Building Codes Division (BCD), Oregon Department of Forestry (ODF), Oregon Department of

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<sup>2</sup> Code of Federal Regulations, Chapter 44. Section 201.6, subsection (a), 2015

<sup>3</sup> *ibid*, subsection (b). 2015

<sup>4</sup> *ibid*, subsection (c). 2015

<sup>5</sup> *ibid*, subsection (d). 2015

Geology and Mineral Industries (DOGAMI) and the Department of Land Conservation and Development (DLCD).

## How was the NHMP Developed?

The NHMP was developed by the Lincoln County NHMP Steering Committee and the Steering Committees for the participating jurisdictions (cities and special districts). The Lincoln County Steering Committee formally convened on two occasions to discuss and revise the NHMP. Each of the participating city and special district steering committees participated in the County NHMP update process. Steering Committee members contributed data and maps, reviewed and updated the community profile, risk assessment, action items, and implementation and maintenance plan.

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunity for the public, neighboring communities, local and regional agencies, as well as, private and non-profit entities to comment on the NHMP during review.<sup>6</sup> Lincoln County provided an accessible project website for the public to provide feedback on the draft NHMP: <https://www.co.lincoln.or.us/planning/page/natural-hazards-mitigation-plan>

In addition, Lincoln County provided a press release on their website to encourage the public to offer feedback on the NHMP update. The County, city, and special district websites continue to be a focal point for distribution natural hazard information using hazard viewers, emergency alerts, hazard preparation and annual natural hazard progress reports. In addition, the County administered a survey (see Appendix F) that was used to inform the content of, and prioritization, of action items.

## How is the NHMP Organized?

Each volume of the NHMP provides specific information and resources to assist readers in understanding the hazard-specific issues facing county and city residents, businesses and the environment. Combined, the sections work in synergy to create a mitigation plan that furthers the community's mission to reduce or eliminate long-term risk to people and their property from hazards and their effects. This NHMP structure enables stakeholders to use the section(s) of interest to them.

### Volume I: Basic Plan

#### Plan Summary

The NHMP summary provides an overview of the FEMA requirements, planning process and highlights the key elements of the risk assessment, mitigation strategy and implementation and maintenance strategy.

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<sup>6</sup> Code of Federal Regulations, Title 44. Section 201.6, subsection (b). 2015

## Section I: Introduction

The Introduction briefly describes the countywide mitigation planning efforts and the methodology used to develop the NHMP.

## Section 2: Hazard Identification and Risk Assessment

This section provides the factual basis for the mitigation strategies contained in Volume I, Section 3. (Additional information is included within Volume III, Appendix C, which contains an overall description of Lincoln County and the incorporated cities.) This section includes a brief description of community sensitivities and vulnerabilities. The Risk Assessment allows readers to gain an understanding of each jurisdiction's vulnerability and resilience to natural hazards.

A hazard summary is provided for each of the hazards addressed in the NHMP. The summary includes hazard history, location, extent, vulnerability, impacts and probability. This NHMP addresses the following hazards:

- Coastal Erosion
- Drought
- Earthquake
- Tsunami
- Flood
- Landslide
- Severe Weather
  - Windstorm (& Tornado)
  - Winter Storm (snow/ice)
- Volcanic Event
- Wildfire

Additionally, this section provides information on each jurisdictions' participation in the National Flood Insurance Program (NFIP).

## Section 3: Mitigation Strategy

This section documents the NHMP vision, mission, goals and actions (mitigation strategy) and describes the components that guide implementation of the identified actions. Actions are based on community sensitivity and resilience factors and the risk assessments in Volume I, Section 2 and Volume II.

## Section 4: Plan Implementation and Maintenance

This section provides information on the implementation and maintenance of the NHMP. It describes the process for prioritizing projects and includes a suggested list of tasks for updating the NHMP, to be completed at the semi-annual and five-year review meetings.

## Volume II: Jurisdictional Addenda

Volume II of the NHMP is reserved for any city or special district addenda developed through this multi-jurisdictional planning process. Each of the cities with a FEMA approved addendum went through an update to coincide with the county's update. As such, the five-year update cycle will be the same for the participating cities, special districts, and the county.

The NHMP includes addenda for the following cities and special districts:

- Depoe Bay
- Lincoln City
- Toledo
- Waldport

- Newport
- Siletz
- Yachats
- Central Lincoln PUD
- Lincoln County School District
- Seal Rock Water District

## **Volume III: Appendices**

The appendices are designed to provide the users of the Lincoln County NHMP with additional information to assist them in understanding the contents of the NHMP and provide them with potential resources to assist with NHMP implementation.

### **Appendix A: Action Item Forms**

This appendix contains the detailed action item forms for each of the mitigation strategies identified in this NHMP.

### **Appendix B: Planning and Public Process**

This appendix includes documentation of all the countywide public processes utilized to develop the NHMP. It includes invitation lists, agendas and sign-in sheets of Steering Committee meetings as well as any other public involvement methods.

### **Appendix C: Community Profile**

The community profile describes the County from several perspectives to help define and understand the region's sensitivity and resilience to natural hazards. The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the region when the NHMP was updated.

### **Appendix D: Economic Analysis of Natural Hazard Mitigation Projects**

This appendix describes the FEMA requirements for benefit cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

### **Appendix E: Grant Programs and Resources**

This appendix lists state and federal resources and programs by hazard.

### **Appendix F: Community Survey**

This appendix includes the survey instrument and results from the community survey administered by OPDR and Lincoln County.

### **Appendix G: Future Climate Projects: Lincoln County**

This appendix includes a report produced by the Oregon Climate Change Research Institute (OCCRI). The reports provides important information regarding the influence and impacts of climate change on existing natural hazards events such as coastal erosion and flooding, river flooding, ocean temperature and chemistry, loss of coastal wetland ecosystems, drought, heat waves, cold waves, wildfire, and air quality.

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## SECTION 2: HAZARD IDENTIFICATION AND RISK ASSESSMENT

This section of the NHMP addresses 44 CFR 201.6(c)(2) - Risk Assessment. The Risk Assessment applies to Lincoln County and the city addenda included in the NHMP. We address city specific information where relevant. In addition, this section can assist with addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards.

We use the information presented in this section, along with community characteristics presented in Volume III, Appendix C to inform the risk reduction actions identified Volume I, Section 3. Figure 2-1 shows how we conceptualize risk in this NHMP. Ultimately, the goal of hazard mitigation is to reduce the area where hazards and vulnerable systems overlap.

**Figure 2-1 Understanding Risk**



Source: Oregon Partnership for Disaster Resilience.

### What is a Risk Assessment?

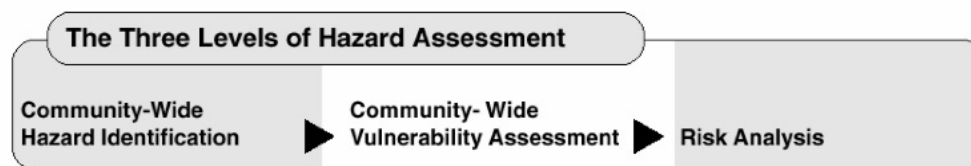
A risk assessment consists of three phases: hazard identification, vulnerability assessment and risk analysis.

- **Phase 1:** Identify hazards that can affect the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.

- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The following figure illustrates the three-phase risk assessment process:

**Figure 2-2 Three Phases of a Risk Assessment**



Source: Planning for Natural Hazards: Oregon Technical Resource Guide, 1998

This three-phase approach to developing a risk assessment should be conducted sequentially because each phase builds upon data from prior phases. However, gathering data for a risk assessment need not occur sequentially.

## Hazard Identification

Lincoln County identifies eight natural hazards that could have an impact on the County and participating cities and special districts. Table 2-1 lists the hazards identified in the County in comparison to the hazards identified in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#) which includes Lincoln County.

**Table 2-1 Lincoln County Hazard Identification**

Lincoln County	Oregon NHMP Region 1: Oregon Coast
Coastal Erosion	Coastal Hazards*
-	Dam Safety
Drought	Drought
-	Extreme Heat
Earthquake (Cascadia/ Crustal)	Earthquake (Cascadia/ Crustal)
Flood (Riverine/ Coastal)	Flood (Riverine/ Coastal)
Landslide	Landslide
Tornado	-
Tsunami (Local/ Distant)	Tsunami (Local/ Distant)
Volcanic Events	Volcano
Wildfire	Wildfire
Windstorm	Windstorm
Winter Storm	Winter Storm

Source: Lincoln County NHMP Steering Committee (2019) and State of Oregon NHMP, Region 1: Oregon Coast (2020)

\* - Coastal Hazards include coastal erosion and flooding

## Hazard Analysis Matrix and Methodology

For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response and recovery. The method provides the jurisdiction with a sense of hazard priorities but does not predict the occurrence of a hazard.

For the purposes of this NHMP, the County, cities, and special districts utilized the Oregon Office of Emergency Management (OEM) Hazard Analysis methodology. The hazard analysis methodology in Oregon was first developed by FEMA circa 1983 and gradually refined by OEM over the years.

The methodology produces scores that range from 24 (lowest possible) to 240 (highest possible). Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score and probability approximately 40%. We include the hazard analysis summary here to ensure consistency between the EOP and NHMP.

The Oregon method provides the jurisdiction with a sense of hazard priorities, or relative risk. It doesn't predict the occurrence of a hazard, but it does "quantify" the risk of one hazard compared with another. By doing this analysis, planning can first be focused where the risk is greatest.

In this analysis, severity ratings and weight factors, are applied to the four categories of history, vulnerability, maximum threat (worst-case scenario) and probability.

## Probability and Vulnerability Summary

Table 2-2 presents the probability scores for each of the natural hazards present in Lincoln County for which descriptions are provided herein. Probability assesses the likelihood that a hazard event will take place in the future. Vulnerability assesses the extent to which people are susceptible to injury or other impacts resulting from the average occurrence of a hazard as well as the exposure of the built environment or other community assets (social, environmental, economic, etc.) to hazards. The exposure of community assets to hazards is critical in the assessment of the degree of risk a community has to each hazard. Identifying the populations, facilities and infrastructure at risk from various hazards can assist the County in prioritizing resources for mitigation and can assist in directing damage assessment efforts after a hazard event has occurred. The exposure of County assets to each hazard and potential implications are explained in each hazard section.

Community vulnerabilities are an important component of the NHMP risk assessment. Changes to population, economy, built environment, critical facilities, and infrastructure have not significantly influenced vulnerability within the unincorporated County. New development has complied with the standards of the Oregon Building Code and the county's development code including their floodplain ordinance. For more in-depth information regarding specific community vulnerabilities see Volume II and Volume III, Appendix C.

The hazard analysis matrix involves estimating the damage, injuries and costs likely to be incurred in a geographic area over time. Risk has two measurable components: (1) the magnitude of the harm that may result, defined through the vulnerability assessment (assessed in the previous sections) and (2) the likelihood or probability of the harm occurring.

### **Jurisdiction Specific Risk Assessment**

Each participating jurisdiction (cities and special districts) in Lincoln County completed a jurisdiction specific hazard analysis that assessed each jurisdiction's risks where they vary

from the risks facing the entire planning area. The multi-jurisdictional risk assessment information is located within each jurisdiction’s addendum in Volume II.

**Table 2-2 Probability and Vulnerability Assessment Summary**

Hazard	Probability	Vulnerability
Coastal Erosion	High	Low
Drought	High	Moderate
Earthquake (Cascadia)	Moderate	High
Earthquake (Crustal)	Low	Moderate
Flood (Coastal)	High	Moderate
Flood (Riverine)	High	Moderate
Landslide	High	High
Tornado	High	Low
Tsunami (Distant)	Moderate	Low
Tsunami (Local)	Moderate	High
Volcanic Events	Low	Low
Wildfire	High	Moderate
Windstorm	High	High
Winter Storm (Snow/Ice)	High	Moderate

Source: Lincoln County Steering Committee, 2020

Table 2-3 presents the updated hazard analysis matrix for Lincoln County. The hazards are listed in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. With considerations for past historical events, the probability or likelihood of a hazard event occurring, the vulnerability to the community and the maximum threat or worst-case scenario, windstorm, winter storm, landslide, the Cascadia Subduction Zone earthquake, wildfire, and local tsunami rank as the top hazard threats to the County (top tier). Flood (riverine and coastal), drought, and coastal erosion rank in the are the next highest ranked hazards (middle tier). Tornado, distant tsunami, crustal earthquake, and volcanic event (ashfall, tephra) comprise the lowest ranked hazards in the county (bottom tier).

**Table 2-3 Hazard Analysis Matrix – Lincoln County**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Winter Storm (Snow/Ice)	18	35	90	70	213	#2	
Landslide	20	40	80	70	210	#3	
Earthquake (Cascadia)	10	50	100	49	209	#4	
Wildfire	20	25	90	70	205	#5	
Tsunami (Local)	2	40	100	49	191	#6	
Flood (Riverine)	20	30	60	70	180	#7	Middle Tier
Flood (Coastal)	20	30	40	70	160	#8	
Drought	20	25	40	70	155	#9	
Coastal Erosion	20	15	30	70	135	#10	
Tornado	8	10	30	56	104	#11	Bottom Tier
Tsunami (Distant)	10	15	40	35	100	#12	
Earthquake (Crustal)	10	20	40	21	91	#13	
Volcanic Event	2	5	40	7	54	#14	

Source: Lincoln County Steering Committee, 2020

## Federal Disaster and Emergency Declarations

Reviewing past events can provide a general sense of the hazards that have caused significant damage in the county. Where trends emerge, disaster declarations can help inform hazard mitigation project priorities.

President Dwight D. Eisenhower approved the first federal disaster declaration in May 1953 following a tornado in Georgia. Since then, federally declared disasters have been approved within every state because of natural hazard related events. As of September 17, 2020 FEMA has approved a total of 38 major disaster declarations, 56 fire management assistance declarations, 36 fire suppression authorizations, and four (4) emergency declarations in Oregon.<sup>1</sup> When governors ask for presidential declarations of major disaster or emergency, they stipulate which counties in their state they want included in the declaration.

Table 2-4 summarizes fire management assistance, fire suppression authorizations, and emergency declarations. Fire Management Assistance may be provided after a State submits a request for assistance to the FEMA Regional Director at the time a "threat of major disaster" for a fire emergency exists. There is one fire management assistance declaration or fire suppression authorizations on record for the county related to the 2020 Echo Mountain Fire Complex.

An Emergency Declaration is more limited in scope and without the long-term federal recovery programs of a Major Disaster Declaration. Generally, federal assistance and funding are provided to meet a specific emergency need or to help prevent a major disaster from occurring. Lincoln County has two recorded Emergency Declarations related to the 2005 Hurricane Katrina evacuation, the 2020 COVID-19 Pandemic, and the 2020 Oregon wildfires.

**Table 2-4 FEMA Fire Management (FM) and Emergency Declarations (EM) for Lincoln County**

Declaration Number	Declaration Date	Incident Period		Incident	Individual Assistance	Public Assistance Categories
		From	To			
FM-5362	9/9/2020	9/8/2020	-	Echo Mountain Fire Complex	None	-
EM-3228	9/7/2005	8/29/2005	10/1/2005	Hurricane Katrina Evacuation	None	B
EM-3429	3/13/2020	1/20/2020	-	COVID-19 Pandemic	None	B
EM-3542	9/10/2020	9/8/2020	-	Oregon Wildfires	None	-

Source: FEMA, Oregon Disaster History. Major Disaster Declarations.

Note: Oregon was granted an Emergency Declaration to support the Hurricane Katrina Evacuation. The Oregon National Guard deployed over 2,100 soldiers and their equipment to New Orleans in less than three days.

Table 2-5 summarizes the major disasters declared in Oregon that affected Lincoln County, since 1955. The table shows that there have been 17 major disaster declarations for Lincoln County. Most of which were related to weather events resulting primarily in flooding, landslide, winter storm (snow, ice), wildfire and related damage. There has been one disaster declaration for tsunami and for the 2020 COVID-19 Pandemic.

<sup>1</sup> FEMA, *Declared Disasters by Year or State*, <https://www.fema.gov/disasters/#>. Accessed July 1, 2020.

**Table 2-5 FEMA Major Disaster (DR) for Lincoln County**

Declaration Number	Declaration Date	Incident Period		Incident	Individual Assistance	Public Assistance Categories
		From	To			
DR-184	12/24/1964	12/24/1964	12/24/1964	Heavy Rains and Flooding	Yes	A, B, C, D, E, F, G
DR-319	1/21/1972	1/21/1972	1/21/1972	Severe Storms, Flooding	Yes	A, B, C, D, E, F, G
DR-413	1/25/1974	1/25/1974	1/25/1974	Severe Storms, Snowmelt, Flooding	Yes	A, B, C, D, E, F, G
DR-1099	2/9/1996	2/4/1996	2/21/1996	Severe Storms, Flooding	Yes	A, B, C, D, E, F, G
DR-1107	3/19/1997	12/10/1996	12/12/1996	Severe Storms, High Winds	None	A, B, C, D, E, F, G
DR-1510	2/19/2004	12/26/2003	1/14/2004	Severe Winter Storm	None	A, B, C, D, E, F, G
DR-1632	3/20/2006	12/18/2005	1/21/2006	Severe Storms, Flooding, Landslides, Mudslides	None	A, B, C, D, E, F, G
DR-1672	12/29/2006	11/5/2006	11/8/2006	Severe Storms, Flooding, Landslides, and Mudslides	None	A, B, C, D, E, F, G
DR-1683	2/22/2007	12/14/2006	12/15/2006	Severe Winter Storm and Flooding	None	A, B, C, D, E, F, G
DR-1733	12/8/2007	12/1/2007	12/17/2007	Severe Storms, Flooding, Landslides, and Mudslides	None	A, B, C, D, E, F, G
DR-1956	2/17/2011	1/13/2011	1/21/2011	Severe Winter Storm, Flooding, Mudslides, Landslides, And Debris Flows	None	A, B, C, D, E, F, G
DR-1964	3/25/2011	3/11/2011	3/11/2011	Tsunami Wave Surge	None	A, B, C, D, E, F, G
DR-4055	3/2/2012	1/17/2012	1/21/2012	Severe Winter Storm, Flooding, Landslides, and Mudslides	None	A, B, C, D, E, F, G
DR-4169	4/4/2014	2/6/2014	2/10/2014	Severe Winter Storm	None	A, B, C, D, E, F, G
DR-4258	2/17/2016	12/6/2015	12/23/2015	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	None	A, B, C, D, E, F, G
DR-4499	3/28/2020	1/20/2020	-	COVID-19 Pandemic	None	A, B
DR-4562	6/7/2020	continuing	9/15/2020	Wildfires, Straight-line Winds	Yes	B

Source: FEMA, Oregon Disaster History. Major Disaster Declarations.

## Future Climate Variability<sup>2</sup>

Temperatures have increased across Oregon by 2.2 °F in the period 1895–2015 (the observed record). In that same timeframe, Cascade Mountain snowpacks have declined, and higher temperatures are causing earlier spring snowmelt and spring peak streamflows. In

<sup>2</sup> Oregon Climate Change Research Institute (OCCRI), 4<sup>th</sup> Oregon Climate Assessment Report (2019) and Northwest Climate Assessment Report (2013). <http://www.occri.net/publications-and-reports/publications/>

Oregon’s forested areas, large areas have been impacted by disturbances that include wildfire in recent years, and climate change is probably one major factor. <sup>3</sup>

Climate models for Oregon suggest increases in temperature around 0.2-1°F per decade in the 21st Century, along with warmer and drier summers, and some evidence that extreme precipitation will increase in the future. By the 2050s Oregon is expected to see temperature increases between 3.6°F and 5.0°F depending on global emissions.

The Department of Land Conservation and Development (DLCD) contracted with the Oregon Climate Change Research Initiative (OCCRI) to provide an analysis of climate change influences on natural hazards (Appendix G). OCCRI’s *Future Climate Projections: Lincoln County* provides important information regarding the influence and impacts of climate change on existing natural hazards events such as heavy rains, river flooding, drought, heat waves, cold waves, wildfire, air quality, coastal erosion and flooding, and ocean temperature and chemistry (Appendix G).

The basis of the research prepared by OCCRI uses future climate projections that are derived from 10–20 global climate models and have been “downscaled”—made locally relevant. Several climate metrics that relate to natural hazards are being calculated for historical and mid-21<sup>st</sup> century periods under two future emissions scenarios that result in varying future temperature increases for the State of Oregon.















The report describes county-specific projected changes in climate metrics related to the selected natural hazards. The reports present future climate projections for the 2020s (2010-2039 average) and the 2050s (2040-2069 average) compared to the 1971-2000 average historical baseline. Each hazard in the report has a box highlighting “key messages” that call out the main points of the research and analysis for that hazard.

Figure 2-3 provides an overview of expected climate change impacts for Lincoln County. The table shows the direction of change (increasing, decreasing, unchanging) and indicates the level of confidence in direction of change (high, medium, low). According to the OCCRI reports there is very high confidence that heat waves will increase and that cold waves will decrease. The table also shows that there is high confidence that heavy rains, river flooding, wildfire, loss of wetland ecosystems, ocean temperature and chemistry changes, and coastal hazards will increase. The overview describes results for the natural hazards using climate metrics in summary and as a comparison. For more information see the OCCRI report in Appendix G.

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<sup>3</sup> Ibid.

**Figure 2-3 Summary of projected direction of change along with the level of confidence in climate change related risk of natural hazard occurrence.**

	Low Confidence	Medium Confidence	High Confidence	Very High Confidence
Risk Increasing 	 Poor Air Quality	 Drought   Increased Invasive Species Risk	 Heavy Rains Flooding  Wildfire  Loss of Wetland Ecosystems  Ocean Temp & Chemistry Changes  Coastal Hazards 	 Heat Waves
Risk Unchanging =	 Windstorms			
Risk Decreasing 				 Cold Waves

Source: OCCRI. 2020. Future Climate Projections Lincoln County (see Appendix G).

Very high confidence means all models agree on the direction of change and there is strong evidence in the published literature. High confidence means most models agree on the direction of change and there is strong to medium evidence in the published literature. Medium confidence means that there is medium evidence and consensus on the direction of change with some caveats. Low confidence means the direction of change is small compared to the range of model responses or there is limited evidence in the published literature.



# Hazard Profiles

The following subsections briefly describe relevant information for each hazard. For additional background on the hazards, vulnerabilities, and general risk assessment information for hazards in Lincoln County, refer to the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the cities of Lincoln City, Depoe Bay, Siletz, Newport, Toledo, Waldport, and Yachats, and the Confederated Tribes of Siletz Indians, and the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach. The study was funded through the FEMA Risk MAP program and was published in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The County hereby incorporates the Risk Report into this NHMP by reference ([DOGAMI, Open-file Report O-20-11](#)).

Coastal Erosion.....	10
Drought .....	14
Earthquake.....	17
Tsunami .....	31
Flood .....	47
Landslide.....	58
Severe Weather (Windstorm, Tornado, and Winter Storm) .....	67
Windstorm & Tornado.....	68
Winter Storm.....	70
Volcanic Event.....	74
Wildfire.....	77

## Coastal Erosion

### Significant Changes since Previous NHMP:

New data is included from the Risk Report, OCCRI “Future Climate Projections”, and other technical reports.

### Characteristics

Coastal erosion is a natural process that continually affects the entire coast. Erosion becomes a hazard when human development, life and safety are threatened. Waves, currents, tides and storms resulting in episodic and recurrent erosion constantly affect beaches, sand spits, dunes and bluffs. Shoreline retreat may be gradual over a season or many years, or it can be drastic, with the loss of substantial upland area during a single storm event.

Various combinations of large waves, storm surges, rip cell embayments, high winds, rain, runoff, flooding, or increased water levels and ocean conditions caused by periodic El Niño events cause Ocean erosion. Coastal bluffs comprised of uplifted marine terrace deposits and especially coastal dunes are vulnerable to both chronic erosion hazards.

Coastal erosion hazard poses a threat to structures and other development through the retreat of the shoreline from periodic high rates of beach, dune and bluff erosion and from mass wasting of sea cliffs in the form of landslides and slumps due to wave attack and geologic instability.

Coastal erosion is considered a chronic hazard, meaning it is usually local in nature, and the threats to human life and property that arise from it are generally less severe than those associated with catastrophic hazards. However, the wide distribution and frequent occurrence of chronic hazards such as coastal erosion makes them more of an immediate concern.

The damage caused by coastal erosion is usually gradual and cumulative. However, storms that produce large winter waves, heavy rainfall and/or high winds may result in very rapid erosion or other damage that can affect properties and infrastructure in a matter of hours. The regional, oceanic and climatic environments that result in intense winter storms determine the severity of chronic erosion hazards along the Oregon coast.

### Location and Extent

Coastal erosion is a chronic hazard affecting the entire Lincoln County Coast. There are a variety of identifiable factors which affect shoreline stability. Dune-backed shorelines, which are most susceptible to wave attack, make up only a small portion of the Lincoln County coast. Processes of wave attack, including undercutting and wave overtopping, are the primary processes affecting shoreline stability in these areas. Bluff-backed shorelines, while less susceptible to rapid shoreline retreat from wave attack, are nonetheless impacted over time by coastal erosion, particularly during large storm events which result in the formation of rip cell embayments.

Coastal recession rates for Lincoln County were estimated and mapped in the Environmental Hazard Inventory of Coastal Lincoln County, RNKR Associates, 1978.

For more information, see the following DOGAMI reports:

- Coastal flood hazard study, Lincoln County, Oregon (2018, [O-15-06](#))
- Evaluation of erosion hazard zones along the Alsea Bay shoreline between the Alsea Bay Bridge and the Port of Alsea, Lincoln County, Oregon (2013, [O-13-20](#))
- Evaluation of Coastal Erosion Hazard Zones along Dune and Bluff-Backed Shorelines for southern Lincoln County: Seal Rock to Cape Perpetua (Open File Report [O-07-03](#))
- Evaluation of coastal erosion hazard zones along dune and bluff backed shorelines in Lincoln County Oregon: Cascade Head to Seal Rock - Technical report to Lincoln County (Open File Report [O-04-09](#))

Additional reports are available via DOGAMI's Publications Search website:

<https://www.oregongeology.org/pubs/pubsearch.htm>

## History

Chronic coastal erosion has impacted development along the Lincoln County coast for decades. Examples include the Jump Off Joe area in Newport, where a landslide, undermined by ocean wave attack, accelerated during the mid-1940s, carrying roads, drain pipes, and 15 houses seaward to their destruction.<sup>4</sup> Other examples include the severe erosion which took place on the Salishan Spit in the early 1970s, resulting in the destruction of one home under construction. Only a massive effort to armor the shoreline saved the remaining development on the spit. In similar episodes, development on the Bayshore Spit at the mouth of Alsea Bay was threatened by rapid erosion, first in the 1985 El Nino, and again in similar conditions in the winter of 1998. Emergency shore front hardening was employed to save several homes in the Gleneden Beach area that were threatened by bluff face failure.

## Probability Assessment

Based on the available data and research the Steering Committee (Steering Committee) assessed the **probability of experiencing coastal erosion is "high,"** meaning at least one incident is likely within the next 35 years.

Coastal erosion can, and does, occur along the entire Lincoln County coastline. The probability of a coastal erosion event happening is based in part on probabilistic (waves) and deterministic (water levels) values. The active hazard zone for Lincoln County includes coastal bluff and dunes that are undergoing erosion whether by waves, near-shore sediment transport, or mass wasting processes. The active-hazard zone for dune-backed shorelines reflects the area of historic transformation and for bluff-backed shorelines the active-hazard zone includes the beach, bluff toe, and escarpment. DOGAMI has completed coastal erosion hazard maps for Lincoln County that depict the following hazard zones:<sup>5</sup>

- Active-Hazard Zone: Area of active, ongoing erosion.
- High-Hazard Zone: High likelihood that the area could be affected by active erosion in the next 60 years.

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<sup>4</sup> DOGAMI. Geologic Hazards on the Oregon Coast: Coastal Landslides.  
<http://www.oregongeology.com/sub/earthquakes/Coastal/CoastalLandslides.htm>

<sup>5</sup> DOGAMI. 2007. Evaluation of Coastal Erosion Hazard Zones Along Dune and Bluff Backed Shorelines In Southern Lincoln County, Oregon: Seal Rock to Cape Perpetua. Open-File Report O-07-03.

- Moderate-Hazard Zone: Moderate likelihood that the area could be affected by active erosion in the next 60 to 100 years.
- Low-Hazard Zone: Low but significant likelihood that the area could be affected by active erosion in the next 60 to 100 years.

Within Lincoln County the active-hazard zone varies in width from a few meters on cliffy headlands to hundreds of meters on low sloping beaches. Along dune-backed beaches the active-hazard zone experiences near constant change due to movement of dunes, while on bluff-backed shorelines the active-hazard zone includes large areas of active, or potentially, active landslides. For more information see Appendix A “Erosion Hazard Maps” of Open-File Report [O-04-09](#) and Plate 1 of Open-File Report [O-07-03](#).

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the risk of coastal erosion is expected to increase due to sea level rise and changing wave dynamics.

## Vulnerability Assessment

The Steering Committee rated the County as having a “**low**” vulnerability to the coastal erosion hazard; meaning less than 1% of the region’s population or property could be affected by a major emergency or disaster.

Buildings, parks and various infrastructure located along the ocean shore are vulnerable to coastal erosion. This is most obvious in low-lying, dune backed shoreline areas adjacent to bays or the ocean; it is also the case in areas of bluff backed beaches where buildings and infrastructure have been located on readily erodible materials (e.g., consolidated sand, weakly cemented sandstone, siltstone, etc.). The problem is historic.

There are numerous examples of buildings and infrastructure threatened or damaged by wave attack/erosion (e.g. Salishan Spit, Bayshore Spit).

The Oregon SNHMP’s Risk Assessment<sup>6</sup> considers Lincoln County to be the second most vulnerable county to coastal hazards (erosion). Particularly susceptible are the areas listed below:

- Yachats to Alsea Spit (erosion)
- Waldport (erosion and flooding)
- Alsea Spit (erosion; replaced by recent sand inundation)
- Seal Rock (erosion and landsliding)
- Ona Beach to South Beach (erosion and landsliding)
- Newport (landsliding)
- Beverly Beach (erosion and landsliding)
- Gleneden Beach to Siletz (erosion, landsliding, and flooding)
- Lincoln City (erosion and landsliding)

Highway 101 is the major infrastructure component vulnerable to coastal erosion. In Lincoln County, much of the problem is linked to the local geology. Bedrock conditions can and do change abruptly within very short distances. This results in an inconsistent highway

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<sup>6</sup> DLCD. *Oregon Natural Hazards Mitigation Plan*. 2020.

foundation; some sections are more susceptible to erosion than others and require continuous maintenance. There is no practical solution outside of relocation of the highway; in most cases, this option is not financially feasible now.

**Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

The Risk Report provides an analysis of dune-backed beaches and bluff-backed shorelines to identify the general level of susceptibility due to storm-induced erosion, sea level rise, and subsidence due to CSZ earthquake event. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled coastal erosion scenario.

Population Vulnerability (Residents)

Approximately one percent of unincorporated Lincoln County’s population (186 people) may be displaced by coastal erosion within Lincoln County. These people are expected to have mobility or access issues and/or may have their residences impacted by coastal erosion. It is important to note that impact from coastal erosion may vary depending on areas that are impacted during an event. Seal Rock-Bayshore has the most population at risk (105), however, no area has more than five percent of its population impacted by coastal erosion.

**Table 2-6 Potentially Displaced Residents, Coastal Erosion**

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	0	0%
Otis-Rose Lodge	1,926	0	0%
Otter Rock	489	26	5%
Salishan-Lincoln Beach	2,093	39	2%
Seal Rock-Bayshore	2,766	105	4%
Wakonda Beach	1,326	16	1%
<b>Total Unincorporated</b>	<b>18,893</b>	<b>186</b>	<b>1%</b>

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; “Rural” Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

Properties that are most vulnerable to the coastal erosion hazard are those that are developed in an area of steep dunes or cliffs. Just under two percent (358 buildings) of unincorporated Lincoln County buildings are exposed to the high coastal erosion hazard zone. The percent of exposed buildings is greatest in the Otter Rock (8.7%), however,

Salishan-Lincoln Beach and Seal Rock-Bayshore have more total building value at risk (about \$25 million is at risk in each community). The value of exposed buildings is \$63.8 million.<sup>7</sup>

**Table 2-7 Exposed Buildings, Coastal Erosion, by Unincorporated Area**

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate (\$)	Loss Ratio
"Rural" Lincoln County	12,637	2	0.0%	\$197,000	< 1%
Otis-Rose Lodge	1,747	0	0.0%	\$0	0.0%
Otter Rock	634	55	8.7%	\$6,469,000	7.9%
Salishan-Lincoln Beach	2,847	102	3.6%	\$26,168,000	6.7%
Seal Rock-Bayshore	3,345	155	4.6%	\$25,329,000	7.3%
Wakonda Beach	1,614	44	2.7%	\$5,629,000	4.6%
<b>Total Unincorporated</b>	<b>22,824</b>	<b>358</b>	<b>1.6%</b>	<b>\$63,792,000</b>	<b>3.5%</b>

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability

There are no critical facilities exposed to the high coastal erosion zone.

Risk Report Identified Areas of Vulnerability<sup>8</sup>

- Almost every building built adjacent to the shoreline in Lincoln County has some exposure to coastal erosion. During times of high tide occurring along with powerful storms, the rate of erosion can greatly increase.
- Coastal erosion risk is particularly high for the communities of Newport and Otter Rock.

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

<sup>7</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Tables A-1 through A-11.

<sup>8</sup> Ibid. Page 31.

# Drought

## Significant Changes since Previous NHMP:

New data is included from the OCCRI “Future Climate Projections” report and other technical reports.

## Characteristics

A drought is a period of drier than normal conditions. Drought occurs in virtually every climatic zone, but its characteristics vary significantly from one region to another. Drought is a temporary condition; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate. The extent of drought events depends upon the degree of moisture deficiency and the duration and size of the affected area. Typically, droughts occur as regional events and often affect more than one city and county.

There are four types of drought: meteorological, agricultural, hydrological and socioeconomic. *Meteorological drought* is based on the degree of dryness. *Agricultural drought* focuses the amount of soil moisture versus the needs of the crops. *Hydrological drought* is associated with shortfalls of surface and subsurface water supply. *Socioeconomic drought* refers to physical water shortages and its human effect and occurs when the need for water exceeds the supply resulting in a shortfall.

## Location and Extent

Droughts occur in every climate zone and can vary from region to region. Drought may occur throughout Lincoln County and may have profound effects on the economy, particularly the agricultural and hydro-power sectors. The extent of drought depends upon the degree of moisture deficiency, and the duration and size of the affected area. Typically, droughts occur as regional events and often affect more than one county. In severe droughts, environmental and economic consequences can be significant. The extent of the hazard is shown in Figure 2-4.

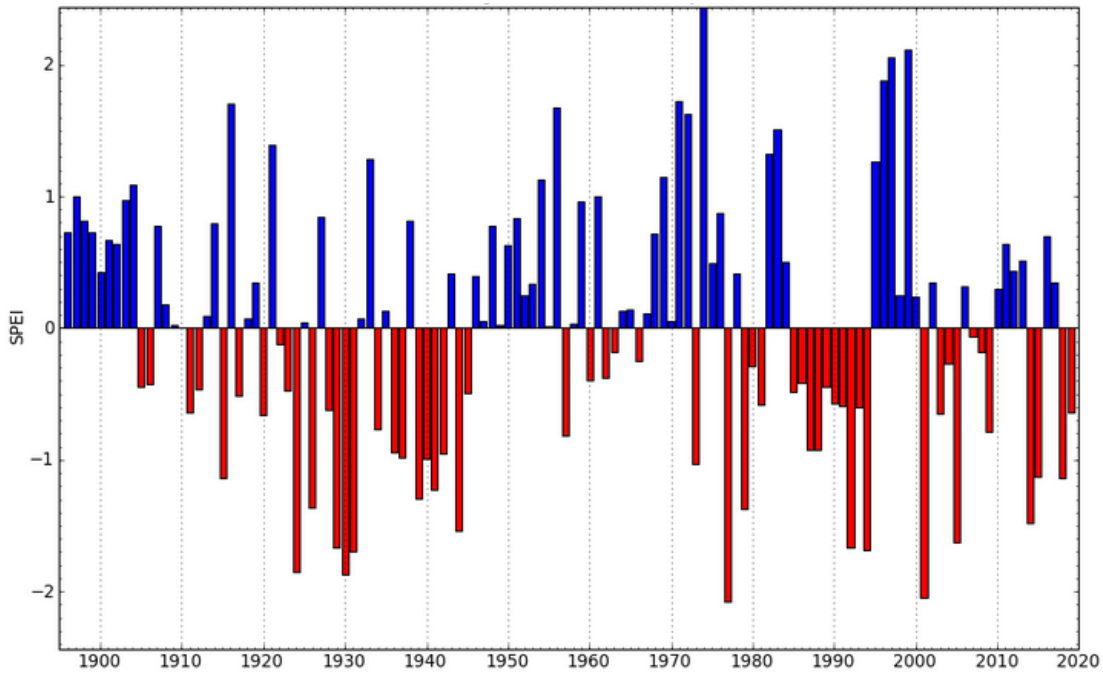
## History

Lincoln County experiences annual dry conditions typically during the summer months from July through September. Drought is typically measured in terms of water availability in a defined geographical area. It is common to express drought with a numerical index that ranks severity. Most federal agencies use the Palmer Method which incorporates precipitation, runoff, evaporation and soil moisture. However, the Palmer Method does not incorporate snowpack as a variable. Therefore, it is not believed to provide a very accurate indication of drought conditions in Oregon and the Pacific Northwest.

The Standardized Precipitation-Evapotranspiration Index (SPEI) is an index of water conditions throughout the state. The index is designed to account for precipitation and evapotranspiration to determine drought. The lowest SPEI values, below -2.0, indicate extreme drought conditions. Severe drought occurs at SPEI values between -2.0 and -1.5, and moderate drought occurs between -1.5 and -1.0.

Figure 2-4 shows the water year (October 1 – September 30) history of SPEI from 1895 to 2019 for Lincoln County. The SPEI record indicates that Lincoln County has experienced two periods of extreme drought (water years 1977 and 2001), eight periods of severe drought (water years 1924, 1929, 1930, 1931, 1944, 1992, 1994, and 2005), and nine periods of moderate drought (1915, 1926, 1939, 1941, 1973, 1979, 2014, 2015, and 2018). Two (2) executive orders declaring drought emergencies by the Governor occurred in 1992 and 2018 and a federally declared drought occurred in 2015.<sup>9</sup>

**Figure 2-4 Standardized Precipitation-Evapotranspiration Index, 12-Months Ending in September, Lincoln County, OR (1896-2019)**



Source: Western Regional Climate Center. West Wide Drought Tracker. <https://wrcc.dri.edu/wwdt/time/>. Created July 6, 2020.

### **El Niño/La Niña**

El Niño Southern Oscillation (ENSO) weather patterns can increase the frequency and severity of drought. During El Niño periods, alterations in atmospheric pressure in equatorial regions yield an increase in the surface temperature off the west coast of North America. This gradual warming sets off a chain reaction affecting major air and water currents throughout the Pacific Ocean; La Niña periods are the reverse with sustained cooling of these same areas. In the North Pacific, the Jet Stream is pushed north, carrying moisture laden air up and away from its normal landfall along the Pacific Northwest coast. In Oregon, this shift results in reduced precipitation and warmer temperatures, normally experienced several months after the initial onset of the El Niño. These periods tend to last nine to twelve months, after which surface temperatures begin to trend back towards the long-term average. El Niño periods tend to develop between March and June, and peak from December to April. ENSO generally follows a two to seven-year cycle, with El Niño or La Niña periods occurring every three to five years. However, the cycle is highly irregular, and no set

<sup>9</sup> Oregon Water Resources Department Public Declaration Status Report, [http://apps.wrd.state.or.us/apps/wr/wr\\_drought/declaration\\_status\\_report.aspx](http://apps.wrd.state.or.us/apps/wr/wr_drought/declaration_status_report.aspx), accessed July 6, 2020.



pattern exists. The last major El Niño was during 1997-1998, and in 2015-2016 Oregon experience a “super” El Niño (the strongest in 15 years, the two previous events occurred in 1982-1983 and 1997-1998) that included record rainfall and snowpack in areas of the state.<sup>10</sup>

## Probability Assessment

Based on the available data and research the Steering Committee (Steering Committee) assessed the **probability of experiencing a locally severe drought as “high”** meaning at least one incident is likely within the next 35 years.

Droughts are not uncommon in the State of Oregon, nor are they just an “east of the mountains” phenomenon. They occur in all parts of the state, in both summer and winter. Oregon’s drought history reveals many short-term and a few long-term events. The average recurrence interval for severe droughts in Oregon is somewhere between 8 and 12 years. Droughts are particularly a concern in parts of Lincoln County that rely on surface water.

### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## Vulnerability Assessment

The Steering Committee rated the County as having a **“moderate” vulnerability to drought hazards**, meaning it is expected that between 1% and 10% of the unincorporated County’s population or property could be affected by a major drought emergency or disaster.

The environmental and economic consequences can be significant, especially for the agricultural sector. Drought also increases the probability of wildfires – a major natural hazard concern for Lincoln County. Drought can affect all segments of Lincoln County’s population, particularly those employed in water-dependent activities (e.g., agriculture, hydroelectric generation, recreation, etc.). Also, domestic water-users may be subject to stringent conservation measures (e.g., rationing) as per the County’s water management plan.

All parts of Lincoln County are susceptible to drought. Potential impacts to county water supplies and the agriculture industry are the greatest threats. Additionally, long-term drought periods of more than a year can impact forest conditions and set the stage for potentially destructive wildfires. The following issues are also of concern: drinking water sources and systems, power and water enterprises, residential and community wells in rural areas, fire response capabilities, and fish and wildlife.

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

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<sup>10</sup> Cho, Renne. “El Nino and global warming – what’s the connection.” Phys.org, February 3, 2016. <https://phys.org/news/2016-02-el-nino-global-warmingwhat.html>

# Earthquake

## Significant Changes since Previous NHMP:

New data is included from the Risk Report and other technical reports.

## Characteristics

The Pacific Northwest in general is susceptible to earthquakes from four sources: 1) the offshore Cascadia Subduction Zone, 2) deep intraplate events within the subducting Juan de Fuca Plate, and 3) shallow crustal events within the North American Plate.

### Crustal Fault Earthquakes

Crustal fault earthquakes are the most common earthquakes and occur at relatively shallow depths of 6-12 miles below the surface.<sup>11</sup> While most crustal fault earthquakes are smaller than magnitude 4 and generally create little or no damage, they can produce earthquakes of magnitudes up to 7, which cause extensive damage.

### Deep Intraplate Earthquakes

Occurring at depths from 25 to 40 miles below the earth's surface in the subducting oceanic crust, deep intraplate earthquakes can reach up to magnitude 7.5.<sup>12</sup> The February 28, 2001 earthquake in Washington State was a deep intraplate earthquake. It produced a rolling motion that was felt from Vancouver, British Columbia to Coos Bay, Oregon and east to Salt Lake City, Utah. A 1965 magnitude 6.5 intraplate earthquake centered south of Seattle-Tacoma International Airport caused seven deaths.<sup>13</sup>

### Subduction Zone Earthquakes

The Pacific Northwest is located at a convergent plate boundary, where the Juan de Fuca and North American tectonic plates meet (Figure 2-5). The two plates are converging at a rate of about 1-2 inches per year. This boundary is called the Cascadia Subduction Zone (CSZ). It extends from British Columbia to northern California. Subduction zone earthquakes are caused by the abrupt release of slowly accumulated stress.<sup>14</sup>

Subduction zones like the CSZ have produced earthquakes with Magnitudes (M) of 8 or larger. Historic subduction zone earthquakes include the 1960 Chile (M 9.5) and 1964 southern Alaska (M 9.2) earthquakes<sup>15</sup> with more recent events being the 2004 Indian Ocean (M 9.1) and 2011 Japan (M 9).

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<sup>11</sup> Madin, Ian P. and Zhenming Wang. Relative Earthquake Hazard Maps Report. (1999) DOGAMI.

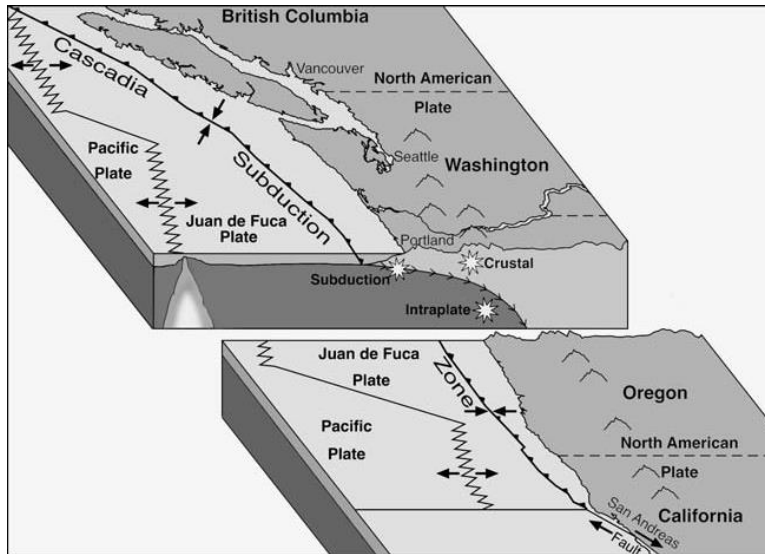
<sup>12</sup> Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000), Ch. 8, pp. 8.

<sup>13</sup> The Oregonian. "A region at risk." March 4, 2001.

<sup>14</sup> Questions and Answers on Earthquakes in Washington and Oregon (February 2001)  
[www.geophys.washington.edu/seis/pnsn/info\\_general/faq.html](http://www.geophys.washington.edu/seis/pnsn/info_general/faq.html).

<sup>15</sup> The Oregonian. "A region at risk." March 4, 2001.

**Figure 2-5 Cascadia Subduction Zone**



Source: Shoreland Solutions. Chronic Coastal Natural Hazards Model Overlay Zone. Salem, OR: Oregon Department of Land Conservation and Development (1998) Technical Guide-3.

The specific hazards associated with earthquakes are explained below:

### Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. Ground shaking is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault that is slipping, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

### Ground Shaking Amplification

Ground shaking amplification refers to the soils and soft sedimentary rocks near the surface that can modify ground shaking from an earthquake. Such factors can increase or decrease the amplification (i.e., strength) as well as the frequency of the shaking. The thickness of the geologic materials and their physical properties determine how much amplification will occur. Ground motion amplification increases the risk for buildings and structures built on soft and unconsolidated soils.

### Surface Faulting

Surface faulting are planes or surfaces in Earth materials along which failure occurs. Such faults can be found deep within the earth or on the surface. Earthquakes occurring from deep lying faults usually create only ground shaking.

### Liquefaction and Subsidence

Liquefaction occurs when ground shaking causes wet, granular soils to change from a solid state into a liquid state. This results in the loss of soil strength and the soil's ability to

support weight. When the ground can no longer support buildings and structures (subsidence), buildings and their occupants are at risk.

The severity of an earthquake is dependent upon a number of factors including: 1) the distance from the earthquake's source (or epicenter); 2) the ability of the soil and rock to conduct the earthquake's seismic energy; 3) the degree (i.e., angle) of slope materials; 4) the composition of slope materials; 5) the magnitude of the earthquake; and 6) the type of earthquake.

#### Earthquake-Induced Landslides and Rockfalls

Earthquake-induced landslides are secondary hazards that occur from ground shaking and can destroy roads, buildings, utilities and critical facilities necessary to recovery efforts after an earthquake. Some Lincoln County communities are built in areas with steep slopes. These areas often have a higher risk of landslides and rockfalls triggered by earthquakes. Landslide hazard is addressed in detail in a separate section.

#### Tsunamis

Tsunamis are another secondary earthquake hazard created by events occurring under the ocean. A tsunami often incorrectly referred to a "tidal wave," is a series of gravity-induced waves that can travel great distances from the earthquake's origin and can cause serious flooding and damage to coastal communities. Tsunami hazard is addressed in detail in a separate section.

### Location and Extent

The seismic hazard for Lincoln County arises predominantly from major earthquakes on the Cascadia Subduction Zone. Additional fault zones throughout the county and region may produce localized crustal earthquakes up to M6.0 and will be less damaging than a CSZ earthquake event which will impact the entire western portion of Oregon. Table 2-8 presents a list of the different Class A faults in, and offshore, of the county that are shown in Figure 2-7. For more information on Class A faults located in Lincoln County see the US Geological Survey, Quaternary Fault and Fold Database: <https://earthquake.usgs.gov/hazards/qfaults/>.

A local earthquake of M 6.0 or a regional M 9.0 earthquake is likely to cause substantial structural damage to bridges, buildings (residential, commercial, industrial), utilities, and communications systems, as well as the following impacts to infrastructure and the environment:

- Floods and landslides
- Fires, explosions, and hazardous materials incidents
- Disruption of vital services such as water, sewer, power, gas, and transportation routes
- Disruption of emergency response systems and services
- Displaced Households
- Economic losses for buildings
- Economic loss to highways, airports, communications
- Generated debris
- Illness, injury, and death

- Significant damage to critical and essential facilities, including schools, hospitals, fire stations, police departments, city hall

**Table 2-8 Class A Faults Located in or near Lincoln County**

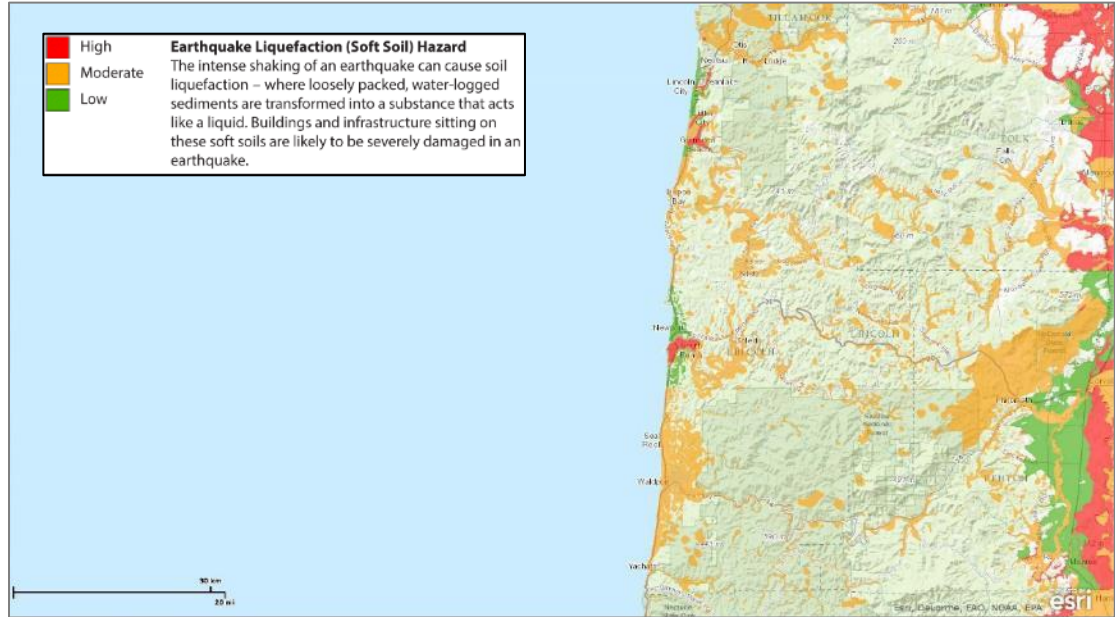
Name	Class	Fault ID	Primary County, State	Length (km)	Time of Most Recent Deformation	Slip-Rate Category
Cascadia Megathrust	A	781	Offshore	754km	Latest Quaternary	Greater than 5.0 mm/yr
Cascadia Fold and Fault Bed	A	784	Offshore	484km	Latest Quaternary	Between 1.0 & 5.0 mm/yr
unnamed offshore faults	A	785	Offshore	280km	Latest Quaternary	Between 1.0 & 5.0 mm/yr
Stonewall Anticline	A	786	Offshore	49km	Quaternary (<1.6 Ma)	Less than 0.2 mm/yr
Siletz Bay Faults	A	883	Offshore	10km	Late Quaternary	Less than 0.2 mm/yr
Cape Foulweather Fault	A	884	Lincoln County	10km	Late Quaternary	Less than 0.2 mm/yr
Yaquina Faults	A	885	Lincoln County	13km	Late Quaternary	Between 0.2 & 1.0 mm/yr
Waldport Faults	A	886	Lincoln County	14km	Late Quaternary	Less than 0.2 mm/yr

Source: Source: US Geological Survey (USGS), Quaternary Fault and Fold Database

The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides. DOGAMI has published several seismic hazard maps that are available for Oregon communities to use. The maps show liquefaction, ground motion amplification, landslide susceptibility, and relative earthquake hazards.

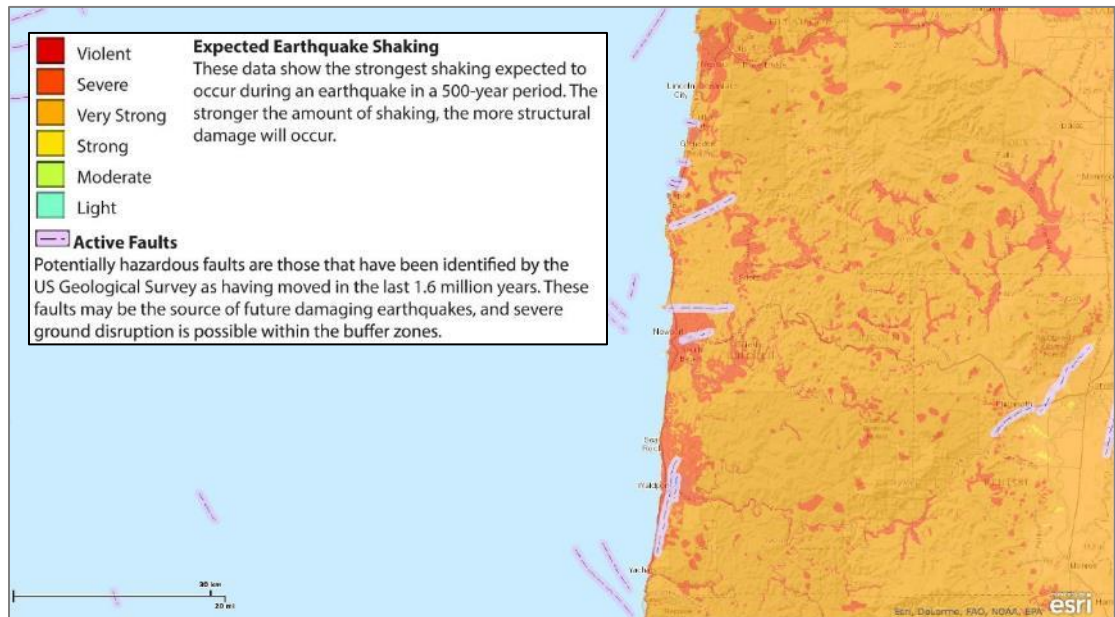
The extent of the earthquake hazard is measured in magnitude. Figure 2-6 shows areas for liquefaction hazards and Figure 2-7 shows active faults. Figure 2-9 shows recent earthquakes have registered as Magnitude 5 or less (earthquakes at this magnitude are often felt but cause no damage, or only minor damage). Lincoln County can expect similar crustal earthquake magnitudes to occur in the future. The Cascadia Subduction Zone earthquake has the capacity to cause a magnitude 8.5 or greater earthquake. Due to the proximity of the fault zone the damage locally is expected to be significant.

**Figure 2-6 Earthquake Liquefaction (Soft Soil) Hazard**



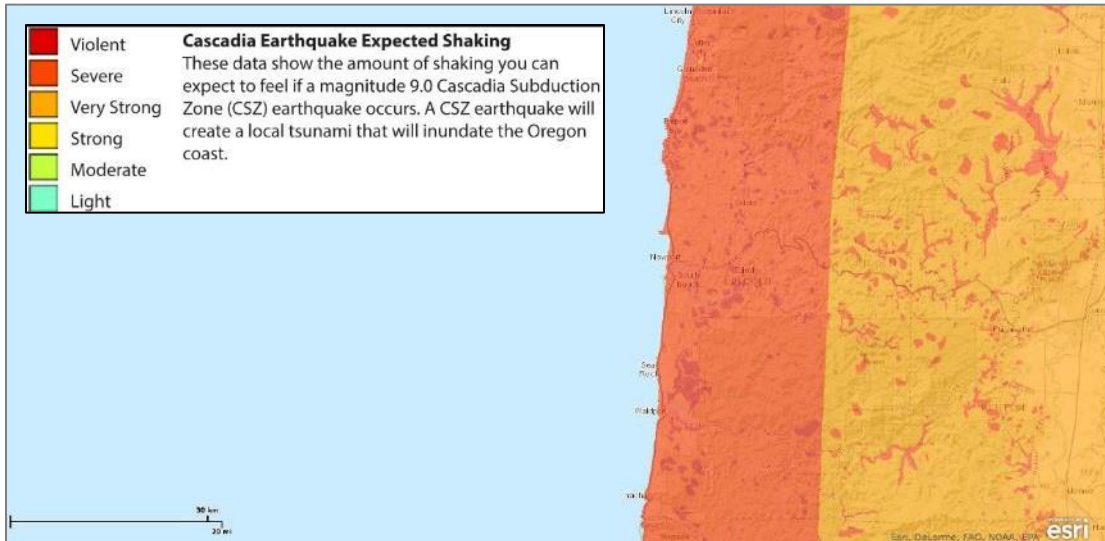
Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

**Figure 2-7 Combined Earthquake Events Expected Shaking and Active Faults**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

**Figure 2-8 Cascadia Earthquake Expected Shaking**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

For more information, see the following DOGAMI reports:

- Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) *Note: this analysis was published after the 2020 NHMP update developed.*
- Oregon Coastal Hospital Resilience Project (2020, [O-20-02](#))
- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, [O-20-03](#))
- Resilience guidance for Oregon hospitals (2019, [O-19-02](#))
- Oregon coastal hospitals preparing for Cascadia (2018, [O-18-03](#))
- Oregon Hospital and Water System Earthquake Risk Evaluation Pilot Study (2017, [O-17-01](#))
- Statewide Cascadia earthquake hazard data (2013, [O-13-06](#))
- Cascadia Subduction Zone earthquakes: A magnitude 9.0 earthquake scenario, (2012, [O-12-22](#))
- Statewide seismic needs assessment: Implementation of Oregon 2005 Senate Bill 2 relating to public safety, earthquakes, and seismic rehabilitation of public buildings, (2007, [O-07-02](#)).
- Map of selected earthquakes for Oregon: 1841-2002 (2003, [O-03-02](#)).I
- Relative earthquake hazard maps for selected coastal communities in Oregon: Astoria-Warrenton, Brookings, Coquille, Florence-Dunes City, Lincoln City, Newport, Reedsport-Winchester Bay, Seaside-Gearhart-Cannon Beach, Tillamook (1999, [IMS-10](#))
- Earthquake damage in Oregon: Preliminary estimate for future earthquake losses (1999, [SP-29](#))

Additional reports are available via DOGAMI's Publications Search website:

<https://www.oregongeology.org/pubs/pubsearch.htm>

Other agency/ consultant reports:

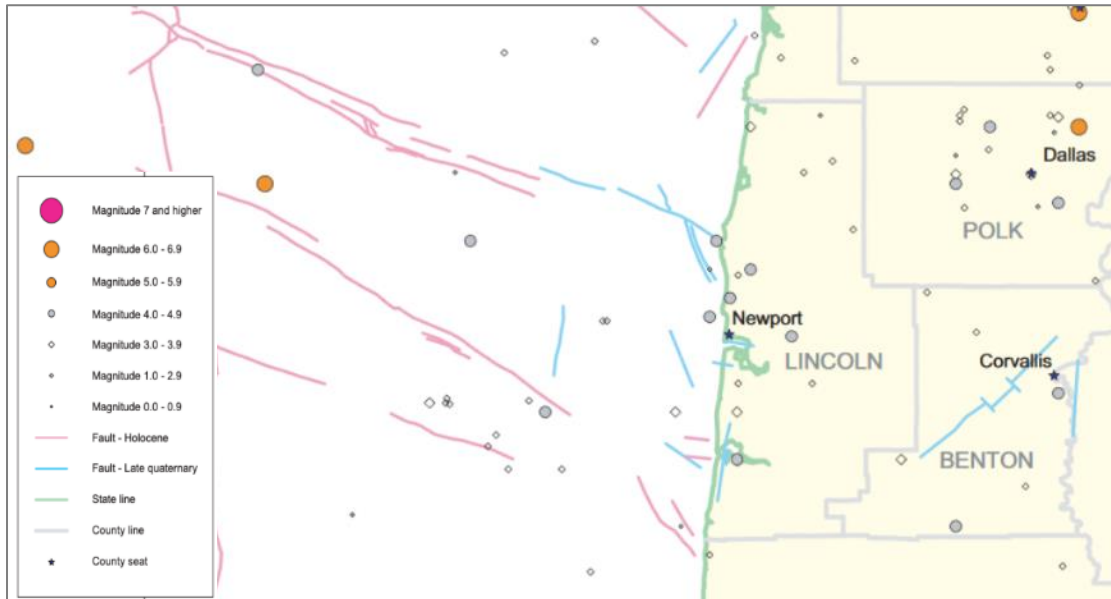
[Oregon Resilience Plan \(2013\)](#)

## History

Lincoln County routinely has small earthquake events. The earthquakes shown in Figure 2-9 are relatively insignificant. They were felt by several people but little to no structural/property damage resulted. The map shows clusters of earthquakes occurring off the shoreline of Lincoln County. There is no historic record of significant crustal earthquakes centered in the region in the past 150 years, although Oregon has experienced crustal earthquakes that originated outside the region. The geologic record shows that movement has occurred along numerous offshore faults as well as some onshore faults. The faulting has occurred over the past 20,000 years.

More recently there have been several earthquakes off the Lincoln County coast. In 2003 there was a magnitude 6.3 earthquake along the Blanco Fracture Zone, one of several seismically active transform faults off the coast of Oregon. In July of 2004 there was a magnitude 4.9 earthquake located 19 miles west of Yachats. Within a three-week period in April of 2008, there were more than 600 tremors, three of which were magnitude 5 or higher.<sup>16</sup>

**Figure 2-9 Regional Earthquake History (1841-2002)**



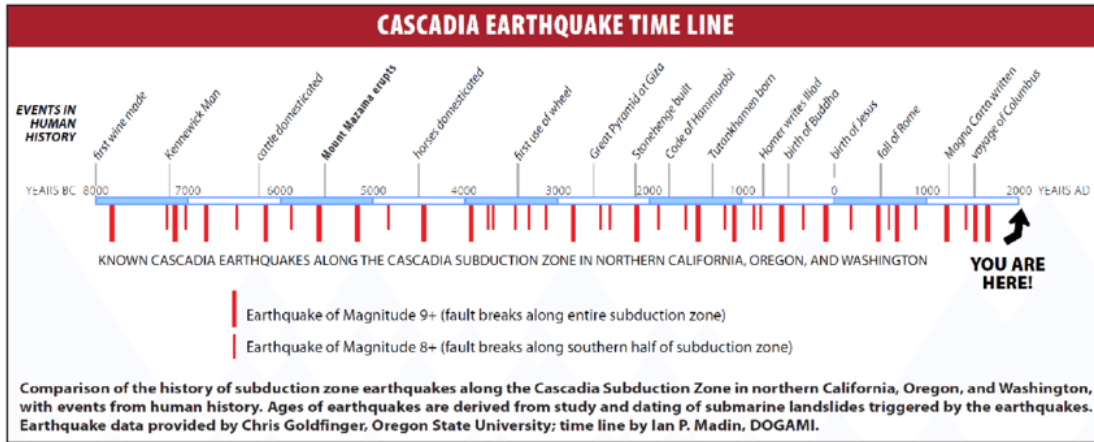
Source: DOGAMI, Snippet of Map of Selected Earthquakes for Oregon, 1841 through 2002 ([O-03-02](#))

Geologic evidence shows that the Cascadia Subduction Zone has generated great earthquakes, most recently about 300 years ago. It is generally accepted to have been magnitude 9 or greater. The average recurrence interval of these great Cascadia earthquakes is approximately 500 years, with gaps between events as small as 200 years and as large as 1,000 years. The last known great earthquake to hit the Lincoln County area was in January of 1700. This CSZ event also produced a tsunami, which is discussed in the Tsunami chapter.

<sup>16</sup> Milstein, Michael, The Oregonian, Earthquakes continue off Oregon Coast: April 14, 2008.  
[http://blog.oregonlive.com/breakingnews/2008/04/quakes\\_continue\\_off\\_oregon\\_coa.html](http://blog.oregonlive.com/breakingnews/2008/04/quakes_continue_off_oregon_coa.html)



**Figure 2-10 Cascadia Earthquake Timeline**



Source: OSSPAC, [The Oregon Resilience Plan](#) (2013)

## Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a Cascadia Subduction Zone (CSZ) is “moderate”**, meaning one incident may occur within the next 35 to 75 years. The Steering Committee determined the **probability of experiencing a crustal earthquake is “low”**, meaning one incident may occur within the next 75 to 100-year period.

Lincoln County is susceptible to deep intraplate events within the Cascadia Subduction Zone (CSZ), where the Juan de Fuca Plate is diving beneath the North American Plate and shallow crustal events within the North American Plate.

According to the Oregon NHMP, the return period for the largest of the CSZ earthquakes (Magnitude 9.0+) is 530 years with the last CSZ event occurring 314 years ago in January of 1700 (Figure 2-10). The probability of a 9.0+ CSZ event occurring in the next 50 years ranges from 7 - 12%. Notably, 10 - 20 “smaller” Magnitude 8.3 - 8.5 earthquakes occurred over the past 10,000 years that primarily affected the southern half of Oregon and northern California. The average return period for these events is roughly 240 years. The combined probability of any CSZ earthquake occurring in the next 50 years is 37 - 43%.<sup>17</sup>

Establishing a probability for crustal earthquakes is difficult given the small number of historic events in the region. However, the crustal faults used to inform this report are considered to have a low probability of rupture.

## Vulnerability Assessment

The Steering Committee rated the County as having a **“high” vulnerability to the Cascadia Subduction Zone (CSZ) earthquake hazard** meaning that more than 10% of the unincorporated County’s population or property could be affected by a major CSZ event. The Steering Committee rated the County as having a **“moderate” vulnerability to a crustal earthquake hazard**, meaning that between 1% and 10% of the unincorporated County’s population or property could be affected by a major crustal earthquake event.

<sup>17</sup> DLCD. *Oregon Natural Hazards Mitigation Plan*. 2020.

The local crustal faults, the county's proximity to the Cascadia Subduction Zone, potential slope instability and the prevalence of certain soils subject to liquefaction and amplification combine to give the county a high-risk profile.

Factors included in an assessment of earthquake risk include population and property distribution in the hazard area, the frequency of earthquake events, landslide susceptibility, buildings, infrastructure and disaster preparedness of the region. This type of analysis can generate estimates of the damages to the county due to an earthquake event in a specific location.

Seismic activity can cause great loss to businesses, either a large-scale corporation or a small retail shop. Losses not only result in rebuilding cost, but fragile inventory and equipment can be destroyed. When a company is forced to stop production for just a day, business loss can be tremendous. Residents, businesses and industry all suffer temporary loss of income when their source of finances is damaged or disrupted.

Figure 2-8 (above) shows the expected shaking/damage potential for Lincoln County as a result of a Cascadia Subduction Zone (CSZ) earthquake event. The figure shows that the county will experience "moderate" to "severe" shaking that will last two to four minutes. The strong shaking will be extremely damaging to lifeline transportation routes including I-5. For more information on expected losses due to a CSZ event see the [Oregon Resilience Plan](#).

### **Natural Hazard Risk Report for Lincoln County**

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to the Cascadia subduction zone earthquake. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled earthquake scenarios. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*<sup>18</sup>

#### **Population Vulnerability (Residents)**

Approximately 30% of unincorporated Lincoln County's population (5,653 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, approximately 20% will be impacted by the accompanying tsunami. The communities of Otis-Rose Lodge and Wakonda Beach have the highest percent of potentially displaced residents. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.*

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<sup>18</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Tables A-1 through A-11.

**Table 2-9 Potentially Displaced Residents, CSZ M9.0 Earthquake and Tsunami by Unincorporated Area**

	CSZ M9.0 Earthquake		Tsunami	Combined Total	
	Resident Population	Potentially Displaced Residents	Potentially Displaced Residents	Number	Percent
"Rural" Lincoln County	10,293	2,374	459	2,833	28%
Otis-Rose Lodge	1,926	746	0	746	39%
Otter Rock	489	76	5	81	17%
Salishan-Lincoln Beach	2,093	465	118	583	28%
Seal Rock-Bayshore	2,766	546	289	835	30%
Wakonda Beach	1,326	307	268	575	43%
Total Unincorporated	18,893	4,514	1,139	5,653	30%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

Earthquakes will impact every building in Lincoln County, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as "damaged" in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The communities of Wakonda Beach (57%) and Otis-Rose Lodge (50%) are expected to see the highest percent of their buildings damaged by a CSZ earthquake and tsunami event. Salishan-Lincoln Beach (1,093 buildings), Seal Rock-Bayshore (1,418 buildings), and "Rural" Lincoln County (5,194 buildings) have the highest number of buildings expected to be damaged. The combined (earthquake and tsunami) value of building damage losses is \$677 million (\$402.5 million from earthquake alone).<sup>19</sup>

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<sup>19</sup> Ibid.

**Table 2-10 Damaged and Exposed Buildings, CSZ M9.0 Earthquake and Tsunami by Unincorporated Area**

	CSZ M9.0 Earthquake		Tsunami	Combined Total	
	Total Buildings	Damaged Buildings	Exposed Buildings	Number	Percent
"Rural" Lincoln County	12,637	4,386	808	5,194	41%
Otis-Rose Lodge	1,747	871	0	871	50%
Otter Rock	634	202	22	224	35%
Salishan-Lincoln Beach	2,847	866	227	1,093	38%
Seal Rock-Bayshore	3,345	968	450	1,418	42%
Wakonda Beach	1,614	414	506	920	57%
<b>Total Unincorporated</b>	<b>22,824</b>	<b>7,707</b>	<b>2,013</b>	<b>9,720</b>	<b>43%</b>

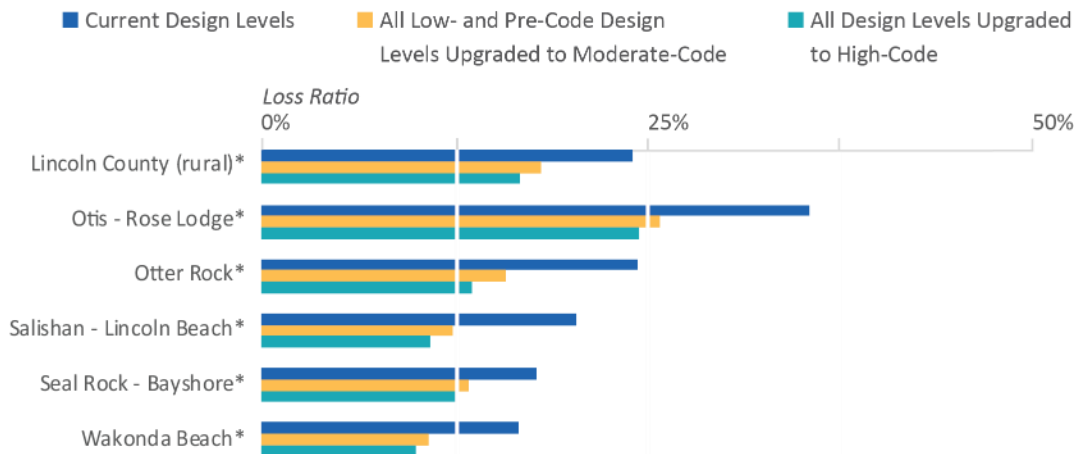
Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

As discussed in the Risk Report seismic building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and the early 2000s. As noted in the Community Profile (Appendix C), about 65% of residential buildings were built prior to 1990, which increases the county's vulnerability to the earthquake hazard. The Risk Report indicates that approximately 53% of unincorporated Lincoln County buildings were built prior to modern seismic building code enforcement (pre-code); 72% are either pre-code or low code.<sup>20</sup>

The age of the building stock is therefore a primary indicator of vulnerability and communities with older building stocks are expected to experience more damage from an earthquake event. If buildings were retrofitted to moderate or high-code standards (see Appendix C) the impact of the CSZ event would be reduced. Figure 2-11 shows the reduction in loss estimates from a magnitude 9.0 CSZ earthquake event via two scenarios where all buildings have been retrofitted to moderate-code or high-code design standards. Communities that have a high percent of buildings within the tsunami inundation zone would benefit the least from seismic retrofits and would need additional tsunami retrofits to reduce risk.

<sup>20</sup> Ibid. Table D-2.

**Figure 2-11 Reduction in Damage with simulated seismic building code upgrades, CSZ M9.0 Earthquake**



Source: Figure modified from DOGAMI. 2020. Lincoln County Natural Hazard Risk Report. Figure 3-3. Note: \* - Unincorporated community. "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this figure.

Critical Facility Vulnerability

Vulnerable critical facilities include those that were considered non-functioning if the Risk Report analysis determined that the building (or complex) had a greater than 50-percent change of beings at least moderately damaged (not including areas within the tsunami inundation zone (medium sized). Critical facilities determined to be non-functioning following a CSZ earthquake include:

- Central Oregon Coast Fire Station 7300 (*Tidewater, Central Oregon Coast Fire & Rescue District*)
- Depoe Bay Fire Station 2400 (*Otter Rock, Depoe Bay Fire District*)
- Eddyville Charter School (*Charter School, Lincoln County School District*)
- North Lincoln Fire Station 1200 (*Rose Lodge, North Lincoln Fire & Rescue District*)
- North Lincoln Fire Station 1300 (*Otis, North Lincoln Fire & Rescue District*)
- North Lincoln Fire Station 1700 (*Kernville, North Lincoln Fire & Rescue District*)
- Seal Rock Fire Station (*Seal Rock, Seal Rock Rural Fire Protection District*)
- Siletz Bay Airport (*Gleneden Beach*)
- Toledo High School (*Toledo area, Lincoln County School District*)
- Toledo State Airport (*Toledo area*); also exposed to Tsunami (medium-sized)
- Wakonda Beach Airport (*Wakonda Beach*)
- Waldport Water Treatment Plant (*Waldport Area, City of Waldport*)
- Yachats Fire Station (*outside Waldport, Yachats Rural Fire Protection District*)

The following vulnerable critical facilities were identified by the County but not included in the Risk Report analysis:

- Depoe Bay RFPD Fire Station 2200 (*Gleneden Beach*)

### Risk Report Identified Areas of Vulnerability<sup>21</sup>

- Although every building in Lincoln County will experience shaking from a CSZ earthquake, many of the buildings within the communities of Lincoln City, Salishan-Lincoln Beach, Newport, Seal Beach-Bayshore, and Waldport are located on soils with a high liquefaction potential, which increases the likelihood of substantial ground deformation and building damage. Especially for areas close to the several estuaries within the study area.
- Many of the buildings in the communities of Newport, Siletz, Toledo, and Otis-Rose Lodge are older, less likely to meet modern building design standards, and are more vulnerable to catastrophic damage during an earthquake.
- Because of the liquefaction and landslides, these communities will likely be “islands” disconnected from other communities by severed transportation routes. With losses up to 44%, it is very important for the community to be able to respond to emergencies within its own community.
- Fifty-two (56 when including areas of tsunami inundation) of the 72 critical facilities in the study area are estimated to be non-functioning due to a CSZ earthquake.

### **2007 Rapid Visual Survey**

In 2007, DOGAMI completed a rapid visual screening (RVS) of educational and emergency facilities in communities across Oregon, as directed by the Oregon Legislature in Senate Bill 2 (2005). RVS is a technique used by FEMA ([FEMA P-154](#)) to identify, inventory and rank buildings that are potentially vulnerable to seismic events. DOGAMI’s Rapid Visual Screening for Lincoln County lists 43 facilities, 12 are in the unincorporated County.

DOGAMI rated each building surveyed with a ‘low,’ ‘moderate,’ ‘high,’ or ‘very high’ potential for collapse in the event of an earthquake (Table 2- 11; each “X” represents one building within that category). It is important to note that these ratings represent a probability of collapse based on limited observed and analytical data and are therefore approximate. Of the facilities evaluated by DOGAMI, that have not been retrofitted, using their Rapid Visual Survey (RVS), one building has very high (100% chance) collapse potential and two (2) school buildings have a high (greater than 10% chance) collapse potential.

To fully assess a buildings potential for collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey. Information on specific public buildings’ (schools and public safety) estimated seismic resistance is available on DOGAMI’s website:

<http://www.oregongeology.org/rvs/default.htm>

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<sup>21</sup> Ibid. Page 24.

**Table 2- I I Rapid Visual Survey Scores, Unincorporated County**

Facility	Site ID*	Level of Collapse Potential			
		Low (<1%)	Moderate (>1%)	High (>10%)	Very High (100%)
<b>Schools</b>					
Toledo High** (1800 NE Sturdevant Rd)	Linc_sch11			<b>SRGP 2014: \$1,500,000 (Gym)</b>	
Eddyville Charter** (57 Eddyville School Rd)	Linc_sch15	X		X	X
<b>Public Safety</b>					
Lincoln Co. Communications (815 SW Lee St, Newport)	Linc_eoc01		X		
Lincoln Co. Sheriff's Office** (225 W Olive St, Newport)	Linc_pol02	X	X		
No. Lincoln F&R – Station 1300** (381 Old Scenic Hwy, Otis)	Linc_fir02	X			
No. Lincoln F&R – Station 1200** (5284 Salmon River Hwy, Rose Lodge)	Linc_fir03			<b>SRGP 2015-17 Phase II: \$808,022</b>	
Seal Rock RFPD (10333 NW Rand St, Seal Rock)	Linc_fir09	X			
No. Lincoln F&R – Station 1700** (37625 Siletz River Hwy)	Linc_fir14	X			
Depoe Bay RFPD – Gleneden Beach (6445 Gleneden Beach Lp)	Linc_fir17	X			
Seal Rock RFPD – Bayshore** (2009 NW Hilton Rd, Seal Rock)	Linc_fir20	X			
Yachats RFPD** (1395 SW Corona Ct)	Linc_fir21	X			
Siletz RFPD** (7751 Logsden Rd)	Linc_fir24	X			

Source: [DOGAMI 2007. Open File Report 0-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment.](#) Notes: “\*” – Site ID is referenced on the [RVS Lincoln County Map](#); “\*\*” – Facility determined to be vulnerable to CSZ earthquake and should expect moderate to complete damage (> 50% probability). DOGAMI Risk Report (2020). See jurisdictional addenda (Volume II) for additional facilities.

Mitigation Successes

Seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>22</sup> have been funded to retrofit Toledo High School (near Toledo), (2014 grant award, \$1,500,000) and North Lincoln Fire and Rescue Station 1200 (Rose Lodge), (2015-2017 Phase II grant award, \$808,022). *See city addenda for mitigation successes within each city.*

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

<sup>22</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

## Tsunami

### Significant Changes since the 2015 Plan

New data is included from the Risk Report and other technical reports. HB 3309 (2019) is referenced which repealed prohibitions of the SB 379 (1995) “tsunami inundation line”.

### Characteristics

A tsunami generally begins as a single wave but quickly evolves into a series of ocean waves, generated by disturbances from earthquakes, underwater volcanic eruptions, or landslides (includes landslides that start below the water surface and landslides that enter a deep body of water from above the water surface). In these cases, the initial tsunami wave mimics the shape and size of the sea floor deformation that causes it.

The wavelength of a tsunami generated by sea floor deformation may be 100 miles or more in the deep ocean, with a wave height of only a few feet or less. These waves may reach speeds of up to 500 m.p.h. As tsunamis approach land where the water depth decreases, the forward speed of the tsunami will slow, but wave heights increase to as much as 100 feet. For simplicity, tsunamis can be divided geographically into two categories: those of distant origin and those generated locally. The distant tsunami is one that is usually generated by a subduction zone earthquake elsewhere in the Pacific and would take up to 24 hours to reach the Oregon coastline. A local tsunami is generated by a subduction earthquake off the Oregon Coast and would take minutes to reach the Oregon coastline. The Oregon Coast has experienced both types.<sup>23</sup>

A tsunami from a local source will probably be stronger, higher and travel farther inland (overland and upriver) than a distant tsunami. The tsunami wave may be traveling at 30 mph when it hits the coastline and have heights of 20 to 60 feet, potentially higher depending on the coastal bathymetry (water depths) and geometry (shoreline features). The tsunami wave from a nearby earthquake will break up into a series of waves that will continue to strike the coast over an 8 to 10-hour period. Tsunami activity can continue even longer for a major Pacific-wide tsunami. The first wave is not always the most destructive; for example, some computer simulations for the Central Oregon Coast, show that waves arriving in the second or third hour may be as big or bigger than the initial wave. The deep ocean trenches off the coasts of Alaska, Japan, and South America are known for their underwater subduction zone earthquakes and are the source of many tsunamis.

The Pacific Northwest is located at a convergent plate boundary, where the Juan de Fuca and North American tectonic plates meet. The two plates are converging at a rate of about 1-2 inches per year. This boundary is called the Cascadia Subduction Zone. It extends from British Columbia to northern California. Subduction zone earthquakes are caused by the abrupt release of slowly accumulated stress. Subduction zones like the Cascadia Subduction Zone have produced earthquakes with magnitudes of 8 or larger. Historic subduction zone earthquakes include the 1960 Chile (magnitude 9.5) and 1964 southern Alaska (magnitude 9.2) earthquakes. These types of earthquakes have been known to produce tsunamis.

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<sup>23</sup> State of Oregon Emergency Management Plan. Natural Hazards Mitigation Plan: Tsunami. 2002



Tsunami destruction can come from both the tsunami wave and from the rapid retreat of the water from the coastline. Tsunami waves tend to be fast moving rising surges of water. As a tsunami wave enters coastal bays and rivers, it may move as a high velocity current or a breaking wave that travels up an estuary as a bore (wall of turbulent water like the waves at the coast after they break). This inland surge of water can often cause most or all the damage from a distant tsunami. For example, in Seaside the damage from the 1964 Alaskan tsunami occurred along the Necanicum River and Neawanna Creek, well inland from the coast. In addition, storm waves ride on top of the tsunami waves and may cause even more destruction.<sup>24</sup>

## Location and Extent

Tsunami inundation modeling attempts to identify areas affected by tsunamis, and the water depths, current strengths, wave heights, and wave arrival times associated with an event. Generally, this analysis is conducted for “worst case” scenarios, but it can also be used to look at damages from tsunamis of lesser magnitude. Areas along the coast, low-lying areas along bays or inlets that connect to the ocean should be designated as hazard zones. Areas along rivers that connect to the ocean should also be designated as tsunami hazard areas for at least three kilometers inland and as far as ten kilometers inland for large, flat coastal rivers.<sup>25</sup> In the event of an 8.8 magnitude earthquake, 60-200 miles off the coast, and during high tide, the inundation elevations would be: Siletz Bay, 40 feet; Depoe Bay, 31 feet; Newport, 31 feet; Yaquina Joe Point (Waldport), 26 feet; and Yachats, 27 feet.<sup>26</sup>

DOGAMI has conducted analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami hazard maps were produced to help implement Senate Bill 379 (SB 379), which was passed by the 1995 regular session of the Oregon Legislature. SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005 limits construction of new essential facilities and special occupancy structures in tsunami flooding zones. In this analysis they have considered topography, bathymetry data, and information about potential regional tsunami sources. It should be noted that these maps were produced in 1995. Since then DOGAMI and other agencies have conducted many tsunami inundation studies. An update of these maps was completed in 2013, as described below. Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building “new essential facilities, hazardous facilities, major structures, and special occupancy structures” inside the tsunami inundation zone (SB 379 line):<sup>27</sup>

Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities.<sup>28</sup> There are 30 tsunami inundation map panels for Lincoln County (15 for the local source tsunami scenarios and 15 for the distant source tsunami scenarios).

The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as “T-shirt” sizes S, M, L, XL, and XXL. The

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<sup>24</sup> State of Oregon Emergency Management Plan: Natural Hazards Mitigation Plan: Tsunami, March 2002

<sup>25</sup> Geohazards International. Preparing Your Community for Tsunamis: A Guidebook for Local Advocates. 2007

<sup>26</sup> Lincoln County Emergency Services, June 2007. Lincoln County Hazard Analysis

<sup>27</sup> Oregon Legislature. HB 3309 (2019).

<https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309>

<sup>28</sup> DOGAMI website and Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report.

transition line between the wet and dry zones is termed the Wet/ Dry Zone, only the XXL Wet/ Dry Zone is shown on the map. The distant source tsunami inundation maps show the affects of tsunamis generated by earthquakes along the “Ring of Fire” (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2) and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - <http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm>  
(Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:

<http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm>

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes. There are twelve (12) evacuation brochures created for Lincoln County covering the following communities: Lincoln City North, Lincoln City South, Gleneden Beach/ Salishan Spit, Lincoln Beach, Depoe Bay, Newport North, Newport South, Toledo, Seal Rock, Waldport, Yachats North (San Marine), and Yachats.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

<http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm>

A free application is also available that displays the evacuation routes in coastal areas of Oregon: [http://www.nanoos.org/mobile/tsunami\\_evac\\_app.php](http://www.nanoos.org/mobile/tsunami_evac_app.php)

For more information, see the following DOGAMI reports:

- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, [O-20-03](#))
- Oregon Coastal Hospital Resilience Project (2020, [O-20-02](#))
- Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast (2019, [O-19-06](#))
- Comparison of Oregon tsunami hazard scenarios to a probabilistic tsunami hazard analysis (PTHA) (2019, [O-19-04](#))
- Resilience guidance for Oregon hospitals (2019, [O-19-02](#))
- Coastal flood hazard study, Lincoln County, Oregon (2018, [O-15-06](#))

## History

The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest (Figure 2-10). The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>29</sup> Numerous distant tsunami events have also occurred in the past, including 28 documented by Oregon wave gauges since 1854, notable events are listed below.

In March 2011, a 9.0 magnitude earthquake generated tsunami originating from Japan caused approximately \$7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; \$6.7 million), as well as the Port of Depoe Bay (Lincoln County; \$182,000), and Charleston Harbor (Coos County; \$200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency was declared by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast local official activated the Emergency Alert System and sirens, implemented “reverse 9-1-1” and conducted door-to-door notices in order to evacuate people from the tsunami inundation zone. Local governments activate their Emergency Operations Centers and the state activated its Emergency Coordination Center.

In March 1964, a tsunami struck southeastern Alaska following an earthquake beneath Prince William Sound and arrived along the Alaska coastline between 20 and 30 minutes after the quake, devastating villages. Damages were estimated to be over \$100 million. Approximately 120 people drowned. The tsunami spread across the Pacific Ocean and caused damage and fatalities in other coastal areas. Four children drowned at Beverly Beach and significant property damaged was incurred, including \$5,000 in Depoe Bay. Along the entire Oregon Coast damage was estimated to be between \$750,000 and \$1 million. Tsunamis of lesser magnitude occurred along the Oregon Coast in 1946, 1960, and 1968. Tsunami wave heights reached 10-11.5 feet at Depoe Bay and 11.5 feet at Newport.<sup>30</sup>

## Probability Assessment

Lincoln County’s Natural Hazards Mitigation Steering Committee believes that the County’s **probability of experiencing a local or distance source tsunami event is “moderate”**, meaning one incident of either type is likely within the next 35 to 75-year period.

It is difficult to predict when the next tsunami will occur. With respect to distant sources, Oregon has experienced 25 tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon

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<sup>29</sup> DLCD. *Oregon Natural Hazards Mitigation Plan*. 2020.

<sup>30</sup> DOGAMI Distant Tsunami Inundation Map (2013)

coast from distant sources is about six (6) years. However, the time interval between events has been as little as one year and as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for this region.

A tsunami originating from a Cascadia Subduction Zone earthquake could be exceedingly destructive and thus is of greater concern than distant tsunamis. The average recurrence interval for a CSZ event is between 500 and 600 years. There have been seven CSZ events in the last 3,500 years with time between individual events varying from 150 to 1,000 years. The last CSZ event occurred approximately 300 years ago. According to the Oregon NHMP, the return period for the largest of the CSZ earthquakes (Magnitude 9.0+) is 530 years with the last CSZ event occurring 314 years ago in January of 1700 (Figure 2-10). The probability of a 9.0+ CSZ event occurring in the next 50 years ranges from 7 - 12%. Notably, 10 - 20 “smaller” Magnitude 8.3 - 8.5 earthquakes occurred over the past 10,000 years that primarily affected the southern half of Oregon and northern California. The average return period for these events is roughly 240 years. The combined probability of any CSZ earthquake occurring in the next 50 years is 37 - 43%.<sup>31</sup>

## Vulnerability Assessment

The Lincoln County Natural Hazards Steering Committee rated the County as having a **“high” vulnerability to the local source tsunami event**, meaning that more than 10% of the county’s population or property could be affected by a major emergency or disaster; the committee rated the County as having a **“low” vulnerability to the distant source tsunami event**, meaning that less than 1% of the county’s population or property could be affected by a major emergency or disaster.

The Oregon coast is at risk from tsunamis that originate from local and distant sources. Lincoln County has six communities in the tsunami inundation zone (from north to south): Lincoln City, Depoe Bay, Newport, Toledo, Waldport, and Yachats. Figure 2-12, shows the amount and percentage of developed land within the SB 379 tsunami-inundation zone as of 2007; the data shows that Waldport and Yachats have the most developed land within the tsunami inundation zone; Lincoln City, Newport, and unincorporated areas also have significant percentages in the inundation zone.

Severe damage could occur to low-lying areas of the county in a local source tsunami event, including roads, bridges, communication systems, and infrastructure. Some damage is also expected in a large distant source tsunami event (such as the 2011 Tohoku tsunami).

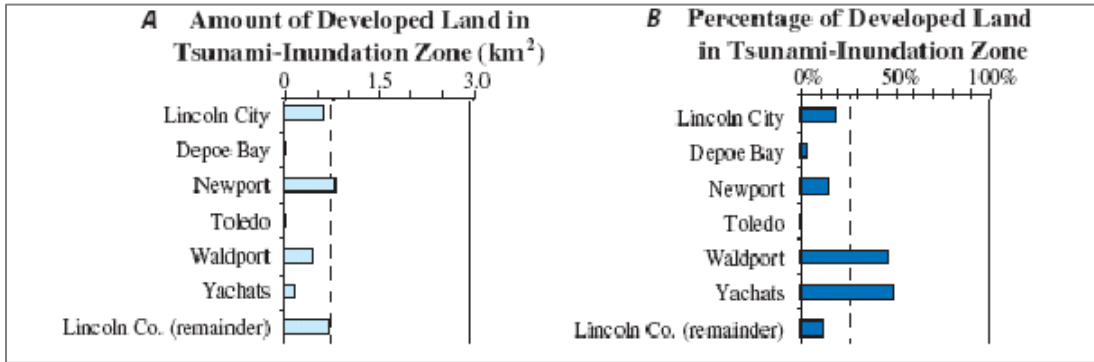
There are about 2,500 manufactured housing units (mobile homes) in unincorporated Lincoln County.<sup>32</sup> Manufactured homes built prior to 2003 are subject to slipping off their foundations potentially compromising the occupants’ ability to exit. The compromised egress may hinder timely evacuation from a tsunami event.

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<sup>31</sup> DLCD. *Oregon Natural Hazards Mitigation Plan*. 2020.

<sup>32</sup> Social Explorer, Table A10032, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

**Figure 2-12 Developed Land in Tsunami-Inundation Zone**



Source: Wood N (2007) Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon. USGS. <http://pubs.usgs.gov/sir/2007/5283/sir2007-5283.pdf>

In 2019, DOGAMI published a tsunami evacuation analysis using the XXL inundation zone which covers the largest CSZ event likely to occur based on the historical record.<sup>33</sup> Safety is reached when evacuees have reached “high ground”, or 20 feet beyond the limit of tsunami inundation. An analysis was conducted for cities and unincorporated areas of the county including: (1) the Siletz Bay area, and (2) the South County area.

#### Siletz Bay Area

The Siletz Bay area is divided into two distinct zones. The first includes Siletz Spit, Salishan, and Siletz Keys which are low-lying communities adjacent to the Siletz Bay that are susceptible to significant tsunami inundation and high liquefaction susceptibility. The second area includes Gleneden Beach, Lincoln Beach, and Fogarty Creek which are bluff backed open coast areas that have limited inundation potential and low liquefaction susceptibility. According to the model the first waves arrive along the open coast 20 minutes after the start of earthquake shaking with most of the Study Area inundated about 8 minutes later. Siletz Spit, Siletz Keys, and much of the remaining areas are expected to be completely inundated under the XXL tsunami inundation scenario. High ground is generally accessible at a slow walking speed of 2 feet per second (fps) or 1.4 mph to a walking speed of 4 fps or 2.7 mph in the communities of Gleneden Beach, Lincoln Beach, Fogarty Creek, and Salishan (parts of Salishan may need faster walking speeds up to 2.7-4.1 mph).

Evacuees in Siletz Keys (see Figure 2-13) and Siletz Spit (see Figure 2-14) will need to move faster in order to beat the wave and make it to high ground. Prompt evacuation, knowledge of the route, signage, and alternative route designation due landslide activity is necessary to improve evacuation speeds.

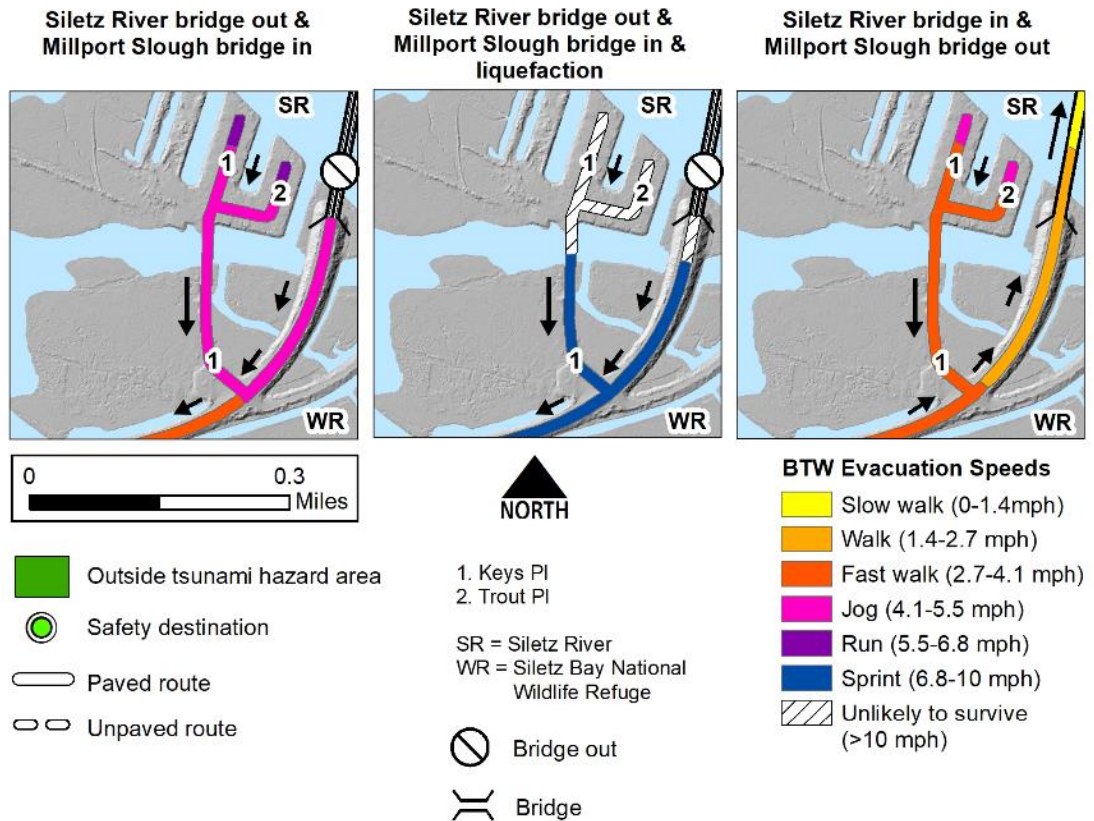
Evacuation speeds in Siletz Spit will need to be a maximum of a sprint (15 fps or 10 mph) and those north of Salishan Loop are unlikely to survive (require sprinting speeds above 10 mph). Mitigation strategies may include developing a shortcut across South Lagoon (including a footbridge) to decrease distances needed for evacuation to the hills near Dune Point Drive during a L tsunami inundation.

Near Siletz Keys it is expected that the Millport Slough Bridge will survive, however, the Siletz River Bridge is likely to fail separating the area from high ground to the north. As such,

<sup>33</sup> DOGAMI, Open-File Report O-19-06.

evacuation south over the Millport Slough Bridge will be necessary (although it is about 0.4 further than potential evacuation to the north over the Siletz River Bridge). Evacuation speeds to the south (to Salishan Lodge) from Siletz Keys will need to be a maximum of a sprint (15 fps or 10 mph) with a small area unlikely to survive (require sprinting speeds above 10 mph). Retrofitting the Siletz River Bridge could decrease distances and travel speed.

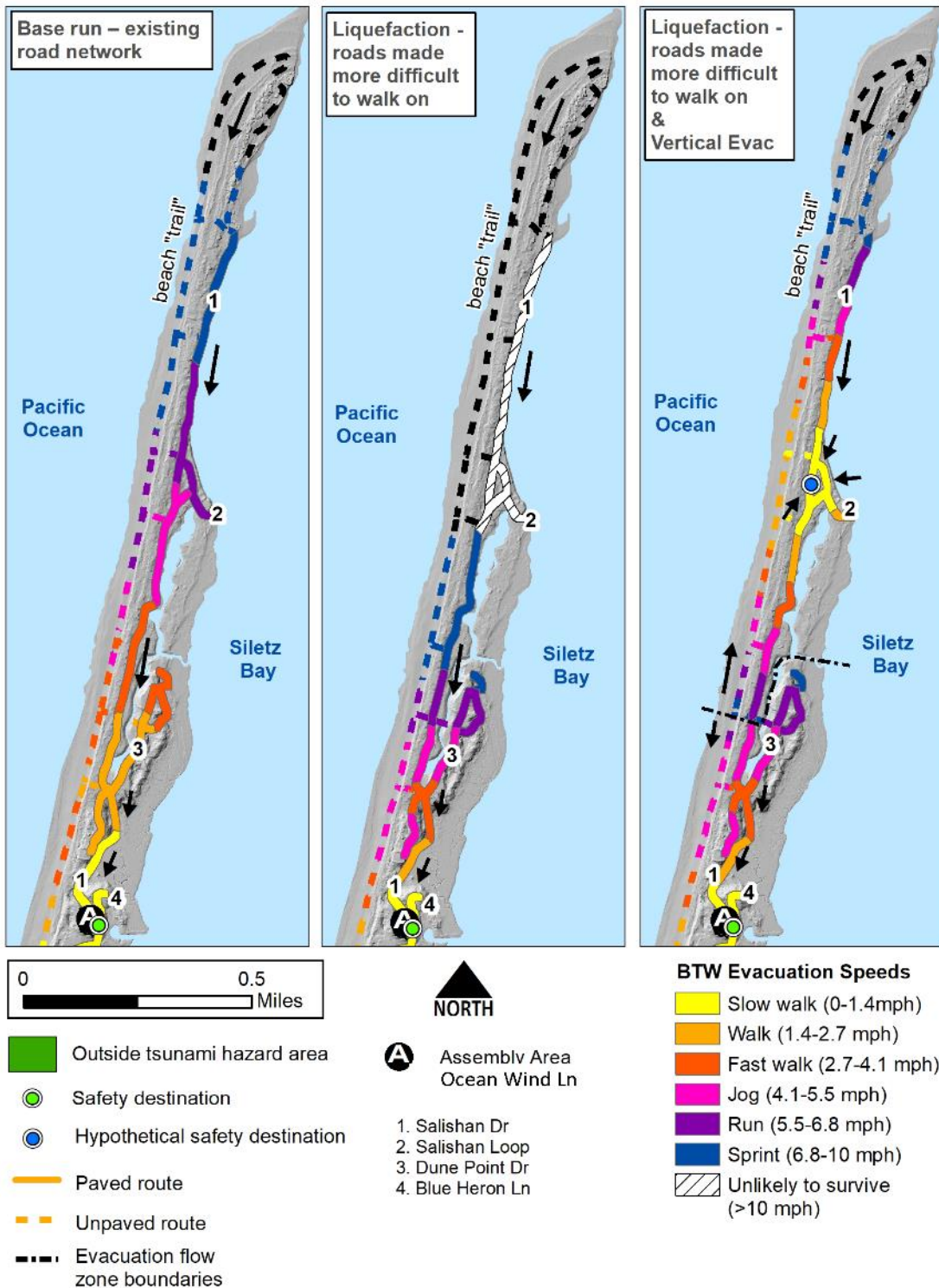
**Figure 2-13 Beat the Wave modeling in Siletz Keys (CSZ earthquake XXL inundation zone)**



Source: DOGAMI, Open-File Report O-19-06.

Note: Beat the Wave modeling in Siletz Keys for base scenario assuming the Siletz River Bridge fails and Millport Slough bridge survives (left), with liquefaction (middle), and with the hypothetical retrofitted of the Siletz River Bridge surviving and Millport Slough bridge failing (right).

**Figure 2-14 Beat the Wave modeling in Siletz Spit (CSZ earthquake XXL inundation zone)**



Source: DOGAMI, Open-File Report O-19-06.

Note: Beat the Wave modeling in Siletz Spit for base scenario/existing conditions (left), with liquefaction (middle), and hypothetical vertical evacuation structure (right).

## South County Area

The South County area is also divided into two distinct zones. The first includes the low-lying communities adjacent to the Alsea Bay that are susceptible to significant tsunami inundation and high liquefaction susceptibility. The second area includes the open coast areas that have limited inundation potential, low liquefaction susceptibility, and higher elevations. According to the model the first waves arrive along the open coast 26 minutes after the start of earthquake shaking with most of the Study Area inundated about 5 to 10 minutes later. The southern half of the Alsea Spit, Beaver Creek, Tillicum Beach, and Yachats north are expected to be completely inundated under the XXL tsunami inundation scenario. High ground is generally accessible for most of this area at walking speed of 4 feet per second (fps) or 2.7 mph. The most challenging unincorporated area is south Alsea Spit where faster walking speeds may be needed.

Most evacuees in the Alsea Spit (aka Bayshore) can make it to high ground at slow walk or walk speeds (see Figure 2-15). However, those in the southern end of Alsea Spit that is expected to be overtopped by an XXL tsunami will need to move faster in order to beat the wave and make it to high ground approximately one mile north. Evacuation speeds to the north from the southernmost portions of Alsea Spit will need to be a minimum of a fast walk (6 fps or 4.1 mph); following liquefaction the minimum speeds increase to a run (10 fps or 6.8 mph). Prompt evacuation, knowledge of the route, signage, and alternative route designation due landslide activity is necessary to improve evacuation speeds. If the private road off NW Bayshore Drive near NW Admiralty Circle becomes sanctioned and signed route, it would reduce travel distance and minimum speeds, to reach a secondary safety destination at the Waldport/Newport Kampground of America. The most significant change at this area would decrease minimum speeds from a fast walk to a walk.

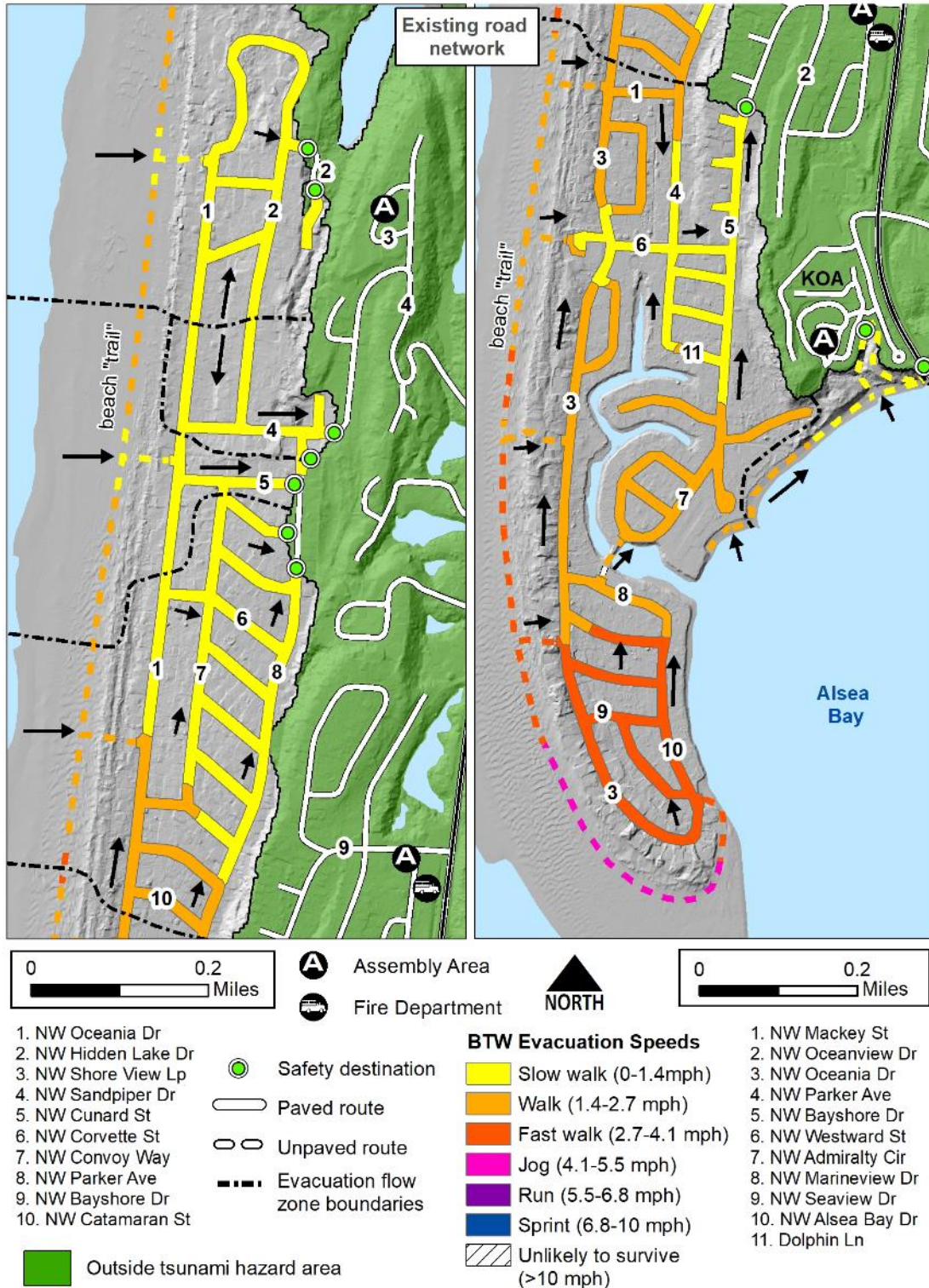
The following is a summary of expected inundation, wave arrival time, and minimum expected evacuation speed for each profiled area:

- Beaver Creek (expected full inundation, 40-minutes until first wave, slow walk to walk speed required for safe evacuation),
- Seal Rock (mostly out of inundation, 26-minutes until first wave, slow walk speed required for safe evacuation),
- Waldport East (Hwy 234 area in inundation area, 34 minutes until first wave, slow walk to walk speed required for safe evacuation),
- Governor Patterson and Beachside recreation areas (Hwy 101, Yachats RFPD Station, and residential area west of Hwy 101 is in inundation area, 26 minutes until first wave, slow walk to walk speed required for safe evacuation),
- Tillicum Beach (expected full inundation, 26 minutes until first wave, walk to fast walk speed required for safe evacuation), and
- Yachats north (expected full inundation, 26 minutes until first wave, walk speed required for safe evacuation).

For detailed information see *Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast* (DOGAMI, 2019, [O-19-06](#)).



**Figure 2-15 Beat the Wave modeling in Alesia Spit (CSZ earthquake XXL inundation zone)**



Source: DOGAMI, Open-File Report O-19-06.

Note: For additional Beat the Wave scenario maps for liquefaction and hypothetical trail to KOA see report.

## **Natural Hazard Risk Report for Lincoln County**

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to the Cascadia subduction zone earthquake. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled tsunami scenarios.

### **Population Vulnerability (Residents)**

Approximately six percent of unincorporated Lincoln County’s population (1,139 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is slightly fewer people than those exposed within the Senate Bill 379 line (1,303 people). The communities of Wakonda Beach (20%) and Seal Rock-Bayshore (10%) have the highest percent of potentially displaced residents. However, the dispersed “rural” Lincoln County has the highest number (459). *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.*

**Table 2-12 Potentially Displaced Residents, CSZ M9.0 Tsunami, by Unincorporated Area**

	Resident Population	Potentially Displaced Residents			
		CSZ M9.0 (Medium)		SB 379	
		Number	Percent	Number	Percent
"Rural" Lincoln County	10,293	459	4%	466	5%
Otis-Rose Lodge	1,926	0	0%	0	0%
Otter Rock	489	5	1%	6	1%
Salishan-Lincoln Beach	2,093	118	6%	172	8%
Seal Rock-Bayshore	2,766	289	10%	309	11%
Wakonda Beach	1,326	268	20%	350	26%
Total Unincorporated	18,893	1,139	6%	1,303	7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; “Rural” Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

### **Property Vulnerability**

A tsunami will impact every building in Lincoln County within the CSZ M9.0 “Medium” zone (note, this is slightly fewer buildings than are predicted to be impacted under the SB 379 event scenario). Building damage (loss) estimates are reported for buildings expected to be damaged by the tsunami inundation zone (medium-sized and SB 379). All buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable). The communities of Wakonda Beach (31%) and Seal Rock-Bayshore (13%) are expected to

see the highest percent of their buildings damaged by a tsunami event. “Rural” Lincoln County (808 buildings), Wakonda Beach (506 buildings), and Seal Rock-Bayshore (450 buildings) have the highest number of buildings expected to be damaged under the SCA M9.0 tsunami scenario. The value of building damage losses due to the tsunami is \$274.6 million (another \$402.5 million will be attributed to the related earthquake).<sup>34</sup>

**Table 2-13 Damaged and Exposed Buildings, CSZ M9.0 Tsunami, by Unincorporated Area**

	Total Buildings	Exposed Buildings			
		CSZ M9.0 (Medium)		SB 379	
		Number	Percent	Number	Percent
"Rural" Lincoln County	12,637	808	6%	864	7%
Otis-Rose Lodge	1,747	0	0%	0	0%
Otter Rock	634	22	3%	5	1%
Salishan-Lincoln Beach	2,847	227	8%	367	13%
Seal Rock-Bayshore	3,345	450	13%	476	14%
Wakonda Beach	1,614	506	31%	497	31%
Total Unincorporated	22,824	2,013	9%	2,013	9%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; “Rural” Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability<sup>35</sup>

Critical facilities determined to be non-functioning following a CSZ tsunami include (additional critical facilities will be impacted by the related earthquake):

- Toledo State Airport (*Toledo area*)

The following vulnerable critical facilities were identified by the County but not included in the Risk Report analysis:

- Depoe Bay RFPD Fire Station 2200 (Gleneden Beach)

Risk Report Identified Areas of Vulnerability<sup>36</sup>

- Residential areas built on the “Salishan Spit” in Salishan-Lincoln Beach are extremely vulnerable to tsunami hazard.
- Low-laying coastal areas and estuarine zones in Yachats, Wakonda Beach, Newport, and Lincoln City are exposed to tsunami hazard.

<sup>34</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmidlein. “Community clusters of tsunami vulnerability in the US Pacific Northwest”, PNAS 2015 112 (17) 5354-5359.

<sup>35</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Table A-2.

<sup>36</sup> Ibid. Page 26.

## **Community Clusters of Tsunami Vulnerability**

Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.<sup>37</sup> The tables below provide community specific information and identify the most vulnerable communities based upon the cluster analysis. Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds.<sup>38</sup> The study placed all communities within Lincoln County within the following cluster category: “Relatively low numbers of residents, employees, or customer-heavy businesses in the tsunami hazard zones that will likely have sufficient time to reach high ground before tsunami wave arrival”.<sup>39</sup> Lincoln City and Toledo were noted to have slightly higher percentages of their population in the over age 65 category which may benefit from specific age related mitigation measures. The report suggests that education efforts that recognize demographic differences may be the best evacuation related mitigation measure for the Lincoln County communities.<sup>40</sup>

Table 2-14 provides exposure analysis for the total number of residents, employees, public venues, dependent care facilities, and community businesses that are located within the “Large” local tsunami-hazard zone. The table shows that the unincorporated county (2,222) and Lincoln City (1,257) have the largest number of residents in the “Large” local tsunami-hazard zone; while Newport (1,445) and Lincoln City (584) have the largest number of employees located in the zone. The cities of Lincoln City (23) and Newport (10) have the largest number of public venues in the “Large” local tsunami-hazard zone; while Waldport (10) has the largest number of dependent care facilities in the zone and Newport (53) has the largest number of community businesses in the zone. Based upon the cluster analysis all the communities within Lincoln County are categorized within the least vulnerable group with regard to people or facilities in tsunami-hazard zones; although the report notes that Newport does have a high number of employees exposed to the tsunami-hazard zone.<sup>41</sup>

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<sup>37</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmidlein. “Community clusters of tsunami vulnerability in the US Pacific Northwest”, PNAS 2015 112 (17) 5354-5359.

<sup>38</sup> Ibid.

<sup>39</sup> Ibid.

<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

**Table 2-14 Total Number in Tsunami-hazard Zones**

Community	Total number in tsunami-hazard zones				
	Residents	Employees	Public Venues	Dependent Care Facilities	Community Businesses
Lincoln City	1,257	584	23	1	27
Depoe Bay	27	0	0	0	0
Newport	578	1,445	10	1	53
Toledo	104	44	0	1	0
Waldport	552	283	6	10	32
Yachats	289	10	0	0	3
Unincorporated	2,222	341	8	0	17

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

The sensitivity of communities within Lincoln County is also related to demographic characteristics of the population. Table 2-15 shows the results of an analysis of commonly used demographic variables associated with block level data in the 2010 US Census.<sup>42</sup> The data shows that Yachats (42%), Waldport (27%), and Lincoln City (16%) have the highest percentage of their populations within the tsunami-hazard zone. In addition, the table shows that Depoe Bay (40%), Yachats (33%), Waldport (28%), and the unincorporated county (29%) have a relatively high percentage of their population greater than 65 years of age. In addition, the table shows that Waldport (60%) has a high percentage of renter-occupied households. The cluster analysis (Wood et al) suggests that Lincoln County communities have relatively minor variability in racial composition, housing tenure, and age compared to other communities in the study.<sup>43</sup> The study does suggest that mitigation efforts may want to focus on the needs of older residents within Depoe Bay, Newport, Waldport, Yachats, and unincorporated Lincoln County; while the needs of renters and Hispanic or Latino populations may be more important in Lincoln City and Toledo.

**Table 2-15 Characteristics of Residents in Tsunami-hazard Zones**

Community	Total Residents in Hazard Zone	Hispanic or Latino	American Indian or Alaska Native	Under 5 years in age	Single-mother households	More than 65 years in age	Living in group quarters	Renter-occupied households
Lincoln City	16%	6%	5%	4%	6%	21%	1%	46%
Depoe Bay	2%	2%	1%	1%	1%	40%	0%	37%
Newport	6%	4%	2%	5%	6%	24%	1%	39%
Toledo	3%	7%	12%	4%	8%	12%	0%	48%
Waldport	27%	3%	4%	2%	6%	28%	0%	60%
Yachats	42%	6%	3%	2%	3%	33%	0%	41%
Unincorporated	10%	3%	4%	3%	4%	29%	3%	25%

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

The ability to reach higher ground before tsunami wave arrival is a critical aspect of population vulnerability to local tsunami hazards in Lincoln County. Table 2-16 shows the total number of residents and employees that may not have sufficient time to evacuate,

<sup>42</sup> Ibid.

<sup>43</sup> Ibid.

assuming a slow walk (1.1 m/s), a local tsunami event; the table also shows the number of public venues, dependent care facilities, and community businesses that have significant customer presence in places where travel times out of hazards zones are greater than the predicated wave arrival times.<sup>44</sup> The table shows that few individuals would have difficulty evacuating; Lincoln City has the largest number of residents and employees that may have difficulty evacuating.

**Table 2-16 Total Number That May Not Have Sufficient Time to Evacuate, Assuming a Slow Walk**

Community	Residents	Employees	Public Venues	Dependent	
				Care Facilities	Community Businesses
Lincoln City	233	16	1	0	0
Depoe Bay	0	0	0	0	0
Newport	0	0	0	0	0
Toledo	0	0	0	0	0
Waldport	2	0	0	0	0
Yachats	0	0	0	0	0
Unincorporated	42	0	0	0	0

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

An individual's ability to move faster during evacuation is another element of short-term resilience to tsunamis. Table 2-17 shows the number of individuals that may not be able to evacuate a local tsunami assuming a faster walk speed (1.52 m/s). Similar to the slow walk evacuation (above) there are few individuals that would have difficulty evacuating within Lincoln County.

**Table 2-17 Total Number That May Not Have Sufficient Time to Evacuate, Assuming a Fast Walk**

Community	Residents	Employees	Public Venues	Dependent	
				Care Facilities	Community Businesses
Lincoln City	15	0	0	0	0
Depoe Bay	0	0	0	0	0
Newport	0	0	0	0	0
Toledo	0	0	0	0	0
Waldport	0	0	0	0	0
Yachats	0	0	0	0	0
Unincorporated	26	0	0	0	0

Source: Nate Wood, "Community clusters of tsunami vulnerability in the US Pacific Northwest" (2015).

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

<sup>44</sup> Ibid.

# Flood

## Significant Changes since Previous NHMP:

New data is included from the NFIP (including RL/SRL), Risk Report, OCCRI “Future Climate Projections”, and other technical reports.

## Characteristics

Flooding results when rain and snowmelt create water flow that exceeds the carrying capacity of rivers, streams, channels, ditches and other watercourses. In Oregon, flooding is most common from October through April when storms from the Pacific Ocean bring intense rainfall. Most of Oregon’s destructive natural disasters have been floods.<sup>45</sup>

Three types of flooding affect Lincoln County: (1) riverine flooding, caused mostly by prolonged, high intensity rainfall events, (2) ocean/coastal flooding from high tides and large, wind-driven waves, and (3) urban flooding.

### Riverine Flooding

Riverine floods occur when water levels in rivers and streams overflow their banks. In Lincoln County, riverine flooding occurs primarily on lands in the five major river valleys (Asea, Salmon, Siletz, Yachats, and Yaquina rivers) and along the larger tributaries. Most communities located along such water bodies have the potential to experience this type of flooding after spring rains, heavy thunderstorms or rapid runoff from snow melt. Riverine floods can be slow or fast rising, but usually develop over a period of days.

The danger of riverine flooding occurs mainly during the winter months, with the onset of persistent, heavy rainfall, and during the spring, with melting of snow in the Cascade and Coast Ranges.

### Coastal Flooding

Coastal flooding occurs in low-lying coastal areas and is caused by heavy rain, storms, large waves, and even tsunamis produced by underwater seismic events. Areas exposed to this intensive wave action are termed by FEMA as high velocity zone, or “V-zones”. Special regulations are usually applied in these areas.

### Urban Flooding

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization of a watershed changes the hydrologic systems of the basin. Heavy rainfall collects and flows faster on impervious concrete and asphalt surfaces. The water moves from the clouds, to the ground, and into streams at a much faster rate in urban areas. Adding these elements to the hydrological systems can result in floodwaters that rise very rapidly and peak with violent force.

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<sup>45</sup> Taylor, George H. and Chris Hannan. *The Oregon Weather Book*. Grants Pass, OR: Oregon State University Press. 1999

During periods of urban flooding, streets can become swift moving rivers and basements can fill with water. Storm drains often back up with vegetative debris causing additional, localized flooding.

## Location and Extent

Lincoln County located along the central Oregon Coast. Its western edge is the Pacific Ocean and its eastern edge lies in the Coast Range. Weather patterns generally move west to east where air masses from the Pacific Ocean rise over the Coast Range, cool, and become saturated.

The principal flood sources for the unincorporated area of Lincoln County include the: Salmon River, Siletz River, Yaquina River, Alsea River, Little Elk Creek, and the Pacific Ocean. The incorporated areas of the county are affected by many of the same rivers and also the following: Alsea Bay, Big Creek, Depoe Bay, Depoe Creek/ Slough, Devils Lake, Drift Creek, Olalla Creek/ Slough, Red River, Schooner Creek, Siletz Bay, Yachats River, and Yaquina Bay.<sup>46</sup> *See the City addenda for a listing of main flood sources for each community.*

Flooding is most common from October through April, when storms from the Pacific Ocean bring intense rainfall to the area. During the rainy season, monthly rainfall totals average far higher than other months of the year. This results in high water, particularly in December and January. The larger floods are the result of heavy rains of two-day to five-day durations augmented by snowmelt at a time when the soil is near saturation from previous rains.

Floods can result in loss of life and property, with the extent of the damage dependent on the depth and velocity of the floodwaters. Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies often use historical records, such as streamflow gauges, to determine the probability of occurrence for floods of different magnitudes.

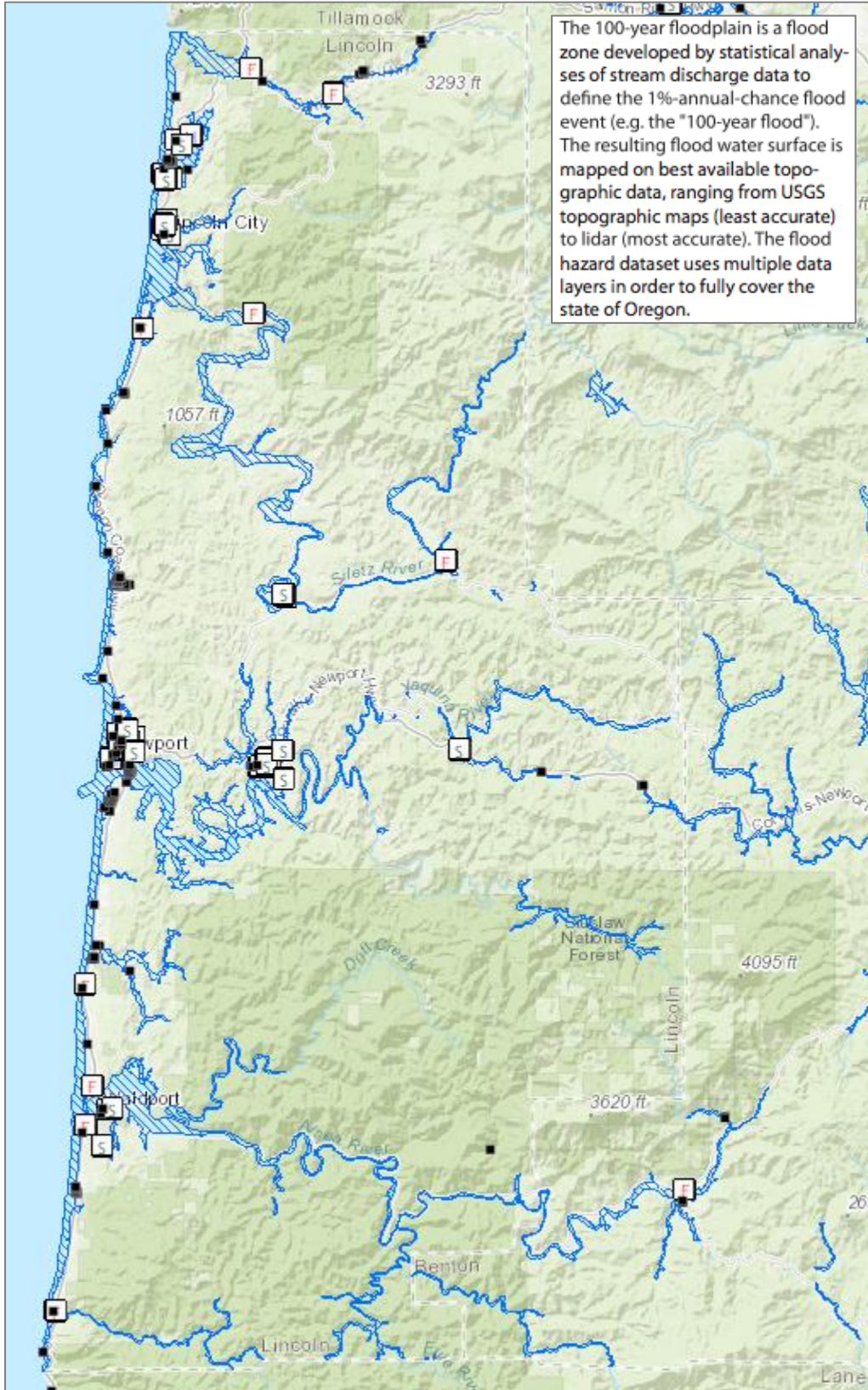
FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one-percent (1%) probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods. These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards; these areas are Special Flood Hazard Areas (SFHAs) and provide the basis for flood insurance and floodplain management requirements. These maps represent a snapshot in time, and do not account for later changes which occurred in the floodplains. Development and other natural and artificial changes in the floodplain have caused changes to the rivers and streams in Lincoln County. Figure 2-16 provides an overview of the flood zones and extent in Lincoln County.

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<sup>46</sup> FEMA, Lincoln County Flood Insurance Study, effective December 18, 2009, and FEMA, Risk MAP Discovery Report, January 10, 2013 (MAS-05-03).



**Figure 2-16 Special Flood Hazard Area (100-year floodplain)**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

The FEMA FIRMs provide a comprehensive analysis of the 100- and 500-year floodplains. The maps cover the entire geographic extent of Lincoln County and therefore include small waterways, reservoirs and less densely populated areas that were not included in previous editions of the FIRMs.

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies often use historical records, such as streamflow gages, to determine the probability of occurrence for floods of different magnitudes. The probability of occurrence is expressed in percentages as the chance of a flood of a specific extent occurring in any given year.

The magnitude of flood used as the standard for floodplain management in the United States is a flood having a one percent probability of occurrence in any given year. This flood is also known as the 100-year flood or base flood. The most readily available source of information regarding the 100-year flood is the system of Flood Insurance Rate Maps (FIRMs) prepared by FEMA. These maps are used to support the National Flood Insurance Program (NFIP). The FIRMs show 100-year floodplain boundaries for identified flood hazards. These areas are also referred to as Special Flood Hazard Areas (SFHAs) and are the basis for flood insurance and floodplain management requirements. In 2019 FEMA completed an update of all FIRMs in Lincoln County.

For detailed information, refer to the following Flood Insurance Study (FIS) and associated Flood Insurance Rate Maps (FIRMs):

- [Lincoln County FIS: Volume 1 \(2019\)](#)
- [Lincoln County FIS: Volume 2 \(2019\)](#)

Additional reports are available via FEMA's Flood Map Service Center website:

<https://msc.fema.gov/portal>

Refer to the following DOGAMI reports for additional information:

- Coastal flood hazard study, Lincoln County, Oregon (2018, [O-15-06](#))
- Statewide subbasin-level channel migration screening (2017, [IMS-56](#)).

Additional reports are available via DOGAMI's Publications Search website:

<https://www.oregongeology.org/pubs/pubsearch.htm>

## History

Riverine flooding events with significant damage potential are relatively frequent; historically, floods with an estimated recurrence interval of 10 to 15 years have caused substantial property damage. Records for coastal flooding are mostly anecdotal, but the recurrence of damaging coastal floods has been less frequent than riverine floods.

Riverine flooding in Lincoln County typically occurs following snow accumulation in the upper reaches of watersheds in combination with southwestern storms that may bring warmer temperatures and heavy precipitation. Along the coast the high spring tides combined with storm surges produced by strong winds from winter storms often cause flooding.

The county has received presidential disaster declarations designation for the following events that included flooding: DR 184 (1964), DR 319 (1972), DR 413 (1974), DR 1099 (1996), DR 1107 (1997), DR 1632 (2006), DR 1672 (2006), DR 1683 (2007), DR 1733 (2007), DR 1956 (2011), DR 1964 (2011, Tsunami), and DR 4055 (2012), and DR 4258 (2016). Other recent flooding events occurred in December 2014, December 2015, and November 2016.

## Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a coastal or riverine flood is “high”**, meaning at least one incident is likely within the next 35-year period.

### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events. Additionally, coastal flooding is expected to increase due to sea level rise (SLR) and changing wave dynamics. Sea level is projected to rise by 1.7 to 5.7 feet by 2100. Tidal wetlands and estuaries throughout the county are also expected to experience changes to their composition and area, thereby impacting their ability to naturally mitigate flood events.

Research has documented a pattern of climate variability in the Northern Pacific known as the Pacific Decadal Oscillation (PDO.) The PDO is a long-lived pattern of climate variability with alternating warm/dry-cool/wet cycles, which persist for 20-30 years. The predictability for this climate oscillation is not currently known but it is suggested that the riverine floods associated with high intensity precipitation events may tend to “cluster” in the decades of the cool/wet cycle of the PDO.<sup>47</sup>

Although ocean storms can be expected every year, property damage associated with coastal flooding is rare in Lincoln County.

El Niño effects, which tend to raise ocean levels and produce higher intensity storms, occur about every three to five years.<sup>48</sup> V zones (wave velocity zones,) depicted on FEMA’s Flood Insurance Rate Maps, are areas subject to 100-year flood events (i.e., 1% chance in any given year). The Flood Insurance Rate Maps also show areas vulnerable to sheet-flow from waves over-topping dunes (AO and AH zones).

Climate change will likely be an influencing factor for future flood probabilities. Long-term modeling suggests increases in annual average temperatures may translate in the Pacific Northwest to less total accumulated snowpack as winter precipitation falls as rain. This may

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<sup>47</sup> Mantua, Nathan. The Pacific Decadal Oscillation. University of Washington, Seattle, WA.

<sup>48</sup> Taylor, G.H. and Hatton, R.R. The Oregon Weather Book: A State of Extremes. Oregon State University Press, Corvallis, OR. 1999

result in faster storm runoff with flashier flood events for upper watersheds and the need for greater attention to storm water management in floodplains.<sup>49</sup>

## Vulnerability Assessment

The Steering Committee rated the county as having a **“Moderate” vulnerability to coastal and riverine flood hazards**, meaning that between 1% and 10% of the unincorporated County’s population or property could be affected by a major coastal or riverine flood event.

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

Lincoln County development regulations restrict, but do not prohibit, new development in areas identified as floodplain. This reduces the impact of flooding on future buildings. As new land has been brought into the regional Urban Growth Boundary, the applicable development codes have been applied to prevent the siting of new structures in flood prone areas.

For mitigation planning purposes, it is important to recognize that flood risk for a community is not limited only to areas of mapped floodplains. Other portions of the county outside of the mapped floodplains may also be at relatively high risk from over bank flooding from streams too small to be mapped by FEMA, from channel migration, from local storm water drainage, from local and distant tsunamis, or from king tides.

Low-lying areas along the lower portions of the County’s major rivers (Salmon, Siletz, Yaquina, Alsea, Yachats) and larger tributaries are most vulnerable to flood hazards. Here, riverine flooding can be exacerbated by high tides (especially King Tides). Also, along the lower portions of the Salmon, Siletz and Alsea Rivers, rural subdivisions and substantial recreational and second home development took place in the 1960s and 1970s, (before Lincoln County entered the National Flood Insurance Program and implemented a system of flood hazard area regulation.) As a result, there are numerous structures located in flood hazard areas along these rivers that are classified as ‘pre-FIRM’ (Table 2-20), meaning their construction predates requirements to elevate above the base flood level, and are therefore subject to damage during larger flood events. The county has worked actively, mostly along the Siletz River (Lower Siletz Mitigation Project,) to assist property owners in retrofitting many of these pre-FIRM residences to meet current elevation requirements. This project has been a success for both homeowners and the government agencies that assisted. Having these homes elevated and out of harm’s way will certainly reduce the amount of property losses as well as insurance payments in the future. There are still, however, substantial numbers of structures in harm’s way in these areas.

Also, some areas along major rivers, highways and roads, in particular Highway 229 along the lower Siletz River, are subject to inundation and damage by flood waters.

In general, the following are subject to damage by riverine flooding:

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<sup>49</sup> Mote, P.W., J. Abatzoglou, K.D. Dello, K. Hegewisch, and D.E. Rupp, 2019: Fourth Oregon Climate Assessment Report. Oregon Climate Change Research Institute. [ocri.net/ocar4](http://ocri.net/ocar4).

- Pre-FIRM residential structures, especially repetitive loss structures/properties
- Manufactured homes inside manufactured home parks
- Roads and highways

The primary economic activities at risk from riverine flood events include:

- RV park and campground operations
- Other businesses that rely on road and highway transportation corridors that may be interrupted by flooding.

Coastal developments within FEMA-designated Velocity (V) zones and A-O zones include the Bayshore development on Alsea spit and the Salishan development on the Siletz spit. Most residences in both developments are post-FIRM, meaning that they are built in compliance with current flood hazard area regulations. There has been no record of significant damage from flooding in either of these areas.

### **Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to riverine and coastal flooding. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the “Rural” portions of Lincoln County, Otter Rock, Salishan-Lincoln Beach, Seal Rock-Bayshore, and Wakonda Beach. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled flood scenario.

#### **Population Vulnerability (Residents)**

Approximately 7% of unincorporated Lincoln County’s population (1,257 people) may be displaced by flooding within Lincoln County. These people are expected to have mobility or access issues due to surrounding water. It is important to note that impact from flooding may vary depending on which rivers are flooding. “Rural” Lincoln County has the most population at risk (963), although the population is dispersed throughout the County. The communities of Otis-Rose Lodge are vulnerable to flooding of the Salmon River.

**Table 2-18 Potentially Displaced Residents, 1% Flood, by Unincorporated Area**

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	963	9%
Otis-Rose Lodge	1,926	127	7%
Otter Rock	489	0	0%
Salishan-Lincoln Beach	2,093	83	4%
Seal Rock-Bayshore	2,766	43	2%
Wakonda Beach	1,326	41	3%
Total Unincorporated	18,893	1,257	7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

### Property Vulnerability

Riverine and coastal flooding have a significant impact on Lincoln County particularly within the floodplain and low-lying coastal areas. Approximately seven percent (1,660 buildings) of unincorporated Lincoln County buildings are exposed to the 1% Flood. An additional 499 are exposed but above the height of the 100-year flood extent. Elevating more of these exposed structures would reduce the potential damages sustained from flooding. The percent of exposed buildings is greatest in the dispersed "rural" Lincoln County (11.6%) and within Otis-Rose Lodge (4.6%). The value of losses is greatest in "rural" Lincoln County (\$15.6 million, loss ratio of 1.9%) and Salishan-Lincoln Beach (\$4.8 million, loss ratio of 1.2%). The value of exposed buildings is \$21.5 million.

**Table 2-19 Damaged and Exposed Buildings, 1% Flood, by Unincorporated Area**

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate (\$)	Loss Ratio
"Rural" Lincoln County	12,637	1,467	11.6%	\$15,579,000	1.9%
Otis-Rose Lodge	1,747	81	4.6%	\$300,000	0.4%
Otter Rock	634	0	0.0%	\$0	0.0%
Salishan-Lincoln Beach	2,847	66	2.3%	\$4,838,000	1.2%
Seal Rock-Bayshore	3,345	17	0.5%	\$372,000	0.1%
Wakonda Beach	1,614	29	1.8%	\$442,000	0.4%
Total Unincorporated	22,824	1,660	7.3%	\$21,531,000	1.2%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

### Critical Facility Vulnerability<sup>50</sup>

The following vulnerable critical facilities were determined to be within the 1% flood zone. Elevating these exposed structures would reduce the potential damages sustained from flooding.

- North Lincoln Fire Station 1700 (*Kernville, North Lincoln Fire & Rescue District*)
- Toledo State Airport

### Risk Report Identified Areas of Vulnerability<sup>51</sup>

- The Port of Toledo and the Georgia Pacific manufacturing facility in the City of Toledo are highly vulnerable to flooding from the Yaquina River.
- Developed areas along the Siletz River in the unincorporated county and in Lincoln City are exposed to the 100-year flood.
- Many buildings in the low-lying business area of Waldport is particularly vulnerable to flooding. This area, along the riverbank, is subject to the 100-year flood due to the proximity of the Alsea River. Mitigation actions, such as elevating buildings, have alleviated some problems.
- Coastal flooding threatens many residences in Wakonda Beach and Salishan-Lincoln Beach.

## National Flood Insurance Program (NFIP)

FEMA's Flood Insurance Study (FIS), and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2010. Table 2-20 shows that as of August 2019, unincorporated Lincoln County has 1,089 National Flood Insurance Program (NFIP) policies in force, representing almost \$300 million in coverage. Of those, 453 are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for the County was April 15, 2004. The table shows that most flood insurance policies are for residential structures, primarily single-family homes. Flood insurance covers only the improved land, or the actual building structure. There have been 271 paid flood insurance claims for a combined total of just over \$4 million.

The County complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The NFIP's Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. Lincoln County, and the incorporated jurisdictions, do not participate in the CRS and, therefore, do not receive discounted flood insurance premiums for residents in a special flood hazard zone.

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<sup>50</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Table A-2.

<sup>51</sup> Ibid. Page 31.

Repetitive Loss Properties:

The Community Repetitive Loss record for Lincoln County identifies 55 Repetitive Loss Properties<sup>52</sup>, of which 10 are Severe Repetitive Loss Properties<sup>53</sup>. Fifty (50) of the repetitive loss properties are single-family residential (seven of these are severe repetitive loss properties), three (3) are condominium associations (all three are severe repetitive loss properties), and two are non-residential.

RL and SRL properties are troublesome because they continue to expose lives and valuable property to the flooding hazard. Local governments as well as federal agencies such as FEMA attempt to address losses through floodplain insurance and attempts to remove the risk from repetitive loss of properties through projects such as acquiring land and improvements, relocating homes or elevating structures. Continued repetitive loss claims from flood events lead to an increased amount of damage caused by floods, higher insurance rates, and contribute to the rising cost of taxpayer funded disaster relief for flood victims.

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<sup>52</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

<sup>53</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.



**Table 2-20 Flood Insurance Detail**

	<b>Lincoln County</b>	<b>Unincorporated Lincoln County</b>
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	9/30/1980
Total Policies	2,325	1,089
Pre-FIRM Policies	1,067	453
<b>Policies by Building Type</b>		
Single Family	1,685	1,023
2 to 4 Family	57	10
Other Residential	462	33
Non-Residential	121	23
Minus Rated A Zone	98	56
Minus Rated V Zone	3	2
Insurance in Force	\$585,856,500	\$298,046,700
Total Paid Claims	343	271
Pre-FIRM Claims Paid	265	207
Substantial Damage Claims	53	49
Total Paid Amount	\$5,479,221	\$4,032,463
Repetitive Loss Structures	64	55
Severe Repetitive Loss Properties	12	10
CRS Class Rating	NP	NP
Last Community Assistance Visit	-	4/15/2004

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

# Landslide

## Significant Changes since Previous NHMP:

New data is included from the Risk Report, OCCRI “Future Climate Projections”, and other technical reports.

## Characteristics

A landslide is any detached mass of soil, rock, or debris that falls, slides or flows down a slope or a stream channel. Landslides are classified according to the type and rate of movement and the type of materials that are transported. In a landslide, two forces are at work: 1) the driving forces that cause the material to move down slope, and 2) the friction forces and strength of materials that act to retard the movement and stabilize the slope. When the driving forces exceed the resisting forces, a landslide occurs.

Lincoln County is subject to shallow- and deep-seated landslides and debris flows (mudslides) especially in the Coast Range in the eastern portion of the county, which may affect buildings, roads and utilities.

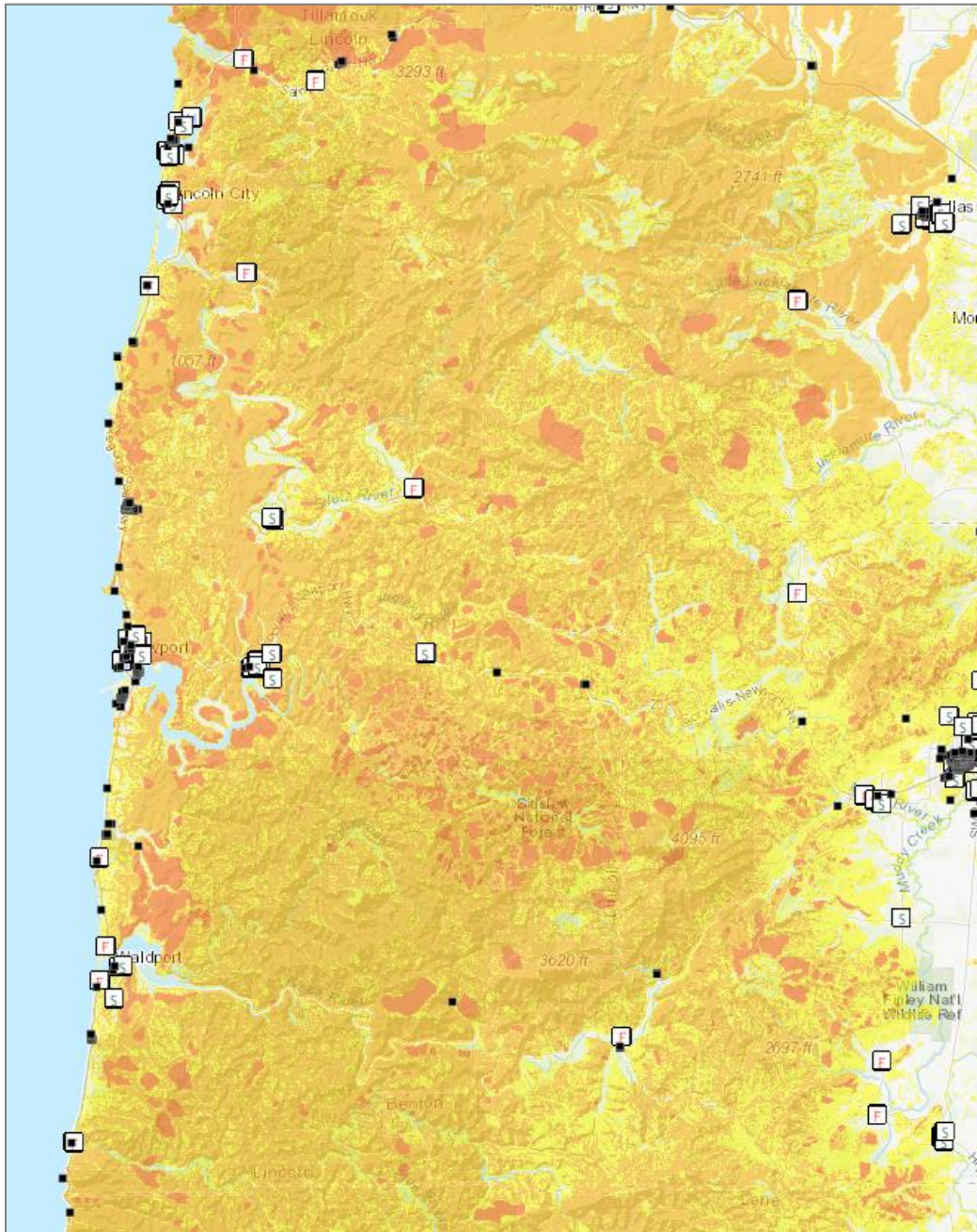
Additionally, landslides often occur together with other natural hazards, thereby exacerbating conditions, as described below:

- Shaking due to earthquakes can trigger events ranging from rockfalls and topples to massive slides.
- Intense or prolonged precipitation that causes flooding can also saturate slopes and cause failures leading to landslides.
- Landslides into a reservoir can indirectly compromise dam safety and a landslide can even affect the dam itself.
- Wildfires can remove vegetation from hillsides, significantly increasing runoff and landslide potential.

## Location and Extent

In Lincoln County, DOGAMI reports the slopes nearest to rivers are at greatest risk of landslides (Figure 2-17). Weak, low-permeability marine sediments overlain by basalts, and clay rich residual soils overlying basalts are susceptible to water-induced landslides on steep slopes and within existing slide masses. Features such as hummocky topography, disrupted drainage patterns, sag ponds, springs, back-tilted bedrock blocks, and subdued head scarps are indicative of landslide terrain. For Lincoln County, most landslide areas are found in less populated eastern hills, historic landslide areas are also present in or adjacent to urban areas. Landslides in these areas could cause disruptions in transportation and potable water systems.

**Figure 2-17 Landslide Susceptibility Exposure**



Low	<b>Landsliding unlikely.</b> Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low.
Moderate	<b>Landsliding possible.</b> Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.
High	<b>Landsliding likely.</b> Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.
Very High	<b>Existing landslides</b> Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

More detailed landslide hazard assessment at specific locations requires a site-specific analysis of the slope, soil/rock and groundwater characteristics at a specific site. Such assessments are often conducted prior to major development projects in areas with moderate to high landslide potential, to evaluate the specific hazard at the development site.

Landslide susceptibility exposure for Lincoln County is shown in Figure 2-17 and Table 2-21 shows landslide susceptibility exposure for Lincoln County and the incorporated cities. Approximately 73% of the county has high or very high landslide susceptibility exposure. These are concentrated in areas of high slopes, and close to river valleys. In general cities within the County have a lower landslide susceptibility exposure than does the unincorporated area of the County. *Note that even if a County or City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries or take lives.

**Table 2-21 Landslide Susceptibility Exposure**

Jurisdiction	Area, ft <sup>2</sup>	Low	Moderate	High	Very High
<b>Lincoln County</b>	27,673,176,599	7.0%	21.1%	61.8%	11.1%
<b>Depoe Bay</b>	50,271,265	19.6%	26.0%	42.3%	12.1%
<b>Lincoln City</b>	166,883,441	22.9%	24.0%	49.6%	3.5%
<b>Newport</b>	291,240,190	44.2%	19.5%	28.7%	7.5%
<b>Siletz</b>	17,593,580	68.5%	21.4%	10.1%	0.0%
<b>Toledo</b>	64,963,983	26.4%	13.8%	39.3%	20.5%
<b>Waldport</b>	85,619,621	40.2%	26.7%	30.8%	2.3%
<b>Yachats</b>	25,746,552	32.6%	25.3%	32.5%	9.6%

Source: DOGAMI [Open-File Report, O-16-02](#), Landslide Susceptibility Overview Map of Oregon (2016)

For more information, refer to the following report and maps provided by DOGAMI:

- Preparing for Landside Hazards, A Land Use Guide for Oregon Communities (October 2019) [Link](#)
- Statewide Landslide Susceptibility (2016, [O-16-02](#)).
- Landslide Susceptibility of Lifeline Routes in the Oregon Coast Range (2015, [O-15-01](#))
- Lidar data and landslide inventory maps of the North Fork Siuslaw River and Big Elk Creek watersheds, Lane, Lincoln, and Benton Counties, Oregon (2012, [O-12-07](#))
- Johnson Creek landslide research project, Lincoln County, Oregon: Final report to the Oregon Department of Transportation(2008, [SP-40](#))
- Slope failures in Oregon: GIS inventory for three 1996/97 storm events (2000, [Special Paper 34](#)).
- Storm Impacts and Landslides of 1996: [Final Report](#)

Additional reports are available via DOGAMI's Publications Search website:

<http://www.oregongeology.org/pubs/search.php>

## History

Landslides may happen at any time of the year. In addition to landslides triggered by a combination of slope stability and water content, earthquakes may also trigger landslides. Areas prone to seismically triggered landslides are generally the same as those prone to ordinary (i.e., non-seismic) landslides. As with ordinary landslides, seismically triggered landslides are more likely for earthquakes that occur when soils are saturated with water.

Debris flows and landslides are a very common occurrence in hilly areas of Oregon, including portions of Lincoln County. Many landslides occur in undeveloped areas and thus may go unnoticed or unreported. For the most part, landslides become a problem only when they impact developed areas and have the potential to damage buildings, roads or utilities.

Landslides accompany almost every major storm system that impacts western Oregon. Although most landslides occur in the undeveloped forested areas of the county, landslides have also occurred in more developed areas. Lincoln County does not have a comprehensive list of landslide events, but they likely occur during major storms that impact the County. In recent history, particularly noteworthy landslides accompanied storms in 1964, 1966, 1982, 1996, 2005, 2006, 2007, 2011, 2012, and 2016. A major winter storm in November 1996 produced more than 9,500 landslides throughout western Oregon, including Lincoln County. More recently, similar winter storm events have resulted in significant slide damages in Lincoln County, including closures of Highway 101 at Cape Perpetua and Cape Foulweather, on Highway 18, and on old Highway 101, which lost a bridge. This isolation due to highway failures became problematic for business and commerce as well as for emergency response vehicles. Private property damage due to landslides has also occurred in recent years, including damage to a restaurant in Toledo, the destruction of a house on the Yaquina Bay Road near Newport, and damage to homes and streets at the west end of NW 57<sup>th</sup> Street in Newport. Most recently, heavy rains in November 2006 triggered a 17-18 acre landslide near Immonen Road, a county road located in the northern portion of the county. This slide continues to be active and has caused extensive damage to the county road.

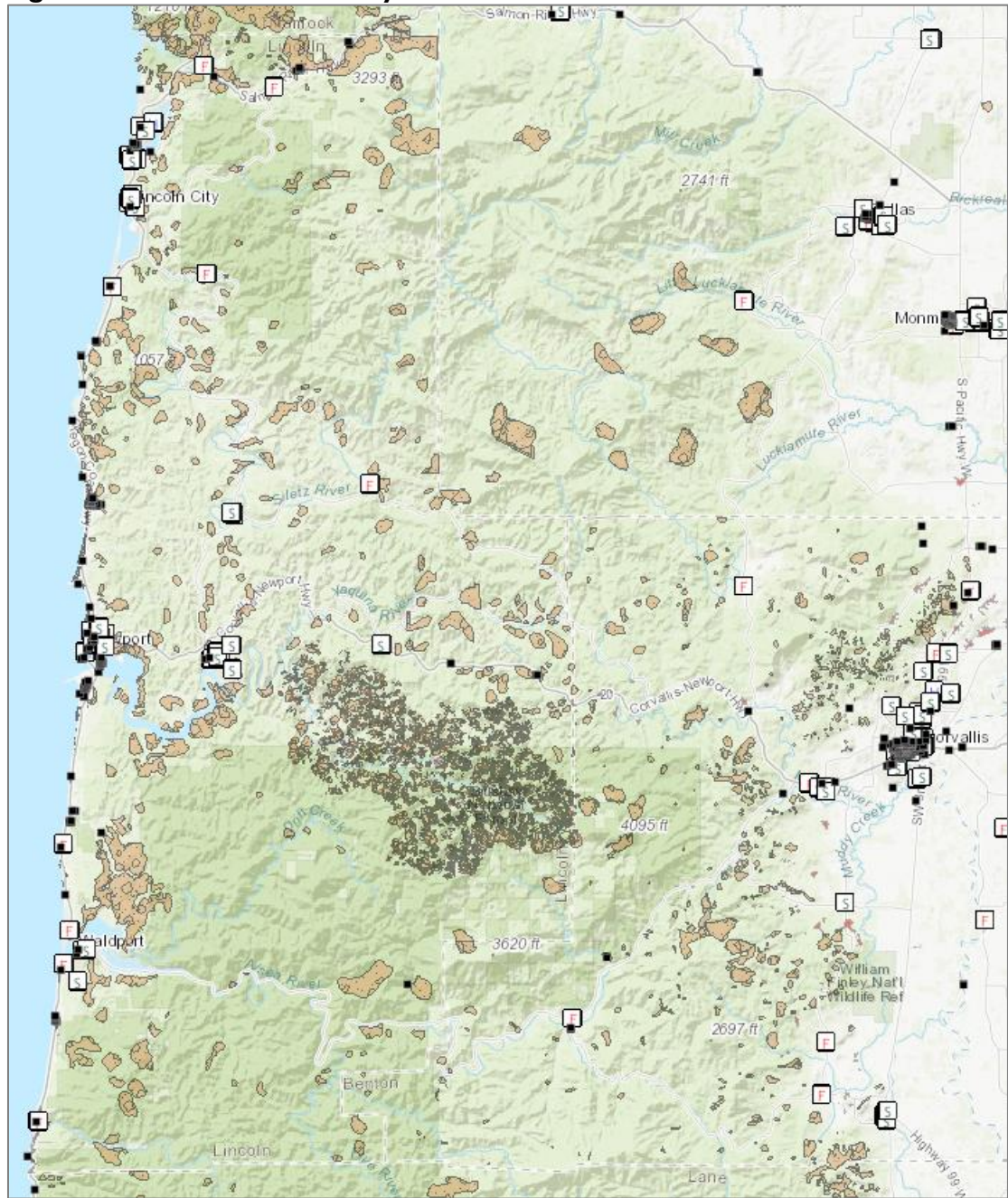
Numerous slow moving slides affect portions of Highway 101 along the coast, including the very large Johnson Creek slide just south of Cape Foulweather. The Johnson Creek landslide is located along the Oregon coast south of Cape Foulweather and is a result of coastal processes. The landslide has a long history of impacting U.S. Highway 101, which passes over the middle section of the slide. The slide is up to 26 m thick, 200 m long, and 360 m wide. Total movement of the slide, as estimated from geologic cross-sections, is 28 m horizontally and 6 m vertically. The most recent significant movement of the slide occurred in early 2002, when it moved approximately 25 cm horizontally and several centimeters vertically.<sup>54</sup>






Figure 2-18 shows the landslide inventory for Lincoln County from the [Statewide Landslide Information Database for Oregon](#).

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<sup>54</sup> USGS. March, 16, 2007. Johnson Creek Landslide. [http://landslides.usgs.gov/monitoring/johnson\\_creek/](http://landslides.usgs.gov/monitoring/johnson_creek/)

**Figure 2-18 Landslide Inventory**



<p>  Scarp   Head Scarp         </p>	<p><b>Deposits</b></p> <p>  Talus-Colluvium   Fan   Landslide         </p>	<p>Scarps are concave, steep areas of a slope where material has been removed due to landsliding. A head scarp is the area at the top of a slope where material has been removed due to landsliding. Talus-colluvium is a general term for loose sediments built up at the base of a slope due to transportation by gravity. A fan is an outspread mass of material, usually at the base of a narrow channel, deposited by a landslide. Landslide is a general term for deposits of material that have been moved by landsliding.</p>
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Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

## Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a landslide or debris flow is “high”**, meaning at least one incident is likely within the next 35-year period.

The probability of rapidly moving landslide occurring depends on several factors, including steepness of slope, slope materials, local geology, vegetative cover, human activity and water. There is a strong correlation between intensive winter rainstorms and the occurrence of rapidly moving landslides (debris flows). Consequently, the National Weather Service tracks storms during the rainy season, monitors rain gauges and snow melt and issues warnings as conditions warrant. Given the correlation between precipitation, snowmelt and rapidly moving landslides, it would be feasible to construct a probability curve. The installation of slope indicators or the use of more advanced measuring techniques could provide information on slower moving slides.

Geo-engineers with DOGAMI estimate widespread landslides about every 20 years; landslides at a local level can be expected every two or three years.<sup>55</sup>

### Future Climate Projection:

According to OCCRI report *“Future Climate Projections: Lincoln County”* (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

## Vulnerability Assessment

The Steering Committee rated the County as having a **“high” vulnerability to landslide hazards**, meaning that more than 10% of the unincorporated County’s population or property could be affected by a major hazard event.

To a large degree, landslides are very difficult to predict. Landslides can impact major transportation arteries, blocking residents from essential services and businesses. Many aspects of the county are vulnerable to landslides. This includes land use and development patterns, the economy, population segments, ecosystem services and cultural assets.

A quantitative landslide hazard assessment requires overlay of landslide hazards (frequency and severity of landslides) with the inventory exposed to the hazard (value and vulnerability) by considering:

- Extent of landslide susceptible areas;
- Inventory of buildings and infrastructure in landslide susceptible areas;
- Severity of earthquakes or winter storm event (inches of rainfall in 24 hours);
- Percentage of landslide susceptible areas that will move and the range of movements (displacements) likely; and
- Vulnerability (amount of damage for various ranges of movement).

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<sup>55</sup>Mills, K. 2002. Oregon’s Debris Flow Warning System. Cordilleran Section–98th Annual Meeting. Corvallis.

## Roads and Bridges

Large losses incurred from landslide hazards in Lincoln County have been associated with roads. The Lincoln County Public Works Department is responsible for responding to slides that inhibit the flow of traffic or are damaging a road or a bridge. The department does its best to communicate with residents impacted by landslides, but can usually only repair the road itself, as well as the areas adjacent to the slide where the county has the right of way.

It is not cost effective to mitigate all slides because of limited funds and the fact that some historical slides are likely to become active again even with mitigation measures. The Public Works Department alleviates problem areas by grading slides, and by installing new drainage systems on the slopes to divert water from the landslides. This type of response activity is often the most cost-effective in the short-term but is only temporary. Unfortunately, many property owners are unaware of slides and the dangers associated with them.

## **Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslides. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled landslide scenario.

### Population Vulnerability (Residents)

Approximately 32% of unincorporated Lincoln County's population (6,033 people) may be displaced by landslides within Lincoln County. These people are expected to have mobility or access issues and/or may have their residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. "Rural" Lincoln County has the most population at risk (4,530), although the population is dispersed throughout the County. About one-third of Otis-Rose Lodge and one-fifth of Otter Rock residents are exposed.



**Table 2-22 Potentially Displaced Residents, High and Very High Landslide, by Unincorporated Area**

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	4,530	44%
Otis-Rose Lodge	1,926	666	35%
Otter Rock	489	105	21%
Salishan-Lincoln Beach	2,093	256	12%
Seal Rock-Bayshore	2,766	364	13%
Wakonda Beach	1,326	112	8%
Total Unincorporated	18,893	6,033	32%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

Property Vulnerability

Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 30% (5,135 buildings) of unincorporated Lincoln County buildings are exposed to the High or Very High landslide susceptibility zones. The percent of exposed buildings is greatest in the dispersed "rural" Lincoln County (40.6%), Otis-Rose Lodge (34.5%), and Otter Rock (26.5%). The value of exposed buildings is \$526 million.

**Table 2-23 Exposed Buildings, High & Very High Landslide, by Unincorporated Area**

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate (\$)	Loss Ratio
"Rural" Lincoln County	12,637	5,135	40.6%	\$354,114,000	43.0%
Otis-Rose Lodge	1,747	602	34.5%	\$21,495,000	31.8%
Otter Rock	634	168	26.5%	\$23,648,000	28.8%
Salishan-Lincoln Beach	2,847	369	13.0%	\$63,765,000	16.4%
Seal Rock-Bayshore	3,345	445	13.3%	\$55,334,000	15.9%
Wakonda Beach	1,614	108	6.7%	\$7,879,000	6.4%
Total Unincorporated	22,824	6,827	29.9%	\$526,235,000	28.7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability<sup>56</sup>

The following vulnerable critical facilities were determined to be exposed to the High or Very High landslide susceptibility zones.

<sup>56</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Tables A-2, A-9, A-11.

- Central Oregon Coast Fire Station 7300 (*Tidewater, Central Oregon Coast Fire & Rescue District*)
- Toledo High School (*Toledo area, Lincoln County School District*)
- Waldport Water Treatment Plant (*Waldport Area, City of Waldport*)
- Seal Rock Water District
- Yachats Fire Station (*outside Waldport, Yachats Rural Fire Protection District*)

Risk Report Identified Areas of Vulnerability<sup>57</sup>

- Many residential buildings in the unincorporated county and the City of Newport, along the Yaquina River, are exposed to high and very high landslide hazard.
- An area deemed very high susceptibility to landslides exists just to the east of the community of Seal Rock-Bayshore.
- Several places within the City of Toledo where there is exposure to very high landslide susceptibility. Nearly half of the buildings in the city, including all of its critical facilities, are threatened by landslide hazard.
- Nearly a quarter of the building in the community of Otis-Rose Lodge is exposed to very high landslide susceptibility.

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

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<sup>57</sup> Ibid. Page 33.

## Severe Weather (Windstorm, Tornado, and Winter Storm)

### Significant Changes since Previous NHMP:

New data is included from the OCCRI “Future Climate Projections” report. Tornado was individually assessed as a hazard unique from windstorm.

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.<sup>58</sup> Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months.<sup>59</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

### Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>60</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

Climate models for Oregon suggest, future regional climate changes include increases in temperature around 0.2-1°F per decade in the 21st Century, along with warmer and drier summers, and some evidence that extreme precipitation will increase in the future.<sup>61</sup> Increased droughts may occur in the Willamette Valley under various climate change scenarios because of various factors, including reduced snowpack, rising temperatures, and likely reductions in summer precipitation. Climate models suggest that as the region warms,

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<sup>58</sup> US Department of Agriculture. <http://www.fsa.usda.gov/or/Notice/Flp104.pdf>.

<sup>59</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

<sup>60</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.

<sup>61</sup> Oregon Climate Change Research Institute (OCCRI), 4<sup>th</sup> Oregon Climate Assessment Report (2019) and Northwest Climate Assessment Report (2013). <http://www.occri.net/publications-and-reports/publications/>

winter snow precipitation will likely shift to higher elevations and snowpack will be diminished as more precipitation falls as rain altering surface flows.

## **Windstorm**

### **Characteristics**

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Although windstorms can affect the entirety of Lincoln County, they are especially dangerous near developed areas with large trees or tree stands.

The most common type of wind pattern affecting Lincoln County is straight-line winds, which originate as a downdraft of rain-cooled air and reach the ground and spread out rapidly. Straight-line winds can produce gusts of 100 mph or greater. Records of major Pacific windstorms are documented by state agencies and weather stations throughout Oregon, including several official weather stations in Lincoln County.

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Windstorms can affect developed areas of the county with significant tree stands and major infrastructure, especially above ground utility lines.

### Tornado

Though tornadoes are not common in Oregon, these events do occasionally occur and sometime produce significant property damage and even injury. They are created by a vortex of rotating winds and strong vertical motion, which possess remarkable strength and cause widespread damage. The low pressure at the center of a tornado can destroy buildings and other structures it passes over. Tornadoes are the most concentrated and violent storms produced by earth's atmosphere, and can produce winds in excess of 300 mph. They have been reported in most of the counties throughout the state since 1887. Oregon's tornadoes can be formed in association with large Pacific storms arriving from the west. Lincoln County tornadoes are most common to originate offshore of Lincoln County during winter months. Waterspouts often form off the Lincoln County coast but decay before reaching land. Tornado intensity is measured by the Fujita Scale (F), or the Enhanced Fujita Scale (EF) since 2007, which is based on the damage tornadoes inflict upon human and natural infrastructure and vegetation. Since 1876 there have been six (6) documented tornadoes in Lincoln County (there have been six additional tornadoes in nearby Tillamook County). All tornadoes in Lincoln County have been rated F0 (sustained winds under 73 mph). However, there has been one F1 (1975, sustained winds between 73-112 mph) and one EF2 (2016, sustained winds between 111-135 mph) in the northern part of Tillamook County.

### **Location and Extent**

The Oregon Residential Specialty Code, Oregon Basic Wind Speeds for 50 Year Mean Recurrence Interval, lists Lincoln County within the highest wind speed category as an area impacted by 85-110 mph wind speeds.

The extent of any windstorm, including tornadoes, is determined by its track, intensity and local terrain.<sup>62</sup> A windstorm will frequently knock down trees and power lines, damage homes, businesses, public facilities and create tons of storm related debris. Windstorms are a common, chronic hazard in Lincoln County.

Along the Oregon Coast wind speed is typically 75 mph for 25-year storm events, 80 mph for 50-year storm events and 90 mph for 100-year storm events. Lincoln County has experienced multiple 25-, 50-, and 100-year windstorm events over the past century with impacts often occurring countywide (Table 2-24).

## History

For winter weather events (including high winds,) the National Weather Service monitors gauging stations and provides public warnings for storms and high winds.

Windstorms in Lincoln County usually occur from October to March, and their extent is determined by their track, intensity (the air pressure gradient they generate), and local terrain.<sup>63</sup> The National Weather Service uses weather forecast models to predict oncoming windstorms, while monitoring storms with weather stations in protected valley locations throughout Oregon.<sup>64</sup>

The most destructive windstorm ever recorded in Oregon, in terms of loss of life and property damage, was the Columbus Day storm of 1962. Damage was most severe in the Willamette Valley. The storm killed thirty-eight people and did upwards of \$200 million in damage (over \$1.7 billion in today's dollars). Hundreds of thousands of homes were without power for short periods of time, while others were without power for two to three weeks. More than 50,000 homes were seriously damaged, and nearly 100 were destroyed. The storm destroyed fruit and nut orchards and killed scores of livestock. Intense wind speeds were recorded in the metropolitan areas with gusts of 116 mph on Portland's Morrison Bridge.

Several additional, small windstorm events have occurred since the previous NHMP, see the [Storm Events Database](#) provided by the National Oceanic and Atmospheric Administration for more information. Recent disaster declarations including high winds include DR-1107 (1996) and DR 4258 (2016). See the "Tornado" section above for tornado event history. Many of the winter storm declared disasters included high winds.

## Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a windstorm or tornado is "high"**, meaning at least one severe incident is likely within the next 35-year period.

Table 2-24 shows the wind speed probability intervals that structures 33 feet above the ground would expect to be exposed to within a 25, 50 and 100-year period. The table shows

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<sup>62</sup> DLCD. *Oregon Natural Hazards Mitigation Plan*. 2020.

<sup>63</sup> Ibid.

<sup>64</sup> "Some of the Area's Windstorms." National Weather Service, Portland.  
<http://www.wrh.noaa.gov/pqr/paststorms/wind.php>

that structures in Region 1, which includes Lincoln County, can expect to be exposed to 75 mph winds in a 25-year recurrence interval (4% annual probability).

**Table 2-24 Probability of Severe Wind Events (Region 2)**

	25-Year Event (4% annual probability)	50-Year Event (2% annual probability)	100-Year Event (1% annual probability)
<b>Region 1:</b>			
Oregon Coast	75 mph	80 mph	90 mph

Source: DLCD. *Oregon Natural Hazards Mitigation Plan*. 2020.

## Vulnerability Assessment

The Steering Committee rated the county as having a **“high” vulnerability to windstorm hazards**, meaning that more than 10% of the unincorporated County’s population or property could be affected by a major disaster. The Steering Committee rated the County as having a **“low” vulnerability to a tornado hazard**, meaning that less than 1% of the unincorporated County’s population or property could be affected by a major tornado event.

Many buildings, utilities and transportation systems within Lincoln County are vulnerable to wind damage. This is especially true in open areas, such as natural grasslands or farmlands. It is also true in forested areas, along tree-lined roads and electrical transmission lines and on residential parcels where trees have been planted or left for aesthetic purposes. Structures most vulnerable to high winds include insufficiently anchored manufactured homes and older buildings in need of roof repair.

Fallen trees are especially troublesome. They can block roads and rails for long periods of time, impacting emergency operations. In addition, up rooted or shattered trees can down power and/or utility lines and effectively bring local economic activity and other critical facilities to a standstill. Much of the problem may be attributed to a shallow or weakened root system in saturated ground. In Lincoln County, trees are more likely to blow over during the winter (wet season).

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

## Winter Storm

### Characteristics

Winter storms occurring in Lincoln County result in several natural hazards— including floods, landslides/debris flows, snow, ice and wind. Each on its own, or in combination, can completely immobilize emergency response activities, close transportation corridors, and disrupt transportation and utilities. Each of these natural hazards is individually discussed in detail in their respective sections.

Winter storms in Lincoln County can bring rain as well as snow or can be followed by rising temperatures that melt newly fallen snow. Either scenario often causes flooding; most

floods in western Oregon occur as a result of winter storms. The flood hazard is described in detail in flood section of this document.

As is the case with flood, wind as a hazard in Lincoln County most frequently occurs as part of a winter storm. The nature, history, location, extent, and probability of future events for wind, including winter storm wind, are explored in detail in the wind section of this plan.

The winter storms that affect Lincoln County typically are not local events affecting only small geographic areas. Rather, winter storms are usually large cyclonic low-pressure systems that move in from the Pacific Ocean and affect large areas of Oregon and/or the whole Pacific Northwest. These storms are most common from October through March.

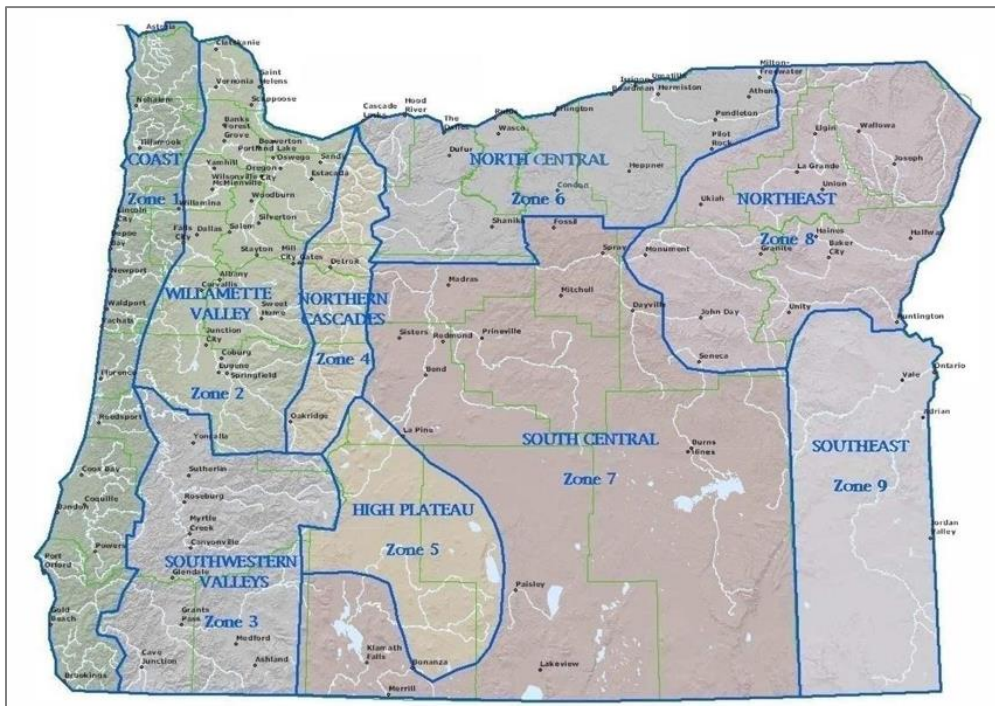
Ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation which may include freezing rain, sleet and hail. Of these, freezing rain can be the most damaging of ice formations.

Outside of mountainous areas, significant snow accumulations are much less likely in western Oregon than on the east side of the Cascades.

## Location and Extent

The National Climatic Data Center has established climate zones in the United States for areas that have similar temperature and precipitation characteristics. Oregon's latitude, topography and proximity to the Pacific Ocean give the state diversified climates. Figure 2-19 shows that Lincoln County is located within Zone 1: Coast. Winter storm events have relatively predictable and longer speeds of onset and the effects of winter storms are often long lasting.

**Figure 2-19 Oregon Climate Divisions**



Source: Oregon Climate Service

The principal types of winter storms that occur include:

- **Snowstorms:** require three ingredients: cold air, moisture and air disturbance. The result is snow, small ice particles that fall from the sky. In Oregon, the further inland and north one moves, the more snowfall can be expected. Blizzards are included in this category.
- **Ice storms:** are a type of winter storm that forms when a layer of warm air is sandwiched by two layers of cold air. Frozen precipitation melts when it hits the warm layer and refreezes when hitting the cold layer below the inversion. Ice storms can include sleet (when the rain refreezes before hitting the ground) or freezing rain (when the rain freezes once hitting the ground).
- **Extreme Cold:** Dangerously low temperatures accompany many winter storms. This is particularly dangerous because snow and ice storms can cause power outages, leaving many people without adequate heating.

Unlike most other hazards, it is not simple to systematically map winter storm hazard zones. The entire County is susceptible to damaging severe weather. Winter storms that bring snow and ice can impact infrastructure, business and individuals. Those resources that exist at higher elevations will experience more risk of snow and ice, but the entire County can face damage from winter storms and, for example, the hail or life threateningly cold temperatures that winter storms bring.

## History

Winter storms occur yearly; more destructive storms occur once or twice per decade, most recently in 2012 (DR-4055), 2014 (DR-4169), 2015 (DR-4258), 2016, 2017, and 2019.

Downed trees disrupted power to several portions of the county, leaving many residents without heat or water for several days. Residential care facilities, home-bound ill personnel requiring daily treatment, hospital patients, and anyone requiring emergency assistance was affected by this winter storm because obstructed roadways prevented emergency vehicle movement. The damage to fire stations, equipment, roads, and other infrastructure affected the ability to effectively respond, as well as reducing the operating budgets of these facilities.

## Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a winter storm is “high”**, meaning at least one incident is likely within the next 35-year period.

The recurrence interval for a moderate to severe winter storm is about once every year; however, there can be many localized storms between these periods. Severe winter storms occur in western Oregon regularly from October through March. Lincoln County experiences moderate winter storms every year to every other year, more damaging winter storms happen less often.



## Vulnerability Assessment

The Steering Committee rated the County as having a **“moderate” vulnerability to winter storm hazards**, meaning that between 1% and 10% of the unincorporated County’s population or property could be affected by a major disaster.

Given current available data, no quantitative assessment of the risk of winter storm was possible at the time of this NHMP update. However, assessing the risk to the County from winter storms should remain an ongoing process determined by community characteristics and physical vulnerabilities. Weather forecasting can give County resources (emergency vehicles, warming shelters) time to prepare for an impending storm, but the changing character of the County population and resources will determine the impact of winter storms on life and property in Lincoln County.

The most likely impact of snow and ice events on Lincoln County are road closures limiting access/egress to/from some areas, especially roads to higher elevations. Winter storms with heavy wet snow or high winds and ice storms may also result in power outages from downed transmission lines and/or poles.

Winter storms which bring snow, ice and high winds can cause significant impacts on life and property. Many severe winter storm deaths occur as a result of traffic accidents on icy roads, heart attacks may occur from exertion while shoveling snow and hypothermia from prolonged exposure to the cold. The temporary loss of home heating can be particularly hard on the elderly, young children and other vulnerable individuals.

Property is at risk due to flooding and landslides that may result if there is a heavy snowmelt. Additionally, ice, wind and snow can affect the stability of trees, power and telephone lines and TV and radio antennas. Downed trees and limbs can become major hazards for houses, cars, utilities and other property. Such damage in turn can become major obstacles to providing critical emergency response, police, fire and other disaster recovery services.

Severe winter weather also can cause the temporary closure of key roads and highways, air and train operations, businesses, schools, government offices and other important community services. Below freezing temperatures can also lead to breaks in un-insulated water lines serving schools, businesses, industries and individual homes. All these effects, if lasting more than several days, can create significant economic impacts for the affected communities and the surrounding region. In the rural areas of the county severe winter storms can isolate small communities, farms, and ranches.

At the time of this update, enough data was not available to determine winter storm vulnerability in terms of explicit types and numbers of existing and future buildings, infrastructure or critical infrastructure.

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

# Volcanic Event

## Significant Changes since Previous NHMP:

No significant change to the volcanic event profile.

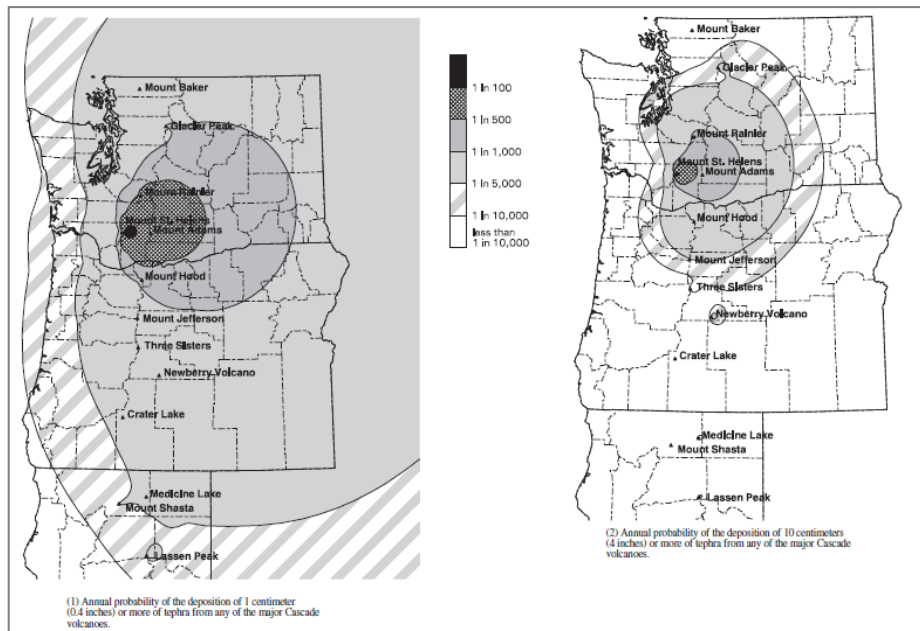
## Characteristics

The Pacific Northwest lies within the “ring of fire,” an area of very active volcanic activity surrounding the Pacific Basin. Volcanic eruptions occur regularly along the ring of fire, in part because of the movement of the Earth’s tectonic plates. The Earth’s outermost shell, the lithosphere, is broken into a series of slabs known as tectonic plates. These plates are rigid, but they float on a hotter, softer layer in the Earth’s mantle. As the plates move about on the layer beneath them, they spread apart, collide, or slide past each other. Volcanoes occur most frequently at the boundaries of these plates and volcanic eruptions occur when molten material, or magma, rises to the surface.

## Location and Extent

Three closest three volcanoes to Lincoln County, Mount St. Helens, Mount Hood, and Mount Jefferson, all lie to the east. Figure 2-20 depicts the potential and geographical extent of volcanic ash fall in excess of ten centimeters from a large eruption of Mt. St. Helens.

**Figure 2-20 Regional Tephra-fall Maps**



Source: USGS “Volcano Hazards in the Mount Jefferson Region, Oregon”

Scientists use wind direction to predict areas that might be affected by volcanic ash; during an eruption that emits ash, the ash fall deposition is controlled by the prevailing wind direction. The predominant wind pattern over the Cascades originates from the west and previous eruptions seen in the geologic record have resulted in most ash fall drifting to the east of the volcanoes. Volcanic activity from ash clouds that drift downwind to the county

from near or distant eruptions is possible from Mount Saint Helens, Mount Hood, the Three Sisters, Mount Bachelor, and the Newberry Crater areas. Because the distance to these potentially active volcanic areas is so great, the only adverse effect that would impact areas of Lincoln County is ash fallout, with potential impact on water supplies. The area affected by ash fallout depends upon the height attained by the eruption column and the atmospheric conditions at the time of the eruption. Volcanic ash can contaminate water supplies, cause electrical storms, create health problems and collapse roofs. Regional tephra fall shows the annual probability of ten centimeters or more of ash accumulation from Pacific Northwest volcanoes.

Geologic hazard maps have been created for most of the volcanoes in the Cascade Range (including Mt. St Helens, Mt. Adams, Mt. Hood, and Mt. Jefferson) by the USGS Volcano Program at the Cascade Volcano Observatory in Vancouver, WA and are available at [http://vulcan.wr.usgs.gov/Publications/hazards\\_reports.html](http://vulcan.wr.usgs.gov/Publications/hazards_reports.html). Volcanic activity from more distant volcanoes will have less impact upon the County.

Additional reports are available via DOGAMI's Publications Search website:

<http://www.oregongeology.org/pubs/search.php>

Other agency/ consultant reports:

- Ewert, J.W., Diefenbach, A.K., and Ramsey, D.W., 2018, 2018 update to the U.S. Geological Survey national volcanic threat assessment: U.S. Geological Survey Scientific Investigations Report 2018–5140, 40 p., <https://doi.org/10.3133/sir20185140>.

## History

Mount St. Helens has been the most active volcano in the Cascade Range during the past 10,000 years. Mount St. Helens is in southern Washington State and has been active throughout its 50,000-year lifetime. Mount Hood is just over 100 miles northeast of the county and is more than 500,000 years old. It has had two significant eruptive periods in the past 1,500 years.

In the past 200 years, seven of the Cascade volcanoes have erupted, including (from north to south): Mt. Baker, Glacier Peak, Mt. Rainier, Mount St. Helens (Washington), Mt. Hood (Oregon), Mt. Shasta and Mt. Lassen (California).

There has been no recent volcanic activity near the county associated with Mount Hood. The 1980 explosion of Mount St. Helens in southern Washington State is the latest on record; both Mount St. Helens and Mount Hood remain listed as active volcanoes.

## Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing volcanic activity is "low"**, meaning one incident is likely within the next 75 to 100-year period.

The United States Geological Survey-Cascades Volcano Observatory (CVO) produced volcanic hazard zonation reports for Mount St. Helens and Mount Hood in 1995 and 1997. The reports include a description of potential hazards that may occur to immediate

communities. The CVO created an updated annual probability of tephra (ash) fall map for the Cascade region in 2001, which could be a rough guide for Lincoln County in forecasting potential tephra hazard problems (Figure 2-20). The map identifies the location and extent of the hazard.

The CVO Volcanic tephra fall map is based on the combined likelihood of tephra-producing eruptions occurring at Cascade volcanoes. Probability zones extend farther east of the range because winds blow from westerly directions most of the time. The map shows annual probabilities for a fall of one centimeter (about 0.4 inch). The patterns on the map show the dominating influence of Mount St. Helens as a tephra producer. Because small eruptions are more numerous than large eruptions, the probability of a thick tephra fall at a given locality is lower than that of a thin tephra fall. The USGS estimates there is annual probability of 0.2 to 1 percent that 10 centimeters or more of tephra (ash) accumulation will occur in Lincoln County.<sup>65</sup>

## Vulnerability Assessment

The Steering Committee rated the county as having a **“low” vulnerability to volcanic activity**, meaning that between less than 1% of the unincorporated County’s population or property could be affected by a major disaster (volcanic ash/lahar).

The U.S. Geological Survey (USGS) lists the threat potential of volcanoes. According to the USGS there are nine volcanoes with Very High or High threat potentials in Oregon and Washington (listed here in order of threat potential): Mount St. Helens, Mount Rainier, Mount Hood, Three Sisters, Newberry, Mount Baker, Glacier Peak, Crater Lake, and Mount Adams (High).<sup>66</sup>

The primary threat to lives and property from active volcanoes is from violent eruptions that unleash tremendous blast forces, generate mud and debris flows (lahars), or produce flying debris and ash clouds. Volcano hazards are divided into proximal (near the volcano) and distal (far from the volcano). Ashfall, and tephra, distal eruptive hazards, are of the greatest concern in Lincoln County. There are no proximal eruptive hazards in Lincoln County.

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

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<sup>65</sup> USGS, 1999, *Volcano Hazards in the Mount Jefferson Region, Oregon*, Open-File Report 99-24

<sup>66</sup> Ewert, J.W., Diefenbach, A.K., and Ramsey, D.W., 2018, 2018 update to the U.S. Geological Survey national volcanic threat assessment: U.S. Geological Survey Scientific Investigations Report 2018–5140, 40 p., <https://doi.org/10.3133/sir20185140>.

## Wildfire

### Significant Changes since Previous NHMP:

New data is included from the Risk Report, OCCRI “Future Climate Projections”, and other technical reports including the Lincoln County CWPP.

The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. The CWPP is hereby incorporated into this NHMP by reference and it will serve to supplement this wildfire section. The following presents a brief summary of key information; refer to the full CWPP for a complete description and evaluation of the wildfire hazard.

### Characteristics

Wildfires occur in areas with large amounts of flammable vegetation that require a suppression response due to uncontrolled burning. Fire is an essential part of Oregon’s ecosystem, but can also pose a serious threat to life and property particularly in the state’s growing rural communities. Wildfire can be divided into three categories: interface, wildland and firestorms. The increase in residential development in interface areas has resulted in greater wildfire risk. Fire has historically been a natural wildland element and can sweep through vegetation that is adjacent to a combustible home. New residents in remote locations are often surprised to learn that in moving away from built-up urban areas, they have also left behind readily available fire services providing structural protection. Recent fires in Oregon and across the western United States have increased public awareness over the potential losses to life, property and natural and cultural resources that fire can pose.

The following three factors contribute significantly to wildfire behavior and can be used to identify wildfire hazard areas.

**Topography:** As slope increases, the rate of wildfire spread increases. South-facing slopes are also subject to more solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridgetops may mark the end of wildfire spread, since fire spreads more slowly or may even be unable to spread downhill.

**Fuel:** The type and condition of vegetation plays a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the “fuel load”). The ratio of living to dead plant matter is also important. The risk of fire is increased significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel’s continuity, both horizontally and vertically, is also an important factor.

**Weather:** The most variable factor affecting wildfire behavior is weather. Temperature, humidity, wind and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildfire activity. By contrast, cooling and higher humidity often signals reduced Wildfire occurrence and easier containment.

The frequency and severity of wildfires is also dependent upon other hazards, such as lightning, drought, equipment use, railroads, recreation use, arson and infestations. If not promptly controlled, wildfires may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. In addition to affecting people, wildfires may severely affect livestock and pets. Such events may require emergency watering/feeding, evacuation and shelter.

The indirect effects of wildfires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thereby enhancing flood potential, harming aquatic life and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards, as described above.

## Location and Extent

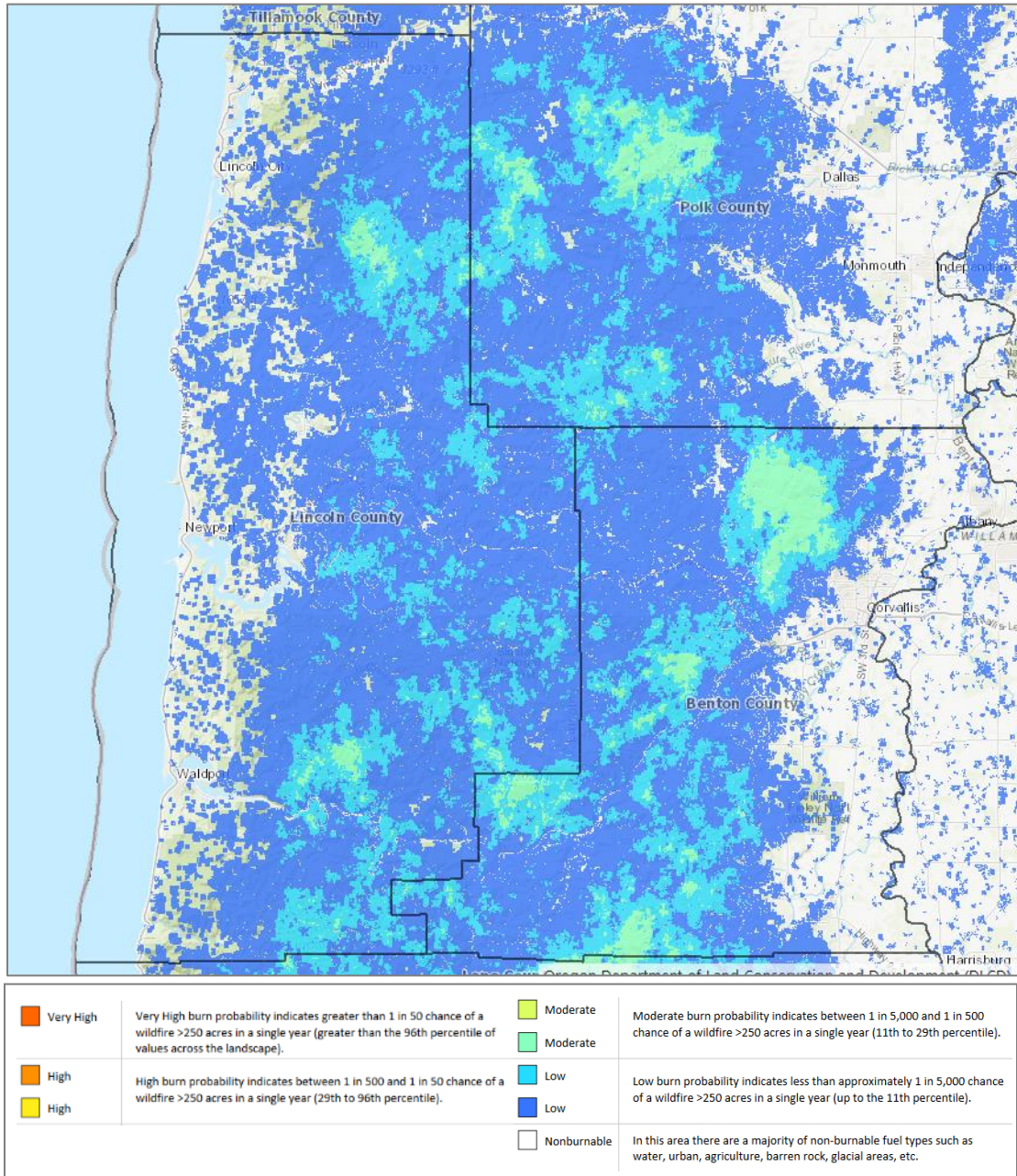
Wildfire hazard areas are commonly identified in regions as the Wildland Urban Interface (WUI). The interface is the urban-rural fringe where homes and other structures are built into a densely forested or natural landscape. If left unchecked, it is likely that fires in these areas will threaten lives and property. One challenge Lincoln County faces is from the increasing number of houses being built in the urban/rural fringe and areas with heavy fuel loads. The “interface” between urban or suburban areas and the resource lands has significantly increased the threat to life and property from fires. Responding to fires in the expanding Wildland Urban Interface area may tax existing fire protection systems beyond original design or current capability.

The ease of fire ignition further determines ranges of the wildfire hazard due to natural or human conditions and the difficulty of fire suppression. The wildfire hazard is also magnified by several factors related to fire suppression/control, such as the surrounding fuel load, weather, topography and property characteristics.

Fire susceptibility throughout the county dramatically increases in late summer and early autumn as summer thunderstorms with lightning strikes increases and vegetation dries out, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. However, various other factors, including humidity, wind speed and direction, fuel load and fuel type and topography can contribute to the intensity and spread of wildland. In addition, common causes of wildfires include arson and negligence from industrial and recreational activities.

In Lincoln County, Wildland/Urban Conflagrations burn primarily vegetative fuels, outside highly urbanized areas. The extent of the hazard is greatest along the county’s mountainous eastern boundary (see Figure 2-21). In these areas, there is low burn probability with expected flame lengths generally less than 4 to 8-feet under normal weather conditions. Most of the developed portion of the county has less severe (unburnable to low) wildfire burn probability (less than 1 in 5,000 chance of a wildfire greater than 250 acres in a single year) that include expected flame lengths less than 8-feet under normal weather conditions (except in the far eastern areas of the county where flame lengths may exceed 11-feet). Conditions vary widely and with local topography, fuels, and local weather (including wind) conditions. Under warm, dry, windy, and drought conditions expect higher likelihood of fire starts, higher intensity, more ember activity, and a more difficult to control wildfire that will include more fire effects and impacts.

**Figure 2-21 Extent of Wildfire Hazard (Burn Probability)**



Source: [Oregon Wildfire Risk Explorer: County Summary Report](#) (June 2020) – To explore and view map detail click hyperlink to left. July 10, 2020.

Other agency/ consultant reports:

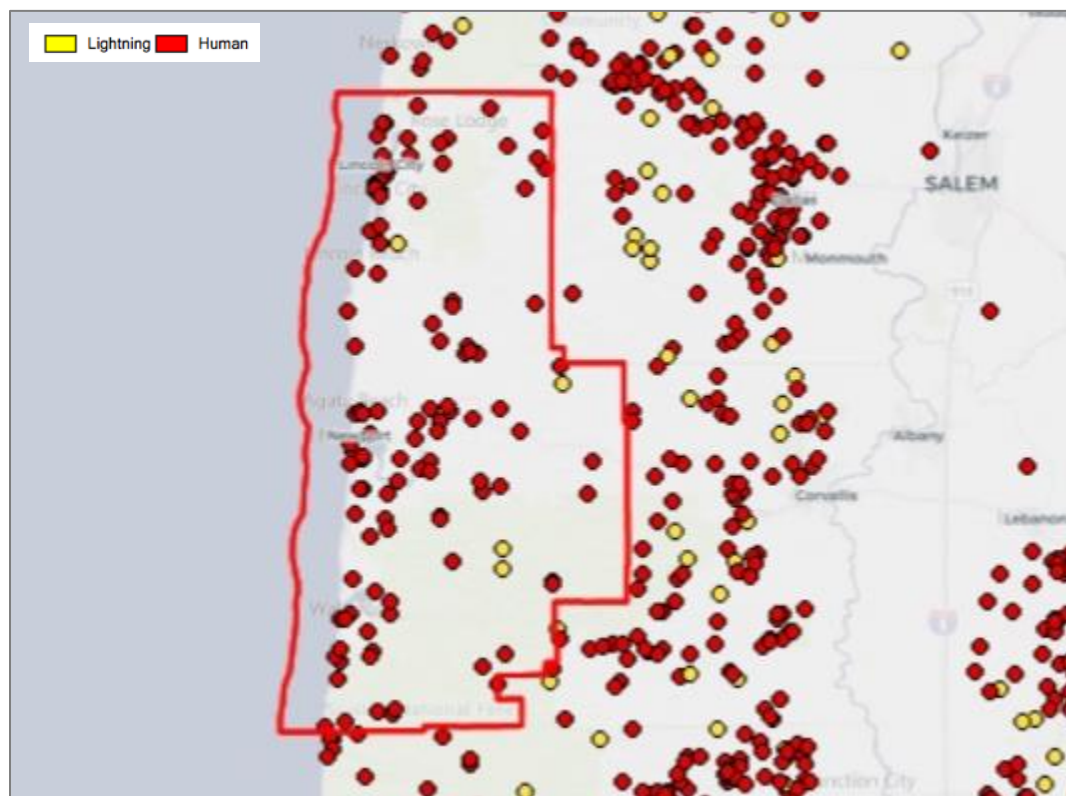
- Scott L. Stephens, Ralph E.J. Boerner, Jason J. Maghaddas, Emily E.Y. Maghaddas, Brandon M. Collins, Christopher B. Dow, Carl Edminster, Carl E. Fiedler, Danny L. Fry, Bruce R. Hartsough, Jon E. Keeley, Eric E. Knapp, James D. McIver, Carl N. Skinner, and Andrew P. Youngblood, Fuel treatment impacts on estimated wildfire carbon loss from forests in Montana, Oregon, California, and Arizona; 07 May 2012, available at <https://pubs.er.usgs.gov/publication/70157098>

## History

The two most significant fires in Lincoln County occurred more than one hundred years ago. In 1849, the Siletz Fire claimed more than 800,000 acres between Lincoln and Polk County. The 1853 Yaquina Fire burned more than 450,000 acres of Douglas fir, Sitka spruce, and western cedar within Lincoln County. The Big Creek Fire (near Yachats) in 1936 burned buildings and a schoolhouse near a logging camp. Flames destroyed an “auto camp” near Yachats, and then continued toward the town. Some residences were lost, but the town was saved. Depoe Bay also lost homes to the flames, but firefighters kept the town from burning. The 1987 fire season included the Shady Lane Fire and the Rockhouse Creek fire burning 6,291 acres. In 2016, the 2500 Road fire burned over 200 acres 2 miles east of Depoe Bay.

From 2010 to 2019, 949 acres burned from a total of 110 fires.<sup>67</sup> Figure 2-22 shows fire starts from 2010 to 2019, fires ignited by humans are shown in red, lightning caused fires are shown in yellow. In the past 10 years 3% of all fires were caused by lightning and 97% of fires were caused by human activity (ranging from arson and debris burning to equipment use and fires caused along powerlines). Likely the most devastating wildfire year in Oregon is 2020. The Echo Mountain Fire Complex burned more than 2,500 acres and impacted hundreds of homes in the Otis, Rose Lodge, Panther Creek area.

**Figure 2-22 Local Fire Starts (2010-2019)**



Source: [Oregon Wildfire Risk Explorer: County Summary Report](#) (June 2020) – To explore and view map detail click hyperlink to left. July 10, 2020.

<sup>67</sup> Oregon Wildfire Risk Explorer, Area of Interest Report, Lincoln County, accessed September 11, 2019. [http://oe.oregonexplorer.info/ExternalContent/wildfire\\_reports/WildfireRisk\\_summary\\_report\\_Lincoln\\_county.pdf](http://oe.oregonexplorer.info/ExternalContent/wildfire_reports/WildfireRisk_summary_report_Lincoln_county.pdf)



In general, the human caused wildfires are in populated areas and within river and stream corridors near transportation routes, while lightning caused wildfires are often in more remote locations. Wildland/Urban Conflagrations are not common on the Coast.

Urban fires are the most preventable type of fire, and future events depend largely on prevention measures. Although no historical urban conflagrations in have occurred, educating residents, building and maintenance code enforcement, and firefighting equipment, staff, and response systems upkeep are all steps that can ensure that highly likely localized urban fires do not become large-scale conflagrations.

While most fire ignitions occurred along travel corridors and the edges of major urban areas, the fires that escape initial suppression efforts tend to be in more remote areas and are more likely to occur in some portions of the landscape than others.

## Probability Assessment

Based on the available data and research the Steering Committee determined the **probability of experiencing a Wildfire is “high”**, meaning at least one incident is likely within the next 35-year period. See Figure 2-21 for more information on location of probable wildfires.

Certain conditions must be present for significant interface fires to occur. The most common are hot, dry and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel, topography, weather, drought and development. Many of these conditions are demonstrated across large areas within Lincoln County, creating a significant collective risk.

The Lincoln County CWPP addresses wildfires countywide and defined as either Strategic Planning Area (SPA) 1 or 2.

SPA 1, the western one-third of the county, is characterized by urban development within incorporated cities and unincorporated communities. Wildfire potential in SPA 1 is considered moderate to low. SPA 2, the eastern portion of the county, is heavily forested with development along transportation routes. Most of the land in SPA 2 is owned by timber companies, investors, the Confederated Tribes of the Siletz Indians, and state or federal agencies. Wildfire potential in SPA 2 is moderate to low due to the moderate and wet climate that prevails throughout the year.

### Future Climate Projection:

According to OCCRI report *“Future Climate Projections: Lincoln County”* (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

## Vulnerability Assessment

The Steering Committee rated the county as having a **“moderate” vulnerability to wildfire hazards**, meaning that between 1% and 10% of the County’s population or property could be affected by a major disaster.

## **Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslides. The Risk Report provides distinct profiles for (1) unincorporated Lincoln County, and (2) the unincorporated communities of Otis-Rose Lodge, Salishan-Lincoln Beach, Otter Rock, Seal Rock-Bayshore, and Wakonda Beach.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment’s Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. In general, the forested unincorporated areas of the county are most vulnerable to wildfire. Although the High Hazard category was used for analysis, it is noted that almost all communities have 30-60% exposure to the moderate wildfire hazard. According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by wildfire.

### **Population Vulnerability (Residents)**

Approximately five percent of unincorporated Lincoln County’s population (875 people) may be displaced by wildfires within Lincoln County. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire (more people may also be impacted by smoke and traffic disruptions that are not accounted for within this analysis). It is important to note that impact from wildfires may vary depending on the specific area that experiences a wildfire. “Rural” Lincoln County has the most population at risk (725), although the population is dispersed throughout the County. About 21% of Otter Rock residents are exposed.

**Table 2-25 Potentially Displaced Residents, Wildfire, by Unincorporated Area**

	Resident Population	Potentially Displaced Residents	
		Number	Percent
"Rural" Lincoln County	10,293	725	7%
Otis-Rose Lodge	1,926	0	0%
Otter Rock	489	101	21%
Salishan-Lincoln Beach	2,093	42	2%
Seal Rock-Bayshore	2,766	0	0%
Wakonda Beach	1,326	7	1%
Total Unincorporated	18,893	875	5%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; “Rural” Lincoln County includes all unincorporated areas that are not otherwise identified in this table. Note: City population based on the 2010 Census population.

### **Property Vulnerability**

Properties that are most vulnerable to the wildfire hazard are those that are developed in the high hazard zone. Approximately five percent (1,091 buildings) of unincorporated Lincoln County buildings are exposed to the High Hazard wildfire zone. The percent of exposed buildings is greatest in Otter Rock (21%), however, the dispersed “rural” Lincoln County has the most exposed buildings (915). The value of exposed buildings is \$68.5 million.

**Table 2-26 Exposed Buildings, Wildfire, by Unincorporated Area**

	Total Buildings	Exposed Buildings		Value of Loss	
		Number	Percent	Loss Estimate (\$)	Loss Ratio
"Rural" Lincoln County	12,637	915	7.2%	\$53,619,000	6.5%
Otis-Rose Lodge	1,747	0	0.0%	\$0	0.0%
Otter Rock	634	133	21.0%	\$11,658,000	14.2%
Salishan-Lincoln Beach	2,847	38	1.3%	\$2,885,000	0.7%
Seal Rock-Bayshore	3,345	0	0.0%	\$0	0.0%
Wakonda Beach	1,614	5	0.3%	\$292,000	0.2%
<b>Total Unincorporated</b>	<b>22,824</b>	<b>1,091</b>	<b>4.8%</b>	<b>\$68,454,000</b>	<b>3.7%</b>

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report. Tables A-1 through A-11; "Rural" Lincoln County includes all unincorporated areas that are not otherwise identified in this table.

Critical Facility Vulnerability<sup>68</sup>

The following vulnerable critical facilities were determined to be exposed to the High wildfire hazard zone.

- North Lincoln Fire Station 1700 (*Kernville, North Lincoln Fire & Rescue District*)
- Siletz Bay Airport (*Gleneden Beach*)
- Toledo High School (*Toledo area, Lincoln County School District*)

Risk Report Identified Areas of Vulnerability<sup>69</sup>

- Wildfire risk is high for hundreds of homes in the forested areas in the eastern portion of unincorporated Lincoln County (rural).

More information on this hazard can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#), the [Lincoln County CWPP \(2018\)](#), and Oregon Explorer's [Wildfire Risk Explorer](#).

<sup>68</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report, Table A-2.

<sup>69</sup> Ibid. Page 39.

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## SECTION 3: MITIGATION STRATEGY

This section outlines Lincoln County's strategy to reduce or avoid long-term vulnerabilities to the identified hazards. Specifically, this section presents a mission and specific goals and actions thereby addressing the mitigation strategy requirements contained in 44 CFR 201.6(c). The NHMP Steering Committee viewed and updated the mission, goals, and action items documented in this NHMP. Additional planning process documentation is in Volume III, Appendix B.

### Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

### Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public and private partners can take while working to reduce the county's risk from natural hazards. These statements of direction form a bridge between the broad mission statement and particular action items. The goals listed here serve as checkpoints as agencies and organizations begin implementing mitigation action items.

Public participation was a key aspect in developing the plan goals. Meetings with the project steering committee, stakeholder interviews and public workshops all served as methods to obtain input and priorities in developing goals for reducing risk and preventing loss for natural hazards in Lincoln County.

All the plan goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available. Below is a list of the re-confirmed plan goals:

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## **Action Item Development Process**

Action items identified through the planning process are an important part of the mitigation plan. Action items are detailed recommendations for activities that local departments, citizens, and others could engage in to reduce risk. Development of action items was a multi-step, iterative process that involved brainstorming, discussion, review and revisions. Action items can be developed through many sources. Figure 3-1 illustrates some of these sources.

Most of the action items were first created during the previous NHMP planning processes. During these processes, the Steering Committee developed maps of local vulnerable populations, facilities and infrastructure in respect to each identified hazard. Review of these maps generated discussion around potential actions to mitigate impacts to the vulnerable areas. The Oregon Partnership for Disaster Resilience (OPDR) provided guidance in the development of action items by presenting and discussing actions that were used in other communities. OPDR also took note of ideas that came up in Steering Committee meetings and drafted specific actions that met the intent of the Steering Committee. All actions were then reviewed by the Steering Committee, discussed at length and revised as necessary before becoming a part of this document.

**Figure 3-I Development of Action Items**



## Action Item Matrix

The action item matrix (Table 3-1) portrays the overall action plan framework and identifies linkages between the NHMP goals, partnerships (coordination and partner organizations), and actions. The matrix documents a brief description of the action, coordinating organization(s), timeline (ongoing, short, medium, or long), priority, and other jurisdictions that are partners to the action. Refer to Volume III, Appendix A for detailed information for each action.

## Action Item Framework

Many of the Lincoln County NHMP’s recommendations are consistent with the goals and objectives of the County’s existing plans and policies. Where possible, Lincoln County will implement the NHMP’s recommended actions through existing plans and policies. Plans and policies already in existence have support from residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs. Implementing the NHMP’s action items through such plans and policies increases their likelihood of being supported and implemented. See *Volume II for the actions for each participating city or special district.*

## Action Item Prioritization

Table 3-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in **bold** text with grey highlight. The County will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for

the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority.

See Volume III, Appendix A for an updated list of action items and Appendix B for information on additional changes.



**Table 3-1 Lincoln County Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing	Partner Jurisdiction(s)						
					Depoe Bay	Lincoln City	Newport	Siletz	Toledo	Waldport	Yachats
Multi-Hazard #1	Consider Local Energy Assurance Planning for critical areas countywide	Emergency Management	L to M	Long	X	X	X	X	X	X	X
Multi-Hazard #2	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers	Emergency Management	L to M	Ongoing	X	X	X	X	X	X	X
Multi-Hazard #3	Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.	Emergency Management, Solid Waste District	L	Short	X	X	X	X	X	X	X
Multi-Hazard #4	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.	Planning and Development, Emergency Management	L	Ongoing	X	X	X	X	X	X	X
Multi-Hazard #5	Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.	Emergency Management	L	Ongoing	X			X		X	X
<b>Multi-Hazard #6</b>	<b>Integrate the NHMP into County and City comprehensive plans.</b>	<b>Planning and Development</b>	<b>L</b>	<b>Medium</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Multi-Hazard #7</b>	<b>Prepare long-term catastrophic recovery plan</b>	<b>Board of Commissioners/ Policy Group</b>	<b>L</b>	<b>Medium</b>		<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing	Partner Jurisdiction(s)						
					Depeo Bay	Lincoln City	Newport	Siletz	Toledo	Waldport	Yachats
Multi-Hazard #8	Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.	Planning and Development	L	Short							
Coastal Erosion #1	Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.	Planning and Development	L	Ongoing	X					X	X
Coastal Erosion #2	Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.	Planning and Development	L	Ongoing	X	X				X	X
Earthquake #1	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.	GIS	L	Short	X	X	X	X	X	X	X
Earthquake #2	Identify, inventory, and retrofit county controlled critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).	Emergency Management	H	Long	X	X	X	X	X	X	X
Earthquake #3	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.	Roads/ Public Works	L	Long	X	X	X	X	X	X	X

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing	Partner Jurisdiction(s)						
					Depeo Bay	Lincoln City	Newport	Siletz	Toledo	Waldport	Yachats
Tsunami #1	Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami inundation zone and likely to be impacted by tsunami.	Emergency Management	H	Long	X					X	X
Tsunami #2	Implement land use strategies and options to increase community resilience	Planning and Development	L	Medium		X					X
Flood #1	Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)	Planning and Development	L to M	Short				X	X	X	X
Flood #2	Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.	Planning and Development	L to M	Short					X	X	X
Flood #3	Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas	Planning and Development	H	Ongoing	X				X	X	
Flood #4	Continue compliance with the National Flood Insurance Program (NFIP).	Planning and Development	L	Ongoing	X	X	X	X	X	X	X
Landslide #1	Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.	Planning and Development	L	Ongoing	X	X	X		X	X	X
Landslide #2	Protect existing development in landslide-prone areas	Emergency Management, Public Works	L to H	Ongoing			X			X	

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing	Partner Jurisdiction(s)						
					Depoe Bay	Lincoln City	Newport	Siletz	Toledo	Waldport	Yachats
Landslide #3	Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.	Planning and Development	L	Long	X	X	X	X		X	X
Severe Weather #1	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).	Public Works	L to H	Ongoing			X	X	X	X	X
Severe Weather #2	Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.	Public Works	L	Ongoing	X	X		X	X	X	X
Wildfire #1	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.	Emergency Management	L to H	Ongoing	X	X	X	X	X	X	X

Source Lincoln County NHMP Steering Committee, updated 2020

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

## **SECTION 4:**

# **PLAN IMPLEMENTATION AND MAINTENANCE**

The common objective of every local mitigation plan is to reduce the community's risk from and exposure to natural hazards before they occur. One of the most effective ways of institutionalizing mitigation in the community is to incorporate natural hazard planning into the community's comprehensive planning activities. In Oregon, comprehensive plans address a wide range of community issues and sectors – from land use and transportation to natural resources and economics. Lincoln County's Comprehensive plan addresses the following broad categories:

- Land Use and Urbanization
- Intergovernmental Coordination
- Citizen Involvement
- Air, Land and Water Resources
- Natural Hazards
- Forest, Agriculture, Estuarine, Coastal, Beaches and Dunes, and Open Space
- Economy
- Transportation
- Energy
- Housing
- Recreation
- Public Facilities
- Natural Resources
- Historic and Cultural Resources

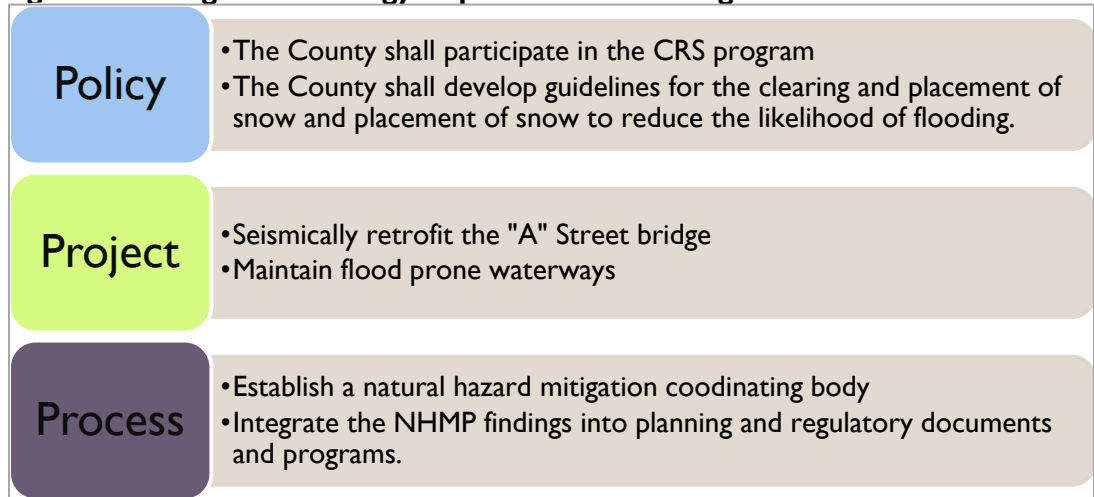
This section outlines a comprehensive approach to implement the mitigation strategies outline in this Multi-jurisdictional Natural Hazards Mitigation Plan (NHMP). This implementation strategy is informed by information collected and developed during the NHMP update process and concurrent Lincoln County Risk MAP project. The implementation strategy strives to demonstrate how risk specific data, both natural hazard and community vulnerability, can be integrated in existing programs, projects and policies.

For the purposes of this NHMP, the Plan Implementation and Maintenance section details the formal process that will ensure that the Lincoln County Multi-jurisdictional Natural Hazards Mitigation Plan (NHMP) remains an active and relevant document. This section includes a schedule for monitoring and evaluating the plan semi-annually, as well as producing an updated plan every five years. Finally, this section describes how the county will integrate public participation throughout the plan maintenance and implementation process.

## **Implementing the Plan**

There are three primary ways mitigation strategies can be implemented at the local level: Policies, Projects, and Processes. Figure 4-1 illustrates these categories with examples.

**Figure 4-1 Mitigation Strategy Implementation Categories**



Source: Oregon Partnership for Disaster Resilience

The success of the Lincoln County NHMP depends on how well the outlined action items are implemented. To ensure that the activities identified are implemented, the following steps will be taken. The plan will be formally adopted, a coordinating body will be assigned, a convener shall be designated, the identified activities will be prioritized and evaluated, and finally, the plan will be implemented through existing plans, programs, and policies.

Table 4-1 on the following pages demonstrates how the actions will be implemented within Lincoln County. For detailed information on action item implementation see Table 4-2.

## **Plan Adoption**

The Lincoln County NHMP was developed and will be implemented through a collaborative process. After the Plan is locally reviewed and deemed complete, the Lincoln County Conveners submits it to the State Hazard Mitigation Officer (SHMO) at the Oregon Military Department – Office of Emergency Management (OEM). OEM submits the plan to the Federal Emergency Management Agency (FEMA--Region X) for review. This review addresses the federal criteria outlined in the FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the County and participating jurisdictions (cities and special districts) will adopt the plan via resolution. Once adopted and approved by FEMA the County and each participating jurisdiction that adopted their NHMP addendum will gain eligibility for the Building Resilient Infrastructure and Communities Grant Program, the Hazard Mitigation Grant Program, and the Flood Mitigation Assistance Grant Program.

**Table 4-I Mitigation Implementation Opportunities for Lincoln County Hazards/ Risks**

System	Potential Risks/Challenges	Mitigation and Implementation Opportunities	Community Planning Connections
<p>Infrastructure</p>	<p><u>Major Findings</u></p> <ul style="list-style-type: none"> <li>Built infrastructure systems rely heavily on institutional standards for guidance, causing delayed implementation of new design or construction practices.</li> <li>Aging infrastructure and population growth are expected to create supply issues over the next 20-50 years.</li> <li>During an emergency, some of the different systems that make up the infrastructure sector are more prepared than others to meet operating and external standards.</li> </ul> <p><u>Crucial Vulnerabilities</u></p> <ul style="list-style-type: none"> <li>Communities do not have adequate fire protection due to inadequate water distribution</li> <li>US Highway 101 is at capacity during the summer months, including chokeholds at key city bridges</li> <li>Rural areas do not have as much built-in redundancy</li> <li>No redundancies exist in the wastewater system</li> </ul>	<p><u>Policy Opportunities:</u></p> <ul style="list-style-type: none"> <li>Develop a long-term (20-50 year) infrastructure vision</li> <li>Focus Capital Improvement Planning on long-term infrastructure resilience</li> <li>Develop local energy assurance plans to increase redundancy and connectivity of energy systems.</li> <li>Develop formal mutual aid agreements between governments, districts – particularly water utilities.</li> <li>Comprehensive Plan Periodic Review</li> </ul> <p><u>Project Opportunities:</u></p> <ul style="list-style-type: none"> <li>Utilize Risk Report data to identify areas of critical infrastructure vulnerability (roads, bridges, buildings, water storage, etc.) and mitigate.</li> <li>Utilize Risk Report data to better assess community ability to evacuate residents/ tourists during a CSZ event.</li> <li>Retrofit water tanks/ reservoirs to withstand a CSZ event.</li> <li>Retrofit systems to withstand local tsunami events, include the development of system redundancies</li> <li>Utilize Risk Report data to enhance understanding of coastal erosion and mitigate vulnerability to roads, bridges, water pump stations, etc.</li> </ul> <p><u>Process Opportunities:</u></p> <ul style="list-style-type: none"> <li>Develop an infrastructure sub-committee to the NHMP coordinating body to prioritize and implement identified and new infrastructure actions.</li> <li>Identify supply chain gaps and develop a system to address them.</li> </ul>	<ul style="list-style-type: none"> <li>Natural Hazards Mitigation Plan</li> <li>Transportation System/ Master Plans</li> <li>Access Management Plans</li> <li>Comprehensive Plans</li> <li>Local land use ordinances</li> <li>Port Business Strategic Plans and Capital Facilities Plans</li> <li>Lincoln County School District Capital Facilities Plan</li> <li>Solid Waste Management Plans</li> <li>Wastewater System Master Plans</li> <li>Water System Master Plans</li> <li>Bayshore Fore dune Management Plan (and Overlay Zone)</li> </ul>
<p>Public Safety</p>	<p><u>Major Findings</u></p> <ul style="list-style-type: none"> <li>Public Safety (law enforcement, fire) relies on property tax for funding, which may not sustain</li> </ul>	<p><u>Policy Opportunities:</u></p> <ul style="list-style-type: none"> <li>Develop long-term public safety planning (CONOPS) to ensure the availability of resources during a catastrophic event (human, fuel, replacement/ repair parts, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Natural Hazards Mitigation Plan</li> <li>Capital Improvement Plans</li> <li>Emergency Operations Plans</li> <li>Local land use ordinances</li> <li>Sherriff's Office Strategic Plan</li> </ul>

System	Potential Risks/Challenges	Mitigation and Implementation Opportunities	Community Planning Connections
	<p>needed service over the next 20-years</p> <ul style="list-style-type: none"> <li>Resources that function on a day to day basis (volunteer fire departments, interagency mutual aid agreements, specialty teams), would be heavily stressed during long term, widespread events</li> <li>Current budget and regulatory unknowns prevent planning beyond a two- to five-year timeframe</li> </ul> <p><u>Crucial Vulnerabilities</u></p> <ul style="list-style-type: none"> <li>Hazards that impact the entire region reduce the availability of resources from partner agencies and neighboring jurisdictions</li> <li>Extended events (more than 12 hours) tap available capacity</li> <li>Available fuel is a key limiting factor</li> </ul>	<ul style="list-style-type: none"> <li>Develop a plan to attract and retain career public safety personnel (fire, police, etc.)</li> <li>Implement policy to require tourist accommodations to post evacuation routes to assembly areas (e.g., Newport policy).</li> <li>Develop stable long-term funding strategy</li> </ul> <p><u>Project Opportunities:</u></p> <ul style="list-style-type: none"> <li>Relocate critical and essential facilities out of the tsunami inundation area.</li> <li>Relocate mitigate critical and essential facilities from the flood hazard.</li> </ul> <p><u>Process Opportunities:</u></p> <ul style="list-style-type: none"> <li>Develop a Public Safety sub-committee to the NHMP coordinating body to prioritize and implement identified and new public safety actions.</li> </ul>	<ul style="list-style-type: none"> <li>Regional Economic Development Strategy</li> </ul>
Social Services	<p><u>Major Findings</u></p> <ul style="list-style-type: none"> <li>Institutional and volunteer providers do their best to operate on a day to day basis; their ability to respond after a major disaster strikes is limited due to supplies, location of personnel, and lack of services</li> <li>Urban migration is especially detrimental to social services and the ability to provide for those in more rural locations</li> <li>The social fabric of the system county wide is strong and local leadership is supportive to planning efforts</li> </ul>	<p><u>Policy Opportunities:</u></p> <ul style="list-style-type: none"> <li>Develop aid agreements between jurisdictions and districts to support recovery efforts.</li> </ul> <p><u>Project Opportunities:</u></p> <ul style="list-style-type: none"> <li>Develop communication redundancy for system.</li> <li>Relocate critical and essential facilities out of the tsunami inundation area (e.g., mental health clinics, ambulance service, etc.).</li> <li>Retrofit critical and essential facilities to address the earthquake hazard.</li> <li>Develop redundancies within the social services sector to assure that supplies and personnel are distributed across the county.</li> <li>Mitigate repetitive loss properties along the lower Siletz River near Lincoln City.</li> </ul>	<ul style="list-style-type: none"> <li>Natural Hazards Mitigation Plan</li> <li>Community Health Improvement Plan</li> <li>Local land use ordinances</li> <li>Housing strategy</li> <li>Hospital/Clinics plan</li> <li>Medical Reserve Corps</li> <li>Regional Economic Development Strategy</li> </ul>



System	Potential Risks/Challenges	Mitigation and Implementation Opportunities	Community Planning Connections
	<u>Crucial Vulnerabilities</u> <ul style="list-style-type: none"> <li>• An aging population combined with a patchwork of service providers and lack of services</li> <li>• Large number of residents vulnerable to disasters with limited ability to shelter them after a disaster</li> <li>• Medical supplies are limited to a 2-5 day supply at any given time</li> </ul>	<u>Process Opportunities:</u> <ul style="list-style-type: none"> <li>• Develop a Social Services sub-committee to the NHMP coordinating body to prioritize and implement identified and new social services actions.</li> </ul>	

Source: 2014 Risk MAP Resilience Workshop, revised 2020

## Convener

The Lincoln County Emergency Manager and Director of Planning and Development will take responsibility for plan implementation and will facilitate the Natural Hazard Mitigation Coordinating body meetings and will assign tasks such as updating and presenting the plan to the rest of the members of the committee. Plan implementation and evaluation will be a shared responsibility among all the assigned Natural Hazard Mitigation Coordinating Body Members. The conveners' responsibilities include:

- Coordinate steering committee meeting dates, times, locations, agendas, and member notification;
- Documenting the discussions and outcomes of committee meetings;
- Serving as a communication conduit between the steering committee and the public/stakeholders;
- Identifying emergency management-related funding sources for natural hazard mitigation projects; and
- Utilizing the Risk Assessment as a tool for prioritizing proposed natural hazard risk reduction projects.

## Coordinating Body

The Lincoln County Conveners will form a Natural Hazard Mitigation Coordinating Body (Steering Committee or Coordinating Body) for updating and implementing the NHMP. The coordinating body responsibilities include:

- Attending future maintenance and plan update meetings (or designating a representative to serve in your place);
- Serving as the local evaluation committee for funding programs such as the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds;
- Prioritizing and recommending funding for natural hazard risk reduction projects;
- Evaluating and updating the Natural Hazards Mitigation Plan in accordance with the prescribed maintenance schedule;
- Developing and coordinating ad hoc and/or standing subcommittees as needed; and
- Coordinating public involvement activities.

## Members

The following jurisdictions, agencies, and/ or organizations were represented and served on the steering committee during the development of the Lincoln County NHMP (for a list of individuals see the Acknowledgements section of this NHMP):

- Lincoln County
- City of Depoe Bay
- City of Lincoln City
- City of Newport
- City of Siletz
- City of Toledo
- City of Waldport
- City of Yachats
- Central Lincoln Peoples Utilities District

- Lincoln County School District
- Seal Rock Water District
- U.S. Coast Guard-North Bend
- Oregon State Parks
- Confederated Tribes of Siletz Indians
- Department of Land Conservation and Development

To make the coordination and review of the Lincoln County Multi-jurisdictional NHMP as broad and useful as possible, the coordinating body will engage additional stakeholders and other relevant hazard mitigation organizations and agencies to implement the identified action items. Specific organizations have been identified as either internal or external partners on the individual action item forms found in Appendix A. The roles of the internal and external partners are listed below.

## **Roles (Locals, DLCD, FEMA)**

Implementation of the NHMP actions will be led primarily by local initiative through the identified implementation program (Table 4-1 and Table 4-2). FEMA, DLCD and other state agencies (OEM, DOGAMI, Business Oregon) will assist with project development and implementation when asked.

### **Locals**

The conveners (Emergency Management and Planning and Development) will meet monthly to discuss progress towards plan implementation. The local coordinating body as identified in the NHMP process will initiate the process of implementing the identified actions. The actions identified in this report will also be provided as distinct actions within the county's NHMP. Quarterly, and as needed, the committee will meet to review actions and report on progress. As needed, the local committee will call upon DLCD staff (Regional Solutions Team, Oregon Coastal Management program) to provide technical assistance in moving an action forward.

### **DLCD**

Governor Kitzhaber's Executive Order No. 11-12 signed on December 16, 2011 established 11 Regional Solutions Centers throughout the State of Oregon. State agency staff are co-located in Regional Solutions Centers and take a collaborative approach to problem-solving to maximize economic and community development opportunities at the state, regional and local level. Regional Advisory Committees adopt annual work plans that focus Team members' attention on projects that will leverage public, private and civic sector resources to address regional priorities. DLCD actively participates in the Regional Solutions framework along with the Oregon Military Department – Office of Emergency Management, Department of Environmental Quality, Department of Transportation, Business Oregon, the Infrastructure Finance Authority, and others. Key stakeholders include counties, cities, special districts, hospitals, utility providers, fire departments, business and property owners, volunteer groups (e.g., CERT), and citizens. Because the Regional Solutions Team is active in

this region, it should be viewed as a potential resource during the implementation phase of this planning effort.<sup>1</sup>

## FEMA

Staff from FEMA will assist on an as needed basis to provide technical assistance with action item implementation. They will aid with federal grant programs.

## Implementation through Existing Programs

The NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the county. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action items. Lincoln County, and the participating cities and special districts, currently address statewide planning goals and legislative requirements through their comprehensive land use plans, capital improvement plans, mandated standards and building codes. To the extent possible, Lincoln County, and participating jurisdictions (cities and special districts), will work to incorporate the recommended mitigation action items into existing programs and procedures.

Many of the NHMP's recommendations are consistent with the goals and objectives of the participating cities', special districts', and county's existing plans and policies. Where possible, Lincoln County, and participating jurisdictions, should implement the NHMP's recommended actions through existing plans and policies. Plans and policies already in existence often have support from residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented.

Examples of plans, programs or agencies that may be used to implement mitigation activities include:

- City and County Budgets
- Community Wildfire Protection Plans
- Comprehensive Land Use Plans
- Economic Development Action Plans
- Zoning Ordinances & Building Codes

For additional examples of plans, programs or agencies that may be used to implement mitigation activities refer to list of plans in Volume III - Appendix C, *Community Profile* and Volume III, *Jurisdictional Addenda*.

## Plan Maintenance

Plan maintenance is a critical component of the NHMP. Proper maintenance of the plan ensures that this plan will maximize the county and participating city's efforts to reduce the risks posed by natural hazards. This section was developed by the University of Oregon's Partnership for Disaster Resilience and includes a process to ensure that a regular review

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<sup>1</sup> By way of example, Clatsop County and the cities of Gearhart, Seaside and Cannon Beach are served by the North Coast Regional Solutions Center located in the City of Tillamook. The North Coast Regional Solutions' adopted 2014-15 Work Plan identifies 'Resilience Planning' as one of its priority projects.

and update of the plan occurs. The conveners, coordinating body, and local staff are responsible for implementing this process, in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

## Meetings

The conveners will meet monthly to ensure implementation of the NHMP remains on schedule. The Coordinating Body will meet quarterly to complete the following tasks. During at least one meeting per year, the Coordinating Body will:

- Review existing action items to determine appropriateness for funding;
- Educate and train new members on the plan and mitigation in general;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential mitigation projects using the methodology described below.

During at least one other meeting the Coordinating Body will:

- Review existing and new risk assessment data;
- Discuss methods for continued public involvement; and
- Document successes and lessons learned during the year.

These meetings are an opportunity for the cities and special districts to report back to the county on progress that has been made towards their components of the NHMP.

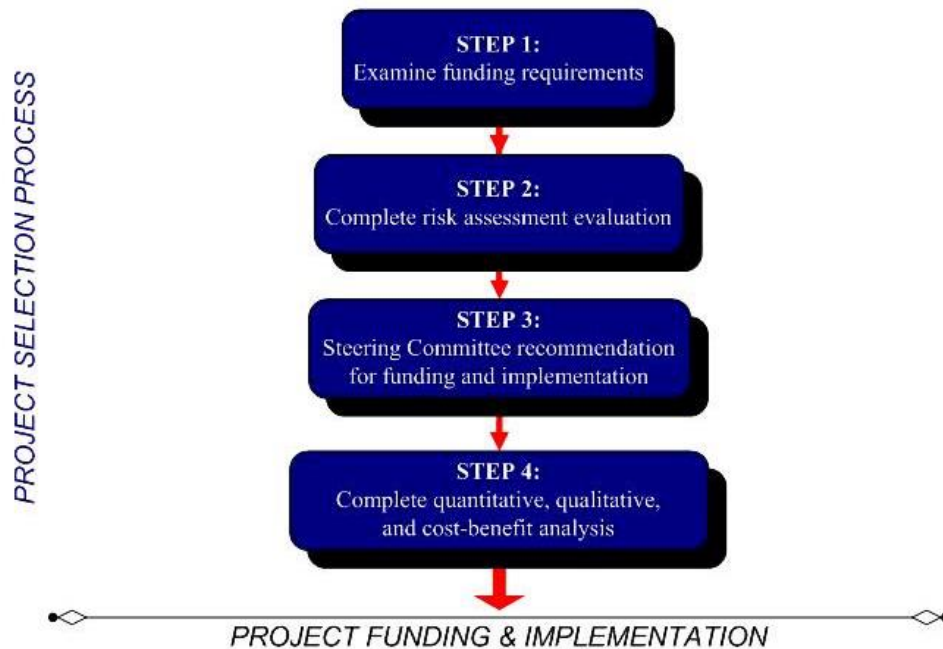
Monthly meetings between the conveners (Lincoln County Emergency Management and Planning and Development) will begin in the month following local adoption (expected October 2020). The Coordinating Body will meet quarterly and is scheduled to occur in October, January, April, and July of each year.

The conveners will be responsible for documenting the outcome of the semi-annual meetings in Appendix B. The process the coordinating body will use to prioritize mitigation projects is detailed in the section below. The plan's format allows the county and participating jurisdictions to review and update sections when new data becomes available. New data can be easily incorporated, resulting in a NHMP that remains current and relevant to the participating jurisdictions.

## Project Prioritization Process

The Disaster Mitigation Act of 2000 requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities often come from a variety of sources; therefore, the project prioritization process needs to be flexible. Committee members, local government staff, other planning documents, or the risk assessment may be the source to identify projects. Figure 4-1 illustrates the project development and prioritization process.

**Figure 4-1 Action Item and Project Review Process**



Source: Oregon Partnership for Disaster Resilience, 2008.

## Step 1: Examine funding requirements

The first step in prioritizing the plan’s action items is to determine which funding sources are open for application. Several funding sources may be appropriate for the county’s proposed mitigation projects. Examples of mitigation funding sources include but are not limited to: FEMA’s Building Resilient Infrastructure and Communities competitive grant program (BRIC), Flood Mitigation Assistance (FMA) program, Hazard Mitigation Grant Program (HMGP), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations, among others. Please see Appendix E, *Grant Programs and Resources* for a more comprehensive list of potential grant programs.

Because grant programs open and close on differing schedules, the coordinating body will examine upcoming funding streams’ requirements to determine which mitigation activities would be eligible. The coordinating body may consult with the funding entity, Oregon Military Department – Office of Emergency Management (OEM), or other appropriate state or regional organizations about project eligibility requirements. This examination of funding sources and requirements will happen during the coordinating body’s semi-annual plan maintenance meetings.

## Step 2: Complete risk assessment evaluation

The second step in prioritizing the plan’s action items is to examine which hazards the selected actions are associated with and where these hazards rank in terms of community risk. The coordinating body will determine whether the plan’s risk assessment supports the implementation of eligible mitigation activities. This determination will be based on the location of the potential activities, their proximity to known hazard areas, and whether

community assets are at risk. The coordinating body will additionally consider whether the selected actions mitigate hazards that are likely to occur in the future or are likely to result in severe / catastrophic damages.

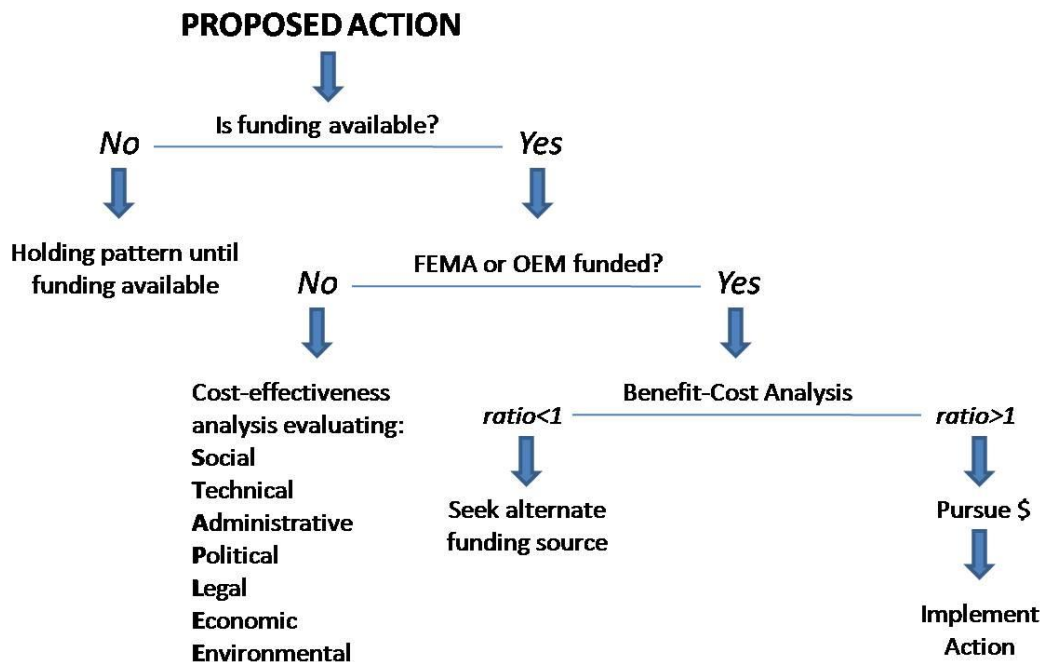
### Step 3: Committee Recommendation

Based on the steps above, the coordinating body will recommend which mitigation activities should be moved forward. If the coordinating body decides to move forward with an action, the coordinating organization designated on the action item form will be responsible for taking further action and, if applicable, documenting success upon project completion. The coordinating body will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

### Step 4: Complete quantitative and qualitative assessment, and economic analysis

The fourth step is to identify the costs and benefits associated with the selected natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity assists in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards provides decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Figure 4-2 shows decision criteria for selecting the appropriate method of analysis.

**Figure 4-2 Benefit Cost Decision Criteria**



Source: Oregon Partnership for Disaster Resilience, 2010.

If the activity requires federal funding for a structural project, the Committee will use a Federal Emergency Management Agency-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one in order to be eligible for FEMA grant funding.

For non-federally funded or nonstructural projects, a qualitative assessment will be completed to determine the project's cost effectiveness. The committee will use a multivariable assessment technique called STAPLE/E to prioritize these actions. STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these seven variables can help define a project's qualitative cost effectiveness. The Oregon Partnership for Disaster Resilience at the University of Oregon's Community Service Center has tailored the STAPLE/E technique for use in natural hazard action item prioritization

## Continued Public Involvement and Participation

The participating jurisdictions are dedicated to involving the public directly in the continual reshaping and updating of the Lincoln County NHMP. Although members of the Coordinating Body represent the public to some extent, the public will have the opportunity to continue to provide feedback about the Plan.

To ensure that these opportunities will continue, the County and participating jurisdictions will:

- Post copies of their plans on corresponding websites;
- Place articles in the local newspaper directing the public where to view and provide feedback; and
- Use existing newsletters such as schools and utility bills to inform the public where to view and provide feedback.

In addition to the involvement activities listed above, Lincoln County will ensure continued public involvement by posting the Lincoln County NHMP on the County's website (<https://www.co.lincoln.or.us/planning/page/natural-hazards-mitigation-plan>). The Plan will also be archived and posted on the University of Oregon Libraries' Scholar's Bank Digital Archive (<https://scholarsbank.uoregon.edu>).

## Five-Year Review of Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. **The Lincoln County NHMP is due to be updated by December 29, 2025.** The convener will be responsible for organizing the coordinating body to address plan update needs. The coordinating body will be responsible for updating any deficiencies found in the plan, and for ultimately meeting the Disaster Mitigation Act of 2000's plan update requirements.

The following 'toolkit' (Table 4-2) can assist the convener in determining which plan update activities can be discussed during regularly scheduled plan maintenance meetings, and which activities require additional meeting time and/or the formation of sub-committees.



**Table 4-2 Natural Hazards Mitigation Plan Update Toolkit**

Question	Yes	No	Plan Update Action
Is the planning process description still relevant?			Modify this section to include a description of the plan update process. Document how the planning team reviewed and analyzed each section of the plan, and whether each section was revised as part of the update process. (This toolkit will help you do that).
Do you have a public involvement strategy for the plan update process?			Decide how the public will be involved in the plan update process. Allow the public an opportunity to comment on the plan process and prior to plan approval.
Have public involvement activities taken place since the plan was adopted?			Document activities in the "planning process" section of the plan update
Are there new hazards that should be addressed?			Add new hazards to the risk assessment section
Have there been hazard events in the community since the plan was adopted?			Document hazard history in the risk assessment section
Have new studies or previous events identified changes in any hazard's location or extent?			Document changes in location and extent in the risk assessment section
Has vulnerability to any hazard changed?			Document changes in vulnerability in the risk assessment section
Have development patterns changed? Is there more development in hazard prone areas?			Document changes in vulnerability in the risk assessment section
Do future annexations include hazard prone areas?			Document changes in vulnerability in the risk assessment section
Are there new high risk populations?			Document changes in vulnerability in the risk assessment section
Are there completed mitigation actions that have decreased overall vulnerability?			Document changes in vulnerability in the risk assessment section
Did the plan document and/or address National Flood Insurance Program repetitive flood loss properties?			Document any changes to flood loss property status

Question	Yes	No	Plan Update Action
Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Did the plan identify data limitations?			If yes, the plan update must address them: either state how deficiencies were overcome or why they couldn't be addressed
Did the plan identify potential dollar losses for vulnerable structures?			1) Update existing data in risk assessment section, or 2) determine whether adequate data exists. If so, add information to plan. If not, describe why this could not be done at the time of the plan update
Are the plan goals still relevant?			Document any updates in the plan goal section
What is the status of each mitigation action?			Document whether each action is completed or pending. For those that remain pending explain why. For completed actions, provide a 'success' story.
Are there new actions that should be added?			Add new actions to the plan. Make sure that the mitigation plan includes actions that reduce the effects of hazards on both new and existing buildings.
Is there an action dealing with continued compliance with the National Flood Insurance Program?			If not, add this action to meet minimum NFIP planning requirements
Are changes to the action item prioritization, implementation, and/or administration processes needed?			Document these changes in the plan implementation and maintenance section
Do you need to make any changes to the plan maintenance schedule?			Document these changes in the plan implementation and maintenance section
Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?			If the community has not made progress on process of implementing mitigation into existing mechanisms, further refine the process and document in the plan.

Source: Oregon Partnership for Disaster Resilience, 2010, revised 2020.

# **Volume II: Jurisdictional Addenda**

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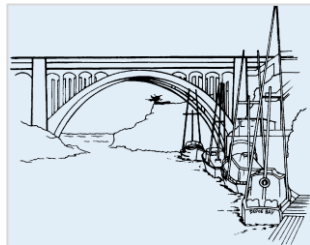
# City of Depoe Bay Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Gary Halvorson, Oregon State Archives

Effective:

December 29, 2020 through December 28, 2025



Prepared for:  
City of Depoe Bay

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



**FEMA**

Federal Emergency Management Agency (FEMA)  
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Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

**Resolution 500-21**

**A Resolution Adopting the City of Depoe Bay's  
Representation in the Updates to the  
Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan**

**WHEREAS**, the City of Depoe Bay recognizes the threat that natural hazards pose to people, property, and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property, and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

**WHEREAS**, the City of Depoe Bay has fully participated in the FEMA prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the City of Depoe Bay has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Depoe Bay to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *City of Depoe Bay addendum* to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

**WHEREAS**, the NHMP is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

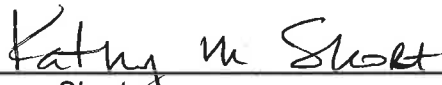
**WHEREAS**, the City of Depoe Bay adopts the NHMP and directs the City Recorder and City Planner to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

**Now, therefore, be it resolved**, that the City of Depoe Bay adopts *the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and



**Be it further resolved,** that the City of Depoe Bay will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

Adopted this 5<sup>th</sup> day of January 2021.

  
\_\_\_\_\_  
Mayor Short

  
\_\_\_\_\_  
City Recorder

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## Purpose

This is the 2020 update of the City of Depoe Bay addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP). The City of Depoe Bay's original addendum to Lincoln County's NHMP was completed and approved by FEMA in 2009 (updated in 2015). This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation, and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Depoe Bay's addendum are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Depoe Bay adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **January 5, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the City's addendum on **March 1, 2021**. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The City concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## **Process and Participation**

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Department of Land Conservation and Development, Oregon Office of Emergency Management (OEM), Lincoln County, and Depoe Bay to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal-Year 2017 (FY17) Pre-Disaster Mitigation (PDM) Competitive Grant Program OR-2018-001 (PDMC-PL-10-OR-2017-02).

Members of the Depoe Bay NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Depoe Bay addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Depoe Bay NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Depoe Bay Planner serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Lincoln County NHMP in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Planning Director and Emergency Manager).

Representatives from the City of Depoe Bay steering committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the city's addendum, with focus on the plan's risk assessment and mitigation strategy (action items).

The current version of the addendum reflects changes decided upon at the designated meetings and through subsequent work and communication with OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include revisions to the city's Risk Assessment and Hazard Identification sections, Action Items, and Community Profile.

The Depoe Bay Steering Committee was comprised of the following representatives:

- Convener, Jaime White, Planner
- Robert Gambino, Mayor
- Brady Weidner, City Superintendent

### Public Participation

Public participation was achieved by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment via a survey administered by IPRE (Volume III, Appendix F). During the City public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The City Council will be responsible for adopting the Depoe Bay addendum to the Lincoln County NHMP. This addendum designates a steering committee and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Depoe Bay addendum on an annual schedule; the county is meeting on a quarterly basis and will provide opportunities for participating jurisdictions (cities and special districts) to report on NHMP implementation and maintenance during their meetings. The city's Planner will serve as the convener and will be responsible for assembling the steering committee. The steering committee will be responsible for identifying new risk assessment data, reviewing

status of mitigation actions, identifying new actions, and seeking funding to implement the city's mitigation strategy (actions). The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and priority actions in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Where possible, Depoe Bay will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Depoe Bay's acknowledged comprehensive plan is the City of Depoe Bay Comprehensive Plan. The City implements the plan through the Community Development Code.

## **Existing Plans and Policies**

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from residents, businesses and policy makers.



Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

Depoe Bay's Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the addendum helps identify what resources already exist that can be used to implement the action items identified in Depoe Bay's Addendum. Implementing the city's mitigation actions through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the city's resources.

The following are Depoe Bay's existing plans and policies that relate to natural hazards:

- **Comprehensive Plan, 1991:** A document stating the general, long-range policies that will govern a local community's future development.

*Relation to Natural Hazard Mitigation:* Contains city-specific information regarding natural hazards within the city's jurisdictional boundaries.

- **Zoning Ordinance, 2011:** Establishes land use zones to regulate the location of building structure and the use of land within the City of Depoe Bay.

*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the placement and construction of buildings, development in the floodplain, development of coastal shorelands, construction on steep slopes, and division of land. The city's flood ordinance was last updated in 2019.

- **Emergency Operations Plan, 2013:** All hazards plan describing how Depoe Bay via the Depoe Bay Rural Fire Protection District will respond to incidents.

*Relation to Natural Hazard Mitigation:* The plan includes a hazard vulnerability assessment, evaluation of hazards in the community, and demonstrates how the community will respond to a natural hazard event such as flood, tsunami, wildfire, etc.

- **Transportation System Plan, 2017:** The Transportation System Plan prepares Depoe Bay for accommodating traffic within its urban growth boundary more efficiently than a piecemeal or unorganized approach.

*Relation to Natural Hazard Mitigation:* The TSP embodies the community's vision for an equitable and efficient transportation system by outlining strategies and projects that are important for protecting and enhancing the quality of life through the next 20 years.

- **Lincoln County Community Wildfire Protection Plan, 2018:** Assists Depoe Bay clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.

*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

## Government Structure

The City Council is the policy making body for Depoe Bay. As the elected legislative body in Depoe Bay, the City Council has overall responsibility for the scope, direction and financing of city services. Council members serve four-year terms. Additional departments within the city include the following:

**City Recorder:** The city recorder assures the timely presentation of formal communications from the public, other agencies and city staff to the City Council. The recorder prepares City Council meeting agendas; maintains official city records which reflect the action of the governing body; maintains depository of contracts, agreements and official Council actions and ensures the timely availability of these records to the Council, public, other agencies and staff.

**Public Works Department:** The public works department provides responsive community services related to planning, design, construction, operation, maintenance and management of public infrastructure, including streets, sewer, water treatment, wastewater treatment, public buildings, harbor, and other facilities. Services provided by the department contribute to the public health, safety, economic diversity, environmental quality, and citizen convenience.

**Land Use Planning:** The city provides services and information to the general public regarding all phases of community development and land use planning. Staff implements city ordinances, administers the local comprehensive plan and land use code, and advises the City Council and Planning Commission on all land use and special project matters.

Although not a city department, the Depoe Bay Rural Fire Protection District provides structural fire protection for the City of Depoe Bay.

Other commissions exist in Depoe Bay and assist in facilitating public services in the following areas: Harbor Commission, Planning Commission, Parks Commission, Salmon Enhancement Commission, and the Urban Renewal Agency.

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review. Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the City's website: <https://www.cityofdepoebay.org/>

In addition, natural hazards information dissemination is conducted throughout the year when opportunities present themselves via the city offices and website.

## NHMP Maintenance

The Lincoln County Multijurisdictional Natural Hazard Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's action items were first developed through a two-stage process during the 2009 NHMP development and revised in 2015. In stage one, OPDR facilitated a work session with the steering committee to discuss the city's risk and to identify potential issues. In the second stage, OPDR, working with the local steering committee, developed potential actions based on the hazards and the issues identified by the steering committee. During the 2019-2020 update process OPDR re-evaluated the Action Items with the county and local steering committees and updated actions, noting what accomplishments had been made and if the actions were still relevant; any new action items were identified at this time. For additional information see the discussion near the end of this document.

The City's actions are listed in Table DA-1. For more detailed information on each action, see the action forms within Attachment A of this addendum.

In addition, there are 19 County Action Items that include the city as an "Affected Jurisdiction" (Table DA-13). For more detailed information on the county actions that involve city participation, see Volume I, Section 3 and the action item forms within Volume III, Appendix A.

Priority Action Items

Table DA-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in bold text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action.

**Table DA-I City of Depoe Bay Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing
Depoe Bay #1	Identify high risk coastal erosion areas and find means to mitigate the hazard.	Public Works	L to H	Long
Depoe Bay #2	Identify over-water transportation alternatives in the event of bridge collapse in an earthquake and/ or tsunami.	Public Works	L	Long
<b>Depoe Bay #3</b>	<b>Continue to educate citizens about earthquake, tsunami, windstorm, winter storm, and other natural hazards.</b>	<b>City of Depoe Bay</b>	<b>L</b>	<b>Ongoing</b>
Depoe Bay #4	Work with DOGAMI to obtain LiDAR data. Create modern landslide inventory and susceptibility maps and use in planning and regulations for future development.	City of Depoe Bay	L to M	Short
Depoe Bay #5	Evaluate and implement mitigation projects for areas east of harbor that are threatened by a slow-moving landslide.	Public Works	L to H	Long
<b>Depoe Bay #6</b>	<b>Identify and implement mitigation projects for facilities, infrastructure, and areas susceptible to CSZ earthquakes and related tsunamis. Consider structural and non-structural retrofit options.</b>	<b>City of Depoe Bay</b>	<b>L to H</b>	<b>Long</b>

Source: City of Depoe Bay NHMP Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

# Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure DA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure DA-1 Understanding Risk**



## Hazard Analysis

The Depoe Bay NHMP steering committee reviewed and revised the plan’s Hazard Analysis and Risk Assessment section. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in probability, vulnerability, and risk from natural hazards unique to the City of Depoe Bay, which are discussed throughout this addendum.

Table DA-2 shows the hazard analysis matrix for Depoe Bay listing each hazard in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

One catastrophic hazard (Cascadia Subduction Zone earthquake) and three chronic hazards (windstorm, winter storm (snow/ice), and landslide) rank as the top hazard threats to the City (Top Tier). Coastal erosion, wildfire, local tsunami, distant tsunami, and tornado comprise the next highest ranked hazards (Middle Tier). Coastal flood, crustal earthquake, drought, riverine flood, and volcanic events comprise the lowest ranked hazards in the City (Bottom Tier).

**Table DA-2 Hazard Analysis Matrix – City of Depoe Bay**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Winter Storm (Snow/Ice)	18	35	90	70	213	#2	
Earthquake (Cascadia)	10	50	100	49	209	#3	
Landslide	20	40	70	70	200	#4	
Coastal Erosion	20	20	70	70	180	#5	Middle Tier
Wildfire	16	25	70	49	160	#6	
Tsunami (Local)	2	25	80	49	156	#7	
Tsunami (Distant)	10	15	50	35	110	#8	
Tornado	8	10	30	56	104	#9	
Flood (Coastal)	16	10	30	42	98	#10	Bottom Tier
Earthquake (Crustal)	10	20	40	21	91	#11	
Drought	14	5	10	49	78	#12	
Flood (Riverine)	16	5	10	42	73	#13	
Volcanic Events	2	5	40	7	54	#14	

Source: City of Depoe Bay NHMP Steering Committee (2020)

Table DA-3 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Lincoln County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings).

**Table DA-3 Probability and Vulnerability Comparison**

Hazard	Depoe Bay		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	High	Moderate	High	Low
Drought	Moderate	Low	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	Moderate	Low	High	Moderate
Flood (Riverine)	Moderate	Low	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	Moderate	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	Moderate	Moderate	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	Moderate	High	Moderate

Source: City of Depoe Bay NHMP Steering Committee and Lincoln County NHMP Steering Committee (2020)

## Community Characteristics

Table DA-4, Appendix C (Volume III), and the following section provide information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2012 and 2019 the City grew by 45 people (3%).<sup>1</sup> According to the State’s official coordinated population forecast, between 2019 and 2040 the City’s population is forecast to grow by 33% to 1,920.<sup>2</sup> Median household income increased by 12% between 2012 and 2017.<sup>3</sup> The City has an educated population with 97% of residents 25 years, and older holding a high school degree, 34% have a bachelor’s degree or higher. The Lincoln County School District has a 76% graduation rate as of 2019. Depoe Bay includes industrial and commercial development but is zoned primarily residential.

Development in Depoe Bay spreads mostly north to south along US-Highway 101 (see Figure DA-2). Dense commercial areas in Depoe Bay exist along US-Highway 101 and are centrally located in the downtown area and around the harbor. Residential development is located north, south, and east of downtown along US-Highway 101, and west along the Pacific Ocean. The city’s Comprehensive Plan identifies land use needs within the city and its urban growth boundary. Depoe Bay is expanding to the east, has an aging population, and has an expanding number of second/ rental homes in the community. Figure DA-2 shows the City of Depoe Bay’s zoning map. New development has complied with the standards of the [Oregon Building Code](#), and the city’s development code including their floodplain ordinance.

<sup>1</sup> Portland State University, Population Research Center, "Annual Population Estimates", 2019.

<sup>2</sup> Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

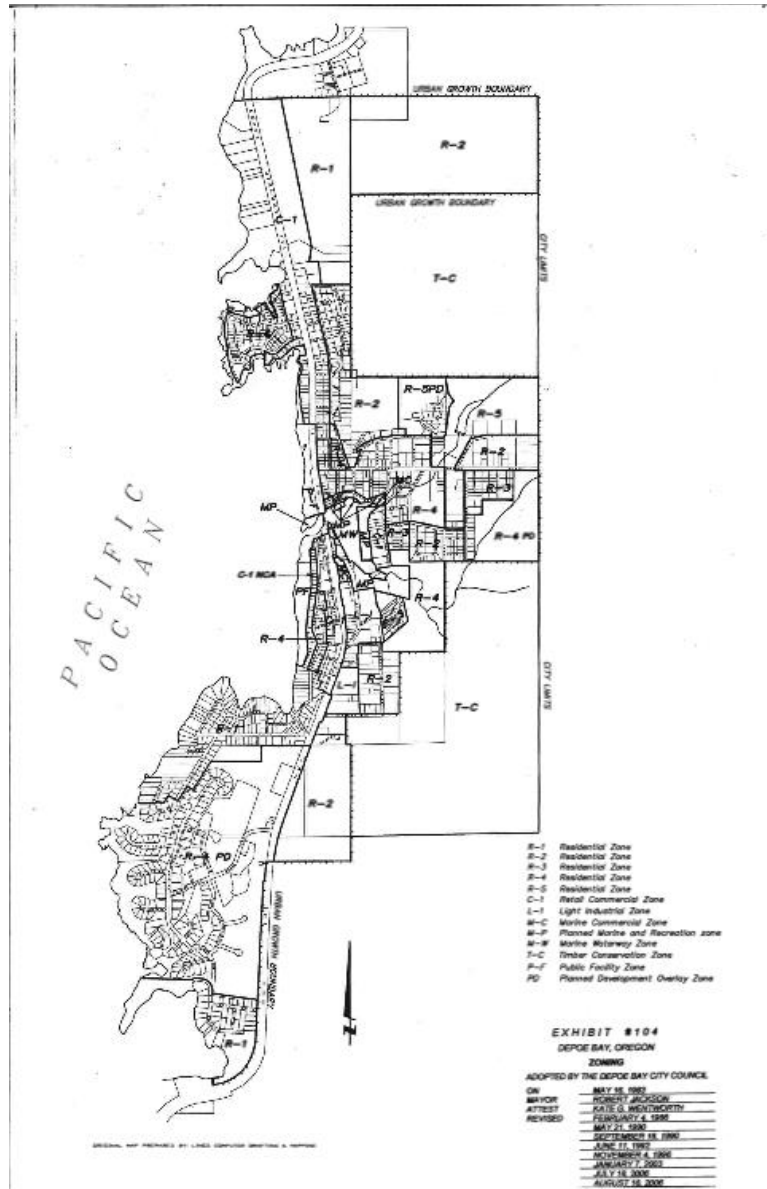
<sup>3</sup> Social Explorer, Table T57, U.S. Census Bureau, 2013-2017 and 2008-2012 American Community Survey Estimates.

## Economy

Depoe Bay's commercial areas developed along primary routes and residential development followed nearby (see Figure DA-2).

Just over 54% of the resident population 16 and over is in the labor force (905 people) and are employed in a variety of occupations including building and grounds cleaning (17%), food preparation and serving (16%), professional (13%), management, business, and financial operations (13%), sales (13%), and office and administrative support (11%) occupations.<sup>4</sup>

**Figure DA-2 Zoning Map**



Source: City of Depoe Bay

<sup>4</sup> Social Explorer, Tables A17008 & A17002, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.



**Table DA-4 Community Characteristics**

Population Characteristics		
<b>2012 Population</b>	1,400	
<b>2019 Population</b>	1,445	
<b>2040 Forecasted Population</b>	1,920	
Race (non-hispanic) and Ethnicity (Hispanic)		
White	93%	
Black/ African American	0%	
American Indian and Alaska Native	< 1%	
Asian	2%	
Native Hawaiian and Other Pacific Islander	0%	
Some Other Race	0%	
Two or More Races	2%	
Hispanic or Latino	3%	
<b>Limited or No English Spoken</b>	0	0%
Vulnerable Age Groups		
Less than 15 Years	94	5%
65 Years and Over	628	36%
Disability Status		
Total Population	369	21%
Children (Under 18)	4	3%
Working Age (18 to 64)	199	20%
Seniors (65 and older)	166	26%

Income Characteristics		
Households by Income Category		
Less than \$15,000	114	13%
\$15,000-\$29,999	119	14%
\$30,000-\$44,999	137	16%
\$45,000-\$59,999	104	12%
\$60,000-\$74,999	145	17%
\$75,000-\$99,999	93	11%
\$100,000-\$199,999	132	15%
\$200,000 or more	12	1%
<b>Median Household Income</b>	\$53,150	
Poverty Rates		
Total Population	194	11%
Children (Under 18)	15	12%
Working Age (18 to 64)	124	12%
Seniors (65 and older)	55	9%
Housing Cost Burden (Cost is 30% or more of income)		
Owners with Mortgage	214	39%
Renters	116	38%

Source: U.S. Census Bureau, 2013-2017 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2019. Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

Housing Characteristics		
Housing Units		
Single-Family	1,065	74%
Multi-Family	302	21%
Mobile Homes	77	5%
Year Structure Built		
Pre-1970	327	23%
1970-1989	349	24%
1990-2009	765	53%
2010 or later	3	< 1%
Housing Tenure and Vacancy		
Owner-occupied	549	38%
Renter-occupied	307	21%
Seasonal	475	33%
Vacant	113	8%

Depoe Bay is located on the central Oregon Coast in Lincoln County, approximately 12 miles south of the Lincoln City and 93 miles from the Portland metropolitan area. Depoe Bay sits at an average elevation of 58 feet above sea level. The city limits cover a land area of approximately 1.80 square miles and is adjacent to a small natural navigable harbor consisting of six square miles. The city is known as the "Whale Watching Capital of the World" and a resident pod of grey whales makes its home off Depoe Bay from March through December.

The climate in Depoe Bay is moderate. Average monthly temperatures range from lows of 39-40° F (December through February) to highs of 65° F (July through September). The driest months are July and August (average about 0.8 inches of precipitation per month) the wettest months are November through January (average more than ten inches of precipitation per month). Depoe Bay has an average annual precipitation of approximately 67.5 inches (71%, 47.6 inches falls November through March). The city is bound to the north by Boiler Bay State Park and to the south by Big Whale Cove.

## Asset Identification

The following assets identified by the City of Depoe Bay were first gathered from the Asset Identification meetings held with community members in 2007. These assets were confirmed and updated by the City steering committee during the 2019-2020 update process.

## Cultural and Historic Resources

Completion of the Roosevelt Highway and Depoe Bay Bridge in 1927 made Depoe Bay more accessible to tourists, new residents and those seeking to invest in the area. The natural beauty of the rugged coastline, rich marine life and abundant natural resources made Depoe Bay a popular destination early on. In 1927, the Depoe Bay Aquarium was built and remained one of the only privately-owned aquariums in the United States until its closure in 1998. Given its proximity to the Pacific Ocean, Depoe Bay is a coastal fishing community where whale watching is also a popular activity.

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The National Register of Historic Places lists one historic site within the City of Depoe Bay while the State Historic Preservation Office includes several other properties.<sup>5</sup> The following list includes the seven sites that are listed on the National Register of Historic Places:

- Archeological Site (35-LNC-68), Address Restricted (vicinity) (eligible/significant)
- Boiler Bay Site (35-LNC-45), Address Restricted (vicinity) (eligible/significant)
- Government Point Site (35-LNC-44), Address Restricted (vicinity) (eligible/significant)
- Rocky Creek Site (35-LNC-43), Address Restricted (vicinity) (eligible/significant)
- Depoe Bay Bridge, Hwy 101, 1927 (eligible/significant)
- Depoe Bay Ocean Wayside, 119 SW Hwy 101, 1956 (eligible/significant)

The following list includes two (2) other properties listed on the State Historic Preservation Office website:

- Depoe Bay City Hall (former elementary school), 570 SE Shell Ave, c.1933 (eligible/significant)
- Bower-Chambers Landmark, Depoe Bay Ocean, 1936 (eligible/contributing)

Depoe Bay has many festivals and community events through the year, including the Recognition Dinner for the Depoe Bay Rural Fire Protection District and Coast Guard, Easter Egg Hunt, Wooden Boat Show and Crab Feed and Ducky Derby, Fleet of Flowers Memorial Day Ceremony, Chamber of Commerce Picnic, Chamber of Commerce Pirate Treasure Hunt, Christmas Lighting, Annual Salmon Bake. Other local attractions include clamming, crabbing, deep sea fishing, watching spouting horns, whale watching, hiking, beachcombing, and tide pooling. Recreational amenities include the Depoe Bay Whale Watch Center, the Depoe Bay

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<sup>5</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 17, 2020.

City Park and numerous pocket parks and nature trails, Rocky Creek Scenic Area, Boiler Bay Scenic Area, and a wide range of restaurants, galleries and shops.

## Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to act in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and wastewater treatment facilities.

Depoe Bay has the following critical facilities (**bold** indicates facility was included in the Risk Report [DOGAMI, O-20-11](#)):

- **City Hall** (570 Shell Avenue)
- Wastewater Treatment Plant (212 South Point St)
  - See [Utility Lifelines](#) for additional system details
- Water Treatment Plant (455 Collins St)
  - See [Utility Lifelines](#) for additional system details
- **Depoe Bay Rural Fire Protection District Station 2300** (325 SW Hwy 101)
- Marine Fueling Bunker and Boats (Depoe Bay Harbor, Coast Guard Dr)
- **Samaritan Depoe Bay Clinic** (531 Hwy 101, Suite A)
- **U.S. Coast Guard Depoe Bay Station** (240 Coast Guard Dr)

In addition, the city's community hall, Neighbors for Kids Building, the park building, and sea wall (built of lava rock) are considered important community assets.

## Transportation

Mobility plays an important role in Depoe Bay, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within the City. Depoe Bay is also served by Lincoln County Transit Route 495 with service running seven days a week with stops in Depoe Bay. Caravan Airport Transportation also provides service from the City to Portland International Airport.

### Roads/Seismic lifelines

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>6</sup>

System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system

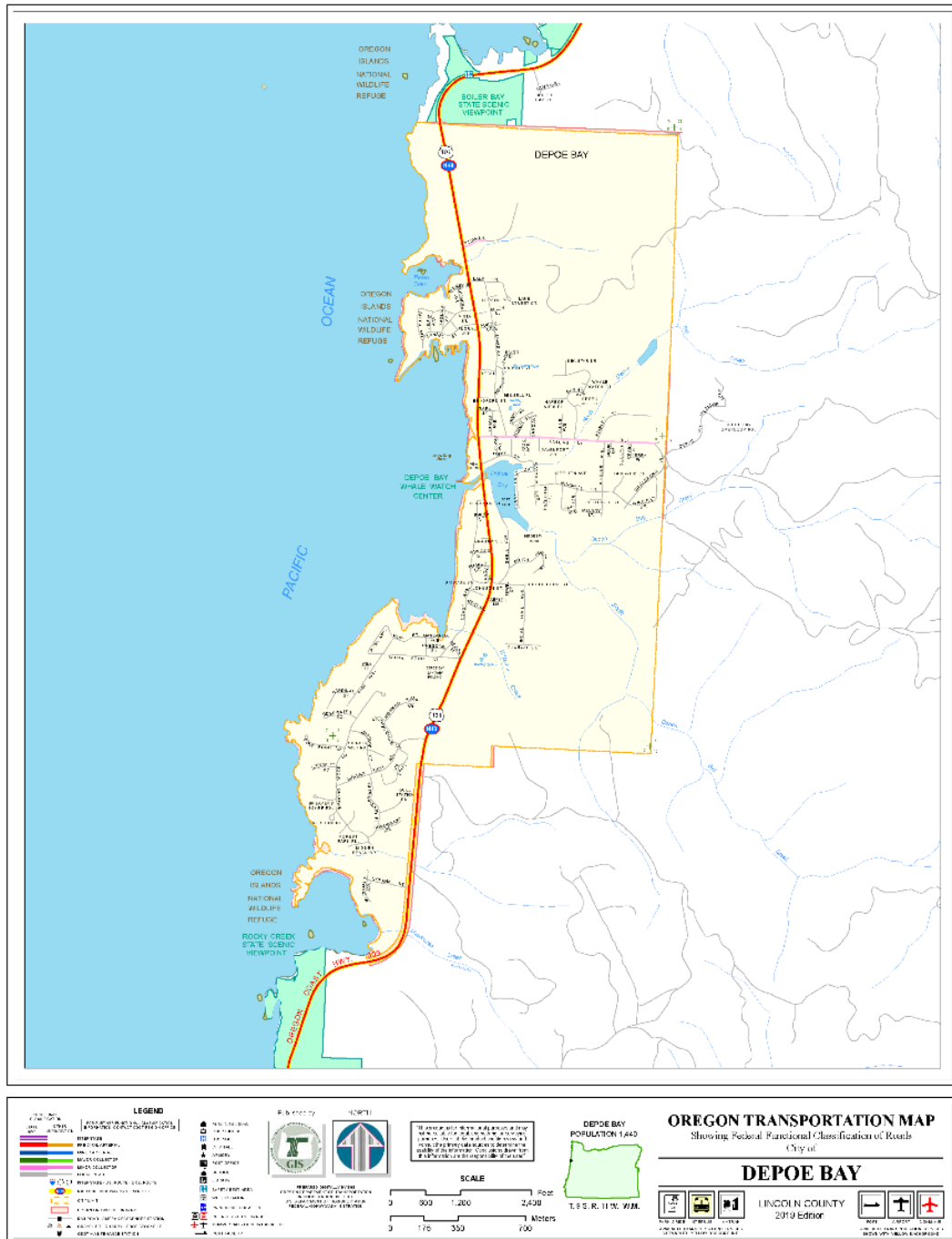
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<sup>6</sup> Oregon Department of Transportation. Oregon Seismic Lifeline Evaluation, Vulnerability Synthesis, and Identification, *Oregon Seismic Lifeline Routes*, May 15 2012.

provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

Highway 101 (Tier I) is the major north-south transportation route through the City (see Figure DA-3). Highway 18 (Tier I, north of Lincoln City), and Highway 20 (Tier III, Newport) are the major east-west transportation routes connecting the coast to the Willamette Valley.

**Figure DA-3 Depoe Bay Functional Classification of Roads**



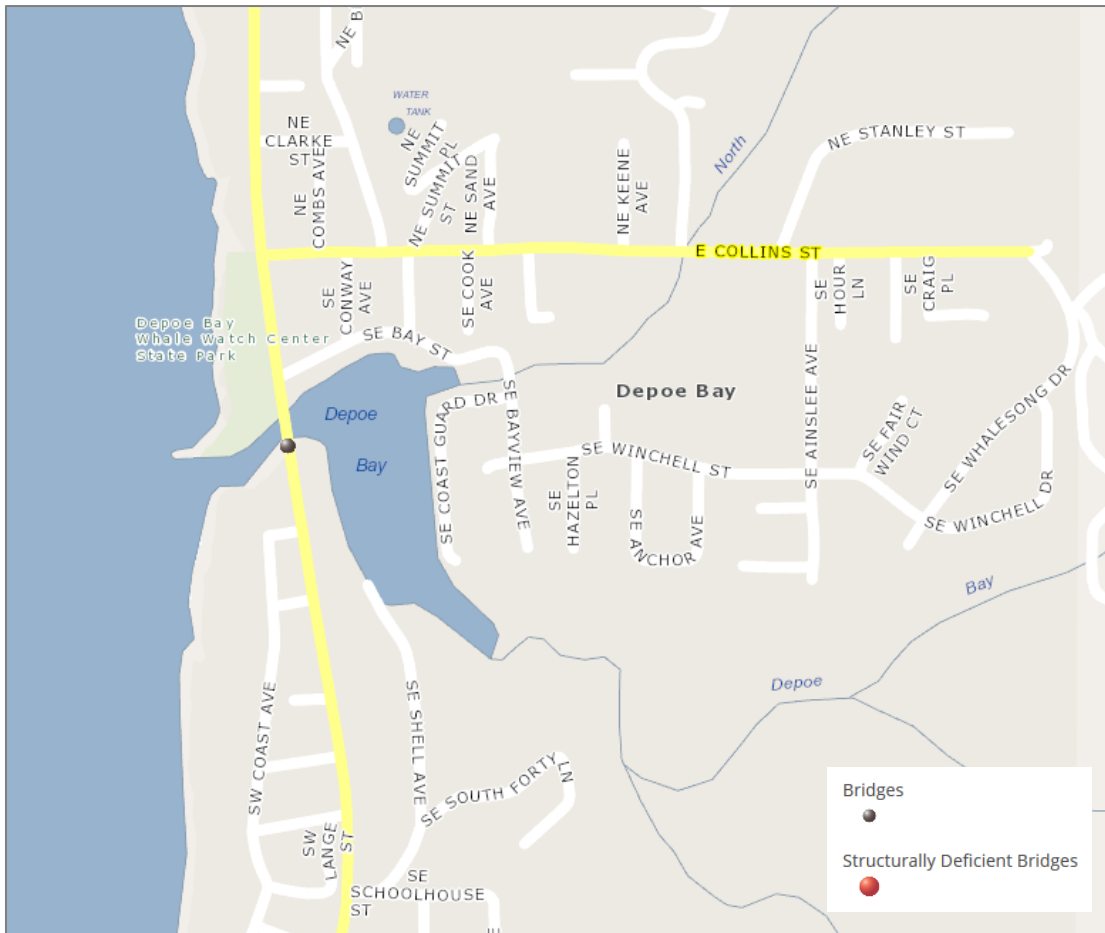
Source: Oregon Department of Transportation - [Link](#)

## Bridges

Because of earthquake risk, the seismic vulnerability of the city's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries are unable to transport goods. Bridges within the city that are critical or essential include (see Figure DA-4):

- Depoe Bay Bridge (ca. 1927), US 101 (Hwy 9) (Bridge ID 02459)

**Figure DA-4 Oregon Bridges and Structurally Deficient Bridges**



Source: Oregon Department of Transportation, ODOT TransGIS, accessed July 17, 2020

More information on Seismic Design of bridges is on the ODOT website:

<https://www.oregon.gov/odot/Bridge/Pages/Seismic.aspx>

## Railroads

There are no railroads in Depoe Bay.

## Airports

There are no public airports in Depoe Bay. The Siletz Bay State Airport is the nearest airport (about 6 miles north of the City). The city has no commercial service airports. The nearest commercial airports are in Eugene and Portland.

### Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Generally, the network of electricity transmission lines running throughout the city is operated by Central Lincoln PUD. The Williams Gas Pipeline provides natural gas that is delivered to customers in the city by Northwest Natural Gas. These lines may be vulnerable as infrequent natural hazards, like earthquakes, could disrupt service to natural gas consumers across the region.

The city water and wastewater systems include the following:

#### Water Infrastructure

- Raw Water Reservoir
- Water Treatment Plant (455 Collins St)
  - 5 Water Pump Stations
  - 2 Water Storage Tanks (1.6 million gallons)
  - Water Mains and Distribution Lines

#### Wastewater Infrastructure

- Wastewater Treatment Plant (212 South Point St)
  - 5 Sewer Pump Stations
  - 14.7 miles of Sewer Mains

## **Community Organizations and Programs**

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The countywide community organizations that are active within the city and county and may be potential partners for implementing mitigation actions can be found in Appendix C: Community Profile.

## **Lincoln County School District**

The Lincoln County School District and schools in Lincoln City serve Depoe Bay students approximately 10 miles north of Depoe Bay.

## Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions better understand risk and can assist in documenting successes. The following efforts have occurred or are ongoing within Depoe Bay:

- The Depoe Bay City Council adopted an Emergency Operations Plan (EOP) in June 2013. The EOP outlines the City's approach to emergency response and enhances the City's ability to protect the safety, health, and welfare of its citizens. It describes the City's emergency response organization and assigns responsibilities for various emergency functions, identifies lines of authority and coordination, and communicates the legal basis and references that provide a framework for emergency planning in the City. The EOP:
  - Includes all hazards and types of emergencies likely to impact the City.
  - Provides a framework for multi-discipline, multi-jurisdictional coordination and cooperation.
  - Addresses all phases of a disaster through mitigation, preparedness, response and recovery activities.
  - Designates the National Incident Management System (NIMS) as the framework within which all emergency management activities occur.
  - Directs use of the Incident Command System (ICS) for managing incident response.
  - Identifies roles and responsibilities of City departments, offices, and personnel in emergency operations, as well as those of cooperating public- and private-sector agencies.
  - Establishes life safety followed by protection of property and the environment as emergency response priorities.
  - Provides a common framework within which the City, Lincoln County, special districts and other agencies/organizations can integrate their emergency planning and response and recovery activities.
- The city has an Emergency Preparedness Locations Map (within their EOP) that identifies evacuation routes and short-term assembly areas for neighborhoods throughout Depoe Bay. The map also identifies long-term assembly areas (updated with new Tsunami Evacuation Maps provided by DOGAMI).
- The city enforces a building setback requirement for all development located along the oceanfront and harbor frontage. A primary purpose of the setback is to reduce property damages related to coastal erosion, windstorms, and flooding. The setback requirements also serve to meet the city's natural hazard goals, as defined in the Depoe Bay Comprehensive Plan:
  - To protect life and property from natural disasters and hazards.
  - To provide for adequate safeguards for land uses in areas of natural hazards.
- The City Comprehensive Plan and Zoning Ordinance state legislation: SB 378, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, limits construction of new essential facilities and special occupancy structures in tsunami flooding zones.

- In addition, the city has tsunami and storm maps and is designated a TsunamiReady and StormReady community by the National Weather Service.
- The City utilizes an advanced Emergency Warning System to alert its residents, businesses and visitors.

## Hazard Profiles

The following sections briefly describe relevant information for each profiled hazard. More information on Lincoln County hazards can be found in Volume I, Section 2 *Risk Assessment* and in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the City of Depoe Bay. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The City hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

## Coastal Erosion

The steering committee determined that the city’s probability for coastal erosion is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to coastal erosion is **moderate**, meaning it is expected that between 1% and 10% of the City’s population or property could be affected by a major coastal erosion event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 describes the characteristics of coastal erosion hazards, as well as the history, location, extent, and probability of a potential event. Coastal erosion is a natural process that continually affects coastal areas; in Depoe Bay and elsewhere along the Pacific, coastal erosion becomes a hazard when lives and properties are at risk of death, injury, or damage. Coastal erosion is typically a gradual process, which can be greatly accelerated in the event of a storm or climate factors that increase the potential for coastal erosion.

### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the risk of coastal erosion is expected to increase due to sea level rise and changing wave dynamics.

## Vulnerability Assessment

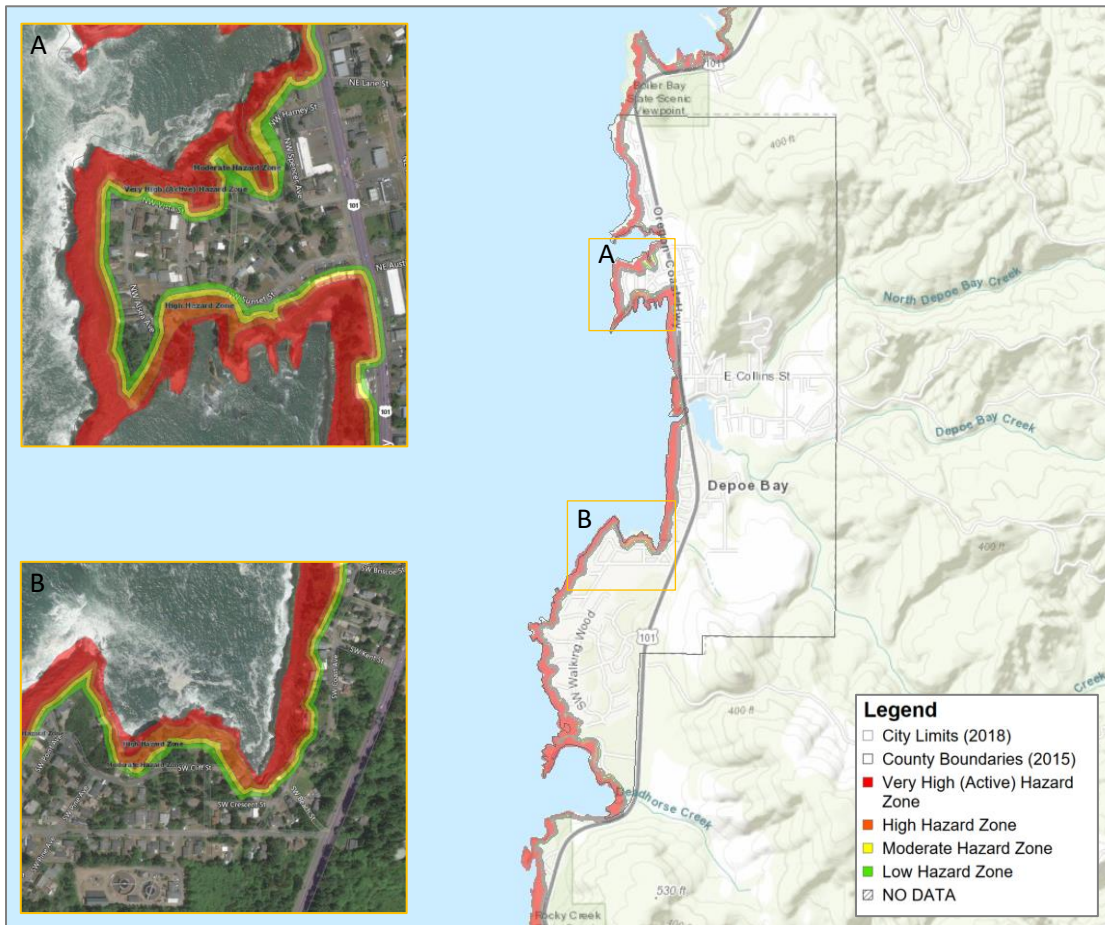
Depoe Bay has many high cliffs, as well as developments that are very close to the ocean. The city rests on a combination of basalt and sandstone. Aside from oceanfront properties, one area identified as particularly vulnerable to coastal erosion is the north side of the Depoe Bay harbor. The north side of the harbor consists of very high, steep, vertical sandstone cliffs where a condominium complex and several homes are located. The city also has a main sewer line located in Bay Street at the top of the cliff. Some erosion has occurred in these areas. The county identified areas along Highway 101 that have sustained erosion-induced damages. Within the City of Depoe Bay, however, the highway is safe. To mitigate the effects of coastal erosion, the city requires new development to comply with setback restrictions.



Potential community-related impacts, including shoreline reduction, economic (tourism-related) impacts, and property/infrastructural damage, are adequately described within the Volume I, Section 2 of the NHMP. See Figure DA-5 for locations of the city’s coastal erosion hazard along coastal bluffs on the city’s western edge.

The City of Depoe Bay uses the RNKR Environmental Hazards Inventory of Coastal Lincoln County, Oregon as a mapping and reporting tool for coastal erosion. Although not included within this addendum, the coastal erosion hazards map can be obtained through City Hall.

**Figure DA-5 Coastal Erosion Hazard**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

**Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion. The Risk Report provides a distinct profile for Depoe Bay.

The Risk Report provides an analysis of dune-backed beaches and bluff-backed shorelines to identify the general level of susceptibility due to storm-induced erosion, sea level rise, and subsidence due to CSZ earthquake event. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Depoe Bay may be impacted by profiled coastal erosion scenario (Table DA-5).

Approximately three percent of the City’s population (45 people) may be displaced by coastal erosion. These people are expected to have mobility or access issues and/or may have their residences impacted by coastal erosion. Properties that are most vulnerable to the coastal erosion hazard are those that are developed in an area of steep dunes or cliffs. Just under five percent (64 buildings) of all buildings (residential, commercial, industrial) are exposed to the high coastal erosion hazard zone. The value of exposed buildings is \$12.8 million (about 5% of total building value). It is important to note that impact from coastal erosion may vary depending on areas that are impacted during an event.

**Table DA-5 Potentially Displaced Residents and Exposed Buildings, Coastal Erosion**

Community Overview: Depoe Bay						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,398		1,337		4	257,610,000	
Exposure Analysis: Coastal Erosion High Hazard Scenario						
Potentially Displaced		Exposed Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
45	3.2%	64	4.8%	0	12,820,000	5.0%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020). Table A-14. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>7</sup>

There are no critical facilities exposed to the profiled coastal erosion scenario.

**Drought**

The steering committee determined that the city’s probability for drought is **moderate**, meaning one incident is likely within the next 35 years and that their vulnerability to drought is **low**, meaning less than 1% of the city’s population or property could be affected by a major drought event. *The probability rating has decreased, and the vulnerability rating has not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of drought hazards, as well as the history, location, extent, and probability of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared coastal communities from the effects of a drought. Depoe Bay, however, has experienced droughts in the past due to a lack of potable surface water.

There are two creeks that supply the city’s water: North Depoe Bay Creek and Rocky Creek. The drinking water supply creeks are a direct-flow water source where contamination is a potential threat to water supply. In recent years, the city upgraded its intake at Rocky Creek; the city has approximately 2.8 million gallons of raw water storage and 1.6 million gallons of finish water storage.<sup>8</sup> Water from the city reservoirs is treated at the water treatment

<sup>7</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-15.

<sup>8</sup> Depoe Bay Annual Water Quality Report (2019)

facility that can treat up to 0.5 million gallons per day (mgd). Following treatment water flows to two water storage reservoirs (1.6 million gallons capacity). The City has enough capacity to meet current and anticipated future demand.

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## Vulnerability Assessment

Due to insufficient data and resources, Depoe Bay is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks apply to humans and resources. Industries important to the City of Depoe Bay’s local economy such as fishing have historically been affected, and any future droughts would have tangible economic and potentially human impacts.

The city’s existing water supply is most vulnerable to wildfire which may impact the city’s watershed and is increased during periods of drought. The City’s storage, water transmission, and distribution lines are vulnerable to seismic activity that could cause them to crack.

## Earthquake

The steering committee determined that the city’s probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a CSZ event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major CSZ earthquake event. The steering committee determined that the city’s probability for a crustal earthquake event is **low**, meaning one incident may occur within the next 100 years and that their vulnerability to a Crustal Earthquake event is **moderate**, meaning that between 1% and 10% of the city’s population or property could be affected by a major crustal earthquake event. *The city’s probability to crustal earthquake was decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of earthquake hazards, as well as the history, location, extent, and probability of a potential event. Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

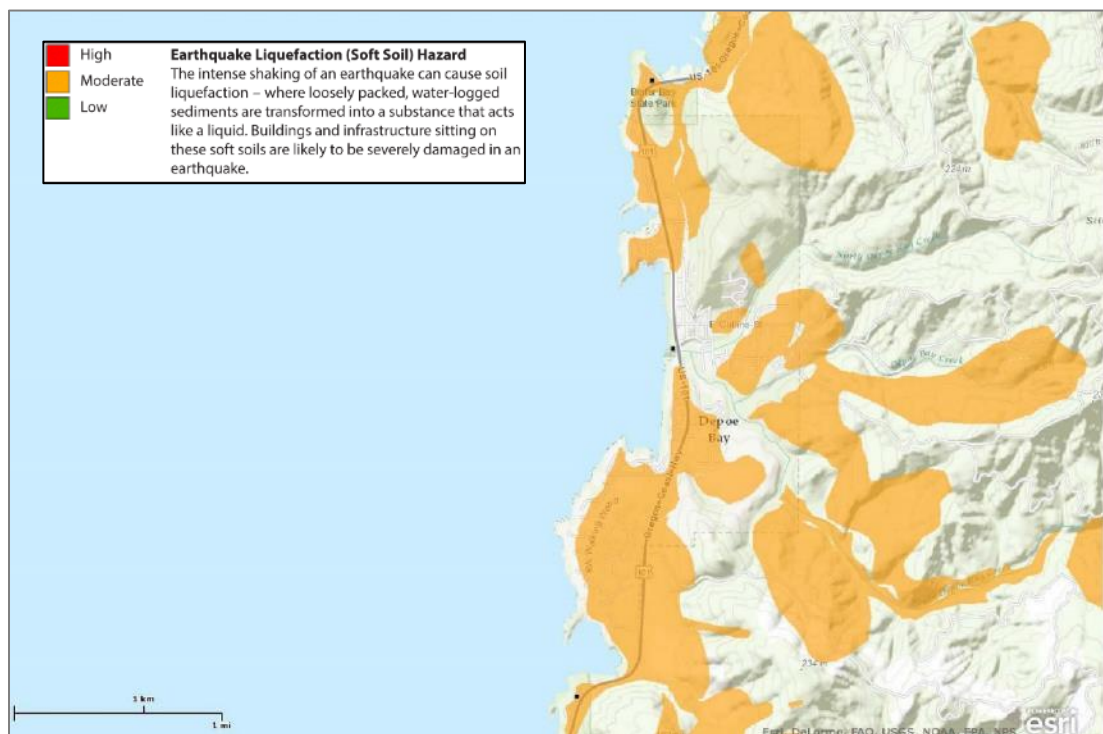
The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time

between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>9</sup>

The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides.

The figures below show earthquake hazards that affect the city, including the soft soil/liquefaction hazard (Figure DA-6), expected ground shaking for crustal events (Figure DA-7), and for the Cascadia Subduction Zone event (Figure DA-8). The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. The soft soils figure below shows that in general the soils in Depoe Bay have low to moderate liquefaction potential; the areas of the population along the coastline are more susceptible to liquefaction than areas further in land and away from rivers.

**Figure DA-6 Earthquake Liquefaction (Soft Soil) Hazard**

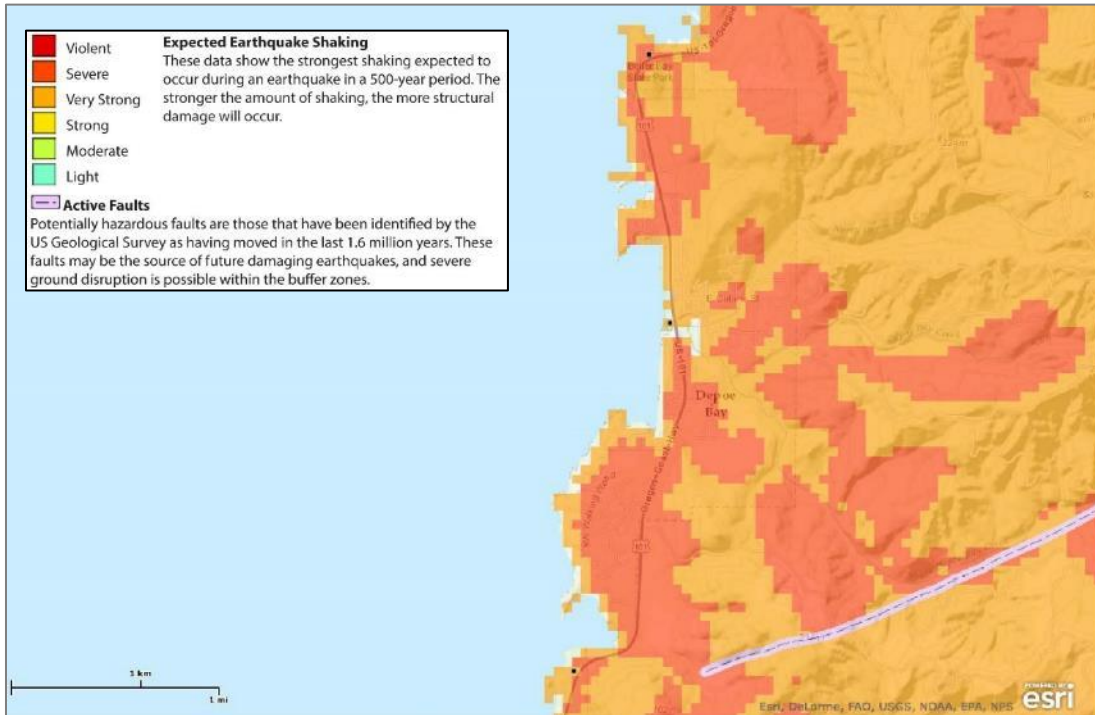


Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Shaking from the combined earthquake scenario is expected to be very strong to violent for much of Depoe Bay as shown in Figure DA-7. The figure also shows one historically active fault southeast of the city.

<sup>9</sup> DLCD. *Oregon State Natural Hazard Mitigation Plan*. 2020 (Draft).

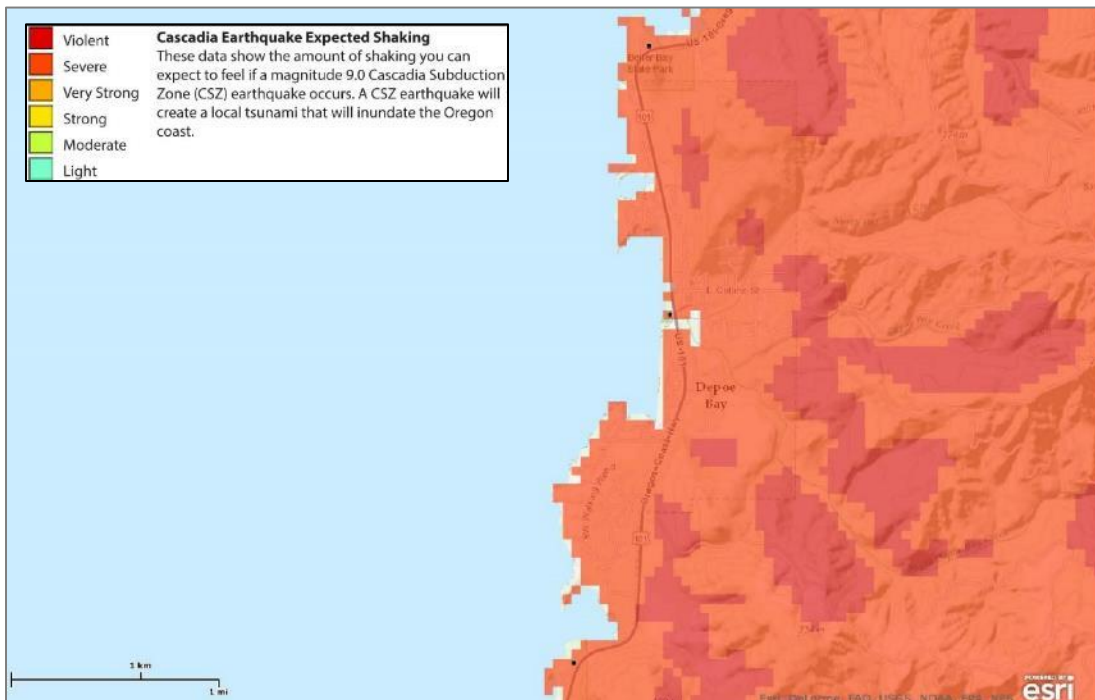
**Figure DA-7 Combined Earthquake Events Expected Shaking and Active Faults**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Figure DA-8 shows expected shaking with a Cascadia Earthquake. The figure shows that the entire city will receive severe to violent shaking.

**Figure DA-8 Cascadia Earthquake Expected Shaking**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

The city's concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described above are cause for significant effort toward mitigating the earthquake hazard. There is considerable development on steep slopes within the city. The Highway 101 Bridge crossing the Bay was built in 1927 and is extremely vulnerable to damage from a high magnitude earthquake. In the event of bridge failure, north Depoe Bay would be isolated from south Depoe Bay. Likewise, transportation throughout the region and along the coast would be impacted if the Depoe Bay Bridge closed. A "park" bridge was constructed ca. 2015 at the southeast corner of the harbor area. It will likely withstand an earthquake of considerable magnitude but may not survive a large Tsunami flow. The bridge can support heavy weight equipment such as a fire apparatus truck. The city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, the Fire Station, and City Hall were identified by the steering committee as vulnerable assets. The city would also expect damage to roads following a CSZ event, as well as deaths and severe injuries region wide. Education and outreach regarding the CSZ is an on-going endeavor in Depoe Bay.

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community characteristics section (Table DA-4), approximately 47% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard. Information on specific public buildings' (schools and public safety) estimated seismic resistance was determined for Lincoln County by DOGAMI in 2007. No facilities within Depoe Bay were evaluated by DOGAMI using RVS. See [critical facility vulnerability](#) section below for a list of facilities identified in the Risk Report.

### Mitigation Activities

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Depoe Bay agencies or organizations.

A primary mitigation objective of the city is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Although the city has not made use of the seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>10</sup> the Depoe Bay RFPD has been funded to retrofit the Fire Station 2300 (2013-14 grant award, \$831,418). Additionally, the School District has retrofitted at risk schools in Lincoln City, that serve Depoe Bay students, through the SRGP program and local resources (see the Lincoln County School District addendum for more information).

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<sup>10</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

## Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to earthquake. The Risk Report provides a distinct profile for Depoe Bay.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled magnitude 9.0 Cascadia Subduction Zone (CSZ) event. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Depoe Bay may be impacted by the profiled earthquake scenarios (Table DA-6). *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*<sup>11</sup>

Approximately 23% of the City's population (314 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, approximately 3% will be impacted by the accompanying tsunami. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Earthquakes will impact every building in the City, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as "damaged" in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The City has 491 buildings that are expected to be damaged by the CSZ earthquake and tsunami event. The combined (earthquake and tsunami) value of building damage losses are \$63.6 million.

The Risk Report estimated losses show that the age of the building stock is the primary metric of earthquake vulnerability. Communities with older building stock are expected to have higher losses. However, if buildings were retrofitted to at least "moderate code" standards the impact of the event would be reduced. The Risk Report concludes that loss estimates for the City drop from 19.7% to 14% (\$13.5 million decrease in loss) when all buildings are upgraded to at least moderate code level.<sup>12</sup> *Note: earthquake vulnerability retrofit benefits are minimized in areas of liquefaction and landslide where additional geotechnical mitigation would be needed.*

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<sup>11</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-14.

<sup>12</sup> Ibid, Table B-2.

**Table DA-6 Potentially Displaced Residents and Exposed Buildings, Earthquake**

Community Overview: Depoe Bay						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,398		1,337		4	257,610,000	
Exposure Analysis: Earthquake CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
269	19.2%	427	31.9%	3	50,750,000	19.7%
Exposure Analysis (within Tsunami Zone - Medium)						
45	3.2%	64	4.8%	1	12,820,000	5.0%
Total Exposure						
314	22.5%	491	36.7%	4	63,570,000	24.7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-14. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>13</sup>

- Depoe Bay City Hall
- Depoe Bay RFPD Fire Station 2300 (seismic retrofit ca. 2019; SRGP 2013-2014)
- Samaritan Depoe Bay Clinic
- U.S. Coast Guard Depoe Bay Station; also exposed to Tsunami (medium-sized)

In addition, although not assessed in the Risk Report, the Community Hall is vulnerable to earthquake and needs to be retrofitted.

**Tsunami**

The steering committee determined that the city’s probability for a distant tsunami event is **moderate** meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a distant tsunami event is **low**, meaning that less than 1% of the city’s population or property could be affected by a major distant tsunami event. The steering committee determined that the city’s probability for a local tsunami event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a local tsunami event is **moderate**, meaning that between 1% and 10% of the City’s population or property could be affected by a major local tsunami event. *The city’s probability to distant tsunami, and vulnerability to local and distant tsunami, were decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of tsunami hazards, as well as the history, location, extent, and probability of a potential event. The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that

<sup>13</sup> Ibid, Table A-15.



caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>14</sup> Distant tsunamis happen more regularly than CSZ related local tsunamis.

It is difficult to predict when the next tsunami will occur. According to the Oregon NHMP the coast has experienced 25 distant tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources would be about six (6) years. However, the time interval between events has been as little as one year and as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for the City.

A 9.0 magnitude earthquake originating from Japan caused approximately \$7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; \$6.7 million), as well as the Port of Depoe Bay (Lincoln County; \$182,000), and Charleston Harbor (Coos County; \$200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency was declared by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast local officials activated the Emergency Alert System and sirens, implemented “reverse 9-1-1” and conducted door-to-door notices in order to evacuate people from the tsunami inundation zone. Local governments activate their Emergency Operations Centers and the state activated its Emergency Coordination Center. For more information view Volume II, Hazard Annex.

In 1995, the Department of Geology and Mineral Industries (DOGAMI) conducted an analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami maps were produced to help implement Senate Bill 379 (SB 379); digitized in 2014 ([O-14-09](#)). SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005, limit construction of new essential facilities and special occupancy structures in tsunami flooding zones. Figure DA-9 shows the regulatory tsunami inundation line showing the much of the residential development west of Highway 101, and areas in, and adjacent to, the harbor are vulnerable to tsunami. It should be noted that the updated tsunami inundation maps (described below) show an increased vulnerability in that area (Figure DA-10). Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building “new essential facilities, hazardous facilities, major structures, and special occupancy structures” inside the tsunami inundation zone (SB 379 line):<sup>15</sup>

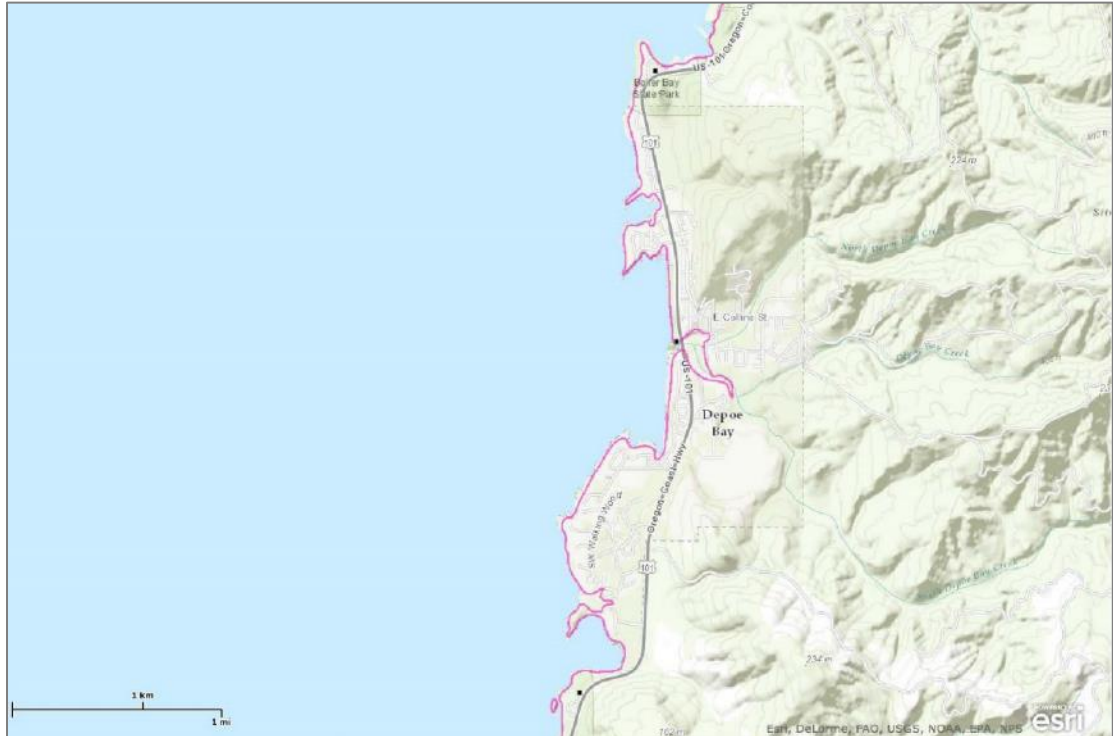
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<sup>14</sup> DLCD. Oregon Natural Hazards Mitigation Plan. 2020.

<sup>15</sup> Oregon Legislature. HB 3309 (2019).

<https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309>

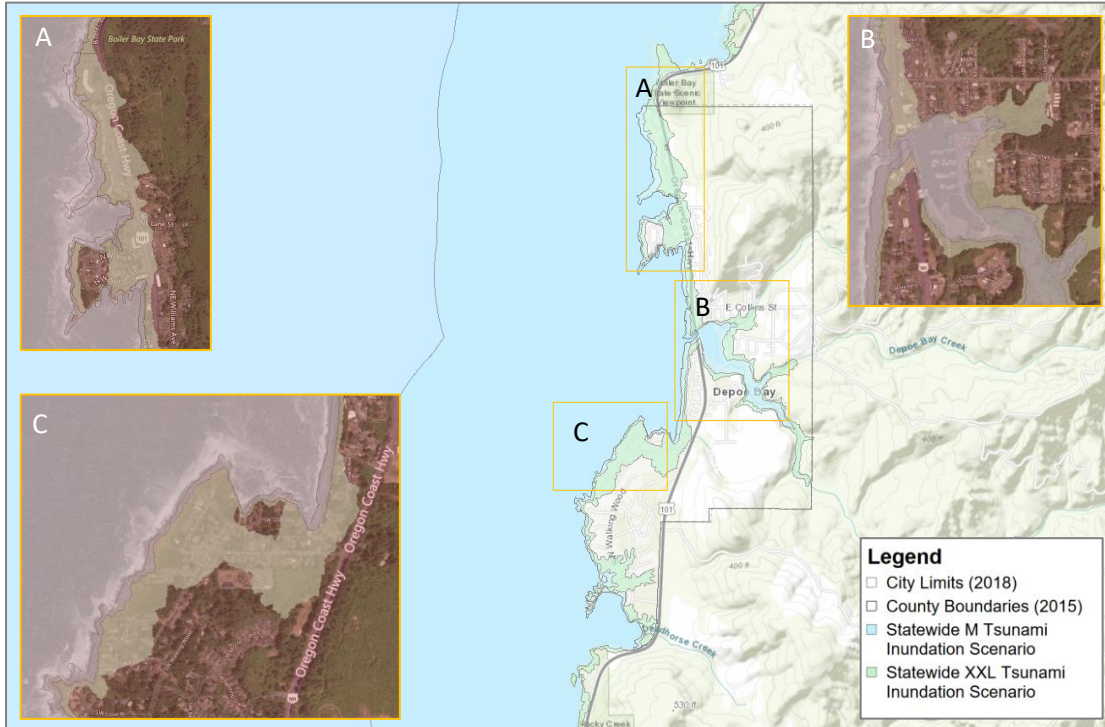
**Figure DA-9 Regulatory (SB 379) Tsunami Inundation Line**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities. Maps were created for local and distant source tsunami events. The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as “T-shirt” sizes S, M, L, XL, and XXL. Figure DA-10 shows the M and XXL tsunami inundation scenarios. The distant source tsunami inundation maps show the potential impacts of tsunamis generated by earthquakes along the “Ring of Fire” (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2) and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

**Figure DA-10 Tsunami Inundation Map (M and XXL Scenarios)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - <http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm>  
(Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:  
<http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm>

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst-case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

<http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm>

A free application is also available that displays the evacuation routes in coastal areas of Oregon: [http://www.nanoos.org/mobile/tsunami\\_evac\\_app.php](http://www.nanoos.org/mobile/tsunami_evac_app.php)

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

In 2013, DOGAMI produced new Tsunami Inundation Maps (TIMs) for the entire Oregon coast. The TIMs identify both local and distant Tsunami Inundation Zones (TIZs) by event size. The maps also tabulate the affected buildings located within the local and distant source tsunami inundation zones. The Risk Report section below provides detailed information on the impact to the City from a CSZ earthquake and medium tsunami.

Population vulnerability is characterized in terms of exposure, demographic sensitivity, and short-term resilience of at-risk individuals. Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.<sup>16</sup> Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds. According to the study Lincoln County (including Depoe Bay) has relatively low numbers of “residents, employees, or customer-heavy businesses” inside the tsunami hazard zones and will likely have enough time to reach high ground before a tsunami wave arrives.

Severe damage could occur to low-lying areas of the city in a local source tsunami event, including roads, bridges, communication systems, and infrastructure within Depoe Bay, particularly surrounding, and including facilities within, the harbor, among other assets described in the county’s plan. Damage is also expected in a large distant source tsunami event (such as the 2011 Tohoku tsunami). The City of Depoe Bay recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future. The city utilizes a reverse 911 service as the tsunami warning system.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to tsunami. The Risk Report provides a distinct profile for Depoe Bay.

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Depoe Bay may be impacted by the profiled tsunami scenario (Table DA-7).

Less than one (1) percent the city’s population (8 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is slightly fewer people than those exposed within the Senate Bill 379 line

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<sup>16</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmidlein. “Community clusters of tsunami vulnerability in the US Pacific Northwest”, PNAS 2015 112 (17) 5354-5359.

(9 people). *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Building damage (loss) estimates are reported for buildings expected to be damaged by the tsunami inundation zone (medium-sized and SB 379). All 13 buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable); the number of buildings damaged is slightly higher under the SB 379 scenario (20). One critical facility is expected to be damaged under the CSZ M9.0 scenario, none are expected to be damaged under the SB 379 scenario.

**Table DA-7 Potentially Displaced Residents and Exposed Buildings, Tsunami**

Community Overview: Depoe Bay						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,398		1,337		4	257,610,000	
Exposure Analysis: Tsunami CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
8	0.6%	13	1.0%	1	1,177,000	0.5%
Exposure Analysis: Tsunami SB 379 Regulatory Line						
9	0.6%	20	1.5%	0	3,818,000	1.5%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-14. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>17</sup>

- U.S. Coast Guard Depoe Bay Station

In addition, although not assessed in the Risk Report, the Community Hall is vulnerable to tsunami and needs to be mitigated or relocated.

**Flood**

The steering committee determined that the city’s probability for riverine or coastal flood is **moderate**, meaning one incident is likely within the next 35 to 75-year period and that their vulnerability to coastal or riverine flood is **low**, meaning that less than 1% of the City’s population or property could be affected by a major coastal or riverine flood event. *The city’s probability of coastal and riverine floods and vulnerability to coastal floods decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of coastal and riverine flood hazards, as well as the history, location, extent, and probability of a potential event. Coastal flooding and North and South Depoe Creeks are the primary sources of flooding. Coastal related flood events happen because of storms and tides. River-related flood events are also caused by storms, as well as rain on snow /

<sup>17</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-15.

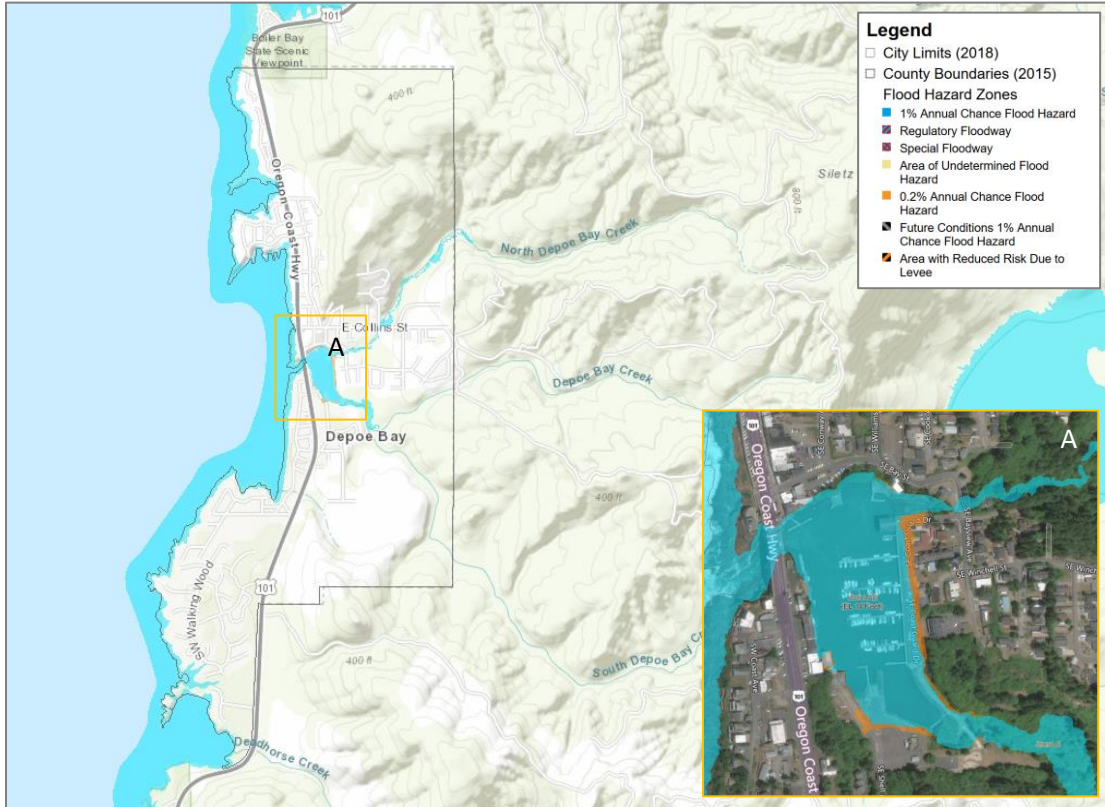
snowmelt. There are no records of sustained damage or serious impacts associated with major flood events.

FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one percent (1%) probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood; also known as the Special Flood Hazard Area (SFHA). The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods (Figure DA-11). These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards. These maps represent a snapshot in time, and do not account for later changes which occurred in the floodplains. According to Oregon Explorer slightly more than 7% of the City is within the 100-year floodplain, including the areas in the southern part of the city that includes several residential properties. In addition, less than 2% of the City is within the 500-year floodplain.

**Future Climate Projection:**

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events. Additionally, coastal flooding is expected to increase due to sea level rise (SLR) and changing wave dynamics. Sea level is projected to rise by 1.7 to 5.7 feet by 2100. Tidal wetlands and estuaries throughout the county are also expected to experience changes to their composition and area, thereby impacting their ability to naturally mitigate flood events.

**Figure DA-11 Flood Hazard Zones (100- and 500-year floodplain)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to flood. The Risk Report provides a distinct profile for Depoe Bay.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the city. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within Depoe Bay may be impacted by the profiled flood scenario (Table DA-8).

Few residents are exposed or potentially displaced by the flood hazard in the City. Less than 1% of the City’s population (2 people) may be displaced by flooding. These people are expected to have mobility or access issues due to surrounding water. Less than one percent (1%) of the City’s buildings (9 buildings) are exposed to the flood hazard and may be damaged. The loss estimate for exposed buildings is \$20,000 (less than 1% of total building value).

**Table DA-8 Potentially Displaced Residents and Exposed Buildings, Flood**

Community Overview: Depoe Bay						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,398		1,337		4	257,610,000	
Exposure Analysis: Flood (1% Annual Chance)						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
2	0.1%	9	0.7%	1	20,000	< 1%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-14. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>18</sup>

There are no critical facilities exposed to the profiled flood scenario.

**National Flood Insurance Program (NFIP)**

FEMA’s Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2019. Table DA-9 shows that as of August 2019, the City has 89 National Flood Insurance Program (NFIP) policies in force, representing almost \$24.6 million in coverage. Of those, 23 are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for the City was August 20, 1998. The table shows that most flood insurance policies are for residential structures, primarily single-family homes. Flood insurance covers only the improved land, or the actual building structure. There have been two (2) paid flood insurance claims for a combined total of just over \$5,222.

The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The NFIP’s Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. The City does not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone.

The Community Repetitive Loss record for Depoe Bay identifies no Repetitive Loss Properties<sup>19</sup> or Severe Repetitive Loss Properties<sup>20</sup>.

<sup>18</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-15.



**Table DA-9 Flood Insurance Detail**

	Lincoln County	Depoe Bay
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	10/15/1980
Total Policies	2,325	89
Pre-FIRM Policies	1,067	23
<b>Policies by Building Type</b>		
Single Family	1,685	57
2 to 4 Family	57	2
Other Residential	462	29
Non-Residential	121	1
Minus Rated A Zone	98	1
Minus Rated V Zone	3	0
Insurance in Force	\$585,856,500	\$24,594,800
Total Paid Claims	343	2
Pre-FIRM Claims Paid	265	0
Substantial Damage Claims	53	0
Total Paid Amount	\$5,479,221	\$5,222
Repetitive Loss Structures	64	0
Severe Repetitive Loss Properties	12	0
CRS Class Rating	NP	NP
Last Community Assistance Visit	-	8/20/1998

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating.

## Landslide

The steering committee determined that the city's probability for landslide is **high**, meaning at least one incident is likely within the next 35-year period, and that their vulnerability to landslide is **high**, meaning that more than 10% of the City's population or property could be affected by a major landslide event. *The city's vulnerability to landslide was increased since the previous NHMP, the probability rating has remained the same.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of landslide hazards, as well as the history, location, extent, and probability

<sup>19</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

<sup>20</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

of a potential event. No records for city-specific landslides have been kept, but the steering committee identified that the Army Corps of Engineers installed 72 pilings, 40-60 feet deep to prevent landslides from occurring east of the harbor.

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries or take lives. Landslide susceptibility exposure for Depoe Bay is shown in Figure DA-12. Approximately 54% of the City has very high or high, and 26% moderate, landslide susceptibility exposure.<sup>21</sup> In general, the areas of greater risk are located adjacent to rivers and creeks and indicate potential areas of erosion; there is portion of the city in the west hills that has high landslide susceptibility. *Note that even if a City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

## Vulnerability Assessment

In general, the east/northeastern portion of the city consists of steep slopes where development pressure exists. Road cracking has occurred in some areas, but no significant losses are documented. The city’s water reservoir and a water tank are in the eastern part of the city. Depoe Bay rebuilt the water tank in accordance with modern seismic and building code requirements to prevent damages from occurring in both earthquake and landslide events.

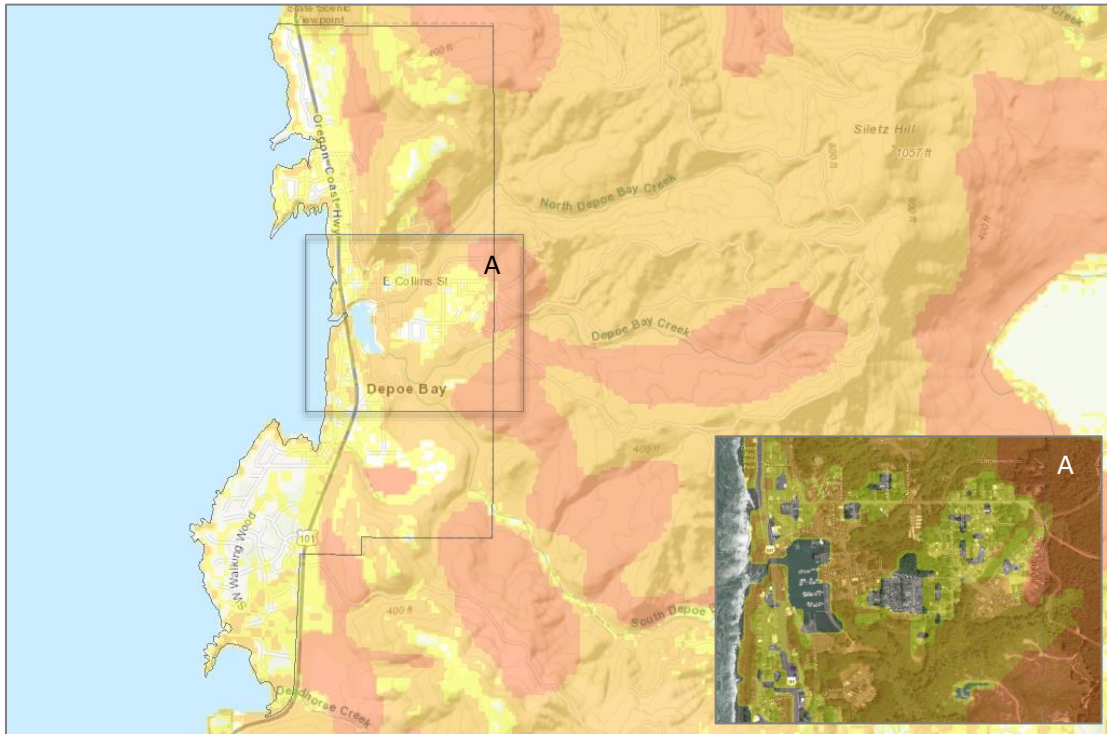
Additionally, as described in the coastal erosion hazard section, the north side of the harbor consists of very high, steep, vertical sandstone cliffs where a condominium complex and several homes are located. The city also has a main sewer line located in Bay Street at the top of the cliff. More detailed landslide hazard assessment at specific locations requires a site-specific analysis of the slope, soil/rock and groundwater characteristics at a specific site. Such assessments are often conducted prior to major development projects in areas with moderate to high landslide potential, to evaluate the specific hazard at the development site.

Potential landslide-related impacts are adequately described within the county’s plan, and include infrastructure damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Lincoln County, and thoroughfares beyond city limits are susceptible to obstruction as well. As such, Depoe Bay is vulnerable to isolation for an extended period.

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<sup>21</sup> DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

**Figure DA-12 Landslide Susceptibility Exposure**



Low	<b>Landsliding unlikely.</b> Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low.
Moderate	<b>Landsliding possible.</b> Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.
High	<b>Landsliding likely.</b> Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.
Very High	<b>Existing landslides</b> Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

## Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Depoe Bay.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the city may be impacted by the profiled landslide scenario (Table DA-10).

Approximately 25% of the City's population (348 people) may be displaced by landslides. These people are expected to have mobility or access issues and/or may have their residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 24% of all buildings (319 buildings) within the City are exposed to the High or Very High landslide susceptibility zones (see Figure DA-12). The value of exposed buildings is \$42 million (about 16% of total building value).

**Table DA-10 Potentially Displaced Residents and Exposed Buildings, Landslide**

Community Overview: Depoe Bay						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,398		1,337		4	257,610,000	
Exposure Analysis: Landslide High & Very High Susceptibility						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
348	24.9%	319	23.9%	2	42,048,000	16.3%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-14. Note: City population based on the 2010 Census population.

### Critical Facility Vulnerability<sup>22</sup>

- Depoe Bay RFPD Fire Station 2300
- U.S. Coast Guard Depoe Bay Station

## **Severe Weather**

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.<sup>23</sup> Similarly, severe winter storms consisting

<sup>22</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-15.

<sup>23</sup> US Department of Agriculture. <http://www.fsa.usda.gov/or/Notice/Flp104.pdf>.

of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months.<sup>24</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

### Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>25</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

## Windstorm

The steering committee determined that the city’s probability for windstorm is **high** (the probability of tornado is also high), meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to windstorm is **high**, meaning that more than 10% of the City’s population or property could be affected by a major windstorm event. The Steering Committee rated the County as having a “**low**” **vulnerability to a tornado hazard**, meaning that less than 1% of the City’s population or property could be affected by a major tornado event. *The windstorm ratings have not changed since the previous NHMP. The tornado ratings are new with this version of the NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of windstorm hazards, as well as the history, location, extent, and probability of a potential event. Because coastal windstorms typically occur during winter months, ice, freezing rain, flooding, and very rarely, snow sometimes accompany them. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Siletz is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. In Depoe Bay, power outages are the

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<sup>24</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

<sup>25</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.

greatest concern during windstorms. Building codes now require new developments to place power lines below ground. Without power, communication is lost, and fuel and food stores shut down. In the December 2007 windstorm, the water treatment plant nearly used up its diesel supply, and the city lost its primary communications route (provided through Telecommunication Utility-owned Fiber Optic routes). Depoe Bay city patrons were unable to access 911.

## Winter Storm (Snow/ Ice)

The steering committee determined that the city's probability for winter storm is **high**, meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to winter storm is **moderate**, meaning that between 1% and 10% of the city's population or property could be affected by a major winter storm event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of winter storm hazards, as well as the history, location, extent, and probability of a potential event. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. More than likely, however, the coast's winter will just be windy, cold, and wet.

### Vulnerability Assessment

Due to insufficient data and resources, Siletz is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Major winter storms can and have occurred in the Depoe Bay area, and while they typically do not cause significant damage; they are frequent and have the potential to impact economic activity. Road closures on Highway 101, or the passes to the Willamette Valley (Hwy 18 and 20), due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

## Volcanic Event

The steering committee determined that the city's probability for volcanic event is **low**, meaning one incident is likely within the next 75 to 100-year period, and that their vulnerability to volcanic event is **low**, meaning that less than 1% of the city's population or property would be affected by a major volcanic event (ash/lahar). *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of volcanic event hazards, as well as the history, location, extent, and probability of a potential event. Generally, an event that affects the county is likely to affect Depoe Bay as well.

### Vulnerability Assessment

Due to insufficient data and resources, Siletz is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Depoe Bay is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens

erupted in 1980, the city received small amounts of ashfall, but not enough to cause significant health and/or economic damages.

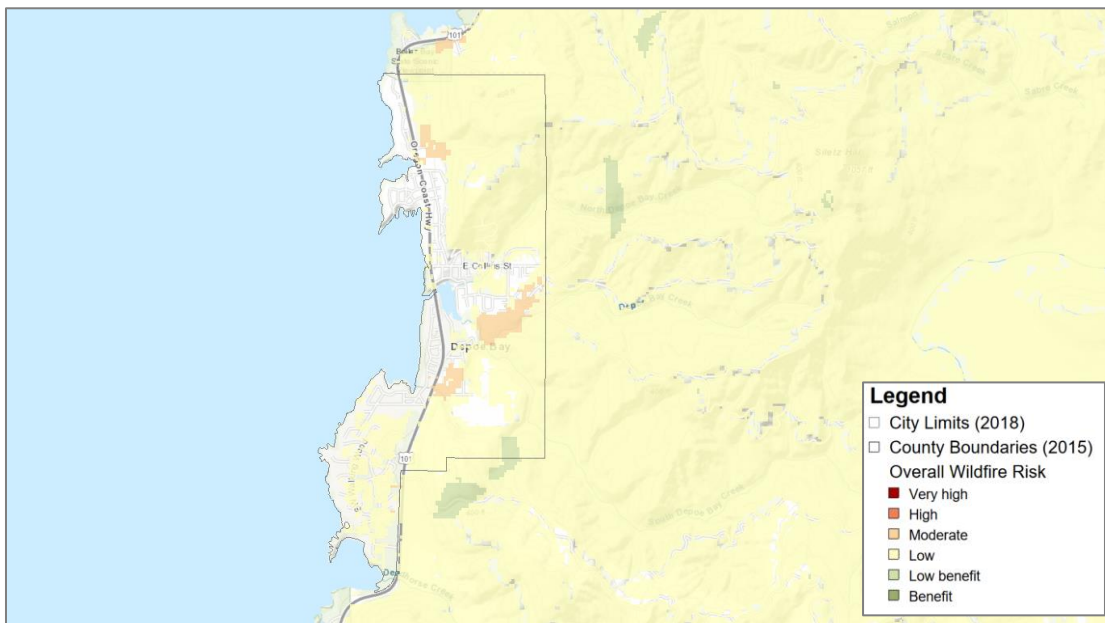
## Wildfire

The steering committee determined that the city’s probability for wildfire is **moderate**, meaning one incident is likely within the next 35 to 75-year period, and that their vulnerability to wildfire is **moderate**, meaning that between 1% and 10% of the City’s population or property could be affected by a major wildfire event. *The city’s probability to wildfire was decreased since the previous NHMP, the vulnerability rating has remained the same.*

The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve to supplement the wildfire section in this addendum.

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of wildfire hazards, as well as the history, location, extent, and probability of a potential event. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Wildfires in 1849 and 1936 were particularly devastating in Lincoln County, but since then, there have been few large events. In 2016, the 2500 Road fire burned over 200 acres 2 miles east of the City. As shown in Figure DA-13 the City has mostly low, with some moderate, overall wildfire risk. Areas of concern include the eastern side of the city (where forestland borders development), and some of the open spaces within the city’s limits. Due to the prevailing wind patterns (i.e., from the north or south), the city’s steering committee felt that the east and south ends of the city might be the most vulnerable. Power, natural gas, and phone lines run through the forest to the east of the city and would be affected in the event of a wildfire. Likewise, active commercial logging occurs just outside the city, and slash burns are a potential wildfire concern.

**Figure DA-13 Overall Wildfire Risk**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

## Vulnerability Assessment

Overall, the city, and its watershed, has low to moderate overall wildfire risk, however, the forested areas have the potential for large wildfires and a wildfire within the watershed could impact the city’s water supply and quality.

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Depoe Bay.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment’s Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the City may be impacted by the profiled wildfire scenario (Table DA-11).

Approximately two percent of the City’s population (21 people) may be displaced by wildfires. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire (more people may also be impacted by smoke and traffic disruptions that are not accounted for within this analysis). It is important to note that impact from wildfires may vary depending on the specific area that experiences a wildfire. The value of exposed buildings (32 buildings) is \$16.3 million (about 6% of total building value).



**Table DA-11 Potentially Displaced Residents and Exposed Buildings, Wildfire**

Community Overview: Depoe Bay						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,398		1,337		4	257,610,000	
Exposure Analysis: Wildfire High-Hazard						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
21	1.5%	32	2.4%	0	16,336,000	6.3%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-14. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>26</sup>

There are no critical facilities exposed to the profiled wildfire scenario.

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<sup>26</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-15.

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# ATTACHMENT A: ACTION ITEM FORMS

Table DA-1 and Table DA-12 provide a summary list of actions for the city. Each high priority action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table DA-12 Action Item Timelines, Status, High Priority and Related Hazards**

Action Item	Priority	Timeline	Status	Related Hazard									
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm
Depoe Bay #1		Long	Ongoing	X									
Depoe Bay #2		Long	Ongoing			X			X				
Depoe Bay #3	X	Ongoing	Ongoing			X			X			X	X
Depoe Bay #4		Short	Deferred	X			X	X			X		
Depoe Bay #5		Long	Ongoing					X					
Depoe Bay #6	X	Long	New			X			X				

NHMP related activity completed since previous NHMP:

- The city has implemented an Emergency Warning System and has extensively built up its emergency operations trailer (related to County Action MH #2).
- The city is working with the Neighbors for Kids (Kid's zone) facility for emergency evacuations, shelter and transportation (related to County Action MH #4).
- The city recently (2019) completed its flood plain mapping requirement (related to County Action FL #4).

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The City NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the City. Existing programs and other resources that might be used to implement these action items are identified. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

County level actions that the city is listed as a partner are shown in Table DA-13. These actions are led by the County; however, the City will incorporate elements of the action that are applicable to their jurisdiction.

**Table DA-13 County Specified Actions that the City is Partner**

Action Item (2015 NHMP)	City Partner	Action Item
MH #1	Yes	Consider Local Energy Assurance Planning for critical areas countywide
MH #2	Yes	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers
MH #3	Yes	Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.
MH #4	Yes	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.
MH #5	Yes	Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.
MH #6	Yes	Integrate the NHMP into County and City comprehensive plans.
MH #7	Yes	Prepare long-term catastrophic recovery plan
MH #8		Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
CE #1	Yes	Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.
CE #2	Yes	Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
EQ #1	Yes	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
EQ #2	Yes	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
EQ #3	Yes	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
TS #1	Yes	Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami

Action Item (2015 NHMP)	City Partner	Action Item
		inundation zone and likely to be impacted by tsunami.
TS #2		Implement land use strategies and options to increase community resilience
FL #1		Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)
FL #2		Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.
FL #3	Yes	Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas
FL #4	Yes	Continue compliance with the National Flood Insurance Program (NFIP).
LS #1	Yes	Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.
LS #2		Protect existing development in landslide-prone areas.
LS #3	Yes	Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
SW #1		Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).
SW #2	Yes	Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.
WF #1	Yes	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

Mitigation Action: Depoe Bay #1 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Identify high risk coastal erosion areas and find means to mitigate the hazard.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
Open-File Report O-04-09 Evaluation of Coastal Erosion along Dune and Bluff Backed Shorelines in Lincoln County, Oregon: Cascade Head to Seal Rock George R. Priest and Jonathan C Allan.					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>In their hazard analysis, the City of Depoe Bay rated itself as having a high coastal erosion risk and moderate vulnerability. Throughout the city there are areas of ongoing coastal erosion. More notably there areas along the Depoe Bay Harbor susceptible to erosion. It is important to identify these areas and mitigate the hazard to ensure the protection of infrastructure, structures, and human life.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify comprehensive mitigation actions to protect critical infrastructure [201.6(c)(3)(ii)]. Making Depoe Bay Public Works aware of coastal erosion issues along roads can help protect these roads by making them a higher priority for Public Works to conduct stabilization work.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
<p>Work with residents to raise awareness of coastal erosion issues in Depoe Bay.</p> <p>Coordinate efforts with Depoe Bay Public Works department responsible for maintaining roads and utilities.</p> <p>Identify critical facilities and infrastructure near high coastal erosion areas.</p> <p>Construct seawalls; install riprap or other means of shoreline stabilization where appropriate.</p> <p>Encourage property owners to retrofit buildings or stabilize landforms.</p> <p>Monitor ground movement in high susceptible areas, especially during or after large storms.</p> <p>Maintain erosion control structures that are already in place.</p> <p>Consider land value losses due to coastal erosion in future risk assessments.</p>			<p><u>2020 Update:</u></p> <p>Depoe Bay City Zoning Codes identify areas of coastal erosion and dictate mandatory setbacks for new development from these areas.</p> <p>ODOT, the City, and the County have identified areas of high erosion and implemented mitigation measures. These areas are monitored on a regular basis for any changes in conditions.</p> <p><u>2015 Update:</u></p> <p>Awaiting data from DOGAMI and Lincoln County Report.</p> <p>Provide information on coastal erosion to residents.</p>		
<b>Champion/ Responsible Organization:</b>		Public Works			
<b>Internal Partners:</b>			<b>External Partners:</b>		
Depoe Bay Planning, Public Works			DLCD, DSL, DOGAMI, ODFW, utility companies		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Local Funding Resources			Low to High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years)



		<input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Depoe Bay Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Depoe Bay #2</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Identify over-water transportation alternatives in the event of bridge collapse in an earthquake and/ or tsunami.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>In the event of a Cascadia Subduction Zone (CSZ) earthquake and/or tsunami, it is possible the U.S. Highway 101 Bridge in Depoe Bay would fail. Essential transportation services would need to be restored. Tsunami destruction can come from both the tsunami wave and from the rapid retreat of the water from the coastline. Tsunami waves tend to be fast moving, rising surges of water.</p> <p>The average recurrence interval for a CSZ event is between 500 and 600 years. There have been seven CSZ events in the last 3500 years with time between individual events varying from 150 to 1000 years. The last CSZ event occurred approximately 315 years ago.</p> <p>Restoration of key infrastructure is essential after a natural disaster "to support the industry and the jobs it provided." To sustain the economy, communities should "provide for temporary infrastructure while long-term rebuilding efforts are underway." Source: Governor's Commission Report on Recovery, Rebuilding, and Renewal. After Katrina: Building Back Better than Ever. December 31, 2005. p. 112.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Coordinate with local fishing and charter fleet to provide emergency services after a CSZ event.</p> <p>Obtain emergency equipment in preparation for an earthquake/tsunami event. Assist fleet with materials and costs associated with emergency service.</p>			<p><u>2020 Update:</u></p> <p>In case of bridge failure, a regional detour route would be required. City will work with Lincoln County and ODOT to identify regional detour.</p> <p><u>2015 Update:</u></p> <p>Replaced bridge in park to get Emergency Vehicle access (48,000 lbs); have local boats; County has provided boat owner assistance.</p>			
<b>Champion/ Responsible Organization:</b>		Depoe Bay Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Depoe Bay Planning, Public Works			Lincoln County Emergency Management, ODOT, NOAA			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Depoe Bay Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Depoe Bay #3</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Continue to educate citizens about earthquake, tsunami, windstorm, winter storm, and other natural hazards.		<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Depoe Bay has engaged in numerous education and outreach activities related to earthquake and tsunami preparedness. The city recognizes the importance of an ongoing education &amp; outreach program that's specifically related to these hazards.</p> <p>Public education and outreach can be inexpensive and provide information that results in safer households, work places and other public areas. Some outreach materials include: informational brochures about community seismic risks and mitigation techniques, public forums, newspaper articles, training classes and television advertisements. Source: Oregon Technical Resource Guide. July 2000. Community Planning Workshop. Eugene, Or. University of Oregon p.8-20.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Encourage hotels, restaurants, and other tourist related facilities and accommodations to post tsunami evacuation maps.</p> <p>Work with Chamber of Commerce on disseminating information on earthquake/tsunami preparedness.</p> <p>Work with local citizens on resources and networking available in case of an event.</p> <p>Update the city website with new information and links to improve to improve the city's emergency preparedness.</p>			<p><u>2020 Update:</u></p> <p>The Chamber of Commerce, along with Depoe Bay CERT have kept businesses and tourist facilities up to date on posters and information.</p> <p>The city has a big push on acquiring a viable web page system, as the present one does not allow for frequent or adequate information dissemination. Cost is an issue.</p> <p><u>2015 Update:</u></p> <p>The updated DOGAMI Tsunami Evacuation Route map/ information was distributed throughout the community in 2013.</p> <p>City provides ongoing hazards information via its website and public offices.</p> <p>City collaborates with the county on natural hazard information outreach.</p>			
<b>Champion/ Responsible Organization:</b>		City of Depoe Bay				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Depoe Bay Public Works, Planning, City Recorder,			Chamber of Commerce, DOGAMI, DLCD, NOAA-NWS			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, DOGAMI, DLCD			Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	

<b>Form Submitted by:</b>	Depoe Bay Steering Committee, revised 2020
<b>Action Item Status:</b>	Ongoing

<b>Mitigation Action: Depoe Bay #4</b> <b>(What do we want to do?)</b>	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Work with DOGAMI to obtain LiDAR data. Create modern landslide inventory and susceptibility maps and use in planning and regulations for future development.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Lincoln County Risk Report		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>LIDAR (light detection and ranging) is a mapping tool that can provide very precise, accurate, and high-resolution images of the surface of the earth, vegetation, and the built environment. It can be used to study landforms and identify areas, especially landslide areas that may be susceptible to future occurrences. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been working with communities to develop large-scale LIDAR maps of entire regions. In 2006- 2007, various local, state, and federal agencies formed the Portland Consortium to gather 2200 square miles of LIDAR data in the Portland Metropolitan region. DOGAMI has formed the Oregon LIDAR Consortium (OLC) to gather data in other Oregon regions, including Lincoln County. Entering into an agreement with the OLC, or obtaining LIDAR collection data from DOGAMI will assist in mapping areas of Western Lane County and landforms around Depoe Bay. Additional, LIDAR analysis has been conducted as part of the Lincoln County Risk Report.</p> <p>With LIDAR, you can quickly, cheaply, and accurately: find landslides, old cuts and grades; measure and estimate fills and cuts; find stream channels and measure gradients; measure the size and height of buildings and bridges; locate and measure every tree in the forest; characterize land cover; model floods, fire behavior; locate power lines and power poles; find archeological sites; map wetlands and impervious surfaces; define watersheds and view-sheds; model insulation and shaking; map road center and sidelines; find law enforcement targets; map landforms and soils; assess property remotely; inventory carbon; monitor quarries, find abandoned mines; enhance any project that requires a detailed and accurate 2-D or 3-D map.</p> <p>The east side of the City of Depoe Bay has relatively steep topography. Despite the city’s topographical characteristics and vulnerabilities to landslides, Depoe Bay does not have accurate information regarding the location and extent of potential landslides. With improved data via participation in the OLC, (or purchase of the OLC’s data), Depoe Bay would have a much greater understanding of its landslide risks.</p> <p>The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Obtaining LIDAR collection data from DOGAMI will help in understanding areas and landforms susceptible to landslide events to protect new and existing buildings, and infrastructure.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
DOGAMI’s LIDAR website provides information about the OLC and LIDAR and is a starting point for entering into an agreement with DOGAMI. <a href="http://www.oregongeology.com/sub/projects/olc/default.htm">http://www.oregongeology.com/sub/projects/olc/default.htm</a> Contact DOGAMI about obtaining the data. DOGAMI staff is additionally available to talk to	<b>2020 Update:</b> The city has not yet acquired LIDAR from DOGAMI. LIDAR is available for areas of the county and data and analysis from the Lincoln County Risk Report is available to incorporate in local planning efforts.	

groups of potential users to show them the data and explain its uses. The LIDAR will be available without license restrictions in standard USGS quadrangles, with a nominal charge for each quadrangle. DOGAMI is happy to work with small communities to develop map products that they can use if they do not have GIS.		
<b>Champion/ Responsible Organization:</b>	City of Depoe Bay	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Depoe Bay Public Works, Planning, City Recorder	DOGAMI	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources	Low to Medium	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Depoe Bay Steering Committee, revised 2020	
<b>Action Item Status:</b>	Deferred	

<b>Mitigation Action: Depoe Bay #5</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Evaluate and implement mitigation projects for areas east of harbor that are threatened by a slow-moving landslide.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
Area is affected by a slow-moving landslide. The city has repaired a sewer sub-main in the area.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
USACE stabilization project and continued monitoring. Control storm water in landslide-prone areas.  Monitor ground movement in high susceptibility areas. Implement grading codes, especially in high susceptibility			<u>2020 Update:</u> Monitoring is ongoing.			
<b>Champion/ Responsible Organization:</b>		USACE/ City of Depoe Bay Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
City Planning, Public Works; County Planning and Development			USACE			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, USACE			Low to High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Depoe Bay Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

Mitigation Action: Depoe Bay #6 (What do we want to do?)	Alignment with Plan Goals:			High Priority Action Item?	
Identify and implement mitigation projects for facilities, infrastructure, and areas susceptible to CSZ earthquakes and related tsunamis. Consider structural and non-structural retrofit options.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>The City has designated an Emergency Operation Center (EOC) in case of a regional emergency. The EOC establishes a meeting area as well as plans for communications and coordination among agencies and the community.</p> <p>The EOC and local emergency responders have developed food and water caches and distribution networks.</p> <p>The EOC has identified local community members with HAM radios and other communication systems. The water department has installed air-actuated automatic valves at key facilities in case of water line breaks. Water department personnel have trained in the identification and isolation of water zones in case of water line breaks.</p> <p>The water department has installed a backup generator at the water treatment plant in case of power failure.</p> <p>The water department has a portable generator that can be used at water pump stations as required. All sewer pump stations are equipped with backup generators in case of power failure.</p> <p>Below are facilities within Depoe Bay that are listed as vulnerable to earthquake/tsunami in the DOGAMI Risk Report or identified by the Depoe Bay NHMP Steering committee:</p> <ul style="list-style-type: none"> <li>• Depoe Bay City Hall</li> <li>• Samaritan Depoe Bay Clinic</li> <li>• U.S. Coast Guard Depoe Bay Station</li> <li>• City Community Hall (for evacuation / shelter)</li> </ul>					
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>			
<p>Determine which structures may be particularly vulnerable to earthquake damage. Seek funding to retrofit and/or re-build structures.</p> <p>Create a local rehabilitation and retrofit program for existing buildings.</p> <p>Rehabilitate identified vulnerable emergency facilities and infrastructure.</p> <p>Inventory port facilities and determine appropriate mitigation measures to increase residency to a tsunami event (improve functionality of pilings, etc.)</p>		<p><u>2020 Update:</u> New</p>			
<b>Champion/ Responsible Organization:</b>	City of Depoe Bay				
<b>Internal Partners:</b>		<b>External Partners:</b>			



Public Works, Planning, Recorder		Harbor, DOGAMI, DLCD, OEM, IFA	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, IFA-SRGP, DLCD Technical Assistance		Low to High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2020 Depoe Bay Steering Committee		
<b>Action Item Status:</b>	New		

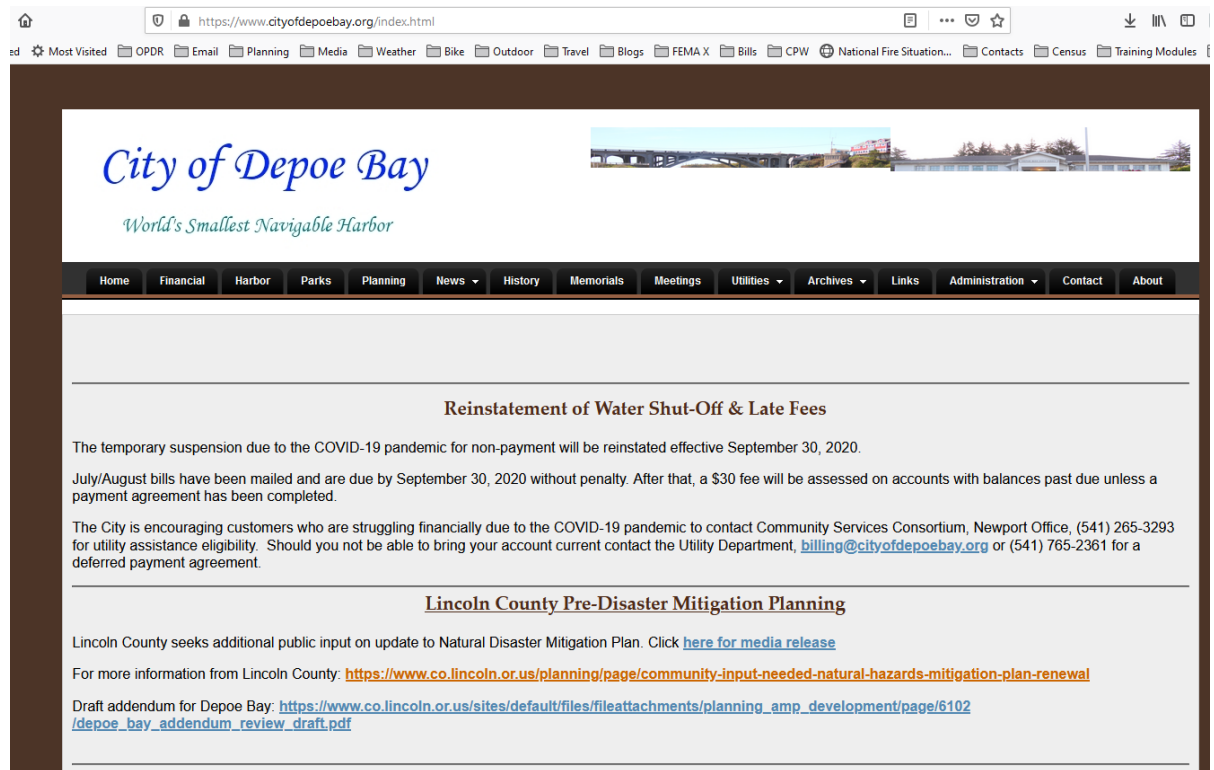
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# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the city's website and an email contact was provided for public comment. The plan was also announced on the County's website and an opportunity to provide feedback was provided.

During the public review period there were no comments provided.



The screenshot shows a web browser window with the URL <https://www.cityofdepoebay.org/index.html>. The website header features the City of Depoe Bay logo and the tagline "World's Smallest Navigable Harbor". A navigation menu includes links for Home, Financial, Harbor, Parks, Planning, News, History, Memorials, Meetings, Utilities, Archives, Links, Administration, Contact, and About. The main content area displays a notice titled "Reinstatement of Water Shut-Off & Late Fees" with the following text:

The temporary suspension due to the COVID-19 pandemic for non-payment will be reinstated effective September 30, 2020. July/August bills have been mailed and are due by September 30, 2020 without penalty. After that, a \$30 fee will be assessed on accounts with balances past due unless a payment agreement has been completed.

The City is encouraging customers who are struggling financially due to the COVID-19 pandemic to contact Community Services Consortium, Newport Office, (541) 265-3293 for utility assistance eligibility. Should you not be able to bring your account current contact the Utility Department, [billing@cityofdepoebay.org](mailto:billing@cityofdepoebay.org) or (541) 765-2361 for a deferred payment agreement.

Below this notice is a section titled "Lincoln County Pre-Disaster Mitigation Planning" with the following text:

Lincoln County seeks additional public input on update to Natural Disaster Mitigation Plan. Click [here for media release](#)

For more information from Lincoln County: <https://www.co.lincoln.or.us/planning/page/community-input-needed-natural-hazards-mitigation-plan-renewal>

Draft addendum for Depoe Bay: [https://www.co.lincoln.or.us/sites/default/files/fileattachments/planning\\_amp\\_development/page/6102/depoe\\_bay\\_addendum\\_review\\_draft.pdf](https://www.co.lincoln.or.us/sites/default/files/fileattachments/planning_amp_development/page/6102/depoe_bay_addendum_review_draft.pdf)

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

Mitigation Action: Depoe Bay # (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# City of Lincoln City Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: City of Lincoln City

Effective:

December 29, 2020 through December 28, 2025



Prepared for:  
City of Lincoln City

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



FEMA

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
Grant: PDMC-PL-10-OR-2017-002  
Disaster Award Number: OR-2018-001

Additional Support Provided by:



DLCD

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FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

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**RESOLUTION NO. 2021-05**

**A RESOLUTION OF THE CITY OF LINCOLN CITY  
ADOPTING THE LINCOLN COUNTY MULTI-JURISDICTIONAL  
NATURAL HAZARDS MITIGATION PLAN, INCLUDING SPECIFICALLY THE  
CITY OF LINCOLN CITY ADDENDUM TO THE PLAN**

**RECITALS**

**WHEREAS**, the City of Lincoln City recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre-and post-disaster mitigation grant programs; and

**WHEREAS**, the City of Lincoln City has fully participated in the FEMA prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the City of Lincoln City has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Lincoln City to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs, including those specific to Lincoln City, have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *City of Lincoln City addendum* to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

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**WHEREAS**, the NHMP is comprised of comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

**WHEREAS**, City of Lincoln City adopts the NHMP, including specifically the Lincoln City Addendum, and directs the City Manager or his designee to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP

**NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LINCOLN CITY, AS FOLLOWS:**

**SECTION 1. RECITALS.** The above recitals are true and correct and are incorporated herein by this reference.

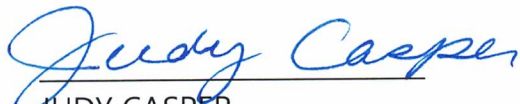
**SECTION 2. ADOPTION.** The City of Lincoln City hereby adopts the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan, including specifically the Lincoln City Addendum to the Plan, as an official plan. A copy of the City of Lincoln City Addendum is attached hereto as "Exhibit A" and incorporated herein by this reference. A copy of the full Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan shall be maintained in the Office of the City Emergency Manager.

**SECTION 3. SUBMITTAL.** The City of Lincoln City will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan.

**SECTION 4. EFFECTIVE DATE.** This resolution is effective as of the date of its adoption and signature by the Mayor.

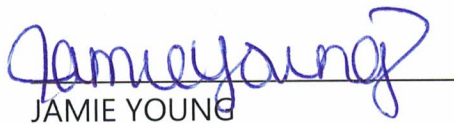
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PASSED AND ADOPTED by the City Council of the City of Lincoln City this 25<sup>th</sup> day of January, 2021.



JUDY CASPER,  
COUNCIL PRESIDENT

ATTEST:



JAMIE YOUNG  
CITY RECORDER

APPROVED AS TO FORM



RICHARD APPICELLO  
CITY ATTORNEY

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## Purpose

This is the 2020 update of the City of Lincoln City addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP). The City of Lincoln City's original addendum to Lincoln County's NHMP was completed and approved by FEMA in 2009 (updated in 2015). This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation, and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Lincoln City's addendum are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Lincoln City adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **January 25, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the City's addendum on **March 1, 2021**. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**. Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The City concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor

eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## **Process and Participation**

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Department of Land Conservation and Development, Oregon Office of Emergency Management (OEM), Lincoln County, and Lincoln City to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal-Year 2017 (FY17) Pre-Disaster Mitigation (PDM) Competitive Grant Program OR-2018-001 (PDMC-PL-10-OR-2017-02). Members of the Lincoln City NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).



The Lincoln County NHMP, and Lincoln City addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Lincoln City NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Lincoln City Emergency Preparedness Coordinator serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Lincoln County NHMP in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Planning Director and Emergency Manager).

Representatives from the City of Lincoln City steering committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the city's addendum, with focus on the plan's risk assessment and mitigation strategy (action items).

The current version of the addendum reflects changes decided upon at the designated meetings and through subsequent work and communication with OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include revisions to the city's Risk Assessment and Hazard Identification sections, Action Items, and Community Profile.

The Lincoln City Steering Committee was comprised of the following representatives:

- Convener, Kenneth Murphey, Emergency Preparedness Coordinator
- Lindsey Sehmel, Planning and Community Development Director
- Lila Bradley, Public Works Director
- Alison Robertson, Urban Renewal Director

### Public Participation

Public participation was achieved by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment via a survey administered by IPRE (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The City Council will be responsible for adopting the Lincoln City addendum to the Lincoln County NHMP. This addendum designates a steering committee and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Lincoln City addendum on an annual schedule; the county is meeting on a quarterly basis and will provide opportunities for the jurisdictions (cities and special districts) to report on NHMP implementation and maintenance during their meetings. The city's Emergency Preparedness Coordinator will serve as the convener and will be responsible for assembling the steering committee. The steering committee will be responsible for identifying new risk assessment data, reviewing status of mitigation actions, identifying new actions, and

seeking funding to implement the city's mitigation strategy (actions). The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and priority actions in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Where possible, Lincoln City will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Lincoln City's acknowledged comprehensive plan is the City of Lincoln City Comprehensive Plan. The City implements the plan through the Community Development Code.

## **Existing Plans and Policies**

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from residents, businesses and policy makers.

Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

Lincoln City's Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the addendum helps identify what resources already exist that can be used to implement the action items identified in Lincoln City's Addendum. Implementing the city's mitigation actions through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the city's resources.

The following are Lincoln City's existing plans and policies that relate to natural hazards:

- **Comprehensive Plan, 1998, last amended 2012:** A document stating the general, long-range policies that will govern a local community's future development. Ordinance No. 2012-08 updated the city's natural hazard Goal 7 element of the comprehensive plan to include policies for natural hazards, beaches and dunes (coastal erosion).

*Relation to Natural Hazard Mitigation:* Contains city-specific information regarding natural hazards within the city's jurisdictional boundaries; including the comprehensive plan natural hazards map.

- **Municipal Code:** Establishes land use zones to regulate the location of building structure and the use of land within the City of Lincoln City.

*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the placement and construction of the buildings. Issues such as floodplain development, fire resistant materials, etc. Chapter 17.47, Natural Hazards, Beaches and Dunes, includes identification of areas subject to coastal erosion and includes standards for development in identified areas.

- **Lincoln City Transportation Master Plan, 2015:** Addresses the county's anticipated transportation needs over a period of 20 years.

*Relation to Natural Hazard Mitigation:* The Transportation Plan may be a resource to identify which roads and transportation systems are most vulnerable to natural disasters. Likewise, the Transportation Plan can be utilized to implement mitigation measures aimed at protecting "transportation disadvantaged" populations in emergency situations. When updated, the Transportation Plan can also include mitigation elements in its implementation considerations.

- **Lincoln County Community Wildfire Protection Plan, 2018:** Assists Lincoln City clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.

*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

- **Lincoln City Storm Water Management Plan, 2009:** The primary purpose of the storm water inventory is to improve and update the City's existing storm water infrastructure and conveyance maps. The intent is to better understand drainage paths and conveyance capacities in a complex and aging storm water network, so that when and if problems arise, they can be remedied as efficiently and effectively as possible.

*Relation to Natural Hazard Mitigation:* Storm Water management looks at the water cycle, effects of development allowing the City to conduct mitigation activities for source control, treatment, flow control and low impact approaches for the community management and mitigation for the City.

## Government Structure

The City Council is the policy making body for Lincoln City. As the elected legislative body in Lincoln City, the City Council has overall responsibility for the scope, direction and financing of city services. Council members serve four-year terms. Additional departments within the city include the following:

**City Manager's Office:** The city manager is appointed by City Council and serves as the administrative head of the city government. As chief executive officer, the city manager provides the leadership and direction for the operation and management of all city departments.

**City Recorder:** The city recorder assures the timely presentation of formal communications from the public, other agencies and city staff to the City Council. The recorder prepares City Council meeting agendas in coordination with the city manager; maintains official city records which reflect the actions of the governing body; maintains a depository of contracts, agreements and official Council actions and ensures the timely availability of these records to the Council, public, other agencies and staff.

**Planning and Community Development Department:** The Planning and Community Development Department provides service and information to the general public regarding all phases of community development. Planning staff implements ordinance and plan requirements through the Site Review Process, Land Use Action Process and Special Projects. Specifically, the Planning and Community Development Department reviews potential development opportunities to ensure compliance with zoning, setback, parking, landscaping, access and other city requirements.

In addition to oversight of the development process, the Planning and Community Development Department advises the City Council and Planning Commission on all land use and special project matters.

**Public Works Department:** The Lincoln City Public Works Department provides responsive community services related to planning, design, construction, operation, maintenance and management of public infrastructure, including streets, sewer, water treatment, wastewater treatment, public buildings and other facilities. Services provided by the department contribute to the public health, safety, economic diversity, environmental quality and citizen convenience.

**Finance Department:** The Finance Department serves the community by managing utility billing, business licenses, collecting taxes and fees, dealing with city expenditures, preparing

the city's budget and managing investments. The goal of the Finance Department staff is to provide all services with an emphasis on timeliness, accuracy and courteous customer service.

**Police Department:** The mission of the Lincoln City Police Department is to maintain human rights while enforcing state and local laws, protecting persons, property and providing the highest quality professional service to all.

**Parks and Recreation Department:** The Parks and recreation Department oversees parks and recreation activities for the city. There are several activities/areas the Parks and Recreation department oversee, such as: the swimming pool, rock climbing wall, youth activities, senior activities, adult fitness, after school program and camps.

**Public Library:** The Lincoln City Public Library collects, preserves, and administers organized collections of books and related materials. The library can also be used for public meetings and other organized activities for the community.

**Urban Renewal Agency:** Established in 1988, the Lincoln City Urban Renewal Agency mission is to eliminate blight and depreciating property values in areas within the Agency's jurisdiction, and in the process, attract job producing private investments that will improve property values, improve the Area's visual quality, and establish a positive linkage between the Area and the Pacific Ocean -- all in a manner which will be compatible with Lincoln City's natural and built setting.

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review. Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the City's website: <https://www.lincolncity.org/>

In addition, natural hazards information dissemination is conducted throughout the year when opportunities present themselves via the city offices and website.

## NHMP Maintenance

The Lincoln County Multijurisdictional Natural Hazard Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?

- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's action items were first developed through a two-stage process during the 2009 NHMP development and revised in 2015. In stage one, OPDR facilitated a work session with the steering committee to discuss the city's risk and to identify potential issues. In the second stage, OPDR, working with the local steering committee, developed potential actions based on the hazards and the issues identified by the steering committee. During the 2019-2020 update process OPDR re-evaluated the Action Items with the county and local steering committees and updated actions, noting what accomplishments had been made and if the actions were still relevant; any new action items were identified at this time. For additional information see the discussion near the end of this document.

The City's actions are listed in Table LA-1. For more detailed information on each action, see the action forms within Attachment A of this addendum.

In addition, there are 16 County Action Items that include the city as an "Affected Jurisdiction" (Table LA-14). For more detailed information on the county actions that involve city participation, see Volume I, Section 3 and the action item forms within Volume III, Appendix A.

### Priority Action Items

Table LA-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in bold text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action.

**Table LA-I City of Lincoln City Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing
Lincoln City #1	Acquire a safe haven shelter (and develop with supplies/ facilities) for Cutler City	Emergency Preparedness Coordinator	M	Short
Lincoln City #2	Seek funding, and develop, water storage capabilities and enhance resiliency of water storage, treatment and distribution systems.	Public Works	H	Long
Lincoln City #3	Identify over-water transportation alternatives in the event that bridges collapse in an earthquake and/ or tsunami.	Public Works	M	Long
Lincoln City #4	Continue to educate citizens about earthquake and tsunami preparedness.	Emergency Preparedness Coordinator	L	Ongoing
Lincoln City #5	Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	Public Works	H	Long
Lincoln City #6	Continue compliance with the National Flood Insurance Program.	Planning and Community Development	L	Ongoing
Lincoln City #7	Explore steps needed to qualify Lincoln City for participation in the National Flood Insurance Program's Community Rating System (CRS)	Planning and Community Development	L	Short
Lincoln City #8	Work with the owners of repetitive flood loss buildings in the city to identify cost effective mitigation strategies including consideration of relocation, elevation, or buy-out.	Planning and Community Development	H	Long
Lincoln City #9	Implement actions identified in the Lincoln City Storm Water Management Plan.	Public Works	M to H	Ongoing
Lincoln City #10	Replace undersized culverts	Public Works	M to H	Ongoing
Lincoln City #11	Research steep slope/ landslide ordinances; consider drafting a steep slope/ landslide development ordinance for Lincoln City	Planning and Community Development	L	Short
Lincoln City #12	Develop disaster plans and provide caches (food and emergency supplies) in strategic locations throughout the city to support residents and visitors.	Emergency Preparedness Coordinator	L to M	Ongoing
Lincoln City #13	Integrate the NHMP into comprehensive plan.	Planning and Community Development	L	Medium

Source: City of Lincoln City NHMP Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

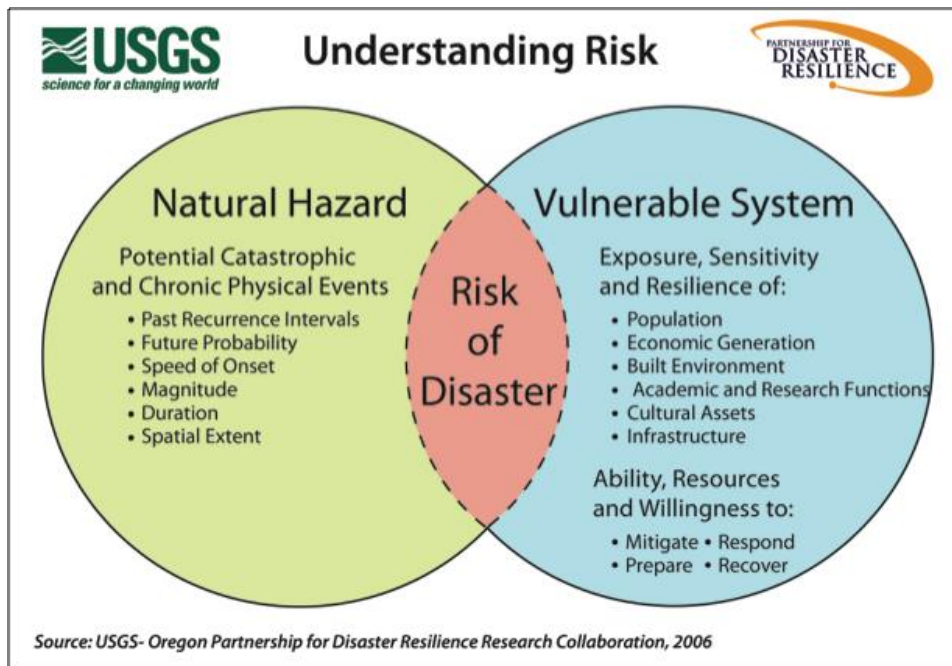
## Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure LA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure LA-1 Understanding Risk**





# Hazard Analysis

The Lincoln City NHMP steering committee reviewed and revised the plan’s Hazard Analysis and Risk Assessment section. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in probability, vulnerability, and risk from natural hazards unique to the City of Lincoln City, which are discussed throughout this addendum.

Table LA-2 shows the hazard analysis matrix for Lincoln City listing each hazard in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

Two catastrophic hazard (Cascadia Subduction Zone earthquake and tsunami) and three chronic hazards (windstorm, winter storm (snow/ice), and landslide) rank as the top hazard threats to the City (Top Tier). Riverine flood, wildfire, drought, coastal erosion, and coastal flood comprise the next highest ranked hazards (Middle Tier). Distant tsunami, tornado, crustal earthquake, and volcanic event comprise the lowest ranked hazards in the City (Bottom Tier).

**Table LA-2 Hazard Analysis Matrix – City of Lincoln City**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Winter Storm (Snow/Ice)	18	35	90	70	213	#2	
Landslide	20	40	80	70	210	#3	
Earthquake (Cascadia)	10	50	100	49	209	#4	
Tsunami (Local)	2	50	100	49	201	#5	
Flood (Riverine)	20	30	60	63	173	#6	Middle Tier
Wildfire	10	30	80	49	169	#7	
Drought	20	40	50	49	159	#8	
Coastal Erosion	20	20	40	70	150	#9	
Flood (Coastal)	20	20	40	56	136	#10	
Tsunami (Distant)	10	15	60	35	120	#11	Bottom Tier
Tornado	8	10	30	56	104	#12	
Earthquake (Crustal)	10	20	40	21	91	#13	
Volcanic Events	2	5	40	7	54	#14	

Source: City of Lincoln City NHMP Steering Committee (2020)

Table LA-3 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Lincoln County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings).

**Table LA-3 Probability and Vulnerability Comparison**

Hazard	Lincoln City		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	High	Moderate	High	Low
Drought	Moderate	High	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	High	Moderate	High	Moderate
Flood (Riverine)	High	Moderate	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	High	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	Moderate	Moderate	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	Moderate	High	Moderate

Source: City of Lincoln City NHMP Steering Committee and Lincoln County NHMP Steering Committee (2020)

## Community Characteristics

Table LA-4, Appendix C (Volume III), and the following section provide information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2012 and 2019 the City grew by 830 people (10%).<sup>1</sup> According to the State’s official coordinated population forecast, between 2019 and 2040 the City’s population is forecast to grow by 20% to 10,565.<sup>2</sup> Median household income increased by 19% between 2012 and 2017.<sup>3</sup> The City has an educated population with 85% of residents 25 years, and older holding a high school degree, 24% have a bachelor’s degree or higher. The Lincoln County School District has a 76% graduation rate as of 2019. Lincoln City includes industrial and commercial development but is zoned primarily residential.

Development in Lincoln City spreads mostly north to south along US-Highway 101 (see Figure LA-2). Dense commercial areas in Lincoln City exist along US-Highway 101. Residential development is located west of downtown and US-highway 101 along the Pacific Ocean as well as east near Devils Lake. The city’s Comprehensive Plan identifies land use needs within the city and the Urban Growth Boundary. The city’s Comprehensive Plan identifies land use needs within the city and its urban growth boundary. Figure LA-2 shows the City of Lincoln City’s zoning map. New development has complied with the standards of the [Oregon Building Code](#), and the city’s development code including their floodplain ordinance.

<sup>1</sup> Portland State University, Population Research Center, "Annual Population Estimates", 2019.

<sup>2</sup> Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

<sup>3</sup> Social Explorer, Table T57, U.S. Census Bureau, 2013-2017 and 2008-2012 American Community Survey Estimates.

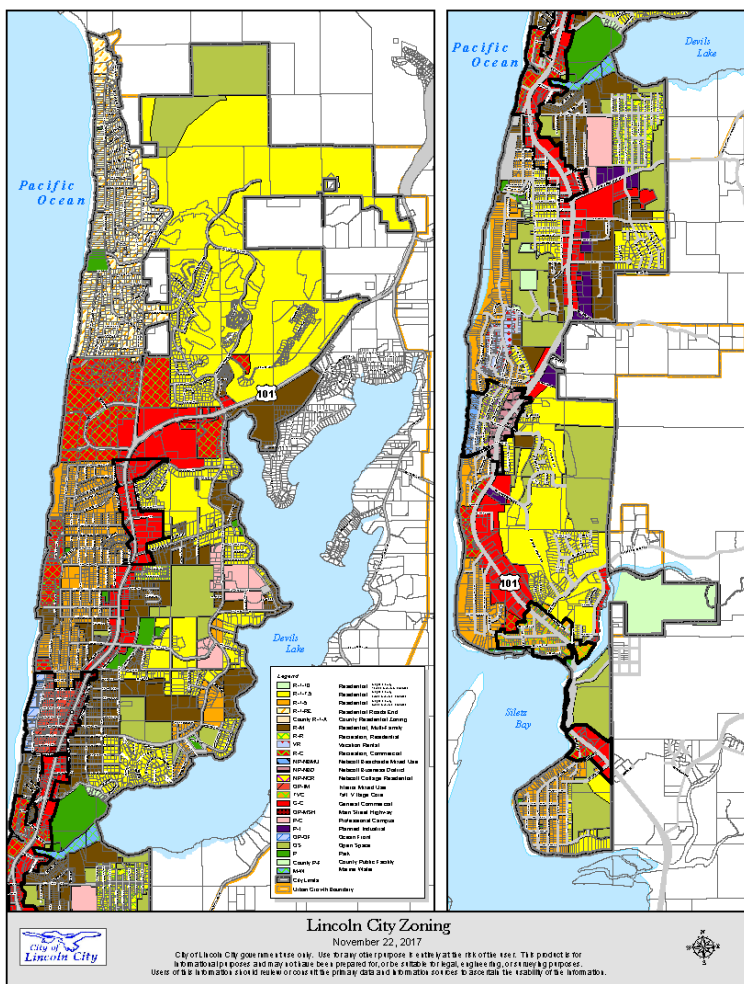
# Economy

Lincoln City’s commercial areas developed along primary routes and residential development followed nearby (see Figure LA-2).

Lincoln City is the second largest incorporated community in Lincoln County. Most workers residing in the city (57%, 2,435 people) travel outside of the city for work primarily to Portland metro area, Newport, Salem, and Lincoln Beach.<sup>4</sup> A significant population of people travel to the city for work, (64% of the workforce, 3,236 people) primarily from Rose Lodge, Lincoln Beach, and Newport.

Just over 52% of the resident population 16 and over is in the labor force (3,693 people) and are employed in a variety of occupations including food preparation and serving (16%), sales (16%), management, business, and financial operations (12%), office and administrative support (12%), and professional and related (12%) occupations.<sup>5</sup>

**Figure LA-2 Zoning Map**



Source: City of Lincoln City

<sup>4</sup> U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2017). Longitudinal-Employer Household Dynamics Program, accessed on April 25, 2020 at <https://onthemap.ces.census.gov>.

<sup>5</sup> Social Explorer, Tables A17008 & A17002, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

**Table LA-4 Community Characteristics**

Population Characteristics		
<b>2012 Population</b>	7,965	
<b>2019 Population</b>	8,795	
<b>2040 Forecasted Population</b>	10,565	
Race (non-hispanic or latino) and Ethnicity (Hispanic)		
White	78%	
Black/ African American	1%	
American Indian and Alaska Native	3%	
Asian	3%	
Native Hawaiian and Other Pacific Islander	0%	
Some Other Race	0%	
Two or More Races	3%	
Hispanic or Latino (of any race)	13%	
<b>Limited or No English Spoken</b>	367	5%
Vulnerable Age Groups		
Less than 15 Years	1,354	16%
65 Years and Over	2,153	25%
Age Dependency Ratio		3.38
Disability Status		
Total Population	1,784	21%
Children (Under 18)	74	5%
Working Age (18 to 64)	902	19%
Seniors (65 and older)	808	39%
Income Characteristics		
Households by Income Category		
Less than \$15,000	639	17%
\$15,000-\$29,999	852	22%
\$30,000-\$44,999	651	17%
\$45,000-\$59,999	540	14%
\$60,000-\$74,999	428	11%
\$75,000-\$99,999	347	9%
\$100,000-\$199,999	304	8%
\$200,000 or more	24	1%
<b>Median Household Income</b>		\$37,898
Poverty Rates		
Total Population	1,963	23%
Children (Under 18)	439	30%
Working Age (18 to 64)	1,216	25%
Seniors (65 and older)	308	15%
Housing Cost Burden (Cost > 30% of household income)		
Owners with Mortgage	408	23%
Renters	999	50%

Source: U.S. Census Bureau, 2013-2017 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2019. Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

Housing Characteristics		
Housing Units		
Single-Family	4,471	68%
Multi-Family	1,625	25%
Mobile Homes	439	7%
Year Structure Built		
Pre-1970	2,612	40%
1970-1989	1,763	27%
1990-2009	2,028	31%
2010 or later	132	15%
Housing Tenure and Vacancy		
Owner-occupied	1,785	27%
Renter-occupied	2,000	31%
Seasonal	2,296	35%
Vacant	454	7%

Located on the Coast of Oregon, Lincoln City resides in the northwestern border of Lincoln County. Lincoln City lies at an elevation of 11 feet above sea level. Devils Lake (680-acres) borders the northeast portion of the city. The Siletz Bay and Siletz River are south of the city, and the Salmon River is to the north. Lincoln City is home to one of the world's shortest rivers, the D River, which connects Devils Lake to the Pacific Ocean.

The climate in Lincoln City is moderate. Average monthly temperatures range from lows of 36-39° F (December through March) to highs of 70-72° F (July through September) degrees. The driest months are July and August (average about 1.4-1.5 inches of precipitation per month) the wettest months are November through January (average 10-15 inches of precipitation per month). Lincoln City has an average annual precipitation of approximately 95.4 inches (69%, 65.5 inches fall November through March).

# Asset Identification

The following assets identified by the City of Lincoln City were first gathered from the Asset Identification meetings held with community members in 2007. These assets were confirmed and updated by the City steering committee during the 2019-2020 update process.

## Cultural and Historic Resources

The first recorded tourists to Lincoln City came in August of 1837, establishing the beginning of the tourist industry that still exists today. In the 1930s the towns of Cutler City, Taft, Nelscott, Delake, Wecoma, and Oceanlake joined together to become Lincoln City, which helped attract tourists and increase business. Annual events like Taft's Redhead Roundup and Oceanlake's Regatta draw visitors from all over the state.<sup>6</sup>

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The National Register of Historic Places and the State Historic Preservation Office lists historic sites and properties within the city:<sup>7</sup>

- The Dorchester House, 2701 NW Highway 101 (1929) – Listed on the National Register of Historic Places
- Lincoln Statue, Kirtsis Park (c. 1965)
- Neel's Autel, 2626 Highway 101, (1948)
- Nelscott Strip Commercial Historic District, Highway 101 (1929)
- Surf tides Recreation Building, 2945 NW Jetty Avenue (1953)
- Jason Lee Campsite, Logan Road (1837)
- House, 340 S Drift Creek Road (c. 1928)
- House, 1327 NW 13<sup>th</sup> Street (c. 1932)
- House, 732 SW 28<sup>th</sup> Street (c. 1944)
- House, 1903 NW 37<sup>th</sup> Street (c. 1948)
- House, 2732 SW Coast (c. 1940)
- House, 6432 SW Inlet (c. 1930)
- House, 244 SE Port Avenue (c. 1944)

Lincoln City has many festivals throughout the year, including the Summer Kite Festival, Iris Pride Festival, Art on the Edge, Siletz Bay Music Festival, Sand Castle contest, Glass Float Gala and the Chowder Cook-off. Other local attractions include clamming, crabbing, whale-watching, coastal hiking trails, beachcombing, kite flying, and exploring tide pools. Recreational amenities include Devils Lake, Otter Crest viewpoint, factory stores, Chinook Winds Casino, The Connie Hansen Garden, Salmon River Estuary, Siletz Bay (Natural Scenic Wildlife Reserve), Chinook Winds Golf Course, city parks, beach access points, North Lincoln County Museum, Lincoln City Glass Center, Mor Art, and the Alder House glassblower.

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<sup>6</sup> Lincoln City, on the Central Oregon Coast. "Things to Do – Heritage & History." <http://www.oregoncoast.org/pages/things-pages/heritage.php>

<sup>7</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 17, 2020.

## Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to act in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and wastewater treatment facilities.

Lincoln City has the following critical facilities (**bold** indicates facility was included in the Risk Report [DOGAMI, O-20-11](#)):

- Three fire stations:
  - **North Lincoln Fire Station 1400 (Bob Everest):** 2525 NW Hwy 101
  - **North Lincoln Fire Station 1500 (Delake):** 1500 SE 9<sup>th</sup> Street
  - **North Lincoln Fire Station 1600 (St Clair):** 4520 SE Hwy 101
- Three hospitals and clinics
  - **Samaritan North Lincoln Hospital:** 3043 NE 28<sup>th</sup> St
  - **Samaritan Coastal Clinic:** 825 NW US 101
  - **Samaritan Women's Health Center:** 3100 NE 28<sup>th</sup> St
  - Adventist Coastal Clinic: 1105 SE Jetty Ave
- Four Schools
  - **Oceanlake Elementary School:** 2420 NE 22<sup>nd</sup> Street
  - **Taft Elementary School:** 4040 High School Drive
  - **Taft 7-12 School:** 3780 SE Spyglass Ridge Road
  - **Career Tech Charter High School:** 801 SW Hwy 101
- **City Hall:** 801 SW Hwy 101
- **Police Department:** 1503 SE East Devils Lake Rd
- Water treatment plant: (317 S Anderson Creek Rd)
  - See [Utility Lifelines](#) for additional system details
- Wastewater plant (and 28 lift stations): 5000 SE Port Ave
  - See [Utility Lifelines](#) for additional system details

## Transportation

Mobility plays an important role in Lincoln City, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within the City. Lincoln City is also served by Lincoln County Transit Routes 4, 60x, 492, and 495 with service running seven days a week with stops in Lincoln City. Caravan Airport Transportation also provides service from the City to Portland International Airport.

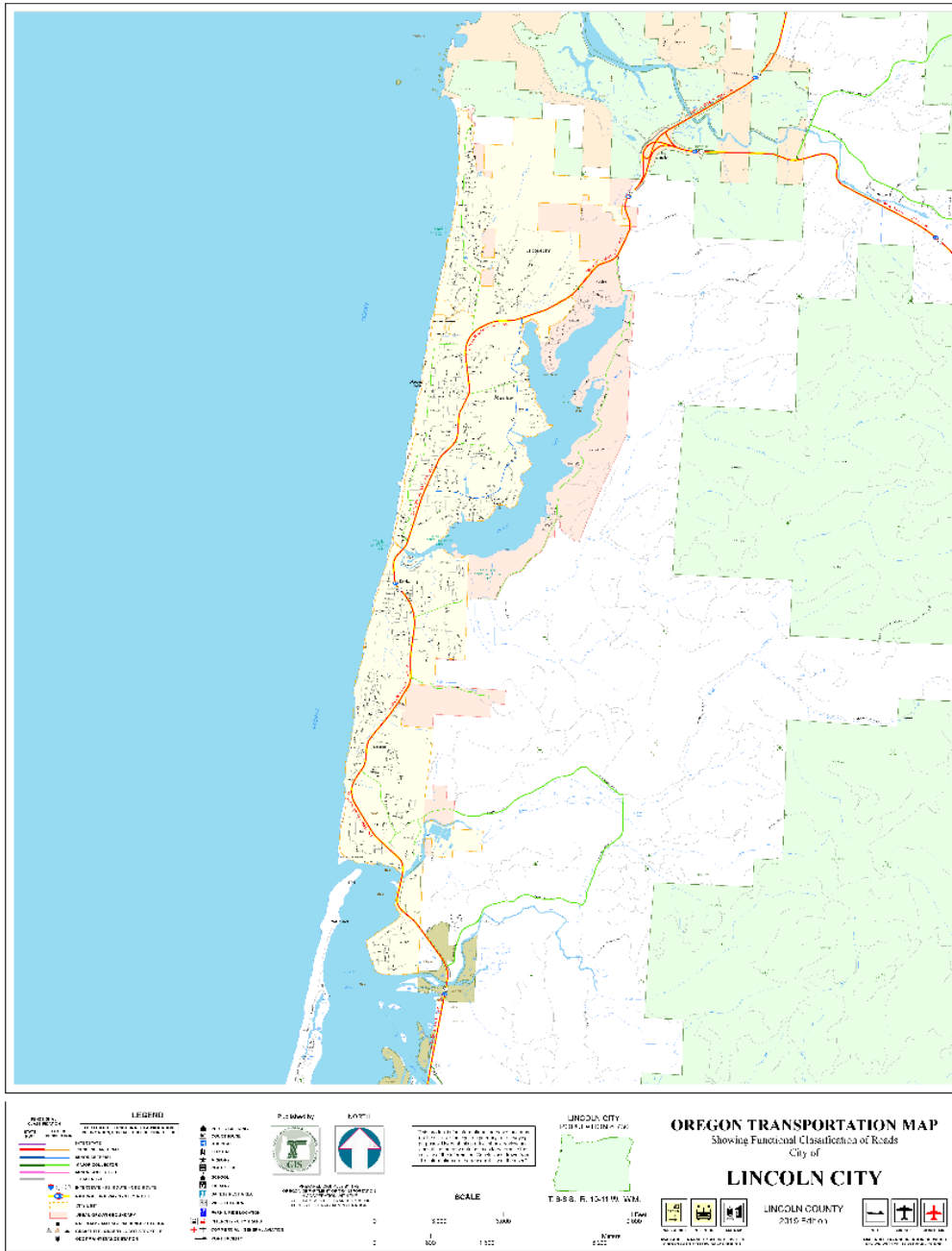
### Roads/Seismic lifelines

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a

secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>8</sup>

Highway 101 (Tier I) is the major north-south transportation route through the City (see Figure LA-3). Highway 18 (Tier I, north of Lincoln City), and Highway 20 (Tier III, Newport) are the major east-west transportation routes connecting the coast to the Willamette Valley.

**Figure LA-3 Lincoln City Functional Classification of Roads**



Source: Oregon Department of Transportation - [Link](#)

<sup>8</sup> Oregon Department of Transportation. Oregon Seismic Lifeline Evaluation, Vulnerability Synthesis, and Identification, *Oregon Seismic Lifeline Routes*, May 15 2012.

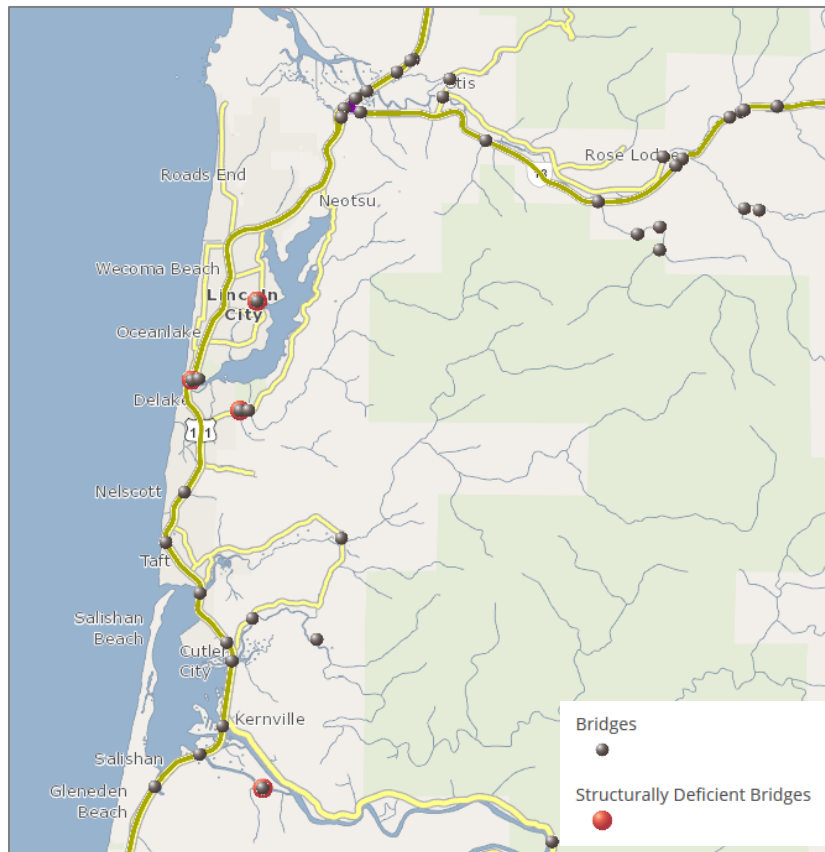
System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

### Bridges

Because of earthquake risk, the seismic vulnerability of the city’s bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries are unable to transport goods. Bridges within the city that are critical or essential include (see Figure LA-4):

- Devils Lake Creek, W Devils Lake Rd (1968), (Bridge ID 41C07) – Structurally Deficient
- Devils Lake Outlet, US 101 (D River, 1949), (Bridge ID 00822A) – Structurally Deficient
- E. Devils Lake Rd, Creek (1968), (Bridge ID 12003) – Structurally Deficient
- Rock Creek, E Devils Lake Rd (1954), (Bridge ID 12004)
- Schooner Creek, US 101 (1945), (Bridge ID 00924A)

**Figure LA-4 Oregon Bridges and Structurally Deficient Bridges**



Source: Oregon Department of Transportation, ODOT TransGIS, accessed July 29, 2020

More information on Seismic Design of bridges is on the ODOT website:

<https://www.oregon.gov/odot/Bridge/Pages/Seismic.aspx>



## Railroads

There are no railroads in Lincoln City.

## Airports

There are no public airports in Lincoln City. The Siletz Bay State Airport is the nearest airport (a few miles south of the City). The city has no commercial service airports. The nearest commercial airports are in Eugene and Portland.

## Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Generally, the network of electricity transmission lines running throughout the city is operated by Pacific Power. The Williams Gas Pipeline provides natural gas that is delivered to customers in the city by Northwest Natural Gas. These lines may be vulnerable as infrequent natural hazards, like earthquakes, could disrupt service to natural gas consumers across the region.

The city water, wastewater, and storm water (culvert) systems include the following:

### Water Infrastructure

- Water Treatment Plant: 317 S. Anderson Creek Rd
- Reservoirs (3): SE 19<sup>th</sup> St, NE 20<sup>th</sup> St and Surf St, and Roads End
- Pump stations (6):
  - 4354 SE Jetty Ave
  - 2097 NE West Devils Lake Rd.
  - 2130 NE 36<sup>th</sup> Dr.
  - 5390 NE Port Ln
  - 1501 SE Oar Ave
  - 2440 SW Coast Ave

### Wastewater Infrastructure

- Wastewater Treatment Plant: 5000 SE Port Ave
  - 28 lift stations to transport sewage

## **Community Organizations and Programs**

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which

could be natural hazard preparedness and mitigation. The countywide community organizations that are active within the city and county and may be potential partners for implementing mitigation actions can be found in Appendix C: Community Profile.

## **Lincoln County School District**

The Lincoln County School District has three schools in Lincoln City including Oceanlake Elementary, Taft Elementary, and Taft 7-12. In addition, Career Tech High Charter School is in Lincoln City. For more information on School District assets see their addendum in Volume II.

## **Existing Mitigation Activities**

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions better understand risk and can assist in documenting successes. The following efforts have occurred or are ongoing within Lincoln City:

- The city maintains an emergency preparedness website that's devoted to earthquakes, tsunamis, storms/flooding, and pandemic flu. FEMA's "Are you Prepared?" document is posted for reference, as well as a link to the Community Emergency Response Team's (CERT) website. The Earthquake and Tsunami hazards have their own web pages for additional information.
  - Tsunami webpage: includes information about tsunamis' causes and characteristics, recommendations for how to prepare and survive a tsunami, and information about how to plan an evacuation route. Additionally, there is tsunami information for kids, post-tsunami information, and a listing of preparedness events in Lincoln City. Tsunami evacuation maps are posted as well.
  - Earthquake webpage: includes information about the latest earthquakes in Washington, Oregon, and Northern California. Additionally, the city provides earthquake preparedness recommendations, as well as some tips about what to do during and after an earthquake. Links to the American Red Cross and US Geological Survey (i.e., for more information about vulnerabilities and preparedness strategies) are posted as well.
- A Community Emergency Response Team (CERT) is active in Lincoln City. The CERT Program educates people about disaster preparedness for hazards that may impact their area, and trains them in basic disaster response skills such as fire safety, light search and rescue, team organization, and disaster medical operations. Lincoln City's CERT group has begun a 'Map Your Neighborhood' effort, which seeks to help neighborhoods prepare for disasters.
- The city enforces a setback requirement for all developments located along the coast. The purpose of the setback is to reduce property damages related to coastal erosion, windstorms, and flooding. The setback requirement also serves to meet the city's natural hazard goal, as defined within the Lincoln City Comprehensive Plan: "The city shall control development in hazardous areas to protect life and property from natural disasters and hazards."

- The city’s Comprehensive Plan addresses natural hazards. Specific hazardous areas have been identified by RNKR Associates in their work Environmental Hazards, Coastal Lincoln County Oregon, 1979. The city has defined ‘hazardous areas’ on the RNKR map and will allow development in these areas if adequate protective measures can be employed to prevent or minimize damage. This portion of the Comprehensive Plan also lists policies related to development in hazardous areas.
- Lincoln City issues practice tsunami warnings every Wednesday morning. Additionally, the city distributes evacuation maps, and pamphlets that address preparedness strategies. A Tsunami Preparedness Coordinator conducted a public awareness survey, as well as an evacuation drill in the Nelscott and Delake areas; she initiated the “Neighbor Helping Neighbor” tsunami buddy system, and created door signs for hotels to show evacuation information (among several other education and outreach projects for the city).
- The City built a new Police Station in 2020 and worked with County School District to move school bus facilities out of the inundation zone.
- The city and county utilize a reverse 911 system for use during natural hazard events.
- State legislation:
  - SB 378 requires schools in potential inundation zones to teach students in K-8 grades about tsunamis and evacuation
  - SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, limits construction of new essential facilities and special occupancy structures in tsunami flooding zones.

## Hazard Profiles

The following sections briefly describe relevant information for each profiled hazard. More information on Lincoln County hazards can be found in Volume I, Section 2 *Risk Assessment* and in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the City of Lincoln City. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The City hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

### Coastal Erosion

The steering committee determined that the city's probability for coastal erosion is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to coastal erosion is **moderate**, meaning it is expected that between 1% and 10% of the City's population or property could be affected by a major coastal erosion event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 describes the characteristics of coastal erosion hazards, as well as the history, location, extent, and probability of a potential event. Coastal erosion is a natural process that continually affects coastal areas; in Lincoln City and elsewhere along the Pacific, coastal erosion becomes a hazard when lives and properties are at risk of death, injury, or damage. Coastal erosion is typically a gradual process, which can be greatly accelerated in the event of a storm or climate factors that increase the potential for coastal erosion.

#### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the risk of coastal erosion is expected to increase due to sea level rise and changing wave dynamics.

### Vulnerability Assessment

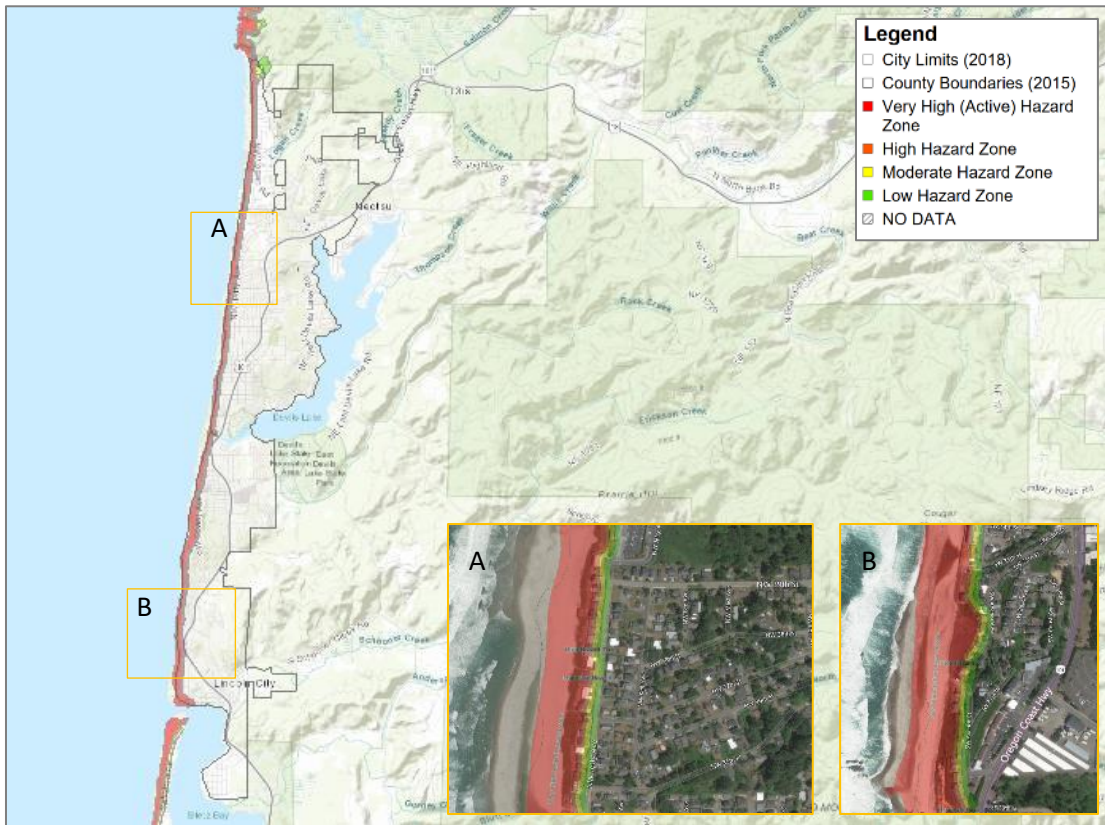
Private sea walls in Lincoln City require constant maintenance, and some property damage has occurred in areas within the city. Records of damages are not available at this time; however, events may have occurred in tandem with previous storms. Properties along Anchor Court, for example, have experienced partial and/or total damages due to storm-induced erosion. Over the last 15 years two houses have been removed and approximately six additional houses are affected in this area; as such, future damages here are likely. The county identified areas along Highway 101 that have sustained erosion-induced damages. Within Lincoln City, however, the Highway is safe.

To mitigate the effects of coastal erosion, the city requires new development to comply with setback restrictions. Permits, additionally, are required for the development of sea walls. Lincoln City believes that, due to their property setback requirements for new developments, they've reduced their vulnerability to this hazard.

Potential community-related impacts, including shoreline reduction, economic (tourism-related) impacts, and property/infrastructural damage, are adequately described within the Volume I, Section 2 of the NHMP. See Figure LA-5 for locations of the city’s coastal erosion hazard along coastal bluffs on the city’s western edge.

To address the risk for coastal erosion, Lincoln City enacted Ordinance 2012-08 (2012) amending the comprehensive plan to include standards for areas affected by coastal erosion.

**Figure LA-5 Coastal Erosion Hazard**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion. The Risk Report provides a distinct profile for Lincoln City.

The Risk Report provides an analysis of dune-backed beaches and bluff-backed shorelines to identify the general level of susceptibility due to storm-induced erosion, sea level rise, and subsidence due to CSZ earthquake event. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Lincoln City may be impacted by profiled coastal erosion scenario (Table LA-5).

Less than one percent of the City’s population (65 people) may be displaced by coastal erosion. These people are expected to have mobility or access issues and/or may have their

residences impacted by coastal erosion. Properties that are most vulnerable to the coastal erosion hazard are those that are developed in an area of steep dunes or cliffs. Just under three percent (184 buildings) of all buildings (residential, commercial, industrial) are exposed to the high coastal erosion hazard zone. The value of exposed buildings is \$60.4 million (about 6% of total building value). It is important to note that impact from coastal erosion may vary depending on areas that are impacted during an event.

**Table LA-5 Potentially Displaced Residents and Exposed Buildings, Coastal Erosion**

Community Overview: Lincoln City						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
7,930		6,687		11	1,086,802,000	
Exposure Analysis: Coastal Erosion High Hazard Scenario						
Potentially Displaced Residents		Exposed Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
65	0.8%	184	2.8%	0	60,436,000	5.6%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020). Table A-16. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>9</sup>

There are no critical facilities exposed to the profiled coastal erosion scenario.

## Drought

The steering committee determined that the city’s probability for drought is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to drought is **high**, meaning more than 10% of the city’s population or property could be affected by a major drought event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of drought hazards, as well as the history, location, extent, and probability of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared coastal communities from the effects of a drought.

Schooner Creek is the city’s only water source, and the city’s reservoirs store enough water for only one day of use. In the event that climate patterns change and drought becomes a probable hazard, Lincoln City would be extremely vulnerable to drought conditions. Furthermore, Schooner Creek is a direct-flow water source and contamination is a potential threat to the water supply.

Water from the city reservoirs is treated at the water treatment facility that can treat up to 6 million gallons per day (mgd). Following treatment water flows via 12 to 24-inch water transmission mains to three water storage reservoirs (combined 7.25 million gallons

<sup>9</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-17.

capacity) at SE 19<sup>th</sup>, NE 20<sup>th</sup>, and Roads End. Most of the system utilizes 6- and 8-inch diameter pipes. There are five (5) pump stations that boost pressure to higher elevations. The City has enough capacity to meet current and anticipated future demand.

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## Vulnerability Assessment

Due to insufficient data and resources, Lincoln City is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks apply to humans and resources. Industries important to the City of Lincoln City’s local economy such as fishing have historically been affected, and any future droughts would have tangible economic and potentially human impacts.

In addition to reduced water supplies, a drought will increase the chances of wildfire and significantly reduce tourism activities. If hotels, for example, are unable to accommodate guests, the city’s economy would greatly suffer. Currently, the city has a water curtailment plan that will go into effect in the event of a drought.

## Earthquake

The steering committee determined that the city’s probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a CSZ event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major CSZ earthquake event. The steering committee determined that the city’s probability for a crustal earthquake event is **low**, meaning one incident may occur within the next 100 years and that their vulnerability to a Crustal Earthquake event is **moderate**, meaning that between 1% and 10% of the city’s population or property could be affected by a major crustal earthquake event. *The city’s probability to crustal earthquake was decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of earthquake hazards, as well as the history, location, extent, and probability of a potential event. Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

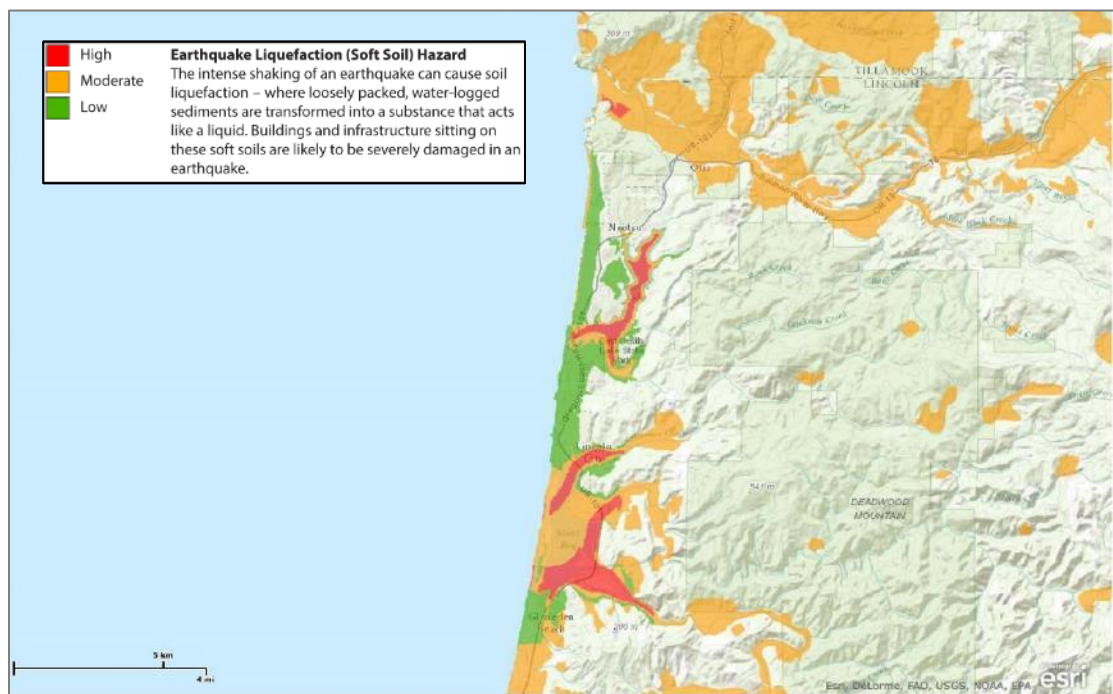
The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time

between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>10</sup>

The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides.

The figures below show earthquake hazards that affect the city, including the soft soil/liquefaction hazard (Figure LA-6), expected ground shaking for crustal events (Figure LA-7), and for the Cascadia Subduction Zone event (Figure LA-8). The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. The soft soils figure below shows that in general the soils in Lincoln City have low to moderate liquefaction potential; the areas of the population along the coastline are more susceptible to liquefaction than areas further in land and away from rivers.

**Figure LA-6 Earthquake Liquefaction (Soft Soil) Hazard**



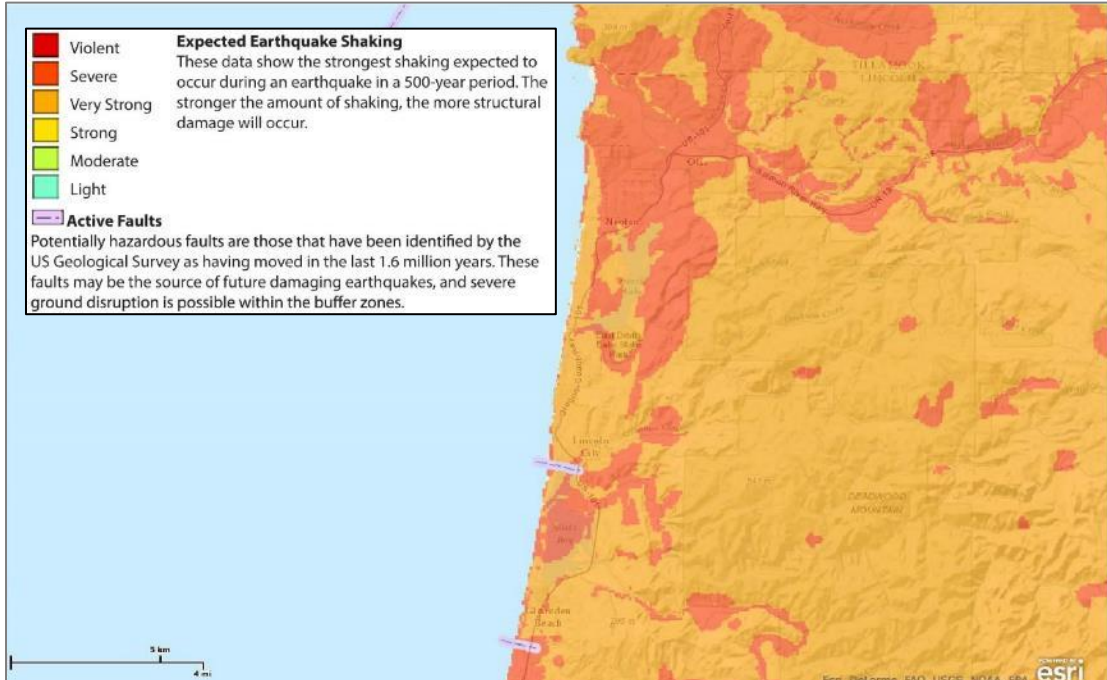
Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Shaking from the combined earthquake scenario is expected to be very strong to violent for much of Lincoln City as shown in Figure LA-7. The figure also shows one historically active fault southeast of the city.

<sup>10</sup> DLCD. *Oregon State Natural Hazard Mitigation Plan*. 2020 (Draft).



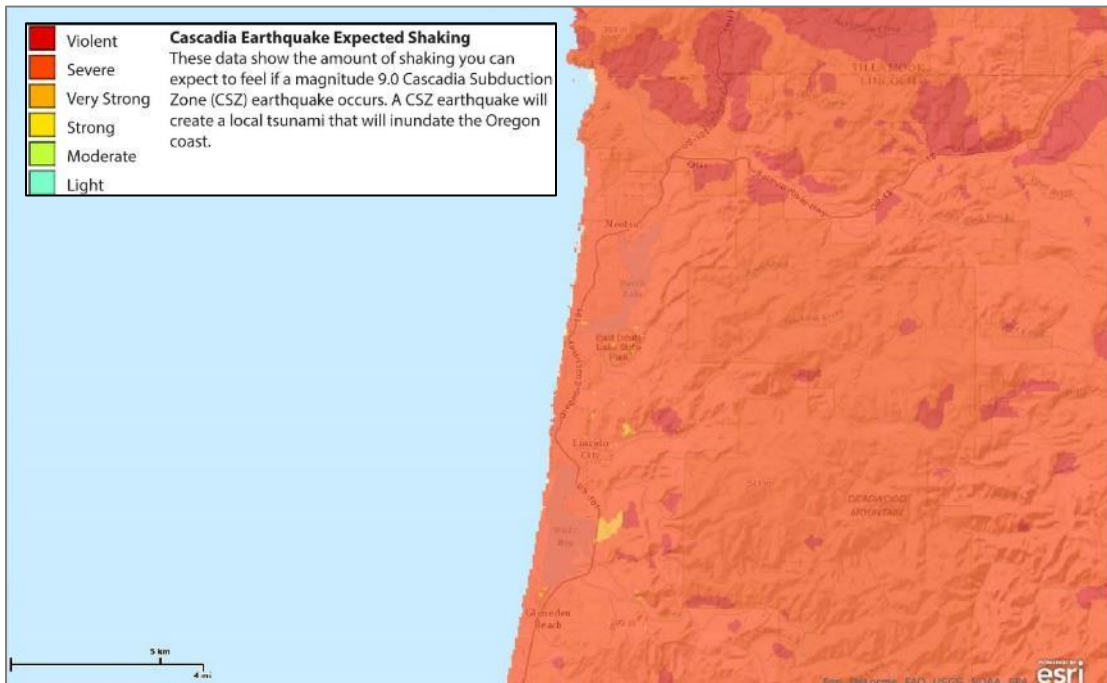
**Figure LA-7 Combined Earthquake Events Expected Shaking and Active Faults**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Figure LA-8 shows expected shaking with a Cascadia Earthquake. The figure shows that the entire city will receive severe to violent shaking.

**Figure LA-8 Cascadia Earthquake Expected Shaking**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

The city's concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described above are cause for significant effort toward mitigating the earthquake hazard. The city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, cell towers, the Samaritan North Lincoln Hospital, and City Hall were identified by the Steering Committee as vulnerable assets. The city would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide. Education and outreach regarding earthquakes (and resultant tsunami) is an ongoing endeavor in Lincoln City.

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community characteristics section (Table LA-4), approximately 67% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard (according to the Risk Report 55% of all buildings are pre-code and 15% are low code)<sup>11</sup>. Information on specific public buildings' (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table LA-6; each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI, that have not been retrofitted, using their Rapid Visual Survey (RVS), no buildings have a very high (100% chance) collapse potential, while one (1) has a high (greater than 10% chance) collapse potential (note this school is Career Tech Charter HS which is in the same building as City Hall and the Driftwood Public Library). To fully assess a buildings potential for collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

### Mitigation Activities

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Lincoln City agencies or organizations.

A primary mitigation objective of the city is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>12</sup> have been funded to retrofit the North Lincoln Fire and Rescue Station 1400 (2015-17, Phase II grant award, \$1,048,039), the Taft Elementary School gym (2017-19, Phase II grant award, \$2,493,455), and Oceanlake Elementary School (2020 grant award. \$2,499,090). The police department and Samaritan North Lincoln Hospital were rebuilt through local funding resources in 2020. The School

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<sup>11</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table D-2.

<sup>12</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

District has retrofitted at risk schools through local resources (see the Lincoln County School District addendum for more information).

**Table LA-6 Rapid Visual Survey Scores**

Facility	Site ID*	Level of Collapse Potential			
		Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100%)
<b>Schools</b>					
Ocreanlake Elementary** (2420 NE 22nd Street) (former) Taft Elementary (1545 SE 50th Street)	Linc_sch01			<b>SRGP 2020 \$2,499,090</b>	
Taft Elementary (former MS)** (4040 High School Drive)	Linc_sch03			<b>Demolished. Site Vacant.</b>	
Taft 7-12 (former HS)** (3780 SE Spyglass Ridge Road)	Linc_sch04			<b>SRGP 2017-2019 Phase II: \$2,493,455</b>	
Career Technical High School (Charter)** (801 SW Hwy 101)	Linc_sch10	X			
	Linc_sch14			X	
<b>Public Safety</b>					
North Lincoln Fire and Rescue Station 1400 (2525 NW Hwy 101)	Linc_fir01			<b>SRGP 2015-2017 Phase II: \$1,048,039</b>	
City Building (former Taft-Nelscott-DeLake FD ) (914 SW 4th Street)	Linc_fir12	X			
North Lincoln Fire and Rescue Station 1600 (4520 SE Hwy 101)	Linc_fir16	X			
Lincoln City Police Department** (1503 SE Devils Lake Road)	Linc_pol06			<b>New building 2020</b>	
<b>Hospitals</b>					
Samaritan North Lincoln Hospital** (3043 NE 28th Street)	Linc_hos02			<b>New building 2020</b>	

Source: [DOGAMI 2007. Open File Report O-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment.](#) Notes: “\*” – Site ID is referenced on the [RVS Lincoln County Map](#). “\*\*” – Facility determined to be vulnerable to CSZ earthquake and should expect moderate to complete damage (> 50% probability). DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020).

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to earthquake. The Risk Report provides a distinct profile for Lincoln City.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled magnitude 9.0 Cascadia Subduction Zone (CSZ) event. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Lincoln City may be impacted by the profiled earthquake scenarios (Table LA-7). *Note: Due to the simultaneous nature of a CSZ*

earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.<sup>13</sup>

Approximately 16% of the City’s population (1,230 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, approximately 3% will be impacted by the accompanying tsunami. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Earthquakes will impact every building in the City, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as “damaged” in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable). The City has 1,621 buildings that are expected to be damaged by the CSZ earthquake and tsunami event. The combined (earthquake and tsunami) value of building damage losses are \$241 million.

**Table LA-7 Potentially Displaced Residents and Exposed Buildings, Earthquake**

Community Overview: Lincoln City						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
7,930		6,687		11	1,086,802,000	
Exposure Analysis: Earthquake CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
1,029	13.0%	1,350	20.2%	6	209,653,000	19.3%
Exposure Analysis (within Tsunami Zone - Medium)						
201	2.5%	271	4.1%	0	31,377,000	2.9%
Total Exposure						
1,230	15.5%	1,621	24.2%	6	241,030,000	22.2%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020). Table A-16. Note: City population based on the 2010 Census population.

The Risk Report estimated losses show that the age of the building stock is the primary metric of earthquake vulnerability. Communities with older building stock are expected to have higher losses. However, if buildings were retrofitted to at least “moderate code” standards the impact of the event would be reduced. The Risk Report concludes that loss estimates for the City drop from 19% to 12% (\$74.3 million decrease in loss) when all buildings are upgraded to at least moderate code level.<sup>14</sup> *Note: earthquake vulnerability*

<sup>13</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Tables A-16.

<sup>14</sup> Ibid, Table B-2.

*retrofit benefits are minimized in areas of liquefaction and landslide where additional geotechnical mitigation would be needed.*

#### Critical Facility Vulnerability<sup>15</sup>

- Lincoln City City Hall (also houses the Public Library and Career Tech High School)
- Lincoln City Police Department  
(new building built to current seismic code in 2020)
- Oceanlake Elementary School
- Samaritan North Lincoln Hospital  
(new building built to current seismic code in 2020)
- Taft Elementary School
- Taft 7-12 School

Note 1: In 2020, DOGAMI published an analysis of people and structures impacted by a CSZ earthquake and tsunami for the M, L, and XXL event scenarios. This report provides information on building damage and impact to residents and tourists (including injury and fatality estimates). For details, see *Analysis of Earthquake and Tsunami Impacts for People and Structures inside the Tsunami Zone for Five Coastal Communities* (DOGAMI, 2020, [O-20-03](#)).

Note 2: It is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Lincoln City by sea and air will be necessary.

For more information, see the following DOGAMI reports:

- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, [O-20-03](#))
- Oregon Coastal Hospital Resilience Project (2020, [O-20-02](#))

## Tsunami

The steering committee determined that the city's probability for a distant tsunami event is **moderate** meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a distant tsunami event is **low**, meaning that less than 1% of the city's population or property could be affected by a major distant tsunami event. The steering committee determined that the city's probability for a local tsunami event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a local tsunami event is **high**, meaning that more than 10% of the City's population or property could be affected by a major local tsunami event. *The city's probability to distant tsunami decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of tsunami hazards, as well as the history, location, extent, and probability of a potential event. The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific

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<sup>15</sup> Ibid, Table A-17.

Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>16</sup> Distant tsunamis happen more regularly than CSZ related local tsunamis.

It is difficult to predict when the next tsunami will occur. According to the Oregon NHMP the coast has experienced 25 distant tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources would be about six (6) years. However, the time interval between events has been as little as one year and as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for the City.

A 9.0 magnitude earthquake originating from Japan caused approximately \$7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; \$6.7 million), as well as the Port of Lincoln City (Lincoln County; \$182,000), and Charleston Harbor (Coos County; \$200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency was declared by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast local officials activated the Emergency Alert System and sirens, implemented “reverse 9-1-1” and conducted door-to-door notices in order to evacuate people from the tsunami inundation zone. Local governments activate their Emergency Operations Centers and the state activated its Emergency Coordination Center. For more information view Volume II, Hazard Annex.

In 1995, the Department of Geology and Mineral Industries (DOGAMI) conducted an analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami maps were produced to help implement Senate Bill 379 (SB 379); digitized in 2014 ([O-14-09](#)). SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005, limit construction of new essential facilities and special occupancy structures in tsunami flooding zones. Figure LA-9 shows the regulatory tsunami inundation line showing the much of the residential development west of Highway 101, and areas in, and adjacent to, the harbor are vulnerable to tsunami. It should be noted that the updated tsunami inundation maps (described below) show an increased vulnerability in many areas (Figure LA-10). Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building “new essential facilities, hazardous facilities, major structures, and special occupancy structures” inside the tsunami inundation zone (SB 379 line):<sup>17</sup>

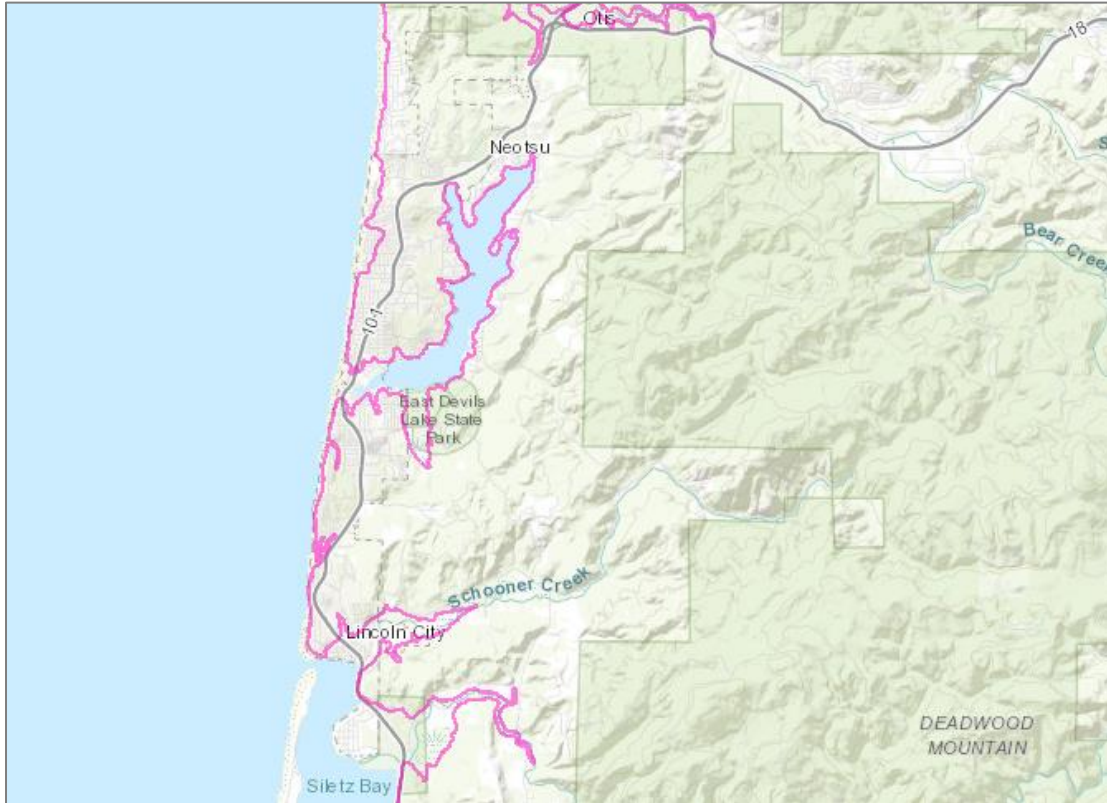
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<sup>16</sup> Oregon Natural Hazard Mitigation Plan. Department of Land Conservation and Development. 2020

<sup>17</sup> Oregon Legislature. HB 3309 (2019).

<https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309>

**Figure LA-9 Regulatory (SB 379) Tsunami Inundation Line**



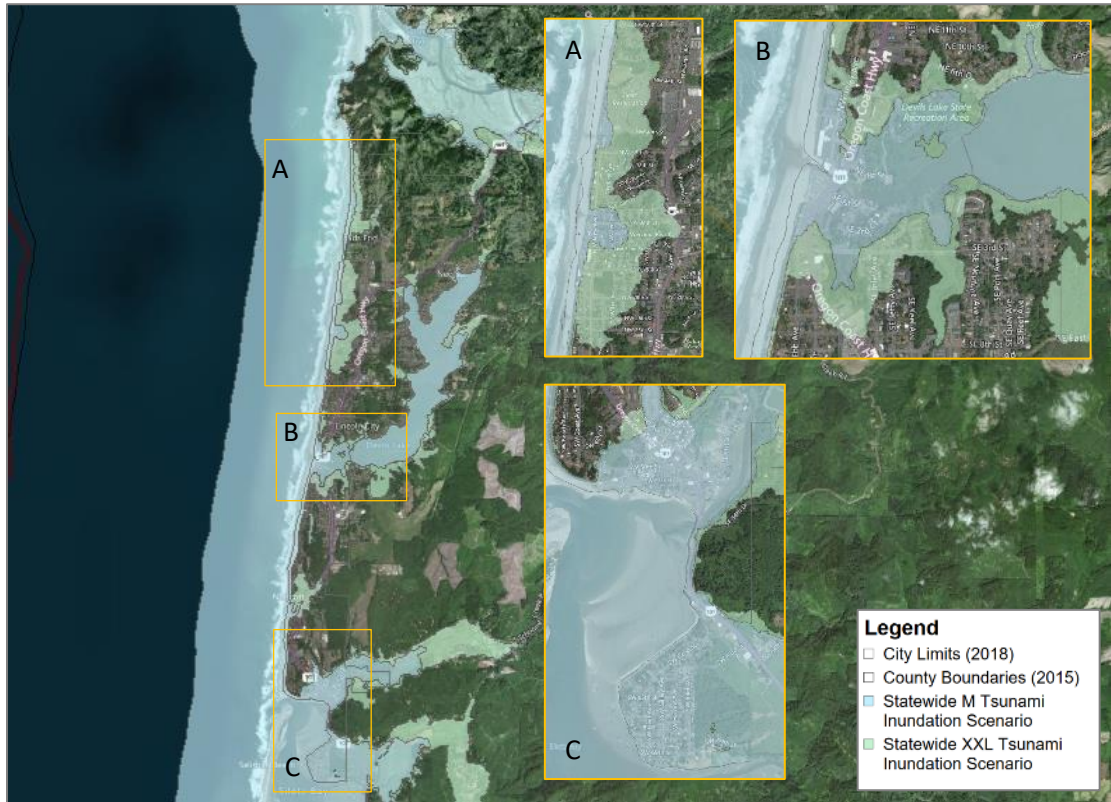
Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Lincoln City has put forth much effort to educate and inform citizens of tsunami hazards found within the city. The city obtained a reverse 911 system; hotels are encouraged to post evacuation signs in private rooms; evacuation signs are posted throughout the city; evacuation maps are posted on the city’s website; and a fire station and school were moved away from the inundation zone two years ago. In the event of a tsunami, the hospital may be at risk; currently it’s just outside the tsunami inundation zone. Severe damage is expected to occur on various properties, roads, bridges, communication systems, and critical infrastructure within Lincoln City, among other assets described in the county’s plan. Lincoln City recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future.

Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities. Maps were created for local and distant source tsunami events. The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as “T-shirt” sizes S, M, L, XL, and XXL. Figure LA-10 shows the M and XXL tsunami inundation scenarios. The distant source tsunami inundation maps show the potential impacts of tsunamis generated by earthquakes along the “Ring of Fire” (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2) and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry

Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

**Figure LA-10 Tsunami Inundation Map (M and XXL Scenarios)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - <http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm>  
(Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:

<http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm>

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst-case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

<http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm>

A free application is also available that displays the evacuation routes in coastal areas of Oregon: [http://www.nanoos.org/mobile/tsunami\\_evac\\_app.php](http://www.nanoos.org/mobile/tsunami_evac_app.php)



## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

In 2013, DOGAMI produced new Tsunami Inundation Maps (TIMs) for the entire Oregon coast. The TIMs identify both local and distant Tsunami Inundation Zones (TIZs) by event size. The maps also tabulate the affected buildings located within the local and distant source tsunami inundation zones. The Risk Report section below provides detailed information on the impact to the City from a CSZ earthquake and medium tsunami.

Severe damage could occur to low-lying areas of the city in a local source tsunami event, including roads, bridges, communication systems, and infrastructure within Lincoln City, particularly surrounding, and including facilities near NW Jetty Ave between NW 26<sup>th</sup> St and NW 50<sup>th</sup> St, D River and Devils Lake, and the Siletz Bay including Cutler City and Taft (see Figure LA-10 areas A, B, and C respectively) among other assets described in the county's plan. Some damage is also expected in a large distant source tsunami event (such as the 2011 Tohoku tsunami). The City of Lincoln City recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future.

As shown in Table LA-4 there are about 439 manufactured housing units (mobile homes) in Lincoln City. Manufactured homes built prior to 2003 are subject to slipping off their foundations potentially compromising the occupants' ability to exit. The compromised egress may hinder timely evacuation.

Population vulnerability is characterized in terms of exposure, demographic sensitivity, and short-term resilience of at-risk individuals. Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.<sup>18</sup> Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds. According to the study Lincoln County (including Lincoln City) has relatively low numbers of "residents, employees, or customer-heavy businesses" inside the tsunami hazard zones and will likely have enough time to reach high ground before a tsunami wave arrives.

In 2019, DOGAMI published a tsunami evacuation analysis using the XXL inundation zone which covers the largest CSZ event likely to occur based on the historical record.<sup>19</sup> Safety is reached when evacuees have reached "high ground", or 20 feet beyond the limit of tsunami inundation. An analysis was conducted for the Roads End, Wecoma, Oceanlake, Delake, Nelscott, Taft, and Cutler City neighborhoods within Lincoln City. According to the model the first waves arrive along the open coast 20-22 minutes after the start of earthquake shaking

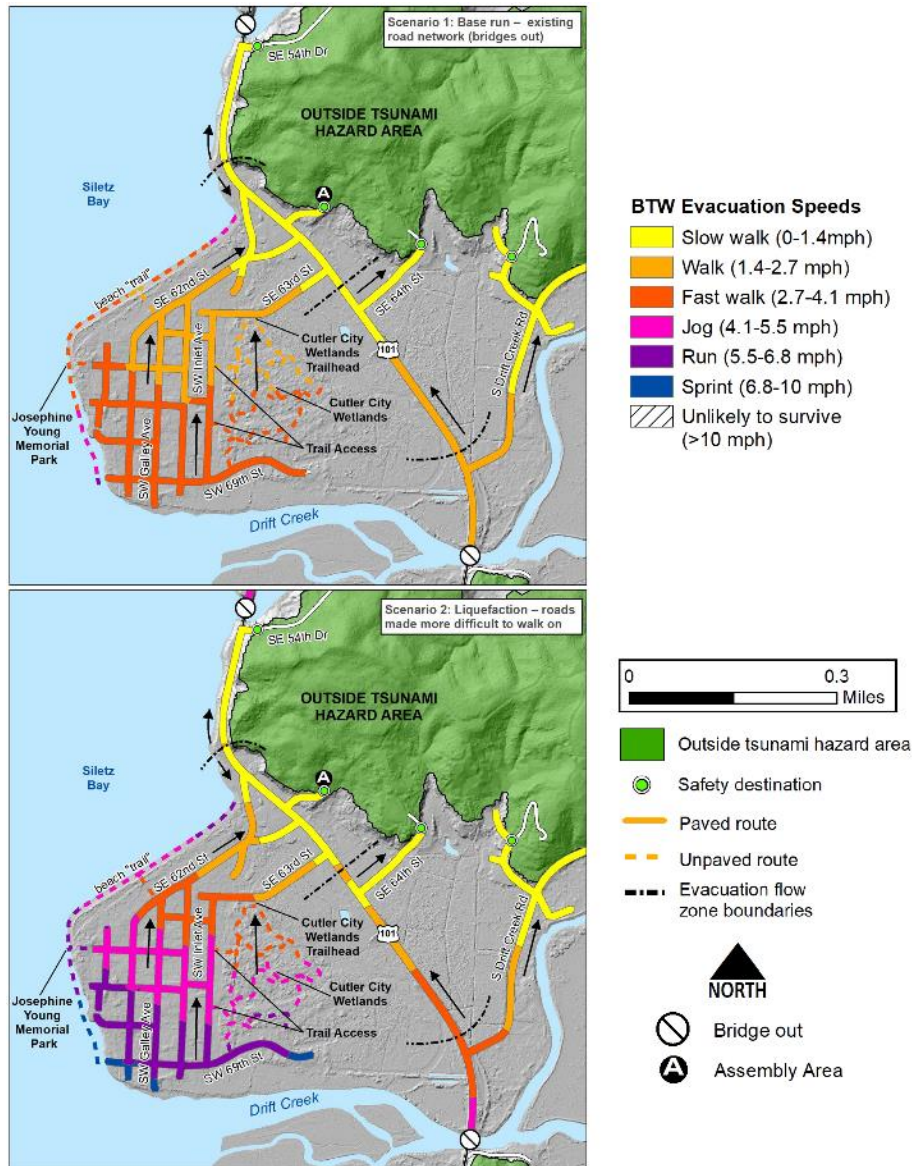
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<sup>18</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmittlein. "Community clusters of tsunami vulnerability in the US Pacific Northwest", PNAS 2015 112 (17) 5354-5359.

<sup>19</sup> DOGAMI, Open-Fire Report O-19-06.

with most of Lincoln City inundated about 4 to 6 minutes later. All of Lincoln City, except for Cutler City, has significant high ground that will accommodate evacuees traveling at a moderate walking speed of 4 feet per second (fps) or less (2.7 mph). Evacuees within the Cutler City neighborhood, particularly in the southwest section near where Drift Creek enters Siletz Bay, will need to move faster in order to beat the wave and make it to high ground (see Figure LA-11 ). For details, including neighborhood analysis, see *Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast* (DOGAMI, 2019, [O-19-06](#)).

**Figure LA-11 Beat the Wave modeling in Cutler City (CSZ earthquake XXL inundation zone)**



Source: DOGAMI, Open-File Report O-19-06.

In 2020, DOGAMI published an analysis of people and structures impacted by a CSZ earthquake and tsunami for the M, L, and XXL event scenarios. This report provides additional information on building damage and impact to residents and tourists (including

injury and fatality estimates). The report identifies Cutler City and SE 2<sup>nd</sup> Court south of Devils Lake, the Taft Trailer Park at SE 52<sup>nd</sup> St, and residences along SE 52<sup>st</sup> Ave and SE Lee Ave as areas of concern for tsunami evacuation.<sup>20</sup>

The report includes additional information on earthquake and building damage, injuries and fatalities, and displaced population which are, in part, included in the Risk Report information below. For more information, see *Analysis of Earthquake and Tsunami Impacts for People and Structures inside the Tsunami Zone for Five Coastal Communities* (DOGAMI, 2020, [O-20-03](#)).

Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to tsunami. The Risk Report provides a distinct profile for Lincoln City.

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Lincoln City may be impacted by the profiled tsunami scenario (Table LA-8).

**Table LA-8 Potentially Displaced Residents and Exposed Buildings, Tsunami**

Community Overview: Lincoln City						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
7,930		6,687		11	1,086,802,000	
Exposure Analysis: Tsunami CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
923	11.6%	899	13.4%	0	128,896,000	11.9%
Exposure Analysis: Tsunami SB 379 Regulatory Line						
1,097	13.8%	1,121	16.8%	0	176,978,000	16.3%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020). Table A-16. Note: City population based on the 2010 Census population.

Just under 12% the city’s population (923 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is slightly fewer people than those exposed within the Senate Bill 379 line (1,097 people). *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event (for more information on temporary residents see DOGAMI O-20-03 referenced in the previous section).* Building damage (loss) estimates are reported for buildings expected to be damaged by the tsunami inundation zone (medium-sized and SB 379). All 899 buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable); the number of buildings damaged is slightly higher under the SB 379

<sup>20</sup> DOGAMI, Open-File Report O-20-03, Section 8.3 Lincoln City.

scenario (1,121 buildings). No critical facilities are expected to be damaged under the CSZ M9.0 scenario, none are expected to be damaged under the SB 379 scenario.

#### Critical Facility Vulnerability<sup>21</sup>

- There are no critical facilities exposed to the profiled tsunami scenarios.

Note 1: DOGAMI, Open-Fire Report O-20-03 includes the following key infrastructure facilities in the tsunami zone (XXL): <sup>22</sup>

- Lift Station, SW Anchor Court
- Water Treatment Plant (317 S. Anderson Creek Rd)
- Antenna Structure (3277 NE Devils Lake Rd, includes KBCH AM 1400 radio)

Note 2: Although critical facilities are not exposed to the profiled tsunami scenarios it is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Lincoln City by sea and air will be necessary.

For more information, see the following DOGAMI reports:

- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, [O-20-03](#))
- Oregon Coastal Hospital Resilience Project (2020, [O-20-02](#))
- Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast (2019, [O-19-06](#))

## Flood

The steering committee determined that the city's probability for riverine or coastal flood is **high**, meaning at least one incident is likely within the next 35-year period and that their vulnerability to coastal or riverine flood is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major coastal or riverine flood event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of coastal and riverine flood hazards, as well as the history, location, extent, and probability of a potential event. Schooner Creek and Devils Lake are the city's primary sources of flooding— typically due to rain and snowmelt. The extent of flooding varies depending on rainfall, and/or precipitation levels throughout the year. Lincoln City's most significant flood event occurred in November 1999; every road out of town was under water, including East Devils Lake Rd just south of Devils Lake. Road closures are the most common flood-related impacts within the community. East Devils Lake Road floods frequently, and despite efforts to mitigate flood related damages by widening culverts along this road, flooding continues. Almost all of Lincoln City's 31 pump stations are in the floodplain. Areas of concern for the city include the floodgate at Schooner Creek and the modular home parks near 51<sup>st</sup> street.

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<sup>21</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-17.

<sup>22</sup> DOGAMI, Open-File Report O-20-03. Section 8.3.5.

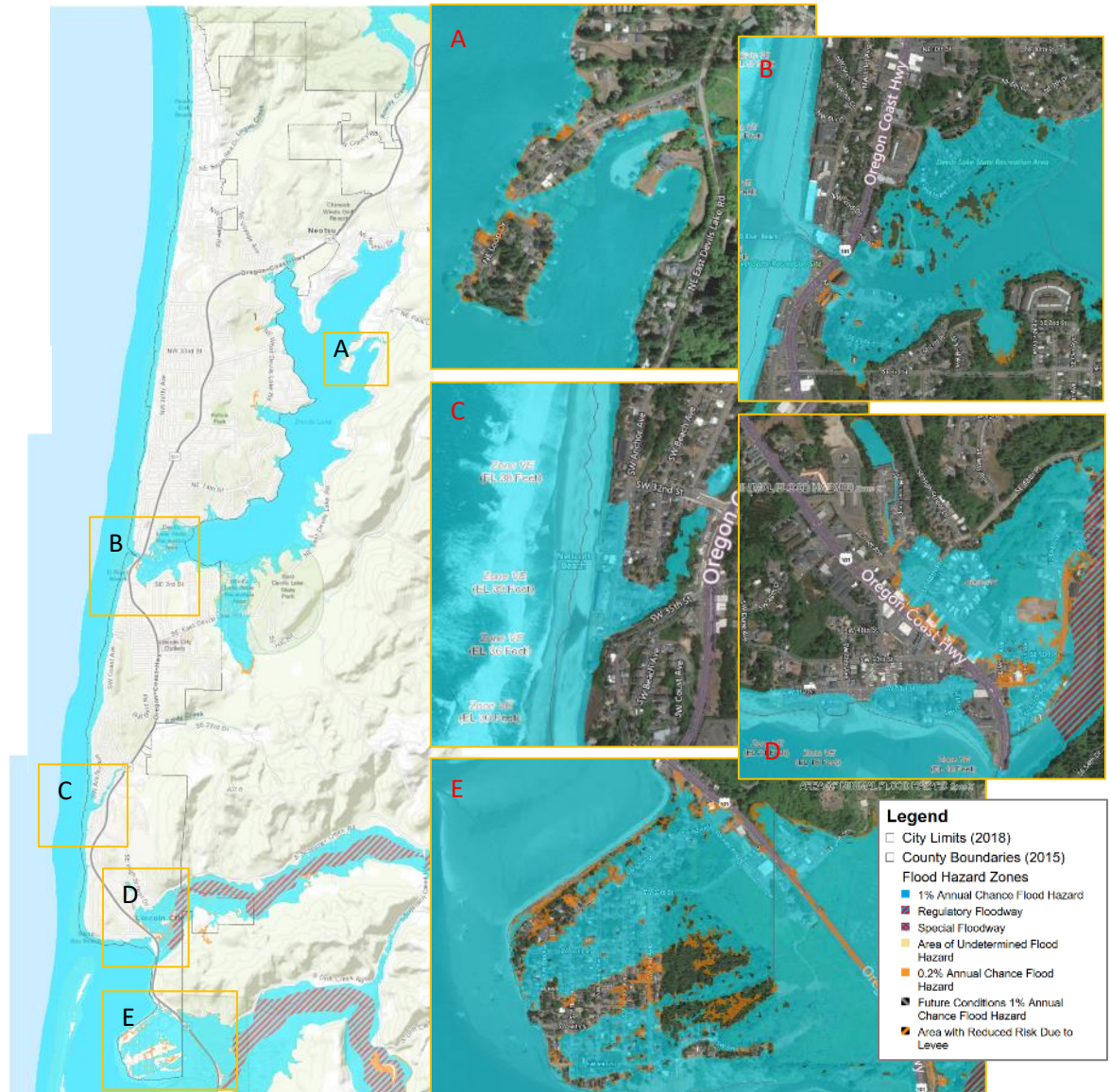
The Lincoln City Storm Water Master Plan includes additional information on flood impacts to the community and includes additional mitigation actions.

FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one percent probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood; also known as the Special Flood Hazard Area (SFHA). The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods (Figure LA-12). These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards. These maps represent a snapshot in time, and do not account for later changes which occurred in the floodplains. According to Oregon Explorer about 14% of the City is within the 100-year floodplain (see Figure LA-12). In addition, less than 2% of the City is within the 500-year floodplain.

Future Climate Projection:

According to OCCRI report *“Future Climate Projections: Lincoln County”* (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events. Additionally, coastal flooding is expected to increase due to sea level rise (SLR) and changing wave dynamics. Sea level is projected to rise by 1.7 to 5.7 feet by 2100. Tidal wetlands and estuaries throughout the county are also expected to experience changes to their composition and area, thereby impacting their ability to naturally mitigate flood events.

**Figure LA-12 Flood Hazard Zones (100- and 500-year floodplains)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to flood. The Risk Report provides a distinct profile for Lincoln City.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the city. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within Lincoln City may be impacted by the profiled flood scenario (Table LA-9).

Just over six percent (6%) of the City’s population (505 people) may be displaced by flooding. These people are expected to have mobility or access issues due to surrounding water. About four percent (4%) of the City’s buildings (249 buildings) are exposed to the flood hazard and may be damaged. The loss estimate for exposed buildings is \$3.6 million (less than one percent of total building value).

**Table LA-9 Potentially Displaced Residents and Exposed Buildings, Flood**

Community Overview: Lincoln City						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
7,930		6,687		11	1,086,802,000	
Exposure Analysis: Flood (1% Annual Chance)						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
505	6.4%	249	3.7%	0	3,648,000	0.3%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020). Table A-16. Note: City population based on the 2010 Census population..

Critical Facility Vulnerability<sup>23</sup>

There are no critical facilities exposed to the profiled flood scenario.

## National Flood Insurance Program (NFIP)

FEMA’s Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2019. Table LA-10 shows that as of August 2019, the City has 730 National Flood Insurance Program (NFIP) policies in force, representing almost \$139.6 million in coverage. Of those, 437 are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for the City was April 16, 2004. The table shows that most flood insurance policies are for residential structures, primarily single-family homes. Flood insurance covers only the improved land, or the actual building structure.

<sup>23</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-17.

There have been 44 paid flood insurance claims for a combined total of just over \$1.2 million.

The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The NFIP’s Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. As of 2019 the City did not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone. However, the City is currently taking steps to participate and is working towards achieving a Class 4 or 5 rating.

**Table LA-10 Flood Insurance Detail**

	Lincoln County	Lincoln City
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	4/17/1978
Total Policies	2,325	730
Pre-FIRM Policies	1,067	437
<b>Policies by Building Type</b>		
Single Family	1,685	306
2 to 4 Family	57	19
Other Residential	462	375
Non-Residential	121	30
Minus Rated A Zone	98	23
Minus Rated V Zone	3	1
Insurance in Force	\$585,856,500	\$139,598,200
Total Paid Claims	343	44
Pre-FIRM Claims Paid	265	37
Substantial Damage Claims	53	2
Total Paid Amount	\$5,479,221	\$1,257,285
Repetitive Loss Structures	64	6
Severe Repetitive Loss Properties	12	0
CRS Class Rating	NP	NP^
Last Community Assistance Visit	-	4/16/2004

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating  
 ^ - The City is currently taking steps to participate and is working towards achieving a Class 4 or 5 rating

Repetitive Loss Properties

The Community Repetitive Loss record for Lincoln City identifies six (6) Repetitive Loss Properties<sup>24</sup>, of which two (2) are Severe Repetitive Loss Properties<sup>25</sup>. Five (5) of the

<sup>24</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.



repetitive loss properties are single-family residential (one is a severe repetitive loss property) and one is non-residential. Two (2) repetitive loss properties have been mitigated.

## Landslide

The steering committee determined that the city's probability for landslide is **high**, meaning at least one incident is likely within the next 35-year period, and that their vulnerability to landslide is **high**, meaning that more than 10% of the City's population or property could be affected by a major landslide event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of landslide hazards, as well as the history, location, extent, and probability of a potential event.

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries or take lives. Landslide susceptibility exposure for Lincoln City is shown in Figure LA-13. Approximately 53% of the City has very high or high, and 21% moderate, landslide susceptibility exposure.<sup>26</sup> In general, the areas of greater risk are located adjacent to rivers and creeks and indicate potential areas of erosion. *Note that even if a City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

### Future Climate Projection:

According to OCCRI report "Future Climate Projections: Lincoln County" (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

## Vulnerability Assessment

Development pressure on steep slopes is an issue that Lincoln City is facing. Also, the road to the city's wastewater treatment plant has occasional slides (last slide was in 1999, the existing Wastewater Master Plan has an action identified for this vulnerability).

Potential landslide-related impacts are adequately described within the county's plan, and include infrastructure damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Lincoln County, and

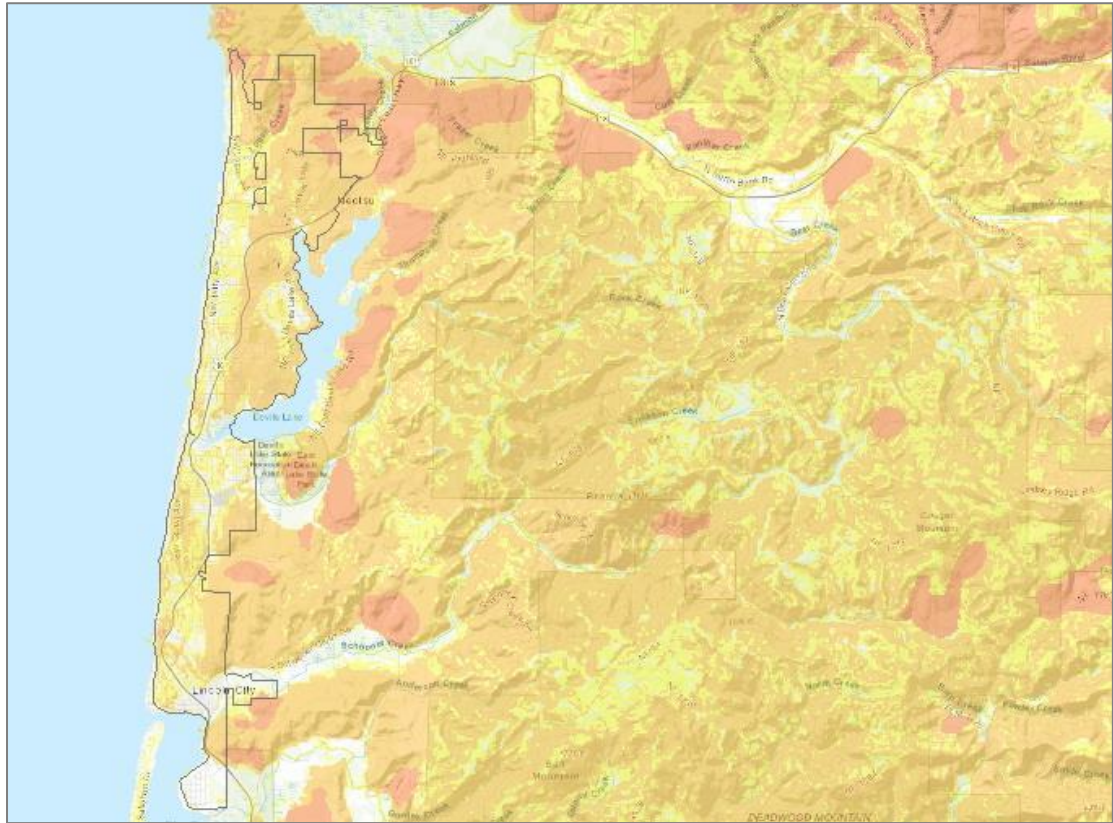
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<sup>25</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

<sup>26</sup> DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

thoroughfares beyond city limits are susceptible to obstruction as well. As such, Lincoln City is vulnerable to isolation for an extended period.

**Figure LA-13 Landslide Susceptibility Exposure**



Low	<b>Landsliding unlikely.</b> Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low.
Moderate	<b>Landsliding possible.</b> Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.
High	<b>Landsliding likely.</b> Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.
Very High	<b>Existing landslides</b> Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report (DOGAMI, O-20-11)** provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Lincoln City.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public

and private) within the city may be impacted by the profiled landslide scenario (Table LA-11).

Approximately 35% of the City’s population (2,758 people) may be displaced by landslides. These people are expected to have mobility or access issues and/or may have their residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 33% of all buildings (2,180 buildings) within the City are exposed to the High or Very High landslide susceptibility zones (see Figure LA-13). The value of exposed buildings is just over \$343 million (about 32% of total building value).

**Table LA-11 Potentially Displaced Residents and Exposed Buildings, Landslide**

Community Overview: Lincoln City						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
7,930		6,687		11	1,086,802,000	
Exposure Analysis: Landslide High & Very High Susceptibility						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
2758	34.8%	2180	32.6%	3	343,400,000	31.6%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020). Table A-16. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>27</sup>

- Lincoln City Police Department (new building built in 2020)
- North Lincoln Fire Station 1400 (new building built in 2020)
- Oceanlake Elementary School

## Severe Weather

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.<sup>28</sup> Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months.<sup>29</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

<sup>27</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-17.

<sup>28</sup> US Department of Agriculture. <http://www.fsa.usda.gov/or/Notice/Flp104.pdf>.

<sup>29</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

## Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>30</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

## **Windstorm**

The steering committee determined that the city’s probability for windstorm is **high** (the probability of tornado is also high), meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to windstorm is **high**, meaning that more than 10% of the City’s population or property could be affected by a major windstorm event. The Steering Committee rated the County as having a “**low**” **vulnerability to a tornado hazard**, meaning that less than 1% of the City’s population or property could be affected by a major tornado event. *The windstorm ratings have not changed since the previous NHMP. The tornado ratings are new with this version of the NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of windstorm hazards, as well as the history, location, extent, and probability of a potential event. Because coastal windstorms typically occur during winter months, ice, freezing rain, flooding, and very rarely, snow sometimes accompany them. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## **Vulnerability Assessment**

Due to insufficient data and resources, Lincoln City is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. In Lincoln City, power outages are the greatest concern during windstorms. Building codes require new developments to place power lines below ground; currently, however, new construction only accounts for about 5% of the city’s total development. Without power, communication is lost, and fuel and food stores shut down. In the December 2007 windstorm, the water treatment plant nearly used up its diesel supply, and the city lost its primary communications route (provided through Telecommunication Utility-owned Fiber Optic routes). Lincoln City patrons were additionally unable to access 911.

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<sup>30</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.

## Winter Storm (Snow/ Ice)

The steering committee determined that the city's probability for winter storm is **high**, meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to winter storm is **moderate**, meaning that between 1% and 10% of the city's population or property could be affected by a major winter storm event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of winter storm hazards, as well as the history, location, extent, and probability of a potential event. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. More than likely, however, the coast's winter will just be windy, cold, and wet.

### Vulnerability Assessment

Due to insufficient data and resources, Lincoln City is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Major winter storms can and have occurred in the Lincoln City area, and while they typically do not cause significant damage; they are frequent and have the potential to impact economic activity. Road closures on Highway 101, or the passes to the Willamette Valley (Hwy 18 and 20), due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

## Volcanic Event

The steering committee determined that the city's probability for volcanic event is **low**, meaning one incident is likely within the next 75 to 100-year period, and that their vulnerability to volcanic event is **low**, meaning that less than 1% of the city's population or property would be affected by a major volcanic event (ash/lahar). *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of volcanic event hazards, as well as the history, location, extent, and probability of a potential event. Generally, an event that affects the county is likely to affect Lincoln City as well.

### Vulnerability Assessment

Due to insufficient data and resources, Lincoln City is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Lincoln City is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens erupted in 1980, the city received small amounts of ashfall, but not enough to cause significant health and/or economic damages.

## Wildfire

The steering committee determined that the city's probability for wildfire is **moderate**, meaning one incident is likely within the next 35 to 75-year period, and that their vulnerability to wildfire is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major wildfire event. *These ratings have not changed since the previous NHMP.*

The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve to supplement the wildfire section in this addendum.

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of wildfire hazards, as well as the history, location, extent, and probability of a potential event. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Wildfires in 1849 and 1936 were particularly devastating in Lincoln County, but since then, there have been few large events. In 2020, the Echo Mountain Fire Complex burned more than 2,500 acres northeast of the city and impacted hundreds of homes in the Otis, Rose Lodge, Panther Creek area. As shown in Figure LA-14 the City has mostly low, with some moderate, overall wildfire risk. Areas of concern include the eastern side of the city (where forestland borders development), and some of the open spaces within the city's limits. Due to the prevailing wind patterns (i.e., from the north or south), the city's steering committee felt that the east and south ends of the city might be the most vulnerable. Power, natural gas, and phone lines run through the forest to the east of the city and would be affected in the event of a wildfire. Likewise, active commercial logging occurs just outside the city, and slash burns are a potential wildfire concern.

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

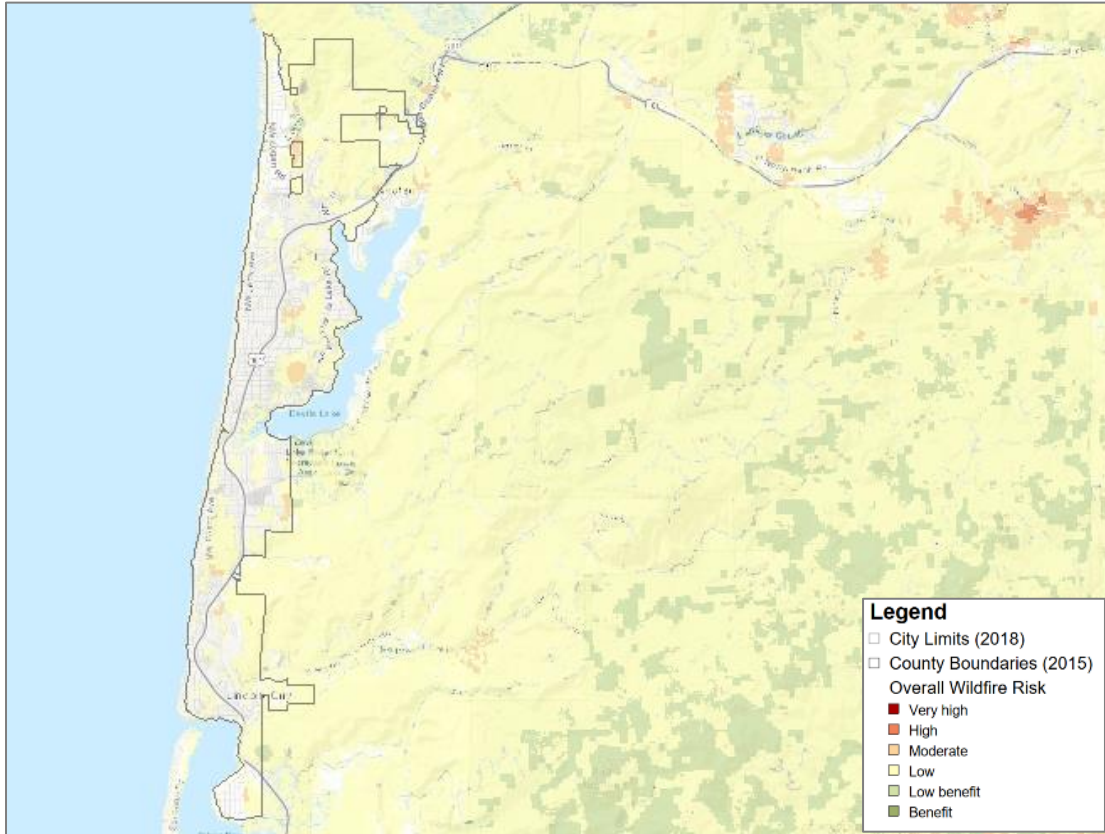
## Vulnerability Assessment

Overall, the city, and its watershed, has low to moderate overall wildfire risk, however, the forested areas have the potential for large wildfires and a wildfire within the watershed could impact the city's water supply and quality.

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair.

**Figure LA-14 Overall Wildfire Risk**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Lincoln City.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment’s Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the City may be impacted by the profiled wildfire scenario (Table LA-12).

Approximately one percent of the City’s population (89 people) may be displaced by wildfires. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire (more people may also be impacted by smoke and traffic disruptions that are not accounted for within this analysis). It is important to note that impact from wildfires may vary depending on the specific area that experiences a wildfire. The value of exposed buildings (75 buildings) is just over \$8 million (less than one percent of total building value).

**Table LA-12 Potentially Displaced Residents and Exposed Buildings, Wildfire**

Community Overview: Lincoln City						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
7,930		6,687		11	1,086,802,000	
Exposure Analysis: Wildfire High-Hazard						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
89	1.1%	75	1.1%	1	8,049,000	0.7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020). Table A-16. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>31</sup>

- Samaritan North Lincoln Hospital (new building built in 2020)

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<sup>31</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-17.



# ATTACHMENT A: ACTION ITEM FORMS

Table LA-1 and Table LA-13 provide a summary list of actions for the city. Each high priority action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table LA-13 Action Item Timelines, Status, High Priority and Related Hazards**

Action Item	Priority	Timeline	Status	Related Hazard												
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm			
Lincoln City #1	X	Medium	Ongoing							X						
Lincoln City #2	X	Long	Ongoing		X											
Lincoln City #3		Long	Ongoing			X				X						
Lincoln City #4		Ongoing	Ongoing			X				X						
Lincoln City #5	X	Long	Ongoing			X										
Lincoln City #6		Ongoing	Ongoing				X									
Lincoln City #7	X	Short	Ongoing				X									
Lincoln City #8		Long	Ongoing				X									
Lincoln City #9		Ongoing	Ongoing				X									
Lincoln City #10		Ongoing	Ongoing				X									
Lincoln City #11		Short	Ongoing	X				X								
Lincoln City #12	X	Ongoing	Ongoing	X	X	X	X	X	X	X	X	X	X	X	X	X
Lincoln City #13	X	Medium	Deferred	X	X	X	X	X	X	X	X	X	X	X	X	X

**Previous NHMP Actions Completed:**

**Lincoln City #1** (2015): “Relocate Police Station out of tsunami inundation zone and establish a police communications system safe from disasters.” is considered complete. The Police Station was relocated, and a new building constructed outside the tsunami inundation zone (2020).

**Lincoln City #15** (2015): “Acquire generators for service stations” is considered complete since three key facilities are retrofitted with transfer switches.

**Lincoln City #19** (2015): “Add debris removal and emergency response strategies to the Lincoln City Storm Water Management Plan” was removed since the activity is considered complete since the City is working with the county on a debris management plan and normal response strategies are all part of the City’s emergency operations plan.

**Lincoln City #21** (2015): “Relocate school buses to a site outside of the tsunami inundation zone” is considered complete since the school buses and barn have been relocated to an area outside the tsunami inundation zone (see School District addendum for more detail).

Previous NHMP Actions Removed/Deleted:

**Lincoln City #10** (2015): “Implement actions identified in the Devils Lake Water Improvement District's Lake Management Plan.” was removed since the City does not believe this action needs to be accomplished through the NHMP.

**Lincoln City #11** (2015): “Construct a bridge on east Devils Lake Road where flooding typically occurs” was removed since the road/bridge is not under City jurisdiction and the activity is accomplished through County NHMP actions.

**Lincoln City #16** (2015): Encourage emergency-related intergovernmental planning” was removed since this is a normal job duty of the emergency preparedness coordinator and the action does not need to be accomplished through the NHMP.

**Lincoln City #17** (2015): “Seek funding to expand tsunami alert systems and to maintain existing tsunami sirens” was removed since the system belongs to North Lincoln Fire & Rescue, not the City.

**Lincoln City #18** (2015): “Explore opportunities to limit and/ or restrict slash-burning near city limits” was removed since the activity is not within the jurisdiction of the City and is accomplished through the Community Wildfire Protection Plan and County NHMP actions.

**Lincoln City #20** (2015): “Evaluate and implement erosion control mitigation projects for Anchor Court” was removed since the area is no longer considered a concern.

**Lincoln City #23** (2015): “Research and develop plans for evacuating / sheltering/ feeding the thousands of tourists that might be in city at time of disaster” was removed since this action duplicates another action (2020 Action: Lincoln City #12).

*Note: 2015 Actions were renamed as follows:*

<b>2015 Action Item</b>	<b>2020 Action Item</b>
Lincoln City #2	Lincoln City #1
Lincoln City #3	Lincoln City #2
Lincoln City #4	Lincoln City #3
Lincoln City #5	Lincoln City #4
Lincoln City #6	Lincoln City #5
Lincoln City #7	Lincoln City #6
Lincoln City #8	Lincoln City #7
Lincoln City #9	Lincoln City #8
Lincoln City #12	Lincoln City #9
Lincoln City #13	Lincoln City #10
Lincoln City #14	Lincoln City #11
Lincoln City #22	Lincoln City #12
Lincoln City #24	Lincoln City #13

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The City NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the City. Existing programs and other resources that might be used to implement these action items are identified. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

County level actions that the city is listed as a partner are shown in Table LA-14. These actions are led by the County; however, the City will incorporate elements of the action that are applicable to their jurisdiction.

**Table LA-14 County Specified Actions that the City is Partner**

Action Item (2015 NHMP)	City Partner	Action Item
MH #1	Yes	Consider Local Energy Assurance Planning for critical areas countywide
MH #2	Yes	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers
MH #3	Yes	Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.
MH #4	Yes	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.
MH #5		Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.
MH #6	Yes	Integrate the NHMP into County and City comprehensive plans.
MH #7	Yes	Prepare long-term catastrophic recovery plan
MH #8		Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
CE #1		Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.
CE #2	Yes	Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
EQ #1	Yes	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
EQ #2	Yes	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
EQ #3	Yes	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
TS #1		Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami

Action Item (2015 NHMP)	City Partner	Action Item
		inundation zone and likely to be impacted by tsunami.
TS #2	Yes	Implement land use strategies and options to increase community resilience
FL #1		Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)
FL #2		Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.
FL #3		Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas
FL #4	Yes	Continue compliance with the National Flood Insurance Program (NFIP).
LS #1	Yes	Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.
LS #2		Protect existing development in landslide-prone areas.
LS #3	Yes	Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
SW #1		Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).
SW #2	Yes	Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.
WF #1	Yes	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

Mitigation Action: Lincoln City #1 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Acquire a safe haven shelter (and develop with supplies/ facilities) for Cutler City	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
It is expected that this project will be included in the new comprehensive planning effort now underway.					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>Cutler City (located west of Hwy 101 at SW 62<sup>nd</sup> St on the Siletz Bay) is identified on DOGAMI's tsunami inundation maps as at risk of inundation for distant and local tsunamis. The community is at low elevation (approximately 9-10 feet above sea level) and lacks high ground for an evacuation assembly area; evacuation for the area is east of Hwy 101 at higher ground off of SE 64<sup>th</sup> Street). At present, there are only rudimentary pathways to the top of the assembly area, which will make it difficult to access in the event of a Cascadia earthquake.</p> <p>Cutler City has most affordable housing within Lincoln City and also contains many vacation rentals. The area is susceptible to liquefaction and subsidence following an earthquake/ tsunami event. No high areas are located west of Hwy 101 to accommodate existing residents/ tourists.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
<p>Investigate the viability of a safe haven shelter east of Hwy 101 utilizing geotechnical analysis and benefit-cost analysis to show that improvements are prudent investment.</p> <p>Install improvements, which may include new sidewalks, pathways, stairs, signage, lighting, and an emergency storage shed.</p>			<p><u>2020 update:</u></p> <p>The City placed one emergency cache near Cutler City at the wastewater treatment plant.</p> <p>The City is working with one potential commercial developer to share land in elevated area on the eastern side of highway 101 for additional assembly area and cache site.</p>		
<b>Champion/ Responsible Organization:</b>		Emergency Preparedness Coordinator			
<b>Internal Partners:</b>			<b>External Partners:</b>		
Planning and Community Development, Neighborhood Associations, City Planning Commission			DLCD, OEM, FEMA, DOGAMI		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Local Funding Resources, FEMA PDM, HMGP			Medium		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator)			
<b>Action Item Status:</b>		Ongoing			

<b>Mitigation Action: Lincoln City #2</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Seek funding, and develop, water storage capabilities and enhance resiliency of water storage, treatment and distribution systems.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Water System Master Plan		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>Schooner Creek is the City’s only water source, and the City’s reservoirs store enough water for only one day of use. In the event that climate patterns change and drought becomes a probable hazard, Lincoln City would be extremely vulnerable to drought conditions. Furthermore, Schooner Creek is a direct-flow water source and contamination is a potential threat to the water supply.</p> <p>The water system serves 4300 residential and 650 commercial customers. As a tourist community, the population swells from a normal daily average of 13,500 to 23,000 on any given Friday evening. Only the amount of water necessary to satisfy the demand of the users is processed.</p> <p>The City has 3 reservoirs, which store a total of 7.25 million gallons. The water is mostly stored for emergency fire protection, but extra capacity additionally helps to ease peak demands and maintain constant pressure within the system.</p> <p>In addition to meeting customer demand, Schooner Creek must additionally maintain a sufficient flow for fisheries and recreational uses.</p> <p>Survey existing systems, identify gaps and develop strategy for water system resiliency            Design and implement water resiliency education plan for residents and businesses</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
Obtain funding to construct additional reservoirs for emergency drought-related storage. Research ways to reduce drought risk within the City. (This may potentially result in non-storage projects) Survey existing systems, identify gaps and develop strategy for water system resiliency Design and implement water resiliency education plan for residents and businesses	<p><u>2020 update:</u>            Three water storage tanks have been purchased and placed in the city. This action has given the city 7.2 million gallons of water storage.            City public works has completed updating numerous water lines and fixing leaks.            City public works has completed XXX% of a loop water system which provides redundancy for the city.</p> <p><u>2015 update:</u>            Upgraded storage capacity of Port Ave reservoir to 4.25 million gallon to assist with emergency water outages.            Concentrated effort on finding and fixing leaks has resulted in cutting water loss in half.            The city has repaired water line from Schooner Creek (main water source). Has a 24” line in Schooner Creek partially exposed due to last slide. Road slide</p>	



		on SE 48th near 51st involves water and sewer lines. Drift Creek is the emergency backup water source in drought conditions.	
<b>Champion/ Responsible Organization:</b>	Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
City Manager, Finance		USDA, USGS, Western States Water Council	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	NHMP Steering Committee, revised 2020 (Public Works Director)		
<b>Action Item Status:</b>	Ongoing		

Mitigation Action: Lincoln City #3 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Identify over-water transportation alternatives in the event that bridges collapse in an earthquake and/ or tsunami.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
Emergency transportation and disaster recovery plans to be built into transportation master plan					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>In the event of a Cascadia Subduction Zone (CSZ) earthquake and/or tsunami, the City expects to lose the bridges over D River, and by 22nd St. The southern portion of the City will be separated from the hospital. Region-wide, portions of the coast may be isolated due to bridge failure.</p> <p>Tsunami destruction can come from both the tsunami wave and from the rapid retreat of the water from the coastline. Tsunami waves tend to be fast moving, rising surges of water.</p> <p>The average recurrence interval for a CSZ event is between 500 and 600 years. There have been seven CSZ events in the last 3500 years with time between individual events varying from 150 to 1000 years. The last CSZ event occurred approximately 315 years ago.</p> <p>Restoration of key infrastructure is essential after a natural disaster "to support the industry and the jobs it provided." To sustain the economy, communities should "provide for temporary infrastructure while long-term rebuilding efforts are underway." Source: Governor's Commission Report on Recovery, Rebuilding, and Renewal. After Katrina: Building Back Better than Ever. December 31, 2005. p. 112.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
<p>Build boat launches in strategic locations to serve as bridge replacements after an earthquake and tsunami. (\$50K)</p> <p>Obtain emergency equipment in preparation for an earthquake and/or tsunami event.</p> <p>Consider fillable sandbags. (\$10-\$20K)</p> <p>Explore with ODOT to contribute to these disaster recovery solutions</p>			<p><u>2020 Update:</u> Developed more alternatives, purchasing flat cars is not the most effective method for solving this issue. They are expensive, hard to move, and would potentially rust out and be of no value. Currently ODOT is completing rebuilds on the D River bridge and Schooner Creek Bridge.</p> <p><u>2015 Update:</u> Railroad sections/flatcars considered but abandoned due to difficulty in storage and transport, and probable destruction due to rust Considering fillable sandbags, but need funds to purchase; Primary obstacle to implementing sand bag option is budgetary, estimates ranging from \$10-20K. Specify equipment necessary to fill and move sand bags. For time being, assumption is that bridges could be bypassed by emergency vehicles on the beach. After a tsunami/earthquake which vehicles will likely be able to use beach.</p>		

<b>Champion/ Responsible Organization:</b>	Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
City Manager, Finance, Emergency Preparedness Coordinator, Community Development and Planning,		ODOT, Department of Homeland Security, NOAA	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		Medium	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator)		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Lincoln City #4</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Continue to educate citizens about earthquake and tsunami preparedness.	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<p>Hazard mitigation and preparedness should be included in discussions/presentations of all master plans and items incorporated as appropriate</p> <p>Include issues such as water resiliency as discussed in Lincoln City #3</p>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>Lincoln City has engaged in numerous education &amp; outreach activities related to earthquake and tsunami preparedness. The City recognizes the importance of an ongoing education &amp; outreach program that's specifically related to these two hazards.</p> <p>Public education and outreach can be inexpensive and provide information that results in safer households, workplaces and other public areas. Some outreach materials include: informational brochures about community seismic risks and mitigation techniques, public forums, newspaper articles, training classes and television advertisements. Source: Oregon Technical Resource Guide. July 2000. Community Planning Workshop. Eugene, OR: University of Oregon. p. 8-20.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Continue to encourage hotels to post tsunami evacuation maps within individual rooms. Explore the possibility of requiring hotels to post evacuation maps.</p> <p>Develop messaging to account for language diversity of residents and tourists.</p> <p>Evaluate if there is enough signage on both sides of the D River Beach Wayside river outlet to help guide the public toward high ground.</p> <p>Acquire funding to support a permanent tsunami preparedness coordinator position within the City.</p> <p>Continue to update and improve the City's emergency preparedness website</p> <p>Conduct awareness campaigns to encourage home and business owners to perform seismic retrofits. Our findings indicate that seismic upgrades can significantly reduce losses to buildings.</p> <p>Pursue adoption of 30 days / 30 ways program; beach evacuation race; geocaching</p>	<p><u>2020 Update:</u></p> <p>March 2018, earthquake-tsunami brief Lincoln City, September 2018, readiness fair in Lincoln City, February -April 2019, all hazards brief to Lincoln City employees, May 2019 briefing to Roads End Neighborhood association, June 2019, briefing to Indian Shores HOA, June 2019 Wildfire presentations in Lincoln City. June 2019 briefing to Lincoln City Rotary, July 2019 briefing to Lincoln City Kiwanis, September 2019 briefing to Nelscott Neighborhood association, September 2019 briefing to Lincoln City Chamber of Commerce</p> <p><u>2015 Update:</u></p> <p>Cutler City evacuation drill completed 7/9/12</p> <p>DOGAMI presentation to planning commission</p> <p>NW Natural Get Ready fairs annually 2012-2014</p> <p>Lincoln City participation in Great Oregon Shake-out</p> <p>DOGAMI seminars and discussions with release of new tsunami inundation maps in 2013</p> <p>Emergency Preparedness Coordinator hired in 2013; AmeriCorps Outreach Coordinator as of 9/14</p> <p>New signage including 15 Assembly Area, evacuation</p>	

		signs, five beach signage in 2013 Adoption of Everbridge as a public notification tool in the county and city Adoption of QR codes and updates to city web sites to add links to relevant information Produced new tsunami posters in 2014 with Spanish and English	
<b>Champion/ Responsible Organization:</b>		Emergency Preparedness Coordinator	
<b>Internal Partners:</b>		<b>External Partners:</b>	
All city departments, CERT, GIS		Chamber of Commerce, neighborhood associations, Red Cross, North Lincoln Fire & Rescue, Tsunami Advisory Committee (TAC), DOGAMI, OEM (Hospitality Industry Awareness and Preparedness program)	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator)		
<b>Action Item Status:</b>	Ongoing		

Mitigation Action: Lincoln City #5 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Capital Improvement Programs		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation?</p> <p>DOGAMI conducted a seismic needs assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. Table LA-4 lists the vulnerable buildings within Lincoln City</p> <p>In addition to the structures listed in Table LA-6, the City's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, cell towers, and City Hall (also houses the Public Library and Career Tech High School) were identified by the Steering Committee as vulnerable assets. The City would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide. See the vulnerable critical facilities listed in the Earthquake section for more information.</p> <p>School District Priorities are included in their addendum. Below are facilities within Lincoln City that are listed as vulnerable to earthquake in the DOGAMI Risk Report.</p> <ul style="list-style-type: none"> <li>• Lincoln City Community Center</li> <li>• City Hall (also houses the Public Library and Career Tech High School)</li> </ul>		
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>
<p>Inventory community buildings and infrastructure: determine which structures may be particularly vulnerable to earthquake damage. Seek funding to retrofit and/or re-build structures.</p> <p>Create a local rehabilitation and retrofit program for existing buildings.</p> <p>Rehabilitate identified vulnerable schools, emergency facilities, infrastructure, and public buildings/lifelines.</p> <p>Coordinate activity with plans to replace/upgrade police station in Lincoln City #1</p>		<p><u>2020 Update:</u> Lincoln City police station constructed new facility, Cache locations identified, placed and stocked for Taft and Oceanlake schools. New hospital built in 2020.</p> <p><u>2015 Update:</u> Taft Elementary relocated (new location is in former Taft Middle School, which has a building with moderate collapse potential)</p> <p>Lincoln City Career Tech getting new emergency egress from 4th floor</p> <p>New seismic ready EOC building getting improved infrastructure: data drops, phones, satellite trailers, backup computer systems</p> <p>Backup repeater acquired</p>

		Agreements in place with Toledo and WVCC to act as backup dispatch Taft and Oceanlake schools supply caches installed	
<b>Champion/ Responsible Organization:</b>	Public Works/ School District		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Finance, City Manager, Planning and Community Development		Oregon Emergency Management, DOGAMI, IFA, SHPO	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Seismic Rehabilitation Grants (IFA), Local Funding Resources		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator)		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Lincoln City #6</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Continue compliance with the National Flood Insurance Program.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input checked="" type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Lincoln City Flood Ordinance, Comprehensive Plan, FEMA Flood Insurance Study, Flood Insurance Rate Maps						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The City estimates a high probability that flooding will occur in the future; see Table LA-10 for detail on current NFIP participation and the flood section of the city addendum and Volume I, Section 2 for detail on city risk and vulnerability to the flood hazard.</p> <p>Everyone in a participating community of the National Flood Insurance Program (NFIP) can buy flood insurance. Increasing flood insurance coverage will allow the county to reduce vulnerability and facilitate recovery.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Continue to participate in the NFIP.</p> <p>Explore participation in the National Flood Insurance Program's Community Rating System (CRS).</p> <p>Encourage property owners that are within the XXL tsunami inundation zone to purchase flood insurance that covers tsunami.</p> <p>Continue to educate and reinforce the need for flood insurance.</p>			<p><u>2020 Update:</u> City updated their flood damage prevention ordinance; including raising the BFE by one-foot, and adding content to "substantial improvement". The city complies with the NFIP.</p> <p><u>2015 Update:</u> Completed elevation project for residence on SE 1st Ave, funded by FEMA Severe Repetitive Loss program.</p>			
<b>Champion/ Responsible Organization:</b>		Planning and Community Development				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Finance			FEMA, DLCD			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator and Planning and Community Development)				
<b>Action Item Status:</b>		Ongoing				



Mitigation Action: Lincoln City #7 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Explore steps needed to qualify Lincoln City for participation in the National Flood Insurance Program's Community Rating System (CRS)	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
Lincoln City Flood Ordinance, Comprehensive Plan, FEMA Flood Insurance Study, Flood Insurance Rate Maps					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>The City estimates a high probability that flooding will occur in the future; see Table LA-10 for detail on current NFIP participation and the flood section of the city addendum and Volume II, Hazard Annex, for detail on city risk and vulnerability to the flood hazard.</p> <p>The Community Rating System (CRS) is operated under the National Flood Insurance Program (NFIP). The NFIP provides flood insurance to homes and businesses located in floodplains at a reasonable cost, and encourages the movement of development away from the floodplain. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce that risk, primarily through restrictions on new development in floodplains. CRS recognizes community efforts that go beyond the minimum standards of the NFIP. This recognition is in the form of reduced flood insurance premiums for communities that adopt such standards. CRS encourages community activities that reduce flood losses, facilitate accurate insurance rating, and promote flood insurance awareness. Source: Oregon Technical Resource Guide. July 2000. Community Planning Workshop. Eugene, OR: University of Oregon. p. 4-34. For communities with a high risk and high vulnerability to a flood, participating in the CRS can help a community reduce flood risk and save money by earning reduced insurance premiums.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
Review CRS participation requirements, and take steps toward reaching the first ranking.			<p><u>2020 Update:</u> City updated ordinance intended to raise standards to comply with CRS level 4 or 5. Need State and FEMA to do community assistance visit and evaluate Cities improvements and then apply for CRS initially.</p> <p><u>2015 Update:</u> City evaluating whether to pursue CRS rating and cost effectiveness of program Completed elevation project for residence on SE 1st Ave, funded by FEMA Severe Repetitive Loss program</p>		
<b>Champion/ Responsible Organization:</b>	Planning and Community Development				
<b>Internal Partners:</b>			<b>External Partners:</b>		
City Manager, Finance			FEMA, DLCD, OEM		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>	<b>Timeline:</b>	

Local Funding Resources, Floodplain Manager	Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator and Planning and Community Development)	
<b>Action Item Status:</b>	Ongoing	

Mitigation Action: Lincoln City #8 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Work with the owners of repetitive flood loss buildings in the city to identify cost effective mitigation strategies including consideration of relocation, elevation, or buy-out.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Lincoln City Flood Ordinance, Comprehensive Plan, FEMA Flood Insurance Study, Flood Insurance Rate Maps, Storm Water Master Plan (2015), Lincoln County Risk Report, 2015		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The City estimates a high probability that flooding will occur in the future; see Table LA-7 for detail on current NFIP participation and the flood section of the city addendum and Volume II, Hazard Annex, for detail on city risk and vulnerability to the flood hazard.</p> <p>Concentrations of pre-FIRM structures in areas subject to flooding are present in several areas along the County’s major rivers. Experience with the floods of the late 1990s showed that properly elevated structures in the flood plain performed well during major flood events, most suffering minimal if any, damage. Especially in areas which may be subject to damage during relatively high frequency flood events, elevating structures in conformance with the County’s flood hazard area codes (lowest floor at least one foot above the base flood level) is a cost effective way to reduce risk.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Assess individual properties for possible mitigation measures (elevation, acquisition, relocation) to reduce or prevent future flood losses.</p> <p>Implement mitigation measures (elevation, acquisition, relocation) for properties within the floodplain.</p> <p>Continue to educate and encourage relocation or buy out of properties.</p> <p>Relocate or elevate vulnerable structures above the estimated base flood elevation. In some cases, communities can use FEMA’s property acquisition or “buyout” program to remove structures that have repeatedly flooded in the past.  <a href="https://www.fema.gov/media-library-data/20130726-1507-20490-4551/fema_317.pdf">https://www.fema.gov/media-library-data/20130726-1507-20490-4551/fema_317.pdf</a>.</p> <p>Evaluate and implement flood mitigation projects for flood prone mobile/ manufactured homes at the mouth of Schooner Creek (Taft Mobile Homes/ 52 St.); large number of low-income population; consider developing a pump station to move flood waters across road</p>	<p><u>2020 Update:</u></p> <p>School District has demolished the former Taft Elementary school and relocated the bus barn to an area outside the flood hazard zone (see Lincoln County School District addendum for more information).</p> <p>City has mitigated two properties within the SFHA.</p>	
<b>Champion/ Responsible Organization:</b>	Planning and Community Development	

<b>Internal Partners:</b>		<b>External Partners:</b>	
Building, Public Works		DLCD, OEM, DOGAMI, FEMA	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, FEMA PDM, HMGP, FMA		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator and Planning and Community Development)		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Lincoln City #9</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Implement actions identified in the Lincoln City Stormwater Management Plan.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input checked="" type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Lincoln City Stormwater Management Plan.						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Lincoln City is recently updated its Stormwater Master Plan. Mitigation actions are identified within that plan as well.</p> <p>The Disaster Mitigation Act of 2000 requires communities to describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (201.6(b)). Implementing actions identified within the Lincoln City Stormwater Management Plan will assist the City in meeting this requirement.</p> <p>Stormwater management is a key element in maintaining and enhancing a community's livability. There is a direct link between stormwater and a community's surface and ground waters. As a community develops, the impervious surfaces that are created increase the amount of runoff during rainfall events, disrupting the natural hydrologic cycle. Without control, these conditions erode stream channels and prevent groundwater recharge. Parking lots, roadways, and rooftops increase the pollution levels and temperature of stormwater runoff that is transported to streams, rivers, and groundwater resources. Protecting these waters is vital for a great number of uses, including fish and wildlife habitat, recreation, and drinking water. Source: Eugene Stormwater Management Manual. Section 1.1</p>						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Monitor the Stormwater Plan's update process. Review the Plan's mitigation actions at one of the County's future semi-annual natural hazard mitigation meetings. Identify and assist with actions that reduce the City's vulnerability to flood-related hazards.				<u>2020 Update:</u> Stormwater master plan updated in 2020 Actions included in City's capital improvement plan.		
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning and Community Development						
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Medium to High		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Mid-Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		NHMP Steering Committee, revised 2020 (Public Works)				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Lincoln City #10</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Replace undersized culverts		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Stormwater Master Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Road closures are the most common flood-related impacts within Lincoln City. East Devils Lake Road floods frequently, and despite efforts to mitigate flood related damages by widening culverts along this road, flooding continues.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Replacing undersized culverts will lessen the effect of flooding within Lincoln City.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Inventory culverts; identify culverts in need of replacement</p> <p>Define priorities for culvert replacement in support of storm water master plan.</p>			<p><u>2020 Update:</u> Lincoln City replaced undersized culverts in the Nelscott area along highway 101.</p> <p><u>2015 Update:</u> Nelscott highway project has increased some culvert sizes considerably</p> <p>See also action #10, Stormwater Master Plan</p>			
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
			Water Districts, ODFW			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Medium to High		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Mid-Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Lincoln City Steering Committee, revised 2015				
<b>Action Item Status:</b>		Ongoing				

Mitigation Action: Lincoln City #11 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Research steep slope/ landslide ordinances; consider drafting a steep slope/ landslide development ordinance for Lincoln City	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>The steering committee determined that the city’s probability for landslide is <b>high</b> and that their vulnerability to landslide is <b>high</b>.</p> <p>Development pressure on steep slopes is an issue that Lincoln City is beginning to deal with. Likewise, the road to the City’s wastewater treatment plant has occasional slides. No significant losses have occurred, but the potential for future damages are believed to exist along this road. Potential impacts from landslides include infrastructural damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes.</p> <p>Landslides and mudflows typically accompany rainstorms on the coast. Increasing development, and logging activities may increase the likelihood that landslides will occur.</p> <p>DOGAMI maps the State Landslide Information Layer for Oregon (SLIDO); the 2012 SLIDO data shows Lincoln City landslides that have been identified on published maps. The database contains only landslides that have been located on these maps. The map shows that the history of landslide events, and landslide deposits, is moderate within the city and distributed along Devils Lake.</p> <p>Oregon Land Use Goal 7 states that local governments shall adopt or amend plan policies that avoid "development in hazard areas where the risk to people and property cannot be mitigated" and prohibit "the siting of essential facilities and special occupancy structures...in identified hazard zones.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
<p>Create modern landslide inventory and susceptibility maps and use in planning and regulations for future development. Utilize lidar mapping from DOGAMI to analyze landslide potential within Lincoln City.</p> <p>Develop/ update existing code to strengthen development regulations within areas impacted by landslide.</p> <p>Utilize the DLCD report <a href="#">Preparing for Landslide Hazards, A Land Use Guide for Oregon Communities</a> (October 2019)</p> <p>Look at existing landslide ordinances within the State and determine how ordinances should be drafted for the City.</p> <p>Control storm water in landslide-prone areas.</p> <p>Monitor ground movement in high susceptibility areas.</p> <p>Implement grading codes, especially in high</p>			<p><u>2020 Update:</u></p> <p>Some controls implemented through existing erosion control measures.</p> <p>The City has amended its natural hazards section of the zoning ordinance to reference Priest-Allan 2004 coastal erosion data and to specify standards for geo-technical reports.</p> <p>Planning and community development have proposed part two of amendments to natural hazards of the zoning ordinance.</p> <p><u>2015 Update:</u></p> <p>PUD regulations include incentives to avoid steep slopes, while not prohibiting building on these slopes</p> <p>Some control through existing erosion control measures</p> <p>The city has amended its natural hazards section of the zoning ordinance to reference the Priest-Allan 2004 coastal erosion data and to specify standards</p>		

susceptibility areas		for geo-technical reports. 7/9/2012 Planning has proposed part two of amendments to natural hazards of the zoning ordinance.	
<b>Champion/ Responsible Organization:</b>	Planning and Community Development		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Public Works		DLCD, ODF, DOGAMI	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	NHMP Steering Committee, revised 2020 (Planning and Community Development)		
<b>Action Item Status:</b>	Ongoing		



<b>Mitigation Action: Lincoln City #12</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Develop disaster plans and provide caches (food and emergency supplies) in strategic locations throughout the city to support residents and visitors.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
City Emergency Operations Plan, City Continuity of Government Plan, and City Ordinances						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Lincoln School District has disaster plans and caches on school property that serve students and employees; however, the city does not have existing disaster caches.</p> <p>The city is vulnerable to a Cascadia Subduction Zone earthquake/tsunami event. Other natural hazards such as flood, landslide and windstorm can leave populations without basic resources during emergencies.</p> <p>The city chooses to be proactive in being prepared to provide basic services when disrupted by natural hazard events.</p>						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
<p>Seek funding for storage containers that will be stocked with emergency supplies and equipment and be strategically placed in key locations.</p> <p>Make part of the City budget each year.</p> <p>Develop and implement education and usage plan for the City.</p>				<p><u>2020 Update:</u></p> <p>Funding approved, containers purchased, city ordinances have been adjusted to allow for placement of containers. Begin filling containers with emergency supplies.</p> <p>Funding and some issues with finding appropriate physical locations.</p> <p>All containers have been placed in the City and we have begun purchasing items to fill the containers.</p>		
<b>Champion/ Responsible Organization:</b>		Emergency Preparedness Coordinator				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Community Development, Public Works, Finance, Police Department; School District			ODOT, OEM, DOGAMI, Chamber of Commerce, Neighborhood Associations			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low to Medium (\$1,700 per container, emergency supplies \$40K)		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		NHMP Steering Committee, revised 2020 (Emergency Preparedness Coordinator)				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Lincoln City #13</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Integrate the NHMP into comprehensive plan.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
City Comprehensive Plan; Lincoln County Risk Report						
<b>Rationale for Proposed Action Item:</b>						
<p>Comprehensive plans provide the framework for the physical design of a community. They shape overall growth and development while addressing economic, environmental and social issues. Oregon’s statewide goals are accomplished through local comprehensive plans. State Law requires local governments to adopt a comprehensive plan and the zoning and land-division ordinances needed to put the plan into action.</p> <p>Integration of NHMPs into comprehensive plans will help to reduce a community’s vulnerability to natural hazards, support in mitigation activities, help to increase the speed in which action items are implemented and therefore the speed in which communities recover from natural disasters.</p> <p>Integration of NHMPs into comprehensive plans gives the action items identified in the NHMP legal status for guiding local decision-making regarding land use and/ or capital expenditures. .</p>						
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>			
<p>Conduct a policy crosswalk of the NHMP and the comprehensive plan to identify areas of possible integration.</p> <p>Integrate natural hazards information and policies into the comprehensive plan.</p> <p>Engage in collaborative planning and integration.</p> <p>Coordinate future NHMP and comprehensive plan reviews and updates.</p> <p>Incorporate relevant aspects of the DLCDC Tsunami Land Use Guide (<a href="#">“Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities”</a>)</p>			<p><u>2020 Update:</u></p> <p>No activity has occurred to accomplish this action. Staff resources, funding, and time are limited.</p>			
<b>Coordinating Organization:</b>		Community Development				
<b>Internal Partners:</b>			<b>External Partners:</b>			
City Council, Emergency Management			DLCDC, OEM, FEMA, OPDR			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, DLCDC			Low		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		NHMP Steering Committee, revised 2020 (Planning and Community Development)				
<b>Action Item Status:</b>		Deferred				

# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the county's website and reference on the city's social media and feedback form was provided for public comment.

During the public review period there were no comments provided.

The screenshot displays the Lincoln County Oregon website's 'Planning & Development' section. The main content area is titled 'Community Input Needed - Natural Hazards Mitigation Plan Renewal'. It includes a navigation menu on the left with links to various divisions and a 'Contact Information' section for the Department of Planning & Development, led by Onno Husing, Director. The main text explains the renewal process and provides a 'Community Member Input' section with a survey link. Below this, it lists 'Natural Hazards Mitigation Plan - September 2020 Renewal Plan' sections: Volume I - Basic Plan, Volume II - Jurisdictional Addenda (listing Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport, Yachats, Central Lincoln PUD, Lincoln Co. School District, and Seal Rock Water District), and Volume III - Appendices. A 'SUPPORTING DOCUMENTS' section lists various draft review PDFs. A 'WEB LINKS' section at the bottom points to the September NHMP separated into three sections (I, II, III).

Overlaid on the bottom left of the screenshot is a 'Natural Hazard Mitigation Plan Public Feedback Survey' form. The form includes a title, a request for feedback on the September 2020 renewal, contact information for Emergency Management (541-265-4199), a large text input field for feedback, and fields for Name (Optional), Contact Phone Number (optional), Contact Email (optional), and Zip Code (Optional). There is a checkbox for 'Send me a copy of my responses' and a 'Submit' button at the bottom.

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

<b>Mitigation Action: Lincoln City #</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# City of Newport Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Gary Halvorson, Oregon State Archives

Effective:

December 29, 2020 through December 28, 2025



Prepared for:  
City of Newport

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



FEMA

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
Grant: PDMC-PL-10-OR-2017-002  
Disaster Award Number: OR-2018-001

Additional Support Provided by:



DLCD

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**FEMA**

January 8, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Chair Jacobson:

On December 29, 2020, the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Hazard Mitigation Plan as a multi-jurisdictional local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance (HMA) grants projects through December 29, 2025, through your state:

City of Newport | Lincoln County | Lincoln County School District | City of Siletz

FEMA individually evaluates all application requests for funding according to the specific eligibility requirements of the applicable program. Though a specific mitigation activity or project identified in the plan may meet the eligibility requirements, it may not automatically receive approval for FEMA funding under any of the aforementioned programs.

Approved mitigation plans may be eligible for points under the National Flood Insurance Program's Community Rating System (CRS). For additional information regarding the CRS, please visit: [www.fema.gov/national-flood-insurance-program-community-rating-system](http://www.fema.gov/national-flood-insurance-program-community-rating-system) or contact your local floodplain manager. Over the next five years, we encourage your communities to follow the plan's schedule for monitoring and updating, and to develop further mitigation actions. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at (503) 378-2911, who locally coordinates and administers these efforts.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

Enclosure

cc: Amie Bashant, Oregon Office of Emergency Management

EG:vl

**CITY OF NEWPORT**

**RESOLUTION NO. 3906**

**ADOPTING THE CITY OF NEWPORT  
REPRESENTATION IN THE UPDATES TO THE  
LINCOLN COUNTY MULTI-JURISDICTIONAL  
NATURAL HAZARDS MITIGATION PLAN**

**WHEREAS**, the City of Newport recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan ("NHMP") is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the City of Newport has fully participated in the FEMA prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the City of Newport has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Newport to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the City of Newport addendum to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities; and

**WHEREAS**, the NHMP is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

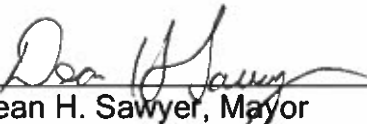
**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

**WHEREAS**, City of Newport adopts the NHMP and directs the City Manager to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

**THE CITY OF NEWPORT RESOLVES AS FOLLOWS:**

1. The City of Newport adopts the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and
2. The City of Newport will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

Adopted by the City Council of the City of Newport this 4<sup>th</sup> day of January, 2021.

  
\_\_\_\_\_  
Dean H. Sawyer, Mayor

ATTEST:

  
\_\_\_\_\_  
Margaret M. Hawker, City Recorder

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## Purpose

This is the 2020 update of the City of Newport addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP). The City of Newport's original addendum to Lincoln County's NHMP was completed and approved by FEMA in 2009 (updated in 2015). This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation, and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Newport's addendum are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Newport adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **January 4, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the City's addendum on **December 29, 2020**. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The City concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## **Process and Participation**

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Department of Land Conservation and Development, Oregon Office of Emergency Management (OEM), Lincoln County, and Newport to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal-Year 2017 (FY17) Pre-Disaster Mitigation (PDM) Competitive Grant Program OR-2018-001 (PDMC-PL-10-OR-2017-02).



Members of the Newport NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Newport addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Newport NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Newport Community Development Director serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Lincoln County NHMP in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Planning Director and Emergency Manager).

Representatives from the City of Newport steering committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the city's addendum, with focus on the plan's risk assessment and mitigation strategy (action items).

The current version of the addendum reflects changes decided upon at the designated meetings and through subsequent work and communication with OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include revisions to the city's Risk Assessment and Hazard Identification sections, Action Items, and Community Profile.

The Newport Steering Committee was comprised of the following representatives:

- Convener, Derek Tokos, Community Development Director
- Rachel Cotton, Associate Planner
- Regina Martinez, Planner
- Tim Gross, Public Works Director

### Public Participation

Public participation was achieved by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment via a survey administered by IPRE (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The City Council will be responsible for adopting the Newport addendum to the Lincoln County NHMP. This addendum designates a steering committee and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Newport addendum on an annual schedule; the county is meeting on a quarterly basis and will provide opportunities for the jurisdictions (cities and special districts) to report on NHMP implementation and maintenance during their meetings. The city's Community Development Director will serve as the convener and will be responsible for assembling the

steering committee. The steering committee will be responsible for identifying new risk assessment data, reviewing status of mitigation actions, identifying new actions, and seeking funding to implement the city's mitigation strategy (actions). The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and priority actions in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Where possible, Newport will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Newport's acknowledged comprehensive plan is the City of Newport Comprehensive Plan. The City implements the plan through the Community Development Code.

## **Existing Plans and Policies**

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies

already in existence have support from residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

Newport's Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the addendum helps identify what resources already exist that can be used to implement the action items identified in Newport's Addendum. Implementing the city's mitigation actions through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the city's resources.

The following are Newport's existing plans and policies that relate to natural hazards:

- **Comprehensive Plan, last amended 2020:** A document stating the general, long-range policies that will govern a local community's future development.

*Relation to Natural Hazard Mitigation:* Contains city-specific information regarding natural hazards within the city's jurisdictional boundaries. Ordinance 2166 (2020) updated the Natural Features Section of the Comprehensive Plan related to tsunami's and earthquakes.

- **Zoning Ordinance, Newport Municipal Code Title XIV:** Establishes land use zones to regulate the location of building structure and the use of land within the City of Newport.

*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the placement and construction of the buildings. Issues such as floodplain development (Flood Hazard Area, Ch. 14.20), fire resistant materials, geologic hazards (Geologic Hazard Overlay, Ch. 14.21), etc. The City has adopted Ordinances No. 2105 and No. 2121 to establish standards for the construction of vertical evacuation structures in tsunami inundation areas and is in the process of adopting Ordinance No. 2166: establishing a Tsunami Hazards Overlay Zone to minimize risks to essential facilities, and special occupancy structures serving high risk populations within a tsunami inundation area. Further, the Tsunami Hazards Overlay Zone creates design standards for new, or substantial improved, multifamily, commercial, industrial, or institutional development to enhance resiliency by requiring all-weather pedestrian access from buildings to adjacent rights-of-way or evacuation routes, directional signage to evacuation routes, and the posting of emergency evacuation information within buildings.

- **Subdivision Ordinance:** An ordinance prescribing regulations governing the subdivision of land.

*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the subdivision of parcels. Issues such as floodplain development, protection from fire, etc.

- **Newport Transportation System Plan, 2012** (update in process): Guides the management of existing transportation facilities and the design and implementation of future facilities.

*Relation to Natural Hazard Mitigation:* Mitigation principles and strategies can be incorporated into Transportation Systems Plans to protect key transportation infrastructure from natural hazards.

- **Newport Access Management Plan, 1997:** The purpose of this document is to define an effective access management program that will enhance mobility and improve the safety of roadways in the City of Newport

*Relation to Natural Hazard Mitigation:* Mitigation principles and strategies can be incorporated into access management plans to protect key transportation infrastructure from natural hazards.

- **Lincoln County Community Wildfire Protection Plan, 2018:** Assists Newport clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.

*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

## Government Structure

The City Council is the policy making body for the City of Newport. Members of the Council serve as Council representatives on many boards and commissions of the city, other local governments, agencies, and the state. The mayor appoints all city boards and commissions. The Mayor and Councilors appoint the city administrator, city attorney, and municipal judge. The city manager supervises department directors, implements policies, goals and objectives of the City Council and oversees the protection of organization assets. The city manager is often required to be the final administrative arbitrator of the rules and ordinances that govern the city.

The City of Newport currently staffs the following departments:

**City Manager's Office:** The city manager supervises department directors, implements policies, goals and objectives of the City Council and oversees the protection of organization assets. The city manager is often required to be the final administrative arbitrator of the rules and ordinances that govern the city. In this roll, the city manager must maintain a careful balance between being an ombudsman for a constituent, protecting the broader public interest, risk management for the organization and ensuring consistency and fairness in the application of city policy.

**Community Development:** The Community Development Department is responsible for land use planning, zoning administration, urban renewal, building inspection, development code enforcement, building and electrical code compliance, and historic preservation. Currently the Community Development Department houses four staff members, a Community Development Director, a Building Official, an Associate Planner, and an Administrative Secretary.

**Public Works Department:** Major areas of responsibility for the City of Newport's Public Works Department include planning, designing, constructing, operating, maintaining and improving the city's utility and transportation systems. Currently the Public Works Department has 33 employees, the supervisory wing of which includes a public works

director/city engineer, assistant city engineer, administrative secretary, streets division superintendent, wastewater division superintendent, and a water division superintendent.

**Finance Department:** The Finance Department is the hub of all financial activities for the city. Billings and receipts for utilities and assessments, lien searches and customer service are all included in this department. This department provides central accounting services for all city departments within the City of Newport. The Finance Department is responsible for accounts receivable, accounts payable, risk management, purchasing, and payroll. The Finance Department is also responsible for coordination of the city's annual budget and audit processes, grant administration, fixed assets, financial reporting and investment of city funds. Currently the Finance Department has six employees including the finance director.

**Police Department:** The Newport Police Department provides law enforcement services for the city's residents and visitors 24 hours every day and places emphasis on responding to the community's calls for service, investigating crimes and traffic enforcement. Currently, the Police Department has 20 sworn officers, five civilian staff members, and 40 volunteers.

**Fire Department:** The Newport Fire Department serves the citizens of the City of Newport, the Newport Rural Fire Protection District, and the community's visitors and guests. The Fire Department consists of 12 career staff and over 35 volunteer firefighters. Services provided include fire suppression, fire prevention, emergency medical services, rescues, and mutual aid to surrounding communities.

**Parks and Recreation:** The Newport Parks and Recreation Department maintains the City's Recreation Center, 60+ Senior Center, Aquatic Facility (under construction), and various parks, trails, and open spaces. Currently, the Parks and Recreation Department has 20 full-time equivalent employees.

**Library:** The Library Department operates the City's municipal library building. Currently, the department employs 12 full time equivalent staff members.

**Airport:** The City of Newport operates a municipal airport that includes a fixed base operations building, two runways (3,000 and 5,400 feet in length), instrument control aids, taxi-ways, hangars and a fueling station. The airport is operated by three full time employees.

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review. Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the City's website: <https://www.newportoregon.gov/>

In addition, natural hazards information dissemination is conducted throughout the year when opportunities present themselves via the city offices and website.

## NHMP Maintenance

The Lincoln County Multijurisdictional Natural Hazard Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's action items were first developed through a two-stage process during the 2009 NHMP development and revised in 2015. In stage one, OPDR facilitated a work session with the steering committee to discuss the city's risk and to identify potential issues. In the second stage, OPDR, working with the local steering committee, developed potential actions based on the hazards and the issues identified by the steering committee. During the 2019-2020 update process OPDR re-evaluated the Action Items with the county and local steering committees and updated actions, noting what accomplishments had been made and if the actions were still relevant; any new action items were identified at this time. For additional information see the discussion near the end of this document.

The City's actions are listed in Table NA-1. For more detailed information on each action, see the action forms within Attachment A of this addendum.

In addition, there are 14 County Action Items that include the city as an "Affected Jurisdiction" (Table NA-14). For more detailed information on the county actions that involve city participation, see Volume I, Section 3 and the action item forms within Volume III, Appendix A.

### Priority Action Items

Table NA-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in bold text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action.

**Table NA-I City of Newport Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing
Newport #1	Secure the City of Newport’s existing domestic water supply.	Public Works	H	Short
Newport #2	Implement structural mitigation projects as recommended in the engineering report assessing the condition and mitigation options for the Big Creek Dams (upper/ lower).	Public Works	H	Medium
Newport #3	Seismically retrofit vulnerable structures and critical facilities.	Community Development, Public Works	H	Long
Newport #4	Implement actions identified in the Stormwater element of the Newport Comprehensive Plan.	Public Works	L to H	Medium
Newport #5	Continue compliance with the National Flood Insurance Program	Community Development	L	Ongoing
Newport #6	Pursue partnerships with DOGAMI, Lincoln County and others to improve understanding of areas subject to coastal erosion and landslides and implement actions to reduce vulnerability.	Community Development	M to H	Ongoing
Newport #7	Educate residents, tourists, and/or business owners within the tsunami inundation zone on evacuation routes and tsunami assembly areas	Fire Department	L	Ongoing
Newport #8	Encourage electric utility providers to convert existing overhead lines to underground lines.	Community Development, Public Works	M to H	Ongoing
Newport #9	Develop and implement education programs aimed at mitigating risk posed by hazards.	Fire Department	L	Ongoing
Newport #10	Assess and determine appropriate mitigation projects for culverts on Nye Creek.	Public Works	M	Long
Newport #11	Establish secondary power distribution system	Central Lincoln PUD	M to H	Medium
Newport #12	Increase reliability of emergency network communication systems and data redundancy	Information Technology	M	Long
Newport #13	Create and adopt a Tsunami Hazard Overlay Zone (THOZ) and Tsunami Evacuation Facilities Improvement Plan (TEFIP)	Community Development	M	Short

Source: City of Newport NHMP Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)



# Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure NA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure NA-1 Understanding Risk**



## Hazard Analysis

The Newport NHMP steering committee reviewed and revised the plan’s Hazard Analysis and Risk Assessment section. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in probability, vulnerability, and risk from natural hazards unique to the City of Newport, which are discussed throughout this addendum.

Table NA-2 shows the hazard analysis matrix for Newport listing each hazard in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

Two catastrophic hazard (Cascadia Subduction Zone earthquake and tsunami) and three chronic hazards (windstorm, winter storm (snow/ice), and landslide) rank as the top hazard threats to the City (Top Tier). Coastal erosion, drought, and coastal and riverine floods comprise the next highest ranked hazards (Middle Tier). Wildfire, distant tsunami, tornado, crustal earthquake, and volcanic event comprise the lowest ranked hazards (Bottom Tier).

**Table NA-2 Hazard Analysis Matrix – City of Newport**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Winter Storm (Snow/Ice)	18	50	90	70	228	#2	
Landslide	20	40	80	70	210	#3	
Earthquake (Cascadia)	10	50	100	49	209	#4	
Tsunami (Local)	2	40	100	49	191	#5	
Coastal Erosion	20	20	70	70	180	#6	Middle Tier
Drought	16	45	60	56	177	#7	
Flood (Coastal)	20	15	50	70	155	#8	
Flood (Riverine)	20	10	40	70	140	#9	
Wildfire	10	15	40	49	114	#10	Bottom Tier
Tsunami (Distant)	10	15	50	35	110	#11	
Tornado	8	10	30	56	104	#11	
Earthquake (Crustal)	10	20	40	21	91	#12	
Volcanic Events	2	5	40	7	54	#13	

Source: City of Newport NHMP Steering Committee (2020)

Table NA-3 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Lincoln County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings).

**Table NA-3 Probability and Vulnerability Comparison**

Hazard	Newport		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	High	Moderate	High	Low
Drought	High	High	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	High	Low	High	Moderate
Flood (Riverine)	High	Low	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	High	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	Moderate	Low	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	High	High	Moderate

Source: City of Newport NHMP Steering Committee and Lincoln County NHMP Steering Committee (2020)

## Community Characteristics

Table NA-4, Appendix C (Volume III), and the following section provide information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2012 and 2019 the City grew by 135 people (1%).<sup>1</sup> According to the State’s official coordinated population forecast, between 2019 and 2040 the City’s population is forecast to grow by 29% to 13,241.<sup>2</sup> Median household income decreased by 21% between 2012 and 2017.<sup>3</sup> The City has an educated population with 92% of residents 25 years, and older holding a high school degree, 28% have a bachelor’s degree or higher. As of 2019, Newport and Lincoln County School District have high school graduation rates of 82% and 76% respectively.

Development in Newport spans a total of 10.6 square miles. Newport’s city limits and urban growth boundary extend north and south along Highway 101 and east and west along US 20 (see Figure NA-2). Newport includes industrial and commercial development but is zoned primarily residential. Populated areas outside city limits include Idaho Point, the neighborhood of Holiday Beach, and a commercial area in South Beach near SE 42<sup>nd</sup> St. Commercial development is concentrated along both highway corridors, in the historic Bayfront and Nye Beach areas. Portions of the city north of the Yaquina Bay Bridge are substantially developed, meaning most of the City’s growth opportunities lie south of the bridge. The downtown core includes government offices and additional retail use and is concentrated between Olive and Fall Street. The downtown grid of streets in Newport is the

<sup>1</sup> Portland State University, Population Research Center, "Annual Population Estimates", 2019.

<sup>2</sup> Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

<sup>3</sup> Social Explorer, Table T57, U.S. Census Bureau, 2013-2017 and 2008-2012 American Community Survey Estimates.

basic footprint of the original town's extent. Newport's high school, middle school, and two elementary schools are in the northeast portion of the city. The fairgrounds and several ball fields are also in this same vicinity. There is a heavy concentration of established residential development on both sides of the highway between NE 25th Street and the Yaquina Bay Bridge.

The city's Comprehensive Plan identifies land use needs within the city and the Urban Growth Boundary. The city's Comprehensive Plan identifies land use needs within the city and its urban growth boundary. Figure NA-2 shows the City of Newport's comprehensive plan map.

Since the previous NHMP (2015) the city has annexed 323 acres surrounding the Big Creek Reservoirs along with adjoining portions of Big Creek Road. In addition, the OMSI Coastal Discovery Center at Camp Gray opened in 2016 (3400 SE Abalone St), Samaritan Pacific Hospital was remodeled (Phase I 2019, Phase II 2020), OSU opened their Marine Studies Initiative Building including a vertical evacuation structure and assembly area (2020 SE Marine Science Dr), Wilder subdivision was constructed off SE 40<sup>th</sup> St and Harborton St in South Beach (40 single family home sites and 28 multifamily rental units), Surf View Village constructed 110 affordable rental housing units at NE 60<sup>th</sup> St and Hwy 101, Wyndhaven Ridge is constructing 66 market rate rental units at NE 36<sup>th</sup> St and Harney St (occupancy expected 2021) and the Yaquina Industrial Park is under construction (1430 SE Bay Blvd/International Terminal). New development has complied with the standards of the [Oregon Building Code](#), and the city's development code including their floodplain ordinance.

## Economy

Newport's commercial areas developed along primary routes and residential development followed nearby (see Figure NA-2).

Newport is the largest incorporated community in Lincoln County. Most workers residing in the city (55%, 2,591 people) travel outside of the city for work primarily to Portland metro area, Salem, Lincoln City, Corvallis, Toledo, and Albany.<sup>4</sup> A significant population of people travel to the city for work, (69% of the workforce, 4,828 people) primarily from Portland metro area, Salem, Lincoln City, Corvallis, Toledo, and Albany.<sup>5</sup>

Just over 56% of the resident population 16 and over is in the labor force (4,749 people) and are employed in a variety of occupations including professional and related (17%), office and administrative support (12%), food preparation and serving (11%), management, business, and financial operations (11%), and sales (10%) occupations.<sup>6</sup>

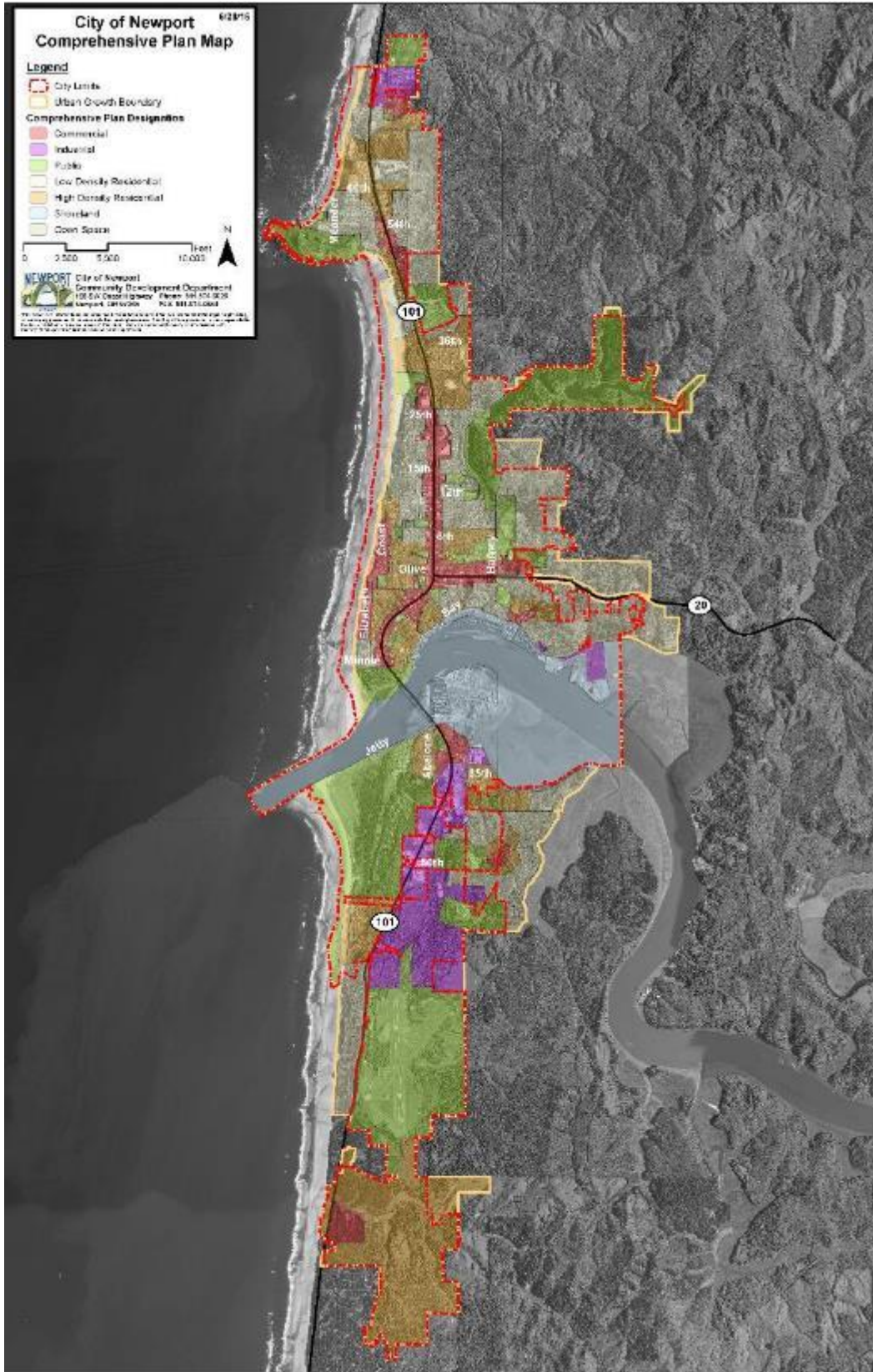
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<sup>4</sup> U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2017). Longitudinal-Employer Household Dynamics Program, accessed on April 25, 2020 at <https://onthemap.ces.census.gov>.

<sup>5</sup> U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2017). Longitudinal-Employer Household Dynamics Program, accessed on April 25, 2020 at <https://onthemap.ces.census.gov>.

<sup>6</sup> Social Explorer, Tables A17008 & A17002, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

Figure NA-2 Comprehensive Plan Map



Source: City of Newport

**Table NA-4 Community Characteristics**

Population Characteristics		
<b>2012 Population</b>	10,150	
<b>2019 Population</b>	10,285	
<b>2040 Forecasted Population</b>	13,241	
Race (non-hispanic or latino) and Ethnicity (Hispanic)		
White	75%	
Black/ African American	1%	
American Indian and Alaska Native	1%	
Asian	1%	
Native Hawaiian and Other Pacific Islander	1%	
Some Other Race	0%	
Two or More Races	5%	
Hispanic or Latino (of any race)	17%	
<b>Limited or No English Spoken</b>	611	6%
Vulnerable Age Groups		
Less than 15 Years	1,705	17%
65 Years and Over	2,399	23%
Age Dependency Ratio		3.95
Disability Status		
Total Population	1,544	15%
Children (Under 18)	29	1%
Working Age (18 to 64)	774	14%
Seniors (65 and older)	741	31%
Income Characteristics		
Households by Income Category		
Less than \$15,000	634	14%
\$15,000-\$29,999	1,005	22%
\$30,000-\$44,999	806	18%
\$45,000-\$59,999	500	11%
\$60,000-\$74,999	483	11%
\$75,000-\$99,999	443	10%
\$100,000-\$199,999	576	13%
\$200,000 or more	73	2%
<b>Median Household Income</b>		\$39,870
Poverty Rates		
Total Population	1,944	19%
Children (Under 18)	649	32%
Working Age (18 to 64)	1,093	19%
Seniors (65 and older)	202	9%
Housing Cost Burden (Cost > 30% of household income)		
Owners with Mortgage	460	20%
Renters	1,029	46%

Source: U.S. Census Bureau, 2013-2017 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2019. Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

Housing Characteristics		
Housing Units		
Single-Family	3,461	61%
Multi-Family	1,689	30%
Mobile Homes	573	10%
Year Structure Built		
Pre-1970	1,918	34%
1970-1989	2,193	38%
1990-2009	1,525	27%
2010 or later	87	10%
Housing Tenure and Vacancy		
Owner-occupied	2,300	40%
Renter-occupied	2,220	39%
Seasonal	865	15%
Vacant	338	6%

The city's topography is both a mix of relatively flat areas and steeper sloped areas such as those near Yaquina Bay and along the Ocean, and the Coast Range is east of the city. Nearby bodies of water include the Pacific Ocean, Yaquina Bay, and Big Creek Reservoir.

The climate in Newport is moderate. Average monthly temperatures range from lows of 39-42° F (November through April) to highs of 65° F (July through September) degrees. The driest months are July and August (average about 0.8 inches of precipitation per month) the wettest months are November through January (average about 10.5 inches of precipitation per month). Newport has an average annual precipitation of approximately 67.5 inches (71%, 47.6 inches fall November through March).

## Asset Identification

The following assets identified by the City of Newport were first gathered from the Asset Identification meetings held with community members in 2007. These assets were confirmed and updated by the City steering committee during the 2019-2020 update process.

## Cultural and Historic Resources

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The National Register of Historic Places and the State Historic Preservation Office lists historic sites and properties within the city:<sup>7</sup>

- Yaquina Head Lighthouse,
- Charles and Theresa Roper House,
- Old Yaquina Bay Lighthouse, and
- New Cliff House.

Additional recreational amenities and attractions (among many) include:

- Newport's Bayfront,
- Nye Beach Commercial District
- Agate Beach Golf Course,
- Mariner's Square,
- Newport Performing Arts Center,
- Newport Visual Arts Center,
- Hatfield Marine Science Center,
- Oregon Coast Aquarium, and
- fishing and sightseeing charters.

## Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to act in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and wastewater treatment facilities.

Newport has the following critical facilities (**bold** indicates facility was included in the Risk Report [DOGAMI, O-20-11](#)):

- Three fire stations:
  - **Main Station 3200:** 245 NW 10th St
  - South Beach Station 3300: 145 SE 72<sup>nd</sup> St
  - **Agate Beach Station 3400:** 225 NE 73<sup>rd</sup> St

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<sup>7</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 17, 2020.

- One hospital and two clinics
  - **Samaritan Pacific Communities Hospital:** 930 SW Abbey St
  - Samaritan Walk-in Clinic: 740 SW 9<sup>th</sup> St
  - Samaritan Health Center: 1010 SW Coast Hwy
- Four Schools
  - **Sam Case Elementary:** 459 NE 12<sup>th</sup> St
  - **Yaquina Elementary:** 351 SE Harney St
  - **Newport Middle:** 825 NE 7<sup>th</sup> St
  - **Newport High:** 311 NE Eads St (West), 322 NE Eads St (East)
- **City Police Department/City Hall:** 169 SE Coast Hwy
- **City Public Works:** 845 NE 3<sup>rd</sup> St
- **Water treatment plant/Big Creek Reservoir:** 2810 NE Big Creek Rd
  - See [Utility Lifelines](#) for additional system details
- Wastewater plant (and collection system): SE 50<sup>th</sup> St
  - See [Utility Lifelines](#) for additional system details
- **Municipal airport:** 135 SE 84<sup>th</sup> St
- **Port of Newport:** 1510 SE Bay Blvd/ SE Bay Blvd
- **County Planning:** 210 SW 2<sup>nd</sup> St
- **County Public Works:** 880 NE 7<sup>th</sup> St
- **County Sheriff's Office:** 225 W Olive St
- **Oregon National Guard Armory:** 541 SW Coast Hwy
- **Oregon State Police:** 52 NE 73<sup>rd</sup> St

## Transportation

Mobility plays an important role in Newport, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within the City. Newport is also served by Lincoln County Transit Routes 491, 493, 495, and 497 with service running seven days a week with stops in Newport. The Coast to Valley Express provides public transit service between Newport and Corvallis. Caravan Airport Transportation also provides service from the City to Portland International Airport.

### Roads/Seismic lifelines

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>8</sup>

System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more

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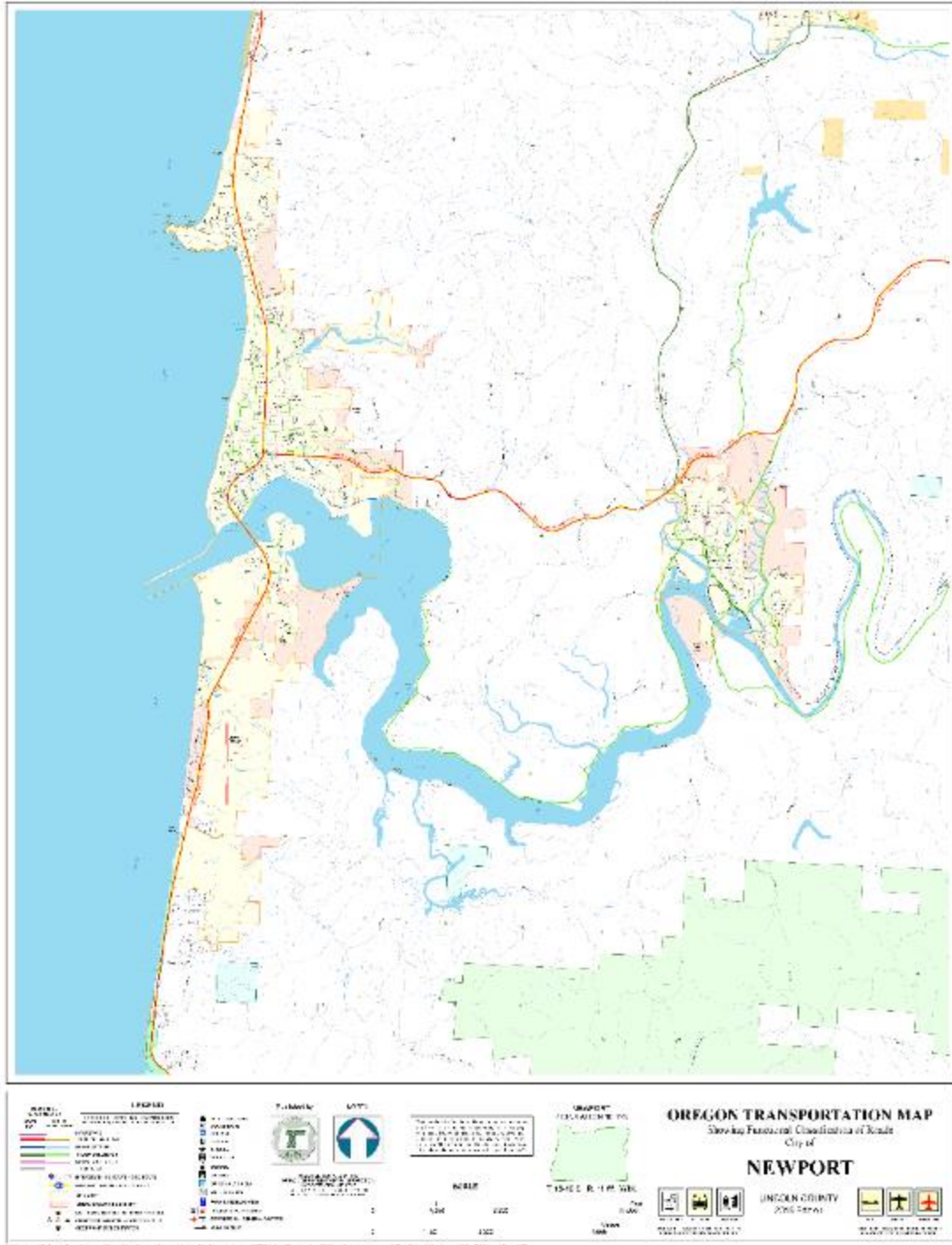
<sup>8</sup> Oregon Department of Transportation. Oregon Seismic Lifeline Evaluation, Vulnerability Synthesis, and Identification, *Oregon Seismic Lifeline Routes*, May 15 2012.



locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

Highway 101 (Tier I) is the major north-south transportation route through the City (see Figure NA-3). Highway 20 (Tier III) and Highway 18 (Tier I, north of Lincoln City) are the major east-west transportation routes connecting the coast to the Willamette Valley.

**Figure NA-3 Newport Functional Classification of Roads**



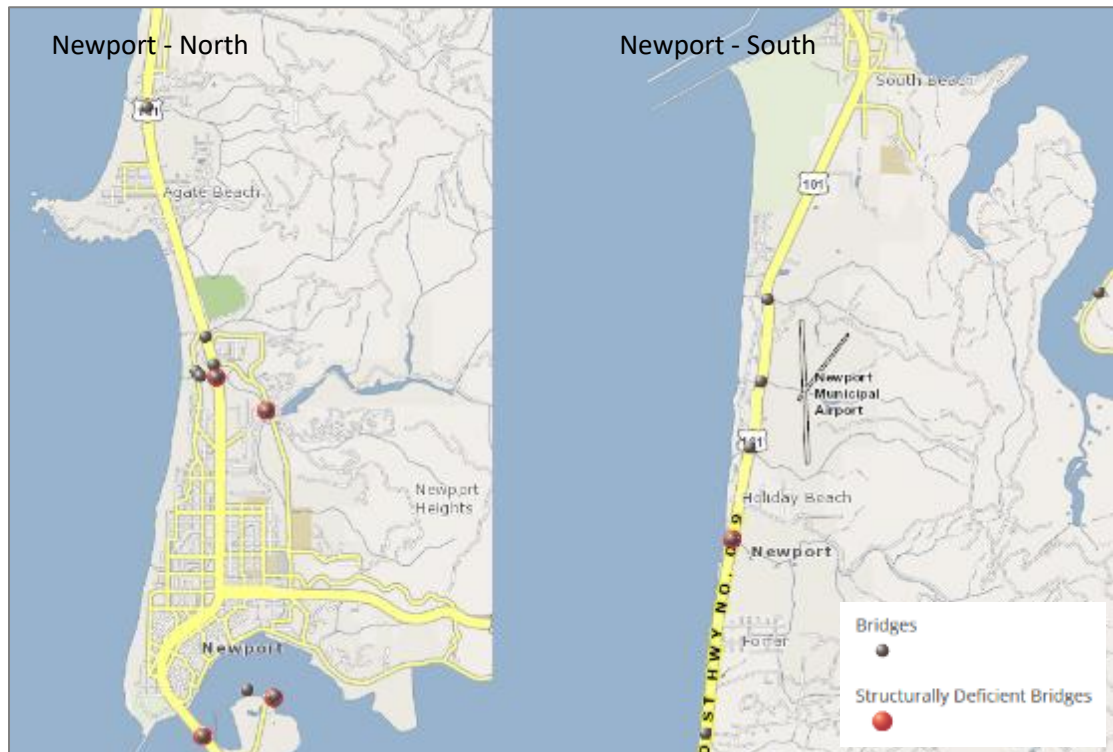
Source: Oregon Department of Transportation - [Link](#)

## Bridges

Because of earthquake risk, the seismic vulnerability of the city's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries are unable to transport goods. Bridges within the city that are critical or essential include (see Figure NA-4):

- (culvert) Schooner Creek, US 101 (1947), (Bridge ID 04153A)
- (culvert) Little Creek, US 101 @ MP 138.51 (1952), (Bridge ID 01160A)
- (ped underpass) Ped Underpass/Machinery Pass, US 101 (1952), (Bridge ID 07412)
- (culvert) Big Creek, US 101 (1952), (Bridge ID 04155A) – Structurally Deficient
- (bridge) Big Creek, Big Creek Rd (1961), (Bridge ID 012087) – Structurally Deficient
- (bridge) Yaquina Bay Bridge (1934), (Bridge ID 01820) – Structurally Deficient
- (culvert) Henderson Creek, US 101 (1928), (Bridge ID 04157)

**Figure NA-4 Oregon Bridges and Structurally Deficient Bridges**



Source: Oregon Department of Transportation, ODOT TransGIS, accessed August 3, 2020

More information on Seismic Design of bridges is on the ODOT website:

<https://www.oregon.gov/odot/Bridge/Pages/Seismic.aspx>

## Railroads

There are no railroads in Newport.

## Airports

The Newport Municipal Airport is the nearest airport (located in South Beach). The city has no commercial service airports. The nearest commercial airports are in Eugene and Portland.

## Ports

The International Port of Newport is located on SE Bay Blvd. The Port accommodates a wide variety of users to retain and create jobs and increase economic development.

## Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Generally, the network of electricity transmission lines running throughout the city is operated by Central Lincoln PUD. The Williams Gas Pipeline provides natural gas that is delivered to customers in the city by Northwest Natural Gas. These lines may be vulnerable as infrequent natural hazards, like earthquakes, could disrupt service to natural gas consumers across the region.

The city water, wastewater, and stormwater (culvert) systems include the following:

### Water Infrastructure

- Water treatment plant/Big Creek Reservoir (upper/lower): 2810 NE Big Creek Rd

#### Holding Tanks, storing 9.25 million gallons (MG):

- Main Tank #1 (2.0 MG), built 1972
- Main Tank #2 (2.0 MG), built 1978
- Smith Tank (0.25 MG), built 1958 (refurbished in late 1990s)
- Yaquina Heights Tank (1.6 MG), built 1993
- South Beach Tank (1.3 MG) built 1998
- (2) City Shops Tanks (1.1 MG), built 1910
- 71st Street Tank (1.0 MG), built 2015

#### Pump Stations:

- Candletree Pump Station, NE 7<sup>th</sup> Street
- NE 54<sup>th</sup> Street Booster Pump Station, NE 54<sup>th</sup> Street
- Yaquina Heights Booster Pump Station, at Yaquina Heights Tank
- Lakewood Booster Pump Station, NE Lakewood Drive
- Salmon Run Booster Pump Station, NE 71st Street
- OCCC Booster Pump Station, SE 40th Street

### Wastewater Infrastructure

- Wastewater Treatment Plant: SE 50<sup>th</sup> St
  - Lift Station (“HMSC Pump Station”), SE Marine Science Dr
  - Lift Station (“Bay Front Pump Station”), SW Bay Blvd
  - Lift Station (“Nye Beach Pump Station”), NW Beach Dr
  - Lift Station (“Big Creek Pump Station”), NW Oceanview Dr
  - Lift Station (“Northside Pump Station”), NW Nye St
  - Lift Station (“NW 48<sup>th</sup> Street Pump Station”), NW 48<sup>th</sup> St
  - Lift Station (“Schooner Creek Pump Station”), NW 68<sup>th</sup> St
  - Lift Station (“Influent Pump Station”), SE 50<sup>th</sup> St
  - Lift Station (“Running Springs Pump Station”), SE Running Springs Dr

### Stormwater Infrastructure (e.g. Culverts)

The City of Newport's existing storm drain system encompasses 43 drainage basins and includes approximately 32 miles of gravity piping in a range of sizes from 6-inches to 144-inches diameter. Pipes are constructed from a variety of materials including concrete, corrugated steel, polyvinyl chloride (PVC), high density polyethylene (HDPE), and others.

## **Community Organizations and Programs**

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The countywide community organizations that are active within the city and county and may be potential partners for implementing mitigation actions can be found in Appendix C: Community Profile.

## **Lincoln County School District**

The Lincoln County School District has four schools in Newport including Sam Case Elementary, Yaquina Head Elementary, Newport Middle, and Newport High. For more information on School District assets see their addendum in Volume II.

## **Hazard Profiles**

The following sections briefly describe relevant information for each profiled hazard. More information on Lincoln County hazards can be found in Volume I, Section 2 *Risk Assessment* and in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the City of Newport. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The City hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

## **Coastal Erosion**

The steering committee determined that the city's probability for coastal erosion is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to coastal erosion is **moderate**, meaning it is expected that between 1% and 10% of the City's population or property could be affected by a major coastal erosion event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 describes the characteristics of coastal erosion hazards, as well as the history, location, extent, and probability of a potential event. Coastal erosion is a natural process that continually affects coastal areas; in Newport and elsewhere along the Pacific, coastal erosion becomes a hazard when lives and properties are at risk of death, injury, or damage. Coastal erosion is typically a gradual process, which can be greatly accelerated in the event of a storm or climate factors that increase the potential for coastal erosion. One catastrophic event has occurred within the City of Newport: Jump off Joe. In this event, a landslide that began moving in the 1920's was accelerated by ocean wave attack in the mid 1940's. Roadways, drainpipes, and 15 houses were moved seaward.

Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the risk of coastal erosion is expected to increase due to sea level rise and changing wave dynamics.

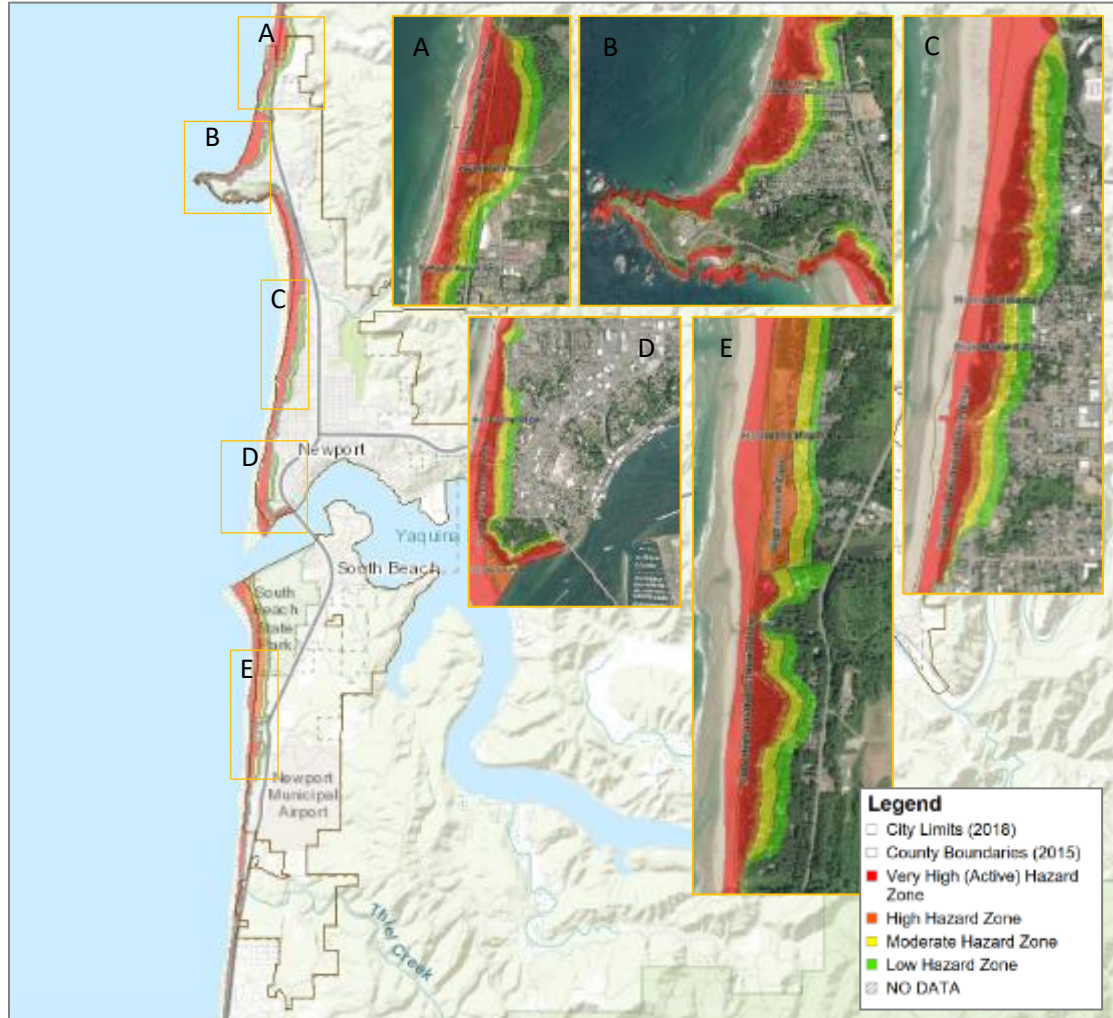
## Vulnerability Assessment

Records of damages are not available at this time; however, events may have occurred in tandem with previous storms. The Newport Steering Committee identified the areas near Yaquina Head Lighthouse and Moolack Beach as particularly vulnerable spots.

Potential community-related impacts, including shoreline reduction, economic (tourism-related) impacts, and property/infrastructural damage, are adequately described within the Volume I, Section 2 of the NHMP. See Figure NA-5 for locations of the city's coastal erosion hazard along coastal bluffs on the city's western edge.

To address the risk for coastal erosion, and other geologic hazards (earthquakes, landslides, expansive soils, fault displacement and subsidence), Newport enacted Ordinance No. 2017 amending the zoning ordinance Geologic Hazards Overlay section effective August 17, 2011.

**Figure NA-5 Coastal Erosion Hazard**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion. The Risk Report provides a distinct profile for Newport.

The Risk Report provides an analysis of dune-backed beaches and bluff-backed shorelines to identify the general level of susceptibility due to storm-induced erosion, sea level rise, and subsidence due to CSZ earthquake event. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Newport may be impacted by profiled coastal erosion scenario (Table NA-5).

Just under three percent of the City's population (260 people) may be displaced by coastal erosion. These people are expected to have mobility or access issues and/or may have their residences impacted by coastal erosion. Properties that are most vulnerable to the coastal erosion hazard are those that are developed in an area of steep dunes or cliffs. About five percent (264 buildings) of all buildings (residential, commercial, industrial) are exposed to

the high coastal erosion hazard zone. The value of exposed buildings is \$100.7 million (about 8% of total building value). It is important to note that impact from coastal erosion may vary depending on areas that are impacted during an event.

**Table NA-5 Potentially Displaced Residents and Exposed Buildings, Coastal Erosion**

Community Overview: Newport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
9,989		5,602		16	1,243,095,000	
Exposure Analysis: Coastal Erosion High Hazard Scenario						
Potentially Displaced Residents		Exposed Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
260	2.6%	264	4.7%	0	100,712,000	8.1%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>9</sup>

There are no critical facilities exposed to the profiled coastal erosion scenario.

## Drought

The steering committee determined that the city’s probability for drought is **high**, meaning at least one incident is likely within the next 10 to 35 years and that their vulnerability to drought is **high**, meaning more than 10% of the city’s population or property could be affected by a major drought event. *These ratings have increased since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of drought hazards, as well as the history, location, extent, and probability of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared coastal communities from the effects of a drought.

Newport’s primary water supply comes from the Big Creek Reservoir, and additional supply is available through water rights to the Blattner Creek and Siletz River. The city has two storage reservoirs, and seven tanks with about 9 million gallons of treated water storage capacity. During hot summer months the only water right that is capable of providing the City with water is from the Siletz River, at 6.0 cfs, due to inadequate flows in Big Creek and Blattner Creek; system demand during these times is met through stored water.<sup>10</sup> The water treatment plant has allowed the city to treat about 7 million gallons per day (up to 10 million) which will enable Newport to meet future demands. The Oregon Water Resources Department, coordinates with municipalities to implement water conservation or curtailment plans when drought emergencies are declared. The city’s [Water System Master](#)

<sup>9</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>10</sup> City of Newport, Water System Master Plan (2008)

[Plan](#) addresses conservation and rationing protocols and includes a [Water Management and Conservation Plan](#).

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## Vulnerability Assessment

Due to insufficient data and resources, Newport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks apply to humans and resources. Industries important to the City of Newport’s local economy such as fishing have historically been affected, and any future droughts would have tangible economic and potentially human impacts.

In addition to reduced water supplies, a drought will increase the chances of wildfire and significantly reduce tourism activities. If hotels, for example, are unable to accommodate guests, the city’s economy would greatly suffer. Currently, the city has a water curtailment plan that will go into effect in the event of a drought.

## Earthquake

The steering committee determined that the city’s probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a CSZ event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major CSZ earthquake event. The steering committee determined that the city’s probability for a crustal earthquake event is **low**, meaning one incident may occur within the next 100 years and that their vulnerability to a Crustal Earthquake event is **moderate**, meaning that between 1% and 10% of the city’s population or property could be affected by a major crustal earthquake event. *The city’s probability to crustal earthquake was decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of earthquake hazards, as well as the history, location, extent, and probability of a potential event. Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The



geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>11</sup>

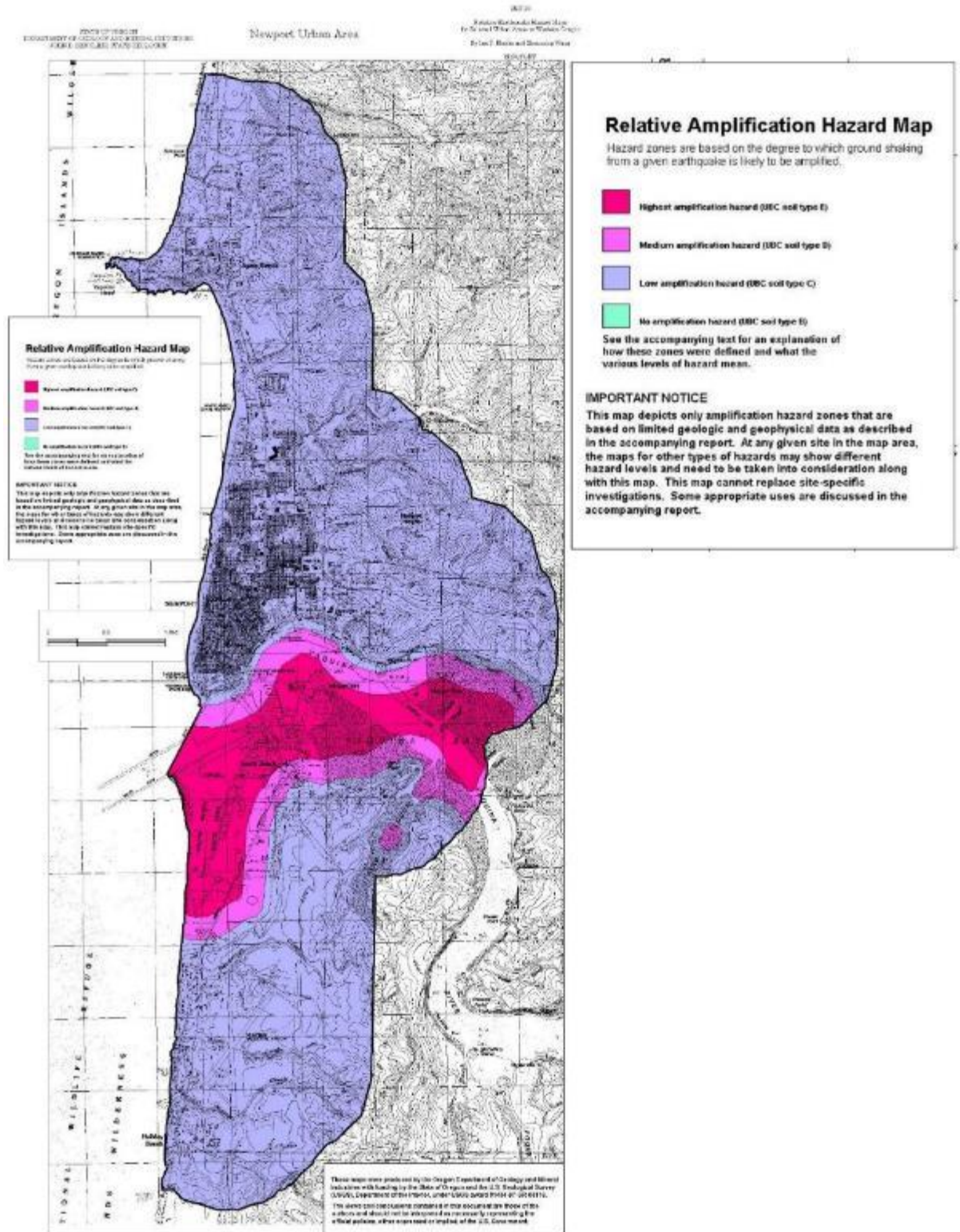
The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides.

The figures below show earthquake hazards that affect the city, including relative amplification hazards (Figure NA-6), relative liquefaction hazard (Figure NA-7), areas subject to earthquake-induced landslides (Figure NA-8), and hazard zones based on the combined effects of ground shaking (Figure NA-9). As shown in each of the maps, the area of greatest concern within the City of Newport is along the Yaquina Bay. The Bayfront area of Newport and the highly populated tourist spots are in this area. The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event.

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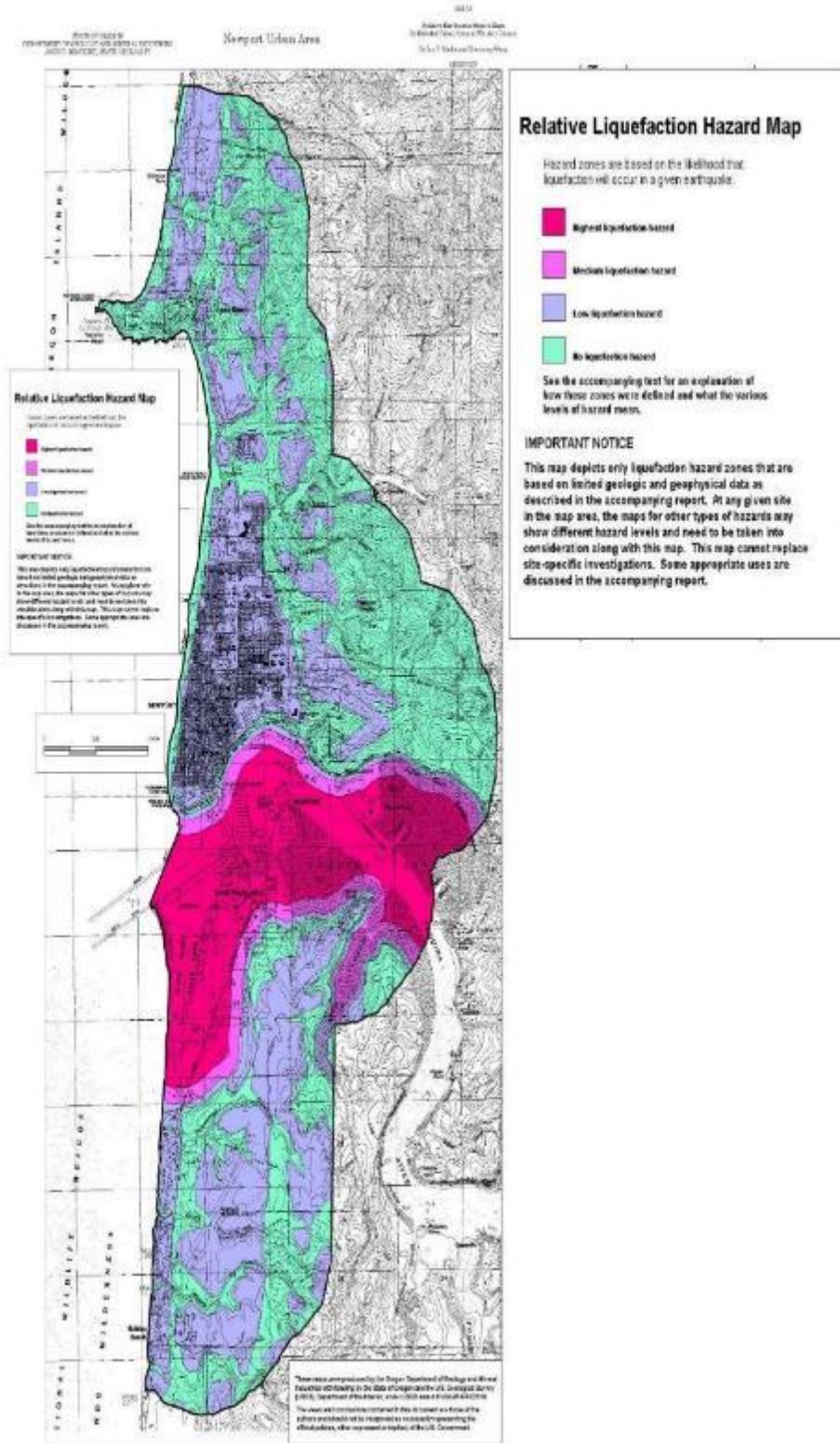
<sup>11</sup> DLCD. *Oregon State Natural Hazard Mitigation Plan*. 2020 (Draft).

Figure NA-6 Relative Amplification Hazard Map



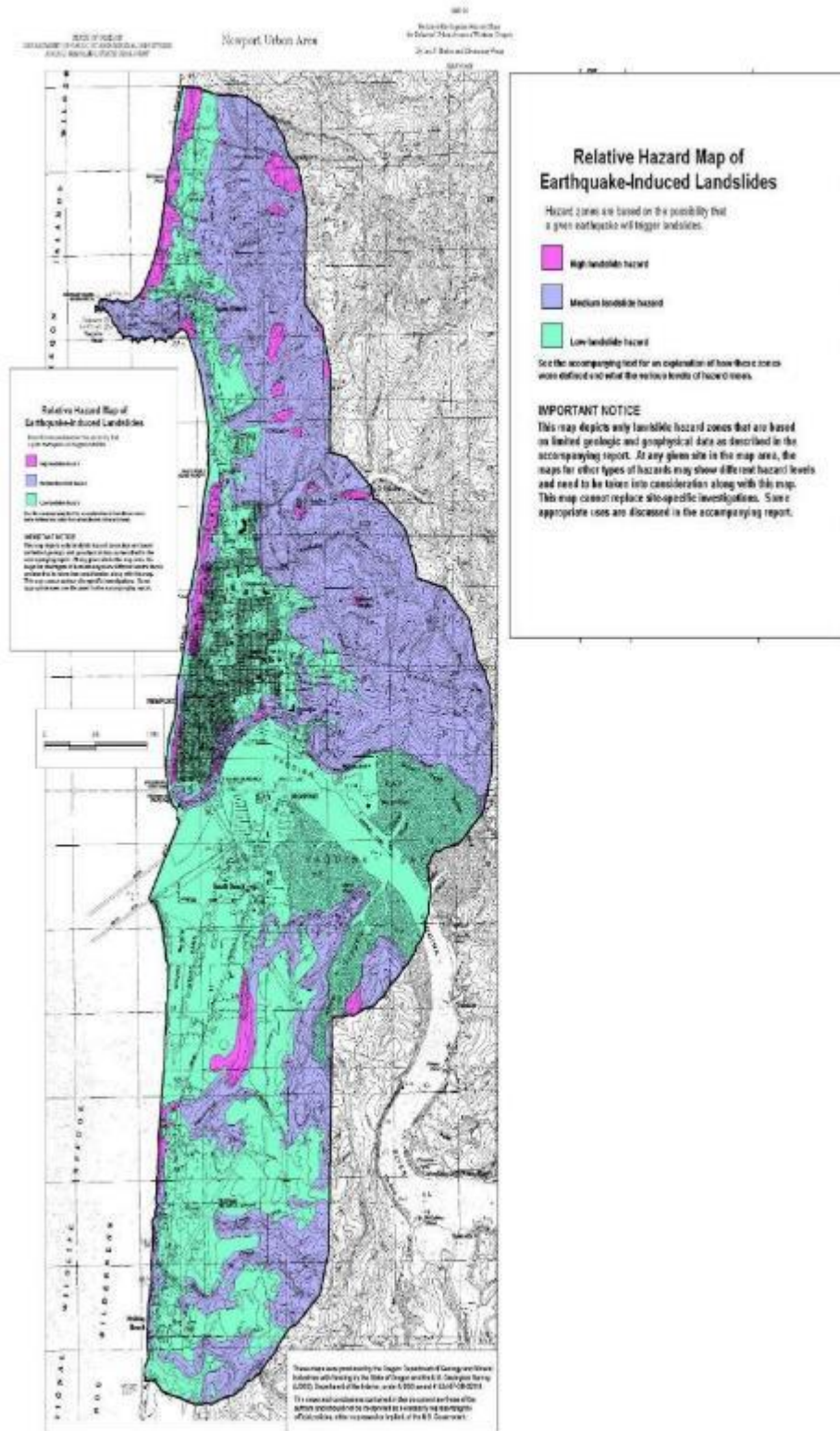
Source: DOGAMI

**Figure NA-7 Relative Liquefaction Hazard Map**



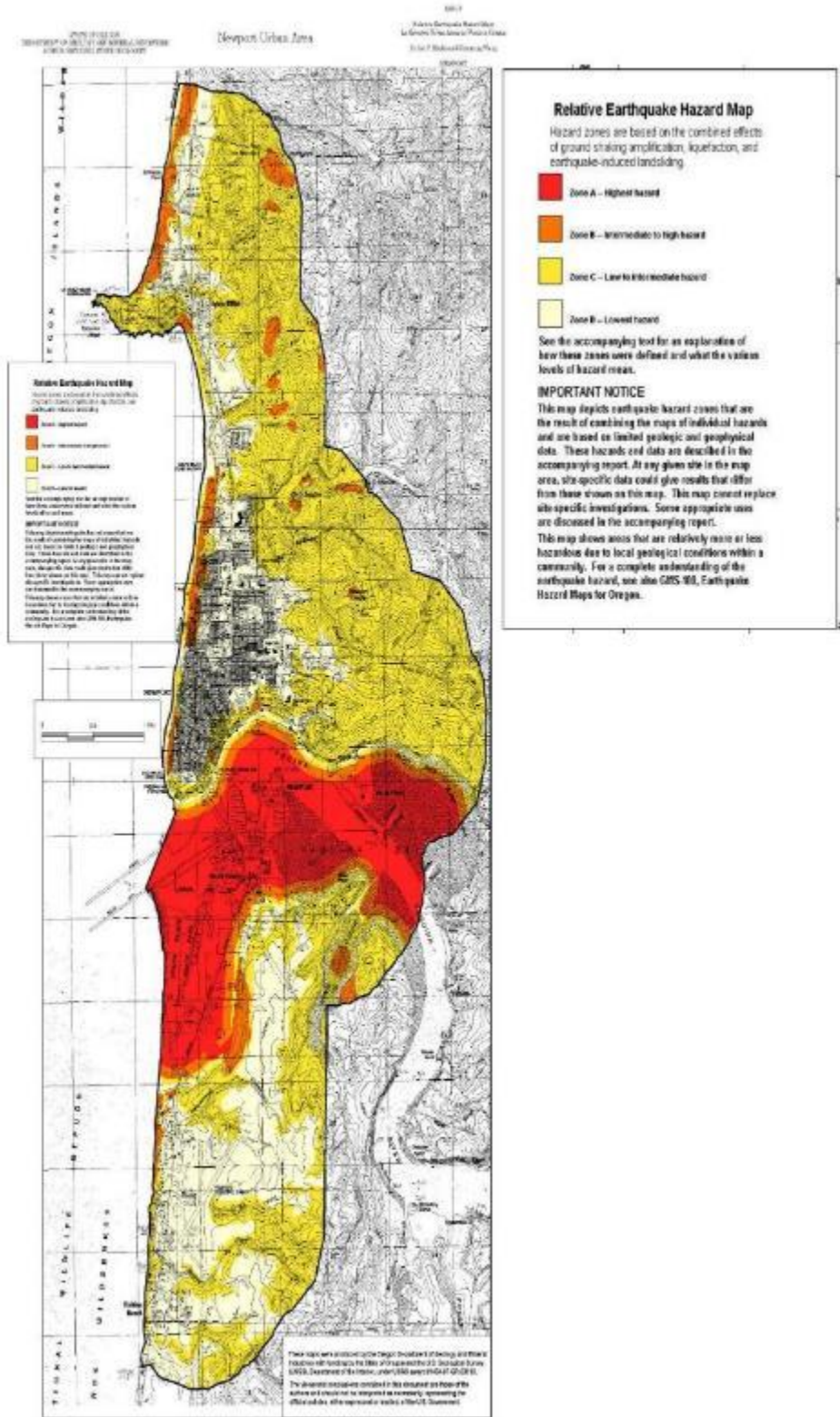
Source: DOGAMI

**Figure NA-8 Earthquake Induced Landslides**



Source: DOGAMI

Figure NA-9 Relative Earthquake Hazard



Source: DOGAMI

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

The city's concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described above are cause for significant effort toward mitigating the earthquake hazard. The city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, cell towers, the Samaritan North Lincoln Hospital, and City Hall were identified by the Steering Committee as vulnerable assets. The city would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide. Education and outreach regarding earthquakes (and resultant tsunami) is an ongoing endeavor in Newport.

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community characteristics section (Table NA-4), approximately 72% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard (according to the Risk Report 63% of all buildings are pre-code and 16% are low code)<sup>12</sup>. Information on specific public buildings' (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table NA-6; each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI, that have not been retrofitted, using their Rapid Visual Survey (RVS), no buildings have a very high (100% chance) collapse potential, while one (1) building has a high (greater than 10% chance) collapse potential. To fully assess a buildings potential for collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

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<sup>12</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table D-2.

**Table NA-6 Rapid Visual Survey Scores**

Facility	Site ID*	Level of Collapse Potential			
		Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100%)
<b>Schools</b>					
Sam Case Elementary** (459 NE 12th Street)	Linc_sch02			<b>SRGP 2015-2017 Phase II: \$1,498,424</b>	
Yaquina View Elementary** (351 SE Harney Street)	Linc_sch08		XXX		
Newport Middle (former Newton Magnet)** (825 NE 7th Street)	Linc_sch17	X			
Newport High - East** (322 NE Eads Street)	Linc_sch09	X	XX		
Newport High - West** (311 NE Eads Street)	Linc_sch22			<b>SRGP 2015-2017 Phase II: \$1,500,000</b>	
Newport Early Childhood Center (420 NE 12th Street)	Linc_sch13	X			
<b>Public Safety</b>					
Lincoln County Communications Agency (815 SW Lee Street)	Linc_eoc01		X		
Newport FD - Station 1** (245 NW 10th Street)	Linc_sch07			<b>SRGP 2013-2014 \$1,491,223</b>	
Lincoln County Sheriff's Office** (225 W Olive Street)	Linc_pol02	X	X		
Newport Police Department** (169 SW Coast Highway)	Linc_pol04			X	
<b>Hospitals</b>					
Samaritan Pacific Communities Hospital** (930 SW Abbey Street)	Linc_hos01	X			

Source: [DOGAMI 2007. Open File Report O-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment](#). Notes: “\*” – Site ID is referenced on the [RVS Lincoln County Map](#); “\*\*” – Facility determined to be vulnerable to CSZ earthquake and should expect moderate to complete damage (> 50% probability). DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020).

**Mitigation Activities**

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Newport agencies or organizations.

A primary mitigation objective of the city is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>13</sup> have been funded to retrofit the Newport Fire District Station 1 (2013-14 grant award, \$1,491,223), Sam Case Elementary School (2015-17, Phase II grant award, \$1,498,424), and the Newport High School gym (2015-17, Phase II grant award, \$1,500,000). Samaritan Pacific Communities Hospital included seismic retrofits when it was remodeled and expanded in 2019 (Phase I) and 2020

<sup>13</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

(Phase II). Additionally, the School District has retrofitted at risk schools through local resources (see the Lincoln County School District addendum for more information).

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to earthquake. The Risk Report provides a distinct profile for Newport.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled magnitude 9.0 Cascadia Subduction Zone (CSZ) event. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Newport may be impacted by the profiled earthquake scenarios (Table NA-7). *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*<sup>14</sup>

Approximately 22% of the City's population (2,088 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, less than 1% will be impacted by the accompanying tsunami. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Earthquakes will impact every building in the City, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as "damaged" in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The City has 2,088 buildings that are expected to be damaged by the CSZ earthquake and tsunami event. The combined (earthquake and tsunami) value of building damage losses are \$452.4 million.

The Risk Report estimated losses show that the age of the building stock is the primary metric of earthquake vulnerability. Communities with older building stock are expected to have higher losses. However, if buildings were retrofitted to at least "moderate code" standards the impact of the event would be reduced. The Risk Report concludes that loss estimates for the City drop from 24% to 14% (\$122 million decrease in loss) when all buildings are upgraded to at least moderate code level.<sup>15</sup> *Note: earthquake vulnerability*

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<sup>14</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Tables A-18.

<sup>15</sup> Ibid, Table B-2.



retrofit benefits are minimized in areas of liquefaction and landslide where additional geotechnical mitigation would be needed.

**Table NA-7 Potentially Displaced Residents and Exposed Buildings, Earthquake**

Community Overview: Newport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
9,989		5,602		16	1,243,095,000	
Exposure Analysis: Earthquake CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
2,122	21.2%	1,902	34.0%	15	294,327,000	23.7%
Exposure Analysis (within Tsunami Zone - Medium)						
73	0.7%	186	3.3%	1	158,074,000	12.7%
Total Exposure						
2,195	22.0%	2,088	37.3%	16	452,401,000	36.4%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>16</sup>

- Public Works (Newport)
- Fire Station No. [3200] (Newport)
- Fire Station No. 3400 (Newport)
- Municipal Airport (Newport)
- Police Department (Newport)
- Water Treatment Plant (Newport)
- Public Works (Lincoln County)
- Sheriff’s Office (Lincoln County)
- Oregon State Police (Oregon)
- Oregon National Guard Armory (Oregon)
- Port of Newport (Port)
- Samaritan Pacific Communities Hospital (Hospital)
- Sam Case Elementary School (Lincoln Co. School District)
- Yaquina View Elementary School (Lincoln Co. School District)
- Newport Middle School (Lincoln Co. School District)
- Newport High School (Lincoln Co. School District)

The following vulnerable critical facilities were identified by the County but not included in the Risk Report analysis:

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<sup>16</sup> Ibid, Table A-19.

- Lincoln County Fair Grounds (633 NE 3<sup>rd</sup> St) – new facility in process (TBD)

Note: It is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Newport by sea and air will be necessary.

For more information, see the following DOGAMI reports:

- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, [O-20-03](#))
- Oregon Coastal Hospital Resilience Project (2020, [O-20-02](#))

## Tsunami

The steering committee determined that the city’s probability for a distant tsunami event is **moderate** meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a distant tsunami event is **low**, meaning that less than 1% of the city’s population or property could be affected by a major distant tsunami event. The steering committee determined that the city’s probability for a local tsunami event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a local tsunami event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major local tsunami event. *The city’s probability and vulnerability ratings to distant tsunami decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of tsunami hazards, as well as the history, location, extent, and probability of a potential event. The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>17</sup> Distant tsunamis happen more regularly than CSZ related local tsunamis.

It is difficult to predict when the next tsunami will occur. According to the Oregon NHMP the coast has experienced 25 distant tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources would be about six (6) years. However, the time interval between events has been as little as one year and as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for the City.

A 9.0 magnitude earthquake originating from Japan caused approximately \$7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; \$6.7 million), as well as the Port of Newport (Lincoln

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<sup>17</sup> Oregon Natural Hazard Mitigation Plan. Department of Land Conservation and Development. 2015

County; \$182,000), and Charleston Harbor (Coos County; \$200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency was declared by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast local official activated the Emergency Alert System and sirens, implemented “reverse 9-1-1” and conducted door-to-door notices in order to evacuate people from the tsunami inundation zone. Local governments activate their Emergency Operations Centers and the state activated its Emergency Coordination Center. For more information view Volume II, Hazard Annex.

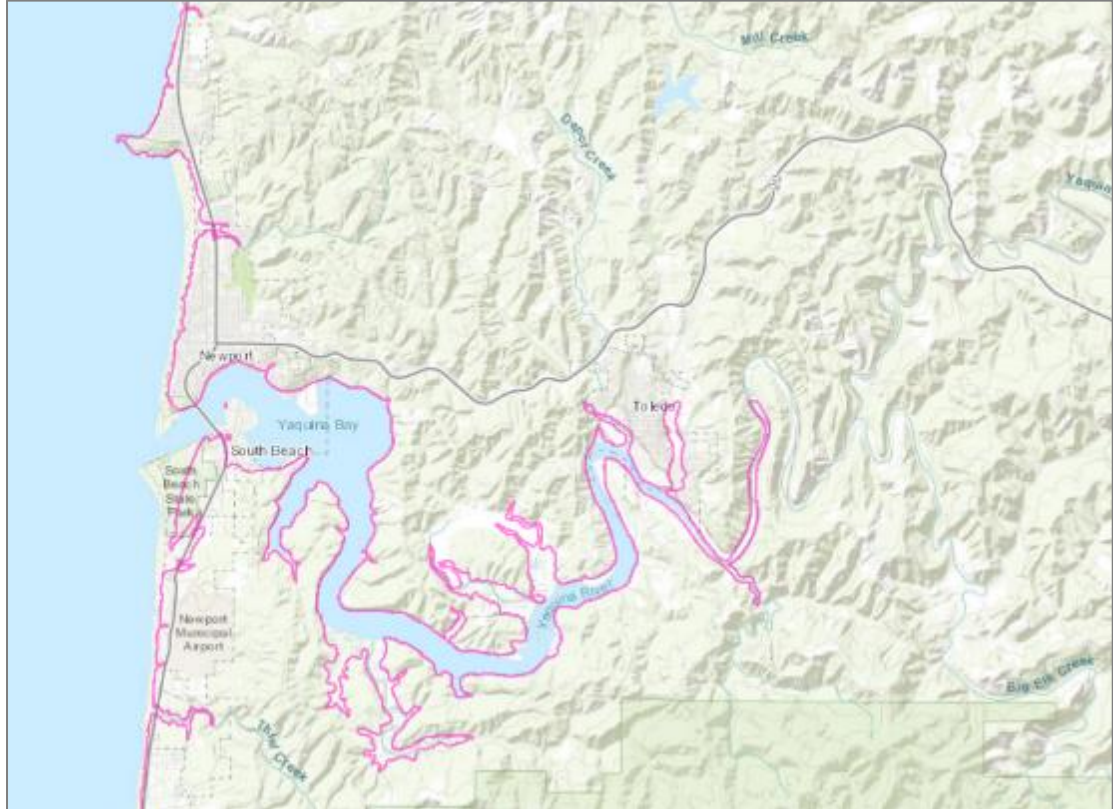
In 1995, the Department of Geology and Mineral Industries (DOGAMI) conducted an analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami maps were produced to help implement Senate Bill 379 (SB 379); digitized in 2014 ([O-14-09](#)). SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005, limit construction of new essential facilities and special occupancy structures in tsunami flooding zones. Figure NA-10 shows the regulatory tsunami inundation line showing the much of the residential development west of Highway 101, and areas in, and adjacent to, the harbor are vulnerable to tsunami. It should be noted that the updated tsunami inundation maps (described below) show an increased vulnerability in many areas (Figure NA-11). Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building “new essential facilities, hazardous facilities, major structures, and special occupancy structures” inside the tsunami inundation zone (SB 379 line):<sup>18</sup>

The City of Newport has put forth much effort to educate and inform citizens of tsunami hazards found within the city. Street signs below 50ft have red bands, and those above 50 ft have blue bands. Evacuation signs are posted throughout the city and can also be found on the city’s website. Severe damage is expected to occur on various properties, roads, bridges, communication systems, and critical infrastructure within Newport, among other assets described in the county’s plan. The city is particularly concerned with the continued operability of the Yaquina Bay Bridge. The City of Newport recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future.

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<sup>18</sup> Oregon Legislature. HB 3309 (2019).  
<https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309>

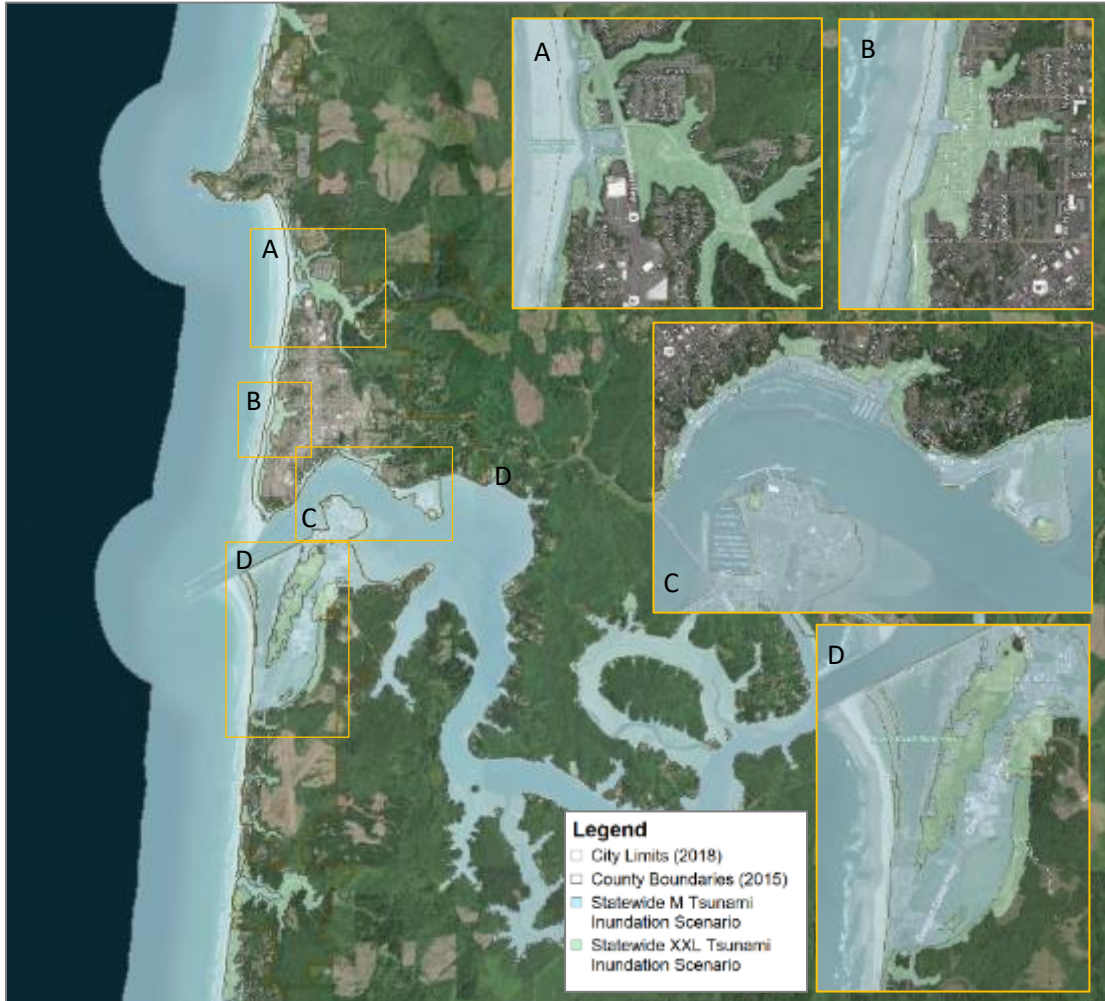
**Figure NA-10 Regulatory (SB 379) Tsunami Inundation Line**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities. Maps were created for local and distant source tsunami events. The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as “T-shirt” sizes S, M, L, XL, and XXL. Figure NA-11 shows the M and XXL tsunami inundation scenarios. The distant source tsunami inundation maps show the potential impacts of tsunamis generated by earthquakes along the “Ring of Fire” (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2) and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

**Figure NA-I I Tsunami Inundation Map (M and XXL Scenarios)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - <http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm>  
(Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:

<http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm>

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst-case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

<http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm>

A free application is also available that displays the evacuation routes in coastal areas of Oregon: [http://www.nanoos.org/mobile/tsunami\\_evac\\_app.php](http://www.nanoos.org/mobile/tsunami_evac_app.php)

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

In 2013, DOGAMI produced new Tsunami Inundation Maps (TIMs) for the entire Oregon coast. The TIMs identify both local and distant Tsunami Inundation Zones (TIZs) by event size. The maps also tabulate the affected buildings located within the local and distant source tsunami inundation zones. The sections below discuss recent USGS and DOGAMI reports including the Risk Report which provides detailed information on the impact to the City from a CSZ earthquake and medium tsunami.

Severe damage could occur to low-lying areas of the city in a local source tsunami event, including roads, bridges, communication systems, and infrastructure within Newport, particularly surrounding, and including facilities within South Beach (e.g., Hatfield Marine Science Center, Southshore neighborhood, South Beach State Park), near creeks (Big Creek, Grant Creek, Henderson Creek, Moore Creek, Schooner Creek, and Thiel Creek), Nye Beach, and the Port of Newport (see Figure NA-11). Some damage is also expected in a large distant source tsunami event (such as the 2011 Tohoku tsunami).

As shown in Table NA-4 there are about 573 manufactured housing units (mobile homes) in Newport. Manufactured homes built prior to 2003 are subject to slipping off their foundations potentially compromising the occupants' ability to exit. The compromised egress may hinder timely evacuation. Three manufactured housing parks are in the tsunami zone: Surf Sounds Court (4623 Oregon Coast Hwy), Harbor Village RV Park (923 SE Bay Blvd), and Surfside Mobile Village (392 NW 3<sup>rd</sup> St).<sup>19</sup>

Population vulnerability is characterized in terms of exposure, demographic sensitivity, and short-term resilience of at-risk individuals. Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.<sup>20</sup> Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds. According to the study Lincoln County (including Newport) has relatively low numbers of "residents, employees, or customer-heavy businesses" inside the tsunami hazard zones and will likely have enough time to reach high ground before a tsunami wave arrives.

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<sup>19</sup> DOGAMI, Open-Fire Report O-20-03. Section 8.4.8.

<sup>20</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmidlein. "Community clusters of tsunami vulnerability in the US Pacific Northwest", PNAS 2015 112 (17) 5354-5359.

In 2020, DOGAMI published an analysis of people and structures impacted by a CSZ earthquake and tsunami for the M, L, and XXL event scenarios.<sup>21</sup> This report provides an analysis of building damage and impact to residents and tourists (including injury and fatality estimates). The study included a tsunami evacuation analysis using the XXL inundation zone which covers the largest CSZ event likely to occur based on the historical record. Safety is reached when evacuees have reached “high ground”, or 20 feet beyond the limit of tsunami inundation. According to the analysis the first waves arrive in Newport 30 minutes after the start of earthquake shaking. Most of Newport, except for areas in South Beach, has significant high ground that will accommodate evacuees traveling at a moderate walking speed of 4 feet per second (fps) or less (2.7 mph).

Within South Beach areas of greatest concern include South Beach State Park, the Southshore neighborhood, and the Hatfield Marine Science Center where residences, commercial areas, and recreation areas (including campsites) are more than one mile from high ground (Safe Haven Hill). People in the Hatfield Marine Science Center area should have the ability to walk to Safe Haven Hill at a moderate pace (4 fps for people less than 65 years, and 3.2 fps for folks 65 and older) or to the vertical evacuation structure located in the marine science center (see Figure LA-12). Evacuees within the Southshore neighborhood and South Beach State Park, particularly at locations further southwest from Safe Haven Hill, will need to move faster in order to beat the wave and make it to high ground. Furthermore, the analysis determines that more than 90% South Beach State Park visitors will have difficulty reaching high ground during an XXL tsunami scenario even if they depart within 5-10 minutes of ground shaking (the ability to reach high ground is greatly increased for all other tsunami scenarios, e.g., only about 5-10% of visitors will have difficulty in a L tsunami inundation). *Note: the study assumes that visitors will know the optimal route to Safe Haven Hill and does not account for visitors taking less than optimal routes or have difficulty navigating beaches or streets.*

It is important to note that tourists and temporary residents greatly outnumber residents during peak summer weekends (within the XXL1 inundation zone it is estimated that temporary residents outnumber permanent residents approximately 7:1). Since the areas temporary residents typically reside in locations that are closer to the ocean and farther from high ground (VRBOs, hotels, campsites, etc.) they are particularly vulnerable to tsunami. In addition, approximately 27% of jobs are estimated to be within the XXL1 tsunami zone including folks who work in Accommodation and Food Services and Manufacturing.<sup>22</sup>

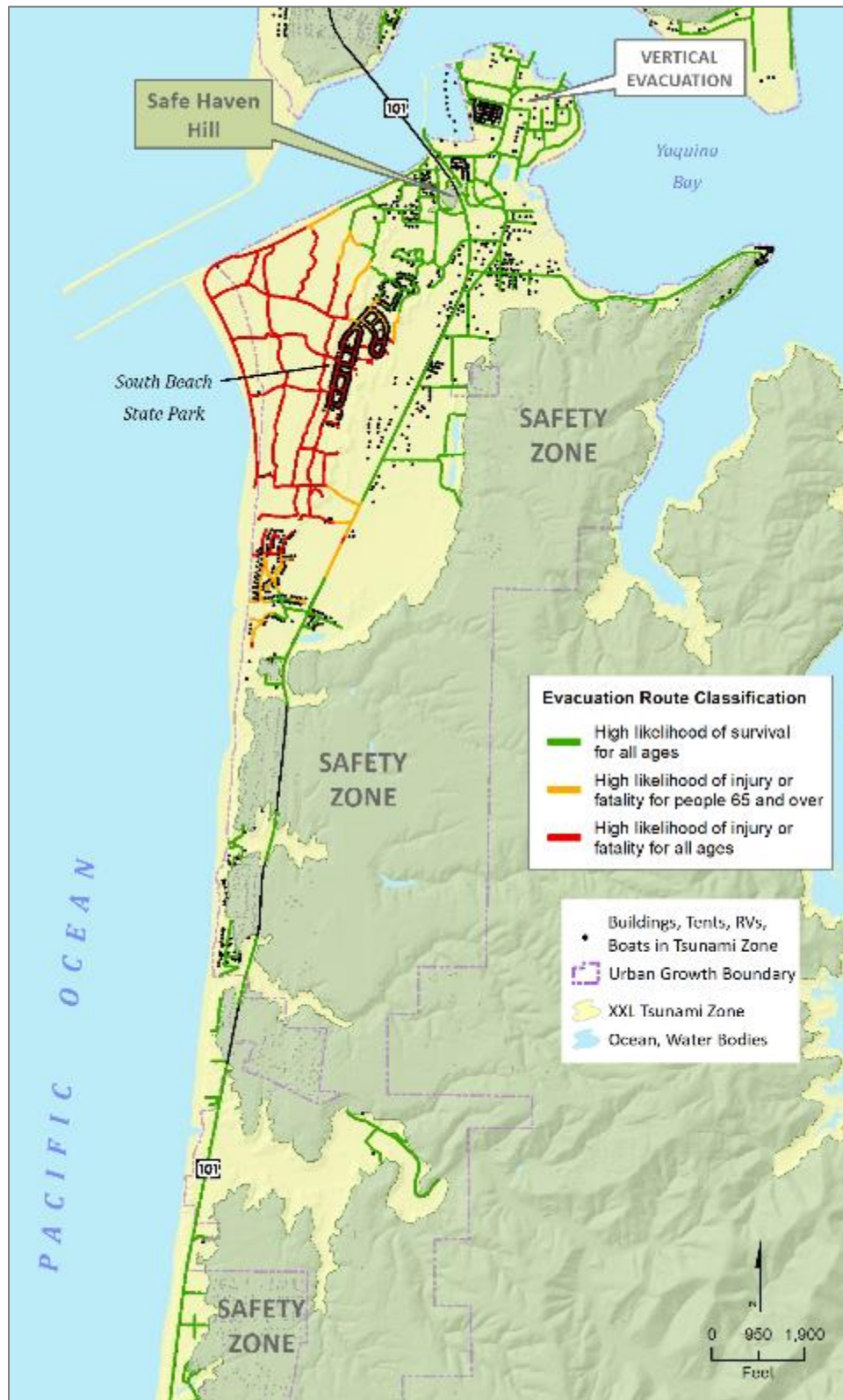
The report includes additional information on earthquake and building damage, injuries and fatalities, and displaced population which are, in part, included in the Risk Report information below. For more information, see *Analysis of Earthquake and Tsunami Impacts for People and Structures inside the Tsunami Zone for Five Coastal Communities* (DOGAMI, 2020, [O-20-03](#)).

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<sup>21</sup> DOGAMI, Open-File Report O-20-03, Section 8.4 Newport.

<sup>22</sup> Ibid. Section 8.4.6.

**Figure LA-12 South Newport evacuation routes & distance to tsunami safety, symbolized into survivability classes. (CSZ earthquake XXL inundation zone)**



Source: DOGAMI, Open-File Report O-20-03. Figure assumes a moderate walking pace of 4 fps for people less than 65 years and 3.2 fps for people 65 and older. It also assumes a wave arrival time at the tsunami runup line of 30 minutes.



Natural Hazard Risk Report for Lincoln County

The Risk Report (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to tsunami. The Risk Report provides a distinct profile for Newport.

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Newport may be impacted by the profiled tsunami scenario (Table NA-8).

Just under three percent of the city’s population (271 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is slightly more people than those exposed within the Senate Bill 379 line (217 people). *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event (for more information on temporary residents see DOGAMI O-20-03 referenced in the previous section).* Building damage (loss) estimates are reported for buildings expected to be damaged by the tsunami inundation zone (medium-sized and SB 379). All 271 buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable); the number of buildings damaged is slightly lower under the SB 379 scenario (217 buildings). One critical facility (the Port of Newport) is expected to be damaged under both the CSZ M9.0 and SB 379 scenarios.

**Table NA-8 Potentially Displaced Residents and Exposed Buildings, Tsunami**

Community Overview: Newport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
9,989		5,602		16	1,243,095,000	
Exposure Analysis: Tsunami CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
271	2.7%	436	7.8%	1	330,953,000	26.6%
Exposure Analysis: Tsunami SB 379 Regulatory Line						
217	2.2%	348	6.2%	1	291,629,000	23.5%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>23</sup>

- Port of Newport (Port)

Note 1: DOGAMI, Open-Fire Report O-20-03 includes the following key infrastructure facilities in the tsunami zone (XXL):<sup>24</sup>

<sup>23</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>24</sup> DOGAMI, Open-File Report O-20-03. Section 8.4.5.

- Essential facilities
  - U.S. Coast Guard Station Yaquina Bay
- Special facilities
  - Oregon Coast Aquarium (“Sleep in the Deep” program, ~80 children)
  - Camp Gray (~140 children in dormitories/classrooms), 3400 SW Abalone St
  - Bayside at South Beach Memory Care Facility, 411 SE 35<sup>th</sup> St (42 beds)
- Key infrastructure
  - Lift Station (“HMSC Pump Station”), SE Marine Science Dr
  - Lift Station (“Bay Front Pump Station”), SW Bay Blvd
  - Lift Station (“Nye Beach Pump Station”), NW Beach Dr
  - Big Creek Reservoir and Water Treatment Plant, 2810 NE Big Creek Rd
  - US Customs and Border Protection Port of Entry, 61 SE Bay Blvd
  - Electrical substation, SE 40 St, east of SE Ash St
  - Cellular tower, Verizon Wireless, 3087 SE Ash St
  - Cellular Tower, 4627 S Coast Highway
  - FM Transmission Towers, Northwest Natural Gas Company, Callsigns WCE 997, WCE 998, near McClean Point

Note 2: Although critical facilities are not exposed to the profiled tsunami scenarios it is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Newport by sea and air will be necessary.

For more information, see the following DOGAMI reports:

- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, [O-20-03](#))
- Oregon Coastal Hospital Resilience Project (2020, [O-20-02](#))

## Flood

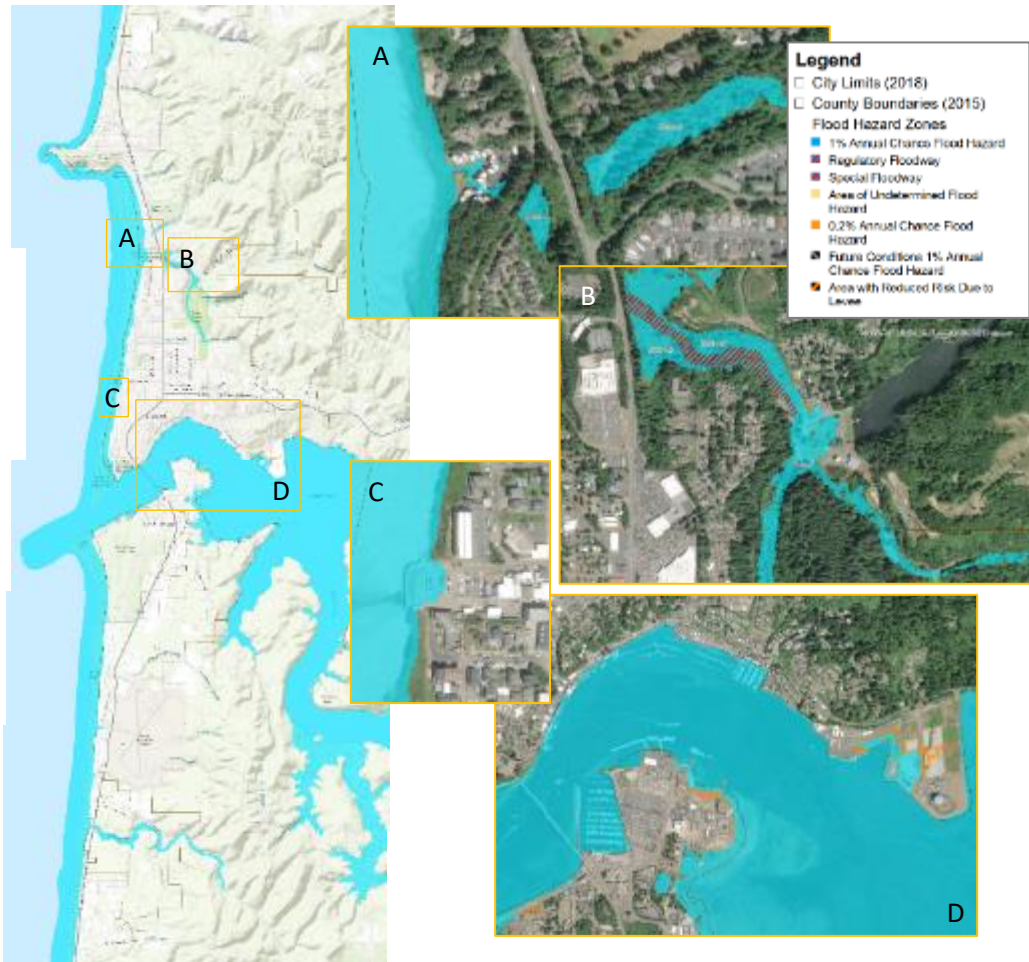
The steering committee determined that the city’s probability for riverine or coastal flood is **high**, meaning at least one incident is likely within the next 35-year period and that their vulnerability to coastal or riverine flood is **moderate**, meaning that between 1% and 10% of the City’s population or property could be affected by a major coastal or riverine flood event. *The vulnerability rating decreased, and the probability rating has not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of coastal and riverine flood hazards, as well as the history, location, extent, and probability of a potential event. The Yaquina River is the city’s primary source of flooding. Due to the River’s width, flooding rarely occurs. The River is affected more by tides than fluctuations in rainfall. Within the city, undersized culverts occasionally present problems. Newport recently updated its stormwater master plan, and culvert inadequacies will be addressed via mitigation in that plan.

FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one percent probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood; also known as the Special Flood Hazard Area (SFHA). The SFHA is

the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods (Figure NA-13). These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards. These maps represent a snapshot in time, and do not account for later changes which occurred in the floodplains. According to Oregon Explorer about 21% of the City is within the 100-year floodplain (see Figure NA-13). In addition, about 2% of the City is within the 500-year floodplain.

**Figure NA-13 Flood Hazard Zones (100- and 500-year floodplains)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

**Future Climate Projection:**

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter

precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events. Additionally, coastal flooding is expected to increase due to sea level rise (SLR) and changing wave dynamics. Sea level is projected to rise by 1.7 to 5.7 feet by 2100. Tidal wetlands and estuaries throughout the county are also expected to experience changes to their composition and area, thereby impacting their ability to naturally mitigate flood events.

## Vulnerability Assessment

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to flood. The Risk Report provides a distinct profile for Newport.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the city. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within Newport may be impacted by the profiled flood scenario (Table NA-9).

Very few residents of the City (10 people) may be displaced by flooding. These people are expected to have mobility or access issues due to surrounding water. Likewise, only a few of the City's buildings (13 buildings) are exposed to the flood hazard and may be damaged. The loss estimate for exposed buildings is almost \$2 million (less than one percent of total building value).

**Table NA-9 Potentially Displaced Residents and Exposed Buildings, Flood**

Community Overview: Newport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
9,989		5,602		16	1,243,095,000	
Exposure Analysis: Flood (1% Annual Chance)						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
10	0.1%	13	0.2%	0	1,973,000	0.2%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>25</sup>

There are no critical facilities exposed to the profiled flood scenario.

**National Flood Insurance Program (NFIP)**

FEMA’s Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2019. Table NA-10 shows that as of August 2019, the City has 161 National Flood Insurance Program (NFIP) policies in force, representing almost \$48.9 million in coverage. Of those, 53 are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for the City was June 29, 2006. The table shows that most flood insurance policies are for residential structures, primarily single-family homes. Flood insurance covers only the improved land, or the actual building structure. There have been 0 paid flood insurance claims.

The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The NFIP’s Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. The City does not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone.

The Community Repetitive Loss record for Newport identifies no Repetitive Loss Properties<sup>26</sup> or Severe Repetitive Loss Properties<sup>27</sup>.

<sup>25</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>26</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

<sup>27</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least

**Table NA-10 Flood Insurance Detail**

	Lincoln County	Newport
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	4/15/1980
Total Policies	2,325	161
Pre-FIRM Policies	1,067	53
<b>Policies by Building Type</b>		
Single Family	1,685	93
2 to 4 Family	57	15
Other Residential	462	15
Non-Residential	121	38
Minus Rated A Zone	98	12
Minus Rated V Zone	3	0
Insurance in Force	\$585,856,500	\$48,886,600
Total Paid Claims	343	0
Pre-FIRM Claims Paid	265	0
Substantial Damage Claims	53	0
Total Paid Amount	\$5,479,221	\$0
Repetitive Loss Structures	64	0
Severe Repetitive Loss Properties	12	0
CRS Class Rating	NP	NP
Last Community Assistance Visit	-	8/27/2019

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating.

## Landslide

The steering committee determined that the city's probability for landslide is **high**, meaning at least one incident is likely within the next 35-year period, and that their vulnerability to landslide is **high**, meaning that more than 10% of the City's population or property could be affected by a major landslide event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of landslide hazards, as well as the history, location, extent, and probability of a potential event.

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in

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<sup>2</sup> separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

injuries or take lives. The City of Newport occasionally sees minor landslides behind buildings along the bay front (i.e., steep slopes). Small slides tend to occur during the rainy season, and the city has seen damage to homes and streets at the west end of NW 57th Street. South of the Bay, the topography is relatively flat, and landslides are generally of less concern.

Landslide susceptibility exposure for Newport is shown in Figure NA-14. Approximately 36% of the City has very high or high, and 20% moderate, landslide susceptibility exposure.<sup>28</sup> In general, the areas of greater risk are located adjacent to rivers and creeks and indicate potential areas of erosion. *Note that even if a City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

To address the risk for landslide, and other geologic hazards (earthquakes, erosion, expansive soils, fault displacement and subsidence), Newport enacted Ordinance No. 2017 amending the zoning ordinance Geologic Hazards Overlay section effective August 17, 2011.

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

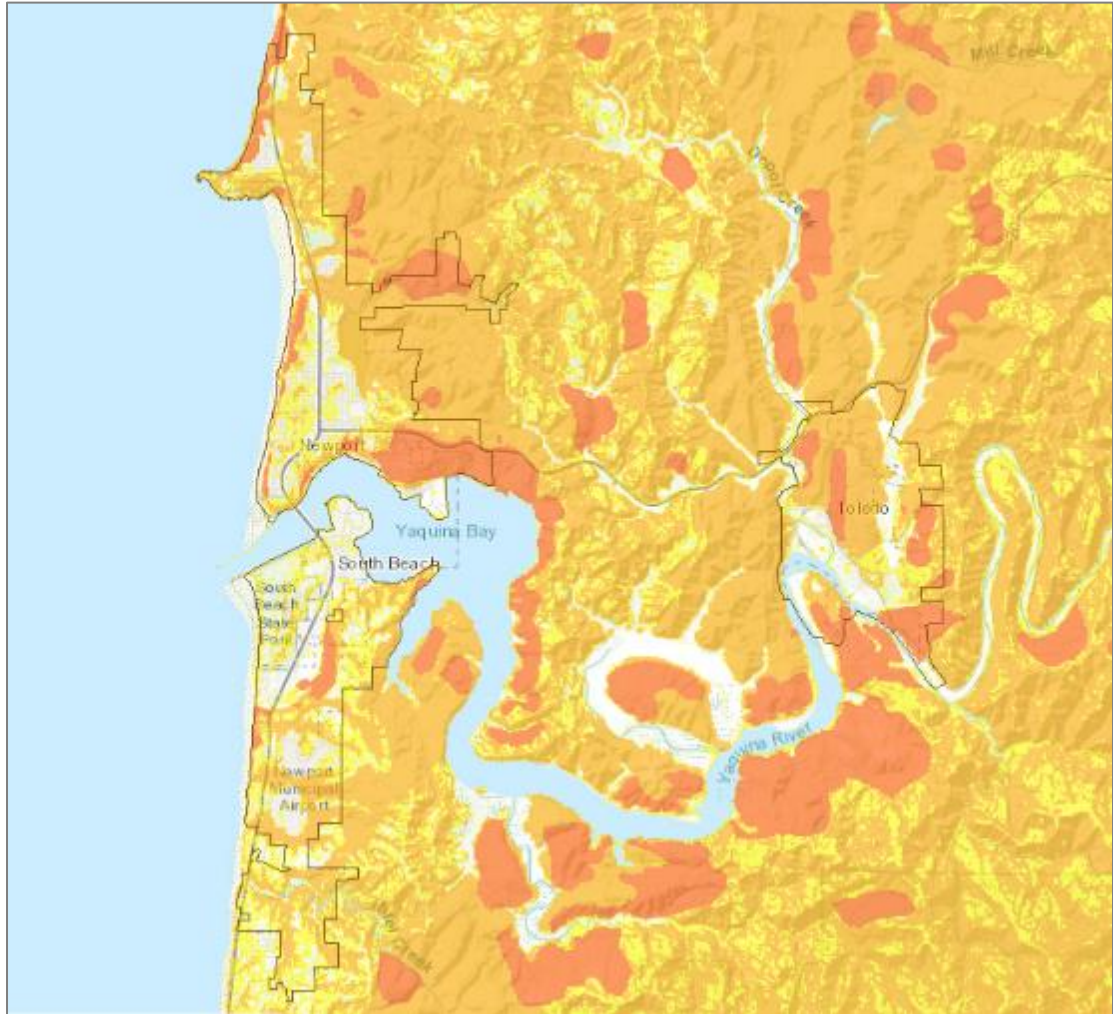
## Vulnerability Assessment

Potential landslide-related impacts are adequately described within the county’s plan, and include infrastructure damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Lincoln County, and thoroughfares beyond city limits are susceptible to obstruction as well. As such, Newport is vulnerable to isolation for an extended period.

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<sup>28</sup> DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

**Figure NA-I4 Landslide Susceptibility Exposure**



Low	Landsliding unlikely. Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low.
Moderate	Landsliding possible. Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.
High	Landsliding likely. Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.
Very High	Existing landslides Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Newport.



The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the city may be impacted by the profiled landslide scenario (Table NA-11).

Approximately 24% of the City’s population (2,418 people) may be displaced by landslides. These people are expected to have mobility or access issues and/or may have their residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 26% of all buildings (1,453 buildings) within the City are exposed to the High or Very High landslide susceptibility zones (see Figure NA-14). The value of exposed buildings is just under \$284 million (about 23% of total building value).

**Table NA-11 Potentially Displaced Residents and Exposed Buildings, Landslide**

Community Overview: Newport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
9,989		5,602		16	1,243,095,000	
Exposure Analysis: Landslide High & Very High Susceptibility						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
2,417	24.2%	1,453	25.9%	4	283,580,000	22.8%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>29</sup>

- Public Works (Newport)
- Fire Station No. 3400 (Newport)
- Municipal Airport (Newport)
- Water Treatment Plant (Newport)

## Severe Weather

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys. Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet

<sup>29</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

stream during fall, winter, and early spring months.<sup>30</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

### Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>31</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

## Windstorm

The steering committee determined that the city’s probability for windstorm is **high** (the probability of tornado is also high), meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to windstorm is **high**, meaning that more than 10% of the City’s population or property could be affected by a major windstorm event. The Steering Committee rated the County as having a “**low**” **vulnerability to a tornado hazard**, meaning that less than 1% of the City’s population or property could be affected by a major tornado event. *The windstorm ratings have not changed since the previous NHMP. The tornado ratings are new with this version of the NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of windstorm hazards, as well as the history, location, extent, and probability of a potential event. Because coastal windstorms typically occur during winter months, ice, freezing rain, flooding, and very rarely, snow sometimes accompany them. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Newport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. In Newport, power outages are the greatest concern during windstorms. Building codes require new developments to place power lines below ground; currently, however, new construction

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<sup>30</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

<sup>31</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.

only accounts for about 5% of the city's total development. Without power, communication is lost, and fuel and food stores shut down.

## Winter Storm (Snow/ Ice)

The steering committee determined that the city's probability for winter storm is **high**, meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to winter storm is **high**, meaning that more than 10% of the city's population or property could be affected by a major winter storm event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of winter storm hazards, as well as the history, location, extent, and probability of a potential event. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. More than likely, however, the coast's winter will just be windy, cold, and wet.

### Vulnerability Assessment

Due to insufficient data and resources, Newport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Major winter storms can and have occurred in the Newport area, and while they typically do not cause significant damage; they are frequent and have the potential to impact economic activity. Road closures on Highway 101, or the passes to the Willamette Valley (Hwy 18 and 20), due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

## Volcanic Event

The steering committee determined that the city's probability for volcanic event is **low**, meaning one incident is likely within the next 75 to 100-year period, and that their vulnerability to volcanic event is **low**, meaning that less than 1% of the city's population or property would be affected by a major volcanic event (ash/lahar). *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of volcanic event hazards, as well as the history, location, extent, and probability of a potential event. Generally, an event that affects the county is likely to affect Newport as well.

### Vulnerability Assessment

Due to insufficient data and resources, Newport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Newport is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens erupted in 1980, the city received small amounts of ashfall, but not enough to cause significant health and/or economic damages.

## Wildfire

The steering committee determined that the city's probability for wildfire is **moderate**, meaning one incident is likely within the next 35 to 75-year period, and that their vulnerability to wildfire is **low**, meaning that less than 1% of the City's population or property could be affected by a major wildfire event. *The vulnerability rating has decreased since the previous NHMP.*

The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve to supplement the wildfire section in this addendum.

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of wildfire hazards, as well as the history, location, extent, and probability of a potential event. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Wildfires in 1849 and 1936 were particularly devastating in Lincoln County, but since then, there have been few large events. As shown in Figure NA-15 the City has mostly low, with some moderate, overall wildfire risk. Areas of concern include the eastern side of the city (where forestland borders development), and some of the open spaces within the city's limits. Due to the prevailing wind patterns (i.e., from the north or south), the city's steering committee felt that the east and south ends of the city might be the most vulnerable. Power, natural gas, and phone lines run through the forest to the east of the city and would be affected in the event of a wildfire. Likewise, active commercial logging occurs just outside the city, and slash burns are a potential wildfire concern.

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

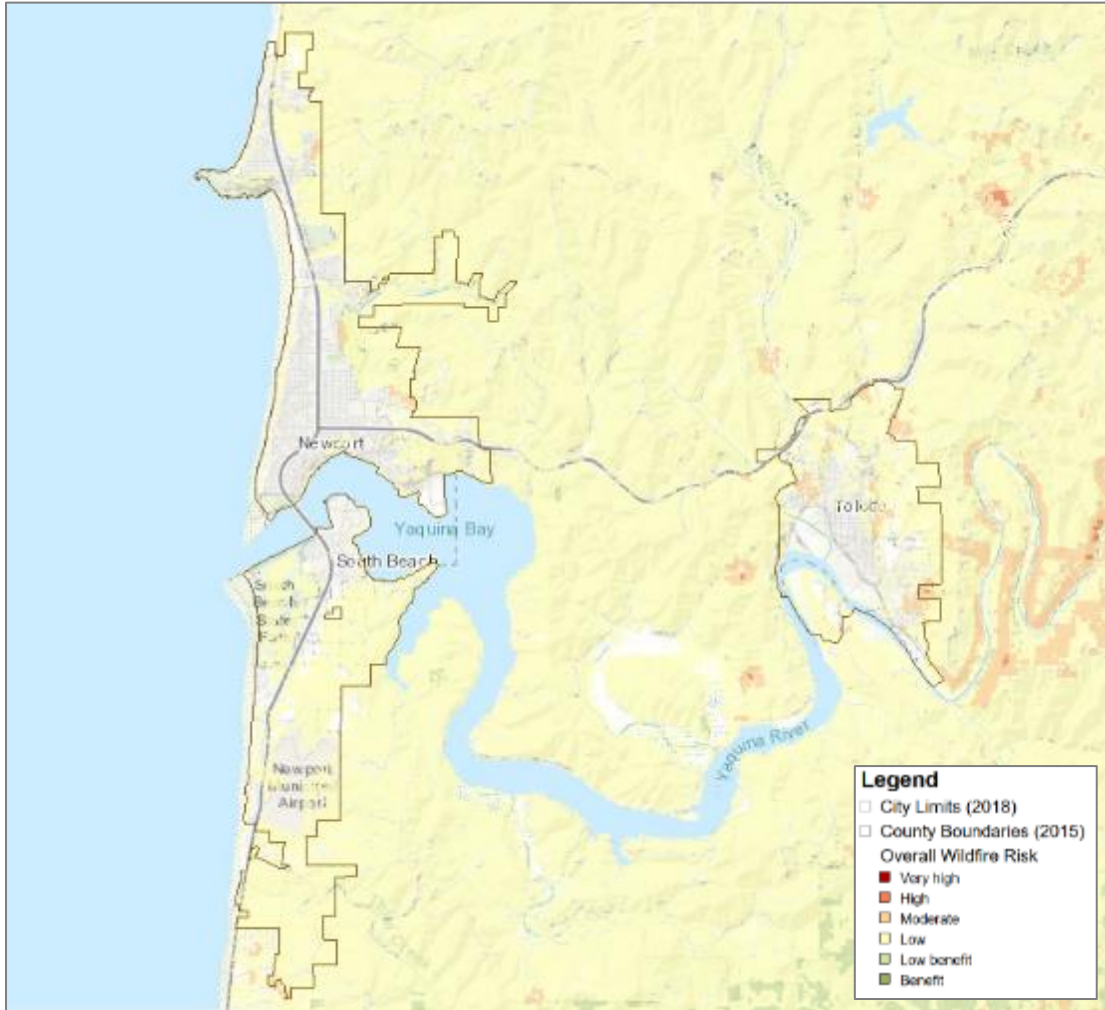
## Vulnerability Assessment

Overall, the city, and its watershed, has low to moderate overall wildfire risk, however, the forested areas have the potential for large wildfires and a wildfire within the watershed could impact the city's water supply and quality.

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair.

**Figure NA-15 Overall Wildfire Risk**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Newport.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment’s Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the City may be impacted by the profiled wildfire scenario (Table NA-12).

Approximately one percent of the City’s population (94 people) may be displaced by wildfires. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire (more people may also be impacted by smoke and traffic disruptions that are not accounted for within this analysis). It is important to note that impact from wildfires may vary depending on the specific area that experiences a wildfire.

The value of exposed buildings (81 buildings) is just under \$23 million (less than two percent of total building value).

**Table NA-12 Potentially Displaced Residents and Exposed Buildings, Wildfire**

Community Overview: Newport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
9,989		5,602		16	1,243,095,000	
Exposure Analysis: Wildfire High-Hazard						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
94	0.9%	81	1.4%	1	22,783,000	1.8%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>32</sup>

- Oregon State Police (Oregon)

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<sup>32</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

# ATTACHMENT A: ACTION ITEM FORMS

Table NA-1 and Table NA-13 provide a summary list of actions for the city. Each high priority action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table NA-13 Action Item Timelines, Status, High Priority and Related Hazards**

Action Item	Priority	Timeline	Status	Related Hazard												
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm			
Newport #1	X	Short	Ongoing		X											
Newport #2	X	Medium	Ongoing			X	X									
Newport #3	X	Long	Ongoing			X										
Newport #4		Medium	Ongoing				X		X							
Newport #5		Ongoing	Ongoing				X									
Newport #6		Ongoing	Ongoing	X				X								
Newport #7		Ongoing	Ongoing						X							
Newport #8		Ongoing	Ongoing										X	X		
Newport #9		Ongoing	Ongoing	X	X	X	X	X	X	X	X	X	X	X	X	X
Newport #10		Long	Ongoing				X									
Newport #11		Medium	New			X		X	X		X	X	X	X	X	
Newport #12		Long	New	X	X	X	X	X	X	X	X	X	X	X	X	X
Newport #13		Short	New						X							

Previous NHMP Actions Completed:

**Newport #12** (2015): “Retrofit Safe Haven Hill Tsunami Evacuation Assembly Area in South Beach” is considered complete. Improvements to Safe Haven Hill were completed in 2016.

**Newport #13** (2015): “Automate addressing” is considered complete.

Previous NHMP Actions Removed/Deleted:

**Newport #8** (2015): “Continue to post ‘high-wind’ warning signs on Yaquina Bay Bridge” was removed since the City does not own the bridge, the action is not considered mitigation, and the responsibility belongs to a state agency (ODOT).

Note: 2015 Actions were renamed as follows:

<b>2015 Action Item</b>	<b>2020 Action Item</b>
Newport #1	Newport #1
Newport #2	Newport #3
Newport #3	Newport #4
Newport #4	Newport #5
Newport #5	Newport #6
Newport #6	Newport #7
Newport #7	Newport #8
Newport #9	Newport #9
Newport #10	Newport #2
Newport #11	Newport #11

### **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The City NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the City. Existing programs and other resources that might be used to implement these action items are identified. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

### **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

### **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

### **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.



**INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

County level actions that the city is listed as a partner are shown in Table NA-14. These actions are led by the County; however, the City will incorporate elements of the action that are applicable to their jurisdiction.

**Table NA-14 County Specified Actions that the City is Partner**

Action Item (2015 NHMP)	City Partner	Action Item
MH #1	Yes	Consider Local Energy Assurance Planning for critical areas countywide
MH #2	Yes	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers
MH #3	Yes	Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.
MH #4	Yes	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.
MH #5		Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.
MH #6	Yes	Integrate the NHMP into County and City comprehensive plans.
MH #7	Yes	Prepare long-term catastrophic recovery plan
MH #8		Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
CE #1		Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.
CE #2		Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
EQ #1	Yes	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
EQ #2	Yes	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
EQ #3	Yes	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
TS #1		Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g.,

Action Item (2015 NHMP)	City Partner	Action Item
		hospitals, nursing homes, etc.) that are within the tsunami inundation zone and likely to be impacted by tsunami.
TS #2		Implement land use strategies and options to increase community resilience
FL #1		Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)
FL #2		Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.
FL #3		Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas
FL #4	Yes	Continue compliance with the National Flood Insurance Program (NFIP).
LS #1	Yes	Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.
LS #2	Yes	Protect existing development in landslide-prone areas.
LS #3		Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
SW #1	Yes	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).
SW #2		Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.
WF #1	Yes	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

Mitigation Action: Newport #1 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Secure the City of Newport’s existing domestic water supply.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Water System Master Plan, Seismic Evaluation of Big Creek Dams No. 1 and No. 2, Phase 3 – Engineering Evaluation and Corrective Action Alternatives (completed June 2015),		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>Newport’s primary water supply comes from the Big Creek Reservoir, and additional supply is available through water rights to the Siletz River. The city has two storage reservoirs, and seven tanks with about 9 million gallons of treated water storage capacity. The city recently constructed a new water treatment facility downstream of its storage reservoirs. As part of that effort, it discovered that both reservoir dams will likely fail in the event of a moderate to severe earthquake. Should those reservoirs fail, then lives would be lost and homes immediately downstream destroyed. Further, the city would be left without a enough domestic water supply for its citizens.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Addressing structural deficiencies in the reservoirs prevents the loss of life and property, and will ensure a continued water source for the City of Newport</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Secure funding for repair work for upper/lower Big Creek dams.</p> <p>Implement interim repair work on Big Creek Reservoir.</p>	<p><u>2020 Update:</u></p> <p>Detailed geotechnical and alternatives analysis has been performed, with the recommendation being to replace the reservoirs with a single roller compacted dam. City is securing funds to complete the design and environmental permitting. Significant supplemental funding from the state and federal government is being sought. Construction costs are anticipated to be in the order of \$70 million. Given the challenges in funding the replacement of the reservoirs the city is looking into interim steps that can be taken to increase safety of the reservoirs until replacement funding is secured. See Newport #2 for related action seeking to replace the dams.</p> <p><u>2015 Update:</u></p> <p>In consultation and partnership with the Oregon Department of Water Resources (ODWR), the city is conducting a thorough subsurface investigation of each reservoir to ascertain the full scope of the problem and range of potential solutions. Additionally, city is taking steps to secure properties</p>	

		and annex the reservoirs and surrounding watershed in order to simplify the jurisdictional/permitting environment in advance of the repair or reconstruction effort. Once a preferred solution is identified, then funding will need to be secured. Construction will likely be phased over several years.	
<b>Champion/ Responsible Organization:</b>	Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
City Manager, Community Development		OWRD, Lincoln County	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, ODWR, FEMA, State and Federal resources		High	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Newport Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Newport #2</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Implement structural mitigation projects as recommended in the engineering report assessing the condition and mitigation options for the Big Creek Dams (upper/ lower).		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water System Master Plan, Seismic Evaluation of Big Creek Dams No. 1 and No. 2, Phase 3 – Engineering Evaluation and Corrective Action Alternatives (completed June 2015),						
<b>Rationale for Proposal (Why is this important?):</b>						
The lower and upper Big Creek Dams have structural resiliency limitations that will likely lead to their failure in the event of an earthquake event. This will result in a loss of life and property damage, and eliminates City’s capability of providing domestic water to its citizens. The Big Creek dams are ranked No. 2 and No. 3 in the State of Oregon inventory of high hazard dam structures.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Implement mitigation recommendations resulting from the above referenced report.</p> <p>Replace both existing earthen dams with a single roller compacted concrete structure.</p> <p>Initiate preliminary design to refine cost estimates.</p> <p>Develop strategy for securing financial assistance as the cost likely exceeds funding resources available at the local level.</p> <p>Acquire additional land that will be inundated by the new reservoir.</p>			<p><u>2020 Update:</u></p> <p>Options for mitigating structural limitations inherent to the upper and lower Big Creek dams have been assessed and it has determined that the only viable option is to replace the two structures with a single, roller compacted dam. The two existing earthen dams will be monitored while work progresses on the design of the new dam, and corrective action will be taken when appropriate and feasible.</p> <p>See Newport #1 for related action seeking interim repair work until funding can be secured.</p>			
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, Building, County			USACE, FEMA, OWRD, Bureau of Reclamation, Oregon Department of Health (Drinking Water Division)			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
OWRD grants, city general obligation bonds, city revenue bonds, State and Federal resources			High \$30 - \$70 million dollars		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Newport Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

Mitigation Action: Newport #3 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Seismically retrofit vulnerable structures and critical facilities.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input checked="" type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>The City of Newport believes that its vulnerability to a high magnitude earthquake would be ‘high,’ meaning more than 10% of the population or regional assets would be affected by an event. The city’s concentrated population and resources, as well as the soil characteristics and relative earthquake hazards are cause for further study and significant effort toward mitigating the earthquake hazard.</p> <p>"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation? <a href="http://www.fema.gov/plan/prevent/earthquake/pdf/fema-275-06-ch-1.pdf">http://www.fema.gov/plan/prevent/earthquake/pdf/fema-275-06-ch-1.pdf</a>. October 12, 2006.</p> <p>DOGAMI conducted a rapid visual assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs’ offices and other law enforcement agency buildings. Buildings were ranked for the “probability of collapse” due to the maximum possible earthquake for any given area.</p> <p>City has since hired Foundation Engineering to perform a site specific geotechnical investigation of the main fire station property because the structure was constructed on fill. The study, completed September 12, 2014, confirmed that to be the case, and concluded that the fire station could be compromised as a result of liquefaction and associated liquefaction-induced settlement.</p> <p>School District Priorities are included in their addendum. Below are facilities within Newport that are listed as vulnerable to earthquake in the DOGAMI Risk Report, ownership is listed in parentheses.</p> <ul style="list-style-type: none"> <li>• Public Works (Newport)</li> <li>• Fire Station No. [3200] (Newport)</li> <li>• Fire Station No. 3400 (Newport)</li> <li>• Municipal Airport (Newport)</li> <li>• Police Department (Newport)</li> <li>• Water Treatment Plant (Newport)</li> <li>• Public Works (Lincoln County)</li> <li>• Sheriff’s Office (Lincoln County)</li> <li>• Oregon State Police (Oregon)</li> <li>• Oregon National Guard Armory (Oregon)</li> <li>• Port of Newport (Port)</li> <li>• Samaritan Pacific Communities Hospital (Hospital)</li> </ul>					

<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
<p>Develop a comprehensive outreach program to educate businesses and residents about Newport's vulnerability to earthquakes and non-structural and structural retrofits they can implement to reduce the impact of a future earthquake event.</p> <p>Develop an inventory of public (i.e., city hall) and large commercial buildings/employers that may be particularly vulnerable to earthquake damage.</p> <p>Improve local capabilities to perform earthquake building safety evaluations.</p> <p>Create a local rehabilitation and retrofit program for existing buildings.</p>		<p><u>2020 Update:</u></p> <p>Seismic retrofit of Newport Fire Station completed in 2017. Seismic upgrade of Newport High gym completed in 2018. Seismic upgrade of Sam Case school completed in 2019. Seismic retrofit of Samaritan Hospital completed in 2020. Seismic work on Yaquina Bay Bridge in progress. City of Newport assessing viability of seismic upgrades of City Hall, currently housing Police and Emergency Operations.</p> <p><u>2015 Update:</u></p> <p>City recently secured funding through Oregon Emergency Management to seismically retrofit the main fire station and is in the process of hiring a firm to design and implement the changes. It is likely that the improvement will be completed within the next couple of years. City will explore opportunities to retrofit other critical city facilities as grant resources become available or the facilities are programmed for major renovation or replacement.</p>	
<b>Champion/ Responsible Organization:</b>	Community Development & Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Finance, Newport Fire Department		School District; ODOT, Oregon Emergency Management, DOGAMI, OBDD-IFA	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Seismic Rehabilitation Grant Program, Local Funding Resources		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Newport Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		



<b>Mitigation Action: Newport #4</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>		<b>High Priority Action Item?</b>		
Implement actions identified in the Stormwater element of the Newport Comprehensive Plan.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input checked="" type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Stormwater Master Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Within the city, undersized and dated storm drainage structures occasionally present problems (i.e., road closures, erosion, localized flooding). Newport has developed a stormwater master plan for a portion of its South Beach neighborhood; however, that plan is more than 10 years old. The City has never prepared a plan for the balance of its neighborhoods. Work on a comprehensive Stormwater Master Plan was completed in 2016 and it was formally adopted into the stormwater element of the Newport Comprehensive Plan in 2020 (Ordinance No. 2169). The plan identifies deficiencies in the storm drainage system and measures for addressing those deficiencies.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Identifying deficiencies in the City's storm drainage system that contribute to localized flooding, along with an action plan for addressing the shortcomings, will lessen the effect of flooding within Newport</p>						
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>				
Implement actions identified in the Stormwater element of the Newport Comprehensive Plan.		<u>2020 Update:</u> Actions to be implemented as staff and funding is available. Priority projects will be those in areas where there is an identified lack of capacity within the system to handle flows attributed to existing and future conditions.				
<b>Champion/ Responsible Organization:</b>	Public Works					
<b>Internal Partners:</b>		<b>External Partners:</b>				
Community Development Department		ODOT, ODFW, ODF, NIMS, ACOE, DSL				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>			
Local Funding Resources		Low to High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)			
<b>Form Submitted by:</b>	Newport Steering Committee, revised 2020					
<b>Action Item Status:</b>	Ongoing					

Mitigation Action: Newport #5 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Continue compliance with the National Flood Insurance Program	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input checked="" type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plan, Development Code		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The National Flood Insurance Program (NFIP) provides communities with federally backed flood insurance, provided that communities develop and enforce adequate floodplain management measures. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.</p> <p>The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will diminish flood damage to new and existing buildings in communities while providing homeowners, renters, and business owners additional flood insurance protection.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Actively participate with DLCD and FEMA during Community Assistance Visits. The Community Assisted Visit (CAV) is a scheduled visit to a community participating in the NFIP for the purpose of: 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered.</p> <p>Assess Newport floodplain ordinances to ensure they reflect current flood hazards.</p> <p>Explore the possibility of updating the county's FEMA Flood Insurance Rate Map.</p> <p>Continue to participate in the NFIP. Explore participation in the National Flood Insurance Program's Community Rating System (CRS).</p> <p>Educate residents in Newport about flood issues and actions they can implement to mitigate the flood risk.</p>	<p><u>2020 Update:</u></p> <p>On 4/18/19 FEMA issued a final flood hazard determination letter, advising the City that the new flood insurance rate maps (FIRM) and study are effective as of 10/18/19. FEMA conducted a Community Assistance Visit on 8/27/19 and requested updates to the City's flood hazard code on 9/2/19. The updated code and FIRM maps were adopted by the City on 10/7/19.</p> <p><u>2015 Update:</u></p> <p>City is actively participating in the NFIP and coordinates with state and federal agencies as needed. Participated in the update of their FIRMs and FIS, as well as the county's Risk Report.</p>	

<b>Champion/ Responsible Organization:</b>	Community Development		
<b>Internal Partners:</b>	<b>External Partners:</b>		
Public Works	FEMA, DLCD		
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>	
Local Funding Resources	Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	Newport Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Mitigation Action: Newport #6 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Pursue partnerships with DOGAMI, Lincoln County and others to improve understanding of areas subject to coastal erosion and landslides and implement actions to reduce vulnerability.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input checked="" type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
DOGAMI Open File Reports		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>LIDAR (light detection and ranging) is a mapping tool that can provide very precise, accurate, and high-resolution images of the surface of the earth, vegetation, and the built environment. It can be used to study landforms and identify areas, especially landslide areas that may be susceptible to future occurrences. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been working with communities to develop large-scale LIDAR maps of entire regions.</p> <p>The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Partnering with DOGAMI, Lincoln County and others to investigate areas that may be prone to landslides will help in understanding areas and landforms susceptible to landslide events to protect new and existing buildings, and infrastructure.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Monitor ground movement in high susceptible areas, especially during or after large storms.</p> <p>Maintain erosion control structures that are already in place.</p> <p>Identify critical facilities and infrastructure near high coastal erosion areas.</p> <p>Consider land value losses due to coastal erosion in future risk assessments.</p> <p>Create modern landslide inventory and susceptibility maps and use in planning and regulations for future development.</p> <p>Control storm water in landslide-prone areas.</p> <p>Monitor ground movement in high susceptibility areas.</p> <p>Implement grading codes, especially in high susceptibility areas.</p>	<p><u>2020 Update:</u></p> <p>DOGAMI published <a href="#">Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon</a> which maps existing landslide data for Lincoln Co and Newport. No additional work has been done on this action item.</p> <p><u>2015 Update:</u></p> <p>LIDAR mapping has been completed, and the resulting data has been used by DOGAMI to update its coastal erosion maps. This has allowed the city to use DOGAMI's maps to regulate development in areas prone to coastal erosion in order to minimize risks. While the LIDAR mapping has identified inland areas that may be subject to landslides, DOGAMI lacks the resources to adequately study these lands. Partnering with DOGAMI and Lincoln County to secure funding to conduct this work, would provide better information on landslide risks and the steps that can be taken to reduce the loss of life and destruction of property associated with such events.</p>	

<p>Utilize the DLCD report <a href="#">Preparing for Landslide Hazards, A Land Use Guide for Oregon Communities</a> (October 2019)</p> <p>Progress will be dependent upon available resources. Partnerships could include a joint application for grant funding where DOGAMI would take the lead in conducting initial studies. Priority would be given to landslide risk areas where there are concentrations of development or that are in the vicinity of critical infrastructure. The city and county are key stakeholders to help inform the analysis and the resulting recommendations. Further, the city and county are positioned to use the information to guide new development and redevelopment in a manner that minimizes loss of life and property as a result of a landslide event.</p>			
<b>Champion/ Responsible Organization:</b>		Community Development	
<b>Internal Partners:</b>		<b>External Partners:</b>	
		DOGAMI, FEMA, OEM, Lincoln County, Lincoln County communities	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Seek funding opportunities through FEMA, OEM, and DOGAMI		Medium to High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Newport Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Mitigation Action: Newport #7 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Educate residents, tourists, and/or business owners within the tsunami inundation zone on evacuation routes and tsunami assembly areas	<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>DOGAMI has updated tsunami evacuation route and assembly area maps for the entire coast. The maps for Newport, effective December 2012, illustrate that a substantial portion of South Beach, the Bayfront, and Nye Beach will be inundated in the event of a near shore Cascadia event. This impacts a substantial number of homes, businesses and recreational areas frequented by tourists. It is estimated that individuals will have 20-30 minutes to evacuate out of the tsunami inundation zone. Educating business owners, tourists, and residents will increase the likelihood that most will be able to evacuate in time and find their way to assembly areas where support resources are more likely to be available. This will reduce loss of life.</p> <p>Three manufactured housing parks are in the tsunami zone: Surf Sounds Court (4623 Oregon Coast Hwy), Harbor Village RV Park (923 SE Bay Blvd), and Surfside Mobile Village (392 NW 3<sup>rd</sup> St). Manufactured homes built prior to 2003 are subject to slipping off their foundations potentially compromising the occupants' ability to exit. The compromised egress may hinder timely evacuation.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Improve and increase saturation of tsunami wayfinding signage to direct people (particularly tourists) along core routes to make their way to high ground following an earthquake event.</p> <p>Continue program that requires tsunami evacuation route information be included in vacation rentals and expand program to include hotels.</p> <p>Attend business association meetings and encourage local businesses to share tsunami evacuation route information with employees.</p> <p>Continue participation in annual tsunami evacuation drills (with effective media coverage), such as the one conducted at the Hatfield Marine Science Center.</p> <p>Secure additional supplies to stock emergency supply caches so that resources are available to the public in the event of a near shore Cascadia event.</p>	<p><u>2020 Update:</u></p> <p>The City created an Emergency Preparedness coordinator position in 2016. Among the duties of this position is ongoing community outreach to vulnerable populations regarding emergency preparedness. Newport Fire and Lincoln County Emergency Management have also facilitated several presentations throughout the County on this topic, and will continue to do so. Tsunami evacuation route maps are available at City Hall and on the City's website. Through grants awarded by DOGAMI, the City has been able to install tsunami evacuation route wayfinding signage and thermoplastic pavement markers citywide and will have "Beat the Wave" maps available in late 2019. Adoption of an ordinance is in progress that will require all lodging establishments to post emergency information, including information about tsunami inundation and evacuation.</p>	

<p>Conduct door-to-door outreach within the tsunami inundation zone.</p> <p>Educate manufactured homeowners of the slippage potential and encourage them to store large crowbars and sledgehammers near potentially compromised doors to facilitate emergency exiting.</p>		<p><u>2015 Update:</u></p> <p>DOGAMI has updated tsunami evacuation route and assembly area maps for the entire coast, effective December 2012.</p>	
<p><b>Champion/ Responsible Organization:</b></p>		<p>Fire Department</p>	
<p><b>Internal Partners:</b></p>		<p><b>External Partners:</b></p>	
<p>Community Development, Police Department, Public Works</p>		<p>Chamber of Commerce, business associations, local utility providers, Hatfield Marine Science Center and other large employers</p>	
<p><b>Potential Funding Sources:</b></p>		<p><b>Estimated cost:</b></p>	<p><b>Timeline:</b></p>
<p>Local Funding Resources</p>		<p>Low</p>	<p><input checked="" type="checkbox"/> Ongoing</p> <p><input type="checkbox"/> Short Term (1-4 years)</p> <p><input type="checkbox"/> Medium Term (4-10 years)</p> <p><input type="checkbox"/> Long-Term (10+ years)</p>
<p><b>Form Submitted by:</b></p>	<p>Newport Steering Committee, revised 2020</p>		
<p><b>Action Item Status:</b></p>	<p>Ongoing</p>		

<b>Mitigation Action: Newport #8</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Encourage electric utility providers to convert existing overhead lines to underground lines.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Although windstorms can affect the entirety of Lincoln County, they are especially dangerous in developed areas with significant tree stands and major infrastructure, especially above ground utility lines. A windstorm will frequently knock down trees and power lines, damage homes, businesses, public facilities, and create tons of storm related debris.</p> <p>The windstorm and winter storm hazard risk assessment rates Newport as having a high vulnerability to windstorm and high probability of a future windstorm or winter storm occurring. Supporting and encouraging the electric utility providers (in particular the consumer-owned electric utility providers) to use underground construction methods to reduce power outages from storms will reduce the impact of future windstorms and winter storms.</p> <p>The Disaster Mitigation Act of 2000 requires communities to develop comprehensive actions to reduce the impacts of natural hazards.[201.6(c)(3)(ii)]. Supporting and encouraging the electric utility providers to underground existing utility lines to reduce power outages from storms will reduce the impact of future windstorms and winter storms.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Work with the consumer-owned electric utility providers to identify “undergrounding districts” so that they can plan for future investments in the area to be undergrounded. Utilize utility franchise fees, urban renewal funds and other resources, including grants, to underground existing overhead lines. Continue to require that utilities be undergrounded with new subdivision approvals.</p> <p>In both rural and urban areas, identify overheard power circuits particularly vulnerable to downed trees (where are power outages are likely to occur). Areas that are difficult to access by power repair crews will be considered when prioritizing these areas for undergrounding power lines.</p>	<p><u>2020 Update:</u></p> <p>Ferry Slip Road and South Beach/US 101 utility undergrounding project design is complete, with construction anticipated to begin in 2020. City is working with Central Lincoln PUD to establish undergrounding districts as part of an updated franchise agreement.</p> <p><u>2015 Update:</u></p> <p>No action in Newport during this period, however, utilities have completed, and are in process of completing, projects in the unincorporated county.</p>	



<b>Champion/ Responsible Organization:</b>	Community Development, Public Works		
<b>Internal Partners:</b>	<b>External Partners:</b>		
	Central Lincoln People’s Utility District, Consumers Power, Inc.		
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>	
Local Funding Resources, Utility Funding Resources, FEMA	Moderate to High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	Newport Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Newport #9</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Develop and implement education programs aimed at mitigating risk posed by hazards.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The City of Newport is vulnerable to coastal erosion hazards, drought, earthquakes, flood, landslides, tsunamis, volcanic eruptions, wildfires, and wind and winter storms. Hazards of concern include earthquakes, tsunamis, and windstorms.</p> <p>Education programs play a pivotal role in reducing risk from coastal hazards. Techniques used for hazard preparedness by an individual are primarily a function of their level of awareness. Realistic perceptions can minimize potential risk by influencing siting and design decisions. An educated community has a greater likelihood of making decisions that will reduce risk in coastal hazard situations.</p> <p>Source: Oregon Technical Resource Guide. July 2000. Community Planning Workshop. Eugene, OR: University of Oregon. p. 6-26.</p> <p>The Disaster Mitigation Act of 2000 requires that communities continue to involve the public beyond the original planning process [201.6(c)(4)(ii)]. Developing public education programs for hazard risk mitigation would be a way to keep the public informed of, and involved in, the city's actions to mitigate hazards.</p> <p>To increase natural hazard mitigation and emergency preparedness in a community, "residents must be aware of the risk and know what they should do before and after the disaster occurs. Outreach and awareness campaigns need to be carefully organized and developed to ensure that residents receive critical information.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Partner with CERT to implement a variety of education and outreach programs along the coast.</p> <p>Partner with DOGAMI's Tsunami Advisory Committee to support grassroots education and outreach programs within the community.</p> <p>Conduct awareness campaigns to encourage home and business owners to perform seismic retrofits.</p>			<p><u>2020 Update:</u></p> <p>Newport has active CERT and LISTOS (Spanish language) programs.</p> <p><u>2015 Update:</u></p> <p>Ongoing activity of city in partnership with CERT, and partners listed herein.</p>			
<b>Champion/ Responsible Organization:</b>		Fire Department				
<b>Internal Partners:</b>			<b>External Partners:</b>			

Police Department, Community Development, Public Works	Lincoln County Community Emergency Response Team (CERT), Central Oregon Coast Association, Lincoln County Public Schools	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DOGAMI, DLCD, OEM	Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Newport Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Newport #10</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Assess and determine appropriate mitigation projects for culverts on Nye Creek.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Stormwater Master Plan (expected 2015)						
<b>Rationale for Proposal (Why is this important?):</b>						
The Nye Creek drainage courses through the oldest sections of Newport. It was channelized and piped in the late 1800's and early 1900's. The system was cobbled together over the years without any type of coherent design. Culvert pipes are undersized in many areas and several were placed underneath buildings making them difficult to access. Given the age of the system it is not uncommon for culverts to collapse and the system is overwhelmed during severe storm events. This has resulted in localized flooding (including US 101) and damage to area businesses.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Implement recommendations contained in the stormwater master plan. This will likely occur in phases over several years and as funding becomes available.			<u>2020 Update:</u> Funds are budgeted to assess opportunities to construct storm water detention facilities so that downstream flooding is minimized during severe storm events. The assessment will take about a year to complete and is to be flowed by 2-3 years of construction at various locations.			
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, Building			OWRD, DEQ, ODOT, FEMA			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
City revenue bonds and DEQ loans			Medium		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Newport Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Newport #11</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Establish secondary power distribution system		<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>			
<b>Rationale for Proposal (Why is this important?):</b>			
Having a secondary power system will help to mitigate the effects of natural hazards and increase community resilience.			
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
CLPUD currently working with the City to identify an alignment for a secondary distribution system		<u>2020 Update:</u> New	
<b>Champion/ Responsible Organization:</b>	Central Lincoln PUD		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Public Works, Planning			
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources (City/PUD)		Medium to High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2020 Newport Steering Committee		
<b>Action Item Status:</b>	New		

<b>Mitigation Action: Newport #12</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Increase reliability of emergency network communication systems and data redundancy		<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
Having reliable network communications during emergencies is critical for emergency response and recovery efforts. Redundant and recoverable Information Systems are critical to increasing post-disaster community resilience.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
City is enrolled in FirstNet and GETS systems and is partnering with others to pursue redundant fiber capabilities.			<u>2020 Update:</u> New			
<b>Champion/ Responsible Organization:</b>		Information Technology				
<b>Internal Partners:</b>			<b>External Partners:</b>			
			CLPUD, Samaritan Hospital, Lincoln County, Centurylink, CoastCom, FirstNet, GETS			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Medium		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2020 Newport Steering Committee				
<b>Action Item Status:</b>		New				

<b>Mitigation Action: Newport #13</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>
Create and adopt a Tsunami Hazard Overlay Zone (THOZ) and Tsunami Evacuation Facilities Improvement Plan (TEFIP)		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input checked="" type="checkbox"/> 8
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input checked="" type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>					
Transportation System Plan, Park System Master Plan					
<b>Rationale for Proposal (Why is this important?):</b>					
In June of 2019 the Governor signed HB 3309, which repeals the ORS Chapter 455 prohibitions on new essential facilities and special occupancy uses within tsunami inundation areas. Following this legislation, the Newport Planning Commission expressed the desire to prohibit new essential facilities and certain special occupancy uses within tsunami inundation areas via a zoning overlay. In its model code for the THOZ, DLCD recommends the creation of a TEFIP to effectively develop and implement evacuation routes in conjunction with the land use review and approval process.					
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>	
Planning Commission work sessions have been held to develop draft code for the THOZ. The City will partner with DLCD and release an RFQ to solicit technical assistance for development of the TEFIP.  Work with Oregon State Parks and community leaders of South Beach State Park and Southshore neighborhood area to evaluate additional trails leading out of the campground toward high ground east of Highway 101 (Gabel and others, 2019a) Also, consider the feasibility of a vertical evacuation shelter for South Beach State Park.				<u>2020 Update:</u> New	
<b>Champion/ Responsible Organization:</b>		Community Development			
<b>Internal Partners:</b>			<b>External Partners:</b>		
			DLCD, DOGAMI		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Local Funding Resources, DLCD Technical Assistance Grant (Coastal)			Medium		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		2020 Newport Steering Committee			
<b>Action Item Status:</b>		New			

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# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the county's website and reference on the city's social media and feedback form was provided for public comment.

During the public review period there were no comments provided.

The image shows a screenshot of the Lincoln County website. The top navigation bar includes 'County Home', 'Contact Us', and a search box. The main header is 'Planning & Development' with the Lincoln County logo. A left sidebar lists various divisions and links, including 'Community Input Needed - Natural Hazards Mitigation Plan Renewal'. The main content area is titled 'Community Input Needed - Natural Hazards Mitigation Plan Renewal' and contains text about the renewal process, a 'Community Member Input' section with a survey link, and a list of 'Natural Hazards Mitigation Plan - September 2020 Renewal Plan' volumes. A 'SUPPORTING DOCUMENTS' section lists various draft review documents. A 'WEB LINKS' section is at the bottom.

Overlaid on the bottom left is a 'Natural Hazard Mitigation Plan Public Feedback Survey' form. The form includes a title, a request for feedback, contact information for Emergency Management (541-265-4199), a large text input field for feedback, and optional fields for Name, Contact Phone Number, Contact Email, and Zip Code. There is a 'Submit' button and a checkbox for 'Send me a copy of my responses'.

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

Mitigation Action: Newport # (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# City of Siletz Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



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Effective:

December 29, 2020 through December 28, 2025



Prepared for:  
City of Siletz

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



FEMA

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
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Disaster Award Number: OR-2018-001

Additional Support Provided by:



DLCD

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**FEMA**

January 8, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Chair Jacobson:

On December 29, 2020, the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Hazard Mitigation Plan as a multi-jurisdictional local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance (HMA) grants projects through December 29, 2025, through your state:

City of Newport | Lincoln County | Lincoln County School District | City of Siletz

FEMA individually evaluates all application requests for funding according to the specific eligibility requirements of the applicable program. Though a specific mitigation activity or project identified in the plan may meet the eligibility requirements, it may not automatically receive approval for FEMA funding under any of the aforementioned programs.

Approved mitigation plans may be eligible for points under the National Flood Insurance Program's Community Rating System (CRS). For additional information regarding the CRS, please visit: [www.fema.gov/national-flood-insurance-program-community-rating-system](http://www.fema.gov/national-flood-insurance-program-community-rating-system) or contact your local floodplain manager. Over the next five years, we encourage your communities to follow the plan's schedule for monitoring and updating, and to develop further mitigation actions. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at (503) 378-2911, who locally coordinates and administers these efforts.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

Enclosure

cc: Amie Bashant, Oregon Office of Emergency Management

EG:vl

**A Resolution Adopting the City of Siletz  
Representation in the Updates to the  
Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan**

**WHEREAS**, the City of Siletz recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the City of Siletz has fully participated in the FEMA prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the City of Siletz has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Siletz to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *City of Siletz addendum* to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

**WHEREAS**, the NHMP is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and




**WHEREAS**, City of Siletz adopts the NHMP and directs the City Recorder to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

**Now, therefore, be it resolved**, that the City of Siletz adopts *the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

**Be it further resolved**, that the City of Siletz will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

Adopted this 14 day of December, 2020

  
\_\_\_\_\_  
Certifying Official

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## Purpose

This is the 2020 update of the City of Siletz addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP). The City of Siletz's original addendum to Lincoln County's NHMP was completed and approved by FEMA in 2009 (updated in 2015). This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation, and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Siletz's addendum are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Siletz adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **December 14, 2020**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the City's addendum on **December 29, 2020**. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The City concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## Process and Participation

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Department of Land Conservation and Development, Oregon Office of Emergency Management (OEM), Lincoln County, and Siletz to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal-Year 2017 (FY17) Pre-Disaster Mitigation (PDM) Competitive Grant Program OR-2018-001 (PDMC-PL-10-OR-2017-02). Members of

the Siletz NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Siletz addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Siletz NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Siletz Public Works Administrator serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Lincoln County NHMP in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Planning Director and Emergency Manager).

Representatives from the City of Siletz steering committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the city's addendum, with focus on the plan's risk assessment and mitigation strategy (action items).

The current version of the addendum reflects changes decided upon at the designated meetings and through subsequent work and communication with OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include revisions to the city's Risk Assessment and Hazard Identification sections, Action Items, and Community Profile.

The Siletz Steering Committee was comprised of the following representatives:

- Convener, Dave Eshleman, Public Works Administrator
- Allen Middaugh, Public Works Superintendent
- Willie Worman, Mayor
- Sheila Jordan, Jr. City Recorder

### Public Participation

Public participation was achieved by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment via a survey administered by IPRE (Volume III, Appendix F). During the City public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The City Council will be responsible for adopting the Siletz addendum to the Lincoln County NHMP. This addendum designates a steering committee and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Siletz addendum on an annual schedule; the county is meeting on a quarterly basis and will provide opportunities for the jurisdictions (cities and special districts) to report on NHMP implementation and maintenance during their meetings. The City's Public Works Administrator will serve as the convener and will be responsible for assembling the steering

committee. The steering committee will be responsible for identifying new risk assessment data, reviewing status of mitigation actions, identifying new actions, and seeking funding to implement the city's mitigation strategy (actions). The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and priority actions in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Where possible, Siletz will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Siletz's acknowledged comprehensive plan is the City of Siletz Comprehensive Plan. The City implements the plan through the Community Development Code.

## **Existing Plans and Policies**

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and



policies already in existence have support from residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

Siletz's Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the addendum helps identify what resources already exist that can be used to implement the action items identified in Siletz's Addendum. Implementing the city's mitigation actions through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the city's resources.

The following are Siletz's existing plans and policies that relate to natural hazards:

- **Comprehensive Plan, 1992, last amended 2014:** A document stating the general, long-range policies that will govern a local community's future development.

*Relation to Natural Hazard Mitigation:* Contains city-specific information regarding natural hazards within the city's jurisdictional boundaries.

- **Zoning Ordinance, 1987:** Establishes land use zones to regulate the location of building structure and the use of land within the City of Siletz.

*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the placement and construction of the buildings and addresses issues such as floodplain development, fire resistant materials, etc. The city's flood damage prevention ordinance was last adopted in 2009 (Chapter 15.12 of the municipal code).

- **Emergency Operations Plan, 2014:** All hazards plan describing how Siletz will respond to incidents.

*Relation to Natural Hazard Mitigation:* The plan includes a hazard vulnerability assessment, evaluation of hazards in the community, and demonstrates how the community will respond to natural hazard events.

- **Lincoln County Community Wildfire Protection Plan, 2018:** Assists Siletz clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.

*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

- **Water Management and Conservation Plan, 2020:** Guides the development and implementation of water management and conservation programs and policies to ensure sustainable use of water resources.

*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment and includes mitigation actions to reduce risk to drought and flood.

## Government Structure

The City Council is the policy making body for Siletz. As the elected legislative body in Siletz, the City Council has overall responsibility for the scope, direction and financing of city services. Council members serve four-year terms. Additional departments within the city include the following:

**City Recorder:** The city recorder assures the timely presentation of formal communications from the public, other agencies and city staff to the City Council. The recorder prepares City Council meeting agendas; maintains official city records which reflect the action of the governing body; maintains depository of contracts, agreements and official Council actions and ensures the timely availability of these records to the Council, public, other agencies and staff.

**Public Works Department:** The Public Works Department provides responsive community services related to planning, design, construction, operation, maintenance and management of public infrastructure, including streets, sewer, water treatment, wastewater treatment, public buildings, and other facilities. Services provided by the department contribute to the public health, safety, economic diversity, environmental quality and citizen convenience.

**Land Use Planning:** The city provides services and information to the general public regarding all phases of community development and land use planning. Staff implements city ordinances, administers the local comprehensive plan and land use code, and advises the City Council and Planning Commission on all land use and special project matters.

**Fire Department:** The Siletz Valley Fire Department is responsible for responding to fires, providing emergency medical service, and managing the aftermath of disasters for the City of Siletz and the surrounding community.

**Library:** The public library has access to books and items through membership in the Coastal Resource Sharing Network, a cooperative of libraries in Lincoln and Tillamook Counties.

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review. Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the City's website: <http://cityofsiletz.org/>

In addition, natural hazards information dissemination is conducted throughout the year when opportunities present themselves via the city offices and website.

## NHMP Maintenance

The Lincoln County Multijurisdictional Natural Hazard Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's action items were first developed through a two-stage process during the 2009 NHMP development and revised in 2015. In stage one, OPDR facilitated a work session with the steering committee to discuss the city's risk and to identify potential issues. In the second stage, OPDR, working with the local steering committee, developed potential actions based on the hazards and the issues identified by the steering committee. During the 2019-2020 update process OPDR re-evaluated the Action Items with the county and local steering committees and updated actions, noting what accomplishments had been made and if the actions were still relevant; any new action items were identified at this time. For additional information see the discussion near the end of this document.

The City's actions are listed in Table SA-1. For more detailed information on each action, see the action forms within Attachment A of this addendum.

In addition, there are 15 County Action Items that include the city as an "Affected Jurisdiction" (Table SA-12). For more detailed information on the county actions that involve city participation, see Volume I, Section 3 and the action item forms within Volume III, Appendix A.

Priority Action Items

Table SA-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in bold text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action.

**Table SA-I City of Siletz Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing
Siletz #1	Educate residents about natural hazards preparedness.	City of Siletz	L	Ongoing
<b>Siletz #2</b>	<b>Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.</b>	<b>City of Siletz</b>	<b>H</b>	<b>Long</b>
Siletz #3	Identify over-water transportation alternatives in the event of bridge collapse in an earthquake.	City of Siletz	M to H	Long
<b>Siletz #4</b>	<b>Identify locations for disaster caches (food and emergency supplies) in strategic locations</b>	<b>City of Siletz</b>	<b>M</b>	<b>Short</b>
Siletz #5	Identify options and strategies to ensure community health facility is prepared to function and support the community after a significant disaster.	City of Siletz	L	Short
<b>Siletz #6</b>	<b>Coordinate with tribal leadership on resilience efforts.</b>	<b>City of Siletz</b>	<b>L</b>	<b>Medium</b>

Source: City of Siletz NHMP Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

# Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure SA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure SA-I Understanding Risk**



## Hazard Analysis

The Siletz NHMP steering committee reviewed and revised the plan’s Hazard Analysis and Risk Assessment section. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in probability, vulnerability, and risk from natural hazards unique to the City of Siletz, which are discussed throughout this addendum.

Table SA-2 shows the hazard analysis matrix for Siletz listing each hazard in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

One catastrophic hazard (Cascadia Subduction Zone earthquake) and three chronic hazards (windstorm, riverine flood, and drought) rank as the top hazard threats to the City (Top Tier). Winter storm (snow/ice), landslide, and wildfire comprise the next highest ranked hazards (Middle Tier). Crustal earthquake, volcanic events, and tornado comprise the lowest ranked hazards in the City (Bottom Tier). *Note: the coastal hazards assessed in Lincoln County were not included in the city’s hazard analysis.*

**Table SA-2 Hazard Analysis Matrix – City of Siletz**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Flood (Riverine)	20	35	90	70	215	#2	
Drought	20	40	80	70	210	#3	
Earthquake (Cascadia)	10	50	100	49	209	#4	Middle Tier
Winter Storm (Snow/Ice)	18	25	80	70	193	#5	
Landslide	10	20	50	35	115	#6	
Wildfire	10	15	50	35	110	#7	
Earthquake (Crustal)	10	20	40	21	91	#8	Bottom Tier
Volcanic Events	2	5	40	7	54	#9	
Tornado	2	10	10	7	29	#10	
Coastal Erosion	The city is not affected by these coastal hazards, as such they were not included.						
Flood (Coastal)							
Tsunami (Distant)							
Tsunami (Local)							

Source: City of Siletz NHMP Steering Committee (2020)

Table SA-3 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Lincoln County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings).

**Table SA-3 Probability and Vulnerability Comparison**

Hazard	Siletz		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	*	*	High	Low
Drought	High	<b>High</b>	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	*	*	High	Moderate
Flood (Riverine)	High	Moderate	High	Moderate
Landslide	<b>Moderate</b>	<b>Moderate</b>	High	High
Tornado	<b>Low</b>	Low	High	Low
Tsunami (Distant)	*	*	Moderate	Low
Tsunami (Local)	*	*	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	<b>Moderate</b>	<b>Low</b>	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	Moderate	High	Moderate

Source: City of Siletz NHMP Steering Committee and Lincoln County NHMP Steering Committee (2020)

Note: \* - Hazard not ranked and does not affect the city.

## Community Characteristics

Table SA-4, Appendix C (Volume III), and the following section provide information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2012 and 2019 the City grew by 10 people (1%).<sup>1</sup> According to the State’s official coordinated population forecast, between 2019 and 2040 the City’s population is forecast to grow by 28% to 1,579.<sup>2</sup> Median household income decreased by 2% between 2012 and 2017.<sup>3</sup> Just under 20% of the city’s population is Native American and the city is the location of the Confederated Tribes of Siletz Indians administration and program building and tribal community center. The City has an educated population with 84% of residents 25 years, and older holding a high school degree, 7% have a bachelor’s degree or higher. The Lincoln County School District has a 76% graduation rate as of 2019 (Siletz Valley School also has a 76% graduation rate). Siletz includes commercial development but is zoned primarily residential.

Development in Siletz spreads mostly north to south along US-Highway 229, and east along Logsdan Road and local access roads surrounding the town (see Figure SA-3). The main commercial area is concentrated near the intersection of Highway 229 and Logsdan Road, and surrounding areas consist of residential and commercial development. The Confederated Tribes of Siletz Indians tribal lands are located on the eastern side of town. The city’s Comprehensive Plan identifies land use needs within the city and its urban growth

<sup>1</sup> Portland State University, Population Research Center, "Annual Population Estimates", 2019.

<sup>2</sup> Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

<sup>3</sup> Social Explorer, Table T57, U.S. Census Bureau, 2013-2017 and 2008-2012 American Community Survey Estimates.

boundary. City zoning designations primarily include residential, commercial, and public lands.

Figure SA-2 shows the City of Siletz's zoning map. New development has complied with the standards of the [Oregon Building Code](#), and the city's development code including their floodplain ordinance.

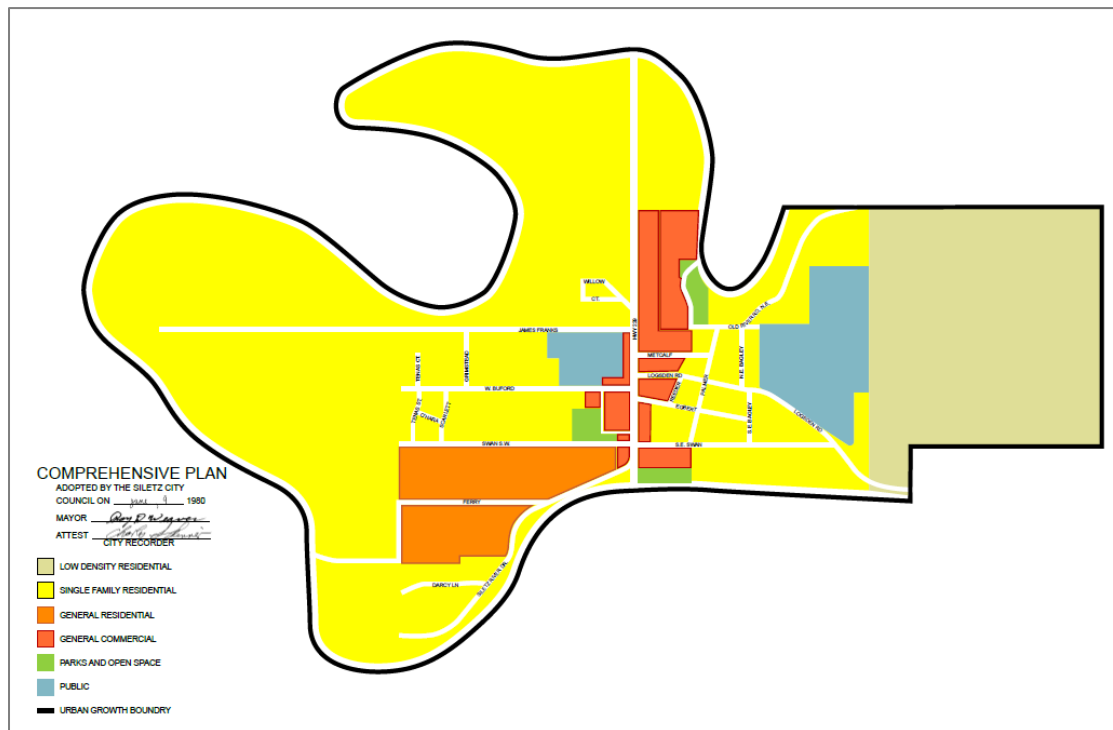
## Economy

Siletz's commercial areas developed along primary routes and residential development followed nearby (see Figure SA-2).

Most workers residing in the city (98%, 388 people) travel outside of the city for work primarily to Newport, Toledo, Lincoln City, Corvallis, and the Portland metro area.<sup>4</sup> A significant population of people travel to the city for work, (91% of the workforce, 96 people) primarily from Newport and Toledo.

Just over 46% of the resident population 16 and over is in the labor force (580 people) and are employed in a variety of occupations including office and administrative support (18%), building and grounds cleaning (15%), sales (12%), transportation and material moving (11%), and construction, extraction, and maintenance (10%) occupations.<sup>5</sup>

**Figure SA-2 Zoning Map**



Source: City of Siletz

<sup>4</sup> U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2017). Longitudinal-Employer Household Dynamics Program, accessed on April 25, 2020 at <https://onthemap.ces.census.gov>.

<sup>5</sup> Social Explorer, Tables A17008 & A17002, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.



**Table SA-4 Community Characteristics**

Population Characteristics		
<b>2012 Population</b>	1,225	
<b>2019 Population</b>	1,235	
<b>2040 Forecasted Population</b>	1,579	
Race (non-hispanic or latino) and Ethnicity (Hispanic)		
White	67%	
Black/ African American	1%	
American Indian and Alaska Native	17%	
Asian	1%	
Native Hawaiian and Other Pacific Islander	0%	
Some Other Race	0%	
Two or More Races	14%	
Hispanic or Latino (of any race)	1%	
<b>Limited or No English Spoken</b>	14	1%
Vulnerable Age Groups		
Less than 15 Years	263	17%
65 Years and Over	235	15%
Age Dependency Ratio		0.48
Disability Status		
Total Population	482	32%
Children (Under 18)	43	11%
Working Age (18 to 64)	301	33%
Seniors (65 and older)	138	59%
Income Characteristics		
Households by Income Category		
Less than \$15,000	85	16%
\$15,000-\$29,999	147	27%
\$30,000-\$44,999	110	20%
\$45,000-\$59,999	70	13%
\$60,000-\$74,999	61	11%
\$75,000-\$99,999	43	8%
\$100,000-\$199,999	25	5%
\$200,000 or more	-	0%
<b>Median Household Income</b>		\$39,044
Poverty Rates		
Total Population	363	24%
Children (Under 18)	113	31%
Working Age (18 to 64)	221	24%
Seniors (65 and older)	29	12%
Housing Cost Burden (Cost > 30% of household income)		
Owners with Mortgage	40	12%
Renters	92	47%

Source: U.S. Census Bureau, 2013-2017 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2019. Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

Housing Characteristics		
Housing Units		
Single-Family	240	43%
Multi-Family	42	7%
Mobile Homes	282	50%
Year Structure Built		
Pre-1970	94	17%
1970-1989	298	53%
1990-2009	169	30%
2010 or later	3	11%
Housing Tenure and Vacancy		
Owner-occupied	347	62%
Renter-occupied	194	34%
Seasonal	0	0%
Vacant	23	4%

The City of Siletz is located on the Siletz River and lies approximately 8 miles inland from the Pacific Ocean, 13 miles from the county seat of Newport and approximately 7 miles north of the City of Toledo. The city is approximately 130 feet above sea level, and city limits cover a land area of approximately 400 acres. The city is situated in the Siletz River Valley, bounded by the Siletz River and coastal mountains.

The climate in Siletz is moderate. Average monthly temperatures range from lows of 39-40° F (December through February) to highs of 65° F (July through September). The driest months are July and August (average about 0.8 inches of precipitation per month) the wettest months are November through January (average more than ten inches of precipitation per month). Siletz has an average annual precipitation of approximately 67.5 inches (71%, 47.6 inches falls November through March).

## Asset Identification

The following assets identified by the City of Siletz were first gathered from the Asset Identification meetings held with community members in 2007. These assets were confirmed and updated by the City steering committee during the 2019-2020 update process.

## Cultural and Historic Resources

The City of Siletz has a long and rich history. As reviewed on the city's website, "The Siletz Reservation is contiguous with Siletz on its east side and lies to the north and southeast of the town as well. The roots of the Siletz peoples lie in some 27 tribes that once populated the coastal areas of Lincoln, Tillamook, and Lane Counties. In 1851 the U.S. Federal Government forced the Indians of Western Oregon onto reservations as a way of reducing conflicts between the Indians and the flood of Euro-American settlers who came for the area's newly found gold.

Over the years the size of the Siletz reservation has been reduced. A railroad to the coast divided the reservation in two in the late 1860s and large sections of the reservation were opened to White settlement by the federal government. In the next couple of decades parts of the reservation were closed and the Dawes Act of 1887 placed tribal lands into allotments. Those lands that were not eventually allocated to Indians went into the public domain and were sold to settlers. In 1956 the Western Oregon Termination Act declared that the people of the Siletz Tribe were no longer Indians. As a result, more of their land was sold to settlers, and given to the town of Siletz. In 1977 the Siletz Tribe, with the enactment of the Siletz Restoration Act, was again recognized as an Indian tribe. The reservation now includes approximately 39 acres near town and 3,630 acres of timberland throughout Lincoln County. In 1991 the Tribe built a 13,500 square foot Tribal Health Clinic just outside of the town. The clinic is an asset to the community as it serves tribal members and non-members. Today the Confederated Tribes of Siletz plays an important role in the area.

Native Americans relied on the area's natural resources long before the arrival of Euro-American settlers. At the beginning of the colonial era, native peoples subsisted by fishing, hunting, and gathering. In the more recent past the Siletz Tribe relied on the area's natural resources for their sustenance. They gathered a variety of plants, hooked and trapped lamprey, caught salmon, collected freshwater mussels, and hunted deer. However, recent declines in lamprey and salmon populations have reduced access to these two important traditional food sources. Although the state does not recognize the Tribes coastal fishing rights today, the tribe believes that they are legitimized via treaty rights.

Euro-American settlers continued to enter the Siletz area throughout the latter 1800s. They established general stores in the community. For homesteaders who settled in rural areas outside of town, pack trains brought supplies to them. Siletz was like the rest of Lincoln County as its major industries were logging, lumbering, farming (agricultural and pastoral), rock crushing, reforestation, gathering of native flora, and cascara bark peeling. The town site of Siletz was established in 1910. The city was eventually incorporated in 1946. In the early days travel in the Siletz area was difficult, as most was done by foot or horse. A ferry aided those who crossed the Siletz River. The June 29th, 1939 Lincoln County Leader describes Siletz as a center of trade and logging, as much of the timber headed for California and many eastern ports at that time came from the area.

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The National Register of Historic Places lists one historic site within the City of Siletz while the State Historic Preservation Office includes several other properties.<sup>6</sup> The following list includes the one property that is listed on the National Register of Historic Places:

- Siletz Agency Site, c.1856 (eligible/significant)

The following list includes 11 other properties listed on the State Historic Preservation Office website:

- Gomes Property, 534 Logsdan Rd, c.1930 (vicinity) (eligible/significant)
- Shaker Church, c.1923 (eligible/contributing)
- Siletz River Bridge, N Gaither St, 1946 (vicinity) (eligible/contributing)
- Siletz River Bridge, Hwy 181, 1956 (vicinity) (eligible/contributing)
- Government Hill Hospital, Park and Cemetery Way, c.1890 (eligible/contributing)
- Siletz River Covered Bridge, Sams Creek Rd, 1922 (vicinity) (eligible/contributing)
- Siletz River Bridge, Siletz Hwy, 1946 (vicinity) (eligible/contributing)
- [House], 419 A St, c.1945 (not eligible/noncontributing)
- [House], 465 W Buford, c.1925 (not eligible/noncontributing)
- House, 218 NE Palmer St, c.1930 (not eligible/noncontributing)
- Siletz Cemetery, Park & Cemetery Rd (undetermined/lack of info)

The City of Siletz is surrounded by a rich diversity of natural resources, which attract residents and tourists to the area. The local grange hosts a weekly market that includes fresh produce, plants, arts, crafts, and food. Fishing, boating and kayaking are popular activities as are hiking, birding and wildlife watching. Local public parks allow residents to enjoy the surrounding natural beauty and they also provide areas for sports, swimming, and skateboarding. The Confederated Tribes of Siletz hosts the annual Nesika Illahee Pow Wow held the second weekend of August. The event celebrates with native crafts, food, dancing competitions and the sale of a wide variety of native crafts and products.

## Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to act in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and wastewater treatment facilities.

Siletz has the following critical facilities (**bold** indicates facility was included in the Risk Report [DOGAMI, O-20-11](#)):

- City Hall (215 W Buford Ave)
- Water treatment plant (389 NW Park Dr)
- Wastewater treatment plant (1264 NW James Frank Ave)

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<sup>6</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 21, 2020.

- Public library (255 SE Gaither St) (*Essential*)
- **Siletz Valley Schools** (245 NW James Frank Ave)
- **Siletz Valley Fire Department: Station 5200** (149 W Buford Ave)
- Police service is provided by the Confederated Tribe of Siletz Indians and the Lincoln County Sheriff
- In addition, there are critical facilities that are owned and operated by the Confederated Tribes of Siletz Indians within the city. Please see their standalone NHMP for more information.

## Transportation

Mobility plays an important role in Siletz, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within the City. Siletz is also served by Lincoln County Transit Route 493 with service running Monday through Saturday connecting Newport, Toledo, and Siletz.

### Roads/Seismic lifelines

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>7</sup>

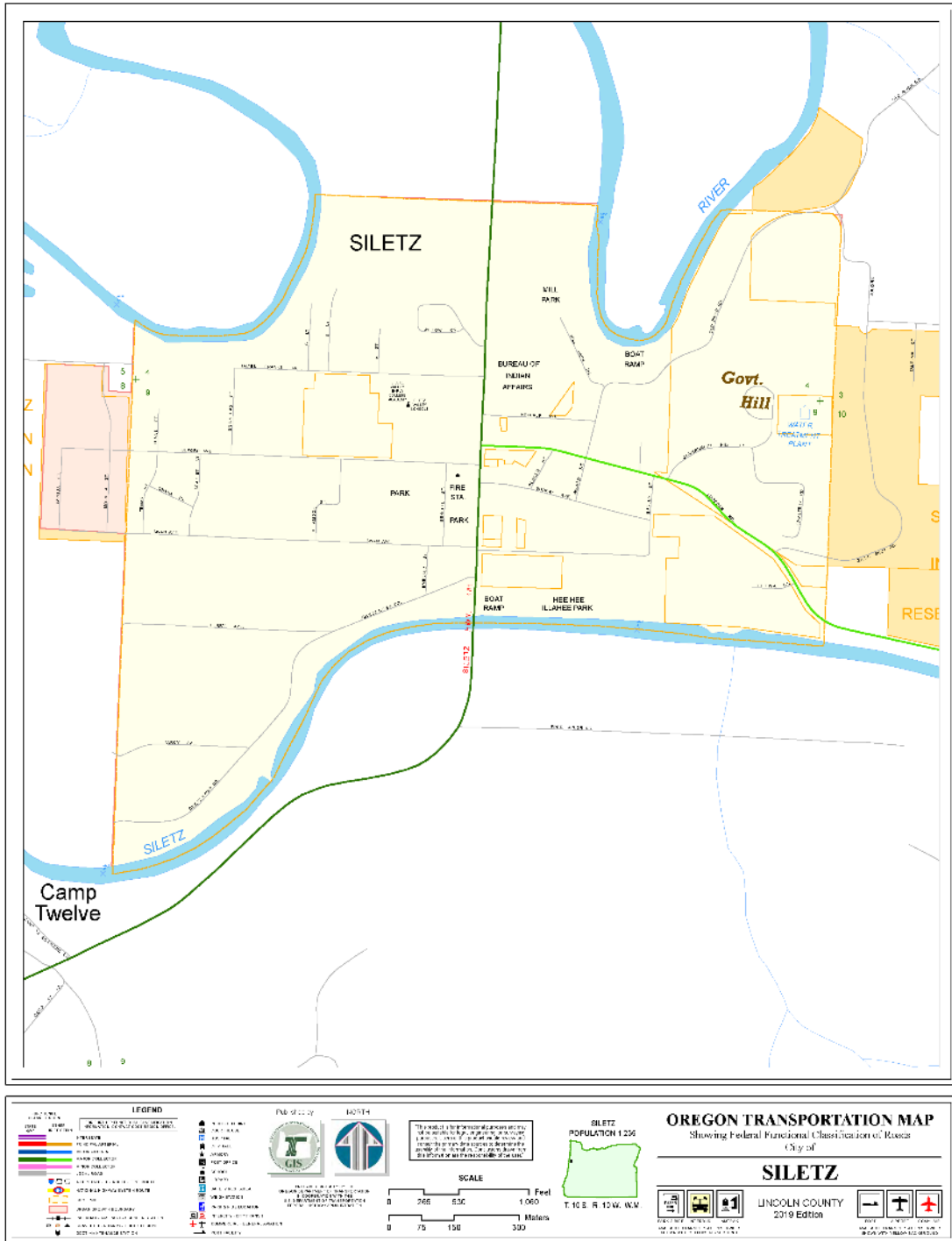
System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

The City of Siletz lies adjacent to US-Highway 229. Highway 101 (Tier I) is the major north-south transportation route for the Coast and is located to the west of the City (see Figure SA-3). Highway 20 (Tier III), south of the City, is the major east-west transportation route connecting the coast to the Willamette Valley.

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<sup>7</sup> Oregon Department of Transportation. Oregon Seismic Lifeline Evaluation, Vulnerability Synthesis, and Identification, *Oregon Seismic Lifeline Routes*, May 15 2012.

**Figure SA-3 Siletz Functional Classification of Roads**



Source: Oregon Department of Transportation - [Link](#)

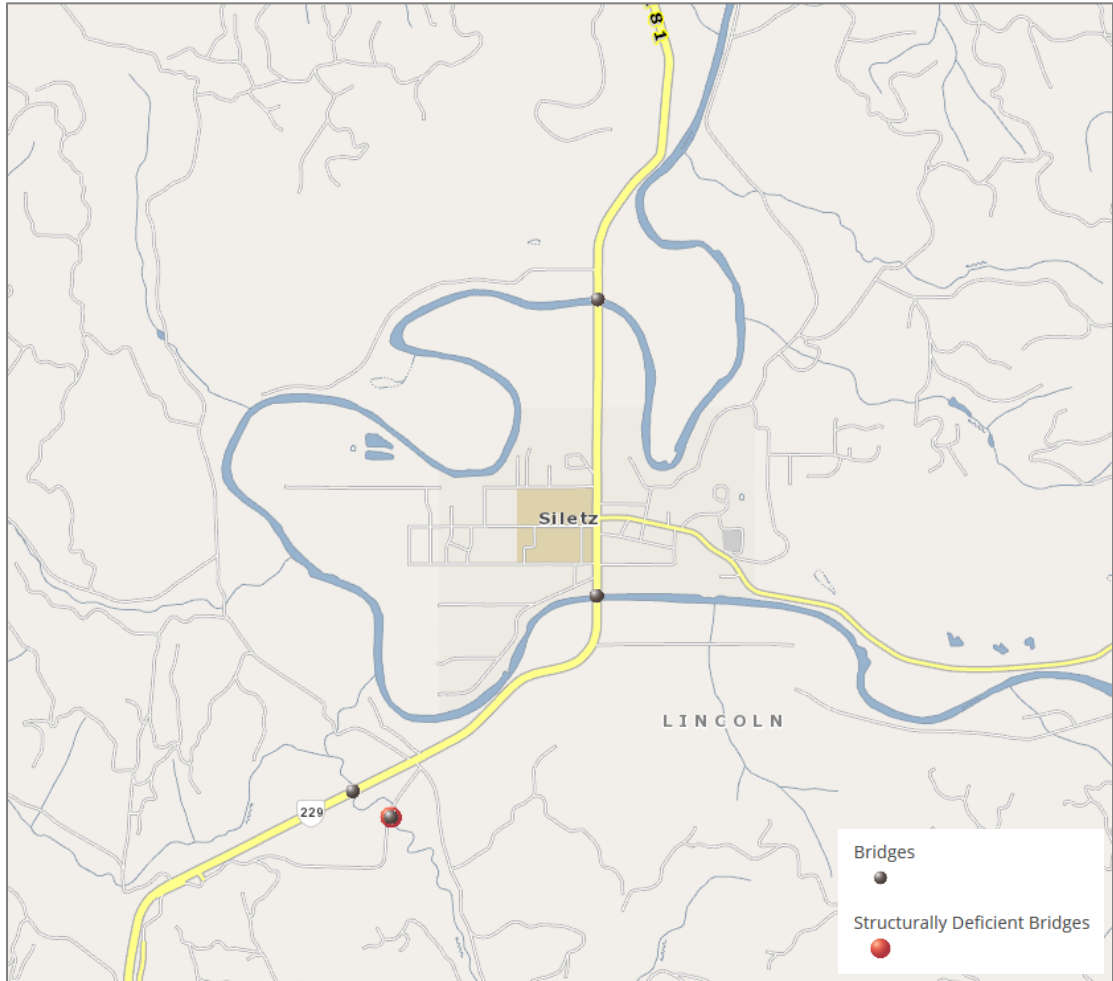
**Bridges**

Because of earthquake risk, the seismic vulnerability of the city’s bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries

are unable to transport goods. Bridges within the city that are critical or essential include (see Figure SA-4):

- Siletz River, Hwy 181 at MP 23.10 (Fuller) (Bridge ID 00851A) – northern bridge
- Siletz River, Hwy 181 at MP 24.10 (Bridge ID 00853A) – southern bridge
- Siletz River, Hwy 181 at MP 20.66 (Ojalla) (Bridge ID 00852A) – north of city

**Figure SA-4 Oregon Bridges and Structurally Deficient Bridges**



Source: Oregon Department of Transportation, ODOT TransGIS, accessed July 21, 2020

More information on Seismic Design of bridges is on the ODOT website:

<https://www.oregon.gov/odot/Bridge/Pages/Seismic.aspx>

### Railroads

There are no railroads in Siletz.

### Airports

There are no public airports in Siletz. The Newport Municipal Airport is the nearest airport (about 18 miles southwest of the City). The city has no commercial service airports. The nearest commercial airports are in Eugene and Portland.

### Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Generally, the network of electricity transmission lines running throughout the city is operated by Central Lincoln PUD. The Williams Gas Pipeline provides natural gas that is delivered to customers in the city by Northwest Natural Gas. These lines may be vulnerable as infrequent natural hazards, like earthquakes, could disrupt service to natural gas consumers across the region.

The city water, wastewater, and stormwater (culvert) systems include the following:

#### Water Infrastructure

- Water Treatment Plant (Government Hill Road)
  - Raw Water Storage Tank (1.5 MG), built 2010, bolted glass fused steel
  - Treated Water Storage Tank (0.2 MG), built 1973, welded steel
  - Treated Water Storage Tank (0.3 MG), built 1987, welded steel
  - Treated Water Storage Tank (0.5 MG), built 1999, bolted glass fused steel
- Pump Stations (no generator for any facility)
  - Siletz River Pump Station, (350 South Gaither St., Hee Hee Illahee Park)
  - Raw Water Tank Pump Station, (Government Hill Road)
  - Treated Water Clearwell Station

#### Wastewater Infrastructure

- Wastewater Treatment Plant (1264 NW James Frank Rd)
- Willow Court Pump Station (Willow Court)

## **Community Organizations and Programs**

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The countywide community organizations that are active within the city and county and may be potential partners for implementing mitigation actions can be found in Appendix C: Community Profile.

## **Lincoln County School District**

The Siletz Valley Schools charter school also serves students in the City of Siletz. Siletz students attend Lincoln County School District schools in Toledo and Newport.

## Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions better understand risk and can assist in documenting successes. The following efforts have occurred or are ongoing within the City of Siletz:

- The City of Siletz adopted in 2005: Vulnerability Assessment and Emergency Action Plan Siletz Water Treatment Plant (reviewed and revised May 2017).
- The City of Siletz: Vulnerability Assessment and Emergency Action Plan Siletz Wastewater Treatment Plant (reviewed and revised May 2017).
- Water Management and Conservation Plan, curtailment plan (October 2018)
- The City of Siletz adopted in 2007: Emergency Response Planning Template for Public Wastewater System.
- The City of Siletz adopted in 2014: City of Siletz Emergency Operations Plan. Updated contacts list in 2020.
- The Siletz Valley Fire Department participates in practice drills locally and county-wide.
- The City of Siletz maintains emergency preparedness information on its website.
- Floodplain ordinance was updated in mid-2020.



## Hazard Profiles

The following sections briefly describe relevant information for each profiled hazard. More information on Lincoln County hazards can be found in Volume I, Section 2 *Risk Assessment* and in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the City of Siletz. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The City hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

### Coastal Erosion

The City of Siletz does not border the Pacific Ocean; as such, coastal erosion is not considered to be a hazard within the community.

### Drought

The steering committee determined that the city's probability for drought is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to drought is **high**, meaning more than 10% of the city's population or property could be affected by a major drought event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of drought hazards, as well as the history, location, extent, and probability of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared coastal communities from the effects of a drought. However, the City of Siletz is concerned about water supply on an annual basis and only has capacity for a 12-day supply of water.

The city maintains two water sources. The Siletz River is a direct-flow water source that can have short periods of high turbidity during winter storms that is a potential threat to water supply. River. Landslides could potentially occur above the Siletz River water-intake and threaten the city's water supply. The city's secondary water source is from the Tangerman Creek Reservoir. The water quality from the reservoir is poorer and has not been used in recent history. If needed it would likely be used during periods of winter storm/flooding when turbidity is too high in the Siletz. The City has two interconnections with the Confederated Tribes of Siletz Indians and the Siletz Mobile Park Water System. The City has about 426 water connections (residential/business) within the City, 190 (residential/business) with the Confederated Tribes of Siletz Indians, and 32 residential water connections outside city limits (Camp 12) for a total of 648 service connections. There are about 2,000 residents within the Siletz Water Service Area. Major upgrades to the city's water treatment plant and system occurred in 1999. Upgrades included a 0.5 MG Treated Water Storage Tank (increasing storage capacity to 1.0 MG), new treatment system, and replacement of about 60% of the water distribution system.

Water from the city reservoirs is treated at the water treatment facility that can treat up to 4.0 million gallons per day (mgd). Following treatment water flows via 8-inch water

transmission mains to three water storage tanks (total capacity of 1 million treated gallons) located at the site of the Water Treatment Plant (outside of the flood hazard zone). The city has an additional 1.5 million gallons of untreated water available that enables the city to turn off water river pumps during periods of high turbidity for 10-12 days before refilling. In 2013, the Confederated Tribes of Siletz Indians constructed a new 0.5 MG water storage tank to increase the storage capacity of their water supply system and meet increasing demands of the community. This difference results from draw-down and pressure needs throughout the city. The city has approximately 8.3 miles of transmission pipeline ranging from 2-inch to 12-inch and about 2.4 miles of distribution pipeline. The City has enough capacity to meet current and anticipated future demand. The city has a Water Management and Conservation Plan that includes water curtailment measures that will go into effect in the event of a drought.

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## Vulnerability Assessment

Due to insufficient data and resources, Siletz is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks apply to humans and resources.

The city’s existing water supply is most vulnerable to wildfire which may impact the city’s watershed and is increased during periods of drought. The City’s storage, water transmission, and distribution lines are vulnerable to seismic activity that could cause them to crack. Additionally, in the event of a fire or turbidity problems, the water supply could be significantly reduced. Storage capacity is limited, and the city’s steering committee believes that increased storage capacity may assist in mitigating the impact of a severe drought event.

## Earthquake

The steering committee determined that the city’s probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a CSZ event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major CSZ earthquake event. The steering committee determined that the city’s probability for a crustal earthquake event is **low**, meaning one incident may occur within the next 100 years and that their vulnerability to a Crustal Earthquake event is **moderate**, meaning that between 1% and 10% of the City’s population or property could be affected by a major crustal earthquake event. *The city’s probability to crustal earthquake was decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of earthquake hazards, as well as the history, location, extent, and probability

of a potential event. Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>8</sup>

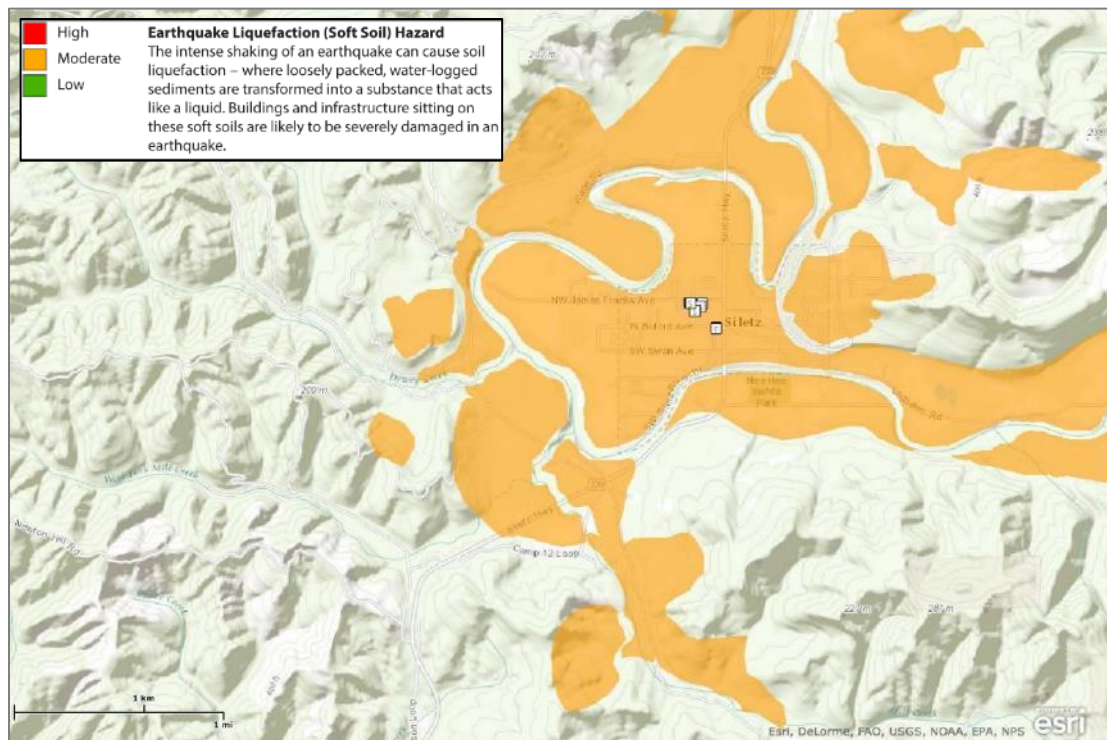
The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides.

The figures below show earthquake hazards that affect the city, including the soft soil/liquefaction hazard (Figure SA-5), expected ground shaking for crustal events (Figure SA-6), and for the Cascadia Subduction Zone event (Figure SA-7). The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. The soft soils figure below shows that in general the soils in Siletz have low to moderate liquefaction potential; the areas of the population along the coastline are more susceptible to liquefaction than areas further in land and away from rivers.

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<sup>8</sup> DLCD. *Oregon State Natural Hazard Mitigation Plan*. 2020 (Draft).

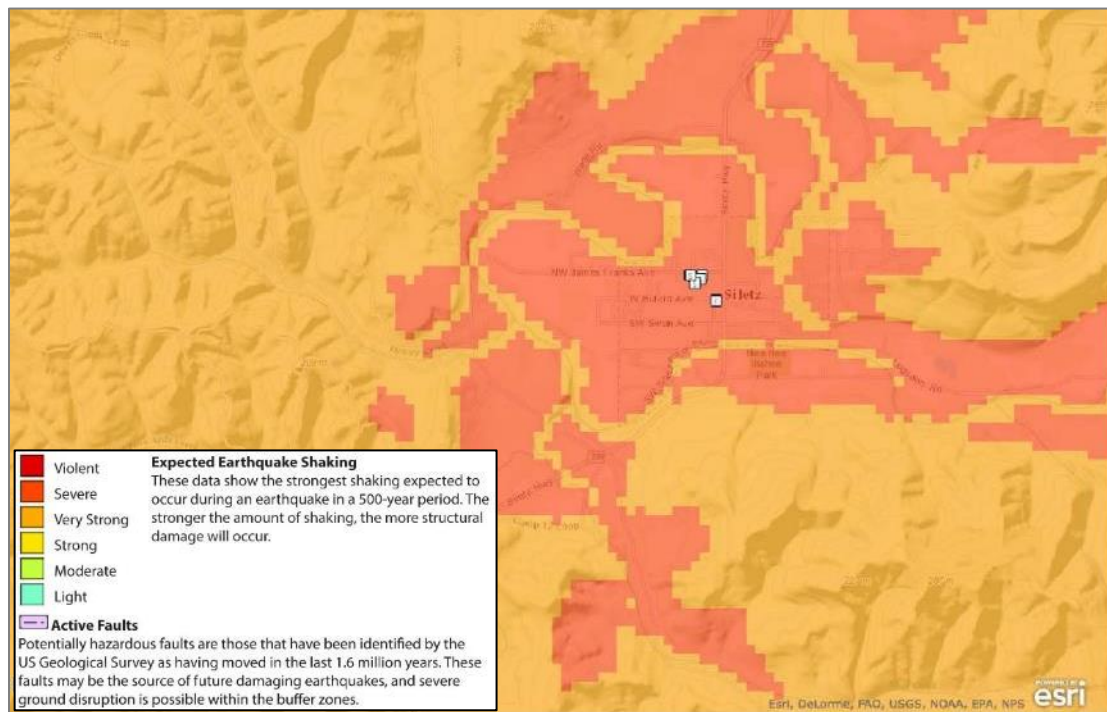
**Figure SA-5 Earthquake Liquefaction (Soft Soil) Hazard**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To view detail click hyperlink to left.

Shaking from the combined earthquake scenario is expected to be very strong to violent for much of Siletz as shown in Figure SA-6.

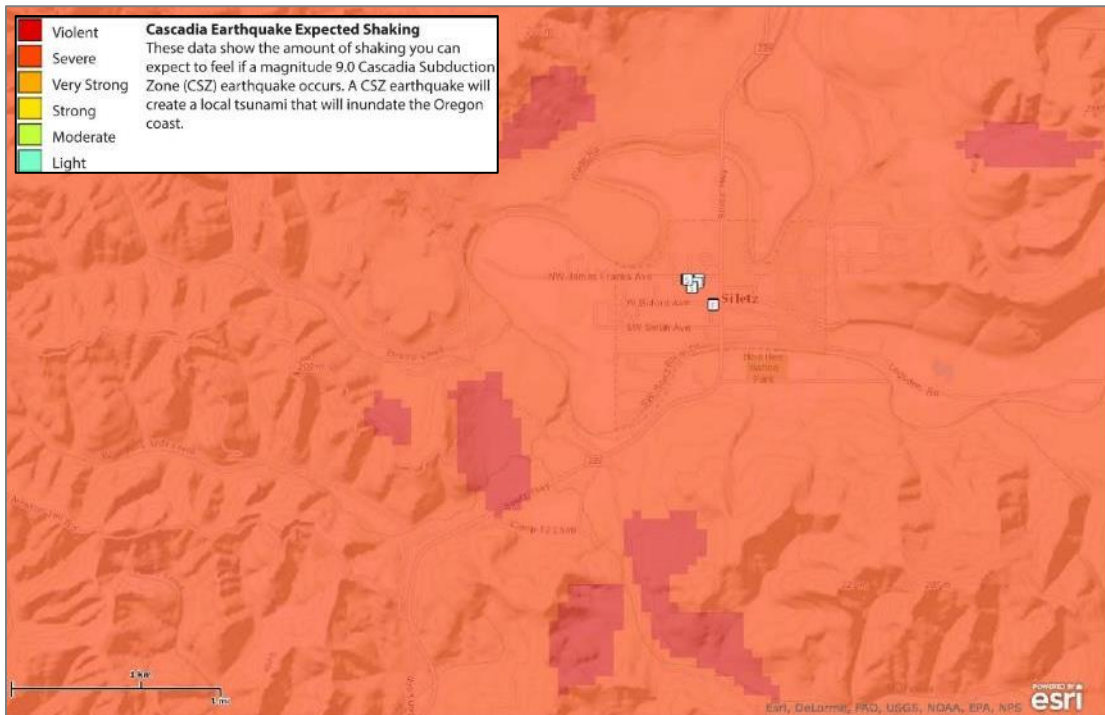
**Figure SA-6 Combined Earthquake Events Expected Shaking and Active Faults**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To view detail click hyperlink to left.

Figure SA-7 shows expected shaking with a Cascadia Earthquake. The figure shows that the entire city will receive severe shaking.

**Figure SA-7 Cascadia Earthquake Expected Shaking**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To view detail click hyperlink to left.

## Vulnerability Assessment

The city's concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described above are cause for significant effort toward mitigating the earthquake hazard.

The city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, and water tanks were identified by the steering committee as vulnerable assets. The city's steering committee additionally identified the following earthquake-related vulnerabilities: steeper topography around the outskirts of town would likely be vulnerable to earthquake-induced landslides; in the event of a magnitude (M) 9 event, the city could be isolated from larger cities in the Willamette Valley, as well as coastal communities. As such, post-disaster self-reliance will be essential, and post-disaster communication may be hindered. The city would also expect damage to roads following a CSZ event, as well as deaths and severe injuries region wide. Education and outreach regarding the CSZ are on-going endeavors in Siletz.

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community characteristics section (Table SA-4), approximately 47% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard. Information on specific public buildings' (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table SA-5; each "X" represents one building within that

ranking category. Of the facilities evaluated by DOGAMI, that have not been retrofitted, using their Rapid Visual Survey (RVS), one school building has very high (100% chance) collapse potential and two (2) have a high (greater than 10% chance) collapse potential. To fully assess a buildings potential for collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

**Table SA-5 Rapid Visual Survey Scores**

Facility	Site ID*	Level of Collapse Potential			
		Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100%)
<b>Schools</b>					
Siletz Valley School** (245 NW James Frank Avenue)	Linc_sch18	X	X	XX	X
<b>Public Safety</b>					
Siletz Rural Fire Station 5200** (149 W Buford Street)	Linc_fir13	<b>SRGP 2015-2017 Phase II: \$1,376,475</b>			

Source: [DOGAMI 2007. Open File Report 0-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment](#). Notes: “\*” – Site ID is referenced on the [RVS Lincoln County Map](#). “\*\*” – Facility determined to be vulnerable to CSZ earthquake and should expect moderate to complete damage (> 50% probability). DOGAMI Risk Report (2020).

Mitigation Activities

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Siletz agencies or organizations.

A primary mitigation objective is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>9</sup> have been funded to retrofit the Siletz Valley Rural Fire District Station 5200 (2015-17, Phase II grant award, \$1,376,475)

Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to earthquake. The Risk Report provides a distinct profile for Siletz.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled magnitude 9.0 Cascadia Subduction Zone (CSZ) event. Siletz does not have any direct risk from the related tsunامي.

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Siletz may be impacted by the profiled earthquake scenarios (Table SA-6).

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<sup>9</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

Approximately 29% of the City’s population (328 people) may be displaced by a magnitude 9.0 CSZ earthquake event. Earthquakes will impact every building in the City, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Buildings reported as “damaged” include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings. The City has 322 buildings that are expected to be damaged by the CSZ earthquake, including two critical facilities (Siletz Valley School and Siletz Valley Fire Station 52). The value of building damage losses is \$10.6 million.

The Risk Report estimated losses show that the age of the building stock is the primary metric of earthquake vulnerability. Communities with older building stock are expected to have higher losses. However, if buildings were retrofitted to at least “moderate code” standards the impact of the event would be reduced. The Risk Report concludes that loss estimates for the City drop from 33% to 19% (\$4.7 million decrease in loss) when all buildings are upgraded to at least moderate code level.<sup>10</sup> *Note: earthquake vulnerability retrofit benefits are minimized in areas of liquefaction and landslide where additional geotechnical mitigation would be needed.*

**Table SA-6 Potentially Displaced Residents and Exposed Buildings, Earthquake**

Community Overview: Siletz						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,149		716		2	31,647,000	
Exposure Analysis: Earthquake CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
328	28.5%	322	45.0%	2	10,591,000	33.5%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>11</sup>

- Siletz Valley Schools
- Siletz Valley Fire District, Station 5200 (*Note: the fire district received a grant award from the SRGP to seismically retrofit this station*)

The following vulnerable critical facilities are owned by the Confederated Tribes of Siletz Indians and are within the City limits of Siletz:

- CTSI Annex STEDCO Building
- CTSI Community Center
- CTSI Cultural Center
- Public Works Shop
- Siletz Community Health Clinic

<sup>10</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table B-2.

<sup>11</sup> Ibid, Table A-19.

- USDA Food Distribution Center

## Tsunami

The City of Siletz does not border the Pacific Ocean; as such, tsunami is not considered to be a hazard within the community.

## Flood

The steering committee determined that the city's probability for riverine flood is **high**, meaning at least one incident is likely within the next 35-year period and that their vulnerability to riverine flood is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major riverine flood event. *These ratings have not changed since the previous NHMP.* The City of Siletz does not border the Pacific Ocean; as such, coastal flooding is not considered to be a hazard within the community.

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of coastal and riverine flood hazards, as well as the history, location, extent, and probability of a potential event. River-related flood events are also caused by storms, as well as rain on snow / snowmelt. Flooding typically occurs within the city when storm drains back up and/or pumps fail to work. The city also experiences riverine flooding from the Siletz River. The extent of riverine flooding varies depending on rainfall and/or precipitation levels throughout the year. Siletz's most significant flood events occurred in 1964, 1996 and 1999.

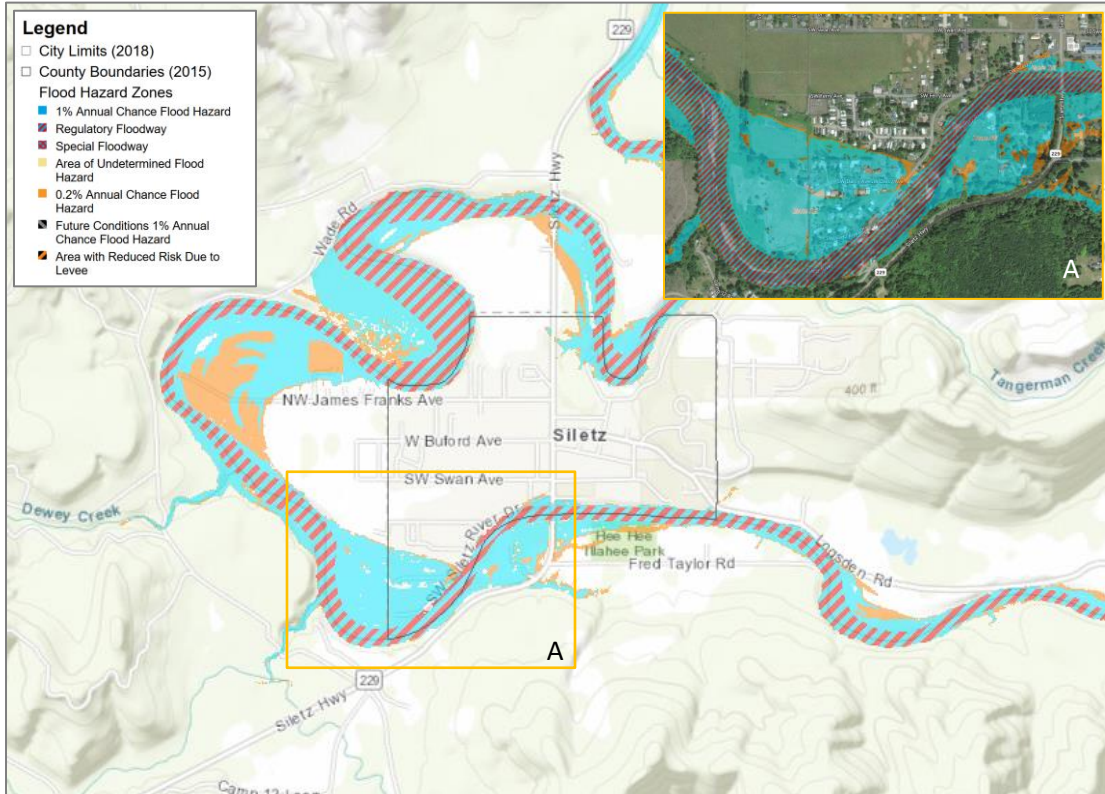
FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one percent probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood; also known as the Special Flood Hazard Area (SFHA). The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods (Figure SA-8). These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards. According to Oregon Explorer almost 16% of the City is within the 100-year floodplain, including the areas in the southern part of the city that includes several residential properties. Another 3% of the City is within the 500-year floodplain.

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events.



**Figure SA-8 Flood Hazard Zones (100- and 500-year floodplain)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to flood. The Risk Report provides a distinct profile for Siletz.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the city. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within Siletz may be impacted by the profiled flood scenario (Table SA-7).

Less than 7% of the City’s population (77 people) may be displaced by flooding. These people are expected to have mobility or access issues due to surrounding water. About seven percent (7%) of the City’s buildings (44 buildings) are exposed to the flood hazard and may be damaged. The loss estimate for exposed buildings is \$289,000 (less than 1% of total building value).

**Table SA-7 Potentially Displaced Residents and Exposed Buildings, Flood**

Community Overview: Siletz						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,149		716		2	31,647,000	
Exposure Analysis: Flood (1% Annual Chance)						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
77	6.7%	44	6.1%	0	289,000	0.9%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>12</sup>

There are no critical facilities exposed to the profiled flood scenario.

## National Flood Insurance Program (NFIP)

FEMA’s Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2019. Table SA-8 shows that as of August 2019, the City has 18 National Flood Insurance Program (NFIP) policies in force, representing almost \$3.9 million in coverage. Of those, seven (7) are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for the City was August 20, 1998. The table shows that most flood insurance policies are for residential structures, primarily single-family homes. Flood insurance covers only the improved land, or the actual building structure. There has been one (1) paid flood insurance claim for \$44,263.

The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The NFIP’s Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. The City does not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone.

<sup>12</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

**Table SA-8 Flood Insurance Detail**

	Lincoln County	Siletz
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	3/1/1979
Total Policies	2,325	18
Pre-FIRM Policies	1,067	7
<b>Policies by Building Type</b>		
Single Family	1,685	18
2 to 4 Family	57	0
Other Residential	462	0
Non-Residential	121	0
Minus Rated A Zone	98	2
Minus Rated V Zone	3	0
Insurance in Force	\$585,856,500	\$3,858,500
Total Paid Claims	343	1
Pre-FIRM Claims Paid	265	1
Substantial Damage Claims	53	1
Total Paid Amount	\$5,479,221	\$44,263
Repetitive Loss Structures	64	0
Severe Repetitive Loss Properties	12	0
CRS Class Rating	NP	NP
Last Community Assistance Visit	-	8/20/1998

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating.

The Community Repetitive Loss record for Siletz identifies no Repetitive Loss Properties<sup>13</sup> or Severe Repetitive Loss Properties<sup>14</sup>.

## Landslide

The steering committee determined that the city's probability for landslide is **moderate**, meaning one incident is likely within the next 35 to 75-year period, and that their vulnerability to landslide is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major landslide event. *The city's probability and vulnerability ratings decreased since the previous NHMP.*

<sup>13</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

<sup>14</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of landslide hazards, as well as the history, location, extent, and probability of a potential event. No records for city-specific landslides have been kept, but the steering committee identified that the Army Corps of Engineers installed 72 pilings, 40-60 feet deep to prevent landslides from occurring east of the harbor.

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries or take lives. Landslide susceptibility exposure for Siletz is shown in Figure SA-9. Approximately 10% of the City has very high or high, and 21% moderate, landslide susceptibility exposure.<sup>15</sup> *Note that even if a City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

## Vulnerability Assessment

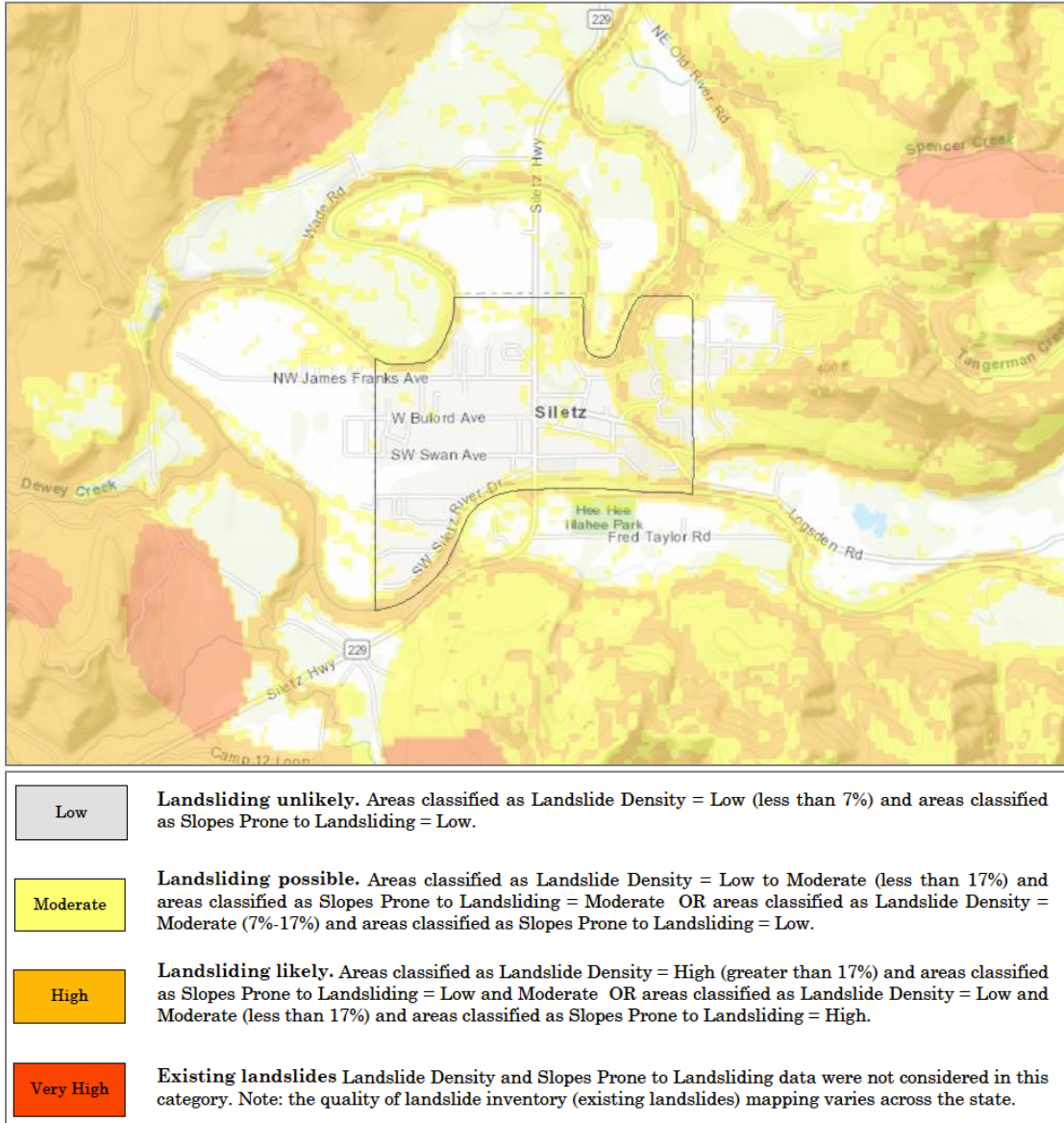
The topography of the city is relatively level, except for steeper hillsides in the northeast section of town by Old River Road and Judd Road. These areas would be more susceptible to landslides events. Road cracking has occurred in some areas, but no significant losses are documented. Additionally, erosion around the Siletz River is a concern, particularly in the river bends along the north side of the city.

Potential landslide-related impacts are adequately described within the county’s plan, and include infrastructure damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Lincoln County, and thoroughfares beyond city limits are susceptible to obstruction as well. As such, Siletz is vulnerable to isolation for an extended period.

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<sup>15</sup> DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

**Figure SA-9 Landslide Susceptibility Exposure**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Siletz.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the city may be impacted by the profiled landslide scenario (Table SA-9).

Approximately two percent (2%) of the City’s population (26 people) may be displaced by landslides. These people are expected to have mobility or access issues and/or may have

their residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately three percent of all buildings (20 buildings) within the City are exposed to the High or Very High landslide susceptibility zones (see Figure SA-9). The value of exposed buildings is \$1.1 million (about 3% of total building value).

**Table SA-9 Potentially Displaced Residents and Exposed Buildings, Landslide**

Community Overview: Siletz						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,149		716		2	31,647,000	
Exposure Analysis: Landslide High & Very High Susceptibility						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
26	2.3%	20	2.8%	0	1,075,000	3.4%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>16</sup>

There are no critical facilities exposed to the profiled landslide scenarios.

**Severe Weather**

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.<sup>17</sup> Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months.<sup>18</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the

<sup>16</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>17</sup> US Department of Agriculture. <http://www.fsa.usda.gov/or/Notice/Flp104.pdf>.

<sup>18</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>19</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

## Windstorm

The steering committee determined that the city’s probability for windstorm is **high** (the probability of tornado is **low**), meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to windstorm is **high**, meaning that more than 10% of the City’s population or property could be affected by a major windstorm event. The Steering Committee rated the County as having a “**low**” **vulnerability to a tornado hazard**, meaning that less than 1% of the City’s population or property could be affected by a major tornado event. *The windstorm ratings have not changed since the previous NHMP. The tornado ratings are new with this version of the NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of windstorm hazards, as well as the history, location, extent, and probability of a potential event. Because coastal windstorms typically occur during winter months, ice, freezing rain, flooding, and very rarely, snow sometimes accompany them. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Siletz is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard.

In Siletz, power outages are the greatest concern during windstorms. Without power, communication is lost, and fuel and food stores shut down. In the December 2007 windstorm the city lost power and some residents were unable to access 911. Also, of concern are downed trees and damage to buildings. The city, in conjunction with some private utility companies, works to remove hazardous trees where possible.

## Winter Storm (Snow/ Ice)

The steering committee determined that the city’s probability for winter storm is **high**, meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to winter storm is **moderate**, meaning that between 1% and 10% of the City’s

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<sup>19</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.

population or property could be affected by a major winter storm event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of winter storm hazards, as well as the history, location, extent, and probability of a potential event. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. More than likely, however, the coast's winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Siletz is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Major winter storms have occurred in the Siletz area, and while they typically do not cause significant damage; they are frequent and have the potential to impact economic activity. Road closures on Highways 20 or 101, or the mountain passes to the Willamette Valley, due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

## Volcanic Event

The steering committee determined that the city's probability for volcanic event is **low**, meaning one incident is likely within the next 75 to 100-year period, and that their vulnerability to volcanic event is **low**, meaning that less than 1% of the City's population or property would be affected by a major volcanic event (ash/lahar). *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of volcanic event hazards, as well as the history, location, extent, and probability of a potential event. Generally, an event that affects the county is likely to affect Siletz as well.

## Vulnerability Assessment

Due to insufficient data and resources, Siletz is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Siletz is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens erupted in 1980, the city received small amounts of ashfall, but not enough to cause significant health and/or economic damages.

## Wildfire

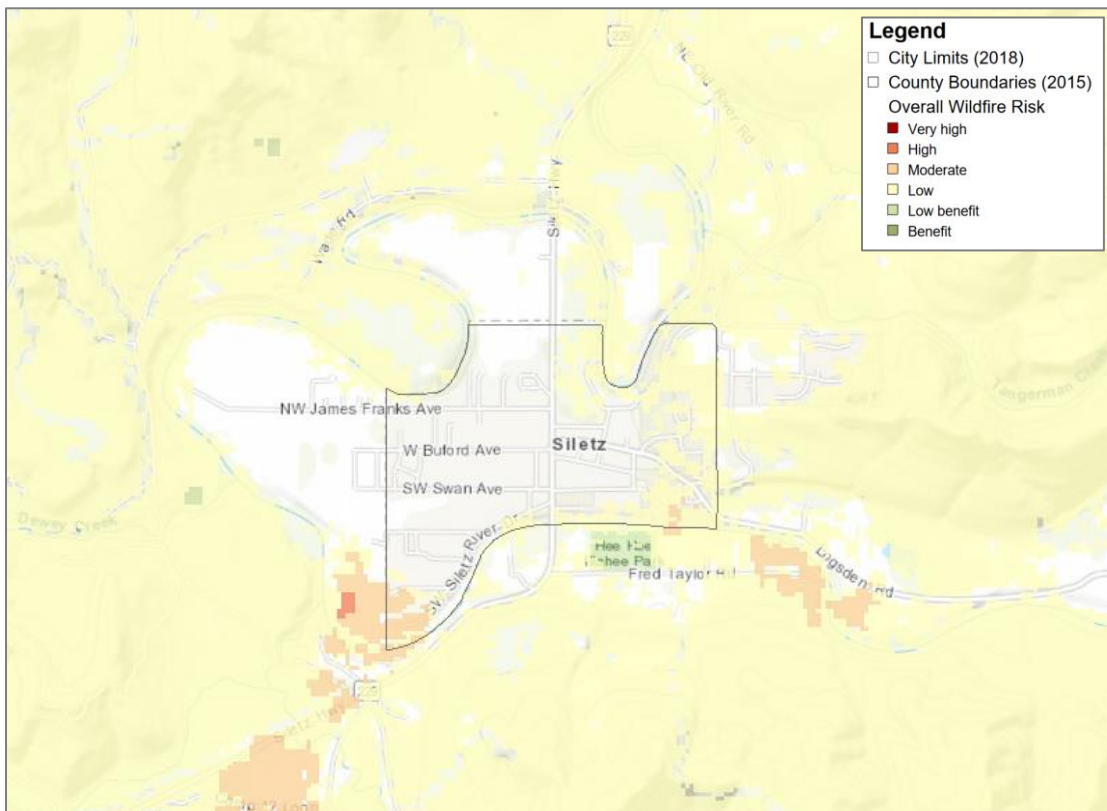
The steering committee determined that the city's probability for wildfire is **moderate**, meaning one incident is likely within the next 35 to 75-year period, and that their vulnerability to wildfire is **low**, meaning that less than 1% of the City's population or property could be affected by a major wildfire event. *The city's probability and vulnerability ratings decreased since the previous NHMP.*



The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve to supplement the wildfire section in this addendum.

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of wildfire hazards, as well as the history, location, extent, and probability of a potential event. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Wildfires in 1849 and 1936 were particularly devastating in Lincoln County, but since then, there have been few large events. There have been no large wildfires near the City in recent history. As shown in Figure SA-10 the City has mostly low, with some moderate and high, overall wildfire risk to the south. The City sits along the Siletz River and is surrounded by industrial and public forestlands. These forestlands are believed to be vulnerable to wildfires.

**Figure SA-10 Overall Wildfire Risk**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

**Future Climate Projection:**

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

## Vulnerability Assessment

Overall, the city, and its watershed, has low to moderate overall wildfire risk, however, the forested areas have the potential for large wildfires and a wildfire within the watershed could impact the city's water supply and quality.

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Siletz.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment's Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report there are no resident population and property (public and private) within the City that may be impacted by the profiled wildfire scenario (Table SA-10).

**Table SA-10 Potentially Displaced Residents and Exposed Buildings, Wildfire**

Community Overview: Siletz						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
1,149		716		2	31,647,000	
Exposure Analysis: Wildfire High-Hazard						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
0	0.0%	0	0.0%	0	0	0.0%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

### Critical Facility Vulnerability<sup>20</sup>

There are no critical facilities exposed to the profiled wildfire scenario.

<sup>20</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

# ATTACHMENT A: ACTION ITEM FORMS

Table SA-1 and Table SA-11 provide a summary list of actions for the city. Each high priority action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table SA-1 I Action Item Timelines, Status, High Priority and Related Hazards**

Action Item	Priority	Timeline	Status	Related Hazard									
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm
Siletz #1		Ongoing	Ongoing		X	X	X	X	X	X	X	X	X
Siletz #2	X	Long	Ongoing			X							
Siletz #3		Long	Ongoing			X			X				
Siletz #4	X	Short	Ongoing			X			X		X		X
Siletz #5		Short	Ongoing			X		X	X		X		X
Siletz #6	X	Medium	Ongoing		X	X	X	X	X	X	X	X	X

Previous NHMP Actions Completed:

**Siletz #1** (2015): “Seek funding to obtain raw water storage capabilities” is considered complete. Improvements to water storage have occurred.

*Note: 2015 Actions were renamed as follows:*

2015 Action Item	2020 Action Item
Siletz #2	Siletz #1
Siletz #3	Siletz #2
Siletz #4	Siletz #3
Siletz #5	Siletz #4
Siletz #6	Siletz #5
Siletz ##7	Siletz #6

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The City NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the City. Existing programs and other resources that might be used to implement these action items are identified. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

County level actions that the city is listed as a partner are shown in Table SA-12. These actions are led by the County; however, the City will incorporate elements of the action that are applicable to their jurisdiction.

**Table SA-12 County Specified Actions that the City is Partner**

Action Item (2015 NHMP)	City Partner	Action Item
MH #1	Yes	Consider Local Energy Assurance Planning for critical areas countywide
MH #2	Yes	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers
MH #3	Yes	Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.
MH #4	Yes	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.
MH #5	Yes	Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.
MH #6	Yes	Integrate the NHMP into County and City comprehensive plans.
MH #7	Yes	Prepare long-term catastrophic recovery plan
MH #8		Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
CE #1		Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.
CE #2		Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
EQ #1	Yes	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
EQ #2	Yes	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
EQ #3	Yes	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
TS #1		Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami

Action Item (2015 NHMP)	City Partner	Action Item
		inundation zone and likely to be impacted by tsunami.
TS #2		Implement land use strategies and options to increase community resilience
FL #1	Yes	Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)
FL #2		Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.
FL #3		Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas
FL #4	Yes	Continue compliance with the National Flood Insurance Program (NFIP).
LS #1		Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.
LS #2		Protect existing development in landslide-prone areas.
LS #3		Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
SW #1	Yes	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).
SW #2	Yes	Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.
WF #1	Yes	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

Mitigation Action: Siletz #1 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Educate citizens about natural hazards preparedness.	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Water Conservation and Management Plan		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The City of Siletz has engaged in numerous education &amp; outreach activities related to natural hazard preparedness. The city recognizes the importance of an ongoing education &amp; outreach program.</p> <p>"To increase natural hazard mitigation and emergency preparedness in a community, residents must be aware of the risk and know what they should do before and after the disaster occurs. Outreach and awareness campaigns need to be carefully organized and developed to ensure that residents receive critical information." Source: Oregon Natural Hazards Workgroup. Lane County Natural Hazard Mitigation Plan (Draft). October 2005. Community Service Center, University of Oregon, Eugene, OR. p. 46.</p> <p>Public education and outreach can be inexpensive and provide information that results in safer households, work places and other public areas. Some outreach materials include: informational brochures about community seismic risks and mitigation techniques, public forums, newspaper articles, training classes and television advertisements. Source: Oregon Technical Resource Guide. July 2000. Community Planning Workshop. Eugene, Or. University of Oregon p.8-20.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Create public service advertisements. Emphasis is on drought and measures within the Water Conservation and Management Plan.</p> <p>Distribute seasonal education &amp; outreach materials with residents' water bills.</p> <p>Teach children about emergency safety &amp; preparedness.</p> <p>Encourage residents to understand how to behave during windstorms. Educate residents about the hazards associated with high winds, and how to prevent harm during power outages.</p> <p>Host public meetings to discuss the earthquake and landslide hazards in Siletz.</p> <p>Educate residents about how to prepare for and mitigate damage caused by earthquakes.</p> <p>Place educational materials on display at the library.</p>	<p><u>2020 Update:</u></p> <p>Have updated website. Completed a Water Conservation and Management Plan</p> <p>Siletz provides ongoing education on natural hazard preparedness and mitigation.</p>	



Create a neighbor assistance program to help residents in need of medical equipment during power outages. Provide information to residents about generator sharing programs and/or purchasing opportunities.		
<b>Champion/ Responsible Organization:</b>	City of Siletz	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Public Works, City Recorder	FEMA, DOGAMI, Ready.gov, Oregon Emergency Management	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources	Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium-Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Siletz Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Siletz #2</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Vulnerability Assessment and Emergency Action Plan Siletz Water Treatment Plant (reviewed and revised May 2017). Vulnerability Assessment and Emergency Action Plan Siletz Wastewater Treatment Plant (reviewed and revised May 2017).		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation?</p> <p>DOGAMI conducted a seismic needs assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. Table SA-4 lists the vulnerable buildings within Newport.</p> <p>In addition to the structures listed in Table SA-4, the city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, cell towers, and City Hall were identified by the steering committee as vulnerable assets. The city would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries regionwide.</p> <p>Priority projects include the following:</p> <ul style="list-style-type: none"> <li>• Siletz Community School</li> </ul>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
Inventory community buildings and infrastructure: determine which structures may be particularly vulnerable to earthquake damage. Seek funding to retrofit and/or re-build structures.  Create a local rehabilitation and retrofit program for existing buildings.  Rehabilitate identified vulnerable schools, emergency facilities, infrastructure, and public buildings/lifelines.	<u>2020 Update:</u> Siletz Rural Fire District Station 5200 (SRGP 2015-2017 Phase II, \$1,376,475); completed in 2019 (fall).	

<b>Champion/ Responsible Organization:</b>	City of Siletz		
<b>Internal Partners:</b>	<b>External Partners:</b>		
Public Works, City Recorder	Oregon Emergency Management, DOGAMI, IFA, SHPO		
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>	
Seismic Rehabilitation Grants (IFA), Local Funding Resources	High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium-Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	Siletz Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Siletz #3</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Identify over-water transportation alternatives in the event of bridge collapse in an earthquake.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>In the event of a Cascadia Subduction Zone (CSZ) earthquake, it is possible the Highway 229 (N Gaither St) Bridges in Siletz would fail. Essential transportation services would need to be restored.</p> <p>The average recurrence interval for a CSZ event is between 500 and 600 years. There have been seven CSZ events in the last 3500 years with time between individual events varying from 150 to 1000 years. The last CSZ event occurred approximately 315 years ago.</p> <p>Restoration of key infrastructure is essential after a natural disaster "to support the industry and the jobs it provided." To sustain the economy, communities should "provide for temporary infrastructure while long-term rebuilding efforts are underway." Source: Governor's Commission Report on Recovery, Rebuilding, and Renewal. After Katrina: Building Back Better than Ever. December 31, 2005. p. 112.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Identify alternative evacuation route to bypass the bridges over the Siletz River.</p> <p>Seismically retrofit the bridges over the Siletz River.</p>			<p><u>2020 Update:</u></p> <p>No route identified at this time would require meetings with the Tribe (will continue); was in emergency fuel planning.</p>			
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning			Lincoln County Emergency Management, ODOT, NOAA			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, grants			Medium to High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium-Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Siletz Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Siletz #4</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Identify locations for disaster caches (food and emergency supplies) in strategic locations		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The city is highly vulnerable to a Cascadia Subduction Zone earthquake event and the regional impacts resulting from the local source tsunami.</p> <p>Lincoln County school district schools, including the Siletz Village charter school, serve as Red Cross emergency shelters and also provide sheltering, food, transportation, and fuel needs for the region.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Develop disaster caches (food and emergency supplies) and locate in strategic locations in/ around the city.			<u>2020 Update:</u> School has some supplies (see their addendum), fire department also has some. CTSI has food/supplies (medical tents, etc.). The City brings diesel tanker to bring fuel, currently fuel city and fire department rigs (2,000 gallons of diesel, 1,000 gallons of gas).			
<b>Champion/ Responsible Organization:</b>		City of Siletz				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Public Works, City Recorder, Planning			OEM, DOGAMI, DLCD			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Medium		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium-Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Lincoln County Risk MAP Resilience Workshop				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Siletz #5</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Identify options and strategies to ensure community health facility is prepared to function and support the community after a significant disaster.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
The community is vulnerable to several chronic (windstorm, winter storm, flooding) and catastrophic (Cascadia earthquake) hazards.						
The community health clinic is a vital resource for residents of Siletz and the Confederated Tribes of Siletz Indians.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Assess facility structural integrity and retrofit with structural and nonstructural options as needed.  Coordinate post-disaster health needs with the clinic.			<u>2020 Update:</u>  Strategic planning has happened, effort is limited but moving forward at this time. City has met with community health, American Red Cross, Confederated Tribes of Siletz Indians.			
<b>Champion/ Responsible Organization:</b>		Siletz Community Health Clinic				
<b>Internal Partners:</b>			<b>External Partners:</b>			
City Recorder			OEM, DLCD			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium-Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Lincoln County Risk MAP Resilience Workshop				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Siletz #6</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Coordinate with tribal leadership on resilience efforts.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plan, Emergency Operations Plans		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The Confederated Tribes of Siletz Indians is located adjacent to the City of Siletz and will be impacted by disasters that affect the city. Coordination resilience efforts between the two entities prior to a natural hazard event will increase the resilience of each entity.</p> <p>Increasing resilience efforts, including developing a post-disaster recovery plan will improve the city’s, and tribes, resilience to natural hazards (i.e. the ability to survive future natural disasters with minimum loss of life and property).</p> <p>Decisions taken in the heat of the emergency period immediately following a disaster often compromise significant opportunities to rebuild a safer community for the future. The pressure exerted by residents and property owners to have their disaster-stricken community rebuilt to its pre-disaster form and condition as quickly as possible remains a powerful factor in local, state, and federal emergency management to this day. There are ways to restrain such pressures and maintain mitigation and other post-disaster goals as high priorities during the process of long-term reconstruction even as the ashes, the rubble, and the water are receding or being cleared away. The secret lies in identifying in advance those decisions that will need to be made after a disaster that are most likely to have long-term repercussions for hazard mitigation.</p> <p>Pre-disaster and post-disaster mitigation should be two parts of a seamless whole in a sound plan for post-disaster recovery and reconstruction. The only difference is one of scale, of accelerating the pace with which existing mitigation plans are implemented, as a result of the influx of outside assistance. What is important about planning for post-disaster hazard mitigation is that the additional resources that facilitate hazard mitigation in the aftermath of a disaster do not materialize by accident. Local governments manage to secure such resources in large part because they have planned to do so. (Source: FEMA, “Policies for Guiding Planning for Post-Disaster Recovery and Reconstruction”)</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Work with the Confederated Tribes of Siletz Indians on natural hazards, and other, resilience efforts.</p> <p>Enhance resiliency of the areas water systems and ensure residents and visitors have access to water in the event of a disaster by developing a framework to address acute shocks (earthquakes, tsunamis) as well as long-term stresses (drought, climate change, etc.)</p> <p>Acquire and strategically locate community</p>	<p><u>2020 Update:</u></p> <p>Had been happening but it is stalled. Mayor is meeting monthly with Tribal leadership and other entities. Has connected the community via Neighborhood Watch.</p> <p>see Lincoln County NHMP Action Item MH #7 for county activities related to this action.</p>	

<p>emergency supply pods to provide food, water, and other supplies (sheltering, etc.) post-disaster event.</p> <p>Designate a recovery management team that is empowered to monitor the process and implement the community's post-disaster recovery policies. This team should also serve as the post-disaster recovery planning team and can/should include persons involved in pre-disaster mitigation planning efforts. Involve a wide range of stakeholders and community leaders/volunteers. Discuss post-disaster recovery planning at future mitigation plan meetings.</p>			
<b>Champion/ Responsible Organization:</b>		City Recorder	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Public Works, Planning		Confederated Tribes of Siletz Indians, DLCD, North Coast Regional Solutions Team	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, NOAA Coastal Resiliency Grant		Low	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium-Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County Risk MAP Resilience Workshop		
<b>Action Item Status:</b>	Ongoing		



# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the county's website and reference on the city's social media and feedback form was provided for public comment.

During the public review period there were no comments provided.

The screenshot displays the Lincoln County Oregon website. The main content area features a news article titled "Community Input Needed - Natural Hazards Mitigation Plan Renewal". The article explains the renewal process and provides a "Survey Link - CLICK HERE" for community members to provide feedback. Below the article is a "SUPPORTING DOCUMENTS" section with a list of PDF files for review, including drafts for various jurisdictions like Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport, Yachats, and Seal Rock Water District. A "WEB LINKS" section at the bottom points to the September NHMP document.

Overlaid on the bottom left of the screenshot is a "Natural Hazard Mitigation Plan Public Feedback Survey" form. The form includes a title, a request for feedback, contact information for Emergency Management (541-265-4199), a large text box for feedback, and fields for Name, Contact Phone Number, Contact Email, and Zip Code. It also has a checkbox for "Send me a copy of my responses" and a "Submit" button.

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

<b>Mitigation Action: Siletz #</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium-Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# City of Toledo Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Gary Halvorson, Oregon State Archives

Effective:

December 29, 2020 through December 28, 2025



Prepared for:  
City of Toledo

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



**FEMA**

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
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Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

**CITY OF TOLEDO  
RESOLUTION NO. 1456**

**A RESOLUTION OF THE TOLEDO CITY COUNCIL ADOPTING THE CITY OF TOLEDO'S REPRESENTATION IN THE UPDATES TO THE LINCOLN COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN**

**WHEREAS**, the City of Toledo recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan (NHMP) is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the City of Toledo has fully participated in the Federal Emergency Management Agency (FEMA) prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the City of Toledo has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Toledo to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *City of Toledo addendum* to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

**WHEREAS**, the NHMP is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and



**WHEREAS**, City of Toledo adopts the NHMP and directs the City Manager to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

**NOW, THEREFORE, THE CITY OF TOLEDO HEREBY RESOLVES AS FOLLOWS:**

- Section 1. The City of Toledo adopts *the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and
- Section 2. The City of Toledo will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.
- Section 3. This resolution shall be effective upon passage by the Toledo City Council, this 6<sup>th</sup> day of January, 2021.

APPROVED:



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Mayor Rod Cross

ATTEST:



---

City Recorder Lisa Figueroa

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## Purpose

This is an update of the City of Toledo addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP). The City of Toledo's original addendum to Lincoln County's NHMP was completed and approved by FEMA in 2009. This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation, and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Toledo's addendum are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Toledo adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **January 6, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the City's addendum on **March 1, 2021**. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The City concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of

priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## **Process and Participation**

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Department of Land Conservation and Development, Oregon Office of Emergency Management (OEM), Lincoln County, and Toledo to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal-Year 2017 (FY17) Pre-Disaster Mitigation (PDM) Competitive Grant Program OR-2018-001 (PDMC-PL-10-OR-2017-02). Members of the Toledo NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Toledo addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Toledo NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Toledo Planner (contract) serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Lincoln County NHMP in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Planning Director and Emergency Manager).

Representatives from the City of Toledo steering committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the city's addendum, with focus on the plan's risk assessment and mitigation strategy (action items).

The current version of the addendum reflects changes decided upon at the designated meetings and through subsequent work and communication with OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include revisions to the city's Risk Assessment and Hazard Identification sections, Action Items, and Community Profile.

The Toledo Steering Committee was comprised of the following representatives:

- Convener, Justin Peterson, Contract Planner
- Dave Inman, Assistant Fire Chief
- Daniel Ammons, Toledo Fire Department
- Arlene Inukai, Planning Technician/ Assistant Planner
- Bill Zuspan, Public Works Director

## **Public Participation**

Public participation was achieved by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment via a survey administered by IPRE (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The City Council will be responsible for adopting the Toledo addendum to the Lincoln County NHMP. This addendum designates a steering committee and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Toledo addendum on an annual schedule; the county is meeting on a quarterly basis and will provide opportunities for participating jurisdictions (cities and special districts) to report on NHMP implementation and maintenance during their meetings. The city's Planner (contract) will serve as the convener and will be responsible for assembling the steering committee. The steering committee will be responsible for identifying new risk assessment data,

reviewing status of mitigation actions, identifying new actions, and seeking funding to implement the city's mitigation strategy (actions). The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and priority actions in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Where possible, Toledo will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Toledo's acknowledged comprehensive plan is the City of Toledo Comprehensive Plan. The City implements the plan through the Community Development Code.

## **Existing Plans and Policies**

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from residents, businesses and policy makers. Many land-



use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

Toledo's Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the addendum helps identify what resources already exist that can be used to implement the action items identified in Toledo's Addendum. Implementing the city's mitigation actions through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the city's resources.

The following are Toledo's existing plans and policies that relate to natural hazards:

- **Comprehensive Plan, 2001, last amended 2016:** A document stating the general, long-range policies that will govern a local community's future development.  
*Relation to Natural Hazard Mitigation:* Contains city-specific information regarding natural hazards within the city's jurisdictional boundaries.
- **Zoning Ordinance, 2020:** Establishes land use zones to regulate the location of building structure and the use of land within the City of Toledo.  
*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the placement and construction of the buildings. Issues such as floodplain development, etc. Floodplain development standards are identified in the flood hazard protection ordinance (Toledo Municipal Code 15.16).
- **Subdivision Ordinance, 2014:** An ordinance prescribing regulations governing the subdivision of land.  
*Relation to Natural Hazard Mitigation:* Contains city specific hazard related requirements for the subdivision of parcels, and hazard specific issues such as floodplain development and construction on steep slopes, etc.
- **Toledo Transportation Plan, 2013:** Guides the management of existing transportation facilities and the design and implementation of future facilities.  
*Relation to Natural Hazard Mitigation:* The Transportation Plan may be a resource to identify which roads and transportation systems are most vulnerable to natural disasters. Likewise, the Transportation Plan can be utilized to implement mitigation measures aimed at protecting "transportation disadvantaged" populations in emergency situations. When updated, the Transportation Plan can also include mitigation elements in its implementation considerations.
- **Lincoln County Community Wildfire Protection Plan, 2018:** Assists Toledo clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.  
*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

## Government Structure

The Mayor and six-member City Council is the policy making body for Toledo. As the elected legislative body in Toledo, the City Council has overall responsibility for the scope, direction and financing of city services. Council members serve four-year terms, the Mayor also serves on the council and serves two-year terms. Additional departments within the city include the following:

**Administration Department:** The Administration Department is located at City Hall and is responsible for the day-to-day general administration and financial management of the city. The city manager, appointed by the mayor and City Council, is the administrative head of the City of Toledo. The department also includes the city attorney, city recorder, treasurer, utility billing clerk, accounting clerk, planning assistant, and contract planner. The Administrative Department is responsible for the city's comprehensive plan, implementing ordinances, building permits, grant administration and special projects.

**Public Works Department:** The City of Toledo Public Works Department is responsible for maintaining the potable water distribution system, the wastewater collection system, the stormwater system, roadside signage, fleet and equipment, and streets. Currently Public Works has the following employees: a Public Works Director, Public Works Operations Supervisor, Administrative Secretary, five Maintenance Workers, one Mechanical Tech, two Water Plant Operators, two Wastewater Treatment Plant Operators. The Property Maintenance team is also included in the Public Works Department. The Property Maintenance Department provides maintenance to City buildings and facilities. This includes city hall, police, fire, library, parks, and various landscape islands and parking lots. The department consists of a two Property Maintenance Workers and one custodian.

**Police Department:** The Toledo Police Department is responsible for the overall law enforcement, code enforcement, and crime prevention programs for the City of Toledo. The department provides dispatch services to the Police Department, Fire Department, Rural Fire District, Currently the Police Department has fifteen employees: a Police Chief, a Police Sergeant, eight officers, a dispatch supervisor, and four dispatchers.

**Fire Department:** The Toledo Fire and Rescue Department is responsible for emergency response to fires, medical services and disaster management for the City of Toledo and surrounding community. The department consists of four city employees and approximately 40 volunteers.

**Library:** The Public Library is located at 173 NW 7th Street and has about 35,000 items available for borrowing. It has access to 250,000 items through its membership in the Chinook Library Network, a cooperative including public and community college libraries.

**Recreation:** The City of Toledo offers resources for recreation activities of all kinds. The city has several park facilities, tennis courts, and ball fields among other resources.

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP

during review. Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the City's website: <https://www.cityoftoledo.org/>

In addition, natural hazards information dissemination is conducted throughout the year when opportunities present themselves via the city offices and website.

## NHMP Maintenance

The Lincoln County Multijurisdictional Natural Hazard Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's action items were first developed through a two-stage process during the 2009 NHMP development and revised in 2015. In stage one, OPDR facilitated a work session with the steering committee to discuss the city's risk and to identify potential issues. In the second stage, OPDR, working with the local steering committee, developed potential actions based on the hazards and the issues identified by the steering committee. During the 2019-2020 update process OPDR re-evaluated the Action Items with the county and local steering committees and updated actions, noting what accomplishments had been made and if the actions were still relevant; any new action items were identified at this time. For additional information see the discussion near the end of this document.

The City's actions are listed in Table TA-1. For more detailed information on each action, see the action forms within Attachment A of this addendum.

In addition, there are 18 County Action Items that include the city as an "Affected Jurisdiction" (Table TA-13). For more detailed information on the county actions that involve city participation, see Volume I, Section 3 and the action item forms within Volume III, Appendix A.

### Priority Action Items

Table TA-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in bold text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action. Full text of the plan goals referenced in Table TA-1 is located on page TA-2.

**Table TA-1 City of Toledo Action Items**

<b>Natural Hazard Action ID</b>	<b>Action Item</b>	<b>Coordinating Organization (Lead)</b>	<b>Cost</b>	<b>Timing</b>
Toledo #1	Educate citizens about natural hazards preparedness.	Fire Department	L	Ongoing
Toledo #2	Evaluate the structural integrity of the Olalla Reservoir Dam (Georgia Pacific owned/operated) and the Mill Creek Reservoir Dam.	Public Works	M to H	Short
Toledo #3	Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	Public Works	H	Long
Toledo #4	Implement specific hazard objectives identified in the city's Comprehensive Plan.	Planning	M to H	Ongoing
Toledo #5	Continue compliance with the National Flood Insurance Program.	Planning	L	Ongoing
Toledo #6	Obtain lidar collection data from DOGAMI	Planning	L	Short
Toledo #7	Identify and address community's vulnerability to a natural gas explosion following a seismic event.	Public Works	L	Medium
Toledo #8	Evaluate and implement mitigation projects for areas of the city that are at risk of landslide.	Public Works	M to H	Long
Toledo #9	Work with the owners of repetitive flood loss buildings in the city (particularly along Yaquina Bay road, Business Hwy 20, and in the A Street area) to identify cost effective mitigation strategies including consideration of relocation, elevation, or buy-out.	Planning/ Floodplain Manager	H	Long
Toledo #10	Relocate Police Station out of tsunami inundation zone and establish a police communications system safe from disasters.	Police	H	Short
Toledo #11	Relocate Public Works out of the floodplain and the tsunami inundation zone.	Public Works	H	Long

Source: City of Toledo NHMP Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

# Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure TA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure TA-1 Understanding Risk**



# Hazard Analysis

The Toledo NHMP steering committee reviewed and revised the plan’s Hazard Analysis and Risk Assessment section. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in probability, vulnerability, and risk from natural hazards unique to the City of Toledo, which are discussed throughout this addendum.

Table TA-2 shows the hazard analysis matrix for Toledo listing each hazard in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

One catastrophic hazard (Cascadia Subduction Zone earthquake) and four chronic hazards (landslide, windstorm, winter storm (snow/ice), riverine flood) rank as the top hazard threats to the City (Top Tier). Drought, crustal earthquake, wildfire, and local tsunami comprise the next highest ranked hazards (Middle Tier). Coastal flood, distant tsunami, volcanic event, and tornado comprise the lowest ranked hazards in the City (Bottom Tier).

**Table TA-2 Hazard Analysis Matrix – City of Toledo**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Landslide	20	50	100	70	240	#1	Top Tier
Windstorm	20	50	100	70	240	#2	
Winter Storm (Snow/Ice)	18	35	90	70	213	#3	
Earthquake (Cascadia)	10	50	100	49	209	#4	
Flood (Riverine)	20	25	80	70	195	#5	
Drought	16	35	50	56	157	#6	Middle Tier
Earthquake (Crustal)	10	35	80	21	146	#7	
Wildfire	10	25	70	35	140	#8	
Tsunami (Local)	2	20	50	49	121	#9	
Flood (Coastal)	10	15	50	35	110	#10	Bottom Tier
Tsunami (Distant)	8	5	30	49	92	#11	
Volcanic Events	2	5	40	7	54	#12	
Tornado	2	10	10	7	29	#13	
Coastal Erosion	The city is not affected by this coastal hazard, as such it is not included.						

Source: City of Toledo NHMP Steering Committee (2020)

Table TA-3 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Lincoln County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings).

**Table TA-3 Probability and Vulnerability Comparison**

Hazard	Toledo		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	*	*	High	Low
Drought	High	Moderate	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	<b>Moderate</b>	<b>Low</b>	High	Moderate
Flood (Riverine)	High	Moderate	High	Moderate
Landslide	High	High	High	High
Tornado	<b>Low</b>	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	<b>Moderate</b>	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	<b>Moderate</b>	Moderate	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	Moderate	High	Moderate

Source: City of Toledo NHMP Steering Committee and Lincoln County NHMP Steering Committee (2020)

Note: \* - Hazard not ranked and does not affect the city.

## Community Characteristics

Table TA-4, Appendix C (Volume III), and the following section provide information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2012 and 2019 the City grew by 25 people (1%).<sup>1</sup> According to the State’s official coordinated population forecast, between 2019 and 2040 the City’s population is forecast to grow by 19% to 4,165.<sup>2</sup> Median household income increased held steady between 2012 and 2017.<sup>3</sup> The City has an educated population with 87% of residents 25 years, and older holding a high school degree, 14% have a bachelor’s degree or higher. As of 2019, Toledo High School and the Lincoln County School District have 77% and 76% graduation rates respectively.

Toledo sits seven miles inland from the Central Oregon coastline, and development spans a total of 2.3 square miles. Toledo includes industrial and commercial development but is zoned primarily residential. Where and how the city decides to grow may influence the city’s level of vulnerability to natural hazards. Toledo’s Comprehensive Plan addresses land use needs within the city and the Urban Growth Boundary. In response to Statewide Planning Goal 7, the city additionally addresses development in relation to floods, tsunamis, earthquakes, landslides, weak foundation soils, high groundwater, wind/winter storms, and wildfires. Please see “Existing Mitigation Activities” below for details regarding Goal 7 within Toledo’s Comprehensive Plan, Article 7.

<sup>1</sup> Portland State University, Population Research Center, "Annual Population Estimates", 2019.

<sup>2</sup> Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

<sup>3</sup> Social Explorer, Table T57, U.S. Census Bureau, 2013-2017 and 2008-2012 American Community Survey Estimates.



Figure TA-2 shows the City of Toledo's zoning map. New development has complied with the standards of the [Oregon Building Code](#), and the city's development code including their floodplain ordinance.

## Economy

Toledo's commercial areas developed along primary routes and residential development followed nearby (see Figure TA-2).

Most workers residing in the city (84%, 1,484 people) travel outside of the city for work primarily to Toledo and Newport.<sup>4</sup> A significant population of people travel to the city for work, (75% of the workforce, 839 people) primarily from Newport.

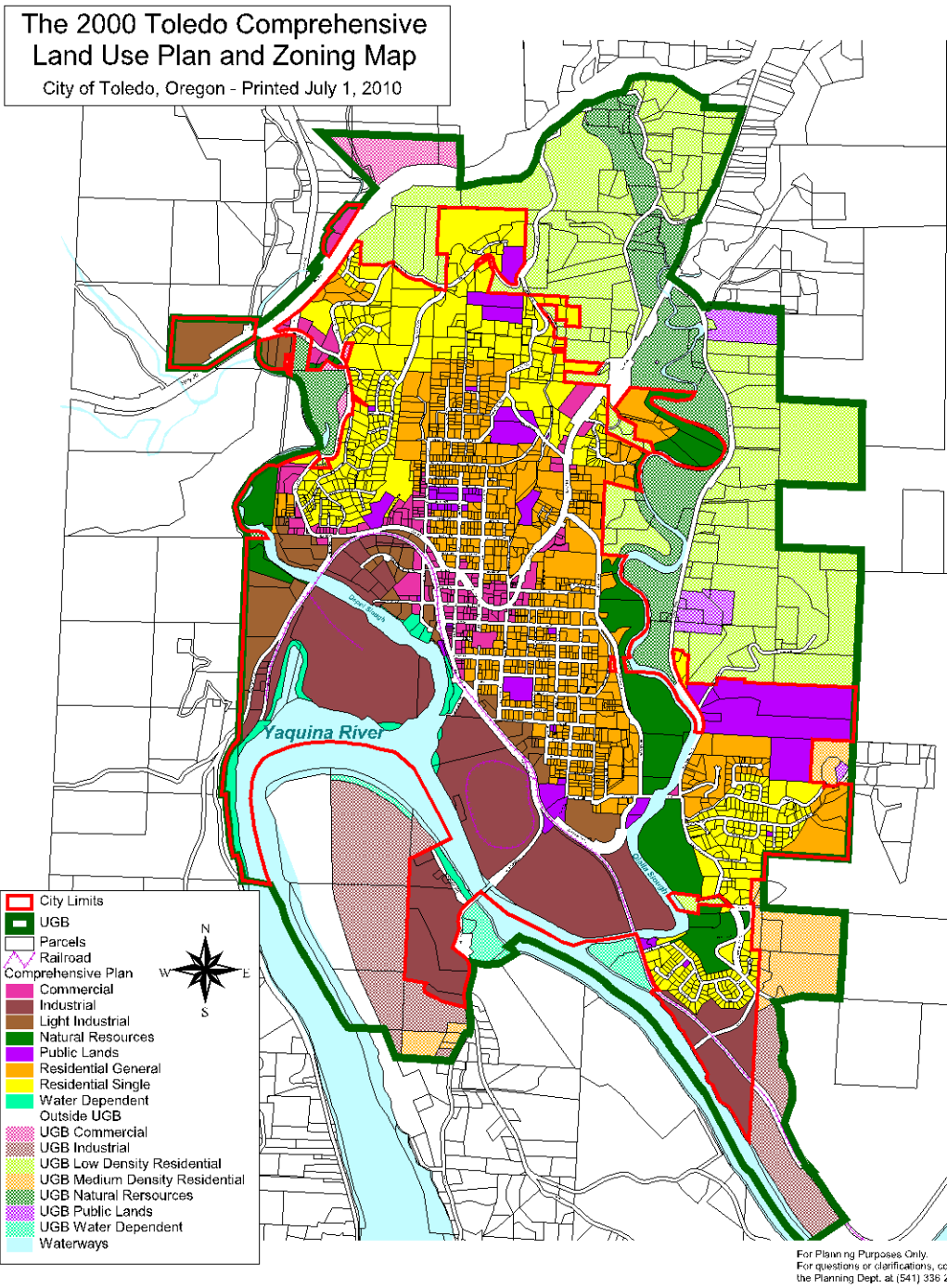
Just over 55% of the resident population 16 and over is in the labor force (1,566 people) and are employed in a variety of occupations including office and administrative support (16%), and professional and related (12%), production (11%), management, business, and financial operations (9%), sales (9%), and personal car and service (9%), occupations.<sup>5</sup>

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<sup>4</sup> U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2017). Longitudinal-Employer Household Dynamics Program, accessed on April 25, 2020 at <https://onthemap.ces.census.gov>.

<sup>5</sup> Social Explorer, Tables A17008 & A17002, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

**Figure TA-2 Zoning Map**



Source: City of Toledo

**Table TA-4 Community Characteristics**

Population Characteristics		
<b>2012 Population</b>	3,465	
<b>2019 Population</b>	3,490	
<b>2040 Forecasted Population</b>	4,165	
Race (non-hispanic or latino) and Ethnicity (Hispanic)		
White	93%	
Black/ African American	0%	
American Indian and Alaska Native	1%	
Asian	0%	
Native Hawaiian and Other Pacific Islander	1%	
Some Other Race	0%	
Two or More Races	2%	
Hispanic or Latino (of any race)	4%	
<b>Limited or No English Spoken</b>	0	0%
Vulnerable Age Groups		
Less than 15 Years	607	17%
65 Years and Over	631	18%
Age Dependency Ratio		1.19
Disability Status		
Total Population	819	23%
Children (Under 18)	83	11%
Working Age (18 to 64)	414	19%
Seniors (65 and older)	322	51%
Income Characteristics		
Households by Income Category		
Less than \$15,000	174	13%
\$15,000-\$29,999	280	21%
\$30,000-\$44,999	178	13%
\$45,000-\$59,999	201	15%
\$60,000-\$74,999	198	15%
\$75,000-\$99,999	156	12%
\$100,000-\$199,999	104	8%
\$200,000 or more	57	4%
<b>Median Household Income</b>		\$48,281
Poverty Rates		
Total Population	665	19%
Children (Under 18)	252	34%
Working Age (18 to 64)	337	16%
Seniors (65 and older)	76	12%
Housing Cost Burden (Cost > 30% of household income)		
Owners with Mortgage	166	20%
Renters	219	41%

Source: U.S. Census Bureau, 2013-2017 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2019. Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

Housing Characteristics		
Housing Units		
Single-Family	1,226	76%
Multi-Family	265	17%
Mobile Homes	129	8%
Year Structure Built		
Pre-1970	1,028	63%
1970-1989	415	26%
1990-2009	163	10%
2010 or later	14	2%
Housing Tenure and Vacancy		
Owner-occupied	815	50%
Renter-occupied	533	33%
Seasonal	75	5%
Vacant	197	12%

Toledo is situated on a bend of the Yaquina River and is surrounded by wooded hills seven miles inland from the Central Oregon Coast. Toledo is the only inland coastal community with a deep-water channel. The city's topography is very hilly. Nearby bodies of water include the Pacific Ocean and Yaquina River.

The climate in Toledo is moderate. Average monthly temperatures range from lows of 39-42° F (November through April) to highs of 65° F (July through September) degrees. The driest months are July and August (average about 0.8 inches of precipitation per month) the wettest months are November through January (average 10-11 inches of precipitation per month). Toledo has an average annual precipitation of approximately 67.5 inches (71%, 47.6 inches fall November through March).

## Asset Identification

The following assets identified by the City of Toledo were first gathered from the Asset Identification meetings held with community members in 2007. These assets were confirmed and updated by the City steering committee during the 2019-2020 update process.

## Cultural and Historic Resources

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The National Register of Historic Places and the State Historic Preservation Office lists historic sites and properties within the city:<sup>6</sup>

The following list includes the four properties that are listed on the National Register of Historic Places:

- Chitwood Bridge, Yaquina River, 1926
- Pacific Spruce Saw Mill Tenant Houses, 146-192 NE 6<sup>th</sup> Street, 1920
- The Ahnkuti Site (35-LNC-76), Address Restricted
- St John's Episcopal Church, 110 NE Alder Street

The following list includes 39 other properties listed on the State Historic Preservation Office website:

- Spruce Division Mill Site Mouth Of Depot Slough 1918
- Akin Block, 155 N Main St, c.1923
- Bank of the West, 112 S Main St, c.1969
- Bateman Building, 119 N Main St, c.1911
- Cascade Services. 203 N Main St, c.2000
- City Hall, 206 N Main St, c.1939
- Dannans Cleaners, 300-318 S Main St, c.1954
- Depot Slough, Hwy 20, 1910
- ELKS, 123 E Alder, c.1956
- Farrington's, 139 S Main St, c.1928
- Gaither Motors, 170 N Main St, c.1926
- Graham Garage, 355-359 N Main St, c.1924
- Heffners & Bensons Variety Store, 281-297 N Main St, c.1911
- House, 145 E 1st St, c.1920
- House, 167 E 1st St, c.1920
- House, 177 E 1st St, c.1920
- House, 878 NW 5th, c.1948
- House, 146 SE Alder St, c.1900
- House, 157-195 NE Alder St, c.1887
- House, 144 E Graham St, c.1900

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<sup>6</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 17, 2020.

- House, 192 E Graham , c.1950
- IOOF Hall, 305 N Main St, c.1911
- Ivan Kelly Studio, 108 E Graham St, c.1920
- Leader Building, 404 N Main St, c.1959
- Main Stream Music, 199 S Main St, c.1960
- Masonic Building, 192 S Main St, 1901
- Methodist Episcopal Church, 199 NE 1st St, c.1887
- Methodist Thrift Shop, 109 N Main St, c.1895
- Penneys Building, 323-333 N Main St, c.1928
- Professional Building, 213-235 S Main St, c.1957
- St Johns Episcopal Parsonage, 140 NE Alder St, c.1920
- Sunnyside, 159-181 S Main St, c.1930
- Toledo Eagles # 2219, 161 SE 2nd St, c.1940
- Toledo Library, 150 NE Alder St, c.1920
- Toledo Post Office, 138 NW 1st St, c.1960
- Updike Building, 334-320 N Main St, c.1926
- Yaquina Bay Hotel, 160 N Main St, c.1922
- Yaquina Building, 208-246 S Main St, c.1926
- Yaquina River Museum of Art 151 NE Alder St c.1900

In addition, community recreational amenities include Toledo’s Municipal Pool, the Olalla Valley Golf Course, kayaking, fishing, bowling, bird-watching, the city library, and city parks. Seasonal attractions include the Summer Festival and Fireworks in July, the Antique Street Fair and Wooden Boat Festival in August, the Art Walk in September and Hometown Holiday in December.

## Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders’ ability to act in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and wastewater treatment facilities.

Toledo has the following critical facilities (**bold** indicates facility was included in the Risk Report):

- **Police department**, 250 W Highway 20, vulnerable to flood and tsunami
- **Fire department/ EMS facility**, 285 NE Burgess Road
- Public works shop facility, 415 NW Industrial Park Way, vulnerable to local tsunami and flood
- City hall, 206 N Main Street, vulnerable to earthquake and heavy snow
- Water treatment plant, 860 NE Reservoir Lane, vulnerable to landslide/ earthquake
- Four water storage reservoir tanks:
  - Ammon Road – 1 MG
  - Graham Street – 0.4 MG
  - Clearwell Storage – 0.85 MG
  - Skyline Drive Storage – 1.9 MG

- Wastewater treatment plant, 1105 SE Fir Street, vulnerable to flood, tsunami, and earthquake
- **Elementary school**, 600 SE Sturdevant Road, vulnerable to earthquake
- **Junior/ Senior high school**, 1800 NE Sturdevant Road, vulnerable to earthquake
- **Samaritan Toledo Medical Clinic**, 199 Hwy 20
- **Port of Toledo**, 496 NE Hwy 20

## Transportation

Mobility plays an important role in Toledo, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within the City. Toledo is also served by Lincoln County Transit Route 493 with service running six days a week with stops in Toledo. The Coast to Valley Express provides public transit service between Newport and Corvallis and includes stops in Toledo.

### Roads/Seismic lifelines

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>7</sup>

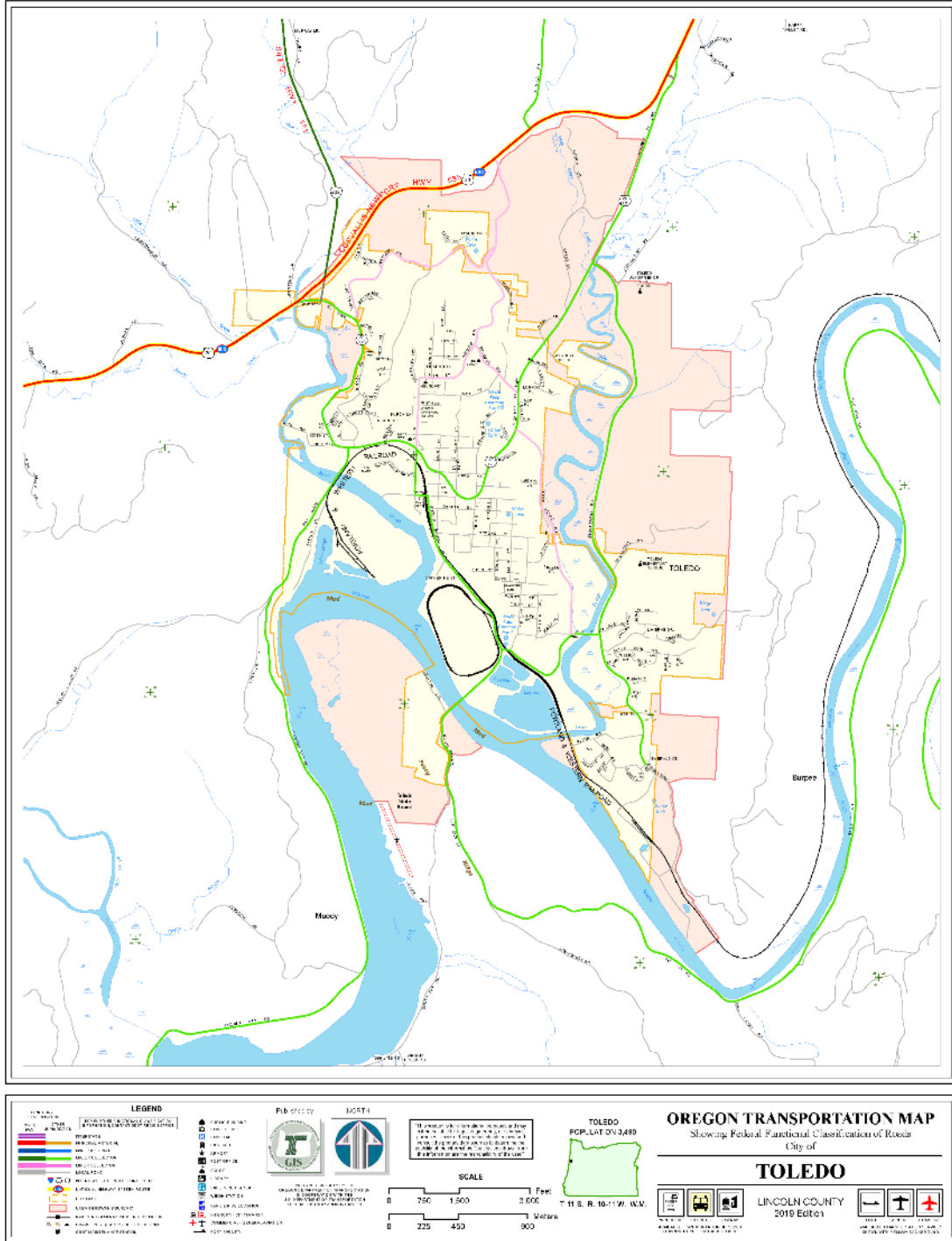
System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

Highway 20 (Tier III) and Business 20 are important arterials in and near the City and Highway 20 is a major east-west transportation routes connecting the coast to the Willamette Valley. Highway 101 (Tier I), to the west, is the major north-south transportation route connecting Toledo to other coastal cities (see Figure TA-3).

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<sup>7</sup> Oregon Department of Transportation. Oregon Seismic Lifeline Evaluation, Vulnerability Synthesis, and Identification, *Oregon Seismic Lifeline Routes*, May 15 2012.

**Figure TA-3 Toledo Functional Classification of Roads**



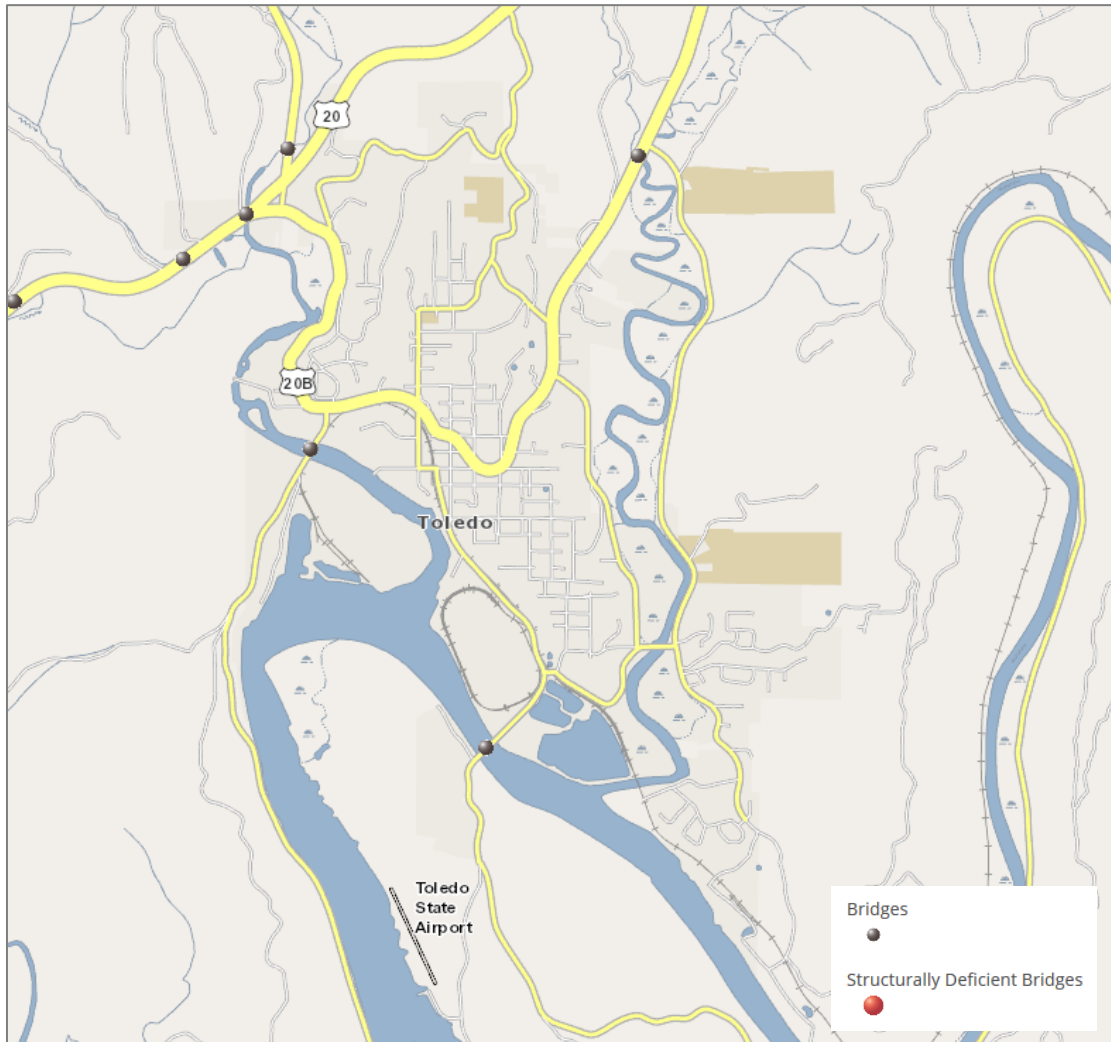
Source: Oregon Department of Transportation - [Link](#)

## Bridges

Because of earthquake risk, the seismic vulnerability of the city's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries are unable to transport goods. Bridges and culverts within the city that are critical or essential include (see Figure TA-4):

- Depoe Bay Slough, Yuina Bay Rd (1962), (Bridge ID 12131A)
- Yaquina River, Butler Bridge Rd (1956), (Bridge ID 12132A)
- West Olalla Slough, US 20 at MP F8.17 (1936), (Bridge ID 02275)
- Depot Slough, US 20 (1960), (Bridge ID 00439B)

**Figure TA-4 Oregon Bridges and Structurally Deficient Bridges**



Source: Oregon Department of Transportation, ODOT TransGIS, accessed August 6, 2020

More information on Seismic Design of bridges is on the ODOT website:

<https://www.oregon.gov/odot/Bridge/Pages/Seismic.aspx>

## Railroads

Railroads are major providers of regional and national cargo and trade flows. Railroads run through the Willamette Valley region and provide a vital transportation link to the City of



Toledo. The Portland & Western (PNWR) provides freight service to/from the city. There is no passenger rail service in the city.

Rails are sensitive to icing from the winter storms that can occur in the region. For industries in the region that utilize rail transport, these disruptions in service can result in economic losses. The potential for rail accidents caused by natural hazards can also have serious implications for the local communities if hazardous materials are involved.

### Airports

The Toledo State Airport is located south of the city on the east side of the Yaquina River. The Newport Municipal Airport is approximately 12 miles southwest in the South Beach area of Newport. The city has no commercial service airports. The nearest commercial airports are in Eugene and Portland.

### Ports

The Port of Toledo accommodates a wide variety of users to retain and create jobs and increase economic development. The Port district covers 443 square miles including the cities of Siletz and Toledo and unincorporated Lincoln County located along the Yaquina River. The Port includes the Toledo Shipyard, industrial leases, and recreational facilities.

### Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Generally, the network of electricity transmission lines running throughout the city is operated by Central Lincoln PUD (see their addendum for more information). The Williams Gas Pipeline provides natural gas that is delivered to customers in the city by Northwest Natural Gas. These lines may be vulnerable as infrequent natural hazards, like earthquakes, could disrupt service to natural gas consumers across the region.

The city water, wastewater, and stormwater (culvert) systems include the following:

#### Water Infrastructure

- Water Treatment Plant (ca. 1976): 860 NE Reservoir Ln
- Reservoirs: Mill Creek Reservoir (ca. 1967, 250 acre-feet)
  - Storage Tank: Ammon Road – 1 MG (ca. 1970)
  - Storage Tank: Graham Street – 0.45 MG (ca. 1968)
  - Storage Tank: Clearwell Storage – 0.85 MG
  - Storage Tank: Skyline Drive Storage – 1.9 MG (ca. 2014)
- Pump stations:
  - Mill Creek Raw Water Pump Station (ca. 1968): 1132 SE River Road
  - Siletz River Intake/Pump Station (ca. 2015): 24772 Siletz Hwy/east side of City of Siletz
  - Seal Rock Finished Water Pump Station (provides water for the Seal Rock Water District, see addendum for more information): 1621 S Bay Road
  - Wagon Road Water Pump Station: 1209 NE Wagon Road

### Wastewater Infrastructure

- Wastewater (Sewage) Treatment Plant: 1105 SE Fir St
- Wastewater pump stations:
  - Lincoln Way = 1615 NW Lincoln Way
  - High School = 1660 NE Hwy 20
  - A Street = 200 NW 1st Street
  - Ammon Road = 1298 SE Sturdevant Road
  - Butler Bridge = 675 SE Butler Bridge Road

### Stormwater Infrastructure (e.g. Culverts)

- Tidegate/stormwater station: 440 NW 1<sup>st</sup> Street

## **Community Organizations and Programs**

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The countywide community organizations that are active within the city and county and may be potential partners for implementing mitigation actions can be found in Appendix C: Community Profile.

## **Lincoln County School District**

The Lincoln County School District has three schools in Toledo including Toledo Elementary and Toledo Jr/Sr High (outside city limits). For more information on School District assets see their addendum in Volume II.

## **Existing Mitigation Activities**

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions better understand risk and can assist in documenting successes. Within the City of Toledo, specific hazard objectives are listed within the city's Comprehensive Plan (dated 2000):

Overall Objectives:

1. Identify potential natural hazard areas where development may occur when appropriate safeguards can minimize the impact of hazards upon development and impacts of new development upon adjoining properties.
2. Identify and preserve known natural hazard areas best retained for open space, yards, natural resource areas, wildlife habitats, recreation, or other non-structural uses.

3. Maintain an inventory of areas subject to natural disasters and hazards. The inventory shall be used to determine the suitability of a location for development and, if necessary, be used to limit the development to a level consistent with the degree of a hazard, the disaster potential and the environmental protection policies in the Comprehensive Plan.
  - a. The city shall utilize the Soil Survey of Lincoln County Area, Oregon July, 1997 (and later editions), the Environmental Geology of Lincoln County Oregon - Bulletin 81 (Department of Geology and Mineral Industries, 1973), the Environmental Hazard Inventory Coastal Lincoln County (RNKR Associates, 1977), the All Hazard Mitigation Plan: Lane, Lincoln, and Linn Counties, Oregon (G & E Engineering Systems, Inc. 1998) and other appropriate materials as guides for developing policies and regulations to minimize damages from developing in hazardous areas.
4. Develop comprehensive and effective safeguards for developments within known natural hazard areas by requiring the use of special design and construction features to reduce potential risks/damages in accordance with state building codes, other state codes, federal regulations, and local codes.

Specific hazard objectives are also listed. The Comprehensive Plan can be viewed online at the city's website, or at City Hall.

## Hazard Profiles

The following sections briefly describe relevant information for each profiled hazard. More information on Lincoln County hazards can be found in Volume I, Section 2 *Risk Assessment* and in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the City of Toledo. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The City hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

### Coastal Erosion

The City of Toledo does not border the Pacific Ocean; as such, coastal erosion is not considered to be a hazard within the community.

### Drought

The steering committee determined that the city's probability for drought is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to drought is **moderate**, meaning more than 10% of the city's population or property could be affected by a major drought event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of drought hazards, as well as the history, location, extent, and probability of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared coastal communities from the effects of a drought.

The Siletz River is Toledo's primary water supply during the summer months, and Mill Creek, its dam and its reservoir (circa 1967, 65 feet tall with a permitted storage capacity of 250 acre-feet) is the primary water source during the winter months.<sup>8</sup> The city owns about 400 acres of the Mill Creek Watershed above the reservoir and the remainder is owned by the U.S. Forest Service. Storage capacity is limited, and the city's steering committee believes that increased storage capacity may assist in mitigating the impact of a severe drought event. The Toledo Steering Committee additionally noted that emergency shut-off valves may increase the amount of water that the city's able to supply in the aftermath of a high magnitude earthquake event.

Water from the city reservoirs is treated at the water treatment facility that can treat up to 3.0 million gallons per day (mgd) or 2,080 gallons per minute (gpm); current typical flows range from 850 to 1,200 gpm. Following treatment water flows via 12 to 16-inch water transmission mains to four water storage tanks (combined over 3.35 million gallons capacity) provides enough water supply for about 3.7 days under current demand.<sup>9</sup> The city

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<sup>8</sup> City of Toledo, [Water System Master Plan](#), 2017.

<sup>9</sup> City of Toledo, [Water Management and Conservation Plan](#), 2017.

has about 35 miles of piping and is separated into three pressure zones. The City has enough capacity to meet current and anticipated future demand.

#### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## Vulnerability Assessment

Due to insufficient data and resources, Toledo is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks apply to humans and resources. Industries important to the City of Toledo’s local economy such as fishing and the timber industry have historically been affected, and any future droughts would have tangible economic and potentially human impacts.

In addition to reduced water supplies, a drought will increase the chances of wildfire and significantly reduce tourism activities. The city has a [Water Management and Conservation Plan](#) that includes water curtailment measures that will go into effect in the event of a drought.

## Earthquake

The steering committee determined that the city’s probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a CSZ event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major CSZ earthquake event. The steering committee determined that the city’s probability for a crustal earthquake event is **low**, meaning one incident may occur within the next 100 years and that their vulnerability to a Crustal Earthquake event is **moderate**, meaning that between 1% and 10% of the city’s population or property could be affected by a major crustal earthquake event. *The city’s probability to crustal earthquake was decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of earthquake hazards, as well as the history, location, extent, and probability of a potential event. Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

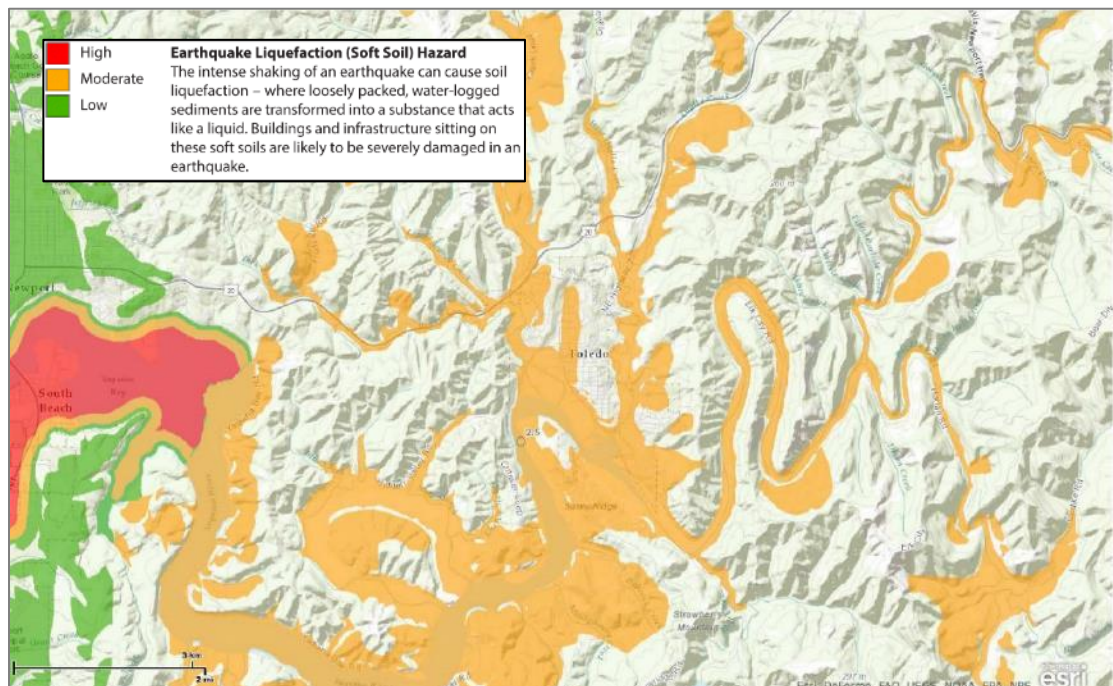
The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The

geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>10</sup>

The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides.

The figures below show earthquake hazards that affect the city, including the soft soil/liquefaction hazard (Figure TA-5), expected ground shaking for crustal events (Figure TA-6), and for the Cascadia Subduction Zone event (Figure TA-7). The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. The soft soils figure below shows that in general the soils in Toledo have low to moderate liquefaction potential; the areas of the population along the coastline are more susceptible to liquefaction than areas further in land and away from rivers.

**Figure TA-5 Earthquake Liquefaction (Soft Soil) Hazard**

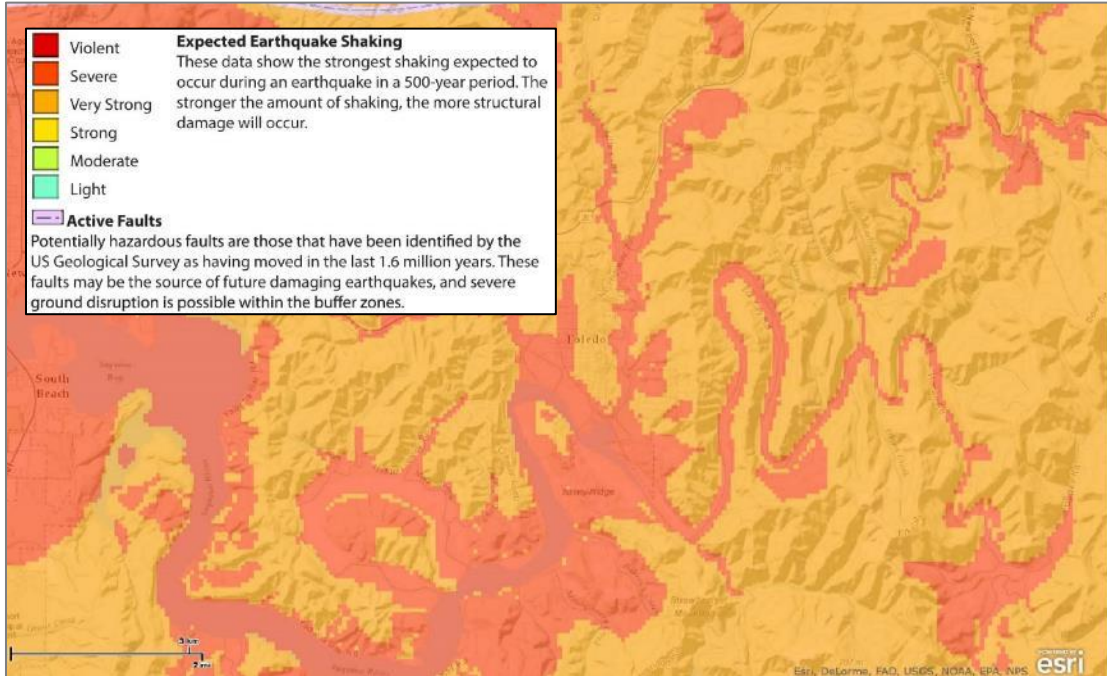


Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Shaking from the combined earthquake scenario is expected to be very strong to violent for much of Toledo as shown in Figure TA-6. The figure also shows one historically active fault southeast of the city.

<sup>10</sup> DLCD. *Oregon State Natural Hazard Mitigation Plan*. 2020 (Draft).

**Figure TA-6 Combined Earthquake Events Expected Shaking and Active Faults**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Figure TA-7 shows expected shaking with a Cascadia Earthquake. The figure shows that the entire city will receive severe to violent shaking.

**Figure TA-7 Cascadia Earthquake Expected Shaking**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

The city's concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described above are cause for significant effort toward mitigating the earthquake hazard. The city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, cell towers, the Samaritan North Lincoln Hospital, and City Hall were identified by the Steering Committee as vulnerable assets. The city would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide. Education and outreach regarding earthquakes (and resultant tsunami) is an ongoing endeavor in Toledo.

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community characteristics section (Table TA-4), approximately 67% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard (according to the Risk Report 71% of all buildings are pre-code and 12% are low code)<sup>11</sup>. Information on specific public buildings' (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table TA-5; each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI, that have not been retrofitted, using their Rapid Visual Survey (RVS), no buildings have a very high (100% chance) collapse potential, while two (2) have a high (greater than 10% chance) collapse potential. To fully assess a buildings potential for collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

### Mitigation Activities

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Toledo agencies or organizations.

A primary mitigation objective of the city is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>12</sup> have been funded to retrofit the Toledo High School gym (outside city) (2013-14 grant award, \$1,468,092). Additionally, the School District has retrofitted at risk schools through local resources (see the Lincoln County School District addendum for more information).

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<sup>11</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table D-2.

<sup>12</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.



**Table TA-5 Rapid Visual Survey Scores**

Facility	Site ID*	Level of Collapse Potential			
		Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100%)
<b>Schools</b>					
Toledo [Elementary] School** (600 SE Sturdevant Road)	Linc_sch05			X	
Toledo [Jr/ Sr] High School (Not in City)** (1800 NE Sturdevant Road)	Linc_sch11			<b>SRGP 2013-14 \$1,468,092</b>	
No Longer in Use ( <i>former Olalla Center site</i> )** (805 NE Reservoir Lane)	Linc_sch20		X		
<b>Public Safety</b>					
City of Toledo Fire Department** (285 NE Burgess Road)	Linc_fir22	X			
Port of Toledo ( <i>former Fire Department</i> )** (496 E Hwy 20)	Linc_fir06			X	
Toledo Police Department** (250 W Hwy 20)	Linc_pol07	X			

Source: [DOGAMI 2007. Open File Report 0-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment](#). Notes: “\*” – Site ID is referenced on the [RVS Lincoln County Map](#); “\*\*” – Facility determined to be vulnerable to CSZ earthquake and should expect moderate to complete damage (> 50% probability). DOGAMI Risk Report (2020).

Notes: The Toledo Fire Department Building (496 E Hwy 20) was assessed by DOGAMI, but was sold to the Port of Toledo; The Olalla Center for Children and Families was assessed by DOGAMI, but has since moved to a new location (321 SE 3<sup>rd</sup> Street).

The city’s steering committee additionally identified the following earthquake-related vulnerabilities:

- The city’s topography is [likely] prone to earthquake-induced landslides;
- In the event of a magnitude (M) 9 earthquake event, the city will likely be isolated from larger cities in the Willamette Valley, as well as coastal communities. Post-disaster self-reliance is essential;
- Post-disaster communication may be hindered; the acquisition of satellite phones may be a beneficial emergency-response related investment;
- Access to hospitals will be difficult;
- The city will likely need to accommodate a large section of Newport’s population post-earthquake and/or tsunami. Currently, the city is not equipped to house and/or provide services for an influx of residents;
- The Olalla Reservoir Dam may breach and cause severe flooding;
- The Mill Creek Reservoir Dam may breach and cause severe flooding;
- Toledo City Hall is comprised of unreinforced masonry and may collapse in the event of a high magnitude earthquake; and
- The city’s Georgia Pacific Paper Mill may be hazardous in the event of an earthquake. Further study is needed.

## Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to earthquake. The Risk Report provides a distinct profile for Toledo.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled magnitude 9.0 Cascadia Subduction Zone (CSZ) event. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Toledo may be impacted by the profiled earthquake scenarios (Table TA-6). *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*<sup>13</sup>

Approximately 26% of the City's population (902 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, approximately less than 1% will be impacted by the accompanying tsunami. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Earthquakes will impact every building in the City, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as "damaged" in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The City has 810 buildings that are expected to be damaged by the CSZ earthquake and tsunami event. The combined (earthquake and tsunami) value of building damage losses are \$125.6 million.

The Risk Report estimated losses show that the age of the building stock is the primary metric of earthquake vulnerability. Communities with older building stock are expected to have higher losses. However, if buildings were retrofitted to at least "moderate code" standards the impact of the event would be reduced. The Risk Report concludes that loss estimates for the City drop from 43% to 37% (\$17.9 million decrease in loss) when all buildings are upgraded to at least moderate code level.<sup>14</sup> *Note: earthquake vulnerability retrofit benefits are minimized in areas of liquefaction and landslide where additional geotechnical mitigation would be needed.*

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<sup>13</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18.

<sup>14</sup> Ibid. Table B-2.

**Table TA-6 Potentially Displaced Residents and Exposed Buildings, Earthquake**

Community Overview: Toledo						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
3,465		1,954		7	288,238,000	
Exposure Analysis: Earthquake CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
898	25.9%	770	39.4%	6	123,401,000	42.8%
Exposure Analysis (within Tsunami Zone - Medium)						
4	0.1%	40	2.0%	0	2,234,000	0.8%
Total Exposure						
902	26.0%	810	41.5%	6	125,635,000	43.6%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>15</sup>

- Toledo Fire and Rescue Station 41 (City)
- Toledo Police Department (City)
- Olalla Center for Children and Families (non-profit)
- Arcadia School: District Offices (Lincoln County School District)
- Toledo Elementary School (Lincoln County School District)
- Toledo Jr/Sr High School (Outside City) (Lincoln County School District)
- Port of Toledo (Port)

Note: It is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Toledo by sea and air will be necessary.

## Tsunami

The steering committee determined that the city’s probability for a distant tsunami event is **moderate** meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a distant tsunami event is **low**, meaning that less than 1% of the city’s population or property could be affected by a major distant tsunami event. The steering committee determined that the city’s probability for a local tsunami event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a local tsunami event is **moderate**, meaning that between 1% and 10% of the City’s population or property could be affected by a major local tsunami event. *The city’s probability to distant tsunami, and their vulnerability to a local tsunami event, decreased since the previous NHMP, all other ratings have remained the same.*

<sup>15</sup> Ibid, Table A-19.

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of tsunami hazards, as well as the history, location, extent, and probability of a potential event. The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>16</sup> Distant tsunamis happen more regularly than CSZ related local tsunamis.

It is difficult to predict when the next tsunami will occur. According to the Oregon NHMP the coast has experienced 25 distant tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources would be about six (6) years. However, the time interval between events has been as little as one year and as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for the City.

A 9.0 magnitude earthquake originating from Japan caused approximately \$7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; \$6.7 million), as well as the Port of Toledo (Lincoln County; \$182,000), and Charleston Harbor (Coos County; \$200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency was declared by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast local officials activated the Emergency Alert System and sirens, implemented "reverse 9-1-1" and conducted door-to-door notices in order to evacuate people from the tsunami inundation zone. Local governments activate their Emergency Operations Centers and the state activated its Emergency Coordination Center. For more information view Volume II, Hazard Annex.

In 1995, the Department of Geology and Mineral Industries (DOGAMI) conducted an analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami maps were produced to help implement Senate Bill 379 (SB 379); digitized in 2014 ([O-14-09](#)). SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005, limit construction of new essential facilities and special occupancy structures in tsunami flooding zones. Figure TA-8 shows the regulatory tsunami inundation line showing the much of the residential development west of Highway 101, and areas in, and adjacent to, the harbor are vulnerable to tsunami. It should be noted that the updated tsunami inundation maps (described below) show an increased vulnerability in many areas (Figure TA-9). Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building "new essential facilities, hazardous facilities,

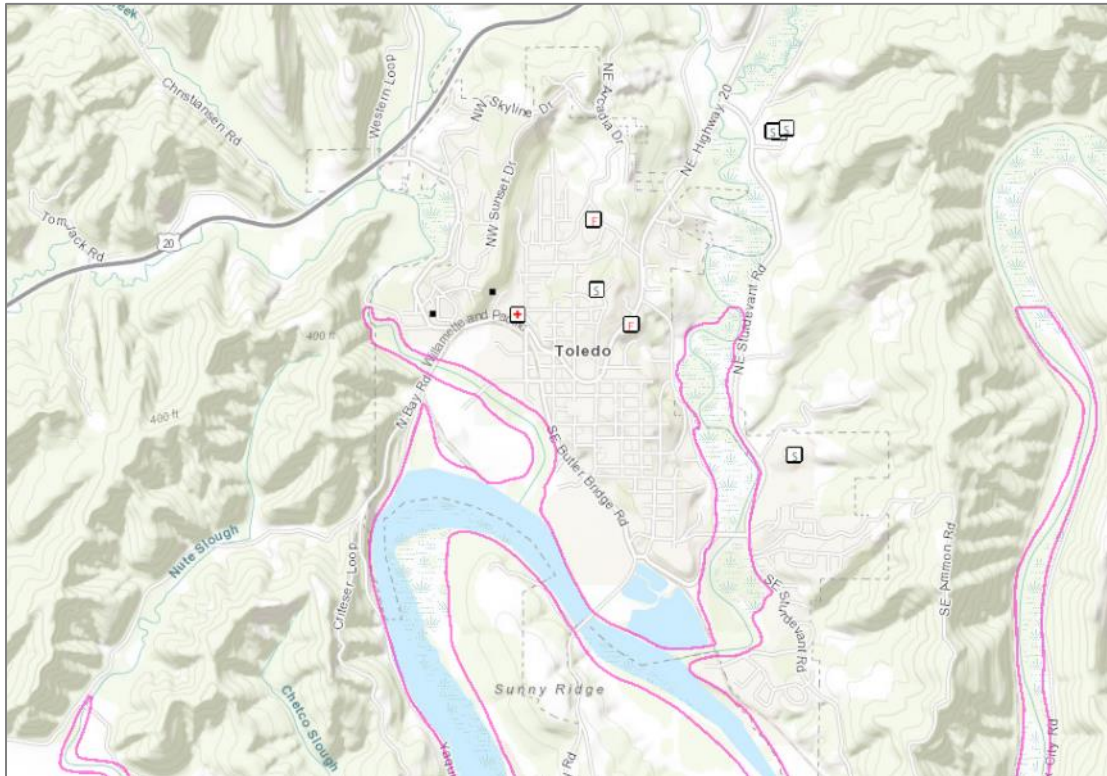
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<sup>16</sup> Oregon Natural Hazard Mitigation Plan. Department of Land Conservation and Development. 2015

major structures, and special occupancy structures” inside the tsunami inundation zone (SB 379 line):<sup>17</sup>

Toledo has put forth much effort to educate and inform citizens of tsunami hazards found within the city. Much of the city is outside of the expected tsunami inundation zone, however, damage is expected to occur on various properties, roads, bridges, communication systems, and critical infrastructure within Toledo, among other assets described in the county’s plan. Toledo recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future.

**Figure TA-8 Regulatory (SB 379) Tsunami Inundation Line**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities. Maps were created for local and distant source tsunami events. The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as “T-shirt” sizes S, M, L, XL, and XXL. Figure TA-9 shows the M and XXL tsunami inundation scenarios. The distant source tsunami inundation maps show the potential impacts of tsunamis generated by earthquakes along the “Ring of Fire” (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2) and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry

<sup>17</sup> Oregon Legislature. HB 3309 (2019).

<https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309>

Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

**Figure TA-9 Tsunami Inundation Map (M and XXL Scenarios)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - <http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm>  
(Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:  
<http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm>

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst-case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

<http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm>

A free application is also available that displays the evacuation routes in coastal areas of Oregon: [http://www.nanoos.org/mobile/tsunami\\_evac\\_app.php](http://www.nanoos.org/mobile/tsunami_evac_app.php)

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

In 2013, DOGAMI produced new Tsunami Inundation Maps (TIMs) for the entire Oregon coast. The TIMs identify both local and distant Tsunami Inundation Zones (TIZs) by event size. The maps also tabulate the affected buildings located within the local and distant source tsunami inundation zones. The Risk Report section below provides detailed information on the impact to the City from a CSZ earthquake and medium tsunami.

Although Toledo has relatively few developed properties within the tsunami inundation zones, the city expects to see an influx of Newport residents following a large tsunami event. Likely, this will be the city's greatest tsunami-related impact. Toledo is currently unprepared for such an increase, and will be unable to house, feed, and care for a much larger population. The city's steering committee noted that the city may want to increase its capacity to handle such a population surge, and that the Emergency Response Plan should account for such a scenario.

Severe damage could occur to low-lying areas of the city in a local source tsunami event, including roads, bridges, communication systems, and infrastructure within Toledo. Some damage is also may occur in a large distant source tsunami event (such as the 2011 Tohoku tsunami) particularly to the low-lying areas of town including the Port of Toledo. The City of Toledo recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future.

As shown in Table TA-4 there are about 129 manufactured housing units (mobile homes) in Toledo. Manufactured homes built prior to 2003 are subject to slipping off their foundations potentially compromising the occupants' ability to exit. The compromised egress may hinder timely evacuation.

Population vulnerability is characterized in terms of exposure, demographic sensitivity, and short-term resilience of at-risk individuals. Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.<sup>18</sup> Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds. According to the study Lincoln County (including Toledo) has

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<sup>18</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmidlein. "Community clusters of tsunami vulnerability in the US Pacific Northwest", PNAS 2015 112 (17) 5354-5359.

relatively low numbers of “residents, employees, or customer-heavy businesses” inside the tsunami hazard zones and will likely have enough time to reach high ground before a tsunami wave arrives.

**Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to tsunami. The Risk Report provides a distinct profile for Toledo.

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Toledo may be impacted by the profiled tsunami scenario (Table TA-7).

Less than one percent (1%) of the city’s population (15 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is slightly more people than those exposed within the Senate Bill 379 line (10 people). Building damage (loss) estimates are reported for buildings expected to be damaged by the tsunami inundation zone (medium-sized and SB 379). All 60 buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable); the number of buildings damaged is lower under the SB 379 scenario (22 buildings). No critical facilities are expected to be damaged under the CSZ M9.0 scenario or the SB 379 scenario.

**Table TA-7 Potentially Displaced Residents and Exposed Buildings, Tsunami**

Community Overview: Toledo						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
3,465		1,954		7	288,238,000	
Exposure Analysis: Tsunami CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
15	0.4%	60	3.1%	0	5,754,000	2.0%
Exposure Analysis: Tsunami SB 379 Regulatory Line						
10	0.3%	22	1.1%	0	1,277,000	0.4%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

**Critical Facility Vulnerability<sup>19</sup>**

- There are no critical facilities exposed to the profiled tsunami scenarios.

Note: Although critical facilities are not exposed to the profiled tsunami scenarios it is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Toledo by sea and air will be necessary.

<sup>19</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.



## Flood

The steering committee determined that the city's probability for riverine flood is **high**, meaning at least one incident is likely within the next 35-year period and that their vulnerability to riverine flood is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major riverine flood event. The probability of a coastal flood is **moderate**, meaning one incident is likely within the next 35 to 75-year period and that their vulnerability to coastal flood is **low**, meaning that less than 1% of the City's population or property could be affected by a major coastal or riverine flood event. *The vulnerability rating for riverine flood decreased since the previous NHMP. The probability and vulnerability for coastal flood decreased since the previous NHMP. Note: coastal flood "VE" zones do not occur in Toledo, however, the Yaquina River is tidally influenced and coastal backwater flooding compounds riverine flooding within the city.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of coastal and riverine flood hazards, as well as the history, location, extent, and probability of a potential event. Flooding typically occurs within the city when storm drains back up and/or pumps fail to work. The Yaquina River borders the City of Toledo, but riverine flooding is typically not an issue. The extent of flooding varies depending on rainfall, and/or precipitation levels throughout the year. Toledo's most significant flood events occurred in 1964 and 1996, and heavy rain in 1999 caused flooding along A Street. Three landslides additionally affected city residents during that same event. Landslides are the most common flood-related impacts within the community.

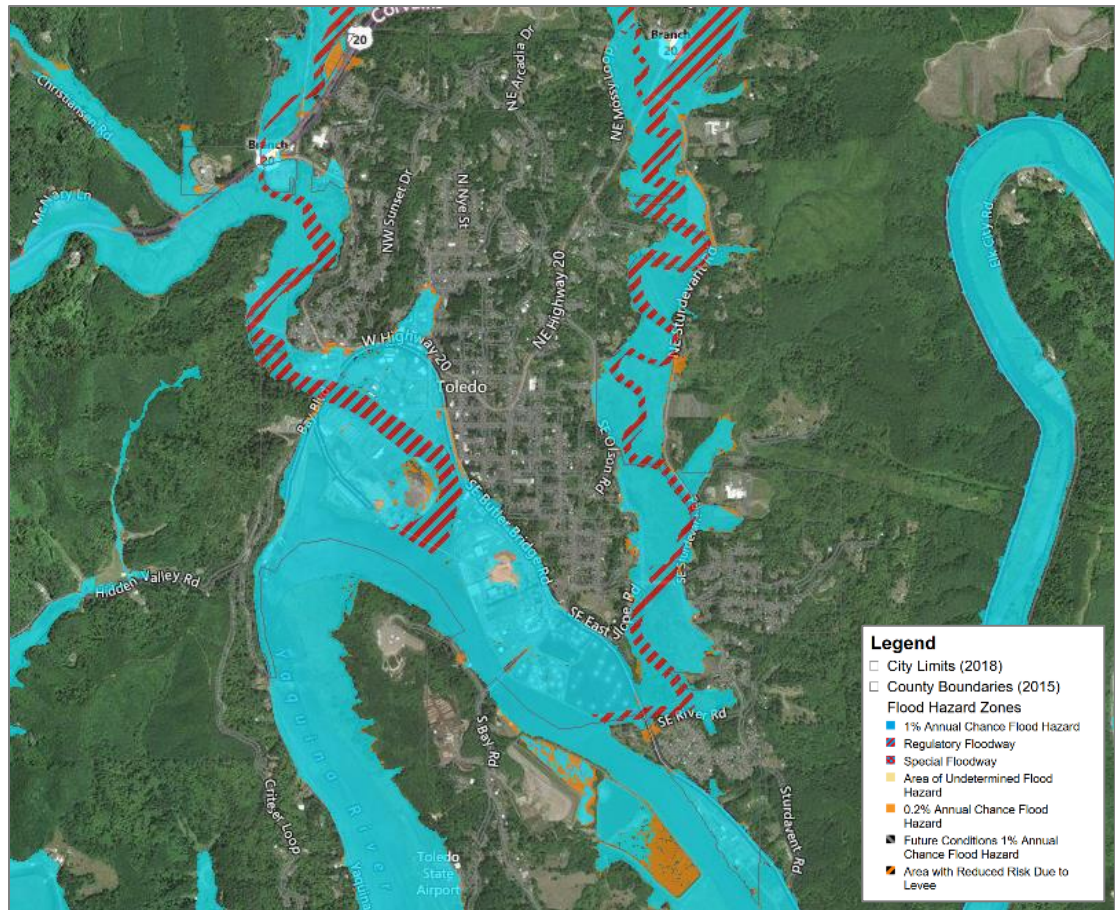
FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one percent probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood; also known as the Special Flood Hazard Area (SFHA). The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods (Figure TA-10). These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards. These maps represent a snapshot in time, and do not account for later changes which occurred in the floodplains. According to Oregon Explorer about 34% of the City is within the 100-year floodplain, and less than 1% is within the 500-year floodplain (see Figure TA-10).

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events. Additionally, coastal flooding is expected to increase due to sea level rise (SLR) and changing wave

dynamics. Sea level is projected to rise by 1.7 to 5.7 feet by 2100. Tidal wetlands and estuaries throughout the county are also expected to experience changes to their composition and area, thereby impacting their ability to naturally mitigate flood events.

**Figure TA-10 Flood Hazard Zones (100- and 500-year floodplains)**

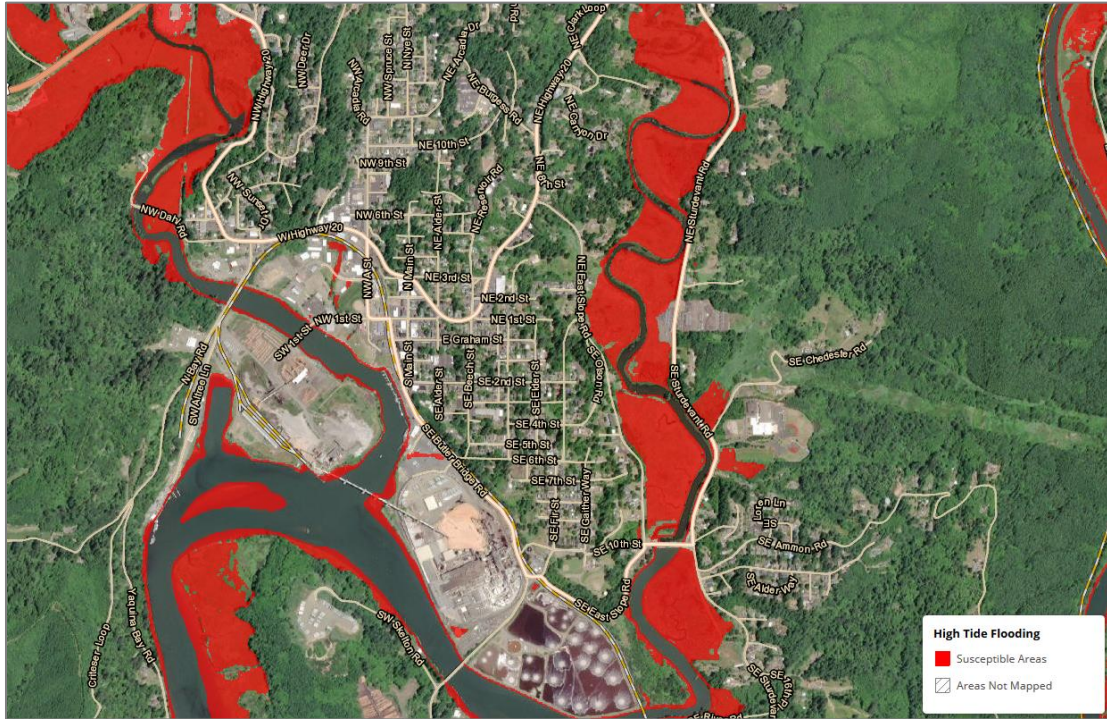


Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events. The city is most vulnerable within the Special Flood Hazard Area which includes low lying areas surrounding A Street and the Port of Toledo, including the Georgia Pacific manufacturing facility. Note: The city considers riverine flooding to be the primary concern but recognizes that tidally influenced flooding (backwater flooding) may compound riverine flooding within the city. Figure TA-11 shows areas of concern for tidally influenced flooding (coastal flooding) in the City. Areas around NW A Street, near Hwy 20 (Business) and the railroad, and Dahl Road, where it travels over Depot Slough, among other low-lying areas are of concern. The Risk Report does not include analysis for coastal flooding within Toledo, however, coastal flooding (including backwater flooding) is studied for portions of the Yaquina River near Newport (for more information see DOGAMI Open-file Report [O-15-06](#)).

**Figure TA-I | High Tide Flooding**



Source: [NOAA Coast Flood Exposure Mapper](#) – To explore and view map detail click hyperlink to left.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to flood. The Risk Report provides a distinct profile for Toledo.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the city. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within Toledo may be impacted by the profiled flood scenario (Table TA-8).

Just under three percent (3%) of the City’s population (87 people) may be displaced by flooding. These people are expected to have mobility or access issues due to surrounding water. About eight percent (8%) of the City’s buildings (151 buildings) are exposed to the flood hazard and may be damaged. The loss estimate for exposed buildings is \$23.3 million (about eight percent of total building value). The Police Department is vulnerable to flood.

**Table TA-8 Potentially Displaced Residents and Exposed Buildings, Flood**

Community Overview: Toledo						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
3,465		1,954		7	288,238,000	
Exposure Analysis: Flood (1% Annual Chance)						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
87	2.5%	151	7.7%	1	23,272,000	8.1%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>20</sup>

- Toledo Police Department

**National Flood Insurance Program (NFIP)**

FEMA’s Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2019. Table TA-9 shows that as of August 2019, the City has nine (9) National Flood Insurance Program (NFIP) policies in force, representing almost \$2.3 million in coverage. Of those, seven (7) are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for the City was February 22, 2000. The table shows that five flood insurance policies are for residential structures, primarily single-family homes and four are for non-residential structures. Flood insurance covers only the improved land, or the actual building structure. There have been two (2) paid flood insurance claims for a combined total of \$33,157.

The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The NFIP’s Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. The City does not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone.

The Community Repetitive Loss record for Toledo identifies no Repetitive Loss<sup>21</sup> or Severe Repetitive Loss Properties<sup>22</sup>.

<sup>20</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>21</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

<sup>22</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least

**Table TA-9 Flood Insurance Detail**

	Lincoln County	Toledo
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	3/1/1979
Total Policies	2,325	9
Pre-FIRM Policies	1,067	7
<b>Policies by Building Type</b>		
Single Family	1,685	4
2 to 4 Family	57	1
Other Residential	462	0
Non-Residential	121	4
Minus Rated A Zone	98	0
Minus Rated V Zone	3	0
Insurance in Force	\$585,856,500	\$2,323,200
Total Paid Claims	343	2
Pre-FIRM Claims Paid	265	2
Substantial Damage Claims	53	0
Total Paid Amount	\$5,479,221	\$33,157
Repetitive Loss Structures	64	0
Severe Repetitive Loss Properties	12	0
CRS Class Rating	NP	NP
Last Community Assistance Visit	-	2/22/2000

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating.

## Landslide

The steering committee determined that the city's probability for landslide is **high**, meaning at least one incident is likely within the next 35-year period, and that their vulnerability to landslide is **high**, meaning that more than 10% of the City's population or property could be affected by a major landslide event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of landslide hazards, as well as the history, location, extent, and probability of a potential event.

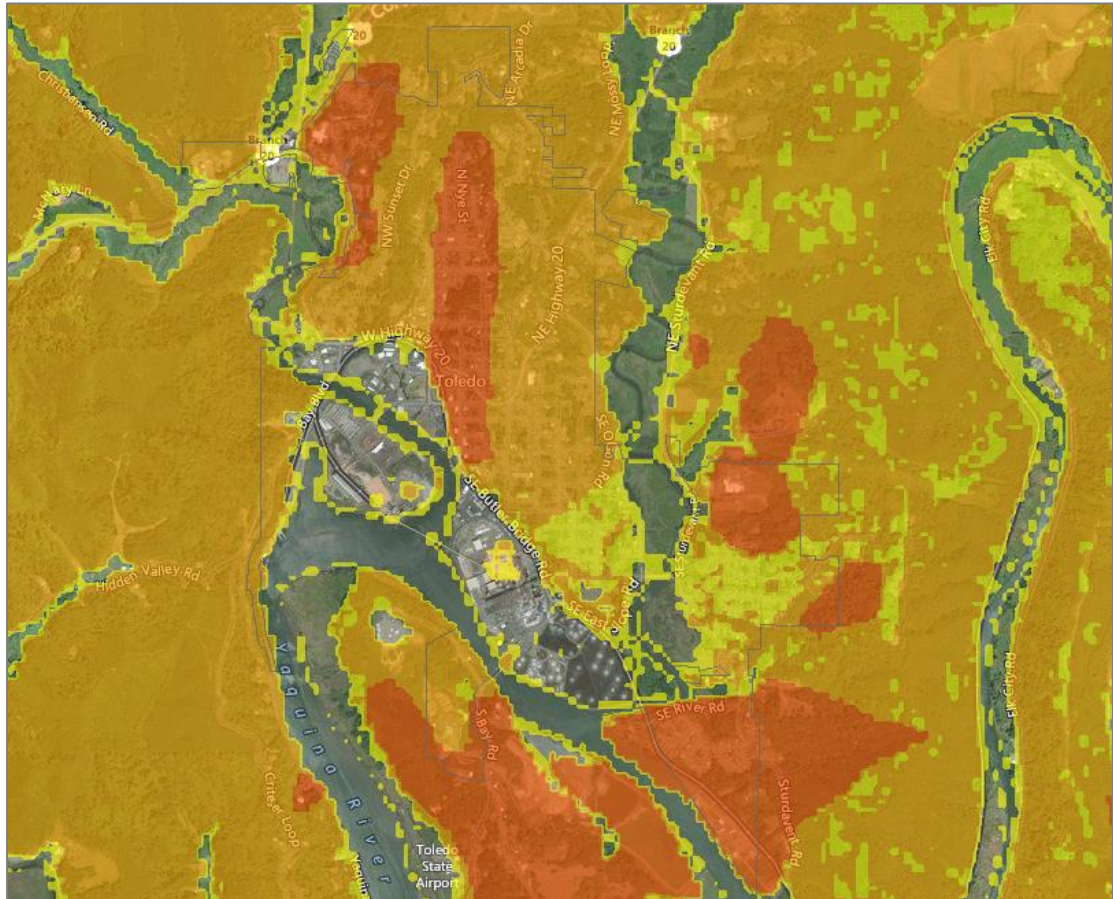
The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries or take lives.

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2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

Landslide susceptibility exposure for Toledo is shown in Figure TA-12. Approximately 60% of the City has very high or high, and 14% moderate, landslide susceptibility exposure.<sup>23</sup> In general, the areas of greater risk are located adjacent to rivers and creeks and indicate potential areas of erosion. *Note that even if a City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

**Figure TA-12 Landslide Susceptibility Exposure**



Low	<b>Landsliding unlikely.</b> Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low.
Moderate	<b>Landsliding possible.</b> Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.
High	<b>Landsliding likely.</b> Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.
Very High	<b>Existing landslides</b> Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

<sup>23</sup> DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

Future Climate Projection:

According to OCCRI report “Future Climate Projections: Lincoln County” (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

## Vulnerability Assessment

Toledo has very steep slopes, and a long history of logging practices increase the probability that landslides will occur. Homes on Nye Street suffered landslide-related damages following Oregon’s 1996 storms, and slides accompanied storms in 1966 and 1999.

Potential landslide-related impacts are adequately described within the county’s plan, and include infrastructure damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Lincoln County, and thoroughfares beyond city limits are susceptible to obstruction as well. As such, Toledo is vulnerable to isolation for an extended period.

Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Toledo.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the city may be impacted by the profiled landslide scenario (Table TA-10).

**Table TA-10 Potentially Displaced Residents and Exposed Buildings, Landslide**

Community Overview: Toledo						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
3,465		1,954		7	288,238,000	
Exposure Analysis: Landslide High & Very High Susceptibility						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
2,739	79.0%	1,528	78.2%	7	113,948,000	39.5%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Approximately 79% of the City’s population (2,739 people) may be displaced by landslides. These people are expected to have mobility or access issues and/or may have their residences impacted by a landslide. It is important to note that impact from landslides may

vary depending on the specific area that experiences landslides during an event. Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 78% of all buildings (1,528 buildings) within the City are exposed to the High or Very High landslide susceptibility zones (see Figure TA-12). The value of exposed buildings is just under \$114 million (about 40% of total building value). All seven identified critical facilities are vulnerable to landslide.

#### Critical Facility Vulnerability<sup>24</sup>

- Toledo Fire and Rescue Station 41 (City)
- Toledo Police Department (City)
- Olalla Center for Children and Families (non-profit)
- Arcadia School: District Offices (Lincoln County School District)
- Toledo Elementary School (Lincoln County School District)
- Toledo Jr/Sr High School (Outside City) (Lincoln County School District)
- Port of Toledo (Port)
- Samaritan Toledo Clinic (Hospital)

## **Severe Weather**

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.<sup>25</sup> Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months.<sup>26</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

#### Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>27</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

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<sup>24</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>25</sup> US Department of Agriculture. <http://www.fsa.usda.gov/or/Notice/Flp104.pdf>.

<sup>26</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

<sup>27</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.



According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

## Windstorm

The steering committee determined that the city’s probability for windstorm is **high** (the probability of tornado is **low**), meaning one severe incident is likely within the next 35-year period, and that their vulnerability to windstorm is **high**, meaning that more than 10% of the City’s population or property could be affected by a major windstorm event. The Steering Committee rated the County as having a “**low**” **vulnerability to a tornado hazard**, meaning that less than 1% of the City’s population or property could be affected by a major tornado event. *The windstorm ratings have not changed since the previous NHMP. The tornado ratings are new with this version of the NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of windstorm hazards, as well as the history, location, extent, and probability of a potential event. Because coastal windstorms typically occur during winter months, ice, freezing rain, flooding, and very rarely, snow sometimes accompany them. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Toledo is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. In Toledo, power outages are the greatest concern during windstorms. Building codes require new developments to place power lines below ground. Without power, communication is lost, and fuel and food stores shut down. Toledo experiences sporadic power failures all winter long, and trees frequently block roads. Typically, however, residents are prepared for power outages. The city’s steering committee discussed the need for assisting residents with medical vulnerabilities during power-outages; Toledo’s fastest growing age group is the elderly population, and medical isolation will continue to be an issue unless mitigated.

## Winter Storm (Snow/ Ice)

The steering committee determined that the city’s probability for winter storm is **high**, meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to winter storm is **moderate**, meaning that between 1% and 10% of the city’s population or property could be affected by a major winter storm event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of winter storm hazards, as well as the history, location, extent, and probability of a potential event. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Toledo is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Major winter storms can and have occurred in the Toledo area, and while they typically do not cause significant damage; they are frequent and have the potential to impact economic activity. Road closures on Highway 101, or the passes to the Willamette Valley (Hwy 18 and 20), due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

## Volcanic Event

The steering committee determined that the city's probability for volcanic event is **low**, meaning one incident is likely within the next 75 to 100-year period, and that their vulnerability to volcanic event is **low**, meaning that less than 1% of the city's population or property would be affected by a major volcanic event (ash/lahar). *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of volcanic event hazards, as well as the history, location, extent, and probability of a potential event. Generally, an event that affects the county is likely to affect Toledo as well.

## Vulnerability Assessment

Due to insufficient data and resources, Toledo is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Toledo is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens erupted in 1980, the city received small amounts of ashfall, but not enough to cause significant health and/or economic damages.

## Wildfire

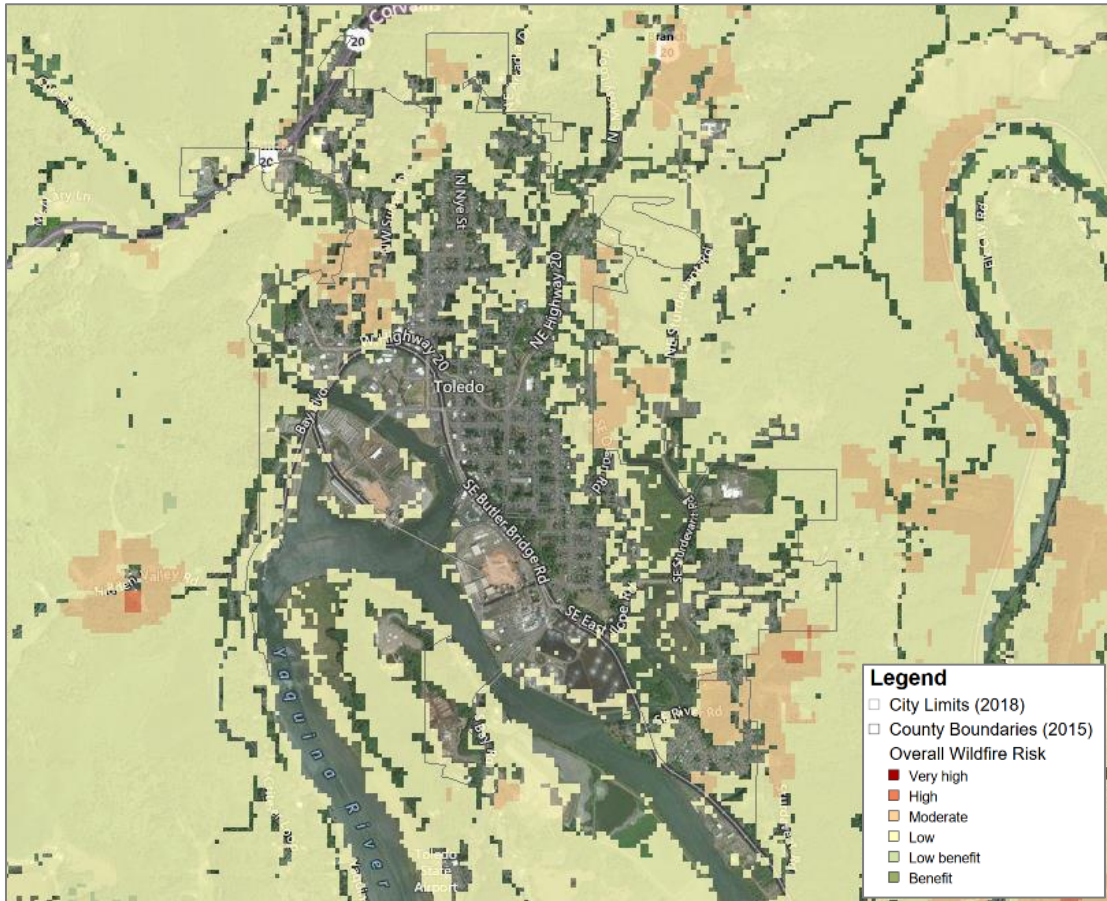
The steering committee determined that the city's probability for wildfire is **moderate**, meaning one incident is likely within the next 35 to 75-year period, and that their vulnerability to wildfire is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major wildfire event. *The probability rating has decreased since the previous NHMP.*

The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve to supplement the wildfire section in this addendum.

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of wildfire hazards, as well as the history, location, extent, and probability of a potential event. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Wildfires in 1849 and 1936 were particularly devastating in Lincoln County, but since then, there have been few large events. As shown in Figure TA-13 the City has mostly low, with some moderate, overall wildfire risk. Areas of concern include the eastern side of the city (where forestland borders development), and some of the open spaces within the city's limits. Due to the prevailing wind patterns (i.e., from the north or south). Power, natural gas, and phone lines run through the forest to the east of the city and

would be affected in the event of a wildfire. Likewise, active commercial logging occurs just outside the city, and slash burns are a potential wildfire concern.

**Figure TA-13 Overall Wildfire Risk**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Future Climate Projection:

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

### **Vulnerability Assessment**

Overall, the city, and its watershed, has low to moderate overall wildfire risk, however, the forested areas have the potential for large wildfires and a wildfire within the watershed could impact the city’s water supply and quality.

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair.

**Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Toledo.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment’s Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the City may be impacted by the profiled wildfire scenario (Table TA-11).

Approximately five percent of the City’s population (169 people) may be displaced by wildfires. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire (more people may also be impacted by smoke and traffic disruptions that are not accounted for within this analysis). It is important to note that impact from wildfires may vary depending on the specific area that experiences a wildfire. The value of exposed buildings (120 buildings) is just under \$9 million (about three percent of total building value).

**Table TA-11 Potentially Displaced Residents and Exposed Buildings, Wildfire**

Community Overview: Toledo						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
3,465		1,954		7	288,238,000	
Exposure Analysis: Wildfire High-Hazard						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
169	4.9%	120	6.1%	0	8,976,000	3.1%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

**Critical Facility Vulnerability**<sup>28</sup>

- There are no critical facilities exposed to the profiled wildfire scenario.

<sup>28</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

# ATTACHMENT A: ACTION ITEM FORMS

Table TA-1 and Table TA-12 provide a summary list of actions for the city. Each high priority action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table TA-12 Action Item Timelines, Status, High Priority and Related Hazards**

Action Item	Priority	Timeline	Status	Related Hazard									
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm
Toledo #1		Ongoing	Ongoing		X	X	X	X	X	X	X	X	X
Toledo #2		Short	Ongoing			X	X						
Toledo #3	X	Long	Ongoing			X							
Toledo #4		Ongoing	Ongoing		X	X	X	X	X	X	X	X	X
Toledo #5		Ongoing	Ongoing				X						
Toledo #6	X	Short	Ongoing				X	X	X		X		
Toledo #7		Medium	Ongoing			X			X				
Toledo #8	X	Long	Ongoing					X					
Toledo #9		Long	Ongoing				X						
Toledo #10	X	Short	Ongoing				X		X				
Toledo #11	X	Long	New				X		X				

**Previous NHMP Actions Removed/Deleted:**

**Toledo #11 (2015):** “Implement actions identified by the Lincoln County School District that affect the community’s resilience to earthquake and tsunami” was removed since the activities are now incorporated into the School District’s addendum. See the Lincoln County School District addendum for more information.

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The City NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the City. Existing programs and other resources that might be used to implement these action items are identified. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

County level actions that the city is listed as a partner are shown in Table TA-13. These actions are led by the County; however, the City will incorporate elements of the action that are applicable to their jurisdiction.

**Table TA-13 County Specified Actions that the City is Partner**

Action Item (2015 NHMP)	City Partner	Action Item
MH #1	Yes	Consider Local Energy Assurance Planning for critical areas countywide
MH #2	Yes	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers
MH #3	Yes	Develop and implement, or enhance strategies for debris management and/or removal after natural hazard events.
MH #4	Yes	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.
MH #5		Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.
MH #6	Yes	Integrate the NHMP into County and City comprehensive plans.
MH #7	Yes	Prepare long-term catastrophic recovery plan
MH #8		Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
CE #1		Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.
CE #2		Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
EQ #1	Yes	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
EQ #2	Yes	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
TS #1		Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami inundation zone and likely to be impacted by tsunami.
TS #2		Implement land use strategies and options to increase community resilience



Action Item (2015 NHMP)	City Partner	Action Item
EQ #3	Yes	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
FL #1	Yes	Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)
FL #2	Yes	Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.
FL #3	Yes	Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas
FL #4	Yes	Continue compliance with the National Flood Insurance Program (NFIP).
LS #1	Yes	Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.
LS #2		Protect existing development in landslide-prone areas.
LS #3	Yes	Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
SW #1	Yes	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).
SW #2	Yes	Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.
WF #1	Yes	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

<b>Mitigation Action: Toledo #1</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Educate citizens about natural hazards preparedness.	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>In the event of a magnitude (M) 9 event, the city will likely be isolated from larger cities in the Willamette Valley, as well as coastal communities. Post-disaster self-reliance is essential.</p> <p>"To increase natural hazard mitigation and emergency preparedness in a community, "residents must be aware of the risk and know what they should do before and after the disaster occurs. Outreach and awareness campaigns need to be carefully organized and developed to ensure that residents receive critical information." Source: Oregon Natural Hazards Workgroup. Lane County Natural Hazard Mitigation Plan (Draft). October 2005. Community Service Center, University of Oregon, Eugene, OR. p. 46.</p> <p>The Toledo Steering Committee expressed interest in developing strategies to assist residents that are in need of medical equipment during power outages.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Create public service advertisements.</p> <p>Distribute seasonal education &amp; outreach materials with residents' water bills.</p> <p>Teach children about emergency safety &amp; preparedness.</p> <p>Encourage residents to understand how to behave during windstorms. Educate residents about the hazards associated with high winds, and how to prevent harm during power outages.</p> <p>Host public meetings to discuss the earthquake and landslide hazards in Toledo.</p> <p>Educate residents about how to prepare for and mitigate damage caused by earthquakes.</p> <p>Place educational materials on display at the library.</p> <p>Create a neighbor assistance program to help residents in need of medical equipment during power outages. Provide information to residents about generator sharing programs and/or</p>	<p><u>2020 Update:</u></p> <p>The City of Toledo applied for a grant for Tsunami Evacuation Signage.</p> <p><u>2015 Update:</u></p> <p>The Toledo Fire Department provides ongoing education on natural hazard preparedness and mitigation.</p>	

purchasing opportunities.		
<b>Champion/ Responsible Organization:</b>	Fire Department (volunteers)	
<b>Internal Partners:</b>	<b>External Partners:</b>	
	FEMA, DOGAMI, Ready.gov, Oregon Emergency Management	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources	Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Toledo Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Toledo #2</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Evaluate the structural integrity of the Olalla Reservoir Dam (Georgia Pacific owned/operated) and the Mill Creek Reservoir Dam.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>Toledo is located in a high hazard area for earthquakes. The city's steering committee expressed concern that the Georgia Pacific/Olalla Reservoir Dam and/or the Mill Creek Reservoir Dam may breach in the event of a high magnitude earthquake and cause severe flooding within the city.</p> <p>If we can understand the risk from dam failure closer to reality, we can plan and use resources more appropriately to prepare against this hazard. <i>Source: DOGAMI</i></p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Create an Emergency Action Plan for dam failure. An EAP is a formal document that identifies potential emergency conditions at a dam and specifies preplanned actions to be followed to reduce property damage and loss of life. An EAP specifies actions the dam owner should take to take care of problems at the dam. It also includes steps to assist the dam owner in issuing early warning and notification messages to responsible downstream emergency management authorities of the emergency.</p> <p>Evaluate the community's risk of flooding from dam failure. Determine whether recreational facilities, campgrounds, or residences are located below the dam.</p> <p>Contact the state or county emergency management agency to determine whether the Olalla Dam is a high-hazard or significant-hazard potential dam.</p> <p>Educate residents about what to do during a flood event. For example, if residents are instructed to evacuate, they should do the following:</p> <p>Secure your homes. If you have time, bring in outdoor furniture. Move essential items to an upper floor.</p>	<p><u>2020 Update:</u></p> <p>Mill Creek continues to be inspected by the State.</p> <p><u>2015 Update:</u></p> <p>Mill Creek is inspected by State; may have some issues (piping), concern is with a Cascadia Earthquake.</p>	

Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you're wet or standing in water.		
<b>Champion/ Responsible Organization:</b>	Public Works	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Lincoln County	FEMA, OEM, Georgia Pacific	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources	Medium to High	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Toledo Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Toledo #3</b> <b>(What do we want to do?)</b>	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation?</p> <p>DOGAMI conducted a seismic needs assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. Table TA-4 lists the vulnerable buildings within Newport.</p> <p>In addition to the structures listed in Table TA-4, the city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, cell towers, and City Hall were identified by the steering committee as vulnerable assets. The city would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide.</p> <p>School District Priorities are included in their addendum. Below are facilities within Toledo that are listed as vulnerable to earthquake in the DOGAMI Risk Report, ownership is listed in parentheses.</p> <p>Priority projects include the following:</p> <ul style="list-style-type: none"> <li>• City Hall</li> <li>• Toledo Fire and Rescue Station 41 (City)</li> <li>• Toledo Police Department (City)</li> <li>• Olalla Center for Children and Families (non-profit)</li> <li>• Arcadia School: District Offices (Lincoln County School District)</li> <li>• Toledo Elementary School (Lincoln County School District)</li> <li>• Toledo Jr/Sr High School (Outside City) (Lincoln County School District) (Gym retrofitted per 2014 SRGP Grant)</li> <li>• Port of Toledo (Port)</li> </ul>		

<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
<p>Inventory community buildings and infrastructure: determine which structures may be particularly vulnerable to earthquake damage. Seek funding to retrofit and/or re-build structures.</p> <p>Create a local rehabilitation and retrofit program for existing buildings.</p> <p>Rehabilitate identified vulnerable schools, emergency facilities, infrastructure, and public buildings/lifelines.</p>		<p><u>2020 Update:</u></p> <p>The city is in the process of moving the police station to a seismically resilient structure.</p> <p><u>2015 Update:</u></p> <p>The city is in process of assessing municipal structures and commercial occupancies for collapse potential.</p> <p>In 2014 the school district was awarded a SRGP Grant to retrofit the Jr/ Sr High School. The retrofit was completed.</p>	
<b>Champion/ Responsible Organization:</b>	Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Finance, City Manager, Community Development, Property Management		Oregon Emergency Management, DOGAMI, IFA, SHPO, School District	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Seismic Rehabilitation Grants (IFA), Local Funding Resources		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Toledo Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Toledo #4</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Implement specific hazard objectives identified in the city's Comprehensive Plan.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p><u>Article 7 of Toledo's Comprehensive Plan lists the following primary goal:</u></p> <p>Prevent loss of life and property damage by requiring appropriate safeguards for all development of properties within known natural hazard areas. Natural hazards include: floods, tsunamis, earthquakes, landslide and slope hazards, weak foundation soils, high groundwater, wind/windthrow/winter storms, and wildfires.</p> <p><u>Overall objectives are as follows:</u></p> <ol style="list-style-type: none"> <li>1. Identify potential natural hazard areas where development may occur when appropriate safeguards can minimize the impact of hazards upon development and impacts of new development upon adjoining properties.</li> <li>2. Identify and preserve known natural hazard areas best retained for open space, yards, natural resource areas, wildlife habitats, recreation, or other non-structural uses.</li> <li>3. Maintain an inventory of areas subject to natural disasters and hazards. The inventory shall be used to determine the suitability of a location for development and, if necessary, be used to limit the development to a level consistent with the degree of hazard, the disaster potential and the environmental protection policies in the Comprehensive Plan.             <ol style="list-style-type: none"> <li>a. The city shall utilize the Soil Survey of Lincoln County Area, Oregon July, 1997 (and later editions), the Environmental Geology of Lincoln County Oregon - Bulletin 81 (Department of Geology and Mineral Industries, 1973), the Environmental Hazard Inventory Coastal Lincoln County (RNKR Associates, 1977), the All Hazard Mitigation Plan: Lane, Lincoln, and Linn Counties, Oregon (G &amp; E Engineering Systems, Inc.1998) and other appropriate materials as guides for developing policies and regulations to minimize damages from developing in hazardous areas.</li> </ol> </li> <li>4. Develop comprehensive and effective safeguards for developments within known natural hazard areas by requiring the use of special design and construction features to reduce potential risks/damages in accordance with state building codes, other state codes, federal regulations, and local codes.             <p>Specific hazard objectives are listed for floods, tsunamis, earthquakes, landslide and slope hazards, weak foundation soils, high groundwater, wind/windthrow/winter storms, and wildfires.</p> <p>The Disaster Mitigation Act of 2000 requires that plans include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate. [<i>§201.6(c)(4)(ii)</i>]</p> </li> </ol>		



Ideas for Implementation (How will it get done?):		Action Status Report	
Continue to implement & develop actions based on the objectives listed within the Comprehensive Plan.		<p><u>2020 Update:</u></p> <p>The city updated the floodplain ordinance in compliance with the Federal Emergency Management Act. In addition, the city now has standard operating procedures and a new floodplain permit.</p> <p>The city plans to apply for a technical assistance grant through DLCD to update the natural hazards chapter of the comprehensive plan.</p>	
<b>Champion/ Responsible Organization:</b>	Community Planning and Development		
<b>Internal Partners:</b>		<b>External Partners:</b>	
		Lincoln County, DLCD	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DLCD technical assistance grant		Medium to High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Toledo Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Toledo #5</b> <b>(What do we want to do?)</b>	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Continue compliance with the National Flood Insurance Program.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The National Flood Insurance Program (NFIP) provides communities with federally backed flood insurance, provided that communities develop and enforce adequate floodplain management measures. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.</p> <p>The City estimates a high probability that flooding will occur in the future; see Table TA-7 for detail on current NFIP participation and the flood section of the city addendum and Volume II, Hazard Annex, for detail on city risk and vulnerability to the flood hazard.</p> <p>Everyone in a participating community of the National Flood Insurance Program (NFIP) can buy flood insurance. Increasing flood insurance coverage will allow the county to reduce vulnerability, and facilitate recovery.</p> <p>The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will diminish flood damage to new and existing buildings in communities while providing homeowners, renters, and business owners additional flood insurance protection.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Actively participate with DLCD and FEMA during Community Assistance Visits. The Community Assisted Visit (CAV) is a scheduled visit to a community participating in the NFIP for the purpose of: 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered.</p> <p>Assess Toledo floodplain ordinances to ensure they reflect current flood hazards.</p> <p>Explore the possibility of updating the city's FEMA</p>	<p><u>2020 Update:</u></p> <p>The city complies with the NFIP.</p> <p>The city updated the floodplain ordinance in 2019 to maintain compliance with the NFIP.</p> <p>The city requires floodplain permits and keeps copies of flood elevation certificates.</p>	

<p>Flood Insurance Rate Map.</p> <p>Explore participation in the National Flood Insurance Program's Community Rating System (CRS).</p> <p>Educate residents in Toledo about flood issues and actions they can implement to mitigate the flood risk.</p>		
<p><b>Champion/ Responsible Organization:</b></p>	<p>Planning</p>	
<p><b>Internal Partners:</b></p>	<p><b>External Partners:</b></p>	
<p>Public Works</p>	<p>FEMA, DLCD</p>	
<p><b>Potential Funding Sources:</b></p>	<p><b>Estimated cost:</b></p>	<p><b>Timeline:</b></p>
<p>Local Funding Resources</p>	<p>Low</p>	<p><input checked="" type="checkbox"/> Ongoing</p> <p><input type="checkbox"/> Short Term (1-4 years)</p> <p><input type="checkbox"/> Medium Term (4-10 years)</p> <p><input type="checkbox"/> Long-Term (10+ years)</p>
<p><b>Form Submitted by:</b></p>	<p>Toledo Steering Committee, revised 2020</p>	
<p><b>Action Item Status:</b></p>	<p>Ongoing</p>	

Mitigation Action: Toledo #6 (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
Obtain lidar collection data from DOGAMI	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Lincoln County Risk Report (2015), <i>in process</i>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>LIDAR (light detection and ranging) is a mapping tool that can provide very precise, accurate, and high-resolution images of the surface of the earth, vegetation, and the built environment. It can be used to study landforms and identify areas, especially landslide areas that may be susceptible to future occurrences. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been working with communities to develop large-scale LIDAR maps of entire regions. DOGAMI has formed the Oregon LIDAR Consortium (OLC) to gather data in other Oregon regions, including Lincoln County. Entering into an agreement with the OLC, or obtaining lidar collection data from DOGAMI will assist in mapping areas of Western Lane County and landforms around Toledo.</p> <p>With lidar, you can quickly, cheaply, and accurately: find landslides, old cuts and grades; measure and estimate fills and cuts; find stream channels and measure gradients; measure the size and height of buildings, bridges; locate and measure every tree in the forest; characterize land cover; model floods, fire behavior; locate power lines and power poles; find archeological sites; map wetlands and impervious surfaces; define watersheds and viewsheds; model insolation and shaking; map road center and sidelines; find law enforcement targets; map landforms and soils; assess property remotely; inventory carbon; monitor quarries, find abandoned mines; enhance any project that requires a detailed and accurate 2-D or 3-D map.</p> <p>The City of Toledo has relatively steep topography, and landslides have frequently accompanied heavy rainstorms. Additionally, severe landslides are expected to occur in the event of a high-magnitude earthquake. Despite the city’s topographical characteristics and vulnerabilities to landslides, Toledo does not have accurate information regarding the location and extent of potential landslides. With improved data via participation in the OLC, (or purchase of the OLC’s data), Toledo would have a much greater understanding of its landslide risks.</p> <p>The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Obtaining lidar collection data from DOGAMI will help in understanding areas and landforms susceptible to landslide events to protect new and existing buildings, and infrastructure.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
DOGAMI’s LIDAR website provides information about the OLC and LIDAR and is a starting point for entering into an agreement with DOGAMI. <a href="http://www.oregongeology.com/sub/projects/olc">http://www.oregongeology.com/sub/projects/olc</a>	<p><u>2020 Update:</u></p> <p>The city is working on updating its GIS webmap and may include landslide data in the future.</p> <p>DOGAMI published <a href="#">Open-File Report, O-16-02</a>,</p>	

/default.htm		<p>Contact DOGAMI about obtaining the data. DOGAMI is available to talk to groups of potential users to show them the data and explain its uses. The lidar will be available without license restrictions in standard USGS quadrangles, with a nominal charge for each quadrangle. DOGAMI is happy to work with small communities to develop map products that they can use if they do not have GIS.</p>		<p><i>Landslide Susceptibility Overview Map of Oregon</i> which maps existing landslide data for Lincoln Co and Toledo.</p> <p><u>2015 Update:</u></p> <p>DOGAMI, FEMA, and DLCD and currently updating hazard data in Lincoln County and utilizing Lidar data to enhance risk information for coastal erosion, earthquake, flood, landslide, and tsunami hazards (among others). The report and data will be available for the city to utilize when completed in 2015.</p>	
<b>Champion/ Responsible Organization:</b>		Planning			
<b>Internal Partners:</b>			<b>External Partners:</b>		
Public Works, City Council			DOGAMI, DLCD, FEMA		
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, FEMA, DLCD		Low		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Toledo Steering Committee, revised 2020			
<b>Action Item Status:</b>		Ongoing			

<b>Mitigation Action: Toledo #7</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Identify and address community's vulnerability to a natural gas explosion following a seismic event.		<input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>			
<b>Rationale for Proposal (Why is this important?):</b>			
Risk of a gas explosion, as a result of a seismic event, could occur. This will affect emergency services and response to an area. Areas within the community which are served with natural gas should be identified.			
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
Coordinate with NW Natural to identify service areas within the city to assist with emergency management planning.		<u>2020 Update:</u> Ongoing	
<b>Champion/ Responsible Organization:</b>	Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Planning		NW Natural	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		Low	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Toledo Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Toledo #8</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Evaluate and implement mitigation projects for areas of the city that are at risk of landslide.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input checked="" type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Lincoln County Risk Report (2015), draft						
<b>Rationale for Proposal (Why is this important?):</b>						
The city's probability and vulnerability to landslide is high.						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
<p>Use lidar data to map existing landslides. Model future landslide susceptibility. Perform landslide risk analysis. Use the new information to prioritize risk reduction actions. Perform risk reduction.</p> <p>Create modern landslide inventory and susceptibility maps and use in planning and regulations for future development.</p> <p>Control storm water in landslide-prone areas.</p> <p>Monitor ground movement in high susceptibility areas.</p> <p>Implement grading codes, especially in high susceptibility areas.</p>				<p><u>2020 Update:</u></p> <p>DOGAMI published <a href="#">Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon</a> which maps existing landslide data for Lincoln Co and Toledo.</p>		
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, County Emergency Management			DOGAMI, DLCD			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Medium to High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Toledo Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Toledo #9</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Work with the owners of repetitive flood loss buildings in the city (particularly along Yaquina Bay road, Business Hwy 20, and in the A Street area) to identify cost effective mitigation strategies including consideration of relocation, elevation, or buy-out.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Toledo Flood Ordinance, Comprehensive Plan, FEMA Flood Insurance Study, Flood Insurance Rate Maps, Lincoln County Risk Report		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The City estimates a high probability that flooding will occur in the future; see Table TA-7 for detail on current NFIP participation and the flood section of the city addendum and Volume II, Hazard Annex, for detail on city risk and vulnerability to the flood hazard.</p> <p>Concentrations of pre-FIRM structures in areas subject to flooding are present in several areas along the County’s major rivers. Experience with the floods of the late 1990s showed that properly elevated structures in the flood plain performed well during major flood events, most suffering minimal if any, damage. Especially in areas that may be subject to damage during relatively high frequency flood events, elevating structures in conformance with the County’s flood hazard area codes (lowest floor at least one foot above the base flood level) is a cost-effective way to reduce risk.</p> <p>The area around A street is of concern and includes approximately 60 houses, the police station, the city library, and the local Head Start program within the special flood hazard area.</p> <p>The NFIP identifies no Repetitive Loss or Severe Repetitive Loss Properties in Toledo.</p>		
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>
<p>Assess individual properties for possible mitigation measures (elevation, acquisition, relocation) to reduce or prevent future flood losses.</p> <p>Relocate or elevate vulnerable structures above the estimated base flood elevation. In some cases, communities can use FEMA’s property acquisition or “buyout” program to remove structures that have repeatedly flooded in the past.  <a href="https://www.fema.gov/media-library-data/20130726-1507-20490-4551/fema_317.pdf">https://www.fema.gov/media-library-data/20130726-1507-20490-4551/fema_317.pdf</a>.</p> <p>Implement mitigation measures (elevation, acquisition, relocation) for properties within the floodplain.</p> <p>Evaluate and implement flood mitigation projects</p>		<p><u>2020 Update:</u></p> <p>No structures were mitigated. No properties are identified as repetitive loss.</p>



for flood prone properties along A street. Evaluate and implement flood mitigation projects for the Yaquina Bay Road area		
<b>Champion/ Responsible Organization:</b>	Planning/ Floodplain Manager	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Public works, building	DLCD, OEM, DOGAMI, FEMA	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, FEMA PDM, HMGP, FMA	High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Toledo Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Toledo #10</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Relocate Police Station out of tsunami inundation zone and establish a police communications system safe from disasters.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The Toledo Police Department (250 W Hwy 20) is located within the floodplain and a tsunami inundation area. DOGAMI finalized the remapping of the distant and local tsunami zones providing public, private and citizens with a clearly defined map of hazard areas. However, there was little to be done for the relocation of public safety buildings out of the inundation areas.</p> <p>A significant tsunami event has the potential to cause disruption of power, contamination of water supplies, loss of essential communication systems, a large amount of debris, and traffic congestion. A tsunami has the potential to damage critical buildings and infrastructure in the tsunami inundation zone. Mitigating the effects that a tsunami has on city assets is a high priority.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Assessing and evaluating needed mitigation for critical assets in the tsunami inundation zone, can assist the City in determining what further actions are needed to help mitigate the city's risk to tsunami.</p>						
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>				
Investigate relocation alternatives for critical facilities in the tsunami inundation zone.		<u>2020 Update:</u> The city is working on this action and it has strong support from the City Council. However, funding is not available. If not accomplished before funding may be more available when the General Obligation bonds for the Fire Station are paid off. Bonds could be issued for the Police Station at that time.				
<b>Champion/ Responsible Organization:</b>		Police				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, Building			DLCD, OEM, FEMA, DOGAMI, Business Oregon			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			High		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2014 Risk MAP Resilience Workshop, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Toledo # 11</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>		<b>High Priority Action Item?</b>		
Relocate Public Works out of the floodplain and the tsunami inundation zone.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Toledo Public Works is located within the floodplain and a tsunami inundation area. DOGAMI finalized the remapping of the distant and local tsunami zones providing public, private and citizens with a clearly defined map of hazard areas. However, there was little to be done for the relocation of critical facilities out of the inundation areas.</p> <p>A significant tsunami event has the potential to cause disruption of power, contamination of water supplies, loss of essential communication systems, a large amount of debris, and traffic congestion. A tsunami has the potential to damage critical buildings and infrastructure in the tsunami inundation zone. Mitigating the effects that a tsunami has on city assets is a high priority.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Assessing and evaluating needed mitigation for critical assets in the tsunami inundation zone, can assist the City in determining what further actions are needed to help mitigate the city's risk to tsunami.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Identify property outside the floodplain and tsunami inundation zone			New in 2020			
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>		<b>External Partners:</b>				
Community Development and Finance						
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>			
Local Funding Resources		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)			
<b>Form Submitted by:</b>	2020 NHMP Steering Committee					
<b>Action Item Status:</b>	New in 2020					

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# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the city's website and an email contact was provided for public comment. The plan was also announced on the County's website and an opportunity to provide feedback was provided.

During the public review period there were no comments provided.

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#### NATURAL HAZARDS MITIGATION PLAN RENEWAL - COMMUNITY INPUT NEEDED

The first phase of the Natural Hazards Mitigation Plan renewal process was to solicit feedback from community members to identify what is important to them regarding our local natural hazard risks and planning goals. This was completed in September, 2019. Since 2019, the Steering Committee made up of local City, Tribal, Public Safety Agencies and Addendum Partners have finalized the draft plan for the next renewal period. The next step is to send the final draft out to community members for their feedback and input then to the State of Oregon, then to FEMA, and lastly to the Lincoln County Board of Commissioners.

A natural hazard mitigation plan provides communities with a set of goals, action items, and resources designed to reduce risk from future natural disaster events. Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced loss of life, property, essential services, critical facilities, and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

An electronic version of the updated draft and additional information on the [Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan](https://www.co.lincoln.or.us/planning/page/community-input-needed-natural-hazards-mitigation-plan-renewal) can be found on the County's website, <https://www.co.lincoln.or.us/planning/page/community-input-needed-natural-hazards-mitigation-plan-renewal>. Toledo's Addendum can be found [here](#).

Community member input: Community members are invited to provide feedback by submitting comments or questions by **Friday, October 2, 2020** by using this [SURVEY](#)

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

<b>Mitigation Action: Toledo #</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# City of Waldport Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Gary Halvorson, Oregon State Archives

Effective:

December 29, 2020 through December 28, 2025

Prepared for:  
City of Waldport

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



**FEMA**

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
Grant: PDMC-PL-10-OR-2017-002  
Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

Resolution # 1266

**A Resolution Adopting the City of Waldport  
Representation in the Updates to the  
Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan**

**WHEREAS**, the City of Waldport recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the City of Waldport has fully participated in the FEMA prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the City of Waldport has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Waldport to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *City of Waldport addendum* to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

**WHEREAS**, the NHMP is comprised of comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

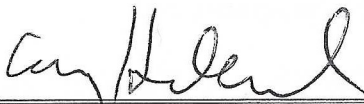
**WHEREAS**, City of Waldport adopts the NHMP and directs the City Manager to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP.

**Now, therefore, be it resolved**, that the City of Waldport adopts *the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

**Be it further resolved**, that the City of Waldport will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

Approved by the Waldport City Council this 14<sup>th</sup> day of January, 2021.

Signed by the Mayor this 14<sup>th</sup> day of January, 2021.

  
\_\_\_\_\_  
Greg Holland, Mayor

Attest:

  
\_\_\_\_\_  
Reda Q Eckerman, City Recorder

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## Purpose

This is an update of the City of Waldport addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP). The City of Waldport's original addendum to Lincoln County's NHMP was completed and approved by FEMA in 2009. This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation, and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Waldport's addendum are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Waldport adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **January 14, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the City's addendum on **March 1, 2021**. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The City concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## **Process and Participation**

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Department of Land Conservation and Development, Oregon Office of Emergency Management (OEM), Lincoln County, and Waldport to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal-Year 2017 (FY17) Pre-Disaster Mitigation (PDM) Competitive Grant Program OR-2018-001 (PDMC-PL-10-OR-2017-02).

Members of the Waldport NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Waldport addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Waldport NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Waldport Contract Planner serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Lincoln County NHMP in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Planning Director and Emergency Manager).

Representatives from the City of Waldport steering committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the city's addendum, with focus on the plan's risk assessment and mitigation strategy (action items).

The current version of the addendum reflects changes decided upon at the designated meetings and through subsequent work and communication with OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include revisions to the city's Risk Assessment and Hazard Identification sections, Action Items, and Community Profile.

The Waldport Steering Committee was comprised of the following representatives:

- Convener, Justin Peterson, Planner
- Kerry Kemp, City Manager
- Scott Andry, Public Works
- Gary Woodson, Central Coastal Fire

### Public Participation

Public participation was achieved by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment via a survey administered by IPRE (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The City Council will be responsible for adopting the Waldport addendum to the Lincoln County NHMP. This addendum designates a steering committee and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Waldport addendum on an annual schedule; the county is meeting on a quarterly basis and will provide opportunities for participating jurisdictions (cities and special districts) to report on NHMP implementation and maintenance during their meetings. The city's Contract Planner will serve as the convener and will be responsible for assembling the steering

committee. The steering committee will be responsible for identifying new risk assessment data, reviewing status of mitigation actions, identifying new actions, and seeking funding to implement the city's mitigation strategy (actions). The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and priority actions in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Where possible, Waldport will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Waldport's acknowledged comprehensive plan is the City of Waldport Comprehensive Plan. The City implements the plan through the Community Development Code.

## **Existing Plans and Policies**

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and

policies already in existence have support from residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

Waldport's Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the addendum helps identify what resources already exist that can be used to implement the action items identified in Waldport's Addendum. Implementing the city's mitigation actions through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the city's resources.

The following are Waldport's existing plans and policies that relate to natural hazards:

- **Comprehensive Plan, 1982, amended 2013:** A document stating the general, long-range policies that will govern a local community's future development.

*Relation to Natural Hazard Mitigation:* Contains city-specific information regarding natural hazards within the city's jurisdictional boundaries.

- **Development Code, 2010:** Establishes land use zones to regulate the location of building structure and the use of land within the City of Waldport.

*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the placement and construction of the buildings. Issues such as floodplain development, fire resistant materials, etc. Section 16.96 was updated in 2010 to strengthen requirements for a site-specific geotechnical analysis for proposed developments on steep slopes.

- **Yaquina Point Land Use and Transportation Plan, 2012:** Provides updated multimodal transportation plan for 150-acre area in west Waldport.

*Relation to Natural Hazard Mitigation:* Mitigation principles and strategies can be incorporated into Land Use and Transportation Plans to protect key transportation infrastructure from natural hazards.

- **Lincoln County Community Wildfire Protection Plan, 2018:** Assists Waldport clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.

*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

- **City of Waldport Transportation System Plan, 2020:** Guides the management of existing transportation facilities and the design and implementation of future facilities.

*Relation to Natural Hazard Mitigation:* The Transportation Plan may be a resource to identify which roads and transportation systems are most vulnerable to natural disasters.

## Government Structure

The City Council is the policy making body for Waldport. As the elected legislative body in Waldport, the City Council has overall responsibility for the scope, direction and financing of city services. Council members serve four-year terms. Additional departments within the city include the following:

**City Manager's Office:** The city manager is appointed by the City Council and serves as the city administrative officer of the city government. The city manager provides the leadership and direction for the operation and management of all city departments and serves as the city's budget officer.

**City Recorder:** The city recorder assures the timely presentation of formal communications from the public, other agencies and city staff to the City Council. The recorder prepares city council meeting agendas in coordination with the city manager; maintains official city records which reflect the actions of the governing body; maintains a depository of contracts, agreements and official council actions and ensures the timely availability of these records to the council, public other agencies and staff.

**City Planner:** The city planner provides service and information to the general public regarding phases of planning and community development. The city planner implements ordinance and plan requirements through a site and land use review process. Specifically, the city planner reviews potential development opportunities to ensure compliance with zoning, setback, parking, landscaping, access and other city requirements.

In addition to oversight of the development process, the city planner advises the City Council, Planning Commission, and city manager on land use and special project matters.

**Public Works Department:** The Waldport Public Works Department provides responsive community services related to planning, design, construction, operation, maintenance and management of public infrastructure, including streets, sewer, water treatment, wastewater treatment, storm drainage, public buildings and other facilities. Services provided by the department contribute to the public health, safety, economic diversity, environmental quality and citizen convenience.

**Finance Department:** The Finance Department serves the community by managing utility billing, business licenses, collecting taxes and fees, dealing with city expenditures, monitoring the city's budget, and managing investments. The goal of the finance department staff is to provide services with an emphasis on timelines, accuracy and courteous customer service

**Public Library:** The Waldport Public Library collects, preserves, and administers organized collections of books, internet communication and related materials.

**Community Center:** The Waldport Community Center provides a wide array of community services including a Senior Meals Program, a meeting facility for several community organizations, a crafts and farmers market, and other organized activities for the community.

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review. Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the City's website: <http://www.waldport.org/>

In addition, natural hazards information dissemination is conducted throughout the year when opportunities present themselves via the city offices and website.

## NHMP Maintenance

The Lincoln County Multijurisdictional Natural Hazard Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's action items were first developed through a two-stage process during the 2009 NHMP development and revised in 2015. In stage one, OPDR facilitated a work session with the steering committee to discuss the city's risk and to identify potential issues. In the

second stage, OPDR, working with the local steering committee, developed potential actions based on the hazards and the issues identified by the steering committee. During the 2019-2020 update process OPDR re-evaluated the Action Items with the county and local steering committees and updated actions, noting what accomplishments had been made and if the actions were still relevant; any new action items were identified at this time. For additional information see the discussion near the end of this document.

The City's actions are listed in Table WA-1. For more detailed information on each action, see the action forms within Attachment A of this addendum.

In addition, there are 23 County Action Items that include the city as an "Affected Jurisdiction" (Table WA-14). For more detailed information on the county actions that involve city participation, see Volume I, Section 3 and the action item forms within Volume III, Appendix A.

### Priority Action Items

Table WA-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in bold text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action. Full text of the plan goals referenced in Table WA-1 is located on page WA-2.



**Table WA-I City of Waldport Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing
Waldport #1	Continue to educate citizens about earthquake and tsunami preparedness	Administration	L	Ongoing
Waldport #2	Prepare a Stormwater Master Plan for the City of Waldport.	Administration	L	Long
Waldport #3	Encourage emergency related intergovernmental planning.	Administration	L	Ongoing
Waldport #4	Mitigate Crestline Drive against earth movement (erosion, slow landslide)	Public Works	M to H	Long
Waldport #5	Relocate critical Fire Station/ equipment out of tsunami inundation zone	Planning	H	Long
Waldport #6	Improve/ increase transportation infrastructure and connectivity to short-term and long-term relocation areas	Planning	M to H	Long
Waldport #7	Identify and mark tsunami evacuation zone/ route for east of Lint Slough and Waldport Schools and Improve sheltering options at Waldport schools to accommodate regional demand.	Planning	L to M	Short
Waldport #8	Assess and implement water/ wastewater intertie options between Waldport and Seal Rock	Public Works	H	Long
Waldport #9	Evaluate and implement erosion control mitigation projects for Alsea Bay.	Public Works	M to H	Long
Waldport #10	Seismically retrofit the 2 MG water storage tank and build a new 300,000-gallon tank.	Public Works	H	Medium
Waldport #11	Implement land use strategies and options to increase community resilience by creating an adoption ready tsunami code.	Administration	L	Short
Waldport #12	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).	Administration	H	Long

Source: City of Waldport NHMP Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

# Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure WA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure WA-1 Understanding Risk**



# Hazard Analysis

The Waldport NHMP steering committee reviewed and revised the plan’s Hazard Analysis and Risk Assessment section. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in probability, vulnerability, and risk from natural hazards unique to the City of Waldport, which are discussed throughout this addendum.

Table WA-2 shows the hazard analysis matrix for Waldport listing each hazard in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

Two catastrophic hazard (Cascadia Subduction Zone earthquake and tsunami) and four chronic hazards (windstorm, landslide, and coastal and riverine floods) rank as the top hazard threats to the City (Top Tier). Winter storms, drought, and wildfire comprise the next highest ranked hazards (Middle Tier). Distant tsunami, tornado, coastal erosion, crustal earthquake, and volcanic event comprise the lowest ranked hazards in the City (Bottom Tier).

**Table WA-2 Hazard Analysis Matrix – City of Waldport**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Landslide	20	40	80	70	210	#2	
Earthquake (Cascadia)	10	50	100	49	209	#3	
Flood (Coastal)	20	45	70	70	205	#4	
Flood (Riverine)	20	45	70	70	205	#4	
Tsunami (Local)	2	50	100	49	201	#6	
Winter Storm (Snow/Ice)	18	20	90	70	198	#7	Middle Tier
Drought	8	40	80	56	184	#8	
Wildfire	6	40	80	49	175	#9	
Tsunami (Distant)	10	15	60	35	120	#10	Bottom Tier
Tornado	8	10	30	56	104	#11	
Coastal Erosion	16	10	20	56	102	#12	
Earthquake (Crustal)	10	20	40	21	91	#13	
Volcanic Events	2	5	40	7	54	#14	

Source: City of Waldport NHMP Steering Committee (2020)

Table WA-3 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Lincoln County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings).

**Table WA-3 Probability and Vulnerability Comparison**

Hazard	Waldport		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	High	Low	High	Low
Drought	High	<b>High</b>	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	High	<b>High</b>	High	Moderate
Flood (Riverine)	High	<b>High</b>	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	High	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	<b>Moderate</b>	<b>High</b>	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	Moderate	High	Moderate

Source: City of Waldport NHMP Steering Committee and Lincoln County NHMP Steering Committee (2020)

## Community Characteristics

Table WA-4, Appendix C (Volume III), and the following section provide information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2012 and 2019 the City grew by 70 people (3%).<sup>1</sup> According to the State’s official coordinated population forecast, between 2019 and 2040 the City’s population is forecast to grow by 33% to 2,801.<sup>2</sup> Median household income increased by 17% between 2012 and 2017.<sup>3</sup> The City has an educated population with 91% of residents 25 years, and older holding a high school degree, 15% have a bachelor’s degree or higher. As of 2019 Waldport and the Lincoln County School District have 80% and 76% graduation rates respectively.

The City of Waldport sits at the mouth of the Alsea Estuary. Development in Waldport spreads mostly north to south along US-Highway 101 and east on Highway 34 (see Figure WA-2). Waldport includes industrial and commercial development but is zoned primarily residential. Dense commercial areas in Waldport exist along US-Highway 101 centrally located in the downtown area and around the Alsea Bay. Residential development is located north, south, and east of downtown, along US-Highway 101 and 34, and west along the Pacific Ocean. The city’s Comprehensive Plan identifies land use needs within the city and its urban growth boundary Figure WA-2 shows the City of Waldport’s zoning map. New development has complied with the standards of the [Oregon Building Code](#), and the city’s development code including their floodplain ordinance.

<sup>1</sup> Portland State University, Population Research Center, "Annual Population Estimates", 2019.

<sup>2</sup> Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

<sup>3</sup> Social Explorer, Table T57, U.S. Census Bureau, 2013-2017 and 2008-2012 American Community Survey Estimates.

## Economy

Waldport's commercial areas developed along primary routes and residential development followed nearby (see Figure WA-2).

Most workers residing in the city (86%, 446 people) travel outside of the city for work primarily to Newport and Yachats.<sup>4</sup> A significant population of people travel to the city for work, (83% of the workforce, 355 people) primarily from Newport and Yachats.

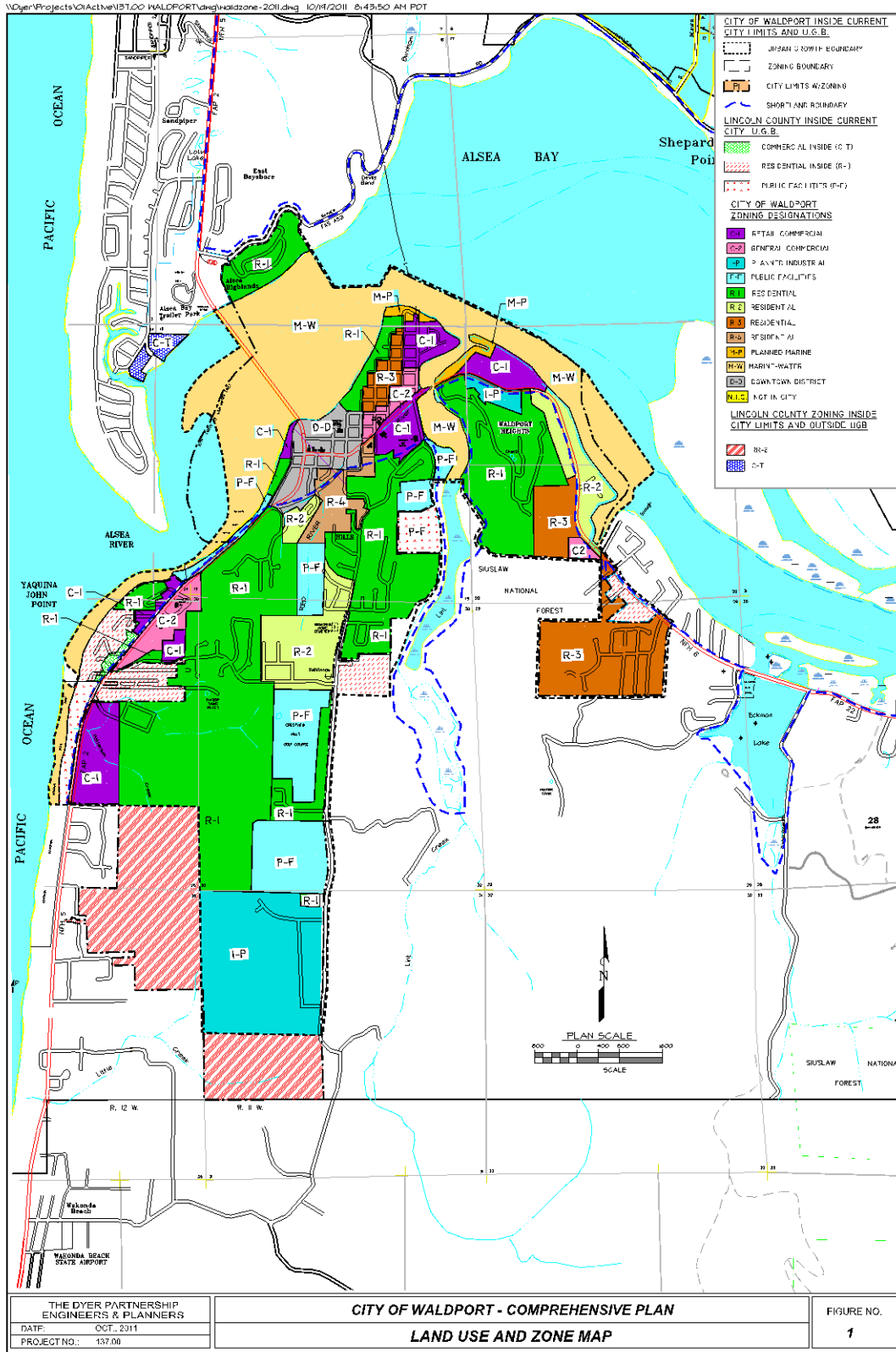
About 44% of the resident population 16 and over is in the labor force (802 people) and are employed in a variety of occupations including building and grounds cleaning (14%), professional (13%), production (11%), management, business, and financial operations (11%), and sales (10%) occupations.<sup>5</sup>

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<sup>4</sup> U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2017). Longitudinal-Employer Household Dynamics Program, accessed on April 25, 2020 at <https://onthemap.ces.census.gov>.

<sup>5</sup> Social Explorer, Tables A17008 & A17002, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

**Figure WA-2 Zoning Map**



Source: City of Waldport

**Table WA-4 Community Characteristics**

Population Characteristics		
<b>2012 Population</b>	2,040	
<b>2019 Population</b>	2,110	
<b>2040 Forecasted Population</b>	2,801	
Race (non-hispanic or latino) and Ethnicity (Hispanic)		
White	88%	
Black/ African American	0%	
American Indian and Alaska Native	0%	
Asian	1%	
Native Hawaiian and Other Pacific Islander	0%	
Some Other Race	0%	
Two or More Races	3%	
Hispanic or Latino (of any race)	8%	
<b>Limited or No English Spoken</b>	4	0%
Vulnerable Age Groups		
Less than 15 Years	353	16%
65 Years and Over	610	28%
Age Dependency Ratio		0.93
Disability Status		
Total Population	718	33%
Children (Under 18)	116	28%
Working Age (18 to 64)	315	27%
Seniors (65 and older)	287	47%

Income Characteristics		
Households by Income Category		
Less than \$15,000	114	12%
\$15,000-\$29,999	156	16%
\$30,000-\$44,999	215	22%
\$45,000-\$59,999	150	16%
\$60,000-\$74,999	74	8%
\$75,000-\$99,999	176	18%
\$100,000-\$199,999	76	8%
\$200,000 or more	9	1%
<b>Median Household Income</b>		\$45,000
Poverty Rates		
Total Population	345	16%
Children (Under 18)	134	32%
Working Age (18 to 64)	143	12%
Seniors (65 and older)	68	11%
Housing Cost Burden (Cost > 30% of household income)		
Owners with Mortgage	160	26%
Renters	179	49%

Source: U.S. Census Bureau, 2013-2017 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2019. Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

Housing Characteristics		
Housing Units		
Single-Family	873	73%
Multi-Family	198	17%
Mobile Homes	128	11%
Year Structure Built		
Pre-1970	345	29%
1970-1989	448	37%
1990-2009	390	33%
2010 or later	16	8%
Housing Tenure and Vacancy		
Owner-occupied	607	51%
Renter-occupied	363	30%
Seasonal	165	14%
Vacant	64	5%

Located on the Coast of Oregon, Waldport is located along the south side of Alsea Bay. Waldport lies at an average elevation of 12 feet above sea level (climbs from sea level at the Port to about 215 feet at the top of Crestline Drive). Alsea Bay is an active commercial and recreational fishing area with more than 50,000 user days by boaters annually.

The climate in Waldport is moderate. Average monthly temperatures range from lows of 36-40° F (November through April) to highs of 74-76° F (July through September) degrees. The driest months are July and August (average about 0.85-1.15 inches of precipitation per month) the wettest months are November through March (average 11-14 inches of precipitation per month). Waldport has an average annual precipitation of approximately 92 inches (73%, 67 inches fall November through March).

## Asset Identification

The following assets identified by the City of Waldport were first gathered from the Asset Identification meetings held with community members in 2007. These assets were confirmed and updated by the City steering committee during the 2019-2020 update process.

## Cultural and Historic Resources

The first settlers in the area floated down the Alsea River in the late 1870's, and the townsite is known to have an old Indian burial ground. Until the last two decades, Waldport's history was based on forest products, fishing, and dairy industries. The original Alsea Bay Bridge was built in the 1930's and was replaced in 1994 with a new bridge designed to resemble the old bridge. Tourism now plays a large role in the local economy. The Port of Alsea promotes business development of Port District assets, and serves to preserve, protect, and promote the ecological, aesthetic and economic resources of the Alsea Estuary and river. The Port has been working with a local oyster grower to develop a small oyster farm in the estuary.

The City of Waldport has many community events throughout the year, including, but not limited to: Beachcomber's Days, Christmas in Waldport, Candle Lighted Bridge Walk, and 4th of July Fireworks. Other local attractions include clamming, crabbing, fishing, beachcombing and exploring tide pools. Recreational amenities include the William Keady Wayside, ALSI Historical and Genealogical Society, the Alsea Bridge Visitor and Interpretive Center, and a wide range of restaurants, galleries and shops.

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The National Register of Historic Places and the State Historic Preservation Office indicates that there are no historic sites or properties within the city.<sup>6</sup>

## Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to act in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and wastewater treatment facilities.

Waldport has the following critical facilities (**bold** indicates facility was included in the Risk Report):

- City Hall: 125 NW Alsea Hwy
- **Central Oregon Coast Rural Fire Protection District Station 7200:** 145 NW Alsea Hwy
- **Public Works Shop:** 4028 SW Ann St

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<sup>6</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 17, 2020.



- Public Library
- Water treatment plant: 3770 SE Nelson Wayside Dr
  - water tanks
  - water lines
- Wastewater treatment plant: 390 NE Lint Slough Rd
  - sewer lines
- Power lines
- **Waldport High School:** 3000 S Crestline Dr
- **Crestview Heights Elementary/ Middle School:** 2750 S Crestline Dr

## Transportation

Mobility plays an important role in Waldport, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within the City. Waldport is also served by Lincoln County Transit Routes 497 with service running six days a week with stops in Waldport.

### Roads/Seismic lifelines

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>7</sup>

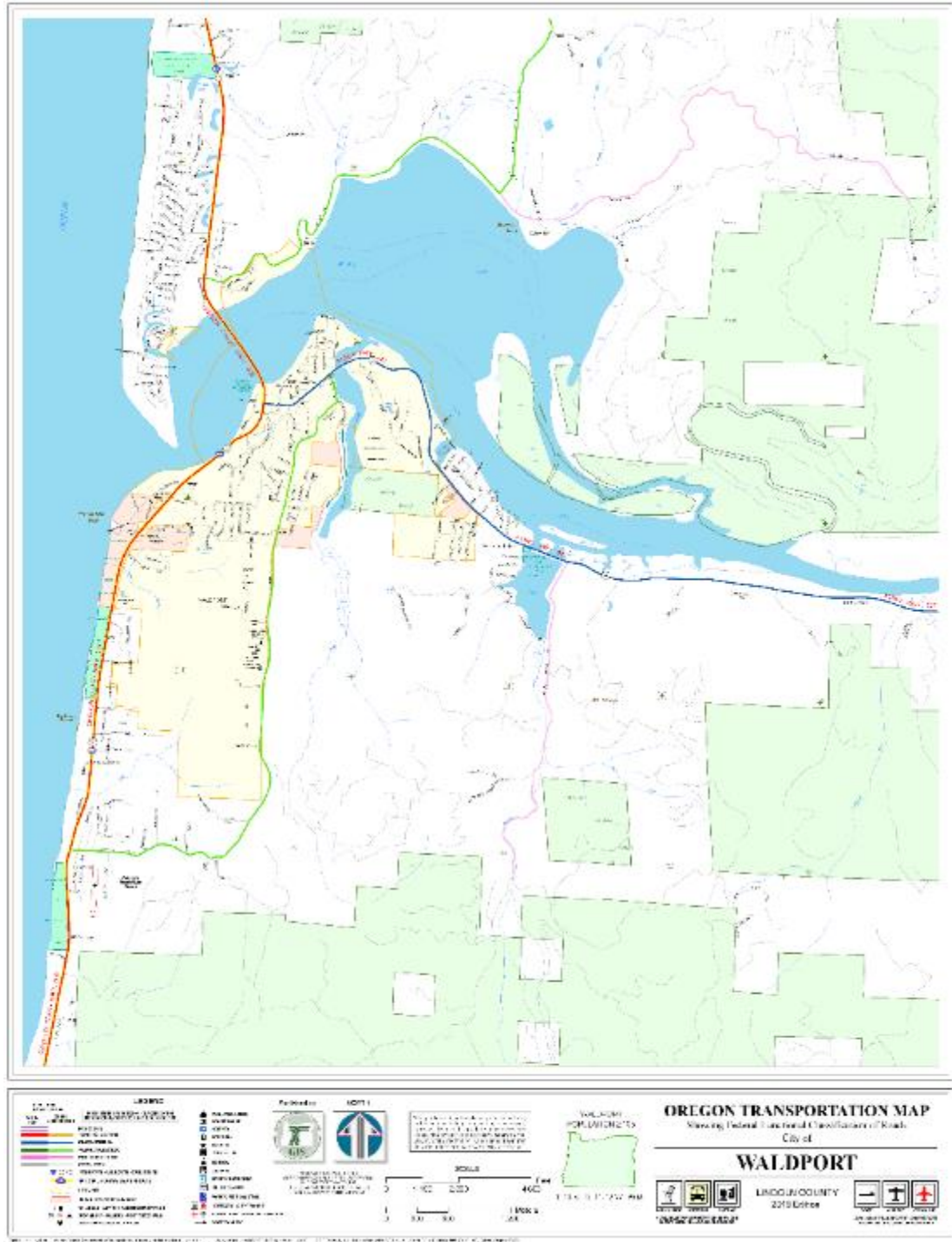
System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

Highway 101 (Tier I) is the major north-south transportation route through the City (see Figure WA-3). Highway 18 (Tier I, north of Lincoln City), and Highway 20 (Tier III, Newport) are the major east-west transportation routes connecting the coast to the Willamette Valley.

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<sup>7</sup> Oregon Department of Transportation. Oregon Seismic Lifeline Evaluation, Vulnerability Synthesis, and Identification, *Oregon Seismic Lifeline Routes*, May 15 2012.

**Figure WA-3 Waldport Functional Classification of Roads**



Source: Oregon Department of Transportation - [Link](#)

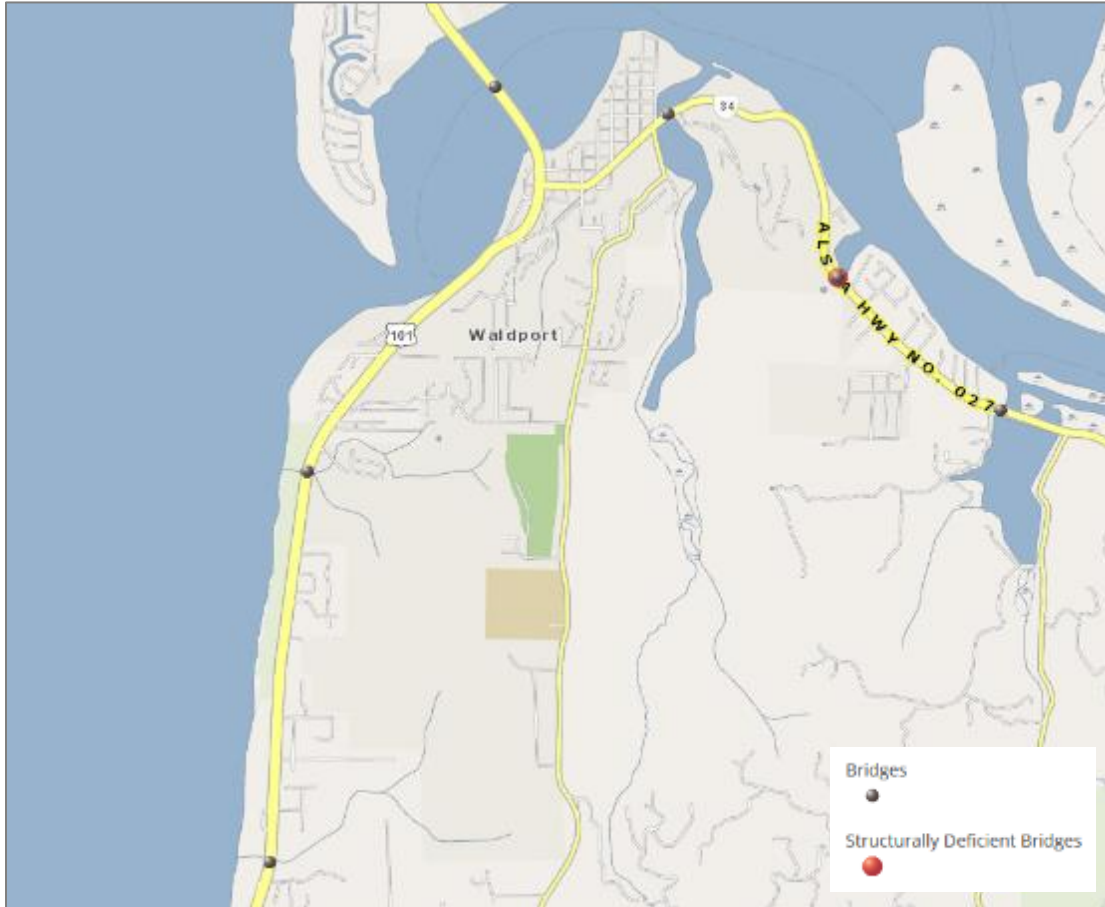
### **Bridges**

Because of earthquake risk, the seismic vulnerability of the city's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries

are unable to transport goods. Bridges and culverts within the city that are critical or essential include (see Figure WA-4):

- Alsea Bay, US 101 (1992), (Bridge ID 01746B)
- Lint Creek, OR 34 (1931), (Bridge ID 04166)
- McKinney Slough, OR 34 (1957), (Bridge ID 04167) – Structurally Deficient
- (culvert) US 101 at MP 157.24 (1930), (Bridge ID 01447)
- (culvert) Little Creek, US 101 at MP 158.64 (1929), (Bridge ID 01449)
- (culvert) Eckman Slough, OR 34 (1900), (Bridge ID 04168)

**Figure WA-4 Oregon Bridges and Structurally Deficient Bridges**



Source: Oregon Department of Transportation, ODOT TransGIS, accessed August 6, 2020

More information on Seismic Design of bridges is on the ODOT website:

<https://www.oregon.gov/odot/Bridge/Pages/Seismic.aspx>

### Railroads

There are no railroads in Waldport.

### Airports

The Wakonda Beach State Airport is located south of the city on the east side of Hwy 101 at Wakonda Beach. The Newport Municipal Airport is approximately 11 miles north in the South Beach area of Newport. The city has no commercial service airports. The nearest commercial airports are in Eugene and Portland.

## Ports

The Port of Alsea accommodates a wide variety of users to retain and create jobs and increase economic development. The Port office is located at 365 Port Street. Public facilities include a watercraft launch ramp, boat moorage, and a picnic area. The Port includes commercial docks.

## Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Generally, the network of electricity transmission lines running throughout the city is operated by Central Lincoln PUD (see their addendum for more information). The Williams Gas Pipeline provides natural gas that is delivered to customers in the city by Northwest Natural Gas. These lines may be vulnerable as infrequent natural hazards, like earthquakes, could disrupt service to natural gas consumers across the region.

The city water, wastewater, and stormwater (culvert) systems include the following:

### Water Infrastructure

- Water Treatment Plant 3770 SE Nelson Wayside Dr
- Reservoirs/storage tanks (3):
  - 2 MG- 3770 SE Nelson Wayside Dr
  - 0.3 MG- 3170 SE NELSON WAYSIDE DR
  - 15,000 Gallon - MAP & Taxlot 13-11-29-00-00500-00
- Pump stations:
  - Pumps from 2 MG to 15,000 Gallon Reservoir: 3770 SE Nelson Wayside Drive

### Wastewater Infrastructure

- Wastewater Treatment Plant: 390 NE Lint Slough Rd

### Stormwater Infrastructure (e.g. Culverts)

- Critical or Essential culverts (listed under bridges above)

## **Community Organizations and Programs**

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The countywide community

organizations that are active within the city and county and may be potential partners for implementing mitigation actions can be found in Appendix C: Community Profile.

## **Lincoln County School District**

The Lincoln County School District has two schools in Waldport including Crestview Heights Elementary and Waldport Middle and High School. For more information on School District assets see their addendum in Volume II.

## **Existing Mitigation Activities**

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions better understand risk and can assist in documenting successes. The following efforts have occurred or are on-going within Waldport:

- The City of Waldport adopted an emergency operations plan in September 2001. The stated purpose of the plan is:
  - To provide, in cooperation with the Lincoln County Department of Emergency Services, an effective operational capability in order to minimize the results of a natural or manmade disaster.
  - To assist in meeting the above capability, the following requirements should be satisfied:
    1. Provision of an adequate warning in event of a natural or man-made disaster.
    2. The development of a local plan to provide emergency operations in times of emergency.
    3. An Emergency Operations Center from which city government can function efficiently.
    4. The identification of facilities suitable for use as shelters for the citizenry as a means of maintaining self-sufficiency in the event of a disaster.
- The Mission of the Emergency Operations Plan is to safeguard life and property by making maximum use of available manpower, equipment, and other resources in order to minimize the effects of a disaster.
- The City of Waldport supports the Central Oregon Coast Fire & Rescue District (COCFRD). This includes supporting COCFRD in the implementation of the 2006 Emergency Disaster Plan prepared by COCFRD. The objectives of the Emergency Disaster Plan are to incorporate and coordinate all facilities and personnel of the District into an efficient organization capable of reacting adequately and promptly in the face of disaster, and to conduct such operations as the nature of the disaster requires, whether during a local emergency or to assist other jurisdictions should they need help.
- The City of Waldport enforces a setback requirement for all developments located along the coast. The purpose of the setback is to reduce property damages related to coastal erosion, windstorms, and flooding. The setback requirement also serves to meet the city's natural hazard goal, as defined with the Waldport Comprehensive Plan: "To protect life and property from natural disasters and hazards."

- The city Comprehensive Plan and Development Code address natural hazards. Specific hazardous areas have been identified by RNKR Associates in their work Environmental Hazards, Coastal Lincoln County, Oregon, 1979. The city has defined 'hazardous areas' and will allow development in these areas if adequate protective measures can be employed to prevent or minimize damage in accordance with city development code standards.
- The city distributes a Waldport tsunami evacuation map and tsunami safety brochure.
- The Waldport Middle School was moved out of the tsunami zone in 2006. The high school was moved out of the tsunami zone in 2012.
- State legislation:
  - SB 378 requires schools in potential inundation zones to teach students in K-8 grades about tsunamis and evacuation. The Waldport elementary and middle schools are located outside potential inundation zones.
  - SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, limits construction of new essential facilities and special occupancy structures in tsunami flooding zones.

## Hazard Profiles

The following sections briefly describe relevant information for each profiled hazard. More information on Lincoln County hazards can be found in Volume I, Section 2 *Risk Assessment* and in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the City of Waldport. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The City hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

### Coastal Erosion

The steering committee determined that the city's probability for coastal erosion is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to coastal erosion is **low**, meaning it is expected that less than 1% of the City's population or property could be affected by a major coastal erosion event. *The vulnerability rating has decreased since the previous NHMP.*

Volume I, Section 2 describes the characteristics of coastal erosion hazards, as well as the history, location, extent, and probability of a potential event. Coastal erosion is a natural process that continually affects coastal areas; in Waldport and elsewhere along the Pacific, coastal erosion becomes a hazard when lives and properties are at risk of death, injury, or damage. Coastal erosion is typically a gradual process, which can be greatly accelerated in the event of a storm or climate factors that increase the potential for coastal erosion.

#### **Future Climate Projection:**

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the risk of coastal erosion is expected to increase due to sea level rise and changing wave dynamics.

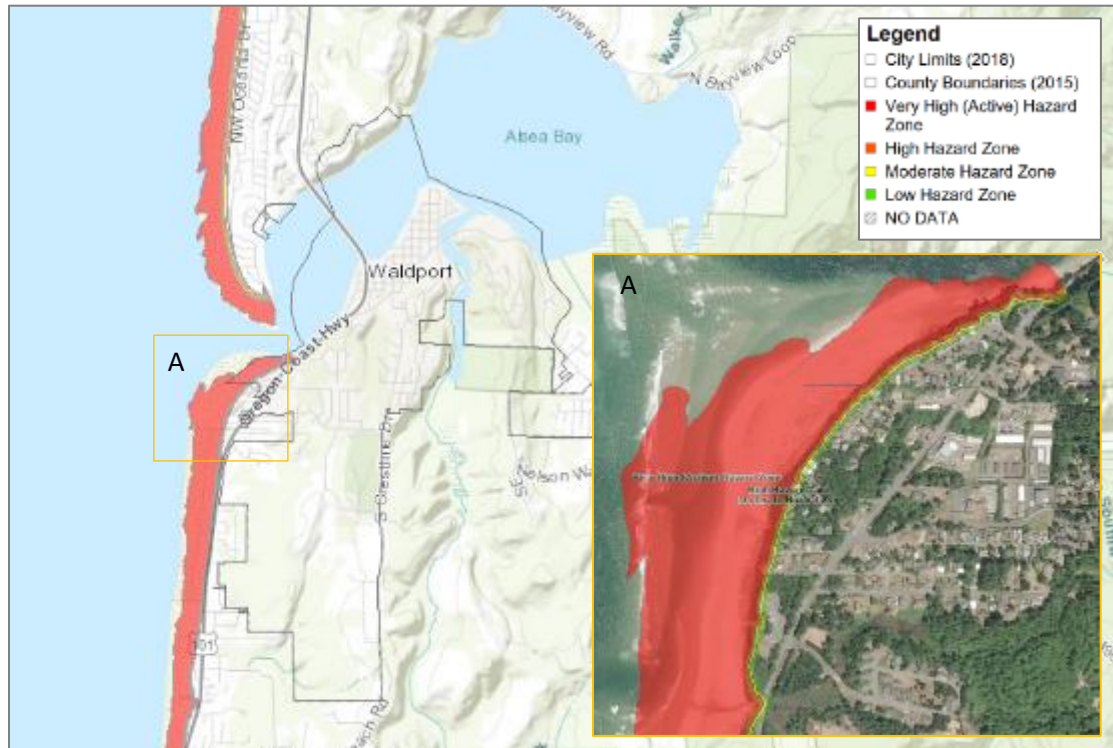
### Vulnerability Assessment

The city can be characterized as consisting of uplifted marine terrace deposits particularly on high cliffs along the north side of the Alsea Bay and south of downtown along the oceanfront. There are also low-lying sand dunes along the bayfront, downtown and south of town, and east of Highway 101. Concentrations of development exist along the high cliffs on the north side of the bay, as well as along the oceanfront. Aside from oceanfront properties, one area that's particularly vulnerable to coastal erosion is inside the Alsea Bay, along the waterfront facing west. This area experienced rapid erosion in the early 1980's as a result of an "El Nino" event. Homes and commercial buildings were threatened when erosion at the distal tip of the Alsea Spit opened the Alsea Bay to increased wave action. Since then, accretion restored the distal tip and reduced the threat. Additionally, structural shoreline stabilization using "riprap" - large boulders imbedded in the sand - was installed to mitigate for future events. The county identified areas along Highway 101 that have sustained erosion-induced damages. Within the City of Waldport, during this same El Nino

event, a portion of Highway 101 along the waterfront was threatened. This event resulted in a seawall being constructed to protect the Highway. Records of other specific events are not available at this time; however, events may have occurred in tandem with previous storms.

Potential community-related impacts, including shoreline reduction, economic (tourism-related) impacts, and property/infrastructural damage, are adequately described within the county's Coastal Erosion Hazard Annex. See Figure WA-5 for locations of the city's coastal erosion hazard along Alsea Bay (particularly at the Alsea Highlands) and coastal bluffs on the city's western edge. Left unmitigated the city is concerned that coastal erosion will impact Old Town Waldport.

**Figure WA-5 Coastal Erosion Hazard**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

The City of Waldport uses the RNKR Environmental Hazards Inventory of Coastal Lincoln County, Oregon as a mapping and reporting tool for coastal erosion. Although not included within this addendum, the coastal erosion hazards map can be obtained through the Planning and Community Development Department at City Hall.

#### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion. The Risk Report provides a distinct profile for Waldport.

The Risk Report provides an analysis of dune-backed beaches and bluff-backed shorelines to identify the general level of susceptibility due to storm-induced erosion, sea level rise, and subsidence due to CSZ earthquake event. The Risk Report performed an analysis of



buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Waldport may be impacted by profiled coastal erosion scenario (Table WA-5).

Almost none of the City’s population may be displaced by coastal erosion. These people are expected to have mobility or access issues and/or may have their residences impacted by coastal erosion. Properties that are most vulnerable to the coastal erosion hazard are those that are developed in an area of steep dunes or cliffs. Only a couple buildings (residential, commercial, industrial) are exposed to the high coastal erosion hazard zone. The value of exposed buildings is \$121,000. It is important to note that impact from coastal erosion may vary depending on areas that are impacted during an event.

**Table WA-5 Potentially Displaced Residents and Exposed Buildings, Coastal Erosion**

Community Overview: Waldport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
2,033		1,698		4	161,309,000	
Exposure Analysis: Coastal Erosion High Hazard Scenario						
Potentially Displaced Residents		Exposed Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
1	0.0%	2	0.1%	0	121,000	0.1%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>8</sup>

There are no critical facilities exposed to the profiled coastal erosion scenario.

## Drought

The steering committee determined that the city’s probability for drought is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to drought is **high**, meaning more than 10% of the city’s population or property could be affected by a major drought event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of drought hazards, as well as the history, location, extent, and probability of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared coastal communities from the effects of a drought.

The city currently receives water from three (3) surface water sources: North and South Weist Creeks and Eckman Creek.<sup>9</sup> The City has a Water Management and Conservation Plan

<sup>8</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>9</sup> City of Waldport Annual Drinking Water Quality Report, accessed July 2015  
<http://www.waldport.org/Documents/pdf%20files/DRINWAT2015.pdf>

(2012) that includes a water curtailment plan for times of drought. The city currently draws about 0.260 mgd on an average annual day, and its peak demand is about 0.649 mgd; by 2031 the average demand is projected to increase to 0.321 mgd with a peak demand of 0.802 mgd.<sup>10</sup> Increases in demand are not expected to outpace supply. However, while existing water rights are adequate, due to lack of a predictable water supply, which may be impacted by drought, the Waldport Steering Committee believes that the impacts of a potential event are much greater for the city than for the county. For more information see the Waldport Water Management and Conservation Plan (2012). In addition to reduced water supplies, a drought will increase the chances of wildfire.

Table ES-2 of the [Water System Master Plan](#) includes several mitigation actions including an action for seismic retrofit of the 2 MG (\$1.2 million) tank and building a new 300,000 gallon tank (\$1.0 million). See Waldport Action #10 (Attachment A).

### ***Future Climate Projection:***

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## **Vulnerability Assessment**

Due to insufficient data and resources, Waldport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks apply to humans and resources. Industries important to the City of Waldport’s local economy such as fishing have historically been affected, and any future droughts would have tangible economic and potentially human impacts.

In addition to reduced water supplies, a drought will increase the chances of wildfire and significantly reduce tourism activities. If hotels, for example, are unable to accommodate guests, the city’s economy would greatly suffer. Currently, the city has a Water Management and Conservation Plan that includes a conservation plan that will go into effect in the event of a drought.

## **Earthquake**

The steering committee determined that the city’s probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a CSZ event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major CSZ earthquake event. The steering committee determined that the city’s probability for a crustal earthquake event is **low**, meaning one incident may occur within the next 100 years and that their vulnerability to a Crustal Earthquake event is **moderate**, meaning that between 1% and 10% of the city’s population or property could be affected by a major crustal earthquake event.

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<sup>10</sup> Waldport Water Management and Conservation Plan (2012)

*The city's probability to crustal earthquake was decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of earthquake hazards, as well as the history, location, extent, and probability of a potential event. Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>11</sup>

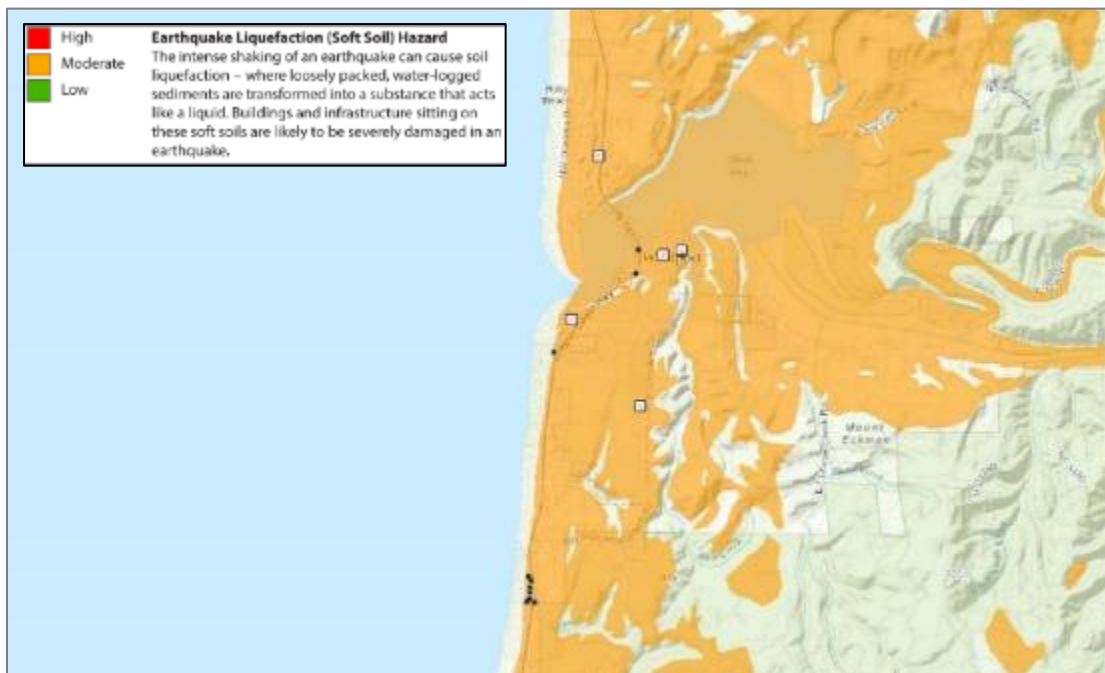
The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides.

The figures below show earthquake hazards that affect the city, including the soft soil/liquefaction hazard (Figure WA-6), expected ground shaking for crustal events (Figure WA-7), and for the Cascadia Subduction Zone event (Figure WA-8). The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. The soft soils figure below shows that in general the soils in Waldport have low to moderate liquefaction potential; the areas of the population along the coastline are more susceptible to liquefaction than areas further in land and away from rivers.

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<sup>11</sup> DLCD. *Oregon State Natural Hazard Mitigation Plan*. 2020 (Draft).

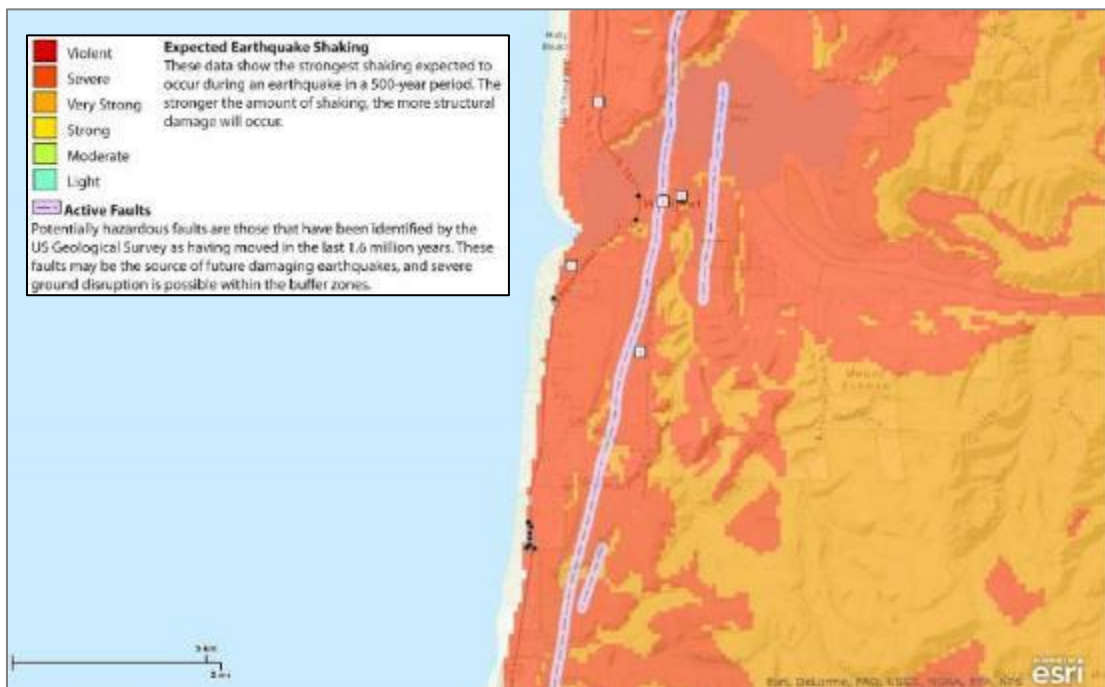
**Figure WA-6 Earthquake Liquefaction (Soft Soil) Hazard**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Shaking from the combined earthquake scenario is expected to be very strong to violent for much of Waldport as shown in Figure WA-7. The figure also shows two historically active faults underneath the city.

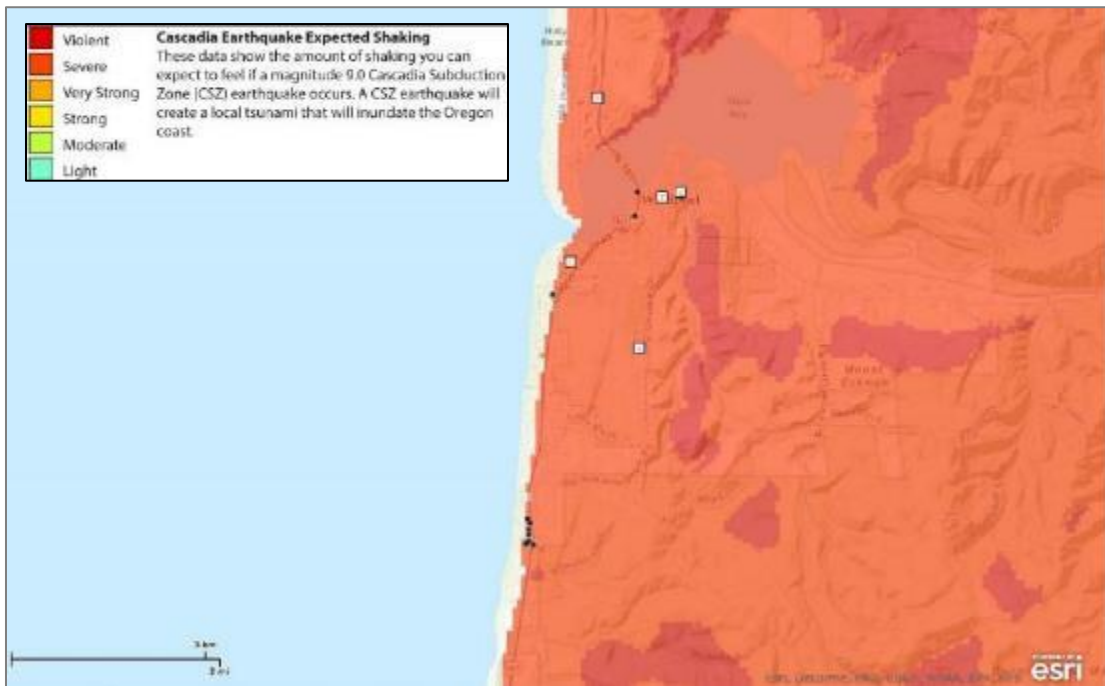
**Figure WA-7 Combined Earthquake Events Expected Shaking and Active Faults**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Figure WA-8 shows expected shaking with a Cascadia Earthquake. The figure shows that the entire city will receive severe to violent shaking.

**Figure WA-8 Cascadia Earthquake Expected Shaking**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

The city's concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described above are cause for significant effort toward mitigating the earthquake hazard. The city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, cell towers, the Samaritan North Lincoln Hospital, and City Hall were identified by the Steering Committee as vulnerable assets. The city would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide. Education and outreach regarding earthquakes (and resultant tsunami) is an ongoing endeavor in Waldport.

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community characteristics section (Table WA-4), approximately 66% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard (according to the Risk

Report 55% of all buildings are pre-code and 18% are low code)<sup>12</sup>. Information on specific public buildings’ (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table WA-6; each “X” represents one building within that ranking category. Of the facilities evaluated by DOGAMI, that have not been retrofitted, using their Rapid Visual Survey (RVS), no buildings have a very high (100% chance) or high (greater than 10% chance) collapse potential. Note Waldport High was demolished and relocated to higher ground and the property is now vacant and has a restriction against rebuilding on the site.

**Table WA-6 Rapid Visual Survey Scores**

Facility	Site ID*	Level of Collapse Potential			
		Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100%)
<b>Schools</b>					
Crestview Heights** (2750 S Crestline Drive)	Linc_sch06	X			
Waldport High School (320 Lower Crestline Drive)	Linc_sch12	<b>DEMOLISHED, Relocated to Middle/High 3000 Crestline Dr</b>			
<b>Public Safety</b>					
Central Oregon Coast Fire and Rescue** (145 Alsea Way)	Linc_fir11	X			
Yachats RFPD (1395 SW Corona Street)	Linc_fir21	X			

Source: [DOGAMI 2007. Open File Report O-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment](#). Notes: “\*” – Site ID is referenced on the [RVS Lincoln County Map](#); “\*\*\*” – Facility determined to be vulnerable to CSZ earthquake and should expect moderate to complete damage (> 50% probability). DOGAMI Risk Report (2020). Note: Waldport High School was relocated out of the tsunami inundation area and built to current seismic code in 2013.

**Mitigation Activities**

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Waldport agencies or organizations.

A primary mitigation objective of the city is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Although seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>13</sup> the School District has retrofitted at risk schools in Waldport through local resources (see the Lincoln County School District addendum for more information).

**Natural Hazard Risk Report for Lincoln County**

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to earthquake. The Risk Report provides a distinct profile for Waldport.

<sup>12</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table D-2.

<sup>13</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled magnitude 9.0 Cascadia Subduction Zone (CSZ) event. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Waldport may be impacted by the profiled earthquake scenarios (Table WA-7). *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*<sup>14</sup>

Approximately 29% of the City's population (586 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, approximately 10% will be impacted by the accompanying tsunami. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Earthquakes will impact every building in the City, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as "damaged" in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered "damaged" (complete, uninhabitable). The City has 727 buildings that are expected to be damaged by the CSZ earthquake and tsunami event. The combined (earthquake and tsunami) value of building damage losses are \$47.3 million.

The Risk Report estimated losses show that the age of the building stock is the primary metric of earthquake vulnerability. Communities with older building stock are expected to have higher losses. However, if buildings were retrofitted to at least "moderate code" standards the impact of the event would be reduced. The Risk Report concludes that loss estimates for the City drop from 19% to 13% (\$9.6 million decrease in loss) when all buildings are upgraded to at least moderate code level.<sup>15</sup> *Note: earthquake vulnerability retrofit benefits are minimized in areas of liquefaction and landslide where additional geotechnical mitigation would be needed.*

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<sup>14</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Tables A-18.

<sup>15</sup> Ibid, Table B-2.

**Table WA-7 Potentially Displaced Residents and Exposed Buildings, Earthquake**

Community Overview: Waldport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
2,033		1,698		4	161,309,000	
Exposure Analysis: Earthquake CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
381	18.7%	421	24.8%	1	31,228,000	19.4%
Exposure Analysis (within Tsunami Zone - Medium)						
205	10.1%	306	18.0%	1	16,078,000	10.0%
Total Exposure						
586	28.8%	727	42.8%	2	47,306,000	29.3%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>16</sup>

- Central Oregon Coast Fire Station 7200 (also impacted by tsunami)
- Crestview Heights Elementary School (Lincoln County School District)

Note: It is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Waldport by sea and air will be necessary.

## Tsunami

The steering committee determined that the city’s probability for a distant tsunami event is **moderate** meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a distant tsunami event is **low**, meaning that less than 1% of the city’s population or property could be affected by a major distant tsunami event. The steering committee determined that the city’s probability for a local tsunami event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a local tsunami event is **high**, meaning that more than 10% of the City’s population or property could be affected by a major local tsunami event. *The city’s probability and vulnerability to distant tsunami decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of tsunami hazards, as well as the history, location, extent, and probability of a potential event. The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific

<sup>16</sup> Ibid, Table A-19.



Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>17</sup> Distant tsunamis happen more regularly than CSZ related local tsunamis.

It is difficult to predict when the next tsunami will occur. According to the Oregon NHMP the coast has experienced 25 distant tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources would be about six (6) years. However, the time interval between events has been as little as one year and as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for the City.

A 9.0 magnitude earthquake originating from Japan caused approximately \$7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; \$6.7 million), as well as the Port of Waldport (Lincoln County; \$182,000), and Charleston Harbor (Coos County; \$200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency was declared by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast local officials activated the Emergency Alert System and sirens, implemented “reverse 9-1-1” and conducted door-to-door notices in order to evacuate people from the tsunami inundation zone. Local governments activate their Emergency Operations Centers and the state activated its Emergency Coordination Center. For more information view Volume II, Hazard Annex.

In 1995, the Department of Geology and Mineral Industries (DOGAMI) conducted an analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami maps were produced to help implement Senate Bill 379 (SB 379); digitized in 2014 ([O-14-09](#)). SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005, limit construction of new essential facilities and special occupancy structures in tsunami flooding zones. Figure WA-9 shows the regulatory tsunami inundation line showing that much of the residential development west of Highway 101, Old Town, and other areas adjacent to the Alsea Bay are vulnerable to tsunami. Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building “new essential facilities, hazardous facilities, major structures, and special occupancy structures” inside the tsunami inundation zone (SB 379 line):<sup>18</sup>

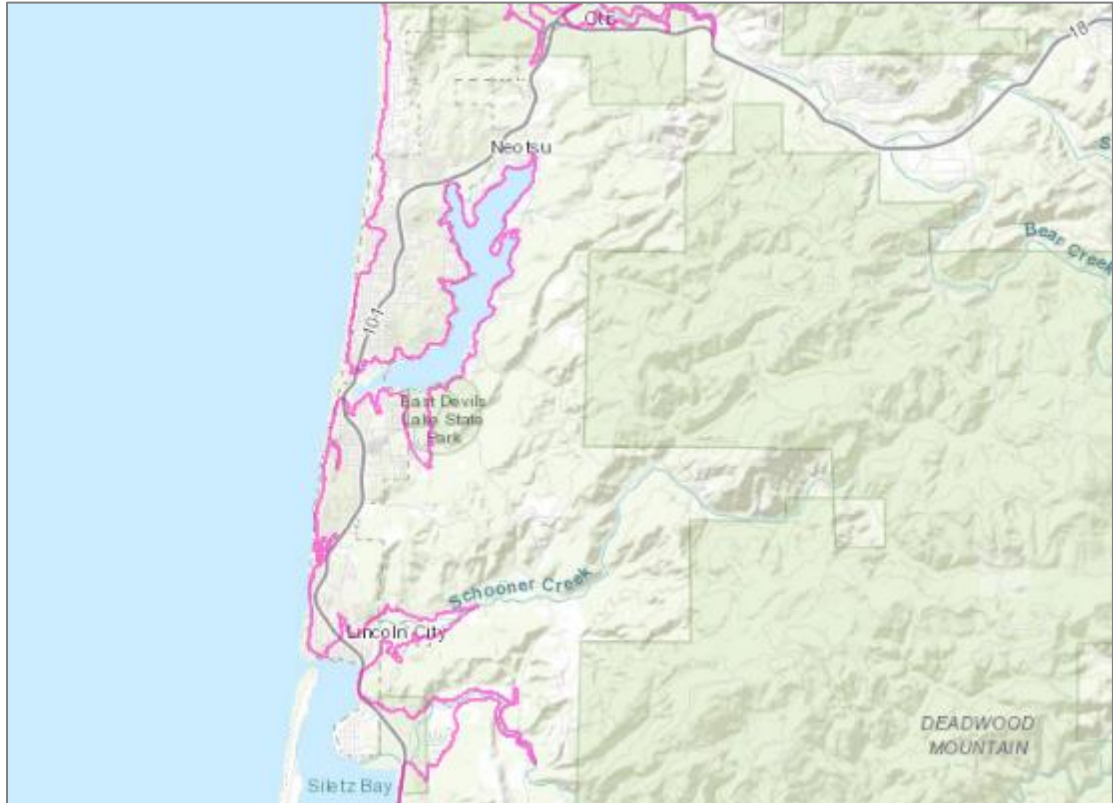
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<sup>17</sup> Oregon Natural Hazard Mitigation Plan. Department of Land Conservation and Development. 2015

<sup>18</sup> Oregon Legislature. HB 3309 (2019).

<https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309>

### Figure WA-9 Regulatory (SB 379) Tsunami Inundation Line

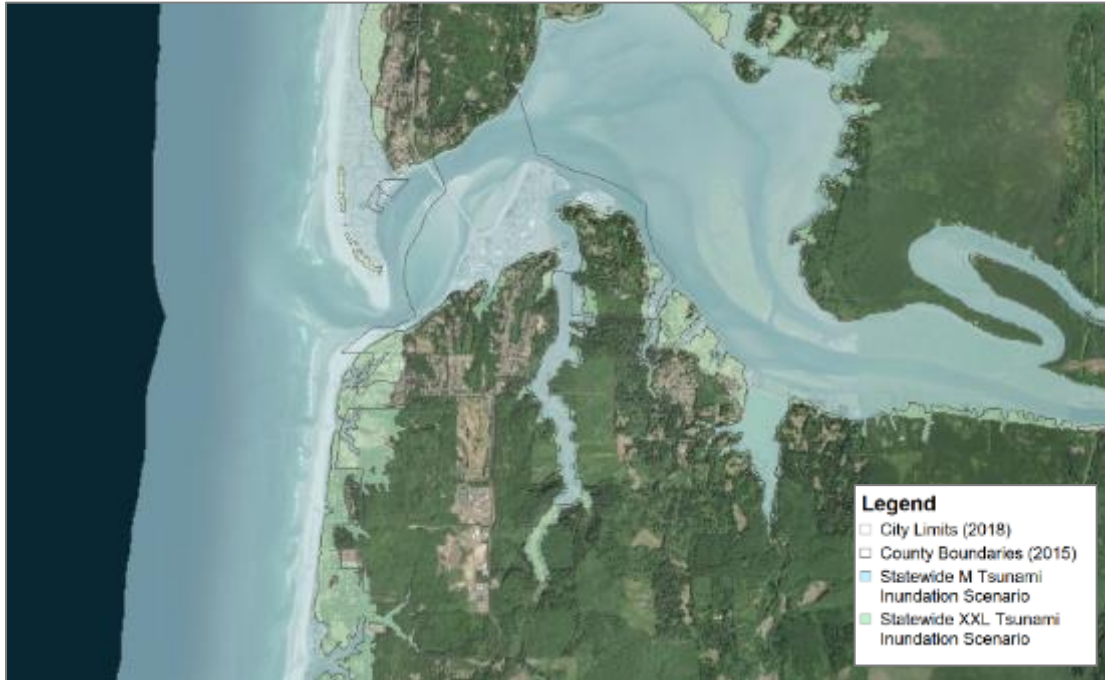


Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Waldport has put forth much effort to educate and inform citizens of tsunami hazards found within the city. The city obtained a reverse 911 system; hotels are encouraged to post evacuation signs in private rooms; evacuation signs are posted throughout the city; evacuation maps are posted on the city’s website; and Waldport High School was moved away from the inundation zone. Severe damage is expected to occur on various properties, roads, bridges, communication systems, and critical infrastructure within Waldport, among other assets described in the county’s plan. Waldport recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future.

Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities. Maps were created for local and distant source tsunami events. The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as “T-shirt” sizes S, M, L, XL, and XXL. Figure WA-10 shows the M and XXL tsunami inundation scenarios. The distant source tsunami inundation maps show the potential impacts of tsunamis generated by earthquakes along the “Ring of Fire” (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2) and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

**Figure WA-I0 Tsunami Inundation Map (M and XXL Scenarios)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - <http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm>  
(Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:

<http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm>

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst-case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

<http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm>

A free application is also available that displays the evacuation routes in coastal areas of Oregon: [http://www.nanoos.org/mobile/tsunami\\_evac\\_app.php](http://www.nanoos.org/mobile/tsunami_evac_app.php)

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

In 2013, DOGAMI produced new Tsunami Inundation Maps (TIMs) for the entire Oregon coast. The TIMs identify both local and distant Tsunami Inundation Zones (TIZs) by event size. The maps also tabulate the affected buildings located within the local and distant source tsunami inundation zones. The Risk Report section below provides detailed information on the impact to the City from a CSZ earthquake and medium tsunami.

Severe damage could occur to low-lying areas of the city in a local source tsunami event, including roads, bridges, communication systems, and infrastructure within Waldport, particularly structures within the business district, Old Town neighborhood, Port of Alsea, and the Central Coast Fire District Station. Some damage is also expected in a large distant source tsunami event (such as the 2011 Tohoku tsunami). The City of Waldport recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future.

As shown in Table WA-4 there are about 128 manufactured housing units (mobile homes) in Waldport. Manufactured homes built prior to 2003 are subject to slipping off their foundations potentially compromising the occupants' ability to exit. The compromised egress may hinder timely evacuation.

Population vulnerability is characterized in terms of exposure, demographic sensitivity, and short-term resilience of at-risk individuals. Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.<sup>19</sup> Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds. According to the study Lincoln County (including Waldport) has relatively low numbers of "residents, employees, or customer-heavy businesses" inside the tsunami hazard zones and will likely have enough time to reach high ground before a tsunami wave arrives.

In 2019, DOGAMI published a tsunami evacuation analysis using the XXL inundation zone which covers the largest CSZ event likely to occur based on the historical record.<sup>20</sup> Safety is reached when evacuees have reached "high ground", or 20 feet beyond the limit of tsunami inundation. An analysis was conducted for Waldport. According to the model the first waves arrive along the open coast 30 minutes after the start of earthquake shaking with most of Waldport inundated about 4 to 6 minutes later. The Old Town neighborhood, Port of Alsea, and the business district are the most vulnerable areas of the city. It is expected that the Alsea Bay Bridge (Hwy 101) and Lint Slough (Hwy34) bridges will not survive the shaking from the expected earthquake event. As such, high ground is located to the south along Crestline Drive. Most people located in vulnerable areas can be evacuated to high ground if traveling at a moderate walking speed of 4 feet per second (fps) or less (2.7 mph). Evacuees closer to the Port of Alsea will need to move faster in order to beat the wave and make it to high ground (see Figure WA-11 ). Note: the figure includes a hypothetical "bridges in" scenario, in which the bridges do not fall and/or are seismically retrofitted to withstand the expected earthquake shaking. Prompt evacuation, knowledge of the route, signage, and

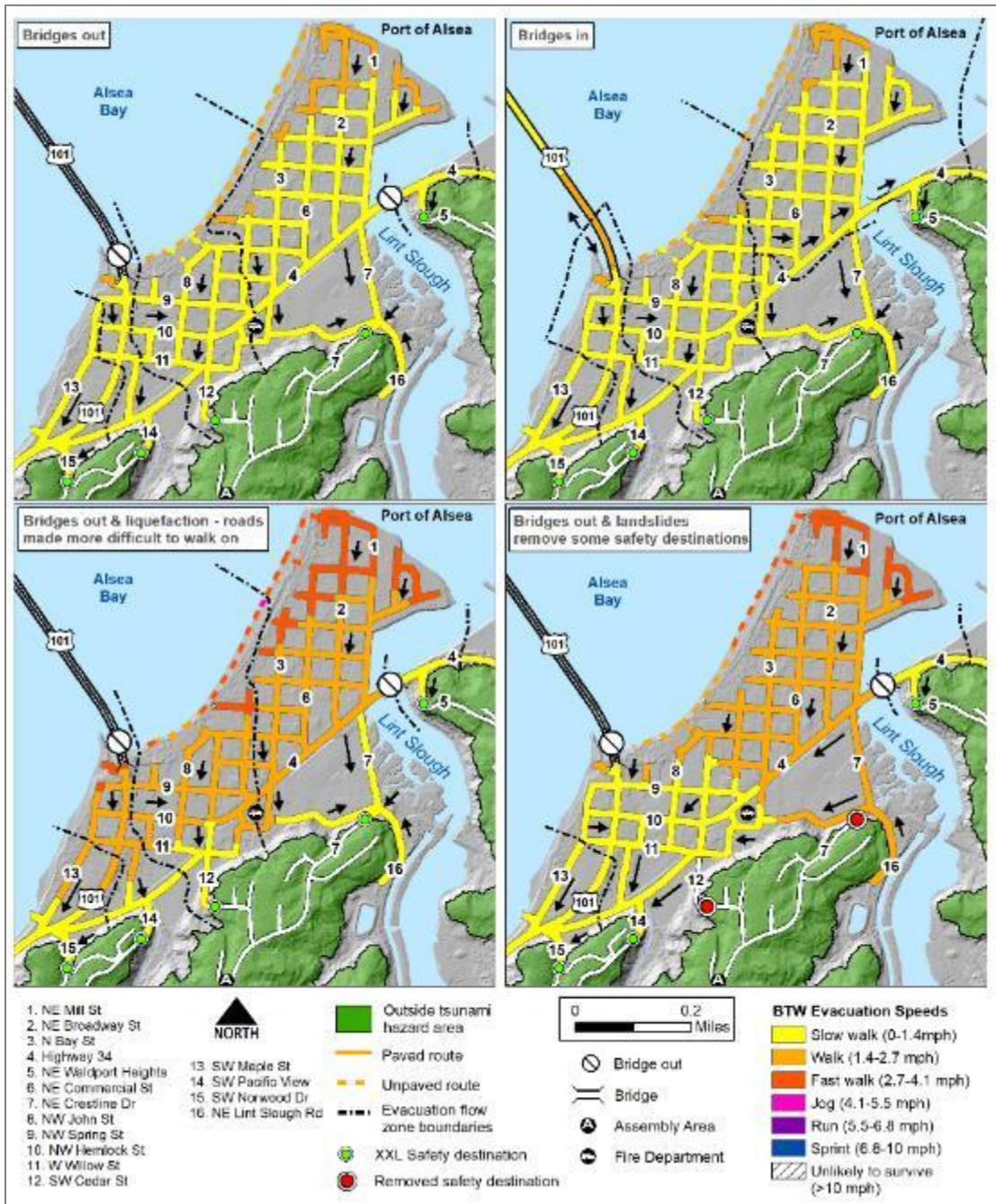
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<sup>19</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmittlein. "Community clusters of tsunami vulnerability in the US Pacific Northwest", PNAS 2015 112 (17) 5354-5359.

<sup>20</sup> DOGAMI, Open-Fire Report O-19-06.

alternative route designation due to landslide activity is necessary to improve evacuation speeds. For details see *Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast* (DOGAMI, 2019, [O-19-06](#)).

**Figure WA-11 Beat the Wave modeling in Waldport (CSZ earthquake XXL inundation zone)**



Source: DOGAMI, Open-File Report O-19-06.

Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to tsunami. The Risk Report provides a distinct profile for Waldport.

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Waldport may be impacted by the profiled tsunami scenario (Table WA-8).

About 25% the city’s population (508 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is slightly fewer people than those exposed within the Senate Bill 379 line (526 people). *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Building damage (loss) estimates are reported for buildings expected to be damaged by the tsunami inundation zone (medium-sized and SB 379). All 520 buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable); the number of buildings damaged is slightly higher under the SB 379 scenario (526 buildings). One critical facility is expected to be damaged under the CSZ M9.0 scenario and the SB 379 scenario.

**Table WA-8 Potentially Displaced Residents and Exposed Buildings, Tsunami**

Community Overview: Waldport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
2,033		1,698		4	161,309,000	
Exposure Analysis: Tsunami CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
508	25.0%	520	30.6%	1	36,666,000	22.7%
Exposure Analysis: Tsunami SB 379 Regulatory Line						
518	25.5%	526	31.0%	1	37,495,000	23.2%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>21</sup>

- Central Oregon Coast Fire Station 7200

Note: Although critical facilities are not exposed to the profiled tsunami scenarios it is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Waldport by sea and air will be necessary.

For more information, see the following DOGAMI reports:

- Tsunami evacuation analysis of Waldport and unincorporated Lincoln County: Building community resilience on the Oregon coast (2019, [O-19-06](#))

<sup>21</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

## Flood

The steering committee determined that the city's probability for riverine or coastal flood is **high**, meaning at least one incident is likely within the next 35-year period and that their vulnerability to coastal or riverine flood is **high**, meaning that more than 10% of the City's population or property could be affected by a major coastal or riverine flood event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of coastal and riverine flood hazards, as well as the history, location, extent, and probability of a potential event. The Waldport Steering Committee notes that flooding occurred on city streets in the low-lying areas of Waldport in 1996. Otherwise, there are no records of sustained damage or serious impacts associated with major flood events. See city action items (Attachment 1) for additional detail on vulnerable areas.

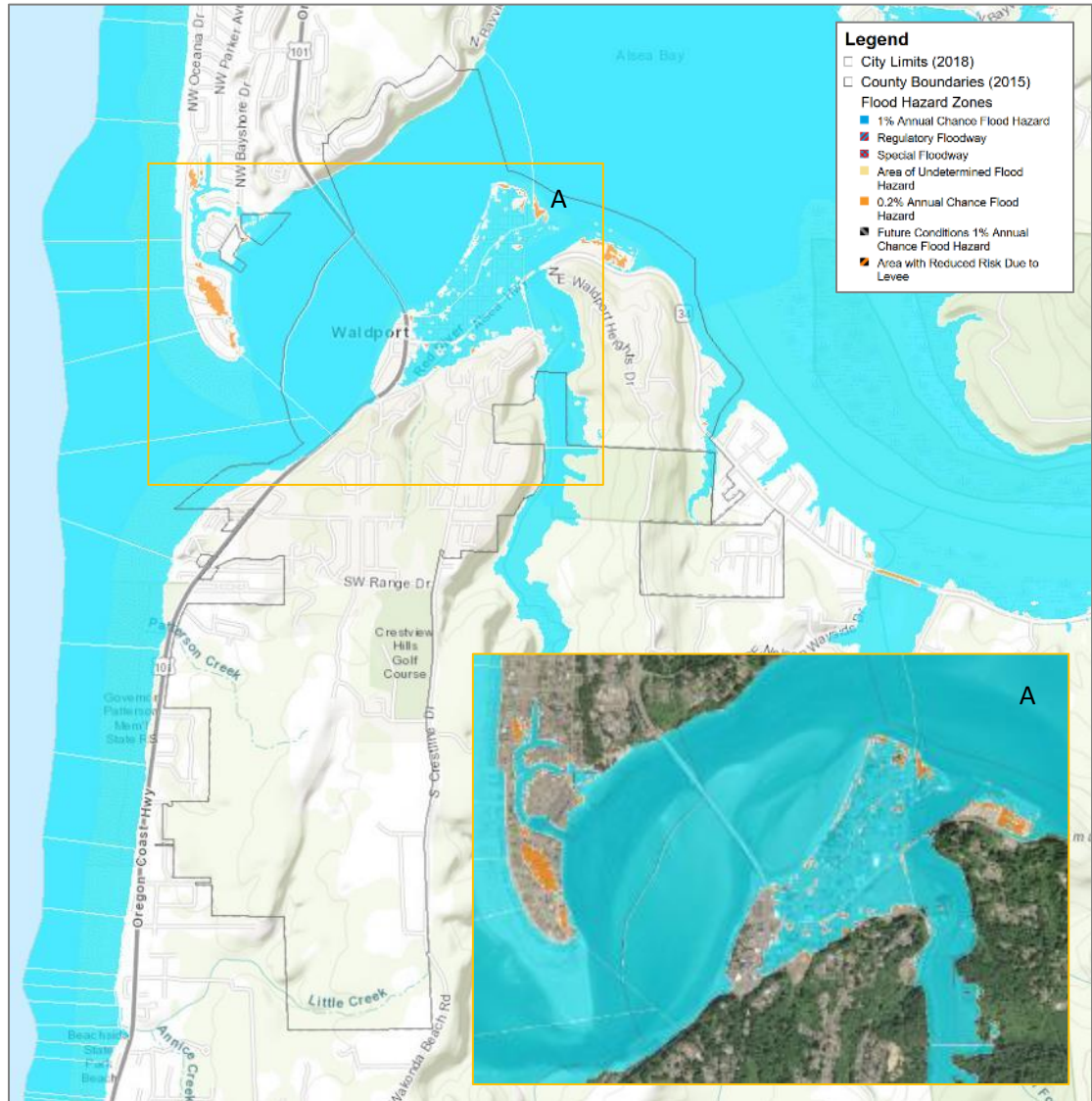
The Alsea River, Lint Slough (Creek), and Eckman Creek are the city's primary sources of flooding— typically due to coastal flood and rain and occasionally snowmelt. The extent of flooding varies depending on height of tides, rainfall, and/or precipitation levels throughout the year.

FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one percent probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood; also known as the Special Flood Hazard Area (SFHA). The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods (Figure WA-12). These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards. These maps represent a snapshot in time, and do not account for later changes which occurred in the floodplains. According to Oregon Explorer about 23% of the City is within the 100-year floodplain, and an additional 4% is within the 500-year floodplain (see Figure WA-12).

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events. Additionally, coastal flooding is expected to increase due to sea level rise (SLR) and changing wave dynamics. Sea level is projected to rise by 1.7 to 5.7 feet by 2100. Tidal wetlands and estuaries throughout the county are also expected to experience changes to their composition and area, thereby impacting their ability to naturally mitigate flood events.

**Figure WA-12 Flood Hazard Zones (100- and 500-year floodplains)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to flood. The Risk Report provides a distinct profile for Waldport.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a



reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the city. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within Waldport may be impacted by the profiled flood scenario (Table WA-9).

More than 22% of the City’s population (452 people) may be displaced by flooding. These people are expected to have mobility or access issues due to surrounding water. About 15% of the City’s buildings (251 buildings) are exposed to the flood hazard and may be damaged. The loss estimate for exposed buildings is \$1.4 million (less than one percent of total building value). No critical facilities are vulnerable to the flood hazard.

**Table WA-9 Potentially Displaced Residents and Exposed Buildings, Flood**

Community Overview: Waldport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
2,033		1,698		4	161,309,000	
Exposure Analysis: Flood (1% Annual Chance)						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
452	22.2%	251	14.8%	0	1,438,000	0.9%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>22</sup>

There are no critical facilities exposed to the profiled flood scenario.

## National Flood Insurance Program (NFIP)

FEMA’s Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2019. Table WA-10 shows that as of August 2019, the City has 99 National Flood Insurance Program (NFIP) policies in force, representing more than \$27 million in coverage. Of those, 56 are for properties that were constructed before the initial FIRMs. The last Community Assistance Visit (CAV) for the City was March 6, 2001. The table shows that most flood insurance policies are for residential structures, primarily single-family homes. Flood insurance covers only the improved land, or the actual building structure. There have been 18 paid flood insurance claims for a combined total of just under \$85,000.

<sup>22</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

**Table WA-10 Flood Insurance Detail**

	Lincoln County	Waldport
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	3/15/1979
Total Policies	2,325	99
Pre-FIRM Policies	1,067	56
<b>Policies by Building Type</b>		
Single Family	1,685	59
2 to 4 Family	57	9
Other Residential	462	10
Non-Residential	121	21
Minus Rated A Zone	98	2
Minus Rated V Zone	3	0
Insurance in Force	\$585,856,500	\$27,049,800
Total Paid Claims	343	18
Pre-FIRM Claims Paid	265	15
Substantial Damage Claims	53	1
Total Paid Amount	\$5,479,221	\$84,988
Repetitive Loss Structures	64	2
Severe Repetitive Loss Properties	12	0
CRS Class Rating	NP	NP
Last Community Assistance Visit	-	3/6/2001

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating.

The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The NFIP's Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. The City does not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone.

#### Repetitive Loss Properties

The Community Repetitive Loss record for Waldport identifies two (2) Repetitive Loss Properties<sup>23</sup> and no Severe Repetitive Loss Properties<sup>24</sup>. Both repetitive loss properties are single-family residential.

<sup>23</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

<sup>24</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment

## Landslide

The steering committee determined that the city's probability for landslide is **high**, meaning at least one incident is likely within the next 35-year period, and that their vulnerability to landslide is **high**, meaning that more than 10% of the City's population or property could be affected by a major landslide event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of landslide hazards, as well as the history, location, extent, and probability of a potential event.

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries or take lives. Landslide susceptibility exposure for Waldport is shown in Figure WA-13. Approximately 33% of the City has very high or high, and 27% moderate, landslide susceptibility exposure.<sup>25</sup> In general, the areas of greater risk are located adjacent to rivers and creeks and indicate potential areas of erosion. *Note that even if a City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

## Vulnerability Assessment

Development pressure on steep slopes is an issue that Waldport is facing. In general, waterfront property along the north side of the Alsea Bay and areas east/ southeast along ridgelines may be vulnerable to landslides. Figure WA-13 shows that the location of landslide hazard is highest at Crestline Drive and north of Alsea Bay (outside of the city).

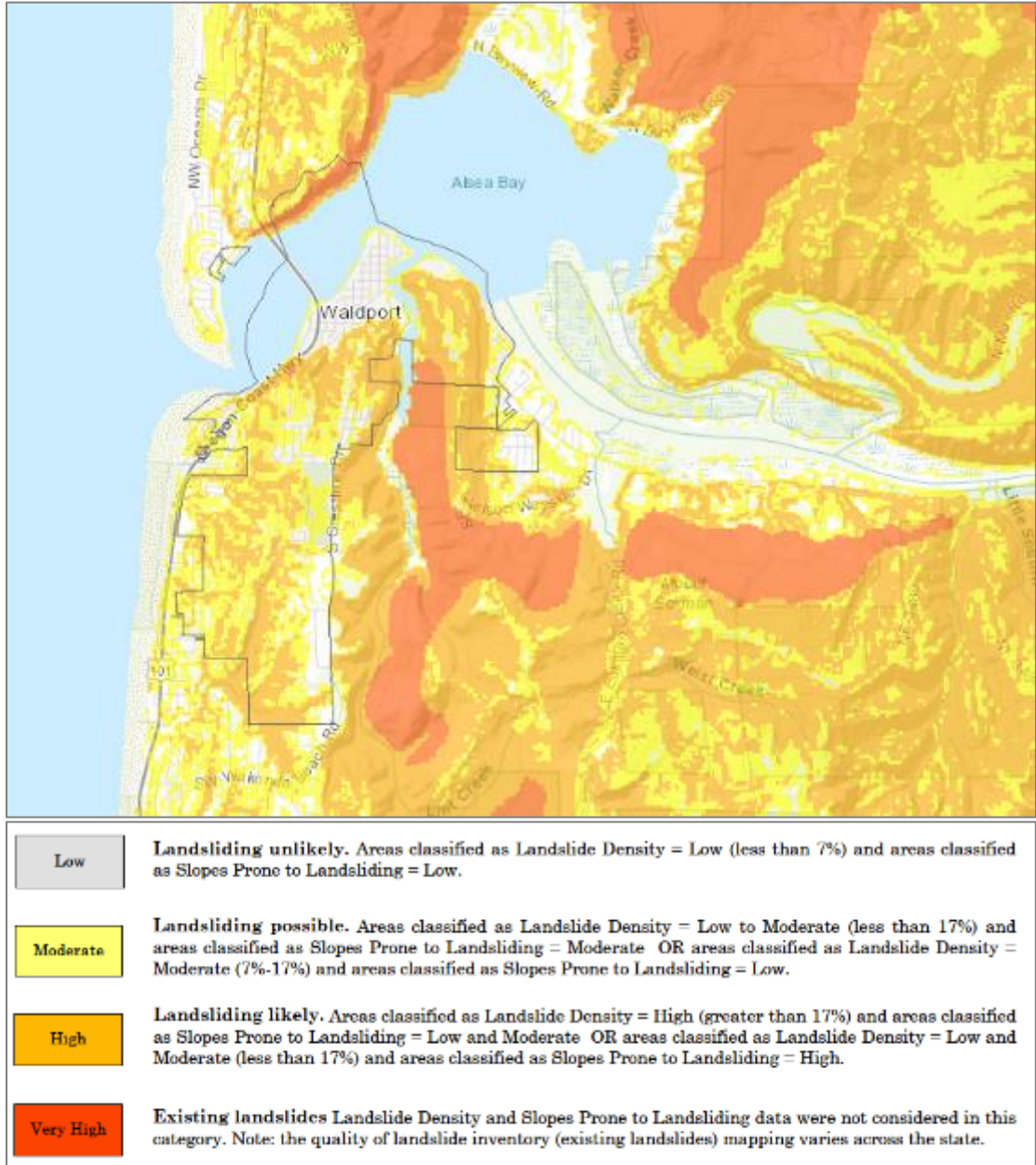
Potential landslide-related impacts are adequately described within the county's plan, and include infrastructure damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Lincoln County, and thoroughfares beyond city limits are susceptible to obstruction as well. As such, Waldport is vulnerable to isolation for an extended period.

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exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

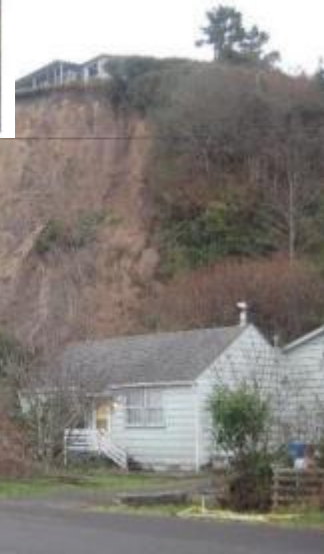
<sup>25</sup> DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

**Figure WA-13 Landslide Susceptibility Exposure**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

As shown in the images below, in 1996, two houses were destroyed by a landslide which was potentially caused by poor drainage related to man-made ponds. Another landslide occurred in 2009 which may have been caused by subsurface drainage issues.



### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Waldport.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the city may be impacted by the profiled landslide scenario (Table WA-11).

Approximately 13% of the City's population (260 people) may be displaced by landslides. These people are expected to have mobility or access issues and/or may have their residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 13% of all buildings (224 buildings) within the City are exposed to the High or Very High landslide susceptibility zones (see Figure WA-13). The value of exposed buildings is just over \$21.6 million (about 13% of total building value).

**Table WA-11 Potentially Displaced Residents and Exposed Buildings, Landslide**

Community Overview: Waldport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
2,033		1,698		4	161,309,000	
Exposure Analysis: Landslide High & Very High Susceptibility						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
260	12.8%	224	13.2%	0	21,613,000	13.4%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>26</sup>

There are no critical facilities exposed to the profiled landslide scenario.

**Severe Weather**

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.<sup>27</sup> Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months.<sup>28</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>29</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

<sup>26</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

<sup>27</sup> US Department of Agriculture. <http://www.fsa.usda.gov/or/Notice/Flp104.pdf>.

<sup>28</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.

<sup>29</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

## Windstorm

The steering committee determined that the city’s probability for windstorm is **high** (the probability of tornado is also high), meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to windstorm is **high**, meaning that more than 10% of the City’s population or property could be affected by a major windstorm event. The Steering Committee rated the County as having a “**low**” **vulnerability to a tornado hazard**, meaning that less than 1% of the City’s population or property could be affected by a major tornado event. *The windstorm ratings have not changed since the previous NHMP. The tornado ratings are new with this version of the NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of windstorm hazards, as well as the history, location, extent, and probability of a potential event. Because coastal windstorms typically occur during winter months, ice, freezing rain, flooding, and very rarely, snow sometimes accompany them. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Waldport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. In Waldport, power outages are the greatest concern during windstorms. Building codes require new developments to place power lines below ground. Without power, communication is lost, and fuel and food stores shut down. The city underwent a project to install the overhead power lines in downtown underground. In the December 2007 windstorm, the city lost power and some residents were unable to access 911. Also, of concern are downed trees and damage to buildings. The city, in conjunction with some private utility companies, works to remove hazardous trees where possible. The county’s plan adequately identifies the remaining impacts and damages that can occur with windstorm events.

## Winter Storm (Snow/ Ice)

The steering committee determined that the city’s probability for winter storm is **high**, meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to winter storm is **moderate**, meaning that between 1% and 10% of the city’s population or property could be affected by a major winter storm event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of winter storm hazards, as well as the history, location, extent, and probability of a potential event. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific

Ocean. These storms are most common from October through March. More than likely, however, the coast's winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Waldport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Major winter storms can and have occurred in the Waldport area, and while they typically do not cause significant damage; they are frequent and have the potential to impact economic activity. Road closures on Highway 101, or the passes to the Willamette Valley (Hwy 34, 20, and 18), due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

## Volcanic Event

The steering committee determined that the city's probability for volcanic event is **low**, meaning one incident is likely within the next 75 to 100-year period, and that their vulnerability to volcanic event is **low**, meaning that less than 1% of the city's population or property would be affected by a major volcanic event (ash/lahar). *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of volcanic event hazards, as well as the history, location, extent, and probability of a potential event. Generally, an event that affects the county is likely to affect Waldport as well.

## Vulnerability Assessment

Due to insufficient data and resources, Waldport is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Waldport is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens erupted in 1980, the city received small amounts of ashfall, but not enough to cause significant health and/or economic damages.

## Wildfire

The steering committee determined that the city's probability for wildfire is **moderate**, meaning one incident is likely within the next 35 to 75-year period, and that their vulnerability to wildfire is **high**, meaning that more than 10% of the City's population or property could be affected by a major wildfire event. *The probability rating decreased and the vulnerability rating increased since the previous NHMP.*

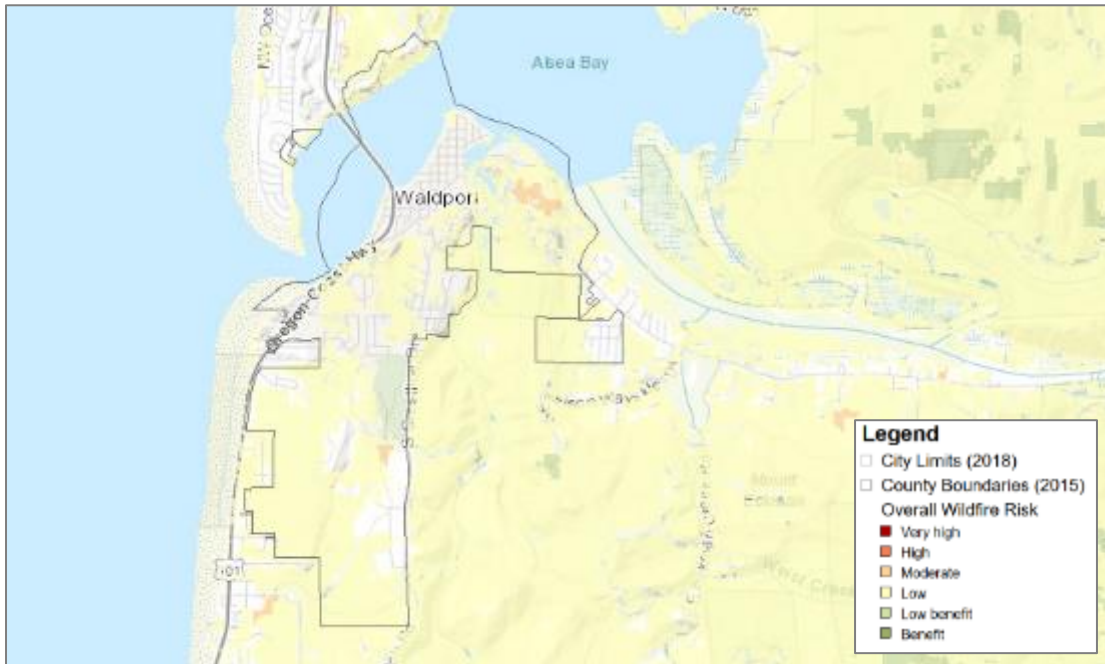
The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve to supplement the wildfire section in this addendum.

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of wildfire hazards, as well as the history, location, extent, and probability of a potential event. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Wildfires in 1849 and 1936 were particularly devastating in Lincoln County, but since then, there have been few large events. As shown in Figure WA-14 the



City has mostly low, with some moderate, overall wildfire risk. Areas of concern include the eastern side of the city (where forestland borders development), and some of the open spaces within the city's limits. Due to the prevailing wind patterns (i.e., from the north or south), the city's steering committee felt that the east and south ends of the city might be the most vulnerable. Power, natural gas, and phone lines run through the forest to the east of the city and would be affected in the event of a wildfire. Likewise, active commercial logging occurs just outside the city, and slash burns are a potential wildfire concern.

**Figure WA-14 Overall Wildfire Risk**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

**Future Climate Projection:**

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

**Vulnerability Assessment**

Overall, the city, and its watershed, has low to moderate overall wildfire risk, however, the forested areas have the potential for large wildfires and a wildfire within the watershed could impact the city's water supply and quality. The city has current fire storage for structural fires but does not have adequate fire storage/ or water rights for wildfire protection. The city water intakes are located on Forest Service land and are vulnerable to wildfire. The city has storage to maintain water service for approximately one week for residential service connections only.

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water,

response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair.

Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Waldport.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment’s Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the City may be impacted by the profiled wildfire scenario (Table WA-12).

Approximately three percent of the City’s population (67 people) may be displaced by wildfires. These people are expected to have mobility or access issues and/or may have their residences impacted by a wildfire (more people may also be impacted by smoke and traffic disruptions that are not accounted for within this analysis). It is important to note that impact from wildfires may vary depending on the specific area that experiences a wildfire. The value of exposed buildings (76 buildings) is just over \$5 million (about three percent of total building value).

**Table WA-12 Potentially Displaced Residents and Exposed Buildings, Wildfire**

Community Overview: Waldport						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
2,033		1,698		4	161,309,000	
Exposure Analysis: Wildfire High-Hazard						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
67	3.3%	76	4.5%	0	5,243,000	3.3%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-18. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>30</sup>

There are no critical facilities exposed to the profiled wildfire scenario.

Note: The city is concerned that their Public Works Shop (4028 SW Ann St) and water intake is at risk to wildfire.

<sup>30</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-19.

# ATTACHMENT A: ACTION ITEM FORMS

Table WA-1 and Table WA-13 provide a summary list of actions for the city. Each high priority action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table WA-13 Action Item Timelines, Status, High Priority and Related Hazards**

Action Item (2015 NHMP)	Priority	Timeline	Status	Related Hazard										
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm	
Waldport #1		Ongoing	Ongoing			X				X				
Waldport #2		Long	Ongoing				X							
Waldport #3		Ongoing	Ongoing	X	X	X	X	X	X	X	X	X	X	X
Waldport #4		Long	Ongoing					X						
Waldport #5	X	Long	Ongoing						X					
Waldport #6		Long	Ongoing			X			X					
Waldport #7		Short	Ongoing						X					
Waldport #8		Long	Ongoing		X									
Waldport #9		Long	Ongoing	X										
Waldport #10	X	Medium	New			X								
Waldport #11	X	Short	New						X					
Waldport #12	X	Long	New			X			X					

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The City NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the City. Existing programs and other resources that might be used to implement these action items are identified. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

County level actions that the city is listed as a partner are shown in Table WA-14. These actions are led by the County, however, the City will incorporate elements of the action that are applicable to their jurisdiction.

**Table WA-14 County Specified Actions that the City is Partner**

Action Item (2015 NHMP)	City Partner	Action Item
MH #1	Yes	Consider Local Energy Assurance Planning for critical areas countywide
MH #2	Yes	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers
MH #3	Yes	Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.
MH #4	Yes	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.
MH #5	Yes	Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.
MH #6	Yes	Integrate the NHMP into County and City comprehensive plans.
MH #7	Yes	Prepare long-term catastrophic recovery plan
MH #8		Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
CE #1	Yes	Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.
CE #2	Yes	Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
EQ #1	Yes	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
EQ #2	Yes	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
EQ #3	Yes	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
TS #1	Yes	Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami

Action Item (2015 NHMP)	City Partner	Action Item
		inundation zone and likely to be impacted by tsunami.
TS #2		Implement land use strategies and options to increase community resilience
FL #1	Yes	Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)
FL #2	Yes	Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.
FL #3	Yes	Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas
FL #4	Yes	Continue compliance with the National Flood Insurance Program (NFIP).
LS #1	Yes	Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.
LS #2	Yes	Protect existing development in landslide-prone areas.
LS #3	Yes	Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
SW #1	Yes	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).
SW #2	Yes	Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.
WF #1	Yes	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

Mitigation Action: Waldport #1 (What do we want to do?)	Alignment with Plan Goals:			High Priority Action Item?	
Continue to educate citizens about earthquake and tsunami preparedness	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>Waldport has engaged in numerous education and outreach activities related to earthquake and tsunami preparedness. The city recognizes the importance of an ongoing education &amp; outreach program that's specifically related to these two hazards.</p> <p>Public education and outreach can be inexpensive and provide information that results in safer households, work places and other public areas. Some outreach materials include: informational brochures about community seismic risks and mitigation techniques, public forums, newspaper articles, training classes and television advertisements. Source: Oregon Technical Resource Guide. July 2000. Community Planning Workshop. Eugene, Or. University of Oregon p.8-20.</p>					
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>			
<p>Encourage hotels, restaurants, and other tourist related facilities and accommodations to post tsunami evacuation maps.</p> <p>Work with Chamber of Commerce on disseminating information on earthquake/tsunami preparedness.</p> <p>Work with local citizens on resources and networking available in case of an event.</p> <p>Update the city website with new information and link's to improve to improve the city's emergency preparedness.</p>		<p><u>2020 Update:</u></p> <p>City adopted the CERT team. 35 members. Central Coast Fire visiting businesses and vacation rentals.</p> <p>Community outreach programs at the community center.</p> <p><u>2015 Update</u></p> <p>The updated DOGAMI Tsunami Evacuation Route map/ information was distributed throughout the community in 2013.</p> <p>City provides ongoing hazards information via its website and public offices.</p> <p>City collaborates with the county on natural hazard information outreach.</p>			
<b>Champion/ Responsible Organization:</b>	Administration				
<b>Internal Partners:</b>		<b>External Partners:</b>			
Waldport Public Works, Planning, City Manager, Chamber of Commerce,		DOGAMI, DLCD			
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>		
Local Funding Resources, DOGAMI, DLCD		Low	<input checked="" type="checkbox"/> Ongoing		



		<input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Waldport Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Waldport #2</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Prepare a Stormwater Master Plan for the City of Waldport.		<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Waldport does not currently have a comprehensive Stormwater Management Plan. Mitigation actions would be identified within the plan which would have beneficial results for the city.</p> <p>Stormwater management is a key element in maintaining and enhancing a community's livability. There is a direct link between stormwater and a community's surface and ground waters. As a community develops, the impervious surfaces that are created increase the amount of runoff during rainfall events, disrupting the natural hydrologic cycle. Without control, these conditions erode stream channels and prevent groundwater recharge. Parking lots, roadways, and rooftops increase the pollution levels and temperature of stormwater runoff that is transported to streams, rivers, and groundwater resources. Protecting these waters is vital for a great number of uses, including fish and wildlife habitat, recreation, and drinking water. Source: Eugene Stormwater Management Manual. Section 1.1</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Develop a city-wide Stormwater Master Plan. Coordinate with local community. Identify mitigation action items that reduce the city's vulnerability to flood and landslide related hazards.			<u>2020 Update:</u> The stormwater master plan is the next master plan listed in the goals to update.  <u>2015 Update:</u> Preparation of a stormwater master plan has not occurred. City needs to discuss prioritization, funding, and schedule.			
<b>Champion/ Responsible Organization:</b>		Administration				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Waldport Planning, Public Works, City Council			ODOT, County Public Works, DOGAMI			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Waldport Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Waldport #3</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Encourage emergency related intergovernmental planning.		<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Communities along the Oregon coast share similar vulnerabilities to earthquake, tsunami, and windstorm hazards. Earthquakes and tsunamis, in particular, present common concerns.</p> <p>Specifically, coastal communities feel unprepared for dealing with the aftermath of a high magnitude Cascadia Subduction Zone earthquake (and tsunami following). In the event that an M9 earthquake occurs off the coast, Oregon's highly populated areas (i.e., Portland, Salem, Eugene) will additionally suffer large amounts of damage. Due to large amount of people who live in the Willamette Valley, relief efforts will likely focus on these inland cities first. (Or, at least, this is the fear of coastal residents). In an effort to become better prepared for the aftermath of such an event, Waldport would like to see broad emergency-related intergovernmental planning along the coast.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Find coastal groups that are already working together on common concerns and/or issues.</p> <p>Coordinate an informational / interest meeting to discuss coastal hazard issues and possibilities for intergovernmental emergency-related planning. Planning efforts could focus on all phases of a disaster, and benefit each participating jurisdiction in terms of preparedness, mitigation, response and recovery.</p>			<p><u>2020 Update:</u> Central Coast Fire Participates in two tabletop exercises a year. This year was wildfire.</p> <p><u>2015 Update:</u> The city conducts ongoing intergovernmental planning with the Central Coast Fire and Rescue District. In September 2014 the city adopted fire protection codes that established reasonable levels of life safety and property protection so that the Fire District could enforce those code in the city limits. City utilizes reverse 911 and is a Storm Ready/ Tsunami Ready community</p>			
<b>Champion/ Responsible Organization:</b>		Administration				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, Public Works			Central Coast Fire and Rescue, OEM, coastal counties, Lincoln County Emergency Management			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Waldport Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Waldport #4</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Mitigate Crestline Drive against earth movement (erosion, slow landslide)	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>Lidar data is now available for the county. The Lincoln County Risk Report will provide additional analysis of the hazard and community vulnerability when complete in 2015.</p> <p>The Landslide Annex of Lincoln County’s risk assessment identified the potential for landslides to cause damage to buildings and infrastructure within Lincoln County as does the Waldport Addendum: landslides may cause road closures and interruptions to utility services. The addendum and annex also identified previous incidents of landslides that affected Lincoln County, including landslides that accompanied the 1996 storm event. Road closures forced residents to find alternate transportation routes. Reviewing and monitoring existing public infrastructure to identify specific exposure to landslide risk.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Identifying existing public infrastructure with exposure to landslide risk will allow the implementation of mitigation measures to reduce this risk.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Analyze problem areas and determine best method to mitigation the landslide hazard along Crestline Drive.</p> <p>Encourage erosion control techniques, such as the temporary use of straw bales, diversion dams, or other physical changes to control storm water runoff during road and site construction;</p> <p>Suggest to property owners to reduce water input into slopes from building roof drains, storm drains, and surface runoff;</p> <p>Where appropriate, reduce the number of building sites and corresponding disruption of the natural contour and vegetation</p> <p>Create modern landslide inventory and susceptibility maps and use in planning and regulations for future development.</p> <p>Implement grading codes, especially in high</p>	<p><u>2020 Update:</u></p> <p>Temporary patch completed (Re-pavement and sinkhole patch).</p> <p>City is looking at long term solutions and funding sources (ODOT).</p> <p>DOGAMI published <a href="#">Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon</a> which maps existing landslide data for Lincoln Co. Incorporate relevant aspects of the DLCD Landslide Land Use Guide (“<a href="#">Preparing for Landslide Hazards, A Land Use Guide for Oregon Communities</a>”)</p>	

susceptibility areas.		
<b>Champion/ Responsible Organization:</b>	Public Works	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Planning	DOGAMI	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, grants (ODOT)	Medium to High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Waldport Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: Waldport #5</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Relocate critical Fire Station/ equipment out of tsunami inundation zone		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The Waldport public works facility, city hall/ fire station are located within a tsunami inundation area. DOGAMI finalized the remapping of the distant and local tsunami zones (TIZ) providing public, private and citizens with a clearly defined map of hazard areas. However, there was little to be done for the relocation of public safety buildings out of the inundation areas.</p> <p>A significant tsunami event has the potential to cause disruption of power, contamination of water supplies, loss of essential communication systems, a large amount of debris, and traffic congestion. A tsunami has the potential to damage critical buildings and infrastructure in the tsunami inundation zone. Mitigating the effects that a tsunami has on city assets is a high priority.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Assessing and evaluating needed mitigation for critical assets in the tsunami inundation zone, can assist the City in determining what further actions are needed to help mitigate the city's risk to tsunami.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Investigate relocation alternatives for critical facilities in the tsunami inundation zone.</p> <p>Investigate alternatives and purchase a cost-effective police communications system that is resilient to natural hazards (earthquake, tsunami, etc.)</p>			<p><u>2020 Update:</u></p> <p>The Public Works building (4028 Ann Street) and the Health Clinic (920 SW Range Dr) have been relocated to areas outside of the tsunami inundation zone.</p> <p>The Central Coast Fire relocation efforts are ongoing. Working group has been meeting over the last two years.</p>			
<b>Champion/ Responsible Organization:</b>		Planning				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Public works			Fire District, other districts, DLCD, OEM, FEMA, DOGAMI			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, grants			High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	2014 Risk MAP Resilience Workshop, revised 2020					
<b>Action Item Status:</b>	Ongoing					

<b>Mitigation Action: Waldport #6</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Improve/ increase transportation infrastructure and connectivity to short-term and long-term relocation areas		<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>			
Transportation Plan, Comprehensive Plan			
<b>Rationale for Proposal (Why is this important?):</b>			
Crestline Drive is a major access route to development that is outside of the tsunami inundation zone Crestline Drive is threatened by earth movement/ erosion and may need to be improved and/ or relocated.			
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
Research routes/ survey/ potential land acquisitions or easements may be needed (potential may exist for school property that is now open space)		<u>2020 Update:</u> Transportation System Plan updated (2020). City will continue to implement projects identified in the TSP that increase connectivity.	
<b>Champion/ Responsible Organization:</b>	Planning		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Public Works		DLCD, FEMA, OEM, DOGAMI, School District	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		Medium to High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2014 Risk MAP Resilience Workshop, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Waldport #7</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Identify and mark tsunami evacuation zone/ route for east of Lint Slough and Waldport Schools and Improve sheltering options at Waldport schools to accommodate regional demand.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
DOGAMI Tsunami Evacuation Brochures						
<b>Rationale for Proposal (Why is this important?):</b>						
Evacuation routes are not clearly marked for area east of Lint Slough and for the two Waldport schools. Waldport will be a regional hub for evacuees in the event of a local earthquake and tsunami event. Current facilities lack the necessary resources to provide services for expected population.						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Develop evacuation routes, including marked trails, for underserved areas.  Install improvements, which may include new sidewalks, bike routes, pathways, stairs, signage, lighting, and an emergency storage shed.  Acquire and strategically locate community emergency supply pods to provide food, water, and other supplies (sheltering, etc.) post-disaster event; pods may be placed at tsunami assembly areas and in other areas within the county. See County MH #7.				<u>2020 Update</u>  Tsunami Evacuation Signage funded and received in 2020.  See School District addendum for more information.		
<b>Champion/ Responsible Organization:</b>		Planning				
<b>Internal Partners:</b>			<b>External Partners:</b>			
City Public Works			School District, DLCDD, DOGAMI			
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Local Funding Resources, DLCDD, OEM, NOAA Coastal Resiliency Grant, School District		Low to Medium		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	2014 Risk MAP Resilience Workshop, revised 2020					
<b>Action Item Status:</b>	Ongoing					
<b>Mitigation Action: Waldport #8</b>		<b>Alignment with Plan Goals:</b>			<b>High Priority</b>	



(What do we want to do?)						Action Item?
Assess and implement water/ wastewater intertie options between Waldport and Seal Rock		<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The benefits of an intertied system go beyond regular transfers and service deliveries and can assist during emergency situations.</p> <p>The Southwest Lincoln County Water District (SLCWD) provides water to the unincorporated area to the south of the City between Waldport and Yachats. The city is physically connected to the SLCWD system through a single 8-inch pipe with valve isolation that may be opened under emergency situations. The city has an MOU with SLCWD to give/ receive emergency water in time of drought (provided water is available). The agreement is not intended to provide water during non-emergency situations.</p> <p>The city has investigated the viability of a regional water supply between Yachats, SLCWD, Waldport, Seal Rock Water District, and Toledo (2002); at that time it was not considered cost effective. The county is interested in enhancing the resilience of the county's water supply in order to ensure adequate availability in the event of a disaster.</p>						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
<p>Enhance resiliency of Lincoln County's water systems and ensure residents and visitors have access to water in the event of a disaster by developing a framework to address acute shocks (earthquakes, tsunamis) as well as long-term stresses (drought, climate change, etc.); see County MH #7</p> <p>Survey supply and water and waste water systems; focus on interdependencies, and gaps; develop a post-disaster water and waste water emergency plan, and a water and waste water system resiliency strategy.</p>				<p><u>2020 Update</u></p> <p>Local Economic Opportunity Fund (LEOF) grant application.</p> <p>Identified in the water system master plan.</p>		
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, Yachats, Toledo, County			Southwest Lincoln County Water District, Seal Rock Water District,			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, NOAA Coastal Resiliency Grant			High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Waldport Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Waldport #9</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Evaluate and implement erosion control mitigation projects for Alsea Bay.		<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>			
DOGAMI, Open-File Report O-13-20, Evaluation of erosion hazard zones along the Alsea Bay shoreline between the Alsea Bay Bridge and the Port of Alsea, Lincoln County, Oregon			
<b>Rationale for Proposal (Why is this important?):</b>			
Area is susceptible to coastal erosion and could affect portions of the Alsea Highlands, Old Town, Port of Alsea, etc.			
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
Buy out and/ or relocate residences Plant and construct erosion control measures (riprap, etc.)		<u>2020 Update</u> Port is in the process of completing some dredging efforts.	
<b>Champion/ Responsible Organization:</b>	Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Planning		Port of Alsea, DLCD, DOGAMI, DSL	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		Medium to High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Waldport Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Waldport #10</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>
Seismically retrofit the 2 MG water storage tank and build a new 300,000-gallon tank.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input checked="" type="checkbox"/> 8
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11	
<input checked="" type="checkbox"/> Yes					
<b>Alignment with Existing Plans/Policies:</b>					
Water System Master Plan (Table ES-2)					
<b>Rationale for Proposal (Why is this important?):</b>					
Water tanks are vulnerable to earthquakes. Seismically retrofitting the water tanks will protect the tanks against earthquakes.					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
Retrofit the city's 2 MG water storage tank (\$1.2 million)			<u>2020 Update</u>		
Build a new 0.3 MG water storage tanks (\$1.0 million)			New in 2020		
<b>Champion/ Responsible Organization:</b>		Public Works			
<b>Internal Partners:</b>			<b>External Partners:</b>		
Planning			FEMA		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Local Funding Resources, HMGP			High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		2020 Waldport Steering Committee			
<b>Action Item Status:</b>		New			

<b>Mitigation Action: Waldport #11</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Implement land use strategies and options to increase community resilience by creating an adoption ready tsunami code.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Preparing for a Cascadia Subduction Zone Tsunami: <a href="#">A Land Use Guide for Oregon Coastal Communities, Comprehensive Plans, Development Codes</a>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The Land Use Guidance prepared by the Oregon Department of Land Conservation and Development (DLCD), was released on January 15, 2014 and updated in April 2015. This tsunami land use guidance was originally developed by DLCD in partnership with a diverse and capable advisory committee comprised of representatives of local government and state agencies assisted by the consulting firm of Cogan Owens Cogan. Advisory committee members from local governments included representatives from the cities of Cannon Beach, Coos Bay, Depoe Bay, Lincoln City, Manzanita, Seaside, Waldport, Yachats, and also included Coos County. The purpose of the guidance is to assist vulnerable communities as they incorporate tsunami resilience measures into their local land use programs. The land use guide is designed to be tailored by communities to address their individual tsunami risk and location, and provides comprehensive information focused on land use planning approaches to reduce tsunami hazard risk and implement important land use resilience measures. The guidance includes sample tsunami related comprehensive land use plan text and policies, information on needed map amendments, a tsunami hazard overlay (THO) zone model to implement resilience measures, tsunami land use strategy financing and incentive concepts, a newly revised and comprehensive chapter 6 on tsunami evacuation facilities improvement planning, information relating to pre-disaster community land use planning for a Cascadia event tsunami, and web links to other helpful information. The guide’s model comprehensive plan, zoning code and other provisions are designed to be used with the new Department of Geology and Mineral Industries Tsunami Inundation Maps (TIMs). The guide is web based with links to other resources. DLCD was assisted by consultants Carole Connell and D.J. Heffernan in the development of the newly revised Chapter 6 as indicated above.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Utilize the Tsunami Land Use Guidance and determine appropriate strategies/ options to increase community resilience</p> <p>Incorporate relevant aspects of the DLCD Landslide Land Use Guide (“Preparing for Landslide Hazards, A land Use Guide for Oregon Communities”)</p> <p>Consider relocating or retrofitting structures with vulnerable populations (e.g. schools, hospitals, and nursing homes) that are within high tsunami hazard zones.</p>	<p><u>2020 Update</u></p> <p>New in 2020</p>	

<b>Champion/ Responsible Organization:</b>	Administration		
<b>Internal Partners:</b>	<b>External Partners:</b>		
Planning, Public Work, Fire	FEMA, OEM, DLCD		
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>	
Local Funding Resources, DLCD-TA	Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	2020 Waldport Steering Committee		
<b>Action Item Status:</b>	New		

<b>Mitigation Action: Waldport #12</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation?</p> <p>Oregon Senate Bill 3 (2005) enables the Oregon Office of Emergency Management to develop a grant program to seismically rehabilitate critical public facilities. While the grant program is still being developed, the existing DOGAMI inventory of critical facilities is available to assist communities in obtaining funding once the grant program is in place.</p> <p>DOGAMI conducted a seismic needs assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. This inventory is almost 15 years old and needs to be updated to reflect changes.</p> <p>The county and cities' infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, and cell towers were identified by the steering committee as vulnerable assets. The county would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide.</p> <p>Priority facilities to retrofit include (location or jurisdiction):</p> <ul style="list-style-type: none"> <li>○ Central Oregon Coast Fire Station 7200</li> <li>○ City Hall</li> <li>○ Water reservoirs (existing 2 MG and 300,000 gallon) (see Waldport Action #10)</li> </ul> <p>The Risk Report (2020) addressed vulnerabilities of critical facilities. The report estimates that 89% of critical facilities countywide (Appendix A: Community Risk Profiles) will be damaged by the CSZ event, which will have many direct and indirect negative effects on first response and recovery efforts. See the Risk Report for specific critical facilities vulnerable to earthquake, tsunami, and other hazards.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
Review the RVS data and revise the inventory of critical infrastructure and key resources and other community buildings and infrastructure: Perform seismic assessment on facilities not included in the 2007 RVS to determine which structures may	<u>2020 Update</u> New in 2020 The school district has relocated their buildings outside the tsunami inundation zone (see School	

<p>be particularly vulnerable to earthquake damage. Seek funding to retrofit and/or re-build new structures.</p> <p>Create a local rehabilitation and retrofit program for existing buildings.</p> <p>Rehabilitate identified emergency facilities and infrastructure.</p> <p>Explore options for including seismic retrofitting in existing programs such as low-income housing, insurance reimbursements, and pre- and post-disaster repairs.</p> <p>Inventory port facilities and determine appropriate mitigation measures to increase resilience to a tsunami event (improve functionality of pilings, etc.)</p>		District addendum)	
<b>Champion/ Responsible Organization:</b>		Administration	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Planning, Public Work, Fire		FEMA, OEM, DLCD	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DLCD-TA, HMA (BRIC, HMGP)		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2020 Waldport Steering Committee		
<b>Action Item Status:</b>	New		

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# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the county's website and reference on the city's social media and feedback form was provided for public comment.

During the public review period there were no comments provided.

The image shows a screenshot of the Lincoln County website. The top navigation bar includes 'County Home', 'Contact Us', and a search box. The main header is 'Planning & Development' with the Lincoln County logo. A left sidebar lists various divisions and links, including 'Community Input Needed - Natural Hazards Mitigation Plan Renewal'. The main content area is titled 'Community Input Needed - Natural Hazards Mitigation Plan Renewal' and contains text about the renewal process, a 'Community Member Input' section with a survey link, and a list of 'Natural Hazards Mitigation Plan - September 2020 Renewal Plan' sections (I, II, III). A 'SUPPORTING DOCUMENTS' section lists various draft review documents. A 'WEB LINKS' section at the bottom provides a link to the September NHMP. Overlaid on the bottom left is a 'Natural Hazard Mitigation Plan Public Feedback Survey' form with fields for Name, Contact Phone Number, Contact Email, and Zip Code, and a 'Submit' button.

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

Mitigation Action: Waldport # (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# City of Yachats Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Sam Beebe, Ecotrust

Effective:

December 29, 2020 through December 28, 2025



Prepared for:  
City of Yachats

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



**FEMA**

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
Grant: PDMC-PL-10-OR-2017-002  
Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

**RESOLUTION NO. 2021-161**

**A RESOLUTION ADOPTING THE CITY OF YACHATS'S REPRESENTATION  
IN THE UPDATES TO THE LINCOLN COUNTY MULTI-JURISDICTIONAL  
NATURAL HAZARDS MITIGATION PLAN**

**WHEREAS**, the City of Yachats recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the City of Yachats has fully participated in the FEMA prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the City of Yachats has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the City of Yachats to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the *City of Yachats addendum* to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan* and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

**WHEREAS**, the NHMP is comprised of comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and



**WHEREAS**, City of Yachats adopts the NHMP and directs the City Manager to develop, approve, and implement the mitigation strategies and any administrative changes to the NHMP subject to City Council approval.

**NOW, THEREFORE, BE IT RESOLVED:**

**Section 1.** The City of Yachats adopts *the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

**Section 2.** The City of Yachats will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

PASSED by the City Council on this


20<sup>th</sup> day of January, 2021.

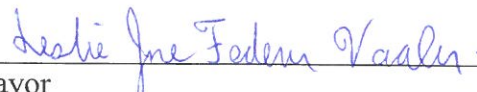
APPROVED by the Mayor on this

25 day of January, 2021.

ATTEST:

APPROVED:

  
\_\_\_\_\_  
City Manager

  
\_\_\_\_\_  
Mayor

Adopted this 20<sup>th</sup> day of January, 2021

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## Purpose

This is an update of the City of Yachats addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (NHMP). The City of Yachats's original addendum to Lincoln County's NHMP was completed and approved by FEMA in 2009. This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation, and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Updates to Yachats's addendum are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Yachats adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **January 25, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the City's addendum on **March 1, 2021**. With approval of this NHMP the City is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The City concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

***To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.***

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2009 and 2015 plan. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of

priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

*(Note: although numbered the goals are not prioritized.)*

## **Process and Participation**

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the city will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Department of Land Conservation and Development, Oregon Office of Emergency Management (OEM), Lincoln County, and Yachats to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal-Year 2017 (FY17) Pre-Disaster Mitigation (PDM) Competitive Grant Program OR-2018-001 (PDMC-PL-10-OR-2017-02). Members of the Yachats NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Yachats addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Yachats NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Yachats Contract Planner serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Lincoln County NHMP in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Planning Director and Emergency Manager).

Representatives from the City of Yachats steering committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the city's addendum, with focus on the plan's risk assessment and mitigation strategy (action items).

The current version of the addendum reflects changes decided upon at the designated meetings and through subsequent work and communication with OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include revisions to the city's Risk Assessment and Hazard Identification sections, Action Items, and Community Profile.

The Yachats Steering Committee was comprised of the following representatives:

- Convener, Justin Peterson, OCWCOG Contract Planner
- Rick McClung, Public Works
- Jacqueline Danos, Planning Commission
- Katherine Guenther, Yachats Rural Fire Protection District
- David Buckwald, Public Works
- Dave Mattison, Contract Planner

### Public Participation

Public participation was achieved by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment via a survey administered by IPRE (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The City Council will be responsible for adopting the Yachats addendum to the Lincoln County NHMP. This addendum designates a steering committee and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Yachats addendum on an annual schedule; the county is meeting on a quarterly basis and will provide opportunities for participating jurisdictions (cities and special districts) to report on NHMP implementation and maintenance during their meetings. The city's Contract Planner will serve as the convener and will be responsible for assembling the steering committee. The steering committee will be responsible for identifying new risk assessment

data, reviewing status of mitigation actions, identifying new actions, and seeking funding to implement the city's mitigation strategy (actions). The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and priority actions in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Where possible, Yachats will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Yachats's acknowledged comprehensive plan is the City of Yachats Comprehensive Plan. The City implements the plan through the Community Development Code.

## **Existing Plans and Policies**

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from residents, businesses and policy makers.



Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

Yachats's Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the addendum helps identify what resources already exist that can be used to implement the action items identified in Yachats's Addendum. Implementing the city's mitigation actions through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the city's resources.

The following are Yachats's existing plans and policies that relate to natural hazards:

- **Comprehensive Plan, 2008, amended 2018:** A document stating the general, long-range policies that will govern a local community's future development.

*Relation to Natural Hazard Mitigation:* Contains city-specific information regarding natural hazards within the city's jurisdictional boundaries.

- **Municipal Code:** Establishes land use zones to regulate the location of building structure and the use of land within the City of Yachats.

*Relation to Natural Hazard Mitigation:* Contains city-specific hazard related requirements for the placement and construction of the buildings. Issues such as floodplain development, fire resistant materials, etc. Title 9.54, Flood Damage Prevention Regulations, includes regulations for areas subject to flood damage.

- **Yachats Village Circulation Plan, 1997, amended 2013:** Guides the management of existing transportation facilities and the design and implementation of future facilities.

*Relation to Natural Hazard Mitigation:* Mitigation principles and strategies can be incorporated into Transportation Systems Plans to protect key transportation infrastructure from natural hazards.

- **Emergency Operations Plan, 2014:** All hazards plan describing how Yachats will respond to incidents.

*Relation to Natural Hazard Mitigation:* The plan includes a hazard vulnerability assessment, evaluation of hazards in the community, and demonstrates how the community will respond to a natural hazard event such as flood, tsunami, wildfire, etc. Much of the hazard assessment cites the Yachats addendum to the Lincoln County NHMP.

- **Lincoln County Community Wildfire Protection Plan, 2018:** Assists Yachats clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.

*Relation to Natural Hazard Mitigation:* Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

## Government Structure

The City Council is the policy making body for Yachats. As the elected legislative body in Yachats, the City Council has overall responsibility for the scope, direction and financing of city services. Council members serve four-year terms. Additional departments within the city include the following:

**City Manager:** The city manager is appointed by the City Council and serves as the city administrative officer of the city government. The city manager provides the leadership and direction for the operation and management of all city departments, and serves as the city's budget officer.

**City Recorder:** The city recorder assures the timely presentation of formal communications from the public, other agencies and city staff to the City Council. The recorder prepares city council meeting agendas in coordination with the mayor; maintains official city records which reflect the actions of the governing body; maintains a depository of contracts, agreements and official council actions and ensures the timely availability of these records to the council, public other agencies and staff.

**City Planner:** The city planner provides service and information to the general public regarding phases of planning and community development. The city planner implements ordinance and plan requirements through a site and land use review process. Specifically, the city planner reviews potential development opportunities to ensure compliance with zoning, setback, parking, landscaping, access and other city requirements.

In addition to oversight of the development process, the city planner advises the City Council and Planning Commission on land use and special project matters.

**Public Works Department:** The Yachats Public Works Department provides responsive community services related to planning, design, construction, operation, maintenance and management of public infrastructure, including streets, sewer, water treatment, waste water treatment, storm drainage, public buildings and other facilities. Services provided by the department contribute to the public health, safety, economic diversity, environmental quality and citizen convenience.

**Finance Department:** The Finance Department serves the community by managing utility billing, business licenses, collecting taxes and fees, dealing with city expenditures, preparing the city's budget and managing investments. The goal of the Finance Department staff is to provide services with an emphasis on timelines, accuracy and courteous customer service.

**Public Library:** The Yachats Public Library collects, preserves, and administers organized collections of books and related materials.

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review. Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such,

the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the City's website: <https://www.yachatsoregon.org/>

In addition, natural hazards information dissemination is conducted throughout the year when opportunities present themselves via the city offices and website.

## NHMP Maintenance

The Lincoln County Multijurisdictional Natural Hazard Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City's action items were first developed through a two-stage process during the 2009 NHMP development and revised in 2015. In stage one, OPDR facilitated a work session with the steering committee to discuss the city's risk and to identify potential issues. In the second stage, OPDR, working with the local steering committee, developed potential actions based on the hazards and the issues identified by the steering committee. During the 2019-2020 update process OPDR re-evaluated the Action Items with the county and local steering committees and updated actions, noting what accomplishments had been made and if the actions were still relevant; any new action items were identified at this time. For additional information see the discussion near the end of this document.

The City's actions are listed in Table YA-1. For more detailed information on each action, see the action forms within Attachment A of this addendum.

In addition, there are 23 County Action Items that include the city as an “Affected Jurisdiction” (Table YA-13). For more detailed information on the county actions that involve city participation, see Volume I, Section 3 and the action item forms within Volume III, Appendix A.

### Priority Action Items

Table YA-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in bold text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action. Full text of the plan goals referenced in Table YA-1 is located on page YA-2.

**Table YA-I City of Yachats Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing
Yachats #1	Identify over-water transportation alternatives in the event of bridge collapse in an earthquake and/or tsunami.	Public Works	L	Long
Yachats #2	Continue to maintain and keep stocked two mobile storage containers with emergency supplies and equipment.	Administration	L to M	Ongoing
Yachats #3	Update and implement actions identified in the Yachats Storm Drainage Master Plan	Administration	L to H	Ongoing
Yachats #4	Encourage purchase of flood insurance, even for those outside of NFIP mapped hazard areas.	Administration	L	Ongoing
Yachats #5	Provide supplemental water supply tanks in key locations to ensure availability of water throughout the city.	Administration	H	Short
Yachats #6	Obtain LiDAR collection for DOGAMI and adopt and adopt Landslide code updates.	Administration	L	Short
Yachats #7	Encourage the County to evaluate and implement erosion control mitigation projects for NE Ocean View Drive/ 804 Trail.	Public Works	M to H	Long
Yachats #8	Work with the owners of repetitive flood loss buildings in the city to identify cost effective mitigation strategies including consideration of relocation, elevation, or buy-out.	Floodplain Manager	H	Long
Yachats #9	Relocate or mitigate City Hall, Water Treatment, and Wastewater Treatment plants out of tsunami inundation zone	Public Works	H	Long
Yachats #10	Implement land use strategies and options to increase community resilience by creating an adoption ready tsunami code.	Planning	L	Short
Yachats #11	Research drought resiliency code amendments (Gray water systems, green infrastructure, etc.). Consider drafting a drought resiliency ordinance.	Planning	L	Long
Yachats #12	Develop a non-potable water source for fire suppression (purple pipe).	Public Works	M	Long
Yachats #13	Develop a Climate Resilience Plan	Public Works	M	Medium

Source: City of Yachats NHMP Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

# Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure YA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure YA-1 Understanding Risk**



## Hazard Analysis

The Yachats NHMP steering committee reviewed and revised the plan’s Hazard Analysis and Risk Assessment section. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in probability, vulnerability, and risk from natural hazards unique to the City of Yachats, which are discussed throughout this addendum.

Table YA-2 shows the hazard analysis matrix for Yachats listing each hazard in rank order from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

One catastrophic hazard (Cascadia Subduction Zone earthquake) and four chronic hazards (drought, windstorm, landslide, and winter storm) rank as the top hazard threats to the City (Top Tier). Local tsunami, riverine floods, wildfire, and coastal floods comprise the next highest ranked hazards (Middle Tier). Coastal erosion, crustal earthquake, tornado, distant tsunami, and volcanic event comprise the lowest ranked hazards in the City (Bottom Tier).

**Table YA-2 Hazard Analysis Matrix – City of Yachats**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Drought	20	50	100	70	240	#1	Top Tier
Windstorm	20	50	100	70	240	#1	
Landslide	20	40	100	70	230	#3	
Winter Storm (Snow/Ice)	18	40	100	70	228	#4	
Earthquake (Cascadia)	10	50	100	49	209	#5	
Tsunami (Local)	2	50	100	49	201	#6	Middle Tier
Flood (Riverine)	20	35	50	70	175	#7	
Wildfire	10	35	70	56	171	#8	
Flood (Coastal)	20	25	50	70	165	#9	
Coastal Erosion	20	15	50	49	134	#10	Bottom Tier
Earthquake (Crustal)	10	20	40	42	112	#11	
Tornado	8	10	30	56	104	#12	
Tsunami (Distant)	10	15	30	35	90	#13	
Volcanic Events	2	5	40	7	54	#14	

Source: City of Yachats NHMP Steering Committee (2020)

Table YA-3 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Lincoln County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings).

**Table YA-3 Probability and Vulnerability Comparison**

Hazard	Yachats		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	Moderate	Low	High	Low
Drought	High	High	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	High	Moderate	High	Moderate
Flood (Riverine)	High	Moderate	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	High	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	High	Moderate	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	High	High	Moderate

Source: City of Yachats NHMP Steering Committee and Lincoln County NHMP Steering Committee (2020)

## Community Characteristics

Table YA-4, Appendix C (Volume III), and the following section provide information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2012 and 2019 the City grew by 55 people (8%).<sup>1</sup> According to the State’s official coordinated population forecast, between 2019 and 2040 the City’s population is forecast to grow by 40% to 1,061.<sup>2</sup> City population varies according to the season, with up to a 400% increase in population occurring during the summer months (July/ August peak); the population increases roughly from 750 to 2,500. Median household income decreased by 5% between 2012 and 2017.<sup>3</sup> The City has an educated population with 92% of residents 25 years, and older holding a high school degree, 45% have a bachelor’s degree or higher. As of 2019 the Lincoln County School District has a 76% graduation rate (Yachats students travel 8 miles north to attend schools in Waldport).

The City of Yachats sits at the mouth of the Yachats River overlooking the Pacific Ocean. Development in Yachats spreads mostly north to south along US-Highway 101 and slightly east along Yachats River Road (see Figure YA-2). Dense commercial areas in Yachats exist along US-Highway 101 and are centrally located in the downtown area and around the Yachats River. Residential development surrounds the downtown commercial core. The city’s Comprehensive Plan identifies land use needs within the city and its urban growth boundary. There are three oceanfront state parks located within the city.

<sup>1</sup> Portland State University, Population Research Center, "Annual Population Estimates", 2019.

<sup>2</sup> Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

<sup>3</sup> Social Explorer, Table T57, U.S. Census Bureau, 2013-2017 and 2008-2012 American Community Survey Estimates.



The city's Comprehensive Plan identifies land use needs within the city and its urban growth boundary Figure YA-2 shows the City of Yachats's zoning map. New development has complied with the standards of the [Oregon Building Code](#), and the city's development code including their floodplain ordinance.

## Economy

Yachats's commercial areas developed along primary routes and residential development followed nearby (see Figure YA-2).

Most workers residing in the city (86%, 446 people) travel outside of the city for work primarily to Newport and Yachats.<sup>4</sup> A significant population of people travel to the city for work, (83% of the workforce, 355 people) primarily from Newport and Yachats.

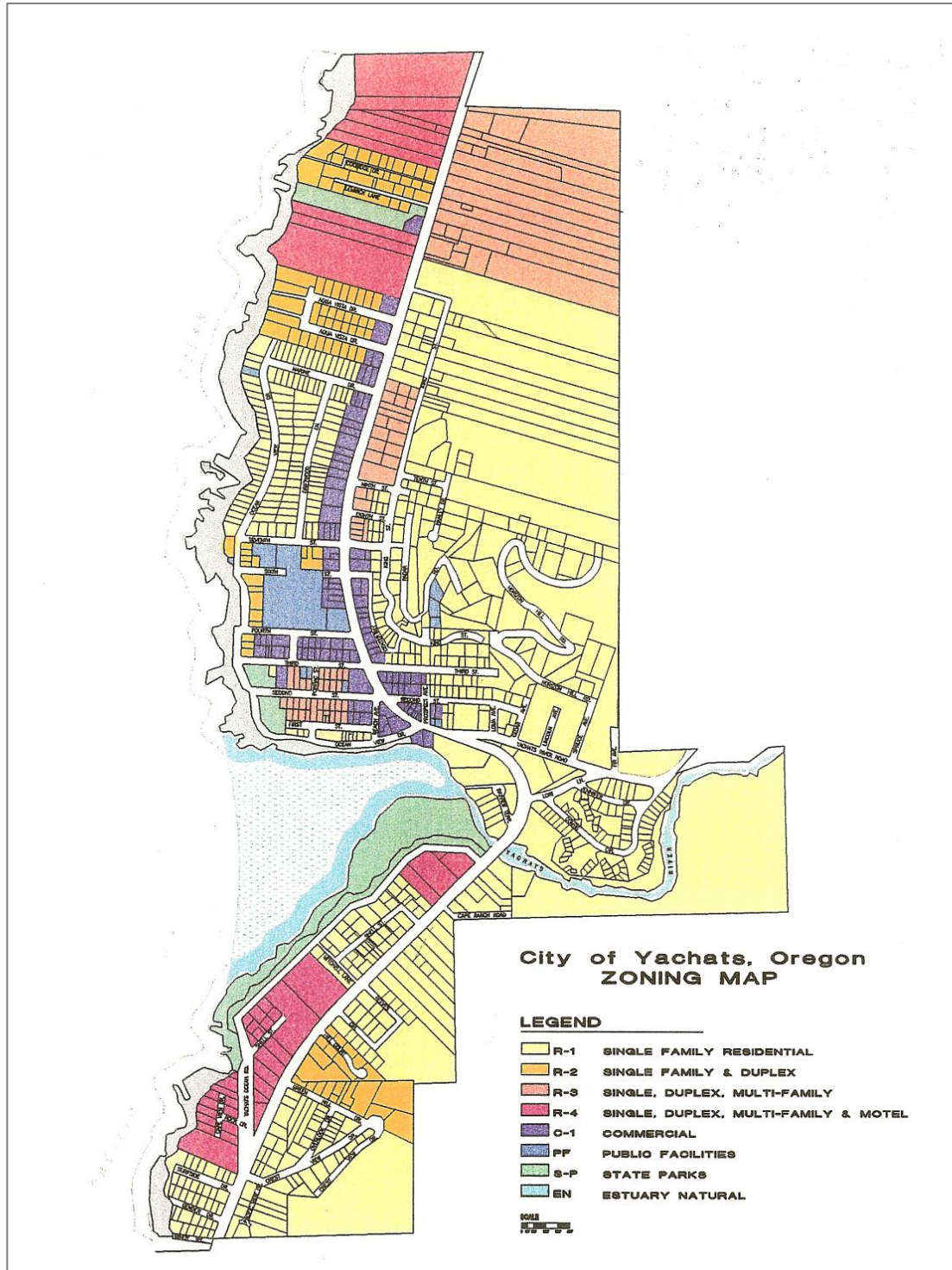
About 40% of the resident population 16 and over is in the labor force (237 people) and are employed in a variety of occupations including professional (22%), building and grounds cleaning (20%), office and administrative support (15%), sales (13%), and food preparation and serving (13%) occupations.<sup>5</sup>

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<sup>4</sup> U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2017). Longitudinal-Employer Household Dynamics Program, accessed on April 25, 2020 at <https://onthemap.ces.census.gov>.

<sup>5</sup> Social Explorer, Tables A17008 & A17002, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

Figure YA-2 Zoning Map



Source: City of Yachats

**Table YA-4 Community Characteristics**

Population Characteristics		
<b>2012 Population</b>	705	
<b>2019 Population</b>	760	
<b>2040 Forecasted Population</b>	1,061	
Race (non-hispanic or latino) and Ethnicity (Hispanic)		
White	77%	
Black/ African American	3%	
American Indian and Alaska Native	0%	
Asian	0%	
Native Hawaiian and Other Pacific Islander	1%	
Some Other Race	0%	
Two or More Races	6%	
Hispanic or Latino (of any race)	14%	
<b>Limited or No English Spoken</b>	32	5%
Vulnerable Age Groups		
Less than 15 Years	69	10%
65 Years and Over	315	48%
Age Dependency Ratio		0.37
Disability Status		
Total Population	162	24%
Children (Under 18)	0	0%
Working Age (18 to 64)	61	23%
Seniors (65 and older)	101	32%

Income Characteristics		
Households by Income Category		
Less than \$15,000	45	13%
\$15,000-\$29,999	82	24%
\$30,000-\$44,999	54	16%
\$45,000-\$59,999	69	20%
\$60,000-\$74,999	3	1%
\$75,000-\$99,999	34	10%
\$100,000-\$199,999	44	13%
\$200,000 or more	13	4%
<b>Median Household Income</b>	\$43,125	
Poverty Rates		
Total Population	91	14%
Children (Under 18)	28	36%
Working Age (18 to 64)	54	20%
Seniors (65 and older)	9	3%
Housing Cost Burden (Cost > 30% of household income)		
Owners with Mortgage	47	25%
Renters	90	59%

Source: U.S. Census Bureau, 2013-2017 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2019. Portland State University, Population Research Center, "Oregon Population Forecast Program Cycle 1 (2014-2017)". 2017.

Housing Characteristics		
Housing Units		
Single-Family	763	88%
Multi-Family	83	10%
Mobile Homes	23	3%
Year Structure Built		
Pre-1970	313	36%
1970-1989	225	26%
1990-2009	318	37%
2010 or later	13	12%
Housing Tenure and Vacancy		
Owner-occupied	191	22%
Renter-occupied	153	18%
Seasonal	443	51%
Vacant	82	9%

The City of Yachats is rich with beauty and abundant natural resources. The coastal community offers recreational amenities, activities and attractions including, but not limited to fishing, beachcombing, clam digging, hiking/ trail running, mountain biking (including the Gravel Epic ride), camping, whale watching, crabbing, windsurfing, scenic flights, golfing, kite-flying and more. In and around the community are the Cape Perpetua Federal Recreational Area and Museum, Smelt Sands State Park, Yachats State Park, the Commons Community Center, and the Yachats Ocean Wayside State Park.

The climate in Yachats is moderate. Average monthly temperatures range from lows of 36-40° F (November through April) to highs of 74-76° F (July through September) degrees. The driest months are July and August (average about 0.85-1.15 inches of precipitation per month) the wettest months are November through March (average 11-14 inches of precipitation per month). Yachats has an average annual precipitation of approximately 92 inches (73%, 67 inches fall November through March).

## Asset Identification

The following assets identified by the City of Yachats were first gathered from the Asset Identification meetings held with community members in 2007. These assets were confirmed and updated by the City steering committee during the 2019-2020 update process.

## Cultural and Historic Resources

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important.

The City of Yachats's website offers noteworthy time periods in the community's history.<sup>6</sup> Before white settlers came to the Yachats area, the coast was inhabited by Native Americans, known as the Alsi and Yahuts tribes. In 1787, Captain Cook, one of the first white people sailing along the Oregon Coast, named Cape Perpetua, an 800-foot cape overlooking the ocean. In 1855, the Coast Range Reservation and Alsea Sub-Agency established a community to be the home to different tribes of Native Americans. In 1871, it noted that the first white child was born in Yachats. In 1875, the Coast Range Reservation and Alsea Sub-Agency was closed when the area was opened to settlement. In 1892, the Oceanview, Benton County Post Office was established in what later became known as the town of Yachats. Vacationers began visiting the Yachats area in the early 1900's. In 1914, the US Forest Service built a narrow road around Cape Perpetua. In 1917, the community was renamed from "Oceanview" to the present name of Yachats. In 1918, soldiers of the Signal Corps were organized at camps in the area to log for spruce used to build airplanes for war efforts. In 1926, the Little Log Church was built to serve the community. The church later became the property of the Lincoln County Historical Society, who eventually turned the church over to the City of Yachats. It is now maintained as the Little Log Church and Museum. In the 1930's, the Roosevelt Memorial Highway, now known as US Highway 101, was completed, opening the coastal area to a greater influx of people. In the 1930's and 40's, the Great Depression and World War II affected the area. Today, Yachats is a lively community home to permanent and seasonal residents, with a vigorous tourist population.

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The National Register of Historic Places and the State Historic Preservation Office lists historic sites and properties within the city:<sup>7</sup>

- US Spruce Production Railroad XII, Spur 5, Linear District],1925
- Ten Mile Creek Bridge, Hwy 101, 1931
- North Fork Of The Yachats Bridge, North Fork Yachats River, c.1938
- Cape Perpetua Shelter and Parapet, Waldport Ranger District, 1933
- (35-LNC-73) Trail 804 Midden #3, Address Restricted

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<sup>6</sup> City of Yachats History. www. <http://www.ci.yachats.or.us/Yachats%20History.htm>

<sup>7</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 17, 2020.

- (35-LNC-72) North 804 Midden, Address Restricted
- (35-LNC-66) Yachats Trail 804 Midden, Address Restricted
- (35-LNC-65) Smelt Sands Midden, Address Restricted
- (35-LNC-63) Archeological Site, Address Restricted
- (35-LNC-57) Cape Creek Site, Address Restricted
- (35-LNC-56) Good Fortune Cove Site, Address Restricted
- (35-LNC-55) Good Fortune Point Site, Address Restricted
- (35-LNC-54) Archeological Site, Address Restricted
- (35-LNC-48) Archeological Site, Address Restricted

The following list includes six other sites listed on the State Historic Preservation Office website:

- [House], 10740 Yachats River Rd
- Upper Yachats School, E Hwy 101, c.1920
- Roosevelt Coast Highway, Hwy 101, c.1919
- Little Log Church by the Sea, 328 W 3rd St, 1927
- Alsea Sub-Agency Indian Reservation Headquarters, Hwy 101, 1875
- [House], 2550 N Hwy 101, c.1930

The City of Yachats holds many community events throughout the year, including, but not limited to, the Yachats Guitar Festival, the Yachats Music Festival, Yachats Big Band, the Yachats Farmers Market, various arts and craft shows, the Yachats la de da Parade, Festivities and Fireworks Show, the Yachats Village Mushroom Festival, the Annual Smelt Fry, the Yachats Celtic Music Festival, and the Yachats Youth and Families Activities Program, as well as a wide range of restaurants, galleries and shops.<sup>8</sup>

## Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to act in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and wastewater treatment facilities.

Yachats has the following critical facilities (**bold** indicates facility was included in the Risk Report):

- **Yachats Rural Fire Protection District:** 2056 Hwy 101 N
- The Commons Building: 441 Hwy 101 N
- Public Library: 560 W 7<sup>th</sup> Street
- Water treatment plant: 500 W 7<sup>th</sup> Street
- Wastewater treatment plant: 500 W 7<sup>th</sup> Street
- City Hal (501 Hwy 101 N)

In addition, the Sea Aire Assisted Living Facility (1882 Hwy 101 N) is considered a community asset serving the elderly population of the community.

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<sup>8</sup> City of Yachats Events. <http://www.ci.yachats.or.us/calendar/commons/events.htm>

In addition, the Sea Aire Assisted Living Facility (1882 Hwy 101 N) is considered a community asset serving the elderly population of the community.

## Transportation

Mobility plays an important role in Yachats, and the daily experience of its residents, and businesses. Motor vehicles represent the dominant mode of travel through, and within the City. Yachats is also served by Lincoln County Transit Routes 497 with service running six days a week with stops in Yachats and by the Florence-Yachats Connector.

### Roads/Seismic lifelines

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>9</sup>

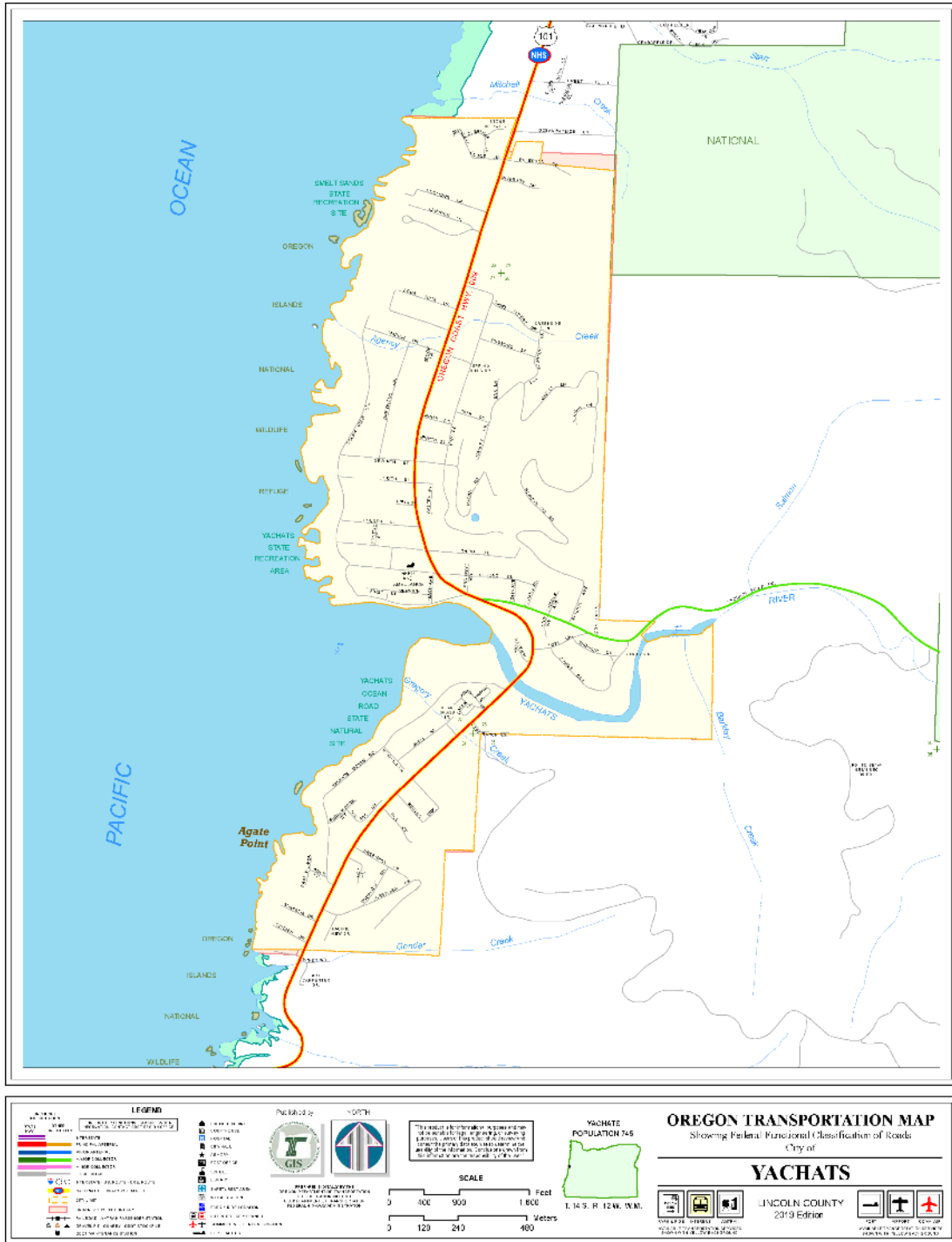
System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

Highway 101 (Tier I) is the major north-south transportation route through the City (see Figure YA-3). Highway 18 (Tier I, north of Lincoln City), Highway 20 (Tier III, Newport), and Highway 126 (Tier II, Florence) are the major east-west transportation routes connecting the coast to the Willamette Valley. Highway 34 (Waldport) is not a seismic program highway, however, it does connect to the Willamette Valley through Alsea.

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<sup>9</sup> Oregon Department of Transportation. Oregon Seismic Lifeline Evaluation, Vulnerability Synthesis, and Identification, *Oregon Seismic Lifeline Routes*, May 15 2012.

**Figure YA-3 Yachats Functional Classification of Roads**



Source: Oregon Department of Transportation - [Link](#)

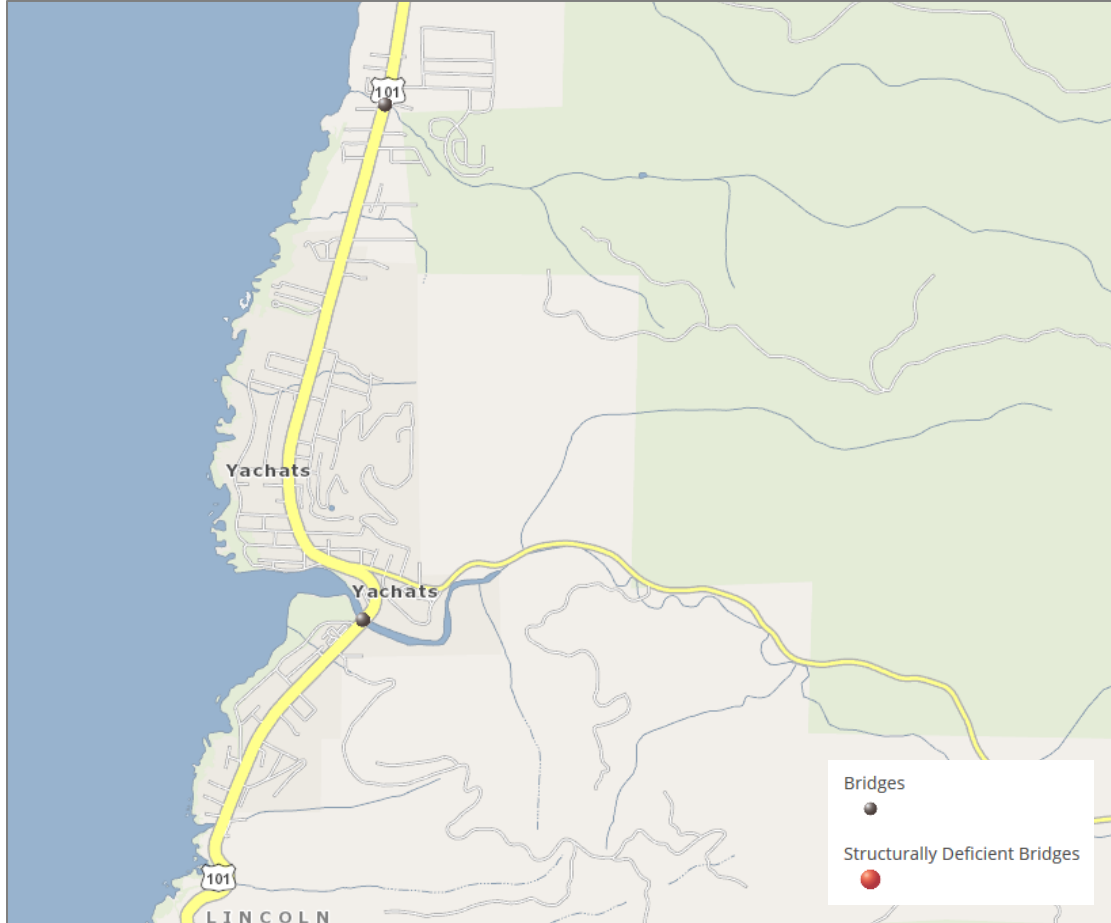
### Bridges

Because of earthquake risk, the seismic vulnerability of the city's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries

are unable to transport goods. Bridges and culverts within the city that are critical or essential include (see Figure YA-4):

- Yachats River, US 101 (1977), (Bridge ID 01173D)
- (culvert) Starr Creek, US 101 (1930), (Bridge ID 01451)

**Figure YA-4 Oregon Bridges and Structurally Deficient Bridges**



Source: Oregon Department of Transportation, ODOT TransGIS, accessed August 7, 2020

More information on Seismic Design of bridges is on the ODOT website:

<https://www.oregon.gov/odot/Bridge/Pages/Seismic.aspx>

### Railroads

There are no railroads in Yachats.

### Airports

There are no public airports in Yachats. Wakonda Beach State Airport is located north just south of Waldport and the Newport Municipal Airport is in the South Beach area of Newport. The city has no commercial service airports. The nearest commercial airports are in Eugene and Portland.

### Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the



community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Generally, the network of electricity transmission lines running throughout the city is operated by Central Lincoln PUD (see their addendum for more information). The Williams Gas Pipeline provides natural gas that is delivered to customers in the city by Northwest Natural Gas. These lines may be vulnerable as infrequent natural hazards, like earthquakes, could disrupt service to natural gas consumers across the region.

The city water, wastewater, and stormwater (culvert) systems include the following:

#### Water Infrastructure

- Water Treatment Plant: 963 Yachats River Road
- Storage tanks:
  - Primary tank, 1.0 MG, east side of Radar Road (ca. 1992)
  - Round tank, 0.2 MG, Radar Road (ca. 1945)
  - Upper tank, 0.01 MG, Horizon Hill Road (ca. 1964)
  - Pressure tank, 1,000-gallon, Horizon Hill Road
  - Blackstone Middle Tank 0.1 MG Gimlet Drive (ca. 2008)
  - Blackstone Upper tank 0.125 MG Horizon Hill Road (ca. 2008)
  - South Tank 0.25 MG Crestline (ca. 2017)
- Pump stations:
  - Radar Road, pumps between the primary tank and round tank
  - Upper Tank pump station used for pressure tank
  - Blackstone Lower pump station
  - Blackstone Middle pump station
  - Blackstone Upper pump station

#### Wastewater Infrastructure

- Wastewater Treatment Plant: 500 W 7<sup>th</sup> Street

#### Stormwater Infrastructure (e.g. Culverts)

- Numerous Critical or Essential culverts (some listed under bridges above)

## **Community Organizations and Programs**

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The county and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The countywide community organizations that are active within the city and county and may be potential partners for implementing mitigation actions can be found in Appendix C: Community Profile.

## Lincoln County School District

The Lincoln County School District has two schools in Yachats including Crestview Heights Elementary and Yachats Middle and High School. For more information on School District assets see their addendum in Volume II.

### Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions better understand risk and can assist in documenting successes. The following efforts have occurred or are on-going within Yachats:

- The City of Yachats has an emergency planning steering committee that meets monthly.
- A Community Emergency Response Team (CERT) is active in Yachats. The CERT Program educates people about disaster preparedness and trains citizens to assist with the community's immediate needs in the aftermath of a disaster (when emergency services are not immediately available). CERT can assist in saving lives and protecting property.
- The City of Yachats coordinates emergency planning activities with the Yachats Rural Fire Protection District.
- The City of Yachats enforces a setback requirement for all developments located along the coast. The purpose of the setback is to reduce property damages related to coastal erosion, windstorms, and flooding. The setback requirement also serves to satisfy a portion of the city's natural hazard goal, as defined in the Yachats Comprehensive Plan: "Through regulation of the location and type of development, the city shall work to protect life and property from natural disasters and hazards, such as landslides, fire, tsunamis and flooding."
- The city's Comprehensive Plan and Zoning and Land Use Code address natural hazards. Specific hazardous areas have been identified by RNKR Associates in their work *Environmental Hazards, Coastal Lincoln County, Oregon, 1979*. The city has defined 'hazardous areas' and will allow development in these areas if adequate protective measures can be employed to prevent or minimize damage in accordance with city development code standards.
- State legislation: SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, limits construction of new essential facilities and special occupancy structures in tsunami flooding zones.

# Hazard Profiles

The following sections briefly describe relevant information for each profiled hazard. More information on Lincoln County hazards can be found in Volume I, Section 2 *Risk Assessment* and in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

In addition, the Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the City of Yachats. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire (summarized herein). The City hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

## Coastal Erosion

The steering committee determined that the city's probability for coastal erosion is **moderate**, meaning one incident is likely within the next 35 to 75 years and that their vulnerability to coastal erosion is **low**, meaning it is expected that less than 1% of the City's population or property could be affected by a major coastal erosion event. *The probability and vulnerability ratings have decreased since the previous NHMP.*

Volume I, Section 2 describes the characteristics of coastal erosion hazards, as well as the history, location, extent, and probability of a potential event. Coastal erosion is a natural process that continually affects coastal areas; in Yachats and elsewhere along the Pacific, coastal erosion becomes a hazard when lives and properties are at risk of death, injury, or damage. Coastal erosion is typically a gradual process, which can be greatly accelerated in the event of a storm or climate factors that increase the potential for coastal erosion.

### Future Climate Projection:

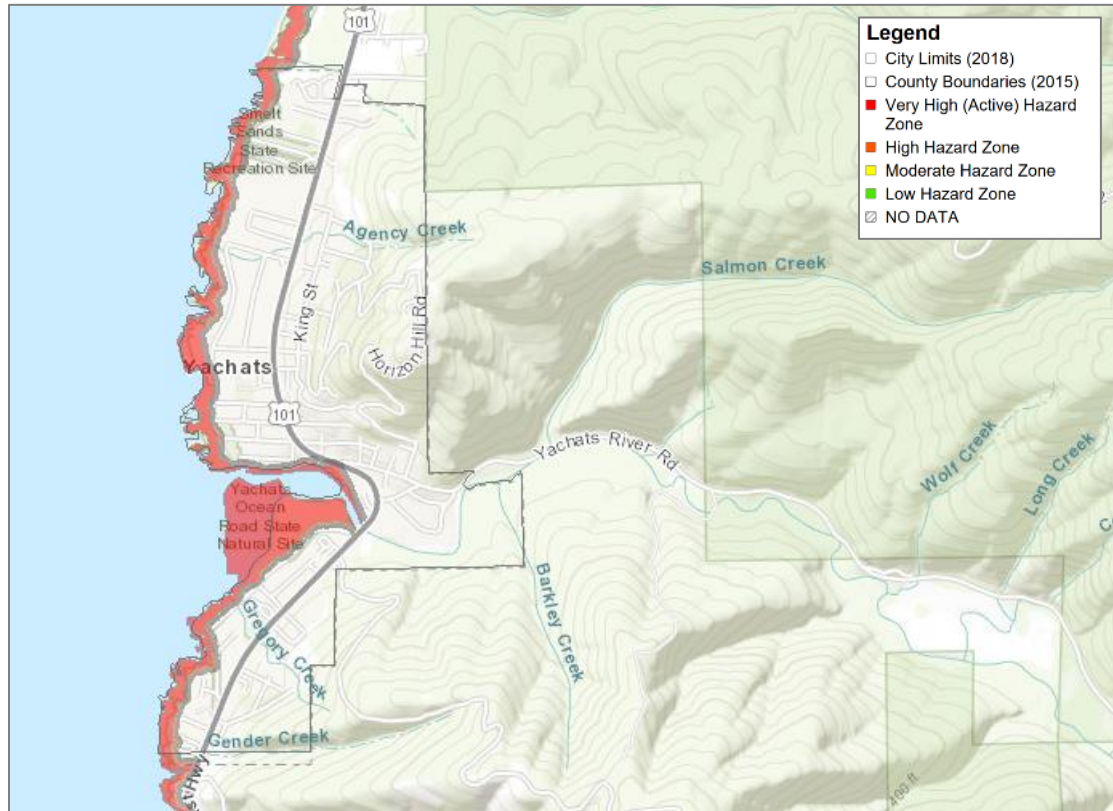
According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the risk of coastal erosion is expected to increase due to sea level rise and changing wave dynamics.

## Vulnerability Assessment

The county identified areas along Highway 101 that have sustained erosion induced damages. The city can be characterized as consisting of low rock beaches, basalt cliffs and benches overlain by sedimentary uplifted marine terrace deposits along US Highway 101. Additionally, the city has steep hillsides east of Highway 101 and southeast of the Yachats River. The most susceptible area for coastal erosion is along the oceanfront where concentrations of homes, businesses, roads and infrastructure are located. The steering committee identified the area along Ocean View Drive from 6<sup>th</sup> Street down to the Yachats Recreation Area as experiencing on-going erosion; this road includes major water and sewer lines. The City of Yachats has engaged in projects to mitigate coastal erosion by installing hardened shoreline stabilization in the form of rip-rip, relocating pump stations away from vulnerable locations, and stabilizing banks. The city previously installed rip-rap to protect utilities and streets along the bluffline. Records of other specific events are not available at this time; however, events may have occurred in tandem with previous storms.

Potential community-related impacts, including shoreline reduction, economic (tourism-related) impacts, and property/infrastructural damage, are adequately described within the Volume I, Section 2 of the NHMP. See Figure YA-5 for locations of the city’s coastal erosion hazard along coastal bluffs on the city’s western edge.

**Figure YA-5 Coastal Erosion Hazard**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

The City of Yachats uses the RNKR Environmental Hazards Inventory of Coastal Lincoln County, Oregon as a mapping and reporting tool for coastal erosion. Although not included within this addendum, the coastal erosion hazards map can be obtained through the Planning and Community Development Department at City Hall.

#### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion. The Risk Report provides a distinct profile for Yachats.

The Risk Report provides an analysis of dune-backed beaches and bluff-backed shorelines to identify the general level of susceptibility due to storm-induced erosion, sea level rise, and subsidence due to CSZ earthquake event. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Yachats may be impacted by profiled coastal erosion scenario (Table YA-5).

Very few people are may be displaced by coastal erosion. These people are expected to have mobility or access issues and/or may have their residences impacted by coastal

erosion. Properties that are most vulnerable to the coastal erosion hazard are those that are developed in an area of steep dunes or cliffs. Only a few buildings (residential, commercial, industrial) are exposed to the high coastal erosion hazard zone. The value of exposed buildings is \$325,000 (a fraction of total building value). It is important to note that impact from coastal erosion may vary depending on areas that are impacted during an event.

**Table YA-5 Potentially Displaced Residents and Exposed Buildings, Coastal Erosion**

Community Overview: Yachats						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
690		1,050		1	160,911,000	
Exposure Analysis: Coastal Erosion High Hazard Scenario						
Potentially Displaced Residents		Exposed Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
2	0.3%	4	0.4%	0	325,000	0.2%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-20. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>10</sup>

There are no critical facilities exposed to the profiled coastal erosion scenario.

## Drought

The steering committee determined that the city’s probability for drought is **high**, meaning at least one incident is likely within the next 35 years and that their vulnerability to drought is **high**, meaning more than 10% of the city’s population or property could be affected by a major drought event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of drought hazards, as well as the history, location, extent, and probability of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared coastal communities from the effects of a drought.

The city is working to protect their water rights on the Yachats River, including the Reedy and Salmon creeks to secure future access and supply (there is some concern in the community that logging within the Salmon Creek Watershed compromises their water availability). Likewise, Yachats has an intergovernmental agreement with the South Lincoln County Water District and the City of Waldport for delivery services in the event of a water-shortage. In addition, Yachats’s population expands during the summer tourist season, peaking in July/ August with a tourist population upwards to 400% the normal population of the community (approximately 750); during these period water meter usage expands from about 150 to about 800; the tourism population, in addition to natural population growth,

<sup>10</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-21.

will further strain the existing system. To mitigate water availability the city installed a 250,000 gallon storage tank in 2017 and plans additional water storage projects.

Due to lack of a predictable water supply, the Yachats Steering Committee believes that the impacts of a potential event are much greater for the city than for the county. Although the city has IGA's to ensure deliverable water in the event of a water shortage, the South Lincoln County Water District and the City of Waldport have similar contamination concerns as Yachats. Funding was recently secured and emergency treatment machines capable of treating 9,000 gallons per day for drinking water were installed. In addition, the city Public Works Department has an ongoing water main inspection program to prevent the loss of water due to leaks. The city also has long range plans to construct a series of reservoirs with water storage capacity of up to 500,000 gallons (one 250,000 gallon tank completed in 2017). The city has a Water Management and Conservation Plan and program in place (Section 7 of their Water System Master Plan). In addition to reduced water supplies, a drought will increase the chances of wildfire and significantly reduce tourism activities. If hotels and rental houses, for example, are unable to accommodate guests, the city's economy would greatly suffer.

The city currently receives water from four (4) surface water sources: Yachats River, Cape Creek, Reedy Creek, and Salmon Creek.<sup>11</sup> Water from the city reservoirs is treated at the water treatment facility that can treat up to 0.50 million gallons per day (mgd) or 350 gallons per minute. Following treatment water flows via water transmission mains to four water storage reservoirs (combined 1.21 million gallons capacity) in the northern half of the city at elevations ranging from 210 to 545 feet. Most of the system utilizes 6- or larger diameter pipes. There are two pump stations that boost pressure to higher elevations. The City has enough capacity to meet current and anticipated future demand.

#### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the probability of future drought conditions (low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation) is expected to be more frequent by the 2050s.

## Vulnerability Assessment

Due to insufficient data and resources, Yachats is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks apply to humans and resources. Industries important to the City of Yachats's local economy such as fishing have historically been affected, and any future droughts would have tangible economic and potentially human impacts.

In addition to reduced water supplies, a drought will increase the chances of wildfire and significantly reduce tourism activities. If hotels, for example, are unable to accommodate guests, the city's economy would greatly suffer.

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<sup>11</sup> [Yachats Water Master Plan](#), 2001.

## Earthquake

The steering committee determined that the city's probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a CSZ event is **high**, meaning that more than 10% of the City's population or property could be affected by a major CSZ earthquake event. The steering committee determined that the city's probability for a crustal earthquake event is **low**, meaning one incident may occur within the next 100 years and that their vulnerability to a Crustal Earthquake event is **moderate**, meaning that between 1% and 10% of the city's population or property could be affected by a major crustal earthquake event. *The city's probability to crustal earthquake was decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of earthquake hazards, as well as the history, location, extent, and probability of a potential event. Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>12</sup>

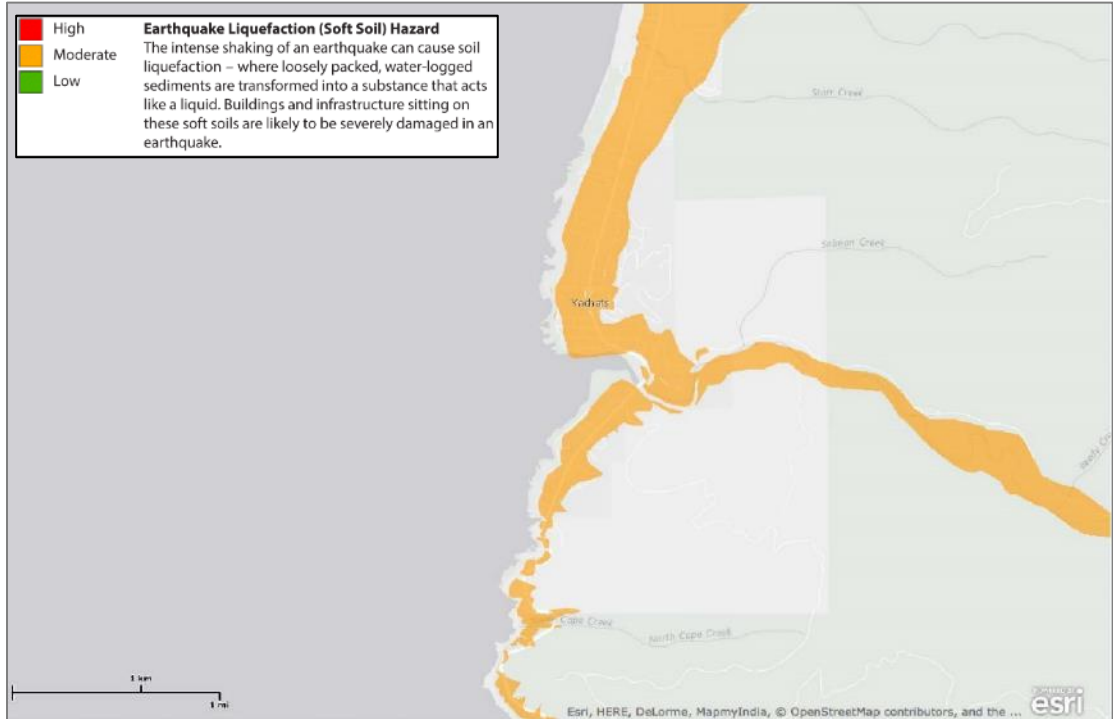
The Oregon Department of Geology and Mineral Industries (DOGAMI), in partnership with other state and federal agencies, has undertaken a rigorous program in Oregon to identify seismic hazards, including active fault identification, bedrock shaking, tsunami inundation zones, ground motion amplification, liquefaction, and earthquake induced landslides.

The figures below show earthquake hazards that affect the city, including the soft soil/liquefaction hazard (Figure YA-6), expected ground shaking for crustal events (Figure YA-7), and for the Cascadia Subduction Zone event (Figure YA-8). The extent of the damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. The soft soils figure below shows that in general the soils in Yachats have low to moderate liquefaction potential; the areas of the population along the coastline are more susceptible to liquefaction than areas further in land and away from rivers.

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<sup>12</sup> DLCD. *Oregon State Natural Hazard Mitigation Plan*. 2020 (Draft).

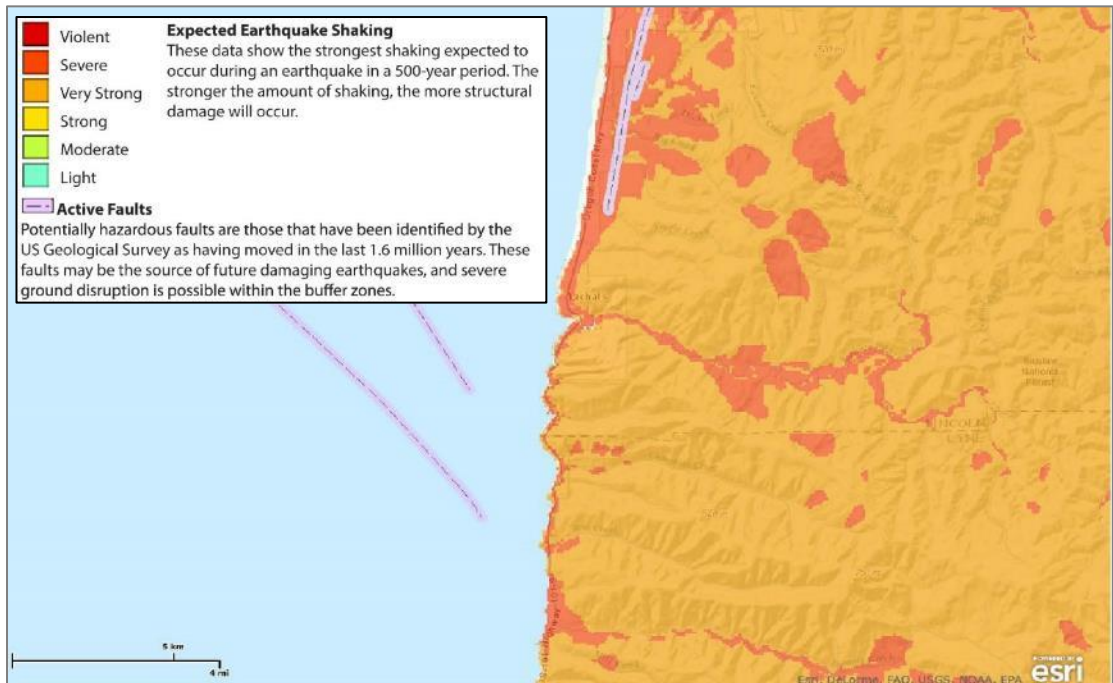
**Figure YA-6 Earthquake Liquefaction (Soft Soil) Hazard**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

Shaking from the combined earthquake scenario is expected to be very strong to violent for much of Yachats as shown in Figure YA-7. The figure also shows active onshore and offshore faults.

**Figure YA-7 Combined Earthquake Events Expected Shaking and Active Faults**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.



Figure YA-8 shows expected shaking with a Cascadia Earthquake. The figure shows that the entire city will receive severe to violent shaking.

**Figure YA-8 Cascadia Earthquake Expected Shaking**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.

The city's concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described above are cause for significant effort toward mitigating the earthquake hazard. The city's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water and sewer treatment systems, and City Hall were identified by the steering committee as vulnerable assets. The city would also expect damage to roads following a CSZ event, as well as deaths and severe injuries region wide. Education and outreach regarding the CSZ is an on-going endeavor in Yachats.

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community characteristics section (Table YA-4), approximately 62% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard (according to the Risk

Report 47% of all buildings are pre-code and 19% are low code)<sup>13</sup>. Information on specific public buildings' (schools and public safety) estimated seismic resistance, was determined by DOGAMI in 2007. The only facility evaluated by DOGAMI was the former Yachats RFPD building at 217 W 2<sup>nd</sup> Street.

### Mitigation Activities

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by Yachats agencies or organizations.

A primary mitigation objective of the city is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Although seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>14</sup> have not been used by the city, the School District has retrofitted at risk schools in Waldport, that serve Yachats students, through local resources (see the Lincoln County School District addendum for more information). Additionally, the fire district relocated to a site at higher ground north of downtown Yachats (2056 Hwy 101 N).

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to earthquake. The Risk Report provides a distinct profile for Yachats.

According to the Risk Report the following resident population and property (public and private) within the study area may be impacted by the profiled magnitude 9.0 Cascadia Subduction Zone (CSZ) event. *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Yachats may be impacted by the profiled earthquake scenarios (Table YA-6). *Note: Due to the simultaneous nature of a CSZ earthquake and tsunami, loss estimates have been separated in the following tables to avoid double counting. Building losses within the tsunami zone are considered total. See the tsunami section for additional information.*<sup>15</sup>

Approximately 19% of the City's population (131 people) may be displaced by a magnitude 9.0 CSZ earthquake and tsunami event. Of those, approximately less than 1% will be impacted by the accompanying tsunami. *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Earthquakes will impact every building in the City, to some degree, by a CSZ magnitude 9.0 earthquake and tsunami. Building damage (loss) estimates

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<sup>13</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table D-2.

<sup>14</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

<sup>15</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-20.

are reported for buildings expected to be damaged by the earthquake outside of the tsunami inundation zone (medium-sized). Additional exposure information is provided for buildings within the tsunami inundation zone to obtain the combined total damage (loss) estimate. Buildings reported as “damaged” in the area *outside* the tsunami zone include yellow tagged (extensive, limited habitability) and red tagged (complete, uninhabitable) buildings, while 100% of buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable). The City has 321 buildings that are expected to be damaged by the CSZ earthquake and tsunami event. The combined (earthquake and tsunami) value of building damage losses are \$41.6 million.

The Risk Report estimated losses show that the age of the building stock is the primary metric of earthquake vulnerability. Communities with older building stock are expected to have higher losses. However, if buildings were retrofitted to at least “moderate code” standards the impact of the event would be reduced. The Risk Report concludes that loss estimates for the City drop from 22% to 16% (\$10.5 million decrease in loss) when all buildings are upgraded to at least moderate code level.<sup>16</sup> *Note: earthquake vulnerability retrofit benefits are minimized in areas of liquefaction and landslide where additional geotechnical mitigation would be needed.*

**Table YA-6 Potentially Displaced Residents and Exposed Buildings, Earthquake**

Community Overview: Yachats						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
690		1,050		1	160,911,000	
Exposure Analysis: Earthquake CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
125	18.1%	289	27.5%	1	35,498,000	22.1%
Exposure Analysis (within Tsunami Zone - Medium)						
6	0.9%	32	3.0%	0	6,089,000	3.8%
Total Exposure						
131	19.0%	321	30.6%	1	41,587,000	25.8%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-20. Note: City population based on the 2010 Census population.

**Critical Facility Vulnerability<sup>17</sup>**

- Yachats Fire Station and South Lincoln Ambulance Service (Fire District)

Note 1: It is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Yachats by sea and air will be necessary.

<sup>16</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table B-2.

<sup>17</sup> Ibid, Table A-21.

Note 2: The city also expects city hall and their water treatment and wastewater treatment plants and systems to be impacted by earthquake.

## Tsunami

The steering committee determined that the city's probability for a distant tsunami event is **moderate** meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a distant tsunami event is **low**, meaning that less than 1% of the city's population or property could be affected by a major distant tsunami event. The steering committee determined that the city's probability for a local tsunami event is **moderate**, meaning one incident may occur within the next 35 to 75 years and that their vulnerability to a local tsunami event is **high**, meaning that more than 10% of the City's population or property could be affected by a major local tsunami event. *The city's probability to distant tsunami decreased since the previous NHMP, all other ratings have remained the same.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of tsunami hazards, as well as the history, location, extent, and probability of a potential event. The Pacific Northwest experienced a subduction zone earthquake estimated at magnitude 9 on January 26, 1700. The earthquake generated a tsunami that caused damage as far away as Japan. Cascadia subduction zone earthquakes and associated tsunamis have occurred on average every 500 years over the last 3,500 years in the Pacific Northwest. The time between events has been as short as 100 to 200 years and as long as 1,000 years. The geologic record indicates that over the last 10,000 years approximately 42 tsunamis have been generated off the Oregon Coast in connection to ruptures of the CSZ (19 of the events were full-margin ruptures and arrived approximately 15-20 minutes after the earthquake).<sup>18</sup> Distant tsunamis happen more regularly than CSZ related local tsunamis.

It is difficult to predict when the next tsunami will occur. According to the Oregon NHMP the coast has experienced 25 distant tsunamis in the last 145 years with only three causing measurable damage. Thus, the average recurrence interval for tsunamis on the Oregon coast from distant sources would be about six (6) years. However, the time interval between events has been as little as one year and as much as 73 years. Since only a few tsunamis caused measurable damage, a recurrence interval for distant tsunamis does not have much meaning for the City.

A 9.0 magnitude earthquake originating from Japan caused approximately \$7.1 million worth of damages along the Oregon Coast. Particularly, there was extensive damage to the Port of Brookings (Curry County; \$6.7 million), as well as the Port of Yachats (Lincoln County; \$182,000), and Charleston Harbor (Coos County; \$200,000); Salmon Harbor on Winchester Bay (Douglas County) and the South Beach Marina in Newport (Lincoln County) were also affected. On March 15, 2011 Governor Kitzhaber declared a State of Emergency was declared by Executive Order in Curry County. Approximately 40% of all docks at the Port of Brookings were destroyed or rendered unusable (including a dock leased by the U.S. Coast Guard) compromising commercial fishing and U.S. Coast Guard operations. Along the Oregon Coast local officials activated the Emergency Alert System and sirens, implemented "reverse 9-1-1" and conducted door-to-door notices in order to evacuate people from the tsunami inundation zone. Local governments activate their Emergency Operations Centers

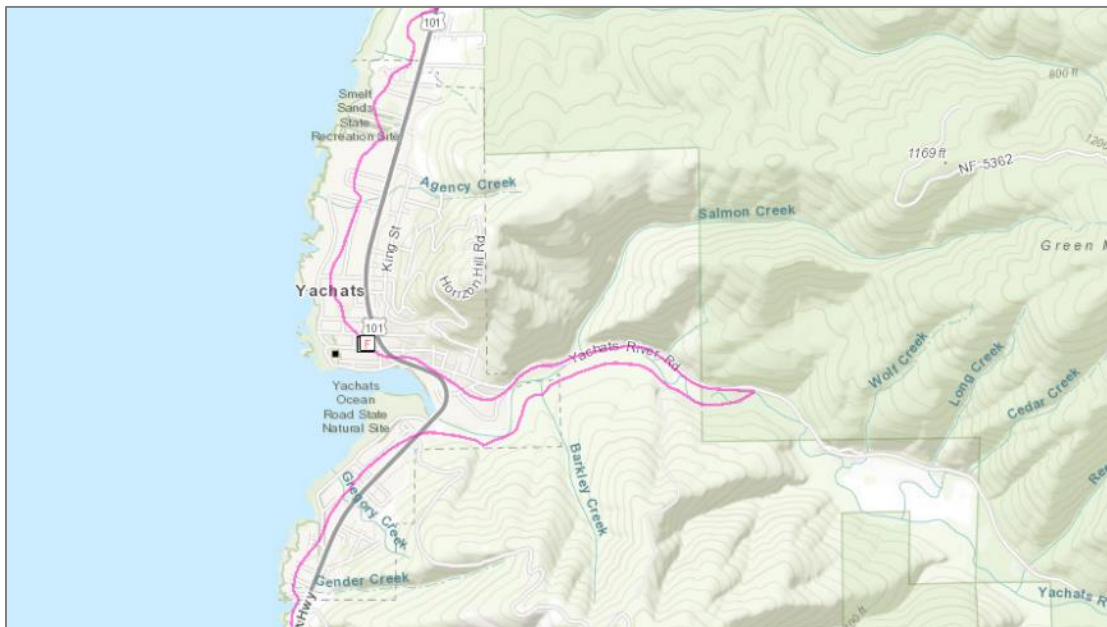
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<sup>18</sup> Oregon Natural Hazard Mitigation Plan. Department of Land Conservation and Development. 2015

and the state activated its Emergency Coordination Center. For more information view Volume II, Hazard Annex.

In 1995, the Department of Geology and Mineral Industries (DOGAMI) conducted an analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquake. The tsunami maps were produced to help implement Senate Bill 379 (SB 379); digitized in 2014 (O-14-09). SB 379, implemented as Oregon Revised Statutes (ORS) 455.446 and 455.447, and Oregon Administrative Rules (OAR) 632-005, limit construction of new essential facilities and special occupancy structures in tsunami flooding zones. Figure YA-9 shows the regulatory tsunami inundation line showing that much of the residential development west of Highway 101 is impacted by tsunami inundation. Note: HB 3309 (2019) effective January 1, 2020 repealed the ban on building “new essential facilities, hazardous facilities, major structures, and special occupancy structures” inside the tsunami inundation zone (SB 379 line):<sup>19</sup>

**Figure YA-9 Regulatory (SB 379) Tsunami Inundation Line**



Source: [Oregon HazVu: Statewide Geohazards Viewer](#) – To explore and view map detail click hyperlink to left.

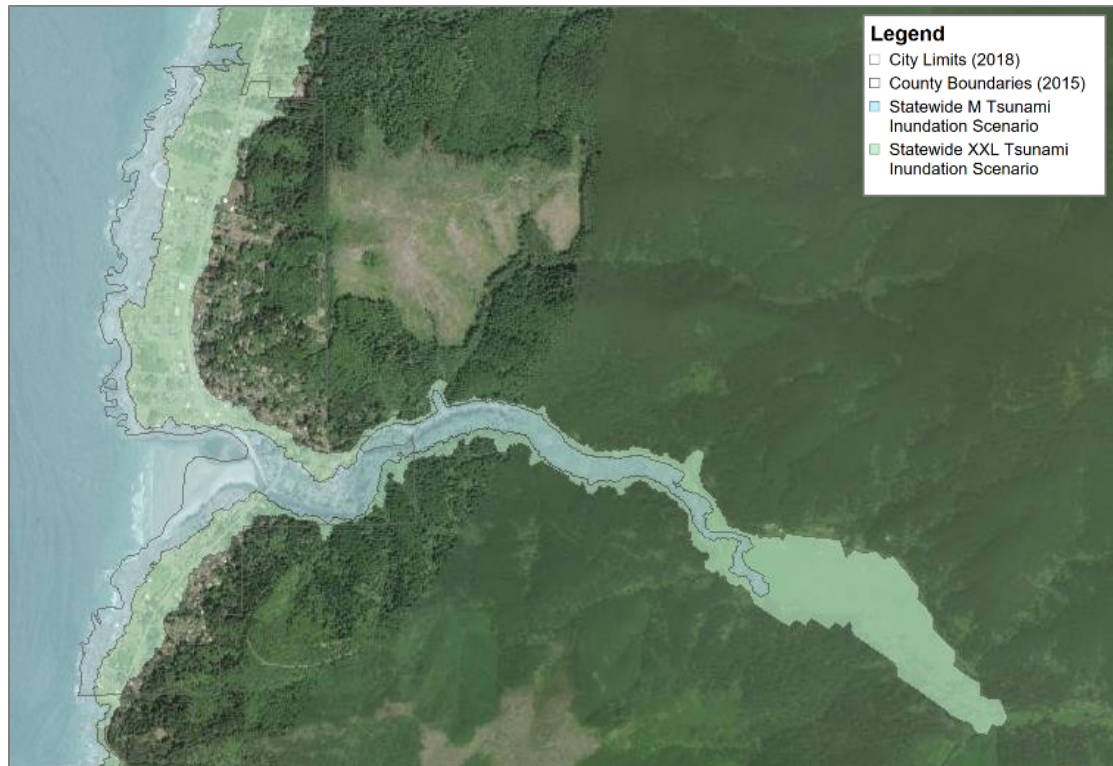
Tsunami inundation maps were created by the Department of Geology and Mineral Industries (DOGAMI) to be used for emergency response planning for coastal communities. Maps were created for local and distant source tsunami events. The local source tsunami inundation maps display the output of computer modeling showing five tsunami event scenarios shown as “T-shirt” sizes S, M, L, XL, and XXL. Figure YA-10 shows the M and XXL tsunami inundation scenarios. The distant source tsunami inundation maps show the potential impacts of tsunamis generated by earthquakes along the “Ring of Fire” (the Circum-Pacific belt, the zone of earthquake activity surrounding the Pacific Ocean). The distant tsunami inundation maps model the 1964 Prince William Sound event (Alaska M9.2)

<sup>19</sup> Oregon Legislature. HB 3309 (2019).

<https://olis.leg.state.or.us/liz/2019R1/Downloads/MeasureDocument/HB3309>

and a hypothetical Alaska Maximum event scenario; only the Alaska Maximum Wet/ Dry Zone is shown on the map. Both the local and distant source tsunami inundation maps show simulated wave heights and inundation extents for the various scenarios.

**Figure YA-10 Tsunami Inundation Map (M and XXL Scenarios)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

For more information on the regulatory and non-regulatory maps visit the Oregon Tsunami Clearinghouse resource library:

Regulatory (SB 379) - <http://www.oregongeology.org/tsuclearinghouse/pubs-regmaps.htm>  
(Note: HB 3309, effective January 1, 2020, repealed ban on building essential facilities within the tsunami inundation zone, SB 379 line.)

Non-Regulatory Tsunami-Inundation Maps:

<http://www.oregongeology.org/tsuclearinghouse/pubs-inumaps.htm>

Evacuation maps (brochures) are available for the populated areas of Lincoln County. The Department of Geology and Mineral Industries (DOGAMI) developed the evacuation zones in consultation with local officials; local officials developed the routes that were reviewed by the Oregon Department of Emergency Management (OEM). The maps show the worst-case scenario for a local source and distant source tsunami event and are not intended for land-use planning or engineering purposes.

For more information on the evacuation brochures visit the Oregon Tsunami Clearinghouse resource library:

<http://www.oregongeology.org/tsuclearinghouse/pubs-evacbro.htm>

A free application is also available that displays the evacuation routes in coastal areas of Oregon: [http://www.nanoos.org/mobile/tsunami\\_evac\\_app.php](http://www.nanoos.org/mobile/tsunami_evac_app.php)

## Vulnerability Assessment

See Earthquake and tsunami impact analysis for coastal Lincoln County, Oregon (2021, [O-21-02](#)) for additional information. *Note: DOGAMI published this report after approval of the 2020 NHMP. A future update of this NHMP will examine the contents of this report in more detail.*

In 2013, DOGAMI produced new Tsunami Inundation Maps (TIMs) for the entire Oregon coast. The TIMs identify both local and distant Tsunami Inundation Zones (TIZs) by event size. The maps also tabulate the affected buildings located within the local and distant source tsunami inundation zones. The Risk Report section below provides detailed information on the impact to the City from a CSZ earthquake and medium tsunami.

When the tourist population swells, many are spending time at accommodations, facilities, or along the beach/bluff-line in these vulnerable locations. An existing assisted living facility (Sea Aire Assisted Living Facility, 1882 Hwy 101 N) is located on the eastern fringe of the tsunami inundation zone. Additionally, the city water and wastewater treatment plants and city hall are among the buildings within the local source tsunami inundations zone. Severe damage could occur to low-lying areas of the city, including roads, bridges, communication systems, and infrastructure within Yachats, among other assets described in the county's plan. The City of Yachats recognizes the importance of continuing education and outreach, especially to the transient populations (i.e., tourists), and plans to implement greater outreach in the future. The city utilizes a reverse 911 service as the tsunami warning system; rental houses are notified if a land line is present.

As shown in Table YA-4 there are about 23 manufactured housing units (mobile homes) in Yachats. Manufactured homes built prior to 2003 are subject to slipping off their foundations potentially compromising the occupants' ability to exit. The compromised egress may hinder timely evacuation.

Population vulnerability is characterized in terms of exposure, demographic sensitivity, and short-term resilience of at-risk individuals. Nate Wood, et al. (USGS) performed a cluster analysis of the data for coastal communities in the Pacific Northwest to identify the most vulnerable communities in the region.<sup>20</sup> Wood, et al. conducted a comprehensive analysis to derive overall community clusters based on (1) the number of people and businesses in the tsunami hazard zone, (2) the demographic characteristics of residents in the zone, and (3) the number of people and businesses that may have insufficient time to evacuate based on slow and fast walking speeds. According to the study Lincoln County (including Yachats) has relatively low numbers of "residents, employees, or customer-heavy businesses" inside the tsunami hazard zones and will likely have enough time to reach high ground before a tsunami wave arrives.

In 2019, DOGAMI published a tsunami evacuation analysis using the XXL inundation zone which covers the largest CSZ event likely to occur based on the historical record.<sup>21</sup> Safety is reached when evacuees have reached "high ground", or 20 feet beyond the limit of tsunami inundation. An analysis was conducted for Yachats. According to the model the first waves

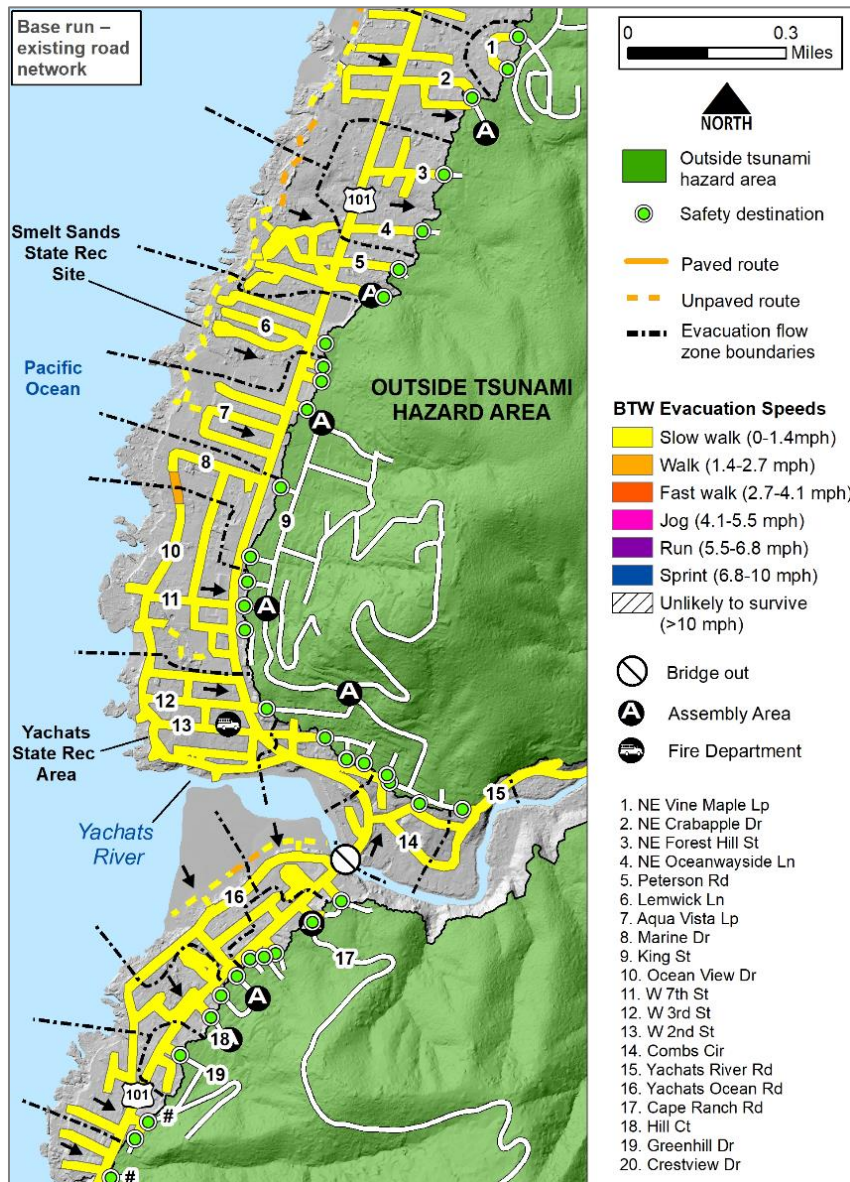
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<sup>20</sup> Nathan J. Wood, Jeanne Jones, Seth Spielman, and Mathew C. Schmittlein. "Community clusters of tsunami vulnerability in the US Pacific Northwest", PNAS 2015 112 (17) 5354-5359.

<sup>21</sup> DOGAMI, Open-File Report O-19-06.

arrive along the open coast 26 minutes after the start of earthquake shaking with most of Yachats inundated about 4 minutes later. North Yachats from Camp One to Starr Creek Dr is expected to be completely inundated under the XXL tsunami inundation scenario. High ground is generally accessible at a slow walking speed of 2 feet per second (fps) or 1.4 mph. Evacuees closer to the ocean (Ocean View Dr and Yachats Ocean Rd) will need to move faster in order to beat the wave and make it to high ground (see Figure YA-11 ). It is expected that the Yachats River Bridge will fail, and that north and south parts of Yachats will be disconnected during a tsunami. Prompt evacuation, knowledge of the route, signage, and alternative route designation due landslide activity is necessary to improve evacuation speeds. For details see *Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast* (DOGAMI, 2019, [0-19-06](#)).

**Figure YA-11 Beat the Wave modeling in Yachats (CSZ earthquake XXL inundation zone)**



Source: DOGAMI, Open-File Report O-19-06.



Natural Hazard Risk Report for Lincoln County

The Risk Report (DOGAMI, O-20-11) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to tsunami. The Risk Report provides a distinct profile for Yachats.

The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for each community. According to the Risk Report the following resident population and property (public and private) within Yachats may be impacted by the profiled tsunami scenario (Table YA-7).

About 12% the city’s population (85 people) may be displaced by a magnitude 9.0 CSZ tsunami event (note there are additional people that will be displaced by the earthquake). This is fewer people than those exposed within the Senate Bill 379 line (215 people). *Note: The data does not include potentially impacted visitor populations that may be lodging or at a public venue during a CSZ earthquake and tsunami event.* Building damage (loss) estimates are reported for buildings expected to be damaged by the tsunami inundation zone (medium-sized and SB 379). All 169 buildings exposed *inside* the tsunami inundation area are considered “damaged” (complete, uninhabitable); the number of buildings damaged is higher under the SB 379 scenario (408 buildings).

**Table YA-7 Potentially Displaced Residents and Exposed Buildings, Tsunami**

Community Overview: Yachats						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
690		1,050		1	160,911,000	
Exposure Analysis: Tsunami CSZ M9.0 (Deterministic) Scenario						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
85	12.3%	169	16.1%	0	37,266,000	23.2%
Exposure Analysis: Tsunami SB 379 Regulatory Line						
215	31.2%	408	38.9%	0	67,112,000	41.7%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-20. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>22</sup>

There are no critical facilities exposed to the profiled tsunami inundation scenario.

Note 1: Although critical facilities are not exposed to the profiled tsunami scenarios it is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into Yachats by sea and air will be necessary.

<sup>22</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-21.

Note 2: The city expects city hall and their water treatment and wastewater treatment plants and systems to be impacted by the M (water treatment plant) and XXL tsunami inundation scenarios (city hall and wastewater treatment plant).

For more information, see the following DOGAMI reports:

- Tsunami evacuation analysis of Yachats and unincorporated Lincoln County: Building community resilience on the Oregon coast (2019, [O-19-06](#))

## Flood

The steering committee determined that the city's probability for riverine or coastal flood is **high**, meaning at least one incident is likely within the next 35-year period and that their vulnerability to coastal or riverine flood is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major coastal or riverine flood event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of coastal and riverine flood hazards, as well as the history, location, extent, and probability of a potential event.

The Yachats River and the Pacific Ocean are the primary sources of flooding— typically due to coastal flood and rain. The extent of flooding varies depending on height of tides, rainfall, and/or precipitation levels throughout the year.

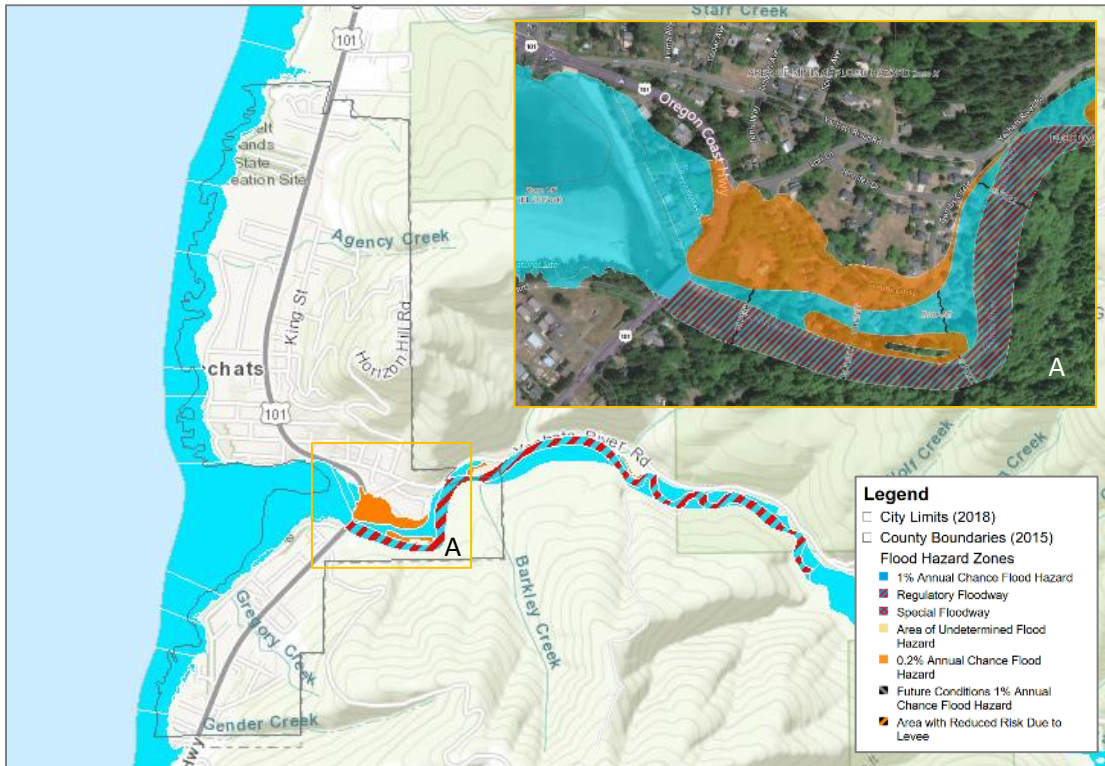
FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (a flood with a one percent probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood; also known as the Special Flood Hazard Area (SFHA). The SFHA is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods (Figure YA-12). These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (a flood with a 0.2-percent probability of occurring within any given year) floodplain boundaries for identified flood hazards. These maps represent a snapshot in time, and do not account for later changes which occurred in the floodplains. According to Oregon Explorer about 17% of the City is within the 100-year floodplain, and an additional 4% is within the 500-year floodplain (see Figure YA-12).

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. The probability of winter flood risk will increase within coastal rain-dominated watersheds (such as the Siletz River) due to projected greater winter precipitation and warmer winter temperatures that will cause precipitation to fall more as rain than snow. There will also be an increase in atmospheric river events. Additionally, coastal flooding is expected to increase due to sea level rise (SLR) and changing wave dynamics. Sea level is projected to rise by 1.7 to 5.7 feet by 2100. Tidal wetlands and

estuaries throughout the county are also expected to experience changes to their composition and area, thereby impacting their ability to naturally mitigate flood events.

**Figure YA-12 Flood Hazard Zones (100- and 500-year floodplains)**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

## Vulnerability Assessment

A floodplain vulnerability assessment combines the floodplain boundary, generated through hazard identification, with an inventory of the property within the floodplain. Understanding the population and property exposed to natural hazards will assist in reducing risk and preventing loss from future events.

The City of Yachats's Steering Committee notes that a couple of homes along Gender Creek located south of the Yachats River have flooded in recent history, most likely from debris that clogs storm drains (possibly from recent logging activity). The city is currently taking steps to address infrastructural vulnerabilities associated with seasonal flooding and flooding associated with storm drain systems. The city's water intake system was upgraded in such a way that improved maintenance capabilities and will reduce potential flood impacts. The city is reviewing its Storm Water Master Plan to identify a list of projects intended to mitigate localized flooding that's associated with clogged or overloaded drains. Except for some pump stations, there are no critical city facilities located in flood hazard areas. Houses along Bayview Terrace near the bridge (see Figure YA-12, Area A), and west of Yachats Ocean Rd, may be more vulnerable to flooding due to low elevation. The Yachats Stormwater Master Plan includes additional information on flood impacts to the community and includes additional mitigation actions.

## Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to flood. The Risk Report provides a distinct profile for Yachats.

The Risk Report provides a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). The 100-year flood scenario is used for reporting since it is commonly used as a reference level for flooding and is the standard FEMA uses for regulatory purposes. In addition to the riverine flood scenarios coastal flooding information is available for the 100-year flood scenario for the city. The Risk Report only analyzed buildings within a flood zone, or within 500 feet of a flood zone. First-floor building height and presence of basements was also considered. Buildings with a first-floor height above the flood level were not included in the flood loss estimate, however, their assumed building occupants (residents) were counted as potentially displaced. According to the Risk Report the following resident population and property (public and private) within Yachats may be impacted by the profiled flood scenario (Table YA-8).

**Table YA-8 Potentially Displaced Residents and Exposed Buildings, Flood**

Community Overview: Yachats						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
690		1,050		1	160,911,000	
Exposure Analysis: Flood (1% Annual Chance)						
Potentially Displaced Residents		Damaged Buildings			Exposed Building Value	
Number	Percent	Number	Percent	Critical Facilities	Loss Estimate (\$)	Loss Ratio
13	1.9%	7	0.7%	0	81,000	0.1%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-20. Note: City population based on the 2010 Census population.

Less than two percent (2%) of the City's population (13 people) may be displaced by flooding. These people are expected to have mobility or access issues due to surrounding water. Similarly, less than one percent (1%) of the City's buildings (7 buildings) are exposed to the flood hazard and may be damaged. The loss estimate for exposed buildings is \$81,000. No critical facilities are vulnerable to the flood hazard.

### Critical Facility Vulnerability<sup>23</sup>

There are no critical facilities exposed to the profiled flood scenario.

## National Flood Insurance Program (NFIP)

FEMA's Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) are effective as of October 10, 2019. Table YA-9 shows that as of August 2019, the City has 130 National Flood Insurance Program (NFIP) policies in force, representing more than \$41.5 million in coverage. Of those, 31 are for properties that were constructed before the initial FIRMs. The

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<sup>23</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-21.

last Community Assistance Visit (CAV) for the City was March 7, 2001. The table shows that most flood insurance policies are for residential structures, primarily single-family homes. Flood insurance covers only the improved land, or the actual building structure. There have been five (5) paid flood insurance claims for a combined total of just under \$22,000.

The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

**Table YA-9 Flood Insurance Detail**

	Lincoln County	Yachats
Effective FIRM and FIS	10/18/2019	10/18/2019
Initial FIRM Date	-	3/1/1979
Total Policies	2,325	130
Pre-FIRM Policies	1,067	31
<b>Policies by Building Type</b>		
Single Family	1,685	125
2 to 4 Family	57	1
Other Residential	462	0
Non-Residential	121	4
Minus Rated A Zone	98	2
Minus Rated V Zone	3	0
Insurance in Force	\$585,856,500	\$41,498,700
Total Paid Claims	343	5
Pre-FIRM Claims Paid	265	3
Substantial Damage Claims	53	0
Total Paid Amount	\$5,479,221	\$21,833
Repetitive Loss Structures	64	1
Severe Repetitive Loss Properties	12	0
CRS Class Rating	NP	NP
Last Community Assistance Visit	-	3/7/2001

Source: Department of Land Conservation and Development, August 2019. Repetitive Flood Loss information provided by FEMA correspondence on September 10, 2020. NP = Not Participating.

The NFIP's Community Rating System (CRS) recognizes jurisdictions for participating in floodplain management practices that exceed NFIP minimum requirements. The City does not participate in the CRS and, therefore, does not receive discounted flood insurance premiums for residents in a special flood hazard zone. The Community Repetitive Loss record for Yachats identifies one (1) Repetitive Loss Property<sup>24</sup> and no Severe Repetitive Loss Properties<sup>25</sup>. The repetitive loss property is single-family residential.

<sup>24</sup> A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

<sup>25</sup> A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP, and has incurred flood-related damage for which 4 or more separate

## Landslide

The steering committee determined that the city's probability for landslide is **high**, meaning at least one incident is likely within the next 35-year period, and that their vulnerability to landslide is **high**, meaning that more than 10% of the City's population or property could be affected by a major landslide event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of landslide hazards, as well as the history, location, extent, and probability of a potential event.

The severity or extent of landslides is typically a function of geology and the landslide triggering mechanism. Rainfall initiated landslides tend to be smaller and earthquake induced landslides may be very large. Even small slides can cause property damage, result in injuries or take lives. Landslide susceptibility exposure for Yachats is shown in Figure YA-13. Approximately 42% of the City has very high or high, and 25% moderate, landslide susceptibility exposure.<sup>26</sup> *Note that even if a City has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of hazard and assets.*

### Future Climate Projection:

According to OCCRI report "*Future Climate Projections: Lincoln County*" (Appendix G) the intensity of extreme precipitation is expected to increase as the atmosphere warms. The magnitude of the wettest days and the wettest consecutive five days is expected to increase by about 13% (range 4% to 28%) by the 2050s under the higher emissions scenario relative to historical baselines. Landslide risk is not expected to change significantly.

## Vulnerability Assessment

Development pressure on steep slopes is an issue that Yachats is facing. Figure YA-13 shows that the areas most susceptible to landslide activity are on steep hillsides east of Highway 101 and southeast of the Yachats River.

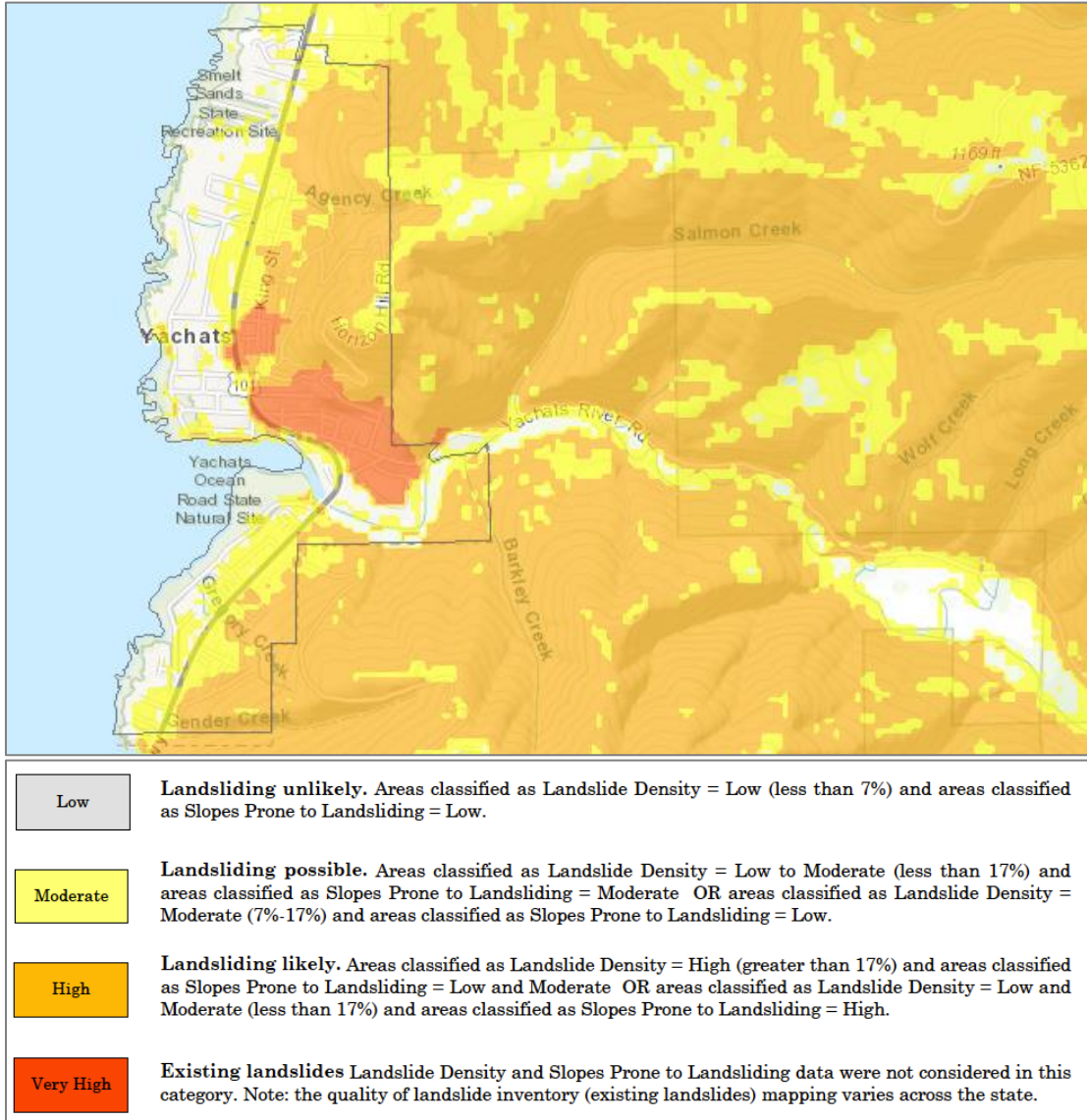
Site-specific geotechnical reports are required for development on steep hillsides, and city approval is also required for road construction and utility installation serving development on steep hillsides. Potential landslide-related impacts are adequately described within the county's plan, and include infrastructure damages, economic impacts (due to isolation and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Lincoln County, and thoroughfares beyond city limits are susceptible to obstruction as well. As such, Yachats is vulnerable to isolation for an extended period.

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claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000, and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

<sup>26</sup> DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

**Figure YA-13 Landslide Susceptibility Exposure**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report (DOGAMI, O-20-11)** provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Yachats.

The Risk Report provides an analysis of landslide susceptibility to identify the general level of susceptibility to landslide hazards, primarily shallow and deep landslides. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report the following resident population and property (public and private) within the city may be impacted by the profiled landslide scenario (Table YA-10).

Approximately 33% of the City's population (225 people) may be displaced by landslides. These people are expected to have mobility or access issues and/or may have their

residences impacted by a landslide. It is important to note that impact from landslides may vary depending on the specific area that experiences landslides during an event. Properties that are most vulnerable to the landslide hazard are those that are developed in an area of, or at the base of, moderate to steep slopes. Approximately 31% of all buildings (322 buildings) within the City are exposed to the High or Very High landslide susceptibility zones (see Figure YA-13). The value of exposed buildings is just over \$49 million (about 31% of total building value).

**Table YA-10 Potentially Displaced Residents and Exposed Buildings, Landslide**

Community Overview: Yachats						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
690		1,050		1	160,911,000	
Exposure Analysis: Landslide High & Very High Susceptibility						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
225	32.6%	322	30.7%	0	49,175,000	30.6%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-20. Note: City population based on the 2010 Census population.

Critical Facility Vulnerability<sup>27</sup>

There are no critical facilities exposed to the profiled landslide scenario.

**Severe Weather**

Severe wind events may occur throughout Oregon during all seasons. Often originating in the Pacific Ocean, westerly winds pummel the coast, slowing as they cross the Coastal mountain range and head into the inland valleys.<sup>28</sup> Similarly, severe winter storms consisting of rain, freezing rain, ice, snow, cold temperatures, and wind originate from troughs of low pressure offshore in the Gulf of Alaska or in the central Pacific Ocean that ride along the jet stream during fall, winter, and early spring months.<sup>29</sup> In summer, the most common wind directions are from the west or northwest; in winter, they are from the south and east. Local topography, however, plays a major role in affecting wind direction.

Future Climate Projections

Oregon and the Pacific Northwest experience a variety of extreme weather incidents ranging from severe winter storms and floods to drought and dust storms, often resulting in morbidity and mortality among people living in the impacted regions. According to the

<sup>27</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-21.

<sup>28</sup> US Department of Agriculture. <http://www.fsa.usda.gov/or/Notice/Flp104.pdf>.

<sup>29</sup> Interagency Hazard Mitigation Team. 2000. State Hazard Mitigation Plan. Salem, OR: Oregon Office of Emergency Management.



Oregon Climate Change Research Institute, climate change is expected to increase the frequency and intensity of some weather incidents.<sup>30</sup>

Climate change poses risks for increased injuries, illnesses and deaths from both direct and indirect effects. Incidents of extreme weather (such as floods, droughts, severe storms, heat waves and fires) can directly affect human health as well as cause serious environmental and economic impacts. Indirect impacts can occur when climate change alters or disrupts natural systems.

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) windstorm events are not expected to increase, however, air temperatures on the coldest day of the year will increase by about 5°F by the 2050s under the higher emissions scenario relative to historical baselines.

## Windstorm

The steering committee determined that the city’s probability for windstorm is **high** (the probability of tornado is also high), meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to windstorm is **high**, meaning that more than 10% of the City’s population or property could be affected by a major windstorm event. The Steering Committee rated the County as having a “**low**” **vulnerability to a tornado hazard**, meaning that less than 1% of the City’s population or property could be affected by a major tornado event. *The windstorm ratings have not changed since the previous NHMP. The tornado ratings are new with this version of the NHMP.*

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of windstorm hazards, as well as the history, location, extent, and probability of a potential event. Because coastal windstorms typically occur during winter months, ice, freezing rain, flooding, and very rarely, snow sometimes accompany them. More than likely, however, the coast’s winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Yachats is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. In Yachats, power outages are the greatest concern during windstorms. Building codes require new developments to place power lines below ground. Without power, communication is lost, and fuel and food stores shut down. Of concern are downed trees and damage to buildings. The city, in conjunction with some private utility companies, works to remove hazardous trees where possible. The county’s plan adequately identifies the remaining impacts and damages that can occur with windstorm events.

## Winter Storm (Snow/ Ice)

The steering committee determined that the city’s probability for winter storm is **high**, meaning at least one severe incident is likely within the next 35-year period, and that their vulnerability to winter storm is **high**, meaning that more than 10% of the city’s population or

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<sup>30</sup> Oregon Climate Change Research Institute <http://occri.net/wp-content/uploads/2011/04/chapter9ocar.pdf> Page 412.

property could be affected by a major winter storm event. *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of winter storm hazards, as well as the history, location, extent, and probability of a potential event. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. More than likely, however, the coast's winter will just be windy, cold, and wet.

## Vulnerability Assessment

Due to insufficient data and resources, Yachats is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Major winter storms can and have occurred in the Yachats area, and while they typically do not cause significant damage; they are frequent and have the potential to impact economic activity. Road closures on Highway 101, or the passes to the Willamette Valley (Hwy 126, 34, 20, and 18), due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

## Volcanic Event

The steering committee determined that the city's probability for volcanic event is **low**, meaning one incident is likely within the next 75 to 100-year period, and that their vulnerability to volcanic event is **low**, meaning that less than 1% of the city's population or property would be affected by a major volcanic event (ash/lahar). *These ratings have not changed since the previous NHMP.*

Volume I, Section 2 of Lincoln County's NHMP adequately describes the causes and characteristics of volcanic event hazards, as well as the history, location, extent, and probability of a potential event. Generally, an event that affects the county is likely to affect Yachats as well.

## Vulnerability Assessment

Due to insufficient data and resources, Yachats is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. Yachats is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens erupted in 1980, the city received small amounts of ashfall, but not enough to cause significant health and/or economic damages.

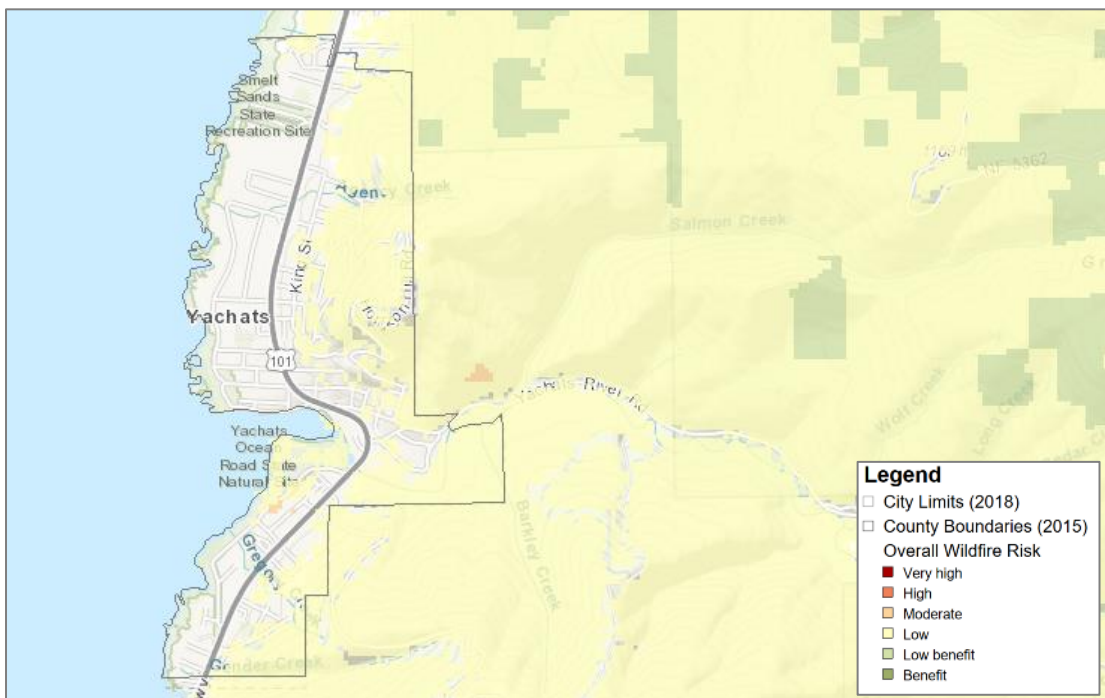
## Wildfire

The steering committee determined that the city's probability for wildfire is **high**, meaning at least one incident is likely within the next 35-year period, and that their vulnerability to wildfire is **moderate**, meaning that between 1% and 10% of the City's population or property could be affected by a major wildfire event. *The vulnerability rating has decreased since the previous NHMP.*

The [Lincoln County Community Wildfire Protection Plan \(CWPP\)](#) was completed in 2010 and revised in 2018. CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve to supplement the wildfire section in this addendum.

Volume I, Section 2 of Lincoln County’s NHMP adequately describes the causes and characteristics of wildfire hazards, as well as the history, location, extent, and probability of a potential event. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Wildfires in 1849 and 1936 were particularly devastating in Lincoln County, but since then, there have been few large events. As shown in Figure YA-14 the City has mostly low, with some moderate, overall wildfire risk. Resource lands that are actively managed for forest uses surround the City of Yachats. Weather conditions are primarily at cause for the hazard level, the steering committee noted that the current drought conditions have heightened fire conditions in the area and likely have increased the probability of a wildfire occurrence. Due to the prevailing wind patterns (i.e., from the north or south), the city’s steering committee felt that the east end of the city might be the most vulnerable. Power, natural gas, and phone lines run through the forest to the east of the city and would be affected in the event of a wildfire. Likewise, active commercial logging occurs just outside the city, and slash burns are a potential wildfire concern.

**Figure YA-14 Overall Wildfire Risk**



Source: [Oregon Explorer: Map Viewer](#) – To explore and view map detail click hyperlink to left.

**Future Climate Projection:**

According to OCCRI report “*Future Climate Projections: Lincoln County*” (Appendix G) wildfire risk is expected to increase as the frequency of higher fire danger days per year increases by 37% by the 2050s under the higher emissions scenario compared with the historical baseline.

## Vulnerability Assessment

Overall, the city, and its watershed, has low to moderate overall wildfire risk, however, the forested areas have the potential for large wildfires and a wildfire within the watershed could impact the city's water supply and quality. Commercial forestry and harvesting activities increase the potential for wildfires. In addition, development on the ridgeline along the eastern boundary of the city has increased over the last few years, making this urban/rural interface more vulnerable to wildfires.

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Exposed infrastructure including wastewater main lines, major water lines, natural gas pipeline and fiber optic lines are buried, decreasing their vulnerability to damage from wildfire hazards. However, wildfire conditions could potentially limit or delay access for the purposes of operation or repair.

### Natural Hazard Risk Report for Lincoln County

The **Risk Report** ([DOGAMI, O-20-11](#)) provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to landslide. The Risk Report provides a distinct profile for Yachats.

The Risk Report provides an analysis of the West Wide Wildfire Risk Assessment's Fire Risk Index (FRI) High Hazard category to identify the general level of susceptibility to the wildfire hazard. The Risk Report performed an analysis of buildings, including critical facilities, to determine exposure for the City. According to the Risk Report there are no resident population and property (public and private) within the City that may be impacted by the profiled wildfire scenario (Table YA-11).

**Table YA-11 Potentially Displaced Residents and Exposed Buildings, Wildfire**

Community Overview: Yachats						
Population		Buildings		Critical Facilities	Total Building Value (\$)	
690		1,050		1	160,911,000	
Exposure Analysis: Wildfire High-Hazard						
Potentially Displaced		Exposed Buildings			Exposed Building	
Number	Percent	Number	Percent	Critical Facilities	Value (\$)	Percent
0	0.0%	0	0.0%	0	0	0.0%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-20. Note: City population based on the 2010 Census population.

### Critical Facility Vulnerability<sup>31</sup>

There are no critical facilities exposed to the profiled wildfire scenario.

<sup>31</sup> DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-21.

# ATTACHMENT A: ACTION ITEM FORMS

Table YA-1 and Table YA-12 provide a summary list of actions for the city. Each high priority action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table YA-12 Action Item Timelines, Status, High Priority and Related Hazards**

Action Item	Priority	Timeline	Status	Related Hazard										
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm	
Yachats #1		Long	Ongoing			X				X				
Yachats #2	X	Ongoing	Ongoing			X	X			X				
Yachats #3	X	Ongoing	Ongoing				X			X				
Yachats #4		Ongoing	Ongoing				X							
Yachats #5	X	Short	Ongoing		X	X				X				
Yachats #6	X	Short	Ongoing	X			X	X				X		
Yachats #7		Long	Ongoing	X										
Yachats #8		Long	Ongoing				X							
Yachats #9	X	Long	Ongoing							X				
Yachats #10	X	Short	New		X									
Yachats #11	X	Long	New		X							X		
Yachats #12	X	Long	New		X							X		
Yachats #13		Medium	New		X							X		

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The City NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the City. Existing programs and other resources that might be used to implement these action items are identified. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity..

County level actions that the city is listed as a partner are shown in Table YA-13. These actions are led by the County, however, the City will incorporate elements of the action that are applicable to their jurisdiction.

**Table YA-13 County Specified Actions that the City is Partner**

Action Item (2015 NHMP)	City Partner	Action Item
MH #1	Yes	Consider Local Energy Assurance Planning for critical areas countywide
MH #2	Yes	Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers
MH #3	Yes	Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.
MH #4	Yes	Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.
MH #5	Yes	Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.
MH #6	Yes	Integrate the NHMP into County and City comprehensive plans.
MH #7	Yes	Prepare long-term catastrophic recovery plan
MH #8		Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.
CE #1	Yes	Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.
CE #2	Yes	Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.
EQ #1	Yes	Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.
EQ #2	Yes	Identify, inventory, and retrofit critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).
EQ #3	Yes	Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.
TS #1	Yes	Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g.,



Action Item (2015 NHMP)	City Partner	Action Item
		hospitals, nursing homes, etc.) that are within the tsunami inundation zone and likely to be impacted by tsunami.
TS #2	Yes	Implement land use strategies and options to increase community resilience
FL #1	Yes	Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)
FL #2	Yes	Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.
FL #3		Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas
FL #4	Yes	Continue compliance with the National Flood Insurance Program (NFIP).
LS #1	Yes	Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.
LS #2	Yes	Protect existing development in landslide-prone areas.
LS #3	Yes	Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.
SW #1	Yes	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).
SW #2	Yes	Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.
WF #1	Yes	Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.

<b>Mitigation Action: Yachats #1</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Identify over-water transportation alternatives in the event of bridge collapse in an earthquake and/or tsunami.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>In the event of a Cascadia Subduction Zone (CSZ) earthquake and/or tsunami, it is possible the U.S. Highway 101 bridge in Yachats would fail. Essential transportation services would need to be restored. Community is most concerned about retaining access to Waldport which will provide evacuation shelters. Tsunami destruction can come from both the tsunami wave and from the rapid retreat of the water from the coastline. Tsunami waves tend to be fast moving, rising surges of water.</p> <p>The average recurrence interval for a CSZ event is between 500 and 600 years. There have been seven CSZ events in the last 3500 years with time between individual events varying from 150 to 1000 years. The last CSZ event occurred approximately 315 years ago.</p> <p>Restoration of key infrastructure is essential after a natural disaster "to support the industry and the jobs it provided." To sustain the economy, communities should "provide for temporary infrastructure while long-term rebuilding efforts are underway." Source: Governor's Commission Report on Recovery, Rebuilding, and Renewal. After Katrina: Building Back Better than Ever. December 31, 2005. p. 112.</p>						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
<p>Build boat launches in strategic locations to serve as bridge replacements after an earthquake and tsunami.</p> <p>Obtain emergency equipment in preparation for an earthquake and/or tsunami event. Purchase flatcars to use as temporary bridges.</p>				<p><u>2020 Update:</u></p> <p>The City is identifying forest service roads as an alternative and developing maps of the forest service roads. This is an ongoing process.</p>		
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning			Lincoln County Emergency Services, ODOT, NOAA, CERT			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Yachats Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Yachats #2</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Continue to maintain and keep stocked two mobile storage containers with emergency supplies and equipment.		<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The City of Yachats is vulnerable to a Cascadia Subduction Zone earthquake/tsunami event. Other natural hazards such as flood, landslide and windstorm can leave populations without basic resources during emergencies.</p> <p>The city chooses to be proactive in being prepared to provide basic services when disrupted by natural hazard events.</p>						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
<p>Two portable storage containers will be stocked with emergency supplies and equipment and be strategically placed in key locations.</p> <p>Seek funding to maintain and keep each unit stocked.</p> <p>Continue community education and outreach regarding the purpose and function of the Emergency Planning Steering Committee.</p> <p>Seek funding for additional containers.</p>				<p><u>2020 Update:</u> The mobile storage containers now have heat.</p> <p><u>2015 Update:</u> The City maintains and stocks two mobile storage containers with emergency supplies and equipment. Electricity was recently supplied to the containers.</p>		
<b>Champion/ Responsible Organization:</b>		Administration				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Public Works, Emergency Planning Steering Committee			Yachats Rural Fire Protection District			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, NOAA Coastal Resilience Grant			Low to Medium		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Yachats Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Yachats #3</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Update and implement actions identified in the Yachats Storm Drainage Master Plan		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input checked="" type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Storm Drainage Master Plan Addendum (2008)						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Yachats is recently updated its Stormwater Master Plan. Mitigation actions are identified within that plan as well. See Section 7 of the Storm Drainage Master Plan Addendum (2008) and Figure A-5, Recommended Improvement Map.</p> <p>The Disaster Mitigation Act of 2000 requires communities to describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (201.6(b)). Implementing actions identified within the Yachats Stormwater Management Plan will assist the City in meeting this requirement.</p> <p>Stormwater management is a key element in maintaining and enhancing a community's livability. There is a direct link between stormwater and a community's surface and ground waters. As a community develops, the impervious surfaces that are created increase the amount of runoff during rainfall events, disrupting the natural hydrologic cycle. Without control, these conditions erode stream channels and prevent groundwater recharge. Parking lots, roadways, and rooftops increase the pollution levels and temperature of stormwater runoff that is transported to streams, rivers, and groundwater resources. Protecting these waters is vital for a great number of uses, including fish and wildlife habitat, recreation, and drinking water.</p>						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Implement and maintain the Stormwater Plan. Review the Plan's mitigation actions at one of the County's future semi-annual natural hazard mitigation meetings. Identify and assist with actions that reduce the City's vulnerability to flood-related hazards.				<u>2020 Update:</u> Storm water master plan implementation is in progress. Quiet Water Tide Gate improvements are complete. Public Works and Streets Commission is interested in a new Storm Drainage Master Plan with new implementation items.		
<b>Champion/ Responsible Organization:</b>		Administration				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Public Works, Planning			DOGAMI			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low to High		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Yachats Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Yachats #4</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Encourage purchase of flood insurance, even for those outside of NFIP mapped hazard areas.		<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
FIS, FIRMs, Lincoln County Risk Report, Comprehensive Plan, Development Code						
<b>Rationale for Proposal (Why is this important?):</b>						
Increasing knowledge about the extent of flood risk in order to educate residents about elevating homes and structures can help mitigate the city's vulnerability to future floods. There are streams affected by seasonal flooding. The Disaster Mitigation Act of 2000 requires that communities continue to involve the public beyond the original planning process [201.6(c)(4)(ii)]. Developing public education programs for hazard risk mitigation would be a way to keep the public informed of, and involved in, the city's actions to mitigate hazards.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Continue to participate in the National Flood Insurance Program. Consider participating in the NFIPs CRS Program. Make contacts with insurance industry representatives to keep current about their requirements, rates, and plans. Provide educational information to property owners. Coordinate activity with Lincoln County.			<b>2020 Update:</b> The city provides educational material as outreach to members of the community. The city is currently participating in the NFIP. The Lincoln County Risk Report is being updated to include additional Hazus loss estimation which could be used to target areas for future outreach.			
<b>Champion/ Responsible Organization:</b>		Administration				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, Lincoln County			Insurance companies			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Yachats Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Yachats #5</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Provide supplemental water supply tanks in key locations to ensure availability of water throughout the city.		<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>			
Water System Master Plan			
<b>Rationale for Proposal (Why is this important?):</b>			
<p>In their hazard analysis, the City of Yachats rated itself as having a high drought risk and vulnerability. It is important water remains available during and after a drought event.</p> <p>Disaster Mitigation Act of 2000 requires communities to create actions that will reduce the impact of natural hazards on the community [201.6(c)(3)(ii)]. Providing supplemental water supply tanks in key locations will enhance the City's resilience in a drought event.</p>			
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
<p>Obtain funding to construct additional water reservoirs for emergency drought-related storage.</p> <p>Research ways to reduce drought risk within the city. This may potentially result in non-structural projects.</p>		<p><u>2020 Update</u></p> <p>The city has storage containers for supplemental water and has portable water treatment plants. Two Blackstone storage tanks are in development and are complete; water filtration systems are available in the containers. The South tank is complete.</p> <p>YRFPD has portable water filtration. The city is working on an inventory of available supplies.</p>	
<b>Champion/ Responsible Organization:</b>	Administration		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Public Works		USDA, USGA, Western States Water Council	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources		High	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Yachats Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Mitigation Action: Yachats #6</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Obtain LiDAR collection for DOGAMI and adopt and adopt Landslide code updates.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Lincoln County Risk Report		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>LIDAR (light detection and ranging) is a mapping tool that can provide very precise, accurate, and high-resolution images of the surface of the earth, vegetation, and the built environment. It can be used to study landforms and identify areas, especially landslide areas that may be susceptible to future occurrences. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been working with communities to develop large-scale LIDAR maps of entire regions. In 2006- 2007, various local, state, and federal agencies formed the Portland Consortium to gather 2200 square miles of LIDAR data in the Portland Metropolitan region. DOGAMI has formed the Oregon LIDAR Consortium (OLC) to gather data in other Oregon regions, including Lincoln County. Entering into an agreement with the OLC, or obtaining LIDAR collection data from DOGAMI will assist in mapping areas of Western Lane County and landforms around Yachats. Additional, LIDAR analysis has been conducted as part of the Lincoln County Risk Report and Open-file Report (O-16-02).</p> <p>With LIDAR, you can quickly, cheaply, and accurately: find landslides, old cuts and grades; measure and estimate fills and cuts; find stream channels and measure gradients; measure the size and height of buildings and bridges; locate and measure every tree in the forest; characterize land cover; model floods, fire behavior; locate power lines and power poles; find archeological sites; map wetlands and impervious surfaces; define watersheds and view-sheds; model insulation and shaking; map road center and sidelines; find law enforcement targets; map landforms and soils; assess property remotely; inventory carbon; monitor quarries, find abandoned mines; enhance any project that requires a detailed and accurate 2-D or 3-D map.</p> <p>The east side of the City of Yachats has relatively steep topography. Despite the city’s topographical characteristics and vulnerabilities to landslides, Yachats does not have accurate information regarding the location and extent of potential landslides. With improved data via participation in the OLC, (or purchase of the OLC’s data), Yachats would have a much greater understanding of its landslide risks.</p> <p>The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Obtaining LIDAR collection data from DOGAMI will help in understanding areas and landforms susceptible to landslide events to protect new and existing buildings, and infrastructure.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
DOGAMI’s LIDAR website provides information about the OLC and LIDAR and is a starting point for entering into an agreement with DOGAMI.	<u>2020 Update:</u> The City of Yachats received a grant in March of 2019 to complete a hazard code audit with DLCD. The	

<a href="http://www.oregongeology.com/sub/projects/olc/default.htm">http://www.oregongeology.com/sub/projects/olc/default.htm</a>		result of the project was adoption ready codes including an updated geo-hazard code.	
Contact DOGAMI about obtaining the data. DOGAMI staff is additionally available to talk to groups of potential users to show them the data and explain its uses. The LIDAR will be available without license restrictions in standard USGS quadrangles, with a nominal charge for each quadrangle. DOGAMI is happy to work with small communities to develop map products that they can use if they do not have GIS.		DOGAMI published <a href="#">Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon</a> which maps existing landslide data for Lincoln Co and Yachats.	
Incorporate relevant aspects of the DLCD Landslide Land Use Guide (" <a href="#">Preparing for Landslide Hazards, A land Use Guide for Oregon Communities</a> ")		<u>2015 Update</u> The city has not yet acquired LIDAR from DOGAMI. LIDAR is available for areas of the county and data and analysis from the Lincoln County Risk Report is available to incorporate in local planning efforts.	
<b>Champion/ Responsible Organization:</b>	Administration		
<b>Internal Partners:</b>	<b>External Partners:</b>		
Public Works, Planning, City Recorder	DOGAMI		
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>	
Local Funding Resources	Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	Yachats Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		



<b>Mitigation Action: Yachats #7</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Encourage the County to evaluate and implement erosion control mitigation projects for NE Ocean View Drive/ 804 Trail.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
804 Trail Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>Area is susceptible to coastal erosion (south side at the inlet, from 6th Street to south of 2nd Street). Lincoln County has jurisdiction over Ocean View Drive and the southern portion is within Yachats State Park.</p> <p>The Yachats 804 Trail/ NE Ocean View Drive is under Lincoln County jurisdiction and is part of former County Road 804, the gravel route between Yachats and Waldport's Alsea Bay before U.S. Highway 101 was built in the 1930s.</p> <p>Area is within the distant tsunami inundation zone</p> <p>This area is the only by-pass of Highway 101 for the northern half of the city</p> <p>Area is undergoing coastal erosion that will affect the street, public utilities (water, sewer), and public pedestrian access.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Plant and construct erosion control measures (riprap, etc.), handrails, and improve storm drainage.</p> <p>Monitor ground movement in high susceptible areas, especially during or after large storms.</p> <p>Maintain erosion control structures that are already in place.</p> <p>Identify critical facilities and infrastructure near high coastal erosion areas.</p> <p>Consider land value losses due to coastal erosion in future risk assessments.</p>			<p><u>2020 Update:</u></p> <p>Ocean View Drive tilts inland and water drains to the ocean through culverts.</p> <p>County is in the process of transferring ownership to the city. This action item will remain and the city will be responsible for erosion control after the transfer.</p>			
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning			Lincoln County, DOGAMI, Oregon Parks & Recreation			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			Medium to High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Yachats Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Yachats #8</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Work with the owners of repetitive flood loss buildings in the city to identify cost effective mitigation strategies including consideration of relocation, elevation, or buy-out.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Yachats Flood Ordinance, Comprehensive Plan, FEMA Flood Insurance Study, Flood Insurance Rate Maps, Stormwater Master Plan (2015), Lincoln County Risk Report, 2015						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The City estimates a high probability that flooding will occur in the future. Repetitive flood loss properties are documented in this addendum and problem areas include Yachats Ocean Road and Gender Creek where flooding in 2009 affected two homes.</p> <p>Concentrations of pre-FIRM structures in areas subject to flooding are present in several areas along the County's major rivers. Experience with the floods of the late 1990s showed that properly elevated structures in the flood plain performed well during major flood events, most suffering minimal if any, damage. Especially in areas which may be subject to damage during relatively high frequency flood events, elevating structures in conformance with the County's flood hazard area codes (lowest floor at least one foot above the base flood level) is a cost-effective way to reduce risk.</p>						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
<p>Coordinate with willing property owners, DLCD, FEMA, and OEM to identify suitable mitigation options.</p> <p>Assess individual properties for possible mitigation measures (elevation, acquisition, relocation) to reduce or prevent future flood losses.</p> <p>Implement mitigation measures (elevation, acquisition, relocation) for properties within the floodplain.</p>				<p><u>2020 Update:</u> Education materials available at City Hall.</p>		
<b>Champion/ Responsible Organization:</b>		Floodplain Manager				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning, Public Works			Lincoln County Building, DLCD, OEM, DOGAMI, FEMA			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, FEMA PDM, HMGP, FMA			High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Yachats Steering Committee, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Yachats #9</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Relocate or mitigate City Hall, Water Treatment, and Wastewater Treatment plants out of tsunami inundation zone		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>City Hall, the water treatment plant, and the wastewater treatment plant are located within a tsunami inundation area. DOGAMI finalized the remapping of the distant and local tsunami zones providing public, private and citizens with a clearly defined map of hazard areas. However, there was little to be done for the relocation of public safety buildings out of the inundation areas.</p> <p>A significant tsunami event has the potential to cause disruption of power, contamination of water supplies, loss of essential communication systems, a large amount of debris, and traffic congestion. A tsunami has the potential to damage critical buildings and infrastructure in the tsunami inundation zone. Mitigating the effects that a tsunami has on city assets is a high priority.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Assessing and evaluating needed mitigation for critical assets in the tsunami inundation zone, can assist the City in determining what further actions are needed to help mitigate the city's risk to tsunami.</p>						
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>				
Investigate relocation alternatives for critical facilities in the tsunami inundation zone. Investigate alternatives and purchase a cost effective police communications system that is resilient to natural hazards (earthquake, tsunami, etc.)		<u>2020 Update:</u> The YRFPD building is now located at 2056 Hwy 101. The Fire Department is in the process of zone change for the old fire station and plans to sell the building. City Hall will move to the former Umpqua Bank Building (located at 5 <sup>th</sup> St and Hwy 101 N) Outside the M tsunami inundation zone (inside the XXL tsunami inundation zone).				
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Administration, Planning			County, DLCDD, Regional Solutions Team			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources			High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2014 Risk MAP Resilience Workshop, revised 2020				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: Yachats #10</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Implement land use strategies and options to increase community resilience by creating an adoption ready tsunami code.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
Preparing for a Cascadia Subduction Zone Tsunami: <a href="#">A Land Use Guide for Oregon Coastal Communities, Comprehensive Plans, Development Codes</a>		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The Land Use Guidance prepared by the Oregon Department of Land Conservation and Development (DLCD), was released on January 15, 2014 and updated in April 2015. This tsunami land use guidance was originally developed by DLCD in partnership with a diverse and capable advisory committee comprised of representatives of local government and state agencies assisted by the consulting firm of Cogan Owens Cogan. Advisory committee members from local governments included representatives from the cities of Cannon Beach, Coos Bay, Depoe Bay, Lincoln City, Manzanita, Seaside, Waldport, Yachats, and also included Coos County. The purpose of the guidance is to assist vulnerable communities as they incorporate tsunami resilience measures into their local land use programs. The land use guide is designed to be tailored by communities to address their individual tsunami risk and location, and provides comprehensive information focused on land use planning approaches to reduce tsunami hazard risk and implement important land use resilience measures. The guidance includes sample tsunami related comprehensive land use plan text and policies, information on needed map amendments, a tsunami hazard overlay (THO) zone model to implement resilience measures, tsunami land use strategy financing and incentive concepts, a newly revised and comprehensive chapter 6 on tsunami evacuation facilities improvement planning, information relating to pre-disaster community land use planning for a Cascadia event tsunami, and web links to other helpful information. The guide’s model comprehensive plan, zoning code and other provisions are designed to be used with the new Department of Geology and Mineral Industries Tsunami Inundation Maps (TIMs). The guide is web based with links to other resources. DLCD was assisted by consultants Carole Connell and D.J. Heffernan in the development of the newly revised Chapter 6 as indicated above.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Utilize the Tsunami Land Use Guidance and determine appropriate strategies/ options to increase community resilience</p> <p>Incorporate relevant aspects of the DLCD Landslide Land Use Guide (“Preparing for Landslide Hazards, A land Use Guide for Oregon Communities”)</p> <p>Consider relocating or retrofitting structures with vulnerable populations (e.g. schools, hospitals,</p>	<p><u>2020 Update</u></p> <p>New in 2020</p>	

and nursing homes) that are within high tsunami hazard zones.		
<b>Champion/ Responsible Organization:</b>	Planning	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Administration, Public Works	FEMA, OEM, DLCD	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DLCD-TA Grant	Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2020 Yachats Steering Committee	
<b>Action Item Status:</b>	New	

<b>Mitigation Action: Yachats #11</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>		<b>High Priority Action Item?</b>		
Research drought resiliency code amendments (Gray water systems, green infrastructure, etc.). Consider drafting a drought resiliency ordinance.		<input type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input checked="" type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input checked="" type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Comprehensive Plan, Development Code, Water Master Plan/Water Management & Conservation Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The steering committee recognized that the city's probability of drought is high and that their vulnerability to drought is high.</p> <p>Development in the city has put more pressure on the existing water supply.</p> <p>Drought was identified as the top hazard in the City of Yachats. Developing drought resiliency code requirements could increase the number of drought resiliency projects in the city.</p>						
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>				
Research drought resiliency code requirements and ordinances passed by other jurisdictions in the State.		<u>2020 Update:</u> New				
<b>Champion/ Responsible Organization:</b>	Planning					
<b>Internal Partners:</b>		<b>External Partners:</b>				
Public Works, Administration		DLCD				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>			
Local funding resources		Low	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)			
<b>Form Submitted by:</b>	2020 Steering Committee					
<b>Action Item Status:</b>	New					

<b>Mitigation Action: Yachats #12</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Develop a non-potable water source for fire suppression (purple pipe).		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
Water is a valuable resource and the City of Yachats is developing a water master plan, source water protection plan and a water management and conservation plan to address water issues.						
A purple pipe system provides an alternative to the existing water suppression methods that use potable water.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Cooperate with the Yachats Rural Fire Protection District and Public Works to Investigate the implementation of a purple pipe system for fire suppression.			<u>2020 Update:</u> New			
<b>Champion/ Responsible Organization:</b>		Public Works				
<b>Internal Partners:</b> Planning		<b>External Partners:</b> DLCD and Regional Solutions Team				
Administration		Yachats RFPD				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Local funding sources and grants		Medium		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	2020 Steering Committee					
<b>Action Item Status:</b>	New					

<b>Mitigation Action: Yachats #13</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>		<b>High Priority Action Item?</b>		
Develop a Climate Resilience Plan		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>A climate resilience plan would help the City of Yachats prepare for and respond to hazardous events. The City of Yachats as discussed above is susceptible to many hazards and a climate resilience plan will help the City be better prepared to bounce back from the listed hazard events.</p> <p>The City is part of the Geos Institute team that is convening and supporting a cohort of communities across Oregon that are interested in developing climate resilience plans.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Apply for grant funding and complete the project.			<u>2020 Update:</u> New			
<b>Champion/ Responsible Organization:</b>	Public Works					
<b>Internal Partners:</b> Planning		<b>External Partners:</b> DLCD and Regional Solutions Team				
Administration, Planning		DLCD, OCCRI, OSU, UO				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>			
Local funding sources, DLCD Technical Assistance Grants, Geo-Institute Funding		Medium	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)			
<b>Form Submitted by:</b>	2020 Steering Committee					
<b>Action Item Status:</b>	New					



# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the city's website and an email contact was provided for public comment. The plan was also announced on the County's website and an opportunity to provide feedback was provided.

During the public review period there was one comment provided.

The screenshot shows the Yachats Region website with an 'ALERTS' banner at the top. Below the banner, there is a 'Home Page News' section with a post titled 'Community Input Needed' dated September 25, 2020. The post includes a link to a page for community input on the natural hazards mitigation plan renewal. The page content is as follows:

**Community Input Needed**

<https://www.co.lincoln.or.us/planning/page/community-input-needed-natural-hazards-mitigation-plan-renewal>

The first phase of the renewal process was to solicit feedback from community members to identify what is important to them regarding our local natural hazard risks and planning goals. This was completed in September of 2019. Since 2019 our Steering Committee made up of our local City, Tribal, Public Safety Agencies and our Addendum Partners have finalized our draft plan for our next renewal period. Our next step is to send our final draft to our community members for their feedback and input then to the State of Oregon, then to FEMA and lastly to our Lincoln County Board of Commissioners.

**Community Member Input:**

- Community members are invited to provide feedback by submitting comments or questions by Friday, October 2nd

**Natural Hazards Mitigation Plan - September 2020 Renewal Plan:**

- The September 2020 page is separated down into 3 sections (I, II, III)

**Volume I – Basic Plan**

**Volume II – Jurisdictional Addenda**

- Depoe Bay
- Lincoln City
- Newport
- Siletz
- Toledo
- Waldport
- Yachats
- Central Lincoln PUD
- Lincoln Co. School District
- Seal Rock Water District

**Volume III - Appendices**

- for current plan - September 2015

## Public Comments and Responses

Listed below is the list of public comments shown in *italic text* followed by the County's response.

By way of introduction, my wife and I have owned the house at 622 Ocean View Drive for the past 20+ years. We read the draft Lincoln County Natural Hazard Mitigation Plan with interest, as we have been doing our part to be aware of and mitigate against the various natural hazards that face us in Yachats.

I wanted to highlight a mitigation recommendation on Page 3-8, for which Public Works is identified as the Coordinating Organization:

Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.

We are very supportive of Yachats working with the utility companies to convert existing overhead lines to underground lines. Over the years, we have had numerous calls into Lincoln PUD and Charter to reattach electrical lines after windstorms and winter storms. The overhead transformer next to our house has exploded, and insulators and other debris have dangerously blown off the top of the poles during these storms.

Over the past few months, I have been in touch with Lincoln PUD, Charter Communications, and our neighbors on Ocean View Drive to explore the feasibility of converting the existing overhead lines on Ocean View Drive to underground lines. There is considerable interest among our neighbors in doing this. While I am primarily interested in having the lines underground between 7th Street and 6th Street, it seems there should be a strong community interest in going all the way from 7th Street to 4th Street. If this can be accomplished, Ocean View Drive would not have any overhead lines on Ocean View Drive from 7th Street to 1st Street. Since this is the portion of Yachats most exposed to the ocean and therefore most vulnerable to windstorms and winter storms, having these lines underground would be a tremendous benefit to the City of Yachats in mitigating against our #1 and #2 highest priority natural hazards: windstorms and winter storms. Burying the powerlines in this area will also significantly beautify the aptly named Ocean View Drive, home of much of the 804 Trail and Yachats' biggest "gem" and tourist attraction.

While I have learned a lot in my discussions with Faye Monroe at Lincoln PUD and Joshua Lightner at Charter Communications and am making progress towards making this happen, as well as determining an approximate cost, it would seem to make a lot more sense to consider this a community-wide project with Yachats Public Works taking the lead from this point forward. What do you think? Would it help to set up a time to talk via phone or Zoom to discuss further?

### Yachats Response:

The Yachats addendum to the NHMP includes an action addressing this comment. The City will continue to coordinate with utility providers and work to accomplish this action item."

## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

Mitigation Action: Yachats # (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# Central Lincoln PUD Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Central Lincoln PUD

Effective: December 29, 2020 through December 28, 2025



Prepared for:  
Central Lincoln People's Utility District

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



**FEMA**

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
Grant: PDMC-PL-10-OR-2017-002  
Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

**RESOLUTION 976**

**A RESOLUTION ADOPTING CENTRAL LINCOLN PUD'S REPRESENTATION IN THE  
UPDATES TO THE LINCOLN COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS  
MITIGATION PLAN**

**WHEREAS**, Central Lincoln People's Utility District (Central Lincoln) recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, Central Lincoln has fully participated in the FEMA prescribed mitigation planning process to prepare the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, Central Lincoln has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of Central Lincoln to the impacts of future disasters within the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan; and

**WHEREAS**, these proposed projects and programs have been incorporated into the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the Central Lincoln addendum to the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan and pre-approved it (dated, December 9, 2020) contingent upon this official adoption of the participating governments and entities;

**WHEREAS**, the NHMP is comprised of comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

**WHEREAS**, Central Lincoln adopts the NHMP and directs the General Manager to implement the mitigation strategies and any administrative changes to the NHMP.

**NOW THEREFORE, BE IT RESOLVED** that Central Lincoln adopts the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan as an official plan; and



**BE IT FURTHER RESOLVED** that Central Lincoln will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable approval of the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan.

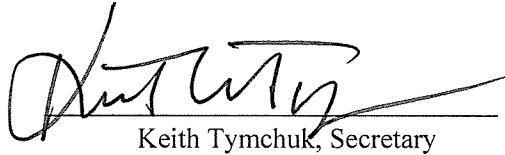
**ADOPTED** this 20<sup>th</sup> of January 2021.

Central Lincoln PUD



Paul Davies, President

ATTEST:



Keith Tymchuk, Secretary

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# Purpose

This document serves as the Central Lincoln People’s Utility District’s (Utility District or PUD) addendum to the Lincoln County Multi-Jurisdiction Natural Hazards Mitigation Plan (MNHMP, NHMP). This addendum describes how the Utility District’s risks vary from the entire Lincoln County planning area (in which a portion of the Utility District is located). Information contained herein supplements information contained in Volume I (Basic Plan) of this NHMP, which serves as the foundation for this jurisdiction’s addendum and Volume III (Mitigation Resources), which provides additional information. This addendum meets all the requirements of Title 44 §201.6 including:

- Multi-jurisdictional **Plan Requirements** §201.6(a)(4),
- Multi-jurisdictional **Planning Process** §201.6(b)(1-3),
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv),
- Multi-jurisdictional **Plan Maintenance Process** §201.6(c)(4), and
- Multi-jurisdictional **Plan Adoption** §201.6(c)(5).

A description of the jurisdiction specific planning and adoption process follows, along with detailed community specific action items. Information about the Utility District’s risk relative to the county’s risk to natural hazards is documented in the addendum’s Hazard Analysis and Issue Identification section. The section considers how the Utility District’s risk differs from or matches that of the county’s; additional information on Risk Assessment is provided within the Lincoln County NHMP’s Section 2 – Risk Assessment.

This is the second addendum to the Lincoln County NHMP for the Utility District. The Utility District was added to the previous version of the NHMP in 2017. In the previous version of the NHMP the Utility District contributed risk assessment information and mitigation strategies. Relevant updates are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the previous Lincoln County NHMP that took place during this update process.

Central Lincoln PUD adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **January 20, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the Utility District’s addendum on **March 1, 2021**. With approval of this NHMP the Utility District is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act’s hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community’s environment or priorities change.

The Utility District concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

*To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.*

The 2019-2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2015 and 2009 NHMP. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the Utility District's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The Utility District concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

Below is a list of the NHMP goals:

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

## Process and Participation

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the Utility District will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Oregon Office of Emergency Management (OEM), the Department of Land Conservation and Development (DLCD), Lincoln County, and Central Lincoln PUD to update the multi-jurisdictional NHMP and to develop the Utility District addendum. This project is funded through the Federal Emergency Management Agency's Pre-Disaster Mitigation (PDM) Competitive Grant Program Grant: OR-2018-001 (PDMC-PL-10-OR-2017-002). Members of the Central Lincoln PUD NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Central Lincoln PUD addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Central Lincoln PUD NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Utility District Senior Project Manager serves as the NHMP addendum convener. The convener of the NHMP addendum will take the lead in implementing, maintaining, and updating the addendum in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Emergency Manager and Planning Director).

Representatives from the Utility District Steering Committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the Utility District's representation in the Lincoln County NHMP, with focus on the NHMP's risk assessment and mitigation strategy (action items).

This addendum reflects decisions made at the designated meetings, and during subsequent work, and communication with OPDR. The changes are highlighted with more detail throughout this document, and within Volume III, Appendix B. Other documented changes include the inclusion of the Utility District's risk assessment and hazard identification sections which were not included in previous versions of the NHMP and mitigation strategy (action items).

The Central Lincoln PUD steering committee was comprised of the following representatives:

- Convener, Gail Malcom, Senior Project Manager
- Randy Grove, General Manager
- Ty Hillebrand, Director of Engineering & Operations
- Mark Freeman, Director of Employee, Customer and Community Services
- Brandon Hignite, Director of Shared Services

## Public Participation

Public participation was achieved in part by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment during the plan development stage via a survey administered by OPDR (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The Utility District Board of Directors will be responsible for adopting the Utility District addendum to the Lincoln County NHMP. This addendum designates the steering committee, and a convener to oversee the development, and implementation of action items. Because the Utility District addendum is part of the County's multi-jurisdictional NHMP, the Utility District will look for opportunities to partner with the County. The Utility District's steering committee will convene after re-adoption of the Utility District NHMP addendum on an annual schedule. The County is meeting on a quarterly basis and will provide opportunities for participating jurisdictions (cities and special districts) to report on NHMP implementation, and maintenance during their meetings. The Utility District Senior Project Manager will serve as the Utility District convener and will be responsible for assembling the steering committee. The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The Utility District will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies, residents, and the Utility District; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other Utility District plans and programs including their Capital Improvement Plan, [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and in Attachment A) are intended to be implemented through existing plans and programs within the Utility District. Plans and policies already in existence have support from district residents, businesses, and policy makers. Where possible, the Utility District will implement the NHMP's recommended actions through existing plans and policies. Many strategic plans get updated regularly,



allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards.

The Utility District currently has the following plans and policies that relate to natural hazard mitigation:

**Central Lincoln PUD Capital Improvement Plan:** The purpose of this document is to outline the planned improvements to infrastructure and equipment for a period of 3-5 years. It is a primary method of accomplishing their mission of providing reliable electric power to their customers.

*Relation to Natural Hazard Mitigation:* This plan is used to allocate funds to implement mitigation measures such as tree trimming and underground conversions, as well as, strengthening our overall infrastructure by adding redundancy to transmission lines, fiber routes and communication systems.

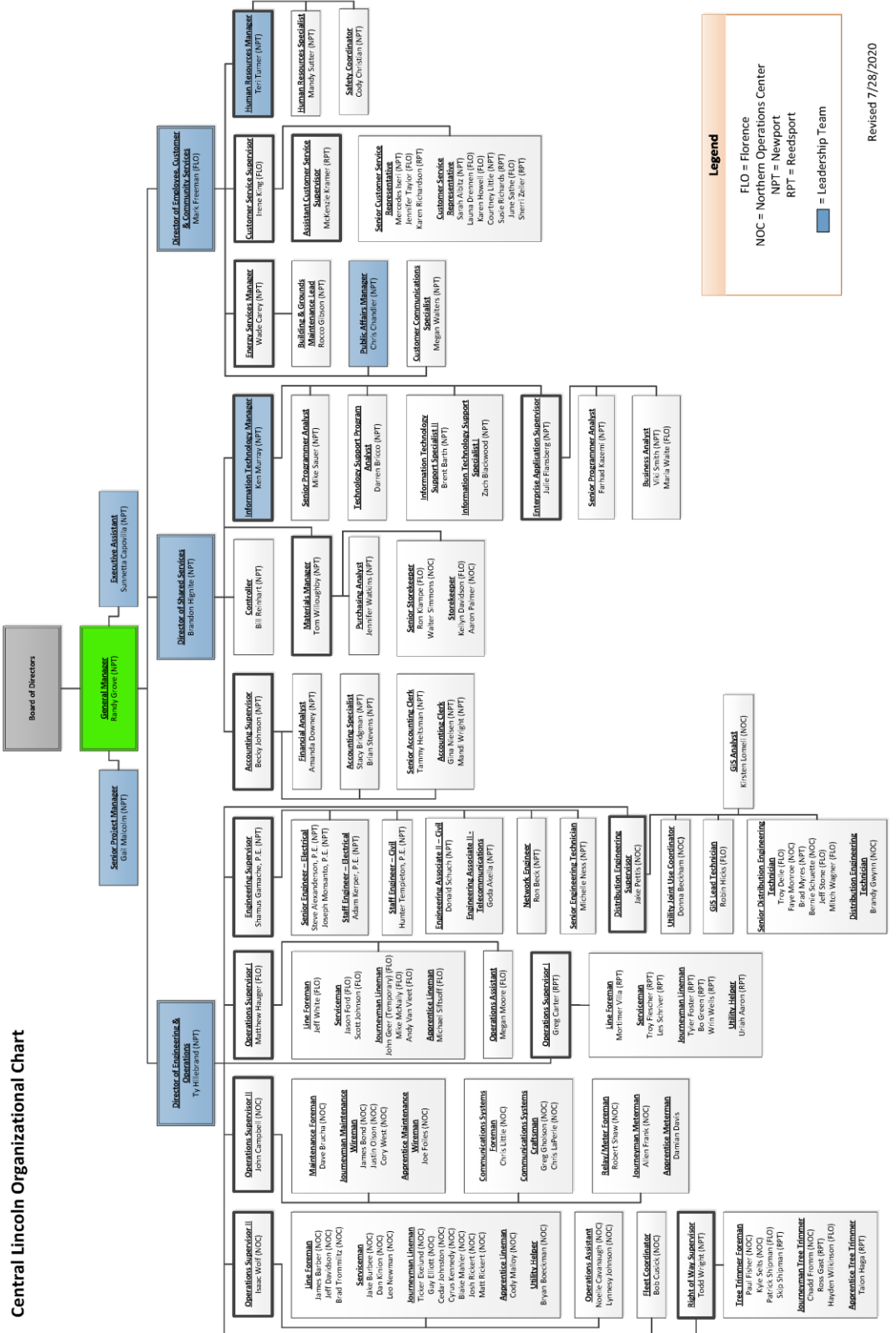
**Vulnerability and Risk Assessment (VRA):** The vulnerability and risk assessment provides information on the Utility District's transmission, substation, and communication systems. Completed in 2016, it was updated in 2018 to include an assessment of the distribution system.

*Relation to Natural Hazard Mitigation:* This VRA is used to identify vulnerable infrastructure and to provide justification for mitigation efforts and the allocation of funds through the Utility District's Capital Improvement Plan.

## **Governance Structure**

The Utility District vests policy authority in an elected five-member Board of Directors and places administrative authority for day-to-day operations in professional staff. The Utility District is a municipal corporation authorized by Section 12, Article XI of the Constitution of the State of Oregon and is organized under [Chapter 261](#), Oregon Revised Statutes. See Figure PUD-1 for the Utility District's organizational chart.

# Figure PUD-I Central Lincoln PUD Organizational Chart



**Legend**

- FLO = Florence
- NOC = Northern Operations Center
- NPT = Newport
- RPT = Reedsport
- [Blue Box] = Leadership Team

Revised 7/28/2020

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review.<sup>1</sup> Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the Utility District is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The Utility District posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the Utility District's website: <https://clpud.org/>

## NHMP Maintenance

The Lincoln County NHMP, and Utility District addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the County NHMP update process, the Utility District will also review, and update its addendum (Volume I, Section 4). The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the NHMP was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the NHMP accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the NHMP.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The Utility District's mitigation strategy (action items) were first developed for the 2015 NHMP (added in 2017). The actions were reviewed, updated, and relocated to this addendum during the 2019-2020 NHMP planning process and will be revised during

---

<sup>1</sup> Code of Federal Regulations, Chapter 44. Section 201.6, subsection (b). 2015

subsequent NHMP updates. During these processes, the steering committee assessed the Utility District's risk, identified potential issues, and developed the mitigation strategy (action items).

### Priority Action Items

Table PUD-1 presents a list of mitigation actions that apply district wide including portions of Lincoln, Lane, Douglas, and Coos counties. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are ranked from highest priority (#1) to lowest priority (#9). The Utility District will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action.

**Table PUD-I Central Lincoln PUD Action Items**

Natural Hazard Action ID	Priority	Action Item	Coordinating Organization (Lead)	Cost	Timing
CLPUD #1	#1	Strengthen local power and communication grids through redundancy and looped systems.	Engineering and Operations	H	Ongoing
CLPUD #2	#2	Preventative maintenance of existing power and communications infrastructure.	Engineering and Operations	H	Ongoing
CLPUD #3	#5	Evaluate the relocation of utility infrastructure in identified flood hazard zones.	Engineering and Operations	H	Medium
CLPUD #4	#6	Design transmission and distribution systems with consideration of potential slides.	Engineering and Operations	L	Ongoing
CLPUD #5	#7	Monitor and evaluate existing infrastructure for potential slide risk.	Engineering and Operations	H	Ongoing
CLPUD #6	#8	Collaborate with Lincoln County to identify potential threats.	GIS	L	Ongoing
CLPUD #7	#3	Enhance vegetation management in right of ways to minimize outages caused by trees or branches touching the power lines	Engineering and Operations	H	Ongoing
CLPUD #8	#9	Selectively convert existing overhead lines to underground.	Engineering and Operations	H	Ongoing
CLPUD #9	#4	Provide for the safety of employees and continuity of operations after a Cascadia event by completing a seismic retrofit on the current Central Lincoln PUD headquarters building or constructing a new headquarters facility by 2022.	Engineering and Operations	H	Short
CLPUD #10	#10	Install cameras on two communication towers by 2022 to monitor transmission lines for wildfire.	Engineering and Operations	H	Short

Source: Central Lincoln PUD steering committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

## Risk Assessment

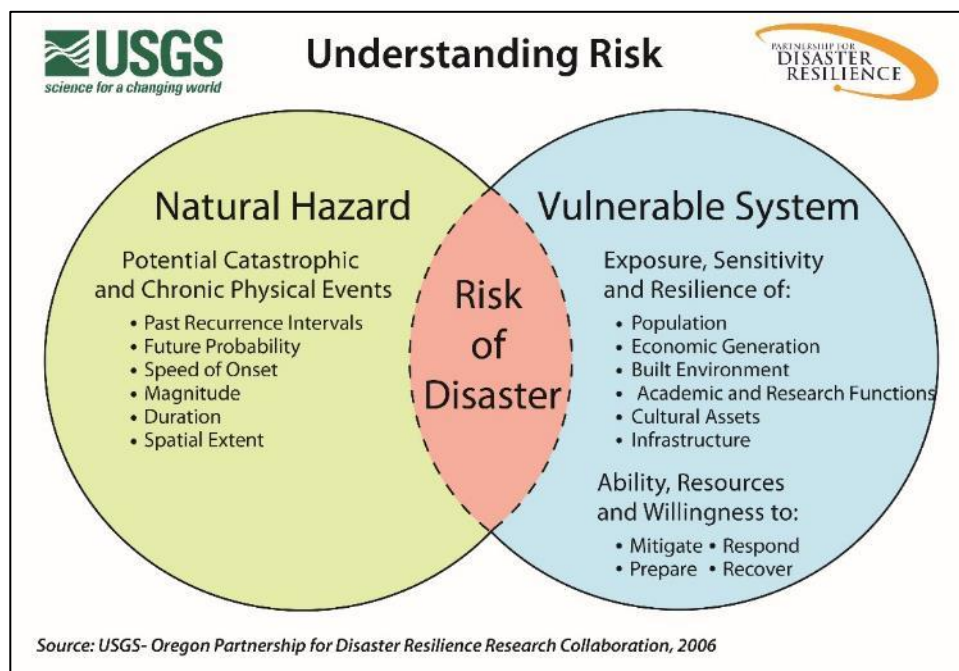
This section of the NHMP addendum addresses 44 CFR 201.6(c)(2)(iii) - Risk Assessment.

Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets, and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places, and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure PUD-2. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure PUD-2 Understanding Risk**



## Hazard Characteristics

Volume I, Section 2 describes the characteristics of the profiled hazards, history, as well as the location, extent and probability of potential events. Additional information is found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#). Generally, an event that affects the County, or applicable cities, where Utility District facilities are located is likely to affect the Utility District as well. Similarly, the causes and characteristics of hazard events are appropriately described within the Volume I, Section 2 as well as the location and extent of potential hazards. Lastly, previous occurrences are well documented within

Volume I, Section 2 and the community impacts described by the County, or applicable City, would generally be the same for the Utility District.

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire. The Utility District hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

### National Flood Insurance Program (NFIP)

FEMA updated the Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) in 2019 (effective October 18, 2019). The Utility District is not a community which has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction. The incorporated Cities of Depoe Bay, Newport, Siletz, Toledo, Waldport, Yachats, and Lincoln County participate in the National Flood Insurance Program (NFIP).

There are no repetitive loss or severe repetitive loss properties owned or operated by the Utility District. For specific information for communities within the Utility District's service area see Volume I, Section 2 and the addenda for the cities of Depoe Bay, Newport, Siletz, Toledo, Waldport, and Yachats (Volume II) for more information.

## **Hazard Analysis**

The Utility District steering committee developed their hazard vulnerability assessment (HVA), using the Lincoln County and applicable City HVAs as references (Depoe Bay, Newport, Siletz, Toledo, Waldport, and Yachats). Differences reflect distinctions in vulnerability and risk from natural hazards unique to the Utility District (including evaluation of their service area outside of Lincoln County within Coos, Douglas, and Lane counties).

Table PUD-2 shows the HVA matrix for the Utility District listing each hazard in order of rank from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

One catastrophic hazard (Cascadia Subduction Zone earthquake) and four chronic hazards (windstorm, winter storm, landslide, and wildfire) rank as the top hazard threats to the Utility District (Top Tier). The tsunami (local), coastal erosion, and flood (coastal and riverine) comprise the next highest ranked hazards (Middle Tier), while the drought, tornado, crustal earthquake, tsunami (distant), and volcanic event hazards comprise the lowest ranked hazards (Bottom Tier).

**Table PUD-2 Hazard Analysis Matrix**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Winter Storm (Snow/Ice)	18	50	100	70	238	#2	
Landslide	20	40	100	70	230	#3	
Earthquake (Cascadia)	10	50	100	49	209	#4	
Wildfire	10	30	90	70	200	#5	
Tsunami (Local)	2	40	100	49	191	#6	Middle Tier
Coastal Erosion	20	20	60	70	170	#7	
Flood (Coastal)	20	10	30	70	130	#8	
Flood (Riverine)	20	10	20	70	120	#9	
Drought	20	5	10	70	105	#10	Bottom Tier
Tornado	8	10	30	56	104	#11	
Earthquake (Crustal)	10	20	40	21	91	#12	
Tsunami (Distant)	10	10	30	35	85	#13	
Volcanic Events	2	5	40	7	54	#14	

Source: Central Lincoln PUD steering committee, 2019-2020.

Table PUD-3 categorizes the probability, and vulnerability scores from the hazard analysis for the Utility District and compares the results to the assessment completed by the Lincoln County steering committee. Variations between the Utility District and County are noted in **bold** text within the Utility District ratings.

**Table PUD-3 Probability and Vulnerability Comparison**

Hazard	Central Lincoln PUD		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	High	<b>Moderate</b>	High	Low
Drought	High	<b>Low</b>	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	High	<b>Low</b>	High	Moderate
Flood (Riverine)	High	<b>Low</b>	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	High	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	High	Moderate	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	<b>High</b>	High	Moderate

Source: Central Lincoln PUD and Lincoln County steering committee, 2019-2020.



## Utility District Asset Identification

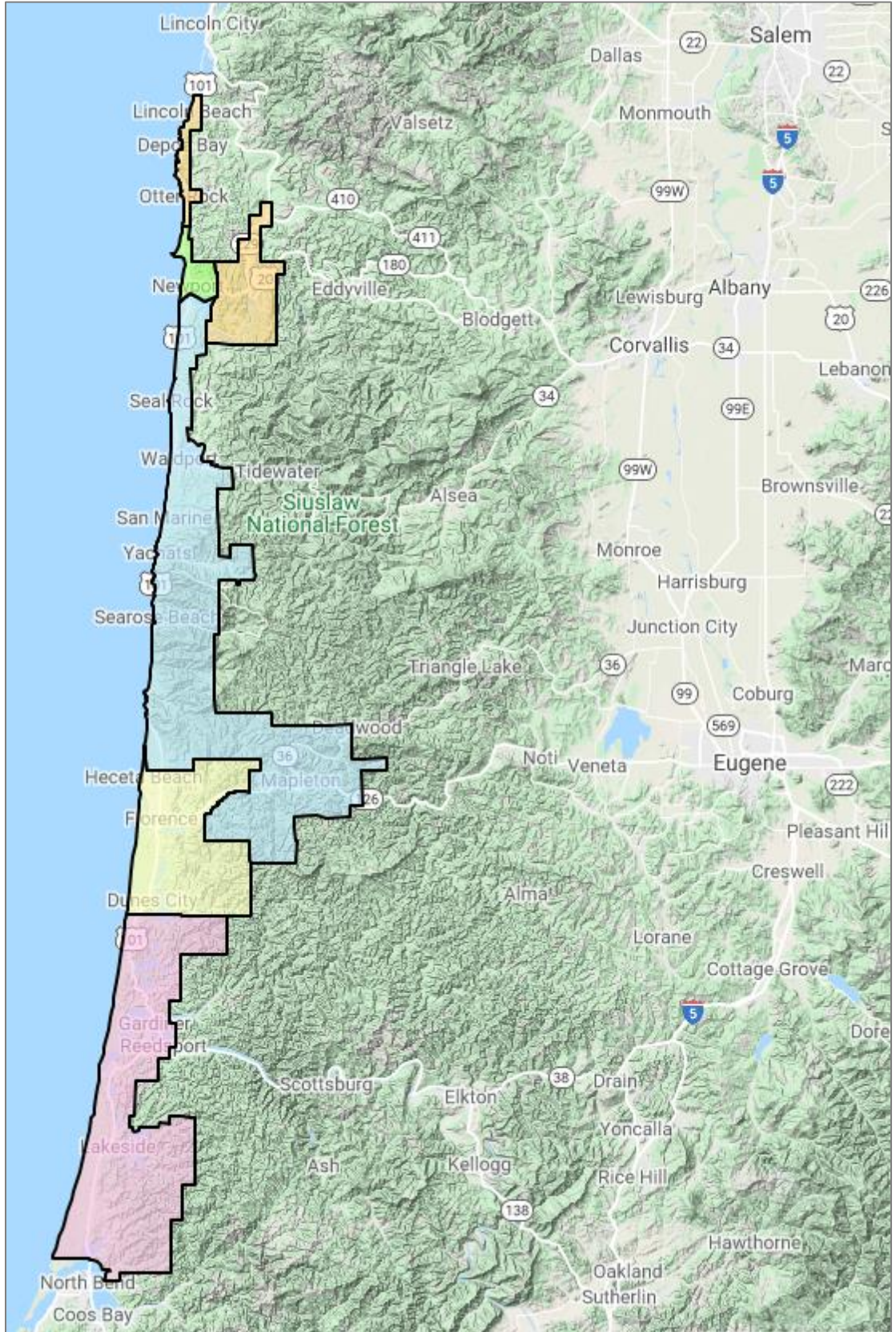
This section provides information on Utility District specific assets. Considering the Utility District specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. This section also provides information on Utility District specific demographics and assets by area. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation.

## Facilities and Property Assets Inventory

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure. Table PUD-4 lists the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of Central Lincoln PUD.

The Utility District's facilities are located within their service area which includes part of Coos, Douglas, Lane, and Lincoln counties (see Figure PUD-3).

**Figure PUD-3 Central Lincoln PUD Area Boundaries**



Source: Central Lincoln PUD

**Table PUD-4 Facilities Summary**

Name/Number	Address	Identified Hazard Exposure									
		CE	DR	EQ	FL	LS	TS	VE	WF	WS	WT
<b>Critical and Essential Facilities</b>											
<b>Intangible plant</b>											
Intangible plant				X							
Headquarters Building	2129 N Coast Hwy, Newport			X							
Northern Operations Center	7501 NE Avery St, Newport										
Southern Operations Center	966 US 101, Florence			X							
Reedsport Office	440 Fir St, Reedsport			X	X						
<b>Transmission plant</b>											
Station equipment				X							
Poles, towers, and fixtures				X		X			X	X	X
Overhead conductors and devices				X		X			X	X	X
Underground conduit				X		X					
Underground conductors and devices				X		X					
<b>Distribution plant</b>											
Station equipment				X							
Structures and improvements				X							
Poles, towers, and fixtures		X		X	X	X	X		X	X	X
Overhead conductors and devices				X		X	X		X	X	X
Underground conduit		X		X		X	X				
Underground conductors and devices		X		X		X	X				
Line transformers				X		X	X		X	X	X
Street lighting equipment											
<b>General Plant</b>											
Structures and Improvements				X	X						
Office furniture and equipment				X	X						
Transportation equipment				X							

Name/Number	Address	Identified Hazard Exposure										
		CE	DR	EQ	FL	LS	TS	VE	WF	WS	WT	
Stores equipment				X	X		X					
Tool and shop equipment				X	X		X					
Laboratory equipment				X								
Communications equipment				X								
<b>Specific Substations Identified in actions</b>												
Substation SS102	Otter Rock											
Substation SS104	Lincoln Beach											
Substation SS106	Depoe Bay											
Substation SS109	Steensen Road, Toledo (adding redundant line)					X			X			
Substation SS134 (mitigation completed)	Sturdevant Road, Toledo (raised elevation)						X					
Substation SS135	Siletz											
Substation SS137 (mitigation completed)	Industrial Park, Toledo (added piles for stability)					X						
Substation SS138	Mossy Lane, Toledo (moving to higher ground)				X							
Substation SS163	Waldport											
Substation SS201	Mapleton											
Substation SS332	Lakeside											

Source: Information provided by Central Lincoln PUD

Table Key:

"X" – Facility may be exposed and may be impacted by the identified hazard per a visual inspection of the mapped hazard area

[blank] = facility exposure has not been assessed for this hazard

Hazard Descriptions:

CE = Coastal Erosion

DR = Drought

EQ = Earthquake

FL = Flood

LS = Landslide

TS = Tsunami

VE = Volcanic Event

WF = Wildfire

WS = Windstorm

WT = Winter Storm

# ATTACHMENT A: ACTION ITEM FORMS

Table PUD-5 provides a summary list of actions for the city. Each action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table PUD-5 Action Item Summary**

Action Item	Priority	Timeline	Status	Related Hazard										
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm	
CLPUD #1	#1	Ongoing	Ongoing	X		X	X	X	X	X		X	X	X
CLPUD #2	#2	Ongoing	Ongoing	X		X	X	X	X			X	X	X
CLPUD #3	#5	Medium	Ongoing	X										
CLPUD #4	#6	Ongoing	Ongoing					X						
CLPUD #5	#7	Ongoing	Ongoing					X						
CLPUD #6	#3	Ongoing	Ongoing									X	X	X
CLPUD #7	#8	Ongoing	Ongoing									X	X	X
CLPUD #8	#4	Short	New	X		X	X	X	X			X	X	X
CLPUD #9	#9	Short	New									X		

Previous NHMP Actions Completed:

**Landslide #1**(2017): “Design transmission and distribution systems with consideration of potential slides” is considered partially complete. Since the previous NHMP Central Lincoln staff completed a Vulnerability and Risk Assessment (VRA) on the utility’s transmission, substation and communication systems in 2016. The VRA was updated in 2018 and an assessment of the distribution was added. The Utility District designs and builds to mitigate for slides almost every year, as such the action is considered an ongoing activity.

**Landslide #2** (2017): “Monitor and evaluate existing infrastructure for potential slide risk” is considered partially complete. The engineering design to remedy the ground settlement and work is to stabilize substation SS137. Ongoing work will occur to monitor SS109. [July 2018, October 2019]

**Tsunami #1** (2017): “Relocate Northern Operations Center out of the tsunami zone” is considered complete. Land was identified, purchased, and a new operations facility designed as an essential facility (seismic category 4 standards) and constructed. (December 2017)

Additional NHMP related activity completed since previous NHMP:

- Utility District installed seismic monitoring devices at seven substations (SS102 Otter Rock, SS104 Lincoln Beach, SS106 Depoe Bay, SS135 Siletz, SS163 Waldport, SS201 Mapleton, and SS332 Lakeside) throughout the Central Lincoln service territory in order to provide early warning in the event of an earthquake.

*Note: 2017 Actions were renamed as follows:*

<b>2017 Action Item</b>	<b>2020 Action Item</b>
Coastal Erosion #1	CLPUD #3
Landslide #1	CLPUD #4
Landslide #2	CLPUD #5
Landslide #4	CLPUD #6
Windstorm #1	CLPUD #7
Windstorm #2	CLPUD #8

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The Utility District NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the Utility District. Existing programs and other resources that might be used to implement these action items are identified. The Utility District addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the Utility District will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the Utility District or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (5-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity. Actions that have been completed or deleted are listed in Volume III, Appendix B.



<b>Mitigation Action: CLPUD #1</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Strengthen local power and communication grids through redundancy and looped systems.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors that address reliable power and customer service and is in alignment with the Vulnerability and Risk Assessment.						
<b>Rationale for Proposal (Why is this important?):</b>						
The current communication network is 20 years old and replacement parts are no longer available. Findings from the Central Lincoln Vulnerability and Risk Assessment specify that the telecommunications network needs replacement.						
A redundant transmission line is needed between Steensen Rd (Newport) and Agate Beach to mitigate for widespread outages north of Newport.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Engage a telecommunications firm to assist in the installation of a new system throughout the service territory. (Est. cost \$2,500,000)			<u>2020 Update:</u>			
Construct a transmission line between the SS109-Steensen and SS108 Agate Beach. (Est. cost \$1,057,000)			Central Lincoln has engaged a telecommunications firm to assist in modernizing the utility's communication system.			
			Central Lincoln is in the process of acquiring permits to build the L9 transmission line between SS109 Steensen and SS108 Agate Beach.			
<b>Champion/ Responsible Organization:</b>		Central Lincoln Engineering and Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>			
All internal Central Lincoln departments						
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Central Lincoln PUD Steering Committee, 2017				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: CLPUD #2</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Preventative maintenance of existing power and communications infrastructure.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors that address reliable power and customer service and is in alignment with the Vulnerability and Risk Assessment.						
<b>Rationale for Proposal (Why is this important?):</b>						
Preventative maintenance is essential to providing reliable power for our coastal communities. Reinvestment in utility's facilities and system infrastructure is part of the annual budget.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Perform ongoing maintenance and replacement of infrastructure using a systematic and data based approach that is affordable to the customer owners. (Est. cost \$15 million annually)			<u>2020 Update:</u> Central Lincoln expends approximately \$15,000,000 each year for capital projects related to the maintenance and modernization of the transmission, substation, distribution and telecommunications systems in order to deliver reliable power.			
<b>Champion/ Responsible Organization:</b>		Central Lincoln Engineering and Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>			
All internal Central Lincoln departments						
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Central Lincoln PUD Steering Committee, 2017				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: CLPUD #3</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Evaluate the relocation of utility infrastructure in identified flood hazard zones.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors and the findings from Central Lincoln's Vulnerability and Risk Assessment.						
<b>Rationale for Proposal (Why is this important?):</b>						
Relocation of identified vulnerable infrastructure adds resiliency to Central Lincoln's transmission and distribution system resulting in more reliable electric service to customers. Two substations has been identified as needing further evaluation.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Relocate substation SS138 on Mossy Lane in Toledo to higher ground outside the flood zone. (Est. cost \$1,000,000)  Raise the elevation of substation SS134 in Toledo to above flood line. (Est. cost \$400,000)			<u>2020 Update:</u>  Land purchase and construction of access road are complete. Substation construction will be completed in 2023.  Work to raise elevation of substation SS134 (Sturdevant Road in Toledo) is complete (2020).			
<b>Champion/ Responsible Organization:</b>		Engineering and Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Central Lincoln Distribution Engineering and GIS			Lincoln County Emergency Management, Public Works, GIS			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Central Lincoln PUD Steering Committee, 2017				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: CLPUD #4</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Design transmission and distribution systems with consideration of potential slides.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors.; Vulnerability and Risk Assessment						
<b>Rationale for Proposal (Why is this important?):</b>						
Designing utility infrastructure using available geophysical and environmental data ensure a more resilient and reliable electric grid. Engineering staff have preliminarily identified areas of concern and will use DOGAMI data to further evaluate the infrastructures for resiliency after a major event.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Complete a Vulnerability and Risk Assessment using available DOGAMI data.  Construct redundant lines where applicable to provide energy assurance.			<u>2020 Update:</u>  Central Lincoln staff completed a Vulnerability and Risk Assessment (VRA) on the utility's transmission, substation and communication systems in 2016. The VRA was updated in 2018 and an assessment of the distribution was added. The assessment required hundreds of hours of staff time and it was not possible to evaluate all potential situations.  Central Lincoln is in the process of constructing a redundant line to assure energy availability in an area susceptible to slides.			
<b>Champion/ Responsible Organization:</b>		Central Lincoln Engineering and Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Central Lincoln Distribution Engineering						
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Local funds		Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	Central Lincoln PUD Steering Committee, 2017					
<b>Action Item Status:</b>	Ongoing					

<b>Mitigation Action: CLPUD #5</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>		<b>High Priority Action Item?</b>	
Monitor and evaluate existing infrastructure for potential slide risk.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>					
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors and the findings from Central Lincoln's Vulnerability and Risk Assessment.					
<b>Rationale for Proposal (Why is this important?):</b>					
Identifying and remediating infrastructure that may be vulnerable to slides or settlement ensures functionality and adds resiliency to Central Lincoln's transmission and distribution system resulting in more reliable electric service to customers.					
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>			
Evaluate SS137 for slide or settlement and determine mitigation. (Est. cost \$200,000)  Continue to monitor SS109 for ground movement and slide risk.		<u>2020 Update:</u> Reinforced SS137 foundation and structure using helical piers (October 2019). Monitoring SS109 (Ongoing)			
<b>Champion/ Responsible Organization:</b>	Central Lincoln Engineering and Operations				
<b>Internal Partners:</b>		<b>External Partners:</b>			
Central Lincoln Engineering and Distribution Engineering					
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>			
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)	High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)			
<b>Form Submitted by:</b>	Central Lincoln PUD Steering Committee, 2017				
<b>Action Item Status:</b>	Ongoing				

<b>Mitigation Action: CLPUD #6</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Collaborate with Lincoln County to identify potential threats.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input checked="" type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors.						
<b>Rationale for Proposal (Why is this important?):</b>						
Participation in Lincoln County tabletops and general interagency coordination and collaboration provide efficiencies for both the utility and County and optimizes recovery efforts.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Attend meetings, briefings, and tabletops the County emergency management team.			<u>2020 Update:</u> Ongoing participation in County seasonal weather briefings and tabletops. Collaboration meetings/tabletops between Central Lincoln PUD and Lincoln County Emergency Management department and the utility and Lincoln County Roads Department.			
<b>Champion/ Responsible Organization:</b>		Central Lincoln GIS				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Central Lincoln Engineering and Distribution Engineering			Lincoln County Emergency Management			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Central Lincoln PUD Steering Committee, 2017				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: CLPUD #7</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Enhance vegetation management in right of ways to minimize outages caused by trees or branches touching the power lines.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors that address reliable power and customer service.						
<b>Rationale for Proposal (Why is this important?):</b>						
Vegetation contacts, in the form of leaning or fallen trees, limbs growing into the line, and wind-blown branches, make up roughly 50% of all Central Lincoln's outages. Trees from inside and outside of the right of way come in contact with power lines and cause the breaker or fuse to trip resulting in an outage.						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Employ a more systematic and strategic approach to tree trimming by hiring a Right of Way supervisor and adding contract crews. (Est. cost \$300,000)				<u>2020 Update:</u> A Right of Way supervisor was hired and the number of in-house crews increased in lieu of contract crews. Tree trimming is ongoing.		
<b>Champion/ Responsible Organization:</b>		Central Lincoln Engineering and Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Central Lincoln Operations			Lincoln County Roads Dept.			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Central Lincoln PUD Steering Committee, 2017				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: CLPUD #8</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Selectively convert existing overhead lines to underground.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors that address reliable customer service.						
<b>Rationale for Proposal (Why is this important?):</b>						
Converting specifically identified overhead lines to underground mitigates for wind related outages on those specific feeders.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Convert overhead lines to underground on routes that have dense vegetation and are difficult to access in the event of an outage.			<u>2020 Update:</u> Converted 12.78 miles of overhead lines to underground during the current plan cycle.  CLPUD will continue annual overhead to underground conversion projects for the next 3-5 years.			
<b>Champion/ Responsible Organization:</b>		Central Lincoln Engineering and Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Central Lincoln Engineering and Distributions						
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)		High		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	Central Lincoln PUD Steering Committee, 2017					
<b>Action Item Status:</b>	Ongoing					



<b>Mitigation Action: CLPUD #9</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Provide for the safety of employees and continuity of operations after a Cascadia event by completing a seismic retrofit on the current Central Lincoln PUD headquarters building or constructing a new headquarters facility by 2022.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors that address reliable power and customer service and is in alignment with the Vulnerability and Risk Assessment.						
<b>Rationale for Proposal (Why is this important?):</b>						
"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation?						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Contract for architect and engineering services to complete a 30% design on the existing building or a next building to be located on the current property.				2020 Update: New		
<b>Champion/ Responsible Organization:</b>		Central Lincoln Engineering and Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>			
All internal Central Lincoln departments						
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Central Lincoln PUD Steering Committee, 2020				
<b>Action Item Status:</b>		New				

<b>Mitigation Action: CLPUD #10</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Install cameras on two communication towers by 2022 to monitor transmission lines for wildfire.		<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>			
The Action Item aligns with the business strategies adopted by the Central Lincoln Board of Directors that address reliable power and customer service and is in alignment with the Vulnerability and Risk Assessment.			
<b>Rationale for Proposal (Why is this important?):</b>			
Oregon's wildfire season has increased from 23 days in the 1970's to 116 days in the 2000's. In light of the changing risk level, Oregon utilities have a heightened awareness that they must document their existing assessment, mitigation and response strategies for wildfire as well as adopt new approaches and tools to address this growing concern.			
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>	
Partner with the U of O to install AlertWildfire cameras on two of Central Lincoln's communication towers.		<u>2020 Update:</u> New	
<b>Champion/ Responsible Organization:</b>	Central Lincoln Engineering and Operations		
<b>Internal Partners:</b>		<b>External Partners:</b>	
All internal Central Lincoln departments		University of Oregon	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Central Lincoln PUD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)		High	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Central Lincoln PUD Steering Committee, 2020		
<b>Action Item Status:</b>	New		

# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the County's website and an email contact was provided for public comment.

During the public review period there were no comments provided.

The screenshot displays the Lincoln County website's 'Planning & Development' section. The main heading is 'Community Input Needed - Natural Hazards Mitigation Plan Renewal'. The page contains the following sections:

- Navigation:** County Home, Contact Us, Search.
- Left Sidebar:**
  - Planning Division
  - Building Division
  - Onsite Waste Management Division
  - Planning Commission
  - Code Compliance
  - Links
  - Marijuana
  - FAQs
  - Staff Directory
  - Community Input Needed - Natural Hazards Mitigation Plan Renewal
  - Fee Schedule - All County Departments
- Contact Information:** Department of Planning & Development, Onno Husing, Director.
- Main Content:**
  - Community Input Needed - Natural Hazards Mitigation Plan Renewal**
  - Text describing the renewal process and the role of the community.
  - Community Member Input:**
    - Community members are invited to provide feedback by submitting comments or questions by Friday, October 2nd using the survey link below.
    - Survey Link - CLICK HERE**
  - Natural Hazards Mitigation Plan - September 2020 Renewal Plan:**
    - The September 2020 page is separated down into 3 sections (I, II, III)
  - Volume I - Basic Plan**
  - Volume II - Jurisdictional Addenda**
    - Depoe Bay
    - Lincoln City
    - Newport
    - Siletz
    - Toledo
    - Waldport
    - Yachats
    - Central Lincoln PUD
    - Lincoln Co. School District
    - Seal Rock Water District
  - Volume III - Appendices**
    - CLICK HERE for current plan - September 2015
  - Questions - need more information?**
    - Planning and Development Department - 541-265-4192
    - County Emergency Management - 541-265-4199
    - Michael Howard, Director for the Oregon Partnership for Disaster Resilience at mhoward@uoregon.edu
  - Seal Rock Water District and Lincoln Co. School District addenda are forthcoming.
  - SUPPORTING DOCUMENTS:**
    - central\_lincoln\_pud\_addendum\_review\_draft.pdf (2 MB)
    - depoe\_bay\_addendum\_review\_draft.pdf (3 MB)
    - lincoln\_city\_addendum\_review\_draft.pdf (4 MB)
    - lincoln\_co\_nhmp\_-\_volume\_i\_review\_draft.pdf (5 MB)
    - lincoln\_co\_nhmp\_-\_volume\_ii\_review\_draft.pdf (8 MB)
    - newport\_addendum\_review\_draft.pdf (3 MB)
    - siletz\_addendum\_review\_draft.pdf (3 MB)
    - toledo\_addendum\_review\_draft.pdf (4 MB)
    - waldport\_addendum\_review\_draft.pdf (3 MB)
    - yachats\_addendum\_review\_draft.pdf (3 MB)
    - Media Release - Community Feedback Needed - Natural Hazards Mitigation Plan (17 KB)
    - seal\_rock\_wd\_addendum\_review\_draft.pdf (2 MB)
    - lincolnsd\_addendum\_review\_draft.pdf (5 MB)
  - WEB LINKS:**
    - September NHMP - Separated down into 3 sections (I, II, III)

### Natural Hazard Mitigation Plan Public Feedback Survey

Please provide feedback for the September 2020 Natural Hazard Mitigation Plan Renewal in the box provided below.

Thank you.

Emergency Management  
541-265-4199

Natural Hazard Mitigation Plan Feedback

Name (Optional)

Contact Phone Number (optional)

Contact Email (optional)

Zip Code (Optional)

Send me a copy of my responses

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

Mitigation Action: CLPUD # (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# Lincoln County School District Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Lincoln County School District

Effective: December 29, 2020 through December 28, 2025



**LINCOLN COUNTY  
SCHOOL DISTRICT**

Prepared for:

**Lincoln County School District**

Prepared by:

**University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience**

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



**FEMA**

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
Grant: PDMC-PL-10-OR-2017-002  
Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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**FEMA**

January 8, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Chair Jacobson:

On December 29, 2020, the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Hazard Mitigation Plan as a multi-jurisdictional local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance (HMA) grants projects through December 29, 2025, through your state:

City of Newport | Lincoln County | Lincoln County School District | City of Siletz

FEMA individually evaluates all application requests for funding according to the specific eligibility requirements of the applicable program. Though a specific mitigation activity or project identified in the plan may meet the eligibility requirements, it may not automatically receive approval for FEMA funding under any of the aforementioned programs.

Approved mitigation plans may be eligible for points under the National Flood Insurance Program's Community Rating System (CRS). For additional information regarding the CRS, please visit: [www.fema.gov/national-flood-insurance-program-community-rating-system](http://www.fema.gov/national-flood-insurance-program-community-rating-system) or contact your local floodplain manager. Over the next five years, we encourage your communities to follow the plan's schedule for monitoring and updating, and to develop further mitigation actions. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at (503) 378-2911, who locally coordinates and administers these efforts.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

Enclosure

cc: Amie Bashant, Oregon Office of Emergency Management

EG:vl

**A Resolution Adopting the Lincoln County School District Representation  
in the Updates to the  
Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan**

**WHEREAS**, the Lincoln County School District recognizes the threat that natural hazards pose to people, property and infrastructure within our community; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future hazard occurrences; and

**WHEREAS**, an adopted Natural Hazards Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Lincoln County School District has fully participated in the FEMA prescribed mitigation planning process to prepare the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*, which has established a comprehensive, coordinated planning process to eliminate or minimize these vulnerabilities; and

**WHEREAS**, the Lincoln County School District has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the Lincoln County School District to the impacts of future disasters within the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*; and

**WHEREAS**, these proposed projects and programs have been incorporated into the *Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan* that has been prepared and promulgated for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials will review the *Lincoln County School District addendum* to the *Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan*. Approval of the plan is contingent upon this official adoption of the participating governments and entities; and

**WHEREAS**, the LCSD Superintendent is authorized to make any necessary administrative changes to the NHMP necessary based on review by the State or FEMA, provided it does not authorize any new fiscal commitments beyond what is currently identified within the plan; and

**WHEREAS**, the NHMP is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the NHMP; and

**WHEREAS**, the NHMP is in an on-going cycle of development and revision to improve its effectiveness; and

**WHEREAS**, Lincoln County School District adopts the NHMP and directs the *Superintendent* to develop, approve, and implement the mitigation strategies, as funding is available, and any necessary administrative changes to the NHMP.

**Now, therefore, be it resolved**, that the Lincoln County School District adopts *the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan* as an official plan; and

**Be it further resolved**, that the Lincoln County School District will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the *Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan*.

Adopted this 8th day of December, 2020



Megan Cawley, Board Chair  
Certifying Official, Lincoln County School Board

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## Purpose

This document serves as the Lincoln County School District's (School District) addendum to the Lincoln County Multi-Jurisdiction Natural Hazards Mitigation Plan (MNHMP, NHMP). This addendum describes how the School District's risks vary from the entire Lincoln County planning area (in which the entirety of the School District is located). Information contained herein supplements information contained in Volume I (Basic Plan) of this NHMP, which serves as the foundation for this jurisdiction's addendum and Volume III (Mitigation Resources), which provides additional information. This addendum meets all the requirements of Title 44 §201.6 including:

- Multi-jurisdictional **Plan Requirements** §201.6(a)(4),
- Multi-jurisdictional **Planning Process** §201.6(b)(1-3),
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv),
- Multi-jurisdictional **Plan Maintenance Process** §201.6(c)(4), and
- Multi-jurisdictional **Plan Adoption** §201.6(c)(5).

A description of the jurisdiction specific planning and adoption process follows, along with detailed community specific action items. Information about the school district's risk relative to the county's risk to natural hazards is documented in the addendum's Hazard Analysis and Issue Identification section. The section considers how the school district's risk differs from or matches that of the county's; additional information on Risk Assessment is provided within the Lincoln County NHMP's Section 2 – Risk Assessment.

This is the first addendum to the Lincoln County NHMP for the School District, however, the School District participated in previous versions of the NHMP. In previous versions of the NHMP the School District contributed risk assessment information and mitigation strategies. Relevant updates are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the previous Lincoln County NHMP that took place during this update process.

Lincoln County School District adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **December 8, 2020**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2020** and the School District's addendum on **December 29, 2020**. With approval of this NHMP the School District is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The School District concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

*To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.*

The 2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2015 and 2009 NHMP. The Steering Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the School District's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The School District concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

Below is a list of the NHMP goals:

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

## Process and Participation

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the School District will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Oregon Office of Emergency Management (OEM), the Department of Land Conservation and Development (DLCD), Lincoln County, and Lincoln County School District to update the multi-jurisdictional NHMP and to develop the school district addendum. This project is funded through the Federal Emergency Management Agency's Pre-Disaster Mitigation (PDM) Competitive Grant Program Grant: OR-2018-001 (PDMC-PL-10-OR-2017-002). Members of the Lincoln County School District NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Lincoln County School District addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Lincoln County School District NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The School District Safety Coordinator serves as the NHMP addendum convener. The convener of the NHMP addendum will take the lead in implementing, maintaining, and updating the addendum in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Emergency Manager and Planning Director).

Representatives from the School District Steering Committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the School District's representation in the Lincoln County NHMP, with focus on the NHMP's risk assessment and mitigation strategy (action items).

This addendum reflects decisions made at the designated meetings, and during subsequent work, and communication with OPDR. The changes are highlighted with more detail throughout this document, and within Volume III, Appendix B. Other documented changes include the inclusion of the School District's risk assessment and hazard identification sections which were not included in previous versions of the NHMP and mitigation strategy (action items).

The Lincoln County School District steering committee was comprised of the following representatives:

- Convener, Susan Graves, Safety Coordinator
- Dr. Karen Gray, Superintendent
- Susan Van Liew, Assistant Superintendent
- Rich Belloni, Facilities Director

## Public Participation

Public participation was achieved in part by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment during the plan development stage via a survey administered by OPDR (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The School District Board of Directors will be responsible for adopting the School District addendum to the Lincoln County NHMP. This addendum designates the steering committee, and a convener to oversee the development, and implementation of action items. Because the School District addendum is part of the County's multi-jurisdictional NHMP, the School District will look for opportunities to partner with the County. The School District's steering committee will convene after re-adoption of the School District NHMP addendum on an annual schedule. The County is meeting on a quarterly basis and will provide opportunities for the cities to report on NHMP implementation, and maintenance during their meetings. The School District Safety Coordinator will serve as the School District convener and will be responsible for assembling the steering committee. The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The School District will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies, residents, and the School District; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other School District plans and programs including their [Strategic Plan](#), [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and in Attachment A) are intended to be implemented through existing plans and programs within the School District. Plans and policies already in existence have support from district residents, businesses, and policy makers. Where possible, the School District will implement the NHMP's recommended actions through existing plans and policies. Many strategic plans get updated regularly,



allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards.

The School District currently has the following plans and policies that relate to natural hazard mitigation:

**All hazards Emergency Plan:** Lincoln County School District has worked closely with local emergency response partners to develop an all-hazards, district-wide School Emergency Plan that is highly customized for their schools. The School District also developed a comprehensive, all-hazards **School Bus Emergency Plan**. These plans are based on the needs of each school, the specific hazards faced in Lincoln County, and emergency service agencies' procedures and response capabilities. The emergency plans include procedures to help respond effectively to emergencies such as fires, earthquakes, hazardous materials, situations involving dangerous persons, threats, severe weather, medical emergencies, and more.

**Family Reunification Plan:** A Family Reunification procedure is used when it is necessary to release students directly to their parent, guardian or designated emergency contact due to an emergency that prevents a normal dismissal. This could include a fire or damage to a school building, a natural disaster, a field trip emergency or bus accident, a hazardous materials emergency, a severe winter storm, a situation involving a threat, weapon or violence at school or in the surrounding community, etc. In addition, the School District has robust Family Reunification Kits at each of their schools.

**Sheltering Plan:** Severe winter storms which bring flooding, downed trees and power lines, landslides, and other hazards, present challenges to transporting students (whether by bus or by family vehicles) to and from school/homes. For these reasons, having the capacity to shelter students for an extended amount of time, is necessary. The School District has a Memorandum of Understanding (MOU) with the Red Cross for the use of all LCSD schools as Emergency Shelters. The following schools also have limited use generators and disaster supply caches: Taft High 7-12 school (Lincoln City), Newport Middle School (Newport), Toledo Elementary School (Toledo), and Waldport High School (Waldport). The School District also has a three-part Sheltering Protocol for situations when 1) schools shelter students overnight; 2) Red Cross shelters the public in one of their schools; and 3) Dual Sheltering - if the school uses part of the school to shelter students and releases another portion of the school to the Red Cross for public sheltering.

**Haz-Mat Preparedness:** All Lincoln County schools have Shelter-in-Place (SIP) supplies in all classrooms so that they can quickly seal off their environments in case of a hazardous materials spill in the community. The most likely hazardous materials spills would come from tanker trucks that travel daily, up and down Hwy 101, the many fish plants on the bayfront in Newport, and from the Georgia Pacific Lumber Mill and the large tanker trucks that travel on Hwy 20 and Sturdevant Road right in front of both Toledo schools on their daily routes to and from the mill. The School District does a complete SIP drill once per school year. The SIP supply buckets/toilets could be used for sanitation needs during an

earthquake/tsunami when water/sewer infrastructure is destroyed. The School District participates in countywide hazmat tabletop exercises.

**Fire Preparedness:** All schools do monthly fire evacuation drills. The School District alternates their drill practices to include blocked exits, practicing during class and non-class times, and using an alternate evacuation assembly area. This helps staff and students get used to “options-based decision-making” so they can adjust their actions as needed depending on the hazard, threat, and circumstances.

**NOAA TsunamiReady Supporter:** In July 2013, Lincoln County School District was the first school district, nation-wide, to achieve the National Oceanic and Atmospheric Administration’s (NOAA) TsunamiReady (TR) Supporter status due to our high level of tsunami awareness and preparedness. The School District’s TsunamiReady (TR) status was renewed in 2019.

**Earthquake Training & Drills:** All schools conduct an earthquake drill twice per year which includes instruction using a customized earthquake/tsunami response video provided on the LCSD website. Key elements of the Lincoln County School District’s Earthquake Plan includes procedures to 1) take protective measures during the ground shaking (drop, cover, & hold-on), 2) safely evacuate the building after the shaking stops, and 3) account for, supervise and meet the basic needs of students afterward. The School District conducts one of these drills in conjunction with the Great Oregon ShakeOut.

**Communications:** The School District has several mechanisms in place in order to communicate during various emergencies. All schools are equipped with *NOAA Weather Alert Radios* in order to receive immediate notice of a distant tsunami alerts, lightning storms, and other hazards. Each school also has multiple two-way radios to facilitate emergency communications within the school and between neighboring schools. The School District also has a mass phone notification system in place for times when they need to push out hundreds/thousands of phone calls/messages at once.

Since the 2015 NHMP the School District added two new communication capabilities:

- Equipped each school with a single landline phone for emergencies for times when the regular phone system is not working such as during a power or internet outage. It may also allow off-site district personnel to call in to a school office when other lines are not accessible due to high call volumes during emergencies.
- Installed base radios in all school offices that allow school personnel to talk with any other school in Lincoln County, as well as with any of our school buses and bus barns.

**Distant Tsunami Plan:** A Distant Tsunami is caused by an earthquake far away, which is not perceived locally, from an earthquake in Alaska, Japan or elsewhere. There is typically four or more hours warning of a Distant Tsunami before tsunami waves arrive in Lincoln County. The School District has a written Distant Tsunami Plan that guides decision making regarding Distant Tsunami watches, warnings, and advisories.

**Tsunami Inundation/Evacuation Maps:** The Oregon Department of Geology and Mineral Industries (DOGAMI) has created Tsunami Inundation and Evacuation Maps for cities in Lincoln County. The maps help residents and visitors identify what areas are in the tsunami

hazard zone and where to locate safe high-ground areas. The School District keeps copies of the maps on their website.

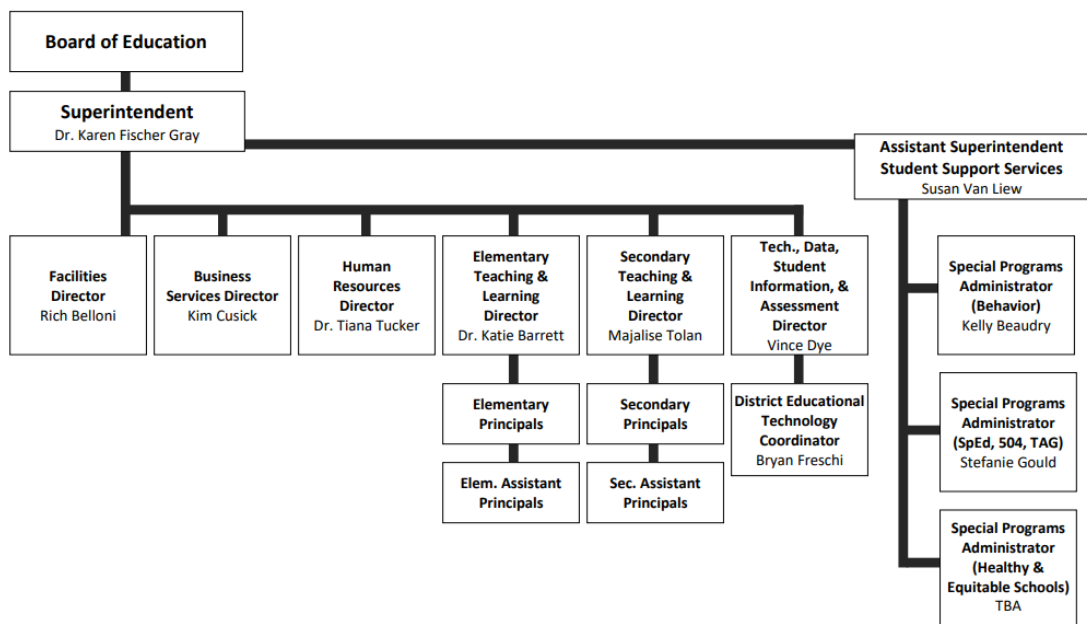
For additional information specific to each region of the School District see section below under community description and the School District website:

<https://lincoln.k12.or.us/resources/family/safety/>

## Governance Structure

The School District vests policy authority in an elected five member School Board and places administrative authority for day-to-day operations in professional staff.

### Lincoln County School District Organizational Chart 2020-2021



## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review.<sup>1</sup> Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the School District is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The School District posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the School District’s website: <https://lincoln.k12.or.us>.

<sup>1</sup> Code of Federal Regulations, Chapter 44. Section 201.6, subsection (b). 2015

## NHMP Maintenance

The Lincoln County NHMP, and School District addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the County NHMP update process, the School District will also review, and update its addendum (Volume I, Section 4). The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the NHMP was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the NHMP accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the NHMP.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3(iv), *Mitigation Strategy*.

The School District's mitigation strategy (action items) were first developed during the planning process for the 2015 NHMP. Although the School District did not have its own addendum, they fully participated in the 2015 NHMP update process, and the actions were incorporated into the applicable city addendum where each school facility is located. The actions were reviewed, updated, and transferred to the School District addendum during the 2020 NHMP planning process and will be revised during subsequent NHMP updates. During these processes, the steering committee assessed the School District's risk, identified potential issues, and developed the mitigation strategy (action items).

### Priority Action Items

Table LCSD-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. High priority actions are shown in **bold** text with grey highlight. The School District will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could

pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action.

**Table LCSD-I Lincoln County School District Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Cost	Timing
LCSD #1	Seismically assess and retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	Facilities and Maintenance	H	Long
LCSD #2	Construct a new school in Lincoln City out of the Tsunami Inundation Zone.	Facilities and Maintenance	H	Long
LCSD #3	Relocate the School District's maintenance building out of the Tsunami Inundation Zone.	Facilities and Maintenance	M	Short
LCSD #4	Develop disaster response plans, procure and stock emergency supplies on all school buses, and provide caches (food and emergency supplies) throughout the School District.	Safety Coordinator	L to H	Ongoing
LCSD #5	Maintain and promote the Teen CERT program activity in the School District and recruit school staff members to be trained in CERT.	Safety Coordinator	L	Ongoing
LCSD #6	Improve, maintain, and obtain resources and equipment essential for mitigating the impacts of disasters.	Facilities and Maintenance	M to H	Short
LCSD #7	Develop, maintain, and enhance the School District's capacity to provide services during and after a disaster event.	Safety Coordinator & Technology Director	L to H	Medium
LCSD #8	Develop a fire and wildfire mitigation plans and perform mitigation actions to decrease the risk of fire and the risk of damage from wildfires at our schools and district facilities.	Safety Coordinator	L to H	Short
LCSD #9	Develop a wind and straight-line windstorm mitigation plan and perform actions to decrease the risk of damage from these high probability events.	Facilities & Maintenance	L to H	Short

Source: Lincoln County School District Steering Committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)

# Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(c)(2)(iii) - Risk Assessment.

Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets, and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places, and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure LCSD-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure LCSD-1 Understanding Risk**



## Hazard Characteristics

Volume I, Section 2 describes the characteristics of the profiled hazards, history, as well as the location, extent and probability of potential events. Additional information is found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#). Generally, an event that affects the County, or applicable City, where each school is located is likely to affect the School District as well. Similarly, the causes and characteristics of hazard events are appropriately described within the Volume I, Section 2 as well as the location and extent of potential hazards. Lastly, previous occurrences are well documented within Volume I, Section 2 and the community impacts described by the County, or applicable City, would

generally be the same for the School District. Additional history and impact are provided in the section below entitled “School District Area Profiles”.

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County. The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire. The School District hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

The School District’s facilities are entirely contained within the Lincoln City, Newport, Toledo, Waldport, and unincorporated areas of Lincoln County.

#### National Flood Insurance Program (NFIP)

FEMA updated the Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) in 2019 (effective October 18, 2019). The School District is not a community which has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction. The Cities of Lincoln City, Newport, Toledo, and Waldport and Lincoln County participate in the National Flood Insurance Program (NFIP).

There are no repetitive loss or severe repetitive loss properties owned or operated by the School District. For specific information for communities within the School District’s service area see Volume I, Section 2 and the addenda for the cities of Lincoln City, Newport, Toledo, and Waldport (Volume II) for more information.

## **Hazard Analysis**

The School District steering committee developed their hazard vulnerability assessment (HVA), using the County and applicable City HVAs as references (Lincoln City, Newport, Toledo, and Waldport). Differences reflect distinctions in vulnerability and risk from natural hazards unique to the School District, which are discussed throughout this addendum.

Table LCSD-2 shows the HVA matrix for the School District listing each hazard in order of rank from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

One catastrophic hazard (Cascadia Subduction Zone earthquake) and four chronic hazards (windstorm, winter storm, landslide, and wildfire) rank as the top hazard threats to the School District (Top Tier). The drought, local tsunami, and riverine flood hazards comprise the next highest ranked hazards (Middle Tier). The tornado, coastal flood, crustal earthquake, distant tsunami, and volcanic event hazards comprise the lowest ranked hazards (Bottom Tier). The coastal erosion hazard was not ranked since it does not impact the School District.

**Table LCSD-2 Hazard Analysis Matrix**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Windstorm	20	50	100	70	240	#1	Top Tier
Winter Storm (Snow/Ice)	18	35	90	70	213	#2	
Landslide	20	40	80	70	210	#3	
Earthquake (Cascadia)	10	50	100	49	209	#4	
Wildfire	10	40	100	56	206	#5	
Drought	20	25	60	70	175	#6	Middle Tier
Tsunami (Local)	2	30	80	49	161	#7	
Flood (Riverine)	20	15	40	70	145	#8	
Tornado	8	10	30	56	104	#9	Bottom Tier
Flood (Coastal)	10	15	40	35	100	#10	
Earthquake (Crustal)	10	20	40	21	91	#11	
Tsunami (Distant)	10	5	20	35	70	#12	
Volcanic Event	2	5	40	7	54	#13	
Coastal Erosion	The School District is not affected by this hazard, as such it was not included.						

Source: Lincoln County School District Steering Committee, 2020.

Table LCSD-3 categorizes the probability, and vulnerability scores from the hazard analysis for the School District and compares the results to the assessment completed by the Lincoln County steering committee. Variations between the School District and County are noted in **bold** text within the School District ratings.

**Table LCSD-3 Probability and Vulnerability Comparison**

Hazard	School District		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	-	-	High	Low
Drought	High	Moderate	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	<b>Moderate</b>	<b>Low</b>	High	Moderate
Flood (Riverine)	High	<b>Low</b>	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	Low	Moderate	Low
Tsunami (Local)	Moderate	<b>Moderate</b>	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	High	<b>High</b>	High	Moderate
Windstorm	High	High	High	High
Winter Storm (Snow/Ice)	High	Moderate	High	Moderate

Source: Lincoln County School District and Lincoln County steering committee, 2020.



## School District Asset Identification

This section provides information on School District specific assets. Considering the School District specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. This section also provides information on School District specific demographics and assets by area. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation.

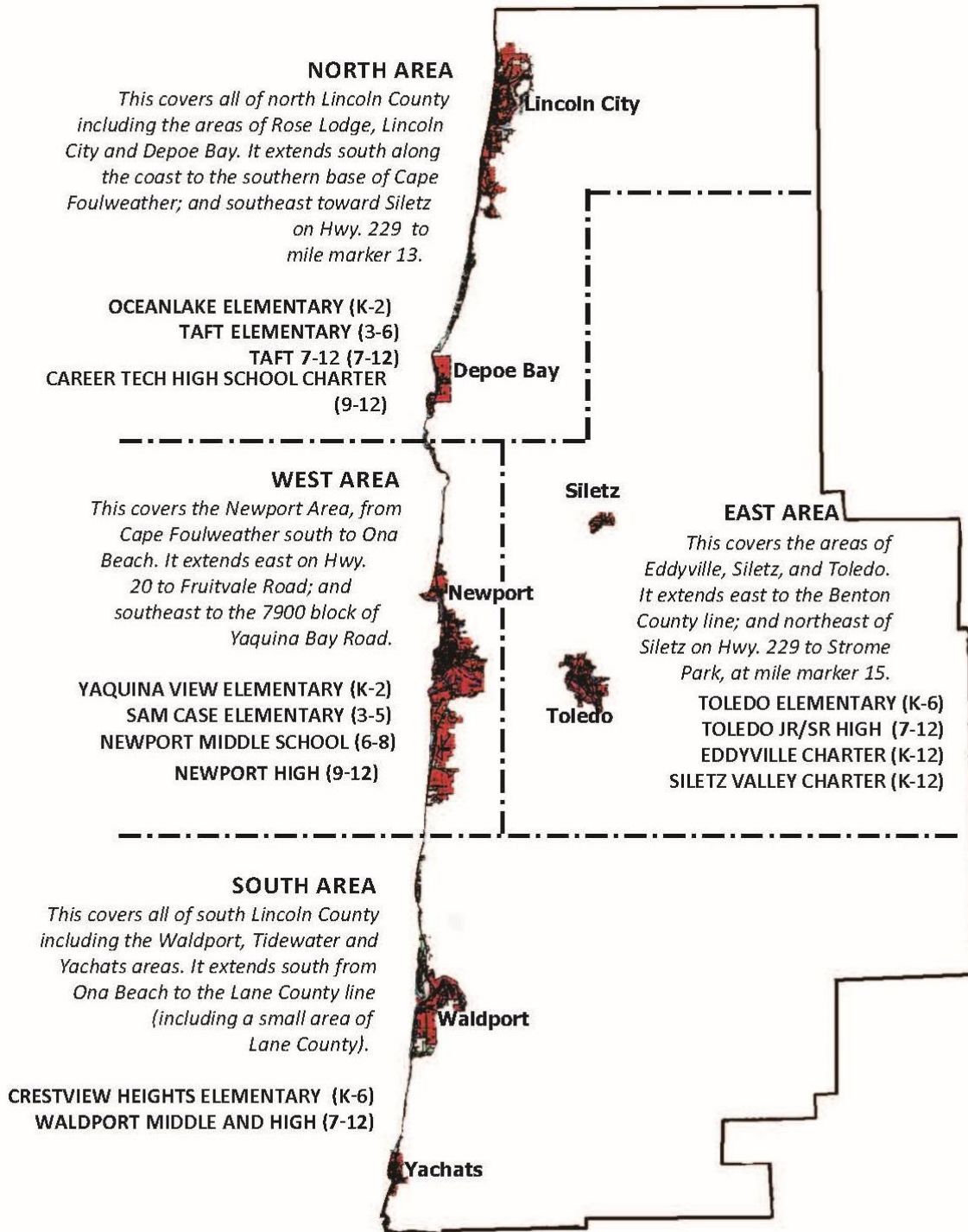
### Facilities and Property Assets Inventory

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure. This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of Lincoln County School District.

The School District facilities listed in the summary table below (Table LCSD-4) and shown by geographic area (Figure LCSD-2) are described in more detail at the end of this section. Additional “charter” schools in the School District include the Eddyville Charter School (Eddyville), Lincoln City Career Technical High School, Siletz Valley Schools and Early College Academy (Siletz). Charter schools are not profiled within this addendum.

Additional schools in Lincoln County include Abundant Life (Toledo, private), Job Corps Angell Conservation Corp (Yachats, private), Mid Coast Christian (Toledo, private), St James Santiago School (Lincoln City, private), Lincoln City Seventh-Day Adventist School (Lincoln City, private), Faith Baptist Kindergarten (Lincoln City, private), and Oregon Coast Community College (Lincoln City, Newport, Waldport). To the extent applicable these schools are discussed within the applicable County Risk Assessment (Volume I, Section 2) and City addendum (Volume II).

**Figure LCSD-2 Lincoln County School District Area Boundaries**



Source: Lincoln County School District

Note: This map shows approximate boundaries for general informational purposes only.

**Table LCSD-4 Facilities Summary**

Name/Number	Address	Identified Hazard Exposure									
		CE	DR	EQ	FL	LS	TS	VE	WF	WS	WT
<b>Essential School Facilities (Schools and Shelters)</b>											
<b>Lincoln City Schools</b>											
Oceanlake Elementary	2420 NE 22 <sup>nd</sup> St, Lincoln City	-		X	-	X	-		-		
Taft Elementary <sup>^</sup> <i>(former high and middle)</i>	4040 SE High School Dr, Lincoln City	-		X	-	Y	-		Y		
Taft 7-12 High* <i>Taft Alternative</i>	3780 SE Spyglass Ridge Dr, Lincoln City <i>(housed in the Voris Field Building)</i>	-		X	-	-	-		Y		
<b>Newport Schools</b>											
Yaquina View Elementary	351 SE Harney St, Newport	-		X	-	Y	-		-		
Sam Case Elementary	459 NE 12 <sup>th</sup> St., Newport	-		X	-		-		-		
Newport Middle <i>Future Bound Alternative</i>	825 NE 7 <sup>th</sup> St, Newport	-		X	-	Y	-		Y		
Newport High – East	322 NE Eads St, Newport	-		X	-		-		-		
Newport High– West* <i>Newport High Alternative</i> <i>Education for Community Employment &amp; Life</i>	311 NE Eads St, Newport	-		X	-		-		-		
<b>Toledo Schools</b>											
Toledo Elementary	600 SE Sturdevant Rd, Toledo	-		X	-	X	-		Y		
Toledo Jr/Sr High* <sup>^</sup> <i>(in County)</i>	1800 NE Sturdevant Rd, Toledo	-		X	-	X	-		X		
<b>Waldport Schools</b>											
Crestview Heights	2750 Crestline Dr, Waldport	-		X	-	-	-		Y		
Waldport Middle and High* <sup>^</sup>	3000 Crestline Dr, Waldport	-		-	-	-	-		Y		
<b>District Offices &amp; Support Facilities</b>											
The Learning Center/District Office <b>(EOC)</b>	1212 NE Fogarty St, Newport			Y		Y			Y		
The Compass Center for Youth & Families <sup>^</sup>	459 SW Coast Hwy, Newport, OR			Y							
Facilities & Maintenance - North	1545 SE 50 <sup>th</sup> St, Lincoln City, OR (at old TAES site)			Y	Y		Y				
Facilities & Maintenance – Main <b>(Alternative EOC)</b> Sodexo Nutrition & Custodial Services	295 NE Burgess Rd, Toledo			Y							

Name/Number	Address	Identified Hazard Exposure									
		CE	DR	EQ	FL	LS	TS	VE	WF	WS	WT
Arcadia School (Offices)	1811 NE Arcadia Dr, Toledo, OR	-		X	-	X	-		-		
<b>Transportation</b>											
Bus Barn – Main (Toledo)	Located at Facilities & Maintenance (Main)			Y		Y			Y		
Bus Barn – North (Lincoln City)	Holly Farm Bus Barn 6110 NE Devils Lake Blvd			Y		Y			Y		
Bus Barn – South (Waldport)	Located at Crestview Heights School			Y		Y			Y		
<b>Childcare and/or Preschool</b>											
Early Intervention (Early Childhood Center)	420 NE 12 <sup>th</sup> St, Newport			Y							
Taft Early Learning Center	Located at Taft 7-12 High, Lincoln City	See vulnerability data for facility that this program is located within									
Early Intervention	Located at Taft Elementary, Lincoln City										
Cubby Preschool & Baby Cubs	Located at Newport High – West, Newport										
LIFT Preschool	Located at The Compass Center for Youth & Families, Newport										
Baby Boomers Preschool	Located at Toledo Jr/Sr High, Toledo										
Wee Irish Preschool	Located at Crestview Heights, Waldport										

Source: Information provided by Sue Graves, Safety Coordinator for Lincoln County School District;  
Potential impact from *DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020)*.

Notes: \* - School Based Health Center Operated by Lincoln County Health and Human Services; ^ - Homeless Education & Literacy Program Center (HELP)

**Table Key:**

“X” = Facility is exposed to and may be impacted by the identified hazard per the *Risk Report*

“-” = Facility is not exposed to the identified hazard per the *Risk Report*

“Y” – Facility may be exposed and may be impacted by the identified hazard per a visual inspection of the mapped hazard area

[blank] = facility exposure has not been assessed for this hazard

**Hazard Descriptions:**

CE = Exposed to Coastal Erosion High Hazard;

DR = Exposed to Drought,

EQ = “> 50% Probability” of Moderate to Complete Damage due to Earthquake,

FL = Exposed to 1% Annual Flood,

LS = Exposed to High to Very High Landslide Susceptibility,

TS = Exposed to Medium CSZ Tsunami M9.0, VE = Exposed to Volcanic Event,

WF = Exposed to Wildfire High Hazard,

WS = Exposed to Windstorm,

WT = Exposed to Winter Storm

### 2007 Rapid Visual Survey

Building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. Information on specific School District buildings' estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table LCSD-5; each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI using their Rapid Visual Survey (RVS), that have not been retrofitted, no buildings have a very high (100% chance) collapse potential, while one (1) has a high (greater than 10% chance) collapse potential (Toledo Elementary). To fully assess a buildings potential for collapse, a more detailed engineering study completed by a qualified professional is required, but the RVS study can help to prioritize which buildings to survey.

Note: each of the assessed charter schools have buildings that have very high or high collapse potential.

### Mitigation Activities

Earthquake mitigation activities listed here include current mitigation programs and activities that are being implemented by School District agencies or organizations.

A primary mitigation objective of the School District is to construct or upgrade critical and essential facilities and infrastructure to withstand future earthquake events. Seismic retrofit grant awards per the [Seismic Rehabilitation Grant Program](#)<sup>2</sup> have been funded to retrofit:

- Toledo High School, (2013-2014 grant award, \$1,468,092) to life-safety standards,
- Sam Case Elementary School (2015-17, Phase II grant award, \$1,498,424) to life-safety standards,
- Newport High School gym (2015-17, Phase II grant award, \$1,500,000) to life-safety standards,
- Taft Elementary School gym (2017-19, Phase II grant award, \$2,493,455) to reoccupancy standards, and
- Oceanlake Elementary School (2020 grant award, \$2,499,090 ) to reoccupancy standards.

In addition:

- The School District passed a bond measure which included building a new high school in Waldport, out of the tsunami zone. The new high school opened for high school students in August 2013. The old high school was then closed.
- The School District received a Pre-Disaster Mitigation Grant from FEMA to demolish the old Waldport High School (WHS) that was in the tsunami zone and convert the land into open space. Funds from the grant were also used to demolish most of the old Waldport Middle School, except for the gymnasium (additional funds from the grant were used to demolish the old Taft Elementary School, in the tsunami zone in Lincoln City).
- Since the 2015 NHMP, the City of Waldport has acquired the old WHS Open Space site.

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<sup>2</sup> The Seismic Rehabilitation Grant Program (SRGP) is a state of Oregon competitive grant program that provides funding for the seismic rehabilitation of critical public buildings, particularly public schools and emergency services facilities.

**Table LCSD-5 Rapid Visual Survey Scores**

Facility	Site ID*	Level of Collapse Potential			
		Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100%)
<b>Schools</b>					
Ocreanlake Elementary** (2420 NE 22nd Street, Lincoln City)	Linc_sch01			<b>SRGP 2020 \$2,499,090</b>	
Taft Elementary (former MS & HS)** (4040 High School Drive, Lincoln City)	Linc_sch04			<b>SRGP 2017-2019 Phase II: \$2,493,455</b>	
Taft 7-12** (3780 SE Spyglass Ridge Road, Lincoln City)	Linc_sch10	X			
Sam Case Elementary** (459 NE 12th Street, Newport)	Linc_sch02			<b>SRGP 2015-2017 Phase II: \$1,498,424</b>	
Yaquina View Elementary** (351 SE Harney Street, Newport)	Linc_sch08		XXX		
Newport Middle (former Isaac Newton Magnet)** (825 NE 7th Street, Newport)	Linc_sch17	X			
Newport High - East** (322 NE Eads Street, Newport)	Linc_sch09			<b>SRGP 2015-2017 Phase II: \$1,500,000</b>	
Newport High - West** (311 NE Eads Street, Newport)	Linc_sch22		XX		
Newport Early Childhood Center (420 NE 12th Street, Newport)	Linc_sch13	X			
Toledo [Elementary]** (600 SE Sturdevant Road, Toledo)	Linc_sch05			X	
Toledo [Jr/ Sr] High (Not in City)** (1800 NE Sturdevant Road, Toledo)	Linc_sch11			<b>SRGP 2013-2014 \$1,468,092</b>	
Crestview Heights** (2750 S Crestline Drive, Waldport)	Linc_sch06 Linc_sch07	X			
<b>Charter Schools</b>					
Eddyville Charter** (57 Eddyville School Road, Eddyville)	Linc_sch15	X		X	X
Career Technical High (Charter)** (801 SW Hwy 101, Lincoln City)	Linc_sch14			X	
Siletz Valley School** (Charter) (245 NW James Frank Avenue, Siletz)	Linc_sch18	X	X	XX	X
<b>Previous School District Facilities (no longer used as schools)</b>					
(former) Taft Elementary (1545 SE 50th Street, Lincoln City)	Linc_sch03			<b>Demolished. Site Vacant.</b>	
Waldport High (320 Lower Crestline Drive, Waldport)	Linc_sch12			<b>Demolished. Site Vacant.</b>	

Source: [DOGAMI 2007. Open File Report 0-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment.](#) Notes: “\*” – Site ID is referenced on the [RVS Lincoln County Map](#); “\*\*\*” – Facility determined to be vulnerable to CSZ earthquake and should expect moderate to complete damage (> 50% probability). DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020).

## School District Area Profiles<sup>3</sup>

The following section provides information on School District specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the School District specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

### Lincoln City (North Area)

Table LCSD-6 shows schools and support facilities within Lincoln City. The three schools serve approximately 1,700 children from an expansive geographic region: from Otter Rock & Depoe Bay in the South, to several miles up Hwy 229 to the East towards Siletz, and out to Cascade Head area off Hwy 101 to the North and to Rose Lodge area on Hwy 18 to the Northeast (see Figure LCSD-2).

**Table LCSD-6 Lincoln City Schools & Support Facilities**

School/Facility Name	Address
Oceanlake Elementary School	2420 NE 22nd St
Taft Elementary School	4040 SE High School Dr
Taft 7-12 High School	3780 SE Spyglass Ridge Dr
Facilities & Maintenance – North	1545 SE 50th St
Bus Barn – North (Holly Farm Bus Barn)	New: 6110 NE Devils Lake Blvd

**Oceanlake Elementary School (OLE)** serves students in grades K-2 and was built in 1951. It also houses a daily afterschool program and summer all-day program operated by Lincoln City Parks & Recreation. Directly across the street is a private K-12 school (Lincoln City Adventist School). OLE is in the middle of the city, near the swimming pool, fire station, ambulance company, and hospital. It is loosely bordered on the west by Hwy 101 going north and south, the Pacific Ocean to the West, and Devils Lake to the East. The building is mostly single-story, except for one section that has a basement and two small sections that have a second story. This school recently had a major addition (of classrooms, a gymnasium and a new office area) due to the passage of a construction bond. Information on the school's estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5 (seismic retrofits have been awarded and the related grant information is provided in place of collapse potential). Oceanlake Elementary School, because of its geographic location, will not be able to rely on the sheltering capacity (including a generator and food supplies) available at Taft High School. Oceanlake School needs its own generator since students would likely need to shelter there during severe weather emergencies. The south and west portion of the campus is heavily wooded with dense trees. This increases risk to the school when considering our high probability wind events and wildfire events. We need to create a defensible space around this school.

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<sup>3</sup> This section was authored by Sue Graves, Lincoln County School District Safety Coordinator, and edited by OPDR.

## Oceanlake Elementary School



**Taft Elementary School (TAES)** serves students in grades 3-6. It also houses an Early Intervention program operated by Linn Benton Lincoln Educational Service District, for preschool aged children. The school also has a HELP Center (Homeless Education and Literacy Program) for our families/students experiencing homelessness. It also houses a daily 21st Century After-School Program. The school, built in 1951, is located on the top of a hilly site with a heavily wooded canyon on its east side, making it at high risk for wildfire and wind damage. While most of the school is single story, the portion adjoining the gymnasium has a basement and a second floor. Information on the school's estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5 (seismic retrofits have occurred and the related grant information is provided in place of collapse potential). However, an independent engineering evaluation indicated that the gymnasium area of the school has a greater risk for collapse. The School District received a SRGP grant to retrofit the gym which is expected to be completed in 2020.

**Taft 7-12 High School (TAHS)** serves students in grades 7-12. It also has a daily early childhood program with an infant/toddler childcare program and a preschool. In addition, the Lincoln County Health & Human Services operates a School-Based Health Center at the school. There is also an Alternative High School on the campus located in the grandstand offices at Voris Field. The school, built in 1998, is a two-story building flanked by wetlands to the immediate west and dense forest to the east. This forest makes it particularly vulnerable to wildfires and wind damage. Information on the school's estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5. Taft 7-12 is a designated Tsunami Evacuation Site for this area of Lincoln City.



Taft Elementary School and Taft 7-12 High School share a larger campus with multiple athletic fields and a neighboring community college. Because these schools are bordered by forest lands, they are at higher risk for wildfires, wild animals wandering onto campus, and errant gun shots, due to target shooting nearby. Both Taft schools are geographically within walking distance of one of Lincoln City's fire stations.

### **Taft Elementary School & Taft 7-12 High School**



#### Transportation & Support Facilities

**Buses & Bus Barn:** School buses and a bus barn have been housed for many years at the old Taft Elementary School property in the tsunami zone (on SE 50<sup>th</sup> Street). In 2019 the buses and bus barn were relocated to a site on the North end of Lincoln City. The new facility is outside of the tsunami zone on NE Devils Lake Rd. However, this property is surrounded by dense forest and is at high risk for wildfire and wind damage.

**Facilities & Maintenance Building (North):** The School District Facilities & Maintenance building is in the tsunami zone at the old Taft Elementary School property. The School District's goal is to move it out of the tsunami zone to the same property as the bus barn, when funding is available.

## Facilities & Maintenance North



### Natural Hazard Preparedness and Mitigation Activities

**Generator:** Taft High School is equipped with a generator with a 500-gallon tank of diesel fuel. The school also has a large freezer that holds a months' worth of food for the school. Taft High is the primary designated shelter school for Lincoln City.

**Earthquake/Tsunami Hazard:** Several years ago, the School District closed the old Taft Elementary School on 51st Street, which was in the tsunami zone and incorporated those students into other Lincoln City schools. Subsequently, the School District used FEMA PDM Grant funds (from the Waldport grant) to demolish the old Taft elementary school. Currently, all Lincoln City schools are out of the tsunami hazard zone. However, in the event of a large Cascadia Subduction Zone earthquake and tsunami, it is expected that access to all Lincoln City schools will be unavailable due to tsunami inundation on Hwy 101 (both north and south) and Hwy 18 to the east. Current building codes are for life-safety only and do not provide for re-occupancy after a Cascadia Subduction Zone Earthquake. Scientists expect roads and bridges to have significant damage from a local earthquake and tsunami. The School District expects all basic infrastructure services to be destroyed/damaged by the earthquake. In anticipation of this, the School District is preparing to do their own search and rescue as much as feasible, provide medical support, expect delayed family reunifications, and provide for the basic needs of students and staff for many days and possibly several weeks before help may arrive. More work is to be done to be adequately prepared.

**Teen CERT:** Taft High School (TAHS) has a robust, semester long Teen CERT class in which students learn about hazards that may impact their area and are taught how to be rescuers in a large disaster when professional rescuers are not readily available or are overwhelmed. These students will be the first responders at both Taft schools if a large Cascadia Subduction Zone earthquake occurs when school is in session. Since the 2009/10 school year, over 400 TAHS students have taken the Teen CERT semester course. North Lincoln Fire & Rescue, Depoe Bay Fire & Rescue, and CERTs of Lincoln County assist with this course. Unfortunately, the Teen CERT students will not be able to serve Oceanlake Elementary School due to geographic distance and expected tsunami inundation.

**Disaster Supply Caches:** In 2012 and again in 2015 the School District collaborated with the county, city, fire, and other agencies and organizations to develop Disaster Caches of basic survival supplies. One Cache is located at Taft High School and the other is near Oceanlake

Elementary in the Kirtsis Field parking lot. The OLE cache is new since the 2015 NHMP. These caches are designated for use by the schools if a disaster occurs when school is in session. Otherwise, they will be available for city and fire to assist with the basic needs of the community in a disaster. More disaster cache supplies are needed in both caches.

**Other Preparedness Activities:** The school district partners with local emergency service agencies to provide regular Emergency Preparedness Fairs in Lincoln City. They also participate in tabletop and full-scale exercises such as tsunami drills, active shooter exercises, hazardous materials spills, and more. Several years ago they collaborated with community partners and coordinated a citywide tsunami drill. A portion of Taft High School was activated as a Red Cross Shelter, and the City & Fire set up a mobile command post at Taft HS. In addition, a Coast Guard Helicopter practiced landing on the field.

Partner Organizations for Lincoln City Schools

City of Lincoln City	American Red Cross
Lincoln City Police Department	Community Emergency Response Team
Lincoln City Emergency Management	National Weather Service
Lincoln City Parks & Rec.	First Student Bus Company
Lincoln County Sheriff’s Office	Sodexo Nutrition & Custodial Services
Oregon State Police	Linn Benton Lincoln ESD Early Intervention
North Lincoln Fire & Rescue	Lincoln County Health & Human Services School-Based Health Centers
Depoe Bay Fire & Rescue	U.S. Coast Guard Stations Depoe Bay and North Bend
Samaritan North Lincoln Hospital	
Pac West Ambulance	
Lincoln County Emergency Management	

**Newport (West Area)**

Table LCSD-7 shows schools and support facilities within Newport. These four schools serve approximately 2,100 children from a large geographic region from Otter Rock/Hwy 101 in the North, to several miles up Hwy 20 to the East, and down to Seal Rock/Hwy 101 to the South (see Figure LCSD-2). Many students have variances to attend Newport schools and self-transport from all over Lincoln County to our Newport schools.

**Table LCSD-7 Newport Schools & Support Facilities**

School/Facility Name	Address
Early Childhood Center	420 NE 12th St
Sam Case Elementary School	459 NE 12th St.
Yaquina View Elementary School	351 SE Harney St
Newport Middle School	825 NE 7 <sup>th</sup> St
Newport High School – East	322 NE Eads St

Newport High School – West	311 NE Eads St
The Learning Center (District Offices)	1212 NE Fogarty St
The Compass Center for Youth & Families	459 SW Coast Hwy

**Yaquina View Elementary School (YVE)** serves students in grades K-2 and was built in 1961. YVE is in the middle of the city, just off Hwy 20 and on a hill above the Bayfront. Yaquina View School was officially closed as a school several years ago due to budget cuts. It was subsequently reopened and fully occupied with a variety of services: preschool, alternative high school, early intervention, homeless literacy program, and various district services. Since the 2015 NHMP, it was reopened as a kindergarten through grade 2 school. Information on the school’s estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5. This school is located at the top of the hill leading to the bayfront (Yaquina Bay) and is bordered on two sides by significant mapped landslide areas on DOGAMI’s current SLIDO map. This school has been designated as a “Temporary Tsunami Assembly Area” on DOGAMI’s new Tsunami Map of the area. However, there are no disaster cache supplies or generator located here in order to help shelter students, staff, or the community.

**Yaquina View Elementary**



**Sam Case Elementary School (SCE)** serves students in grades 3-5 and was built in 1958. The Early Childhood Center (ECC) is operated by the Linn Benton Lincoln Educational Service District and provides services to preschool age children. SCE and ECC are divided by a busy public street: 12th Street. Information on the school’s estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5 (seismic

retrofits have occurred and the related grant information is provided in place of collapse potential). Prior to the 2015 NHMP, Newport Fire Department expressed interest in partnering with the School District so that in a natural disaster they could take over ECC and convert it into their command center, since the fire department's main station was considered likely to collapse. Since the 2015 NHMP, both the school district (SRGP 2015-2017 Phase II, \$1,498,424) and the fire department (SRGP 2013-2014, \$1,491,223) received seismic rehabilitation grants and both Sam Case Elementary School and Newport Main Fire Station are seismically strengthened. As such, the fire department no longer needs to use the ECC as their command center during a seismic event. SCE has an arrangement with the Presbyterian Church on 12th Street for the use of its church in case an off-campus evacuation is necessary. There are no disaster cache supplies or a generator at Sam Case and work needs to be done to add both. The School District plans to be able to do a walking off-campus evacuation of Sam Case to the middle school where disaster supplies are stored. This may be problematic since power lines line the streets between these schools, as well as many other potential hazards. Further, this schools is flanked on the north and east sides by dense forest and is a high risk of wind damage and wildfire damage.

### **Sam Case Elementary School & Early Childhood Center**



**Newport Middle School (NMS)** serves students in grades 6-8 and was built in 1998. It also houses an alternative middle school called "Future Bound." NMS is nestled up next to a dense, forest area to the north and west, making it vulnerable to wildfires. The hill bordering the east side of the school and parking lot had a significant slide on it a few years ago due to heavy rain. Information on the school's estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5. The school was built on a hill with fill and has multiple stories. There are already several cracks in the hallway floors. This could present challenges in a large Cascadia Subduction Zone earthquake. Nevertheless,

NMS has been designated a Temporary Tsunami Assembly Area and is also the primary designated school shelter in Newport. The School District has participated with multiple agencies in several different full-scale exercises at this school and have activated NMS as a Red Cross Shelter for these drills.

### **Newport Middle School**



**Newport High School (NHS)** serves students in grades 9-12. NHS has a daily early childhood program with an infant/toddler childcare program and a preschool. In addition, the Lincoln County Health & Human Services operates a School-Based Health Center at the school. There is an Alternative High School on the campus as well as a young adult special education learning program called Education for Community Employment and Life (ECCL) for students through age 21.

The NHS East and West buildings share a campus that is divided by Eads Street. A few years ago, the school district and city worked together to get Eads Street closed to through traffic during school hours. This significantly reduced the risk of student/pedestrian injuries. Information on the school's estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5 (if seismic retrofits have occurred the related grant information is provided in place of collapse potential). Since the 2015 NHMP, a seismic rehabilitation grant was awarded and the gymnasium on the east campus was retrofitted (SRGP 2015-2017, Phase II, \$1,500,000). Seismic rehabilitation funds are still needed to strengthen other areas of these buildings and reduce the risk of injury and loss of life in an earthquake.

## Newport High School East & West



### District Offices & Support Facilities

We have two support facilities in Newport: 1) our District Offices, called The Learning Center (TLC), and 2) the Compass Center for Youth & Families. These buildings are not in the tsunami zone and neither has had a Rapid Visual Screening assessment by DOGAMI.

**The Learning Center/District Offices (TLC):** Since the 2015 NHMP, the School District acquired the City of Newport's vacated public swimming pool that was built in 1965. In 2018 they remodeled it into a two-story office and training building with a basement for storage. It now serves as the main District Office and professional development center. On the south side, east side, and part of the north side, TLC is nestled up against a forest and canyon area called "Forest Park." To the west, a public street separates TLC from Sam Case Elementary School. After doing earthquake drills at TLC, the School District is concerned about getting out of the building and to a safe evacuation assembly area after an earthquake. There are power poles/lines to the west and south. There is a dense forest/canyon to the north and east, in which part is in the tsunami zone, and the risk of trees falling and/or landslides is also a concern. Further, the wildfire hazard is of concern at this facility due to its immediate proximity to a dense wooded area.

With this acquisition came the designation of two spaces in the building as a Primary and Secondary Emergency Operations Center. This facility is in need of a generator, an EOC plan, EOC equipment, and disaster supplies.

## District Offices/The Learning Center



**The Compass Center for Youth & Families** was the former location of the School District offices. This building currently houses additional district staff offices, a Homeless Education & Literacy Program (HELP), and a Learning is Fun Together (LIFT) preschool program for children and their parents. The Compass Center is a 1937, concrete, three-story building and there is concern about safety during an earthquake. The two-story garage structure is aging, and the entire building needs seismic rehabilitation, including the demolition of the two story garage structure. There is no generator here and there are no disaster supplies stored here.

## The Compass Center for Youth & Families





**Transportation/School Buses:** The School District does not store school buses in Newport. Regional buses are stored at the main bus barn in Toledo.

#### Natural Hazard Preparedness and Mitigation Activities

**Generator:** Newport Middle School is equipped with a small generator with just a 50 gallon diesel tank. A 500 to 1,000 gallon tank is needed.

**Earthquake/Tsunami Hazard:** None of the Newport schools are in the tsunami hazard zone. However, in the event of a large Cascadia Subduction Zone earthquake and tsunami, access to all Newport schools will be unavailable because they will be cut off from all major transportation routes due to tsunami inundation at: Hwy 101 South at the Yaquina Bay Bridge, Hwy 101 North near Walmart, and Hwy 20 to the East. Current building codes are for life-safety only and do not provide for re-occupancy after a Cascadia Subduction Zone Earthquake. Scientists expect roads and bridges to have significant damage from a local earthquake and tsunami. The School District expects all basic infrastructure services to be destroyed/damaged by the earthquake. In anticipation of this, we will need to be prepared to do our own search & rescue, provide medical support, expect delayed family reunifications, and provide for the basic needs of students & staff for many days and possibly several weeks before help may arrive.

**Teen CERT:** Newport High School had a Teen CERT program for one year during the 2010/11 school year but had to discontinue it due to budget cuts. Since the 2015 NHMP, the school has reinstated the Teen CERT semester class starting in the 2018/19 school year. In this semester long Teen CERT class students learn about hazards that may impact their area and are taught how to be rescuers in a large disaster when professional rescuers are not readily available or are overwhelmed. These students will be the first responders at both NHS & NMS schools if a large Cascadia Subduction Zone earthquake occurs when school is in session. Reinstating the Teen CERT program made the school eligible for funds to purchase a Teen CERT Disaster Response Cache located in wind and watertight shipping containers in the NHS parking lot. Newport Fire & Rescue and the CERTs of Lincoln County assist with this course.

**Disaster Supply Caches:** In 2013, initial Disaster Caches were established across the street from Newport Middle School in the County's secure Marine Lot and at the South Beach Oregon Coast Community College Campus. The project was a partnership between the County, School District, City of Newport, Newport Fire, Oregon Coast Community College, OSU Hatfield Marine Science Center, Oregon Coast Aquarium, and the Oregon Department of Fish and Wildlife. The caches have a limited supply of tents, water, and some basic survival supplies. An additional container is needed to store additional supplies. Since the 2015 NHMP, the disaster cache was relocated to another county field near the schools, and the School District partnered with the City of Newport to add more tents and survival food supplies to the cache. These caches are designated for use by the schools if a disaster occurs when school is in session. Otherwise, they will be available for city and fire to assist with the basic needs of the community in a disaster.

**Other Preparedness Activities:** The school district partners with local emergency service agencies to provide regular Emergency Preparedness Fairs in Newport. They also participate in tabletop and full-scale exercises such as tsunami drills, active shooter exercises,

hazardous materials spills, and more. In fact, several years ago they collaborated with our community partners and a portion of Newport Middle School was activated as a Red Cross Shelter.

Partner Organizations for Newport Schools

City of Newport	Community Emergency Response Team
Newport Police Department	Oregon Coast Community College
Newport Emergency Management	National Weather Service
Lincoln County Sheriff’s Office	First Student Bus Company
Oregon State Police	Sodexo Nutrition & Custodial Services
Newport Fire & Rescue	Linn Benton Lincoln ESD Early Intervention
Samaritan Pacific Communities Hospital	Lincoln County Health & Human Services School-Based Health Centers
Pac West Ambulance	U.S. Coast Guard Station Yaquina Bay and North Bend
Lincoln County Emergency Management	
American Red Cross	

**Toledo (East Area)**

Table LCSD-8 shows schools and support facilities within Toledo. These schools serve 730 children from an expansive, rural, geographic region in the east section of Lincoln County off Hwy 20: including Toledo, Siletz, Logsdon, Eddyville, Blodgett, and the surrounding unincorporated areas of Lincoln County (see Figure LCSD-2). Some of the children who live in this region attend the Siletz or Eddyville Charter School, but 730 children attend the Toledo schools. The Toledo Schools are at higher risk for winter snow and ice emergencies due to their higher elevation/inland location than our other coastal schools. Because Toledo schools are bordered by forest lands, they are at higher risk for wildfires, wild animals wandering onto campus, and errant gun shots, due to target shooting nearby.

**Table LCSD-8 Toledo Schools & Support Facilities**

School/Facility Name	Address
Toledo Elementary School	600 SE Sturdevant Rd
Toledo Jr/Sr High School	1800 NE Sturdevant Rd
Arcadia School (offices)	1811 NE Arcadia Dr
Burgess Campus: Facilities & Maintenance, Bus Barn/Transportation, Food, and Custodial Services	295 NE Burgess Rd

**Toledo Elementary School (TOES)** serves students in grades K-6 and was built in 1987. The school is in the City of Toledo and is served by Toledo Police Department and a shared

School Resource Officer from the Sheriff's Office. TOES is bordered by forestland East on most sides and Sturdevant Road, to the west, which is in the tsunami zone. Information on the school's estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5. Seismic rehabilitation is needed. A classroom wing addition along with a new office area and cafeteria were added in 2015 with a construction bond. This school has been designated as a "Temporary Tsunami Assembly Area" on DOGAMI's new Tsunami Map of the area. The older portion of the building has some cracks in the floor and there is some concern of landslide hazards during an earthquake. This school is at high risk for wildfires due to its location and surrounding dense forest areas and trees.

### **Toledo Elementary School**



**Toledo Jr/Sr High School (TOHS)** serves students in grades 7-12. The school is outside City limits in an unincorporated area of the County and is served by Lincoln County Sheriff's Office. Toledo Jr/Sr High is bordered by dense forestland east on most sides and Sturdevant Road, to the west, which is in the tsunami zone. The Lincoln County Health & Human Services operates a School-Based Health Center at the school. The school district has a Learning is Fun Together (LIFT) preschool program for children and their parents at TOHS. The school also has a HELP Center (Homeless Education and Literacy Program) for families/students experiencing homelessness. Built in 1955, TOHS is on a steep hill with multiple floor levels. Information on the school's estimated seismic resistance and collapse potential, determined by DOGAMI in 2007, is provided in Table LCSD-5 (seismic retrofits have occurred and the related grant information is provided in place of collapse potential). In 2014, the School District received a grant and the gym area of TOHS was seismically rehabilitated (SRGP 2014, \$1,500,000). The school also has three separate classroom structures up the hill from the main building. One is an industrial arts building. The others house a computer lab and a video production classroom. This campus is at high risk of wildfires due to its geographic location next to dense forest areas.

## Toledo Jr/Sr High School



### District Offices & Support Facilities

**Arcadia School:** Arcadia school houses offices for some district services. Arcadia school was not included in the DOGAMI Rapid Visual Screening assessment since it was not in service as a school at that time. It needs a seismic assessment. It is not a traditional school at this time but may be reopened as a functioning school in the future. It is surrounded by trees on most sides and is at risk of damage due to wildfires and wind.

### **Arcadia School**



**Burgess Campus:** The School District’s “Burgess Campus” houses the main Facilities & Maintenance Department, the Bus Company, and Food & Custodial Services. The campus is located adjacent to, and shares a parking lot with, the Toledo Fire Department.

**Burgess Complex (Facilities & Maintenance, Bus Barn/Transportation, Food & Custodial Services)**



**Facilities & Maintenance:** Includes offices and a shop for the entire Lincoln County School District. Most of the School District vehicles are housed here (the remaining buses are in Lincoln City and Waldport). Built next to a canyon, this site has a history of slide damage. During a recent winter storm, significant slide damage occurred at this complex. The School District received FEMA disaster assistance for the repairs at this site. The site is surrounded by dense trees and is at elevated risk for wildfire.

The School District has had discussions with the Toledo Fire Department about the School District’s big freezer full of food at this site. In a disaster situation, the fire district and city may need to use this food for community needs. The freezer could also be used as a morgue if necessary, in a disaster situation. When the Fire Station was built, a generator was installed, and conduit was placed to connect the Fire Department generator with the school district’s freezer. However, the project was not completed due to a lack of funding and still needs a significant amount to work (wires, breakers, etc.), in order to be operational. It is estimated to cost approximately \$25,000 to accomplish this.

**Buses & Bus Barn:** The main bus dispatch center for the district is located at this site as are school buses and the bus barn for Toledo & Newport schools. If these assets survive a Cascadia earthquake (no liquefaction, landslides, fire/explosion, etc.), they will be a great

resource of shelter, fuel, security, and communications. Fuel will be necessary for big equipment to clear roads, for fire trucks and police cars to operate, etc.

### Natural Hazard Preparedness and Mitigation Activities

**Generator:** Toledo Elementary School is equipped with a generator and is the primary shelter facility for the east area. The generator is powered by natural gas, which could be problematic in an earthquake. The School District would like to explore converting this to a diesel generator. Toledo Jr/Sr High needs a generator.

**Earthquake/Tsunami Hazard:** Right along the Oregon coast lies the Cascadia Subduction Zone, capable of producing magnitude 8+ earthquakes with several minutes of intense shaking & destructive tsunami waves for 10+ hours. Bridge failures, landslides & tsunami inundation will cut off normal transportation routes and cause families to be separated. We will need to survive for days & possibly weeks without normal infrastructure and services. Current building codes are for life-safety only and do not provide for re-occupancy after a Cascadia Subduction Zone Earthquake. Scientists expect roads and bridges to have significant damage from a local earthquake and tsunami. We also expect all basic infrastructure services to be destroyed/damaged by the earthquake. In anticipation of this, we will need to be prepared to do our own search & rescue, provide medical support, expect delayed family reunifications, and provide for the basic needs of students & staff for many days and possibly several weeks before help may arrive.

DOGAMI's Tsunami Inundation Maps for the Toledo area expose the potential for tsunami inundation onto Sturdevant Road which will cut off both Toledo Schools from immediate emergency response capabilities. This underscores the reality that it will take time to provide rescue and support services to Toledo schools. The Fire Department has informed the School District that as tsunami water recede, they will work to get to TOES after an earthquake/tsunami scenario, but it will take time. They do not plan to come to Toledo Jr/Sr High due to other competing needs of the community. They have requested that students/staff from TOHS take a trail in the woods above the school over to TOES. Since the 2015 NHMP a team assessed the trail on the mountain behind TOHS and determined that the trail is on a steep ridge and dead ends at a heavily wooded/brushed area that is not passable. There is also a concern for landslides in this area. Because of this the School District is developing capacity at each school to be prepared to meet the needs of the students and staff at each campus since they will be isolated from each other.

**Teen CERT:** Toledo High School has a robust, semester long Teen CERT class in which students learn about hazards that may impact our area and are taught how to be rescuers in a large disaster when professional rescuers are not readily available or are overwhelmed. Since the 2009/10 school year, over 100 TOHS students have taken the Teen CERT semester course. Toledo Fire & Rescue and CERTs of Lincoln County assist with this course. Due to the certain isolation of Toledo schools after a Cascadia earthquake due to expected bridge damage, and area landslides, these students will be the first responders, and probably only responders. They will be cut off from Toledo Elementary School due to tsunami inundation on Sturdevant Road (which divides the schools). TOES is an elementary school and does not have Teen CERT students. As such, the School District would like to offer CERT training to Toledo Elementary staff during the summer – need grant funding for a training stipend and CERT kits to be housed at the disaster cache at the school.

**Disaster Supply Caches:** In 2014, the School District partnered with the City of Toledo, Toledo Fire, and the Lincoln County Commissioners and established a Disaster Cache of emergency survival supplies for 700 people at Toledo Elementary School (TOES). In 2019, they partnered again to develop a smaller cache of disaster supplies at Toledo Jr/Sr High. This cache project is complete but more supplies are needed than was funded.

**Other Preparedness Activities:** The school district partners with local emergency service agencies by participating in tabletop and full-scale exercises such as earthquake drills, wildland fire exercises, hazardous materials spills, and more. Several years ago they collaborated with community partners to conduct a citywide earthquake drill and a portion of Toledo Elementary was activated as an evacuation site. In 2019, they participated in a countywide wildfire tabletop exercise that involved the simulated evacuation of both Toledo schools.

Partner Organizations for Toledo Schools

City of Toledo	Lincoln County Emergency Management
Toledo Police Department	American Red Cross
Lincoln County Sheriff’s Office	Community Emergency Response Team
Oregon State Police	National Weather Service
Toledo Fire & Rescue	First Student Bus Company
Samaritan Pacific Communities Hospital	Sodexo Nutrition & Custodial Services
Pac West Ambulance	Lincoln County Health & Human Services School-Based Health Centers

## Waldport (South Area)

Table LCSD-9 shows schools and support facilities within Waldport. These schools serve approximately 625 children from a large geographic region from Yachats in the south (Hwy 101), to several miles up the Alsea Hwy (Hwy 34) to the East, and North off of Hwy 101 to Seal Rock (see Figure LCSD-2). This campus is bordered on all sides by dense trees (one side borders Crestline Drive and then trees). The campus is not fenced. This campus is at a higher risk for wildfires as well as wild animals wandering onto campus.

**Table LCSD-9 Waldport Schools & Support Facilities**

School/Facility Name	Address
Crestview Heights School	2750 Crestline Dr
Waldport High School	3000 Crestline Dr
Waldport Bus Barn	

**Crestview Heights School (CVH)** serves students in grades K-8. Throughout the school day, middle school students migrate back and forth between classes in the Crestview and Waldport High School buildings. CVH also has an early childhood program with a preschool.

**Waldport High School (WHS)** serves students in grades 9-12. In addition, the Lincoln County Health & Human Services operates a School-Based Health Center at the school. There is an Alternative High School on the campus. The school also has a HELP Center (Homeless Education and Literacy Program) for our families/students experiencing homelessness. This campus is flanked by dense forest on its east and west sides. Trees also line its north side. This proximity to heavily wooded areas makes it particularly vulnerable to wildfires.

### **Crestview Heights School & Waldport High School (and OCCC and Bus Barn)**



#### District Offices & Support Facilities

**Buses & Bus Barn:** School buses and bus barn for both Waldport schools are housed on the CVH/WHS campus. Along with the buses and small bus barn building, there is also a 1,000 gallon, above ground, tank of diesel on site for the school buses. If these assets survive a Cascadia earthquake (no liquefaction, landslides, fire/explosion, etc.), they will be a great resource of shelter, fuel, security, and communications.

**Oregon Coast Community College** has a small one-building school on the SE corner of this school campus. They have an Emergency Medical Technician degree program housed at this school (this program may be moved to their Lincoln City campus for the 2020-2021 academic year). These basic medical infrastructure resources could be available to both schools in a disaster. OCCC partners with us to host our Teen CERT training exercises each semester. In addition, the Red Cross currently has a trailer with cots and other shelter supplies stored in the OCCC parking lot.



## Natural Hazard Preparedness and Mitigation Activities

**Generator:** Waldport High School is equipped with a generator. There is a 4,000 gallon, below ground, tank of diesel which operates the heating system of the school as well as a limited generator support for the other areas of the school.

**Freezer:** The city, Red Cross, and school district have all identified a need for a large freezer at Crestview Heights School. The current freezer capacity is very limited and doesn't allow the school district to store and rotate much food. A larger freezer would allow for larger amounts of food storage which would meet a need for food in a disaster. The School District would like to get a freezer the same size as Taft High School's freezer, which stores a month's worth of groceries: 12 x 16, 8' 9" inside height.

**Earthquake/Tsunami Preparedness History:** During the last several years, significant attention has been directed to Waldport Schools about earthquake and tsunami preparedness. Previously, all Waldport schools were in the tsunami inundation zone. Although the schools did tsunami drills, there was not a viable tsunami escape route for these students and staff members. As such, the schools were vacated and rebuilt outside of the tsunami zone.

- A new school (Crestview Heights, CHS) was built out of the tsunami zone to house all elementary school students.
- Waldport Middle School was closed, and students were moved out of the tsunami zone and integrated into the Crestview Heights School, making that school a kindergarten through grade 8 school.
- The School District partnered with the City of Waldport, Central Coast Fire & Rescue and the County Commissioners to establish a disaster cache of basic survival supplies on the Crestview Heights School campus. Angel Job Corps Students helped to build the structure housing the cache of supplies. This school also became the designated shelter & command center for the entire city of Waldport in case of a disaster.
- The School District collaborated with community partners and conducted a citywide tsunami drill. A portion of Crestview Heights School was activated as a Red Cross Shelter, Waldport High School Students evacuated to CHS, and the City & Fire Department (Central Coast Fire & Rescue District) set up a command post at CHS. A Coast Guard Helicopter practiced landing on the field.
- The School District passed a bond measure which included building a new high school in Waldport, out of the tsunami zone. The new high school opened for high school students in August 2013. The old high school was then closed.
- The School District received Pre-Disaster Mitigation Grant from FEMA to demolish the old Waldport High School (WHS) that was in the tsunami zone and convert the land into open space. Funds from the grant were also used to demolish most of the old Waldport Middle School, except for the gymnasium (additional funds from the grant were used to demolish the old Taft Elementary School, in the tsunami zone in Lincoln City).
- Since the 2015 NHMP, the City of Waldport has acquired the old WHS Open Space site.

**Earthquake/Tsunami Hazard:** All Waldport schools are now out of the tsunami hazard zone. However, in an earthquake/tsunami scenario, access to all Waldport schools will be unavailable due to tsunami inundation on Hwy 101 (both north and south) and on Hwy 34 from the east, and because of predicted bridge damage. It is expected that all basic infrastructure services will be destroyed or damaged by the earthquake. In anticipation of this, the School District needs to be prepared and since the Fire Department and City Offices are all down in the tsunami zone, we expect to do our own search & rescue, provide medical support, expect delayed family reunifications, and provide for the basic needs of students & staff for many days and possibly several weeks before help may arrive. Even with newer school facilities in Waldport, since current building codes are for “life-safety” only and not for the “reoccupancy” standard, the School District does not expect to be able to reoccupy schools after a Cascadia Subduction Zone Earthquake.

**Teen CERT:** Waldport High School has a robust, semester long Teen CERT class in which students learn about hazards that may impact our area and are taught how to be rescuers in a large disaster when professional rescuers are not readily available or are overwhelmed. Since the 2009/10 school year, over 150 WHS students have taken the Teen CERT semester course. Central Coast Fire & Rescue, Seal Rock Fire & Rescue, and CERTs of Lincoln County assist with this course. Due to the certain isolation of our Waldport schools after a Cascadia earthquake due to expected bridge damage, and area landslides, and because the fire department is in the tsunami zone without a viable escape route, these students will likely be the first responders, and potentially the only responders for CVH & WHS and the Community College for a time, if a large Cascadia Subduction Zone earthquake occurs when school is in session. Because of this, the School District would like to offer CERT training to Waldport staff during the summer. Funding is needed for training stipends and for teacher CERT kits that would be stored outside the school in a shipping container, for easy access after an earthquake.

**Disaster Supply Caches:** The original masonry structure built for the disaster cache was demolished when the new school was built, so a new building was constructed. Since the 2015 NHMP the School District partnered with the City of Waldport and Central Coast Fire to add more supplies to the cache. The School District did not have a formal MOU in place and there have been some misunderstandings about where the supplies are to be kept and how to distribute them. A formal MOU is needed as well as additional disaster supplies.

Partner Organizations for Waldport Schools

City of Waldport	Oregon Coast Community College
Lincoln County Sheriff’s Office	American Red Cross
Oregon State Police	Community Emergency Response Team
Central Coast Fire & Rescue	National Weather Service
Seal Rock Fire & Rescue	First Student Bus Company
Yachats Fire & Rescue	Sodexo Nutrition & Custodial Services
Samaritan Pacific Communities Hospital	Linn Benton Lincoln ESD Early Intervention
Pac West Ambulance	Lincoln County Health & Human Services School-Based Health Centers
Lincoln County Emergency Management	

# ATTACHMENT A: ACTION ITEM FORMS

## Summary of Action Changes

In the 2015 NHMP, mitigation activities related to the school district were included in each city's plan. For the 2020 NHMP, the school district has its own addendum in the county's multi-jurisdictional NHMP. Below is a list of changes to the 2015 action items, that relate to the School District, since the previous plan.

### Previous NHMP Action Status:

The actions below were identified in the 2015 NHMP addenda for the cities of Lincoln City, Newport, Toledo, and Waldport. The actions in this plan incorporate applicable components of these actions into the 2020 School District Actions.

**Lincoln City #6** (2015): "Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options." is considered partially complete. Since the previous NHMP the School District has demolished the old Taft Elementary School (site is within tsunami zone). The current Taft Elementary School is not in the tsunami zone and is currently being seismically strengthened (expected to be complete in 2020).

**Lincoln City #21** (2015): "Relocate school buses to a site outside of the tsunami inundation zone" is considered complete. In 2019, school buses and bus barn were relocated from their previous location on SE 50<sup>th</sup> St to a new site which is outside the tsunami zone.

**Lincoln City #22** (2015): "Develop disaster plans and provide caches (food and emergency supplies) in strategic locations throughout the city." is considered partially complete. One Cache is located at Taft High School and the other is near Oceanlake Elementary in the Kirtsis Field parking lot. The OLE cache is new since the 2015 NHMP. These caches are designated for use by the schools if a disaster occurs when school is in session. Otherwise, they will be available for city and fire to assist with the basic needs of the community in a disaster. Additional supplies are needed for the OLE cache, such as survival food and warmth.

**Lincoln City #23** (2015): "Research and develop plans for evacuating / sheltering/ feeding the tens of thousands of tourists that might be in city at time of disaster" is considered a Lincoln City action and the School District will continue to support as a partner. The school district and the Red Cross recently updated their MOU for use of all the school district facilities as Red Cross shelters.

**Newport #2** (2015): "Seismically retrofit vulnerable structures and critical facilities" is in process. Since the 2015 NHMP, Newport High School has had a seismic retrofit of its gym on East Campus. Sam Case Elementary School had seismic rehab of a portion of its school in 2017.

**Toledo #3** (2015): "Seismically retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit

options” is considered partially complete. In 2014, the School District received a grant and seismically strengthened the gym at Toledo High (complete in 2015).

**Toledo #11** (2015): “Implement actions identified by the Lincoln County School District that affect the community’s resilience to earthquake and tsunami” is considered partially complete. Since the 2015 NHMP, the city partnered with the school district and the county to establish a disaster cache at Toledo Jr/Sr High School.

**Waldport #6** (2015): “Improve/ increase transportation infrastructure and connectivity to short-term and long-term relocation areas” is considered a primary action for the City of Waldport. The Lincoln County School District will continue to be an external partner on this action identified in the Waldport addendum.

**Waldport #7** (2015): “Identify and mark tsunami evacuation zone/ route for east of Lint Slough and Waldport Schools and Improve sheltering options at Waldport schools to accommodate regional demand” is considered a primary action for the City of Waldport. The Lincoln County School District will continue to be an external partner on this action identified in the Waldport addendum.

Additional NHMP related activity completed since previous NHMP:

- School District updated Red Cross Shelter Agreement for all district schools (2020)
- Relocated bus barn in Lincoln City to a site that is outside the tsunami inundation zone (2020)

*Note: Applicable parts of the 2015 City Actions were relocated to the 2020 School District Actions as indicated below:*

<b>2015 Action Item</b>	<b>2020 Action Item</b>
Lincoln City #6	LCSD #1
Lincoln City #22	LCSD #4
Lincoln City #23	Listed in city addendum
Newport #2	LCSD #1
Toledo #3	LCSD #1
Toledo #11	LCSD #4
Waldport #6	Listed in city addendum
Waldport #7	Listed in city addendum

Each action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

### **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The School District NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the School District. Existing programs and other resources that might be used to implement these action items are identified. To the extent possible, the School District will work to incorporate the recommended mitigation action items into existing plans, programs, and procedures. Each action item identifies related existing plans and policies.

### **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

### **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

### **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

### **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the School District or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (5-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

Mitigation Action: LCSD #1 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Seismically assess and retrofit vulnerable facilities and infrastructure to increase their resiliency to seismic hazards. Consider both structural and non-structural retrofit options.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
Capital Improvement Plan, Long Range Facility Planning Report					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation?</p> <p>DOGAMI conducted a seismic needs assessment for public school buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. Table LCSD-5 lists the vulnerable school district buildings, it also indicates which facilities have been seismically strengthened.</p> <p>Priority projects include the following:</p> <ul style="list-style-type: none"> <li>• Perform an enhanced seismic assessment and perform a seismic retrofit, if deemed necessary, of Taft 7-12 (Lincoln City).</li> <li>• Seismic retrofit of Taft Elementary School (Lincoln City), SRGP 2017-2019, expected to be complete in 2020.</li> <li>• Seismic retrofit of Oceanlake Elementary School (Lincoln City), purchase a generator, and stock, disaster caches. SRGP 2020 (in process 2020).</li> <li>• Seismic retrofit of Yaquina View Elementary School (Newport); also consider options to reduce landslide risk and upgrades necessary to provide service as a Temporary Tsunami Assembly Area.</li> <li>• Seismic assessment and potential retrofit, if deemed necessary, of Newport Middle School; also consider upgrades necessary to provide service as a Temporary Tsunami Assembly Area.</li> <li>• Seismic retrofit of Newport High School (Newport); East Campus Gym complete (SRGP 2015-2017)</li> <li>• Seismic assessment and potential retrofit, if deemed necessary, of Newport Early Childhood Center.</li> <li>• Seismic retrofit of Compass Center for Youth &amp; Families (Newport); not owned by School District.</li> <li>• Seismic assessment and potential retrofit, if deemed necessary, of EOC/District Offices (Newport).</li> <li>• Seismic retrofit of Toledo Elementary School (Toledo). Seismic assessment and potential retrofit, if deemed necessary, of Arcadia School (Toledo, District Offices), retrofit as applicable.</li> <li>• Seismic assessment and potential retrofit, if deemed necessary, of Crestview Heights School (Waldport).</li> <li>• Address foundation cracking at Crestview Heights School.</li> <li>• Install retaining wall at Sam Case Elementary School.</li> <li>• Address structural and foundation issues at Newport Middle School.</li> <li>• Address foundation issues at Newport High School and replace grandstands at NHS.</li> <li>• Address structural issues at Toledo Jr/Sr High School.</li> </ul>					

<ul style="list-style-type: none"> <li>• Address cracks in slab at Early Childhood Center.</li> <li>• Address slab and basement structural deficiencies at the Compass Center.</li> </ul>		
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>
<p>Seismically assess school district buildings and infrastructure, determine which structures may be particularly vulnerable to earthquake damage. Seek funding to retrofit and/or re-build structures.</p> <p>Rehabilitate identified vulnerable schools, infrastructure, and other vulnerable buildings.</p>		<p><u>2020 Update:</u>  Seismic strengthening of Taft Elementary School is underway and expected to be complete in 2020.  Seismic strengthening of Oceanlake School is underway (grant received, currently in planning phase) and expected to be complete in 2021.  Seismic strengthening of Sam Case Elementary is complete (2017).  Seismic strengthening of Newport High east gym complete (2017).</p> <p><u>2015 Update:</u>  Taft Elementary relocated (new location is in former Taft High/Middle School, which has a building with moderate collapse potential).  Taft, Oceanlake, and Toledo schools supply caches installed.  Seismic strengthening of the Toledo Jr/ Sr High School Gym is complete (2015).</p>
<b>Champion/ Responsible Organization:</b>	Facilities and Maintenance	
<b>Internal Partners:</b>		<b>External Partners:</b>
Safety Coordinator		Lincoln County, Lincoln City, Newport, Toledo, Waldport, Oregon Emergency Management, DOGAMI, IFA, SHPO
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Seismic Rehabilitation Grants (IFA), Local Funding Resources (general fund), grants	High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County School District, revised 2020 (action previously in applicable city addenda)	
<b>Action Item Status:</b>	Ongoing	



<b>Mitigation Action: LCSD #2</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Construct a new school in Lincoln City out of the Tsunami Inundation Zone.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Capital Improvement Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
The School District needs another school to meet the demands of current and projected occupancy. Land has already been purchased (in north Lincoln City), but a bond is needed to fund the school.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Secure a bond for the construction of a new school in north Lincoln City (6110 NE Devils Lake Blvd).			<u>2020 Update:</u> Land has been purchased in North Lincoln City to accommodate a new school.			
<b>Champion/ Responsible Organization:</b>		Facilities and Maintenance				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Safety Coordinator						
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Local Funding Resources, bond		High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	Lincoln County School District, 2020					
<b>Action Item Status:</b>	New					

<b>Mitigation Action: LCSD #3</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Relocate the School District's maintenance building out of the Tsunami Inundation Zone.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Capital Improvement Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
The School District's goal is to move the maintenance buildings out of the tsunami zone (near the location of the former Taft Elementary school on SE 50 <sup>th</sup> St) to the same property as the relocated bus barn (6110 NE Devils Lake Blvd), when funding is available.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Relocate the maintenance building to the bus barn site (6110 NE Devils Lake Blvd).			<u>2020 Update:</u> New			
<b>Champion/ Responsible Organization:</b>		Facilities and Maintenance				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Safety Coordinator						
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Local Funding Resources, bond		Medium		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	Lincoln County School District, 2020					
<b>Action Item Status:</b>	New					

Mitigation Action: LCSD #4 (What do we want to do?)	Alignment with Plan Goals:				High Priority Action Item?
Develop disaster response plans, procure and stock emergency supplies on all school buses, and provide caches (food and emergency supplies) throughout the School District.	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
All Hazards Emergency Plan, Family Reunification Plan, Sheltering Plan					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]</p> <p>Lincoln County School District has a robust emergency operations plan but very minimal disaster response plans. In addition, while there are some disaster caches at or near schools that serve students and employees, several schools do not have disaster caches yet, and the existing caches need additional supplies.</p> <p>Lincoln County School District schools can serve as Red Cross emergency, as needed and when available. Having robust disaster caches at or near each school will support Red Cross Shelter Operations.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
<p>Update/Make Disaster Cache MOUs for all areas</p> <p>Write 5-year District Disaster Caching Plan.</p> <p>Seek funding for storage/shipping containers (20') that will be stocked with emergency supplies and equipment and be strategically placed in key locations including Sam Case Elementary, Yaquina View, and Waldport.</p> <p>Seek funding to maintain and keep each unit stocked, rotating expired items as needed.</p> <p>Add supplies including shelter/warmth, water filtration system, cooking system, sanitation system and supplies to all existing caches.</p> <p>Secure a freezer for disaster food storage in Waldport.</p> <p>Write a Disaster Response Plan to include: District Mass Feeding, Sanitation, and Water Plan for Cascadia EQ/Tsunami, for Students &amp; Staff</p>			<p><u>2020 Update:</u></p> <p>A cache was developed at Toledo Jr/Sr in 2019.</p> <p>A cache was developed at Oceanlake in 2015.</p> <p>Additional cache supplies for Waldport Schools were procured in 2017 &amp; 2020, including one dedicated shipping container (20') for Disaster Cache in Waldport in 2020 (need one more)</p>		
<b>Champion/ Responsible Organization:</b>	Safety Coordinator				
<b>Internal Partners:</b>			<b>External Partners:</b>		
Facilities and Maintenance			Lincoln County EM, ODOT, OEM, DOGAMI, Lincoln City, Newport, Toledo, Waldport, Law Enforcement agencies, Fire Districts, Sodexo Nutrition Services, USDA, Sanitation Districts, Water Districts, First Student, Red Cross, FEMA		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>	<b>Timeline:</b>	

Local Funding Resources, grants	Low to High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County School District, revised 2020 (action previously in applicable city addenda)	
<b>Action Item Status:</b>	Ongoing	

<b>Mitigation Action: LCSD #5</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Maintain and promote the Teen CERT program activity in the School District and recruit school staff members to be trained in CERT.		<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
All Hazards Emergency Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]</p> <p>After a large Cascadia Subduction Zone earthquake and tsunami, or other natural disaster, professional responders will not be readily available or able to respond to help perform rescue operations at our schools. Resources for the immediate response and ongoing care of students and staff will be severely disrupted due to damage from the earthquake/tsunami and critical infrastructure limitations. Schools will need to be equipped to take care of the immediate and ongoing needs of their students and staff.</p> <p>Training staff and students to be CERT (Community Emergency Response Team) members, so that they will learn about the hazards that may impact their area and so they will be able to be rescuers in a large disaster when professional rescuers are not readily available or are overwhelmed is a key strategy for reducing the effects of hazards on our community.</p> <p>The school district offers a Teen CERT semester course at its high schools. They have not trained staff members in CERT yet, except those who teach the courses.</p>						
<b>Ideas for Implementation (How will it get done?):</b>					<b>Action Status Report</b>	
Provide information about the CERT program to employees; Obtain funding to purchase CERT supplies and to provide training stipends for school staff; Create CERT teams at each school; Provide CERT training to district employees including (but not limited to) those at OLE (Lincoln City), SCE and YVE (Newport), TOES (Toledo).					<b>2020 Update:</b> Since the 2015 plan, Teen CERT semester courses were added to Newport High School and Toledo Jr/Sr High School.	
<b>Champion/ Responsible Organization:</b>		Safety Coordinator				
<b>Internal Partners:</b>			<b>External Partners:</b>			
			Lincoln County EM, Fire Districts, Lincoln City, Newport, Toledo, Waldport, Fire Partners, Local CERT Teams, OEM, FEMA, DOGAMI			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local funding resources, grants			Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Lincoln County School District, 2020				
<b>Action Item Status:</b>		New				

<b>Mitigation Action: LCSD #6</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Improve, maintain, and obtain resources and equipment essential for mitigating the impacts of disasters.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
All Hazards Emergency Plan, Family Reunification Plan, Sheltering Plan, School Bus Emergency Plan		
<b>Rationale for Proposal (Why is this important?):</b>		
<p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]</p> <p>Effective communications between schools and emergency personnel are essential in everyday emergencies and during natural disasters. There are significant gaps in the current capabilities to communicate into and out of our Taft schools; including a lack of ability for police and fire radios and 911 dispatch to work in these schools.</p> <p>Further, generators are needed at each school and district facility to help protect assets of food for disaster response purposes. Generators are also necessary to enhance communications during a wide variety of natural disasters involving power outages. Generators are also needed for Red Cross and Emergency Sheltering purposes. The district needs a consult to develop a master Generator Plan for all schools, including what is needed, how to construct to serve various assets in each building, how to rotate limited generator power during a Red Cross Shelter activation so that shelter residents are served and assets like freezers and communications are protected and operational. We also need to determine how to transfer diesel fuel from school buses into our generators. A master plan is needed.</p> <p>Some existing fuel tanks and generators need to be replaced, as identified in the LCSD Long Range Facility Planning Report, September 2020.</p> <p>The Burgess Complex has a freezer that can be used for food storage or morgue if it is attached to the neighboring fire department generator. Work was initiated but not completed. Approx. \$25K needed to complete.</p>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<p>Procure communications equipment at TAHS (Lincoln City) and OLE (Lincoln City)</p> <p>Procure a generator for schools and district facilities that do not have a generator. Upgrade or replace existing generators and fuel tanks.</p> <p>Explore the possibility of converting the existing generator at TOES (Toledo) to another fuel source (diesel, etc.).</p> <p>Complete the connection of the fire department generator to the Burgess Complex. (Toledo)</p>	<p><u>2020 Update:</u></p> <p>Lincoln City partners (school and law enforcement) met in 2019/2020 to discuss the communications deficiencies at Taft schools and for first responders. The group is working with a contractor to establish three solutions: a low, medium, and high-cost solution.</p>	

<b>Champion/ Responsible Organization:</b>	Facilities and Maintenance		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Safety Coordinator		LCPD, NLFR, TFD, City of Toledo	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, HMA (BRIC, HMGP), grants		Medium to High	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County School District, 2020		
<b>Action Item Status:</b>	New		

<b>Mitigation Action: LCSD #7</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>
Develop, maintain, and enhance the School District's capacity to provide services during and after a disaster event.		<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>					
All Hazards Emergency Plan, Family Reunification Plan, Sheltering Plan, School Bus Emergency Plan					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]</p> <p>The school district recently established a designated EOC in the Superintendent's Conference Room, and a secondary EOC in the Safety Coordinator's Office. LCSD needs a clearly spelled out Emergency Operations Center Plan, and the corresponding equipment, supplies, and training to carry out that plan.</p> <p>For redundancy, a backup EOC is needed in a different city &amp; location in case the Newport EOC building is compromised.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
Develop Backup District EOC at the Burgess Facilities & Maintenance (Toledo) Procure mobile emergency response vehicles for Newport EOC and Toledo future EOC. Develop a backup EOC at the Toledo Burgess Facility. Explore partnership with neighboring Fire Department in Toledo for EOC assets. EOC Written Plan & Supplies/Equipment & Training			<u>2020 Update:</u> Since the 2015 NHMP, the LCSD identified a location for its first EOC, in its new District Offices in Newport.		
<b>Champion/ Responsible Organization:</b>		Safety Coordinator & Technology Director			
<b>Internal Partners:</b>			<b>External Partners:</b>		
Facilities and Maintenance			OEM, FEMA, Lincoln County EM, Fire Districts, Law Enforcement, Lincoln County Amateur Radio Operators		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Local Funding Resources, grants, bond			Low to High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		Lincoln County School District, 2020			
<b>Action Item Status:</b>		New			



<b>Mitigation Action: LCSD #8</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Develop a fire and wildfire mitigation plans and perform mitigation actions to decrease the risk of fire and the risk of damage from wildfires at our schools and district facilities.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
All Hazards Emergency Plan, Family Reunification Plan, Sheltering Plan						
<b>Rationale for Proposal (Why is this important?):</b>						
<p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]</p> <p>Many of the LCSD schools and facilities are flanked by dense wooded/forest areas, increasing the risk of damage by wildfire. We need to create defensible spaces around all of our schools and campuses to reduce this risk.</p> <p>Further, many LCSD schools do not have sprinkler systems, making them more vulnerable to damage or loss from fires. Others have aging or nearing obsolete fire alarm panels.</p>						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
<p>Work with each city planner and manager, and county planning department, to develop plans and approval to remove trees where appropriate to reduce risk.</p> <p>Seek grant funding opportunities and partnerships to perform mitigation.</p> <p>Identify funding streams for fire alarm systems, panels, and sprinklers in our schools and facilities.</p>			<p><u>2020 Update</u></p> <p>This is a new Action Item</p>			
<b>Champion/ Responsible Organization:</b>		Safety Coordinator				
<b>Internal Partners:</b>		<b>External Partners:</b>				
Facilities & Maintenance		All Cities and County planning departments, Forest companies, Fire departments.				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Grants, bond, local funding resources		Low to High		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	Lincoln County School District, 2020 (Rich Belloni, Director of Facilities and Sue Graves, Safety Coordinator)					
<b>Action Item Status:</b>	New					

<b>Mitigation Action: LCSD #9</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Develop a wind and straight-line windstorm mitigation plan and perform actions to decrease the risk of damage from these high probability events.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>Lincoln County is susceptible to strong storms, including sustained high winds. Several of LCSD’s schools have roofs that are at risk of lifting off during such high windstorms. Some schools have cracks and separation in the floor that with movement in the ground, have weakened the roof systems. Others have old built-up roofs that are in open areas that are quite exposed and highly susceptible to being caught or damaged by sustained high winds. Roof mitigation is needed, as identified in the LCSD Long Range Facilities Plan, at:</p> <ul style="list-style-type: none"> <li>• In the North: Oceanlake Elementary, Taft Elementary, and Taft High School.</li> <li>• In the West: Early Childhood Center, Yaquina View Elementary, Newport Middle, both Newport High campuses, and the Compass Center.</li> <li>• In the East: Toledo Elementary, Toledo Jr/Sr High, and Arcadia.</li> <li>• In the South: Crestview Heights and Waldport High.</li> </ul> <p>Several of these schools are also susceptible to wind damage due to the proximity of large trees next to the buildings. These schools need tree mitigation to reduce the risk of wind damage due to falling trees:</p> <ul style="list-style-type: none"> <li>• In the North, Oceanlake Elementary, Taft Elementary, and Taft High School</li> <li>• In the West: Sam Case Elementary School and The Learning Center/District Office</li> <li>• In the East: Toledo Elementary, Toledo Jr/Sr High, Arcadia, and the Support Services building at Burgess.</li> <li>• In the South: None.</li> </ul>					
<b>Ideas for Implementation (How will it get done?):</b>		<b>Action Status Report</b>			
<p>Explore funding for roof repairs and replacement Work with each city planner and manager, and county planning department, to develop plans and approval to remove trees where appropriate to reduce risk of trees falling on buildings. Identify funding streams for new roofs and/or roof repairs as well as tree removal.</p>		<p><u>2020 Update</u> This is a new Action Item</p>			
<b>Champion/ Responsible Organization:</b>	Facilities & Maintenance				
<b>Internal Partners:</b>		<b>External Partners:</b>			
Safety Coordinator		All cities and County planning departments, forest management agencies.			
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>		
Grants, bond, local funding resources		Low to High	<input type="checkbox"/> Ongoing		

		<input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County School District, 2020 (Rich Belloni, Director of Facilities and Sue Graves, Safety Coordinator)	
<b>Action Item Status:</b>	New	

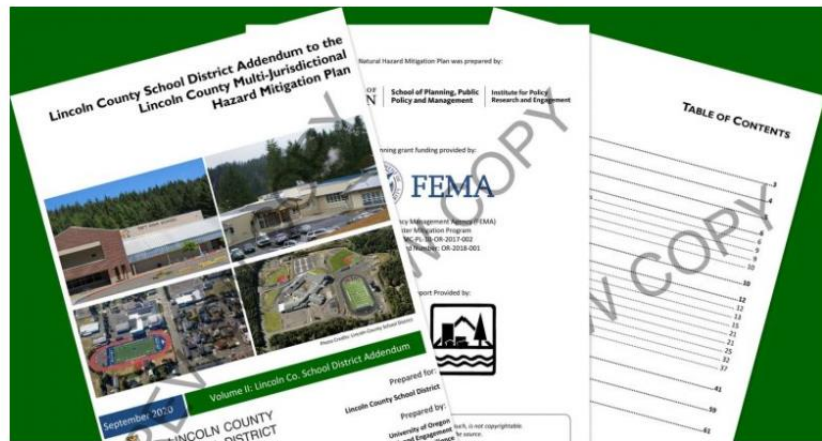
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# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the School District's website and social media and an email contact was provided for public comment. The plan was also announced on the County's website and an opportunity to provide feedback was provided.

During the public review period there were no comments provided.



**Lincoln County School District - Or**  
8h · 🌐

LCSD has developed a Natural Hazards Mitigation Plan as an addendum to Lincoln County's Plan. Community members are invited to provide feedback by submitting comments or questions by October 18. The plan and survey links are here: [Natural Hazards Mitigation Plan](https://lincoln.k12.or.us/.../lcsd-natural-hazards-mitigation-plan)

## LCSD Natural Hazards Mitigation Plan

POSTED ON OCTOBER 5, 2020

LCSD has developed a Natural Hazards Mitigation Plan as an addendum to Lincoln County's Plan. Community members are invited to provide feedback by submitting comments or questions by October 18. The plan and survey links are here:

[Natural Hazards Mitigation Plan](#)

[Link to Feedback Survey](#)

[f SHARE](#) [TWEET](#) [PERMLINK](#)

LINCOLN.K12.OR.US

**LCSD Natural Hazards Mitigation Plan - Lincoln County Schools**

You and 1 other 3 Shares

[Like](#) [Comment](#) [Share](#)

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

Mitigation Action: LCSD # (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# Seal Rock Water District Addendum to the Lincoln County Multi-Jurisdictional Hazard Mitigation Plan



Photo Credits: Seal Rock Water District

Effective: December 29, 2020 through December 28, 2025



Prepared for:  
Seal Rock Water District

Prepared by:  
University of Oregon  
Institute for Policy Research and Engagement  
Oregon Partnership for Disaster Resilience

This Natural Hazard Mitigation Plan was prepared by:



UNIVERSITY OF  
OREGON

School of Planning, Public  
Policy and Management

Institute for Policy  
Research and Engagement

Planning grant funding provided by:



**FEMA**

Federal Emergency Management Agency (FEMA)  
Pre-Disaster Mitigation Program  
Grant: PDMC-PL-10-OR-2017-002  
Disaster Award Number: OR-2018-001

Additional Support Provided by:



**DLCD**

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FEMA

March 1, 2021

The Honorable Kaety Jacobson  
Chair Jacobson, Lincoln County Commissioners  
225 West Olive Street, Room 110  
Newport, Oregon 97365

Dear Ms. Jacobson:

On December 29, 2020, the United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region 10, approved the Lincoln County Natural Hazards Mitigation Plan as a Multi-jurisdictional Plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance grants through December 29, 2025, through your state.

City of Toledo	City of Waldport	City of Depoe Bay
Lincoln City	City of Yachats	Seal Rock Water District
Central Lincoln People's Utility District		

The updated list of approved jurisdictions includes the City of Toledo, City of Depoe Bay, City of Yachats, City of Waldport, Lincoln City, Seal Rock Water District, and Central Lincoln People's Utility District that recently adopted the Addendum to the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at 503-378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director  
Mitigation Division

cc: Amie Bashant, Oregon Office of Emergency Management

Enclosure

EG:vl

**RESOLUTION NO. 0221-01**

**A RESOLUTION OF THE SEAL ROCK WATER DISTRICT BOARD OF COMMISSONERS ADOPTING THE DISTRICTS'S AMMENDMENTS TO THE LINCOLN COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN**

**WHEREAS**, Seal Rock Water District recognizes the threat that natural hazards pose to people, property and infrastructure within our service area; and

**WHEREAS**, undertaking hazard mitigation actions will reduce the potential for harm to people, property and infrastructure from future natural hazards; and

**WHEREAS**, an adopted Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan (MJNHMP) is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Seal Rock Water District has fully participated in the Federal Emergency Management Agency (FEMA) prescribed mitigation planning process to prepare the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan, which has established a comprehensive, coordinated planning process to eliminate or minimize vulnerabilities; and

**WHEREAS**, the Seal Rock Water District has identified natural hazard risks and prioritized a number of proposed actions and programs needed to mitigate the vulnerabilities of the Seal Rock Water District to the impacts of future disasters within the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan; and

**WHEREAS**, these proposed projects and programs have been incorporated into the Lincoln County, Multi-Jurisdictional Natural Hazard Mitigation Plan that has been prepared and endorsed for consideration and implementation by the cities and special districts of Lincoln County; and

**WHEREAS**, the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials have reviewed the Seal Rock Water District addendum to the Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan and pre-approved it (dated, December 9, 2020) contingent upon this official adoption by the participating governments and entities; and

**WHEREAS**, the MJNHMP is comprised of three volumes: Volume I: Basic Plan, Volume II: Jurisdictional Addenda, and Volume III: Appendices, collectively referred to herein as the MJNHMP; and

**WHEREAS**, the MJNHMP is in an on-going cycle of development and revision to improve its effectiveness; and

**WHEREAS**, Seal Rock Water District adopts the MJNHMP and directs the General Manager and staff to develop, approve, and implement the mitigation strategies and any administrative changes to the MJNHMP.

**NOW, THEREFORE, THE SEAL ROCK WATER DISTRICT BOARD OF COMMISSIONERS HEREBY RESOLVES AS FOLLOWS:**

- Section 1.** The Seal Rock Water District adopts the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan as an official plan; and
- Section 2.** The Seal Rock Water District will submit this Adoption Resolution to the Oregon Office of Emergency Management and Federal Emergency Management Agency, Region X officials to enable final approval of the Lincoln County Multi-Jurisdictional Natural Hazards Mitigation Plan.
- Section 3.** This resolution shall be effective upon passage by the Seal Rock Water District Board of Commissioners, this 11th day of February 2021.


PASSED by the Board of Commissioners on this  
11th day of February 2021.

APPROVED by the Chair on this  
11<sup>th</sup> day of February 2021.

ATTEST:

APPROVED:

  
Secretary, Board of Commissioners

  
Chairman, Board of Commissioners

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## Purpose

This document serves as the Central Lincoln People's Water District's (Water District or PUD) addendum to the Lincoln County Multi-Jurisdiction Natural Hazards Mitigation Plan (MNHMP, NHMP). This addendum describes how the Water District's risks vary from the entire Lincoln County planning area. Information contained herein supplements information contained in Volume I (Basic Plan) of this NHMP, which serves as the foundation for this jurisdiction's addendum and Volume III (Mitigation Resources), which provides additional information. This addendum meets all the requirements of Title 44 §201.6 including:

- Multi-jurisdictional **Plan Requirements** §201.6(a)(4),
- Multi-jurisdictional **Planning Process** §201.6(b)(1-3),
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv),
- Multi-jurisdictional **Plan Maintenance Process** §201.6(c)(4), and
- Multi-jurisdictional **Plan Adoption** §201.6(c)(5).

A description of the jurisdiction specific planning and adoption process follows, along with detailed community specific action items. Information about the Water District's risk relative to the county's risk to natural hazards is documented in the addendum's Hazard Analysis and Issue Identification section. The section considers how the Water District's risk differs from or matches that of the county's; additional information on Risk Assessment is provided within the Lincoln County NHMP's Section 2 – Risk Assessment.

This is the second addendum to the Lincoln County NHMP for the Water District. The Water District was added to the previous version of the NHMP in 2017. In the previous version of the NHMP the Water District contributed risk assessment information and mitigation strategies. Relevant updates are further discussed throughout the NHMP, and within Volume III, Appendix B, which provides an overview of alterations to the previous Lincoln County NHMP that took place during this update process.

Seal Rock WD adopted their addendum to the Lincoln County Multi-jurisdictional NHMP on **February 11, 2021**. FEMA Region X approved the Lincoln County NHMP on **December 29, 2021** and the Water District's addendum on **March 1, 2021**. With approval of this NHMP the Water District is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **December 28, 2025**.

## Mitigation Plan Mission

The NHMP mission states the purpose and defines the primary functions of the NHMP. It is intended to be adaptable to any future changes made to the NHMP and need not change unless the community's environment or priorities change.

The Water District concurs with the mission statement developed during the Lincoln County planning process (Volume I, Section 3):

*To promote public policy and mitigation activities which will enhance the safety to life and property from natural hazards.*

The 2019-2020 NHMP update Steering Committee reviewed the 2015 plan mission statement and agreed it accurately describes the overall purpose and intent of this plan. This is the exact wording that was present in the 2015 and 2009 NHMP. The Steering

Committee believes the concise nature of the mission statement allows for a comprehensive approach to mitigation planning.

## Mitigation Plan Goals

Mitigation plan goals are more specific statements of direction that Lincoln County citizens, and public, and private partners can take while working to reduce the Water District's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The Water District concurs with the goals developed during the Lincoln County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

Below is a list of the NHMP goals:

**Goal 1:** Protect life and reduce injuries resulting from natural hazards.

**Goal 2:** Minimize public and private property damages and the disruption of essential infrastructure and services from natural hazards.

**Goal 3:** Implement strategies to mitigate the effects of natural hazards and increase the quality of life and resilience of economies in Lincoln County.

**Goal 4:** Minimize the impact of natural hazards while protecting, restoring, and sustaining environmental processes.

**Goal 5:** Enhance and maintain local capability to implement a comprehensive hazard loss reduction strategy.

**Goal 6:** Document and evaluate progress in achieving hazard mitigation strategies and action items.

**Goal 7:** Motivate the public, private sector, and government agencies to mitigate the effects of natural hazards through information and education.

**Goal 8:** Apply development standards that mitigate or eliminate the potential impacts of natural hazards.

**Goal 9:** Mitigate damage to historic and cultural resources from natural hazards.

**Goal 10:** Increase communication, collaboration, and coordination among agencies at all levels of government and the private sector to mitigate natural hazards.

**Goal 11:** Integrate local NHMPs with comprehensive plans and implementing measures.

## Process and Participation

This section of the NHMP addendum addresses 44 CFR 201.6(a)(3), *Participation*.

In addition to establishing a comprehensive community-level mitigation strategy, the Disaster Mitigation Act of 2000 (DMA2K), and the regulations contained in 44 CFR 201, require that jurisdictions maintain an approved NHMP to receive federal funds for mitigation projects. Local adoption, and federal approval of this NHMP ensures that the Water District will remain eligible for pre-, and post-disaster mitigation project grants.

The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research and Engagement (IPRE) collaborated with the Oregon Office of Emergency Management (OEM), the Department of Land Conservation and Development (DLCD), Lincoln County, and Seal Rock WD to update the multi-jurisdictional NHMP and to develop the Water District addendum. This project is funded through the Federal Emergency Management Agency's Pre-Disaster Mitigation (PDM) Competitive Grant Program Grant: OR-2018-001 (PDMC-PL-10-OR-2017-002). Members of the Seal Rock WD NHMP Steering committee also participated in the County NHMP update process (Volume III, Appendix B).

The Lincoln County NHMP, and Seal Rock WD addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Seal Rock WD NHMP Steering Committee guided the process of developing the NHMP.

### Convener and Committee

The Water District General Manager serves as the NHMP addendum convener. The convener of the NHMP addendum will take the lead in implementing, maintaining, and updating the addendum in collaboration with the designated conveners of the Lincoln County NHMP (Lincoln County Emergency Manager and Planning Director).

Representatives from the Water District Steering Committee met formally, and informally, to discuss updates to their addendum (Volume III, Appendix B). The steering committee reviewed and revised the Water District's representation in the Lincoln County NHMP, with focus on the NHMP's risk assessment and mitigation strategy (action items).

This addendum reflects decisions made at the designated meetings, and during subsequent work, and communication with OPDR. The changes are highlighted with more detail throughout this document, and within Volume III, Appendix B. Other documented changes include the inclusion of the Water District's risk assessment and hazard identification sections which were not included in previous versions of the NHMP and mitigation strategy (action items).

The Seal Rock WD steering committee was comprised of the following representatives:

- Convener, Adam Denlinger, General Manager
- Brad Wynn, Senior Operator

## Public Participation

Public participation was achieved in part by posting the NHMP publicly and providing community members the opportunity to make comments and suggestions during the review process. Community members were also provided an opportunity for comment during the plan development stage via a survey administered by OPDR (Volume III, Appendix F). During the public review period (Attachment B) there were no comments provided.

## **Implementation and Maintenance**

The Water District Board of Directors will be responsible for adopting the Water District addendum to the Lincoln County NHMP. This addendum designates the steering committee, and a convener to oversee the development, and implementation of action items. Because the Water District addendum is part of the County's multi-jurisdictional NHMP, the Water District will look for opportunities to partner with the County. The Water District's steering committee will convene after re-adoption of the Water District NHMP addendum on an annual schedule. The County is meeting on a quarterly basis and will provide opportunities for participating jurisdictions (cities and special districts) to report on NHMP implementation, and maintenance during their meetings. The Water District General Manager will serve as the Water District convener and will be responsible for assembling the steering committee. The steering committee will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing, and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating, and training new steering committee members on the NHMP, and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The Water District will utilize the same action item prioritization process as the County (Volume I, Section 4).

## **Implementation through Existing Programs**

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies, residents, and the Water District; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other Water District plans and programs including their 2010 [Water System Master Plan](#), Capital Improvement Plan, Preliminary Engineering Report for SRWD Primary Source Water Improvements, [Lincoln County NHMP](#), and the [State of Oregon NHMP](#).

The mitigation actions described herein (and in Attachment A) are intended to be implemented through existing plans and programs within the Water District. Plans and policies already in existence have support from district residents, businesses, and policy

makers. Where possible, the Water District will implement the NHMP's recommended actions through existing plans and policies. Many strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards.

The Water District currently has the following plans and policies that relate to natural hazard mitigation:

- [Water System Master Plan with addendums](#) (2010)
- [Water Management and Conservation Plan](#) (2014, update 2019)
  - [Water Conservation Ordinance](#) (1992)
- [Reconnaissance-Level Source Water Study](#) (2015)
- [Phase-IV Conceptual Design Report for the SRWD Beaver Creek Water Supply](#) (2016)
  - [Environmental Report](#) (2017)
  - [Preliminary Engineering Report](#) (2017)
  - [Biological Assessment](#) (2018)
- [Bayshore Dune Management Plan](#) (2012)
- [NOAA BiOp/FONSI](#) (2019)

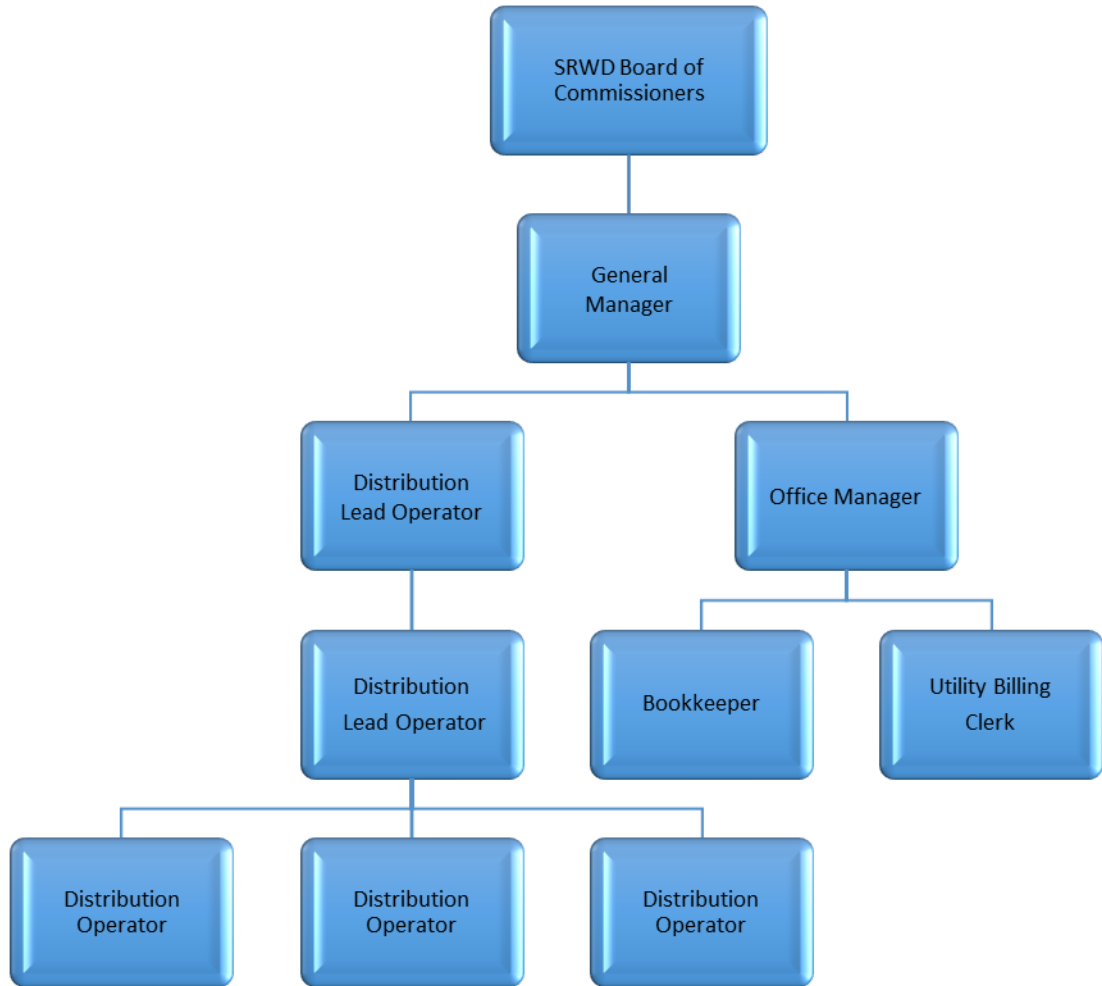
The purpose of these documents is to outline the planned improvements to infrastructure and equipment for a period of three to five years. These documents provide the context for how the District will accomplish our mission to provide reliable, resilient source water to our customers for generations to come.

*Relation to Natural Hazard Mitigation:* Planning documents will be used to support and justify funds necessary to develop source water improvements for the District which include: Constructing an intake on Beaver Creek, installing a raw water supply line from the Beaver Creek intake to the water treatment facility, and constructing a membrane water treatment facility. To withstand natural hazards, improvements will be designed considering resiliency and rapid recovery opportunities.

## **Governance Structure**

Seal Rock Water District is governed by a five-member Board of Commissioners elected to four-year terms by District voters (Figure SRWD-1). The Board of Commissioners, with help from the district's management team, set our policies and procedures.

**Figure SRWD-I Governance Structure**



Source: Seal Rock Water District (2020)

## Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review.<sup>1</sup> Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the Water District is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The Water District posted the plan update for public comment before FEMA approval, and after approval will maintain their addendum to the NHMP on the Water District’s website: <https://www.srwd.org/study-documents-reports>

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<sup>1</sup> Code of Federal Regulations, Chapter 44. Section 201.6, subsection (b). 2015

## NHMP Maintenance

The Lincoln County NHMP, and Water District addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the County NHMP update process, the Water District will also review, and update its addendum (Volume I, Section 4). The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the NHMP was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the NHMP accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the NHMP.

## Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3(iv), *Mitigation Strategy*.

The Water District's mitigation strategy (action items) were first developed for the 2015 NHMP (added in 2017). The actions were reviewed, updated, and relocated to this addendum during the 2019-2020 NHMP planning process and will be revised during subsequent NHMP updates. During these processes, the steering committee assessed the Water District's risk, identified potential issues, and developed the mitigation strategy (action items).

### Priority Action Items

Table SRWD-1 presents a list of mitigation actions. The steering committee decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. While all actions are considered priorities for the Water District, the highest priority actions are shown in **bold** text with grey highlight. The Water District will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the steering committee in terms of implementation, the steering committee has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each high priority action.

**Table SRWD-I Seal Rock WD Action Items**

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Potential Funding	Cost	Timing
<b>District Wide Actions</b>					
SRWD #1	Strengthen local redundancy in municipal source water supply systems.	SRWD Engineering, Operations, and Governing Body	CIP, OWRD, Grants	L	Long
SRWD #2	Develop Preventative maintenance program for existing water and communication infrastructure.	SRWD Consultant Engineers	CIP	M	Long
SRWD #3	Develop redundant water supply connections with neighboring communities.	SRWD Operations, Consultant Engineers, Districts and Municipalities	CIP	H	Long
SRWD #4	Evaluate the relocation of underground utility infrastructure in identified erosion hazard zones.	SRWD Consultant Engineers	CIP, USDA-RD RUAP	L	Short
SRWD #5	Design underground and distribution systems with consideration of potential slides.	SRWD Consultant Engineers	CIP, USDA-RD RUAP, Business Oregon SDWRRFP	H	Short
SRWD #6	Construct the SRWD Beaver Creek primary source water project.	SRWD Engineering and District Operations	CIP, USDA-RD RUAP, Business Oregon SDWRRFP	H	Short
SRWD #7	Construct Membrane Water Treatment Facility within the District's boundaries outside the tsunami inundation zone.	SRWD Consultant Engineers	CIP, USDA-RD RUAP, Business Oregon SDWRRFP	H	Short
SRWD #8	Construct a primary source water intake on Beaver Creek in Lincoln County.	SRWD Consultant Engineers	CIP	H	Short
SRWD #9	Construct primary source water supply piping from Beaver Creek intake site 1.5-miles to proposed Water Treatment Facility on South Beaver Creek Road and Beaver Creek Road.	SRWD Consultant Engineers	CIP	H	Short
SRWD #10	Evaluate the relocation of underground utility infrastructure in identified tsunami hazard zones.	SRWD Consultant Engineers	CIP, USDA-RD RUAP	L	Medium

Source: Seal Rock WD steering committee, 2020.

Cost: L (less than \$50,000), M (\$50,000-\$100,000), H (more than \$100,000)

Timing: Ongoing (continuous), Short (1-4 years), Medium (4-10 years), Long (10 or more years)



# Risk Assessment

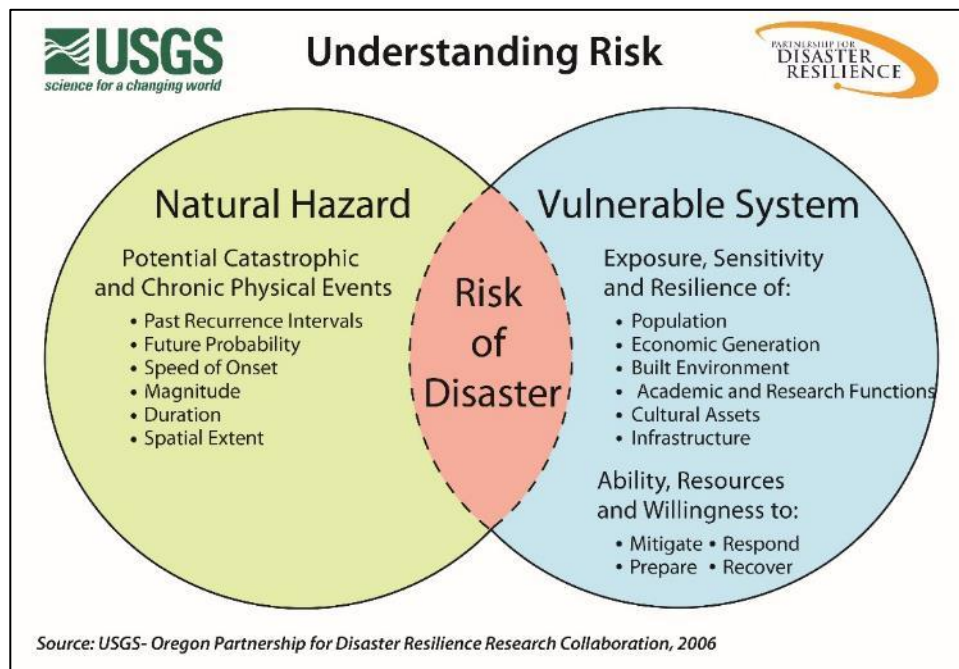
This section of the NHMP addendum addresses 44 CFR 201.6(c)(2)(iii) - Risk Assessment.

Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets, and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places, and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure SRWD-2. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

**Figure SRWD-2 Understanding Risk**



## Community Characteristics

Appendix C (Volume III) and the following section provides information on Seal Rock WD specific demographics and assets (see Table SRWD-5). Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation. Considering the Water District specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

The Water District’s service area is approximately 12.5 square miles and has a population of about 5,500 (expands up to 8,000 during summer months); the population is expected to

grow to about 6,000 by the year 2035.<sup>2</sup> Land within the service area is primarily zoned residential near the Pacific Ocean with some commercial areas along Highway 101. Land to the east of the service area is forested and used for timber production. The Water District has emergency water connections with the cities of Newport and Toledo and provides support to the area fire districts. There are about 2,500 service connections, 95% are residential (by 2035 it is expected service connections will expand to about 3,500).

There are several state parks including Driftwood State Park, Seal Rock State Park, Ona Beach State Park, and Lost Creek State Park. The National Register of Historic Places and the State Historic Preservation Office lists Seal Rock as the only archaeological/historic site (historical village) within the service area.<sup>3</sup> The Water District is part of the Siletz Service Area of the Confederated Tribes of the Siletz Indians. Historical tribal lands include areas around the Yaquina Bay and River (Yaquina Tribe) and Alsea Bay and Tribe (Alsea Tribe). Remnants of tribal settlements have been found in these areas including fishing weirs at the Ahnkuti site along Yaquina Bay (near Toledo).<sup>4</sup>

The Water District has an existing water right on the Siletz River (2.6 cfs) which is junior to instream rights (and could be restricted during summer drought periods for months at a time). Currently the Water District purchases water from the City of Toledo which holds a senior water right (5.75 cfs) and junior water right (4.0 cfs) on the Siletz River. The Water District has enough capacity to meet current and anticipated future demand until at least the year 2035. While the city of Toledo water rights is adequate to meet the needs of the city and the Water District combined for next 100 years.

Seal Rock WD currently purchases about 120-130 million gallons of treated water from the City of Toledo per year. About 95 million gallons are sold to Water District customers while the remaining water is unaccounted (lost). Raw water from the Siletz River is treated at the Toledo Water Treatment Plant (Mill Creek supplies water during winter months). The Toledo and Seal Rock systems are at the same hydraulic grade (300 feet above sea level) but rely upon the Toledo Pump Station near Toledo to overcome friction. Water is transmitted via 50,000 feet of 12-inch transmission mains to two finish water storage tanks (combined over 2.3 million gallons capacity). The Driftwood Tank (ca. 1981) has a storage capacity of 0.9 MG and a water surface elevation of 265.5 feet. The Lost Creek Storage Tank (ca. 2005) has a storage capacity of 2.3 MG and a water surface elevation of 301 feet. There is a third tank (ca. 1971) that is too low to be used in the system today. The Water District has about 65 miles of piping and is separated into six pressure zones. About 30% of the pipes are 4-inch in diameter or less.

The Oregon Water Resources Department, coordinates with water districts to implement water conservation or curtailment plans when drought emergencies are declared. The Water District's [Water System Master Plan](#) addresses conservation and rationing protocols and includes a [Water Management and Conservation Plan](#).

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<sup>2</sup> Seal Rock Water District, Water System Master Plan (2010); Seal Rock Water District, One Stop Meeting (2017)

<sup>3</sup> Oregon Historic Sites Database, <http://heritagedata.prd.state.or.us/historic/>, accessed July 17, 2020.

<sup>4</sup> Seal Rock Water District, Water System Master Plan (2010)

## Hazard Analysis

The Water District steering committee developed their hazard vulnerability assessment (HVA), using the Lincoln County and applicable City HVAs as references (Newport and Waldport). Differences reflect distinctions in vulnerability and risk from natural hazards unique to the Water District.

Table SRWD-2 shows the HVA matrix for the Water District listing each hazard in order of rank from high to low. The table shows that hazard scores are influenced by each of the four categories combined. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard. See Volume I, Section 2: Risk Assessment of the Lincoln County NHMP for a description of the methodology.

Two catastrophic hazards (Cascadia Subduction Zone earthquake and local tsunami) and three chronic hazards (drought, landslide, and riverine flood) rank as the top hazard threats to the Water District (Top Tier). Wildfire, coastal erosion, winter storm (snow/ice), and coastal flood comprise the next highest ranked hazards (Middle Tier), while the distant tsunami, windstorm, tornado, crustal earthquake, and volcanic event hazards comprise the lowest ranked hazards (Bottom Tier).

**Table SRWD-2 Hazard Analysis Matrix**

Hazard	Maximum				Total Threat Score	Hazard Rank	Hazard Tiers
	History	Vulnerability	Threat	Probability			
Earthquake (Cascadia)	10	50	100	49	209	#1	Top Tier
Drought	20	35	80	70	205	#2	
Tsunami (Local)	2	50	100	49	201	#3	
Landslide	20	40	70	70	200	#4	
Flood (Riverine)	20	25	80	70	195	#5	
Wildfire	12	20	80	70	182	#6	Middle Tier
Coastal Erosion	20	30	60	70	180	#7	
Winter Storm (Snow/Ice)	18	15	30	70	133	#8	
Flood (Coastal)	20	10	30	70	130	#9	
Tsunami (Distant)	10	20	50	35	115	#10	Bottom Tier
Windstorm	20	5	10	70	105	#11	
Tornado	8	10	30	56	104	#12	
Earthquake (Crustal)	10	20	40	21	91	#13	
Volcanic Events	2	5	40	7	54	#14	

Source: Seal Rock WD steering committee, 2019-2020.

Table SRWD-3 categorizes the probability, and vulnerability scores from the hazard analysis for the Water District and compares the results to the assessment completed by the Lincoln County steering committee. Variations between the Water District and County are noted in **bold** text within the Water District ratings.

**Table SRWD-3 Probability and Vulnerability Comparison**

Hazard	Seal Rock WD		County	
	Probability	Vulnerability	Probability	Vulnerability
Coastal Erosion	High	<b>Moderate</b>	High	Low
Drought	High	Moderate	High	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	High
Earthquake (Crustal)	Low	Moderate	Low	Moderate
Flood (Coastal)	High	<b>Low</b>	High	Moderate
Flood (Riverine)	High	Moderate	High	Moderate
Landslide	High	High	High	High
Tornado	High	Low	High	Low
Tsunami (Distant)	Moderate	<b>Moderate</b>	Moderate	Low
Tsunami (Local)	Moderate	High	Moderate	High
Volcanic Event	Low	Low	Low	Low
Wildfire	High	Moderate	High	Moderate
Windstorm	High	<b>Low</b>	High	High
Winter Storm (Snow/Ice)	High	<b>Low</b>	High	Moderate

Source: Seal Rock WD and Lincoln County steering committee, 2019-2020.

## Hazard Characteristics

Volume I, Section 2 describes the characteristics of the profiled hazards, history, as well as the location, extent and probability of potential events. Additional information is found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#). Generally, an event that affects the County, or applicable cities where Water District facilities are located (Newport, Toledo, Waldport), is likely to affect the Water District as well. Similarly, the causes and characteristics of hazard events are appropriately described within the Volume I, Section 2 as well as the location and extent of potential hazards. Lastly, previous occurrences are well documented within Volume I, Section 2 and the community impacts described by the County, or applicable City, would generally be the same for the Water District.

### National Flood Insurance Program (NFIP)

FEMA updated the Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) in 2019 (effective October 18, 2019). The Water District is not a community which has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction. Lincoln County and the incorporated cities of Newport and Waldport participate in the National Flood Insurance Program (NFIP).

There are no repetitive loss or severe repetitive loss properties owned or operated by the Water District. For specific information for communities within the Water District’s service area see Volume I, Section 2 and the addenda for the cities of Newport and Waldport (Volume II) for more information.

## Vulnerability Assessment

The Water District’s concentrated population and resources, as well as the soil characteristics and relative earthquake hazards described herein and in Volume I, Section 2 are cause for significant effort toward mitigating the earthquake hazard. The Water

District's infrastructure (water lines, tanks, treatment plant, etc.) is highly vulnerable to a severe earthquake event. No quantitative assessment of the risk of natural hazards has been conducted at a district wide scale. However, there have been several reports conducted for the unincorporated region of the county that include the Seal Rock WD service area.

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (Risk Report) for Lincoln County, including the Seal Rock-Bayshore area (approximately the same boundaries as the Seal Rock WD service area). The study was funded through the FEMA Risk MAP program and was completed in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risk related to the following natural hazards: coastal erosion, Cascadia Subduction Zone earthquake and tsunami, flood, landslide, and wildfire. The Water District hereby incorporates the Risk Report into this NHMP addendum by reference ([DOGAMI, O-20-11](#)).

#### Natural Hazard Risk Report for Lincoln County

The **Risk Report** provides hazard analysis summary tables that identify populations and property within Lincoln County that are vulnerable to coastal erosion, earthquake, flood, landslide, tsunami, and wildfire hazards. The Risk Report does not include a quantitative assessment for the drought, severe weather (windstorm, winter storm), or volcanic event hazards.

The Risk Report performed an analysis of population and buildings, including the Seal Rock WD office (1037 NW Grebe St, Seal Rock) to determine exposure for each community (see Table SRWD-4). The Seal Rock-Bayshore communities are most vulnerable to earthquake (Cascadia Subduction Zone), the associated CSZ tsunami, landslides, and coastal erosion. Note: The data does not include potentially impacted visitor populations that may be lodging, or at a public venue, during hazard events.

The Seal Rock WD Office is located within the moderate and high landslide susceptibility hazard zones. The report does not provide an analysis for any other Water District facility or infrastructure listed in Table SRWD-5.

Note: It is expected that bridges in the area may be impassable by vehicles for over 24 months. As such bringing resources into the Seal Rock WD service area by sea and air will be necessary.

**Table SRWD-4 Seal Rock-Bayshore Hazard Profile**

<u>Community Overview</u>							
Community Name		Population	Number of Buildings		Critical Facilities <sup>1</sup>	Total Building Value (\$)	
Seal Rock-Bayshore		2,766	3,345		2	347,085,000	
<u>Hazus-MH Analysis Summary</u>							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Damaged Buildings	Damaged Critical Facilities	Loss Estimate (\$)	Loss Ratio
Flood <sup>2</sup>	1% Annual Chance	43	2%	17	0	372,000	0.1%
Earthquake*	<i>CSZ M9.0 Deterministic</i>	546	20%	968	0	61,629,000	18%
Earthquake (within Tsunami Zone)		44	2%	86	0	12,237,000	3.5%
<u>Exposure Analysis Summary</u>							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Exposed Buildings	Exposed Critical Facilities	Building Value (\$)	Percent of Exposure
<i>Tsunami</i>	<i>CSZ M9.0 – Medium</i>	289	11%	450	0	65,926,000	19%
Tsunami	Senate Bill 379 Regulatory Line	309	11%	476	0	67,481,000	19%
Landslide	High and Very High Susceptibility	364	13%	445	1	55,334,000	16%
Coastal Erosion	High Hazard	105	4%	155	0	25,329,000	7%
Wildfire	High Hazard	0	0%	0	0	0	0%

Source: IPRE. Data adapted from DOGAMI, Open-File Report O-20-11, Lincoln County Natural Hazard Risk Report (2020), Table A-8.

\*Earthquake losses were calculated for buildings outside of Medium tsunami zone.

Rows with italicized text and tan shaded background indicate results should be considered in tandem as they are expected to occur within minutes of one another.

<sup>1</sup> Facilities with multiple buildings were consolidated into one building complex.

<sup>2</sup> No damage is estimated for exposed structures with “First floor height” above the level of flooding (base flood elevation).

In 2019, DOGAMI published a tsunami evacuation analysis using the XXL inundation zone which covers the largest CSZ event likely to occur based on the historical record.<sup>5</sup> Safety is reached when evacuees have reached “high ground”, or 20 feet beyond the limit of tsunami inundation. An analysis was conducted for cities and unincorporated areas of the county including the Seal Rock-Bayshore (Alsea Spit) area. According to the analysis the Seal Rock community is almost entirely outside the XXL tsunami inundation hazard area except for Highway 101 and the streets immediately south of Seal Rock. The report defines the Alsea Spit area (aka Bayshore) as extending from the mouth of Alsea Bay (south) to NW Hidden Lake Drive (north). The low-lying areas in the northern section of the Alsea Spit and almost all the southern section is expected to be overtopped by the expected XXL tsunami inundation. Liquefaction is also expected in these areas during earthquake shaking. Water District infrastructure within these areas is vulnerable to both earthquake shaking and tsunami inundation. Evacuation to high ground for residents and visitors is accessible and nearby to the east of Highway 101 for most of the Water District service area except for areas closest to the Alsea Bay (see Volume I, Section 2 for more information).

<sup>5</sup> DOGAMI, Open-File Report O-19-06.

For more information, see the following DOGAMI reports:

- Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast (2019, [O-19-06](#))
- Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, [O-20-03](#))
- Oregon Coastal Hospital Resilience Project (2020, [O-20-02](#))

## **Water District Asset Identification**

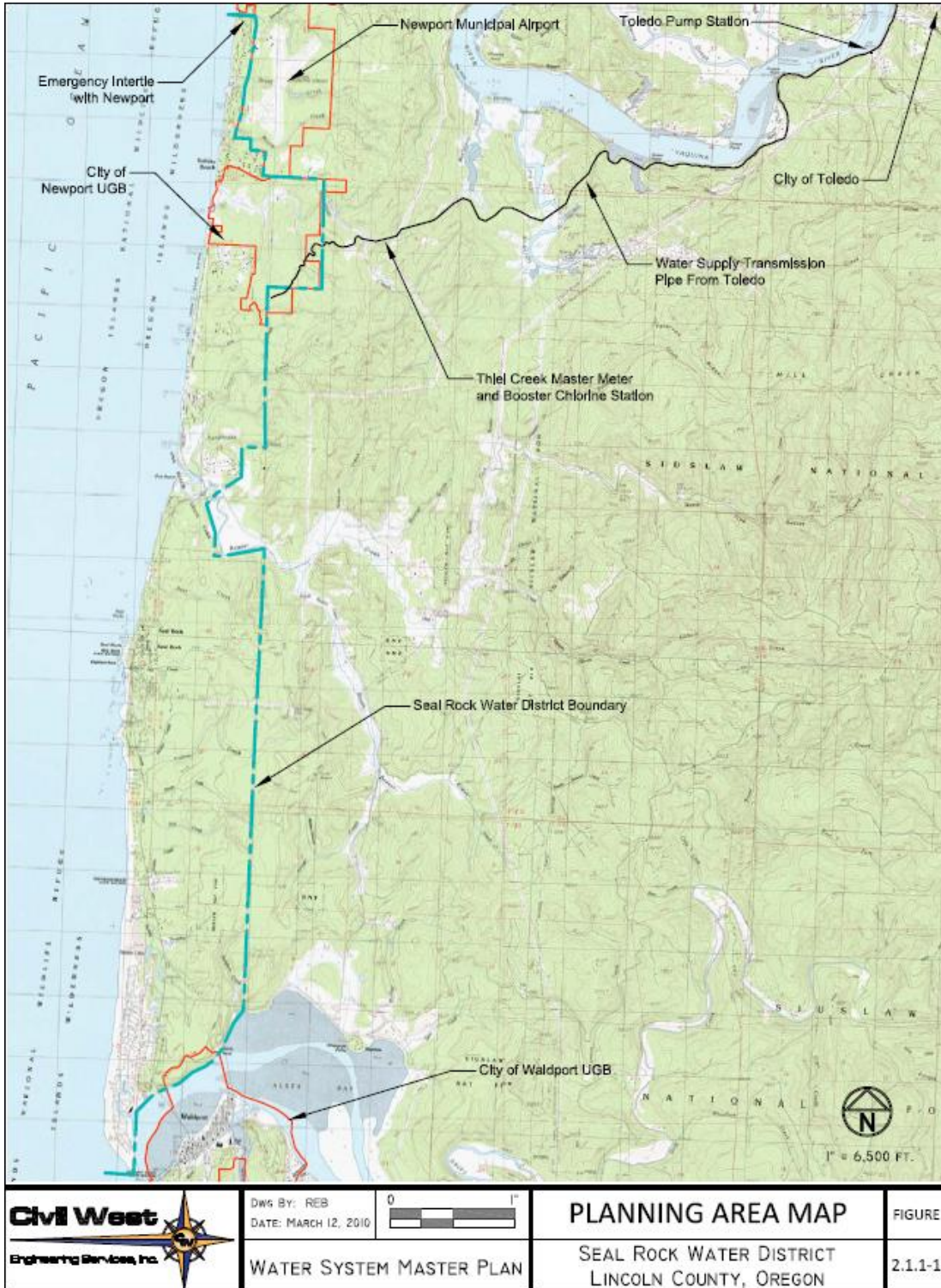
This section provides information on Water District specific assets. Considering the Water District specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. This section also provides information on Water District specific demographics and assets by area. Many of these community characteristics can affect how natural hazards impact communities, and how communities choose to plan for natural hazard mitigation.

### **Facilities and Property Assets Inventory**

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure. Table SRWD-5 lists the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of Seal Rock WD.

The Water District's facilities are located within their service area (see Figure SRWD-3) which includes the Lincoln County unincorporated communities of Seal Rock and Bayshore and small portions of the cities of Newport and Waldport. Additional infrastructure, including the main water transmission line, is in Lincoln County and the City of Toledo (see Figure SRWD-3 for detail). The service area extends from the unincorporated community of South Beach in the north (Henderson Creek area) to the Alsea Bay in the south (including the portion of Waldport on the north side of Alsea Bay).

**Figure SRWD-3 Seal Rock WD Area Boundaries**



Source: Seal Rock WD Water System Master Plan (2010)



**Table SRWD-5 Facilities Summary**

Name/Number	Address	Identified Hazard Exposure									
		CE	DR	EQ	FL	LS	TS	VE	WF	WS	WT
<b>Water Treatment</b>											
Water Treatment Plant (owned by Toledo)	860 NE Reservoir Ln, Toledo			X					X	X	X
Membrane Water Treatment Facility ( <i>proposed</i> )	13745 NW Kona Street, Seal Rock			X					X	X	X
Beaver Creek Source Water Intake ( <i>proposed</i> )	South Beaver Creek Rd and Beaver Creek Rd		X	X	X				X	X	X
<b>Storage Tanks</b>											
Driftwood Tank - 0.9 MG (ca. 1981)	NW Terrace Road, Seal Rock			X		X				X	X
Lost Creek Tank - 2.3 MG (ca. 2005)	593 SE 123 <sup>rd</sup> Street, Seal Rock			X		X				X	X
<i>Makai Tank (ca. 1971), not in service</i>	Membrane Water Treatment Facility			X		X				X	X
<b>Pump Stations</b>											
Toledo Pump Station	Near city of Toledo (1621 S Bay Road)			X	X	X	X		X	X	X
Cross Street Pump Station	NW Corner of Cross St. & Seal Rock St.			X		X				X	X
East Bayshore Pump Station	NE Corner of N. Bay Road and HWY-101			X		X				X	X
York Pump Station	6161 NW Pacific Coast Hwy			X		X				X	X
Driftwood Booster Pump Station	NW Terrace Road, Seal Rock			X		X				X	X
Lost Creek Booster Pump Station	593 SE 123 <sup>rd</sup> Street, Seal Rock			X		X				X	X
<b>Piping, Hydrants, Generators, and other infrastructure</b>											
65 miles of piping (2-inch to 14-inch)	Throughout District	X		X		X	X			X	X
South Bay Road supply line	Throughout District	X		X		X	X			X	X
150 fire hydrants	Throughout District	X		X		X	X			X	X
Pump station generators	All Pump Stations			X		X					X

Source: Information provided by Seal Rock WD

Table Key:

"X" – Facility may be exposed and may be impacted by the identified hazard per a visual inspection of the mapped hazard area

[blank] = facility exposure has not been assessed for this hazard

Hazard Descriptions:

CE = Coastal Erosion

EQ = Earthquake

LS = Landslide

VE = Volcanic Event

WS = Windstorm/Tornado

DR = Drought

FL = Flood

TS = Tsunami

WF = Wildfire

WT = Winter Storm

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# ATTACHMENT A: ACTION ITEM FORMS

Table SRWD-6 provides a summary list of actions for the Water District. Each action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

**Table SRWD-6 Action Item Summary**

Action Item	Priority	Timeline	Status	Related Hazard									
				Coastal Erosion	Drought	Earthquake	Flood	Landslide	Tsunami	Volcano	Wildfire	Windstorm	Winter Storm
SRWD #1	X	Long	Ongoing	X	X	X	X	X	X				
SRWD #2		Long	Ongoing	X	X	X	X	X	X				
SRWD #3	X	Long	Ongoing	X	X	X	X	X	X				
SRWD #4		Short	Ongoing	X									
SRWD #5		Short	Ongoing					X					
SRWD #6	X	Short	Ongoing					X					
SRWD #7	X	Short	Ongoing						X				
SRWD #8	X	Short	Ongoing						X				
SRWD #9		Short	Ongoing						X				
SRWD #10		Medium	Ongoing						X				

**Previous NHMP Actions Removed/Deleted:**

Tsunami #1 (2017): “Collaborate with Lincoln County to identify potential risks and threats” was removed since the Water District collaborates with the County as part of the implementation and maintenance component of the mitigation plan standard practice. Updates to risks and threats will be included during the maintenance period and/or with five-year updates of the plan.

*Note: 2017 Actions were renamed as follows:*

2017 Action Item	2020 Action Item
Coastal Erosion #1	SRWD #4
Landslide #1 (1 <sup>st</sup> )	SRWD #5
Landslide #2 (2 <sup>nd</sup> )	SRWD #6
Tsunami #1/Landslide #1 (1 <sup>st</sup> )	SRWD #7
Tsunami #1/Landslide #1 (2 <sup>nd</sup> )	SRWD #8
Tsunami #1/Landslide #1 (3 <sup>rd</sup> )	SRWD #9

Action item descriptions were modified for 2020 actions SRWD #1, SRWD #3, and SRWD #6.

## **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The Water District NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the Water District. Existing programs and other resources that might be used to implement these action items are identified. The Water District addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the Water District will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

## **STATUS/RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

## **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

## **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

## **INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the Water District or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (5-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

<b>Mitigation Action: SRWD #1</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Strengthen local redundancy in municipal source water supply systems.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Place based planning approved through the States Integrated Water Recourses Stratagem (IWRS) and the joint agency Mid-Coast integrated water resources planning effort currently in progress.						
<b>Rationale for Proposal (Why is this important?):</b>						
The Mid-Coast Water Planning Partnership is co-convened by the City of Newport and Oregon Water Resources Department. The Partnership is working collaboratively to develop an Integrated Water Resources Plan that will identify strategies to balance water uses with supply in the Mid-Coast region in a way that meets the current and future needs of coastal communities, the environment, and the economy. The Partnership includes representation of diverse water interests in the Mid-Coast region.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Integrated Water Recourse Strategy (IWRS)			<b>2020 Update:</b> District serves a co-convenor of the mid coast water planning partnership. District assist in coordinating and planning various patronship meetings and filed tours. Placed based planning includes many interests and takes time to develop relationships			
<b>Champion/ Responsible Organization:</b>		SRWD Engineering, Operations, and Governing Body				
<b>Internal Partners:</b>		<b>External Partners:</b>				
		Mid-Coast Integrated Water Resources Place-Based Planning Group; Lincoln County; OWRD; MCWC; ODF&W; ODEQ; All Lincoln County Cities				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget); Oregon Water Resources Department, Grants and partner funding		Low		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>		Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: SRWD #2</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Develop Preventative maintenance program for existing water and communication infrastructure.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water Master Plan, Vulnerability and Risk Assessment						
<b>Rationale for Proposal (Why is this important?):</b>						
Improving the District's existing supervisory controlled data and acquisition (SCADA) program is necessary to maintain reliable communication with the system.						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Monitor systems throughout the District Evaluate SCADA system to maintain communication				<u>2020 Update:</u> District filed operations staff complete systems evaluation in the field to determine if SCADA system is performing as expected		
<b>Champion/ Responsible Organization:</b>		SRWD Consultant Engineers				
<b>Internal Partners:</b>			<b>External Partners:</b>			
SRWD Operations and Supervisory Controlled Data Acquisition (SCADA); Jacobs Engineering (Corvallis Office)			Consultants and Engineer of Record (EOR)			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			Medium		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: SRWD #3</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Develop redundant water supply connections with neighboring communities.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water Master Plan, Vulnerability and Risk Assessment						
<b>Rationale for Proposal (Why is this important?):</b>						
Redundant water supply systems provide emergency water supply to neighboring communities in the event of an emergency disruption in water supply.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Develop redundant emergency source water connections with the City of Newport. (Est. cost \$1 million) Conceptual design for emergency source water connections with the City of Newport. (Est. cost \$3 million)			<u>2020 Update:</u> District staff and consultant engineers, ODOT representatives collaborated with the City of Waldport to completed preliminary engineering to connect the two water supply systems using the raceway through the Alesa Bridge.			
<b>Champion/ Responsible Organization:</b>		SRWD Operations, Consultant Engineers, Districts and Municipalities				
<b>Internal Partners:</b>			<b>External Partners:</b>			
			Mid-Coast Integrated Water Resources Place-Based Planning Group; Newport; Toledo; Waldport; Yachats, Lincoln County; SW Lincoln County Water PUD; OWRD; MCWC; ODF&W; ODEQ			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>		Ongoing				



<b>Mitigation Action: SRWD #4</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Evaluate the relocation of underground utility infrastructure in identified erosion hazard zones.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water Master Plan, Vulnerability and Risk Assessment						
<b>Rationale for Proposal (Why is this important?):</b>						
Monitor and evaluate infrastructure vulnerable to slides or settlement to protect and preserve the Distribution system and build resiliency to the water distribution system resulting in a more reliable water delivery system.						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Monitor systems throughout the District.				<u>2020 Update:</u> District filed operations staff complete systems evaluation in the field to determine if erosion or prone slides areas are at risk of affecting the Water Distribution system in remote areas.  In 2015 SRWD replaced a 300LF section of water distribution piping along South Bay Road due to slide movement in the roadway. New piping included the instillation of High-Density Polyethylene (HDPE) for added pipe flexibility in this area.		
<b>Champion/ Responsible Organization:</b>		SRWD Consultant Engineers				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Jacobs Engineering (Corvallis Office)			Lincoln County Emergency Management, Public Works and GIS; Toledo			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget); USDA-RD Rural Utility Assistance Program			Low		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: SRWD #5</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Design underground and distribution systems with consideration of potential slides.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input checked="" type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water Master Plan, Vulnerability and Risk Assessment, Beaver Creek Source Water Assessment Plan and Preliminary Engineering report						
<b>Rationale for Proposal (Why is this important?):</b>						
Monitor and evaluate infrastructure vulnerable to slides or settlement to protect and preserve the Distribution system and build resiliency to the water distribution system resulting in a more reliable water delivery system. Design new primary source water intake and treatment system.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Pursue this action per Beaver Creek Source Water Assessment (Est. cost \$12.5 million)			<u>2020 Update:</u> Reconnaissance-Level Source Water Study (2015); Phase-4 Conceptual Design Report – Beaver Creek Water Supply (2016); Preliminary Engineering Report – Beaver Creek Water Supply (2017); Biological Assessment – Beaver Creek Water Supply (2018); NOAA BiOp (2019); Final design for the installation of a new intake and treatment facility is at 100% (2019). Source water project is in the construction phase. Completion date expected December 2021.			
<b>Champion/ Responsible Organization:</b>		SRWD Consultant Engineers				
<b>Internal Partners:</b>		<b>External Partners:</b>				
SRWD Distribution, Operations, and GIS; Jacobs Engineering (Corvallis Office)		Lincoln County Emergency Management, Public Works, and GIS				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget); USDA-RD Rural Utility Assistance Program; Business Oregon-Safe Drinking Water Revolving Loan Fund Program		High		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>		Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: SRWD #6</b> (What do we want to do?)	<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Construct the SRWD Beaver Creek primary source water project.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input type="checkbox"/> 10	<input checked="" type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>					
Water Master Plan, Vulnerability and Risk Assessment, Beaver Creek Source Water Assessment Plan and Preliminary Engineering and Environmental reports					
<b>Rationale for Proposal (Why is this important?):</b>					
<p>Due to risks and vulnerabilities affecting the District’s existing source water supply line, the District Board of Commissioners has authorized the development of a new primary source water supply system located within the District’s service territory.</p> <p>The proposed Beaver Creek source water project and all facilities will be consistent with any current development plans of State, multi-jurisdictional areas, counties, or municipalities in which the project is to be located. The proposed facilities will also follow all State and county land use and floodplain laws, including the Oregon Coastal Management Plan.</p> <p>The District has completed an extensive archaeological survey of the project’s area of potential effects (APE) based on the locations of the new river intake structure, pipe alignment(s), outfall, water treatment facility, reservoir and other critical infrastructure improvements. The State Historic Preservation Office (SHPO) has concurred that the proposed project will likely have no effect on any significant archeological objects or sites or historic properties. Wetland delineation has also been conducted within the APE to ensure compliance with the Department of State Lands (DSL) and the U.S. Army Corps of Engineers (USACE) regulations. A Joint Permit Application is in process for impacts to jurisdictional wetlands and waters.</p>					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
Pursue this action per Beaver Creek Source Water Assessment (Est. cost \$12.5 million)			<u>2020 Update:</u> See SRWD #4 for supporting work.		
<b>Champion/ Responsible Organization:</b>	SRWD Engineering and District Operations				
<b>Internal Partners:</b>			<b>External Partners:</b>		
SRWD Distribution and GIS; Consultant Engineers; Jacobs Engineering (Corvallis Office)			Lincoln County Emergency Management; Oregon Water Resources Department (OWRD); Mid-Coast Watershed Council (MCWC); Lincoln Soil & Water Conservation District (LSWCD); Newport		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>	<b>Timeline:</b>	
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget); USDA-RD Rural Utility Assistance Program; Business Oregon-Safe Drinking Water Revolving Loan Fund Program			High	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>	Ongoing				

<b>Mitigation Action: SRWD #7</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>	
Construct Membrane Water Treatment Facility within the District's boundaries outside the tsunami inundation zone.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water Master Plan, Vulnerability and Risk Assessment						
<b>Rationale for Proposal (Why is this important?):</b>						
Improve infrastructure vulnerable to Tsunami to protect and preserve the Distribution system and build resiliency to the water treatment and distribution system resulting in a more reliable water delivery system.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Develop water treatment facility to provide reliable source water to the District (Est. cost \$8.225 million; overall project cost \$12.5 million)			<u>2020 Update:</u> District staff continue working with consultants and permitting officials to secure necessary permits to complete improvements. Preliminary Engineering Report, Environmental Report and 100% Design Plans and contract documents are all completed as of June 30, 2019.			
<b>Champion/ Responsible Organization:</b>		SRWD Consultant Engineers				
<b>Internal Partners:</b>		<b>External Partners:</b>				
SRWD Distribution Engineers and GIS; Jacobs Engineering (Corvallis Office)		Lincoln County Emergency Management; Newport; Toledo; Waldport; Yachats; OWRD; MCWC				
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>		<b>Timeline:</b>		
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget); USDA-RD Rural Utility Assistance Program; Business Oregon-Safe Drinking Water Revolving Loan Fund Program		High		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)		
<b>Form Submitted by:</b>	Seal Rock WD Steering Committee, 2017 (revised 2020)					
<b>Action Item Status:</b>	Ongoing					

<b>Mitigation Action: SRWD #8</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Construct a primary source water intake on Beaver Creek in Lincoln County.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water Master Plan, Vulnerability and Risk Assessment						
<b>Rationale for Proposal (Why is this important?):</b>						
Improve infrastructure vulnerable to Tsunami to protect and preserve the Distribution system and build resiliency to the water treatment and distribution system resulting in a more reliable water delivery system.						
<b>Ideas for Implementation (How will it get done?):</b>				<b>Action Status Report</b>		
Develop water intake facility on Beaver Creek to provide reliable source water to the District (Est. cost \$2 million; overall project cost \$12.5 million)				<u>2020 Update:</u> District staff continue working with consultants and permitting officials to secure necessary permits to complete improvements. Preliminary Engineering Report, Environmental Report and 100% Design Plans and contract documents are all completed as of June 30, 2019.		
<b>Champion/ Responsible Organization:</b>		SRWD Consultant Engineers				
<b>Internal Partners:</b>			<b>External Partners:</b>			
SRWD Distribution Engineers and GIS; Jacobs Engineering (Corvallis Office)			Lincoln County Emergency Management; Newport; Toledo; Waldport; Yachats; OWRD; MCWC			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>		Ongoing				

<b>Mitigation Action: SRWD #9</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>			<b>High Priority Action Item?</b>
Construct primary source water supply piping from Beaver Creek intake site 1.5-miles to proposed Water Treatment Facility on South Beaver Creek Road and Beaver Creek Road.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>					
Capital Improvement Plan, Water Master Plan, Vulnerability and Risk Assessment					
<b>Rationale for Proposal (Why is this important?):</b>					
Improve infrastructure vulnerable to Tsunami to protect and preserve the Distribution system and build resiliency to the water treatment and distribution system resulting in a more reliable water delivery system.					
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>		
Develop water intake facility on Beaver Creek to provide reliable source water to the District (Est. cost \$2.275 million; overall project cost \$12.5 million)			<u>2020 Update:</u> District staff continue working with consultants and permitting officials to secure necessary permits to complete improvements.  Preliminary Engineering Report, Environmental Report and 100% Design Plans and contract documents are all completed as of June 30, 2019.		
<b>Champion/ Responsible Organization:</b>		SRWD Consultant Engineers			
<b>Internal Partners:</b>			<b>External Partners:</b>		
SRWD Distribution, Consultant Engineers, and GIS			Lincoln County Emergency Management; OWRD; MCWC; Newport; Toledo; Waldport; Yachats		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget)			High		<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Seal Rock WD Steering Committee, 2017 (revised 2020)				
<b>Action Item Status:</b>	Ongoing				

<b>Mitigation Action: SRWD #10</b> (What do we want to do?)		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Evaluate the relocation of underground utility infrastructure in identified tsunami hazard zones.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Alignment with Existing Plans/Policies:</b>						
Water Master Plan, Vulnerability and Risk Assessment						
<b>Rationale for Proposal (Why is this important?):</b>						
Monitor and evaluate infrastructure vulnerable to Tsunami to protect and preserve the Distribution system and build resiliency to the water distribution system resulting in a more reliable water delivery system.						
<b>Ideas for Implementation (How will it get done?):</b>			<b>Action Status Report</b>			
Monitor systems throughout the District.			<u>2020 Update:</u> District staff continue working with consultants and permitting officials to secure necessary permits to complete improvements. Preliminary Engineering Report, Environmental Report and 100% Design Plans and contract documents are all completed as of June 30, 2019.			
<b>Champion/ Responsible Organization:</b>		SRWD Consultant Engineers				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Jacobs Engineering (Corvallis Office)			Lincoln County Emergency Management, Public Works and GIS; Toledo			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Seal Rock WD Capital Improvement Plan budget (Upon Board approval of fiscal year budget); USDA-RD Rural Utility Assistance Program			Low		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		Seal Rock WD Steering Committee, 2018-2019 (revised 2020)				
<b>Action Item Status:</b>		Ongoing				

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# ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY

Members of the steering committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

To provide the public information regarding the draft NHMP addendum, and provide an opportunity for comment, an announcement (see text below) was announced on the county's website and a feedback form was provided for public comment.

During the public review period there were no comments provided.

The screenshot shows the Lincoln County website's 'Planning & Development' section. The main heading is 'Community Input Needed - Natural Hazards Mitigation Plan Renewal'. The page contains the following elements:

- Navigation:** County Home, Contact Us, Search.
- Left Sidebar:**
  - Planning Division
  - Building Division
  - Onsite Waste Management Division
  - Planning Commission
  - Code Compliance
  - Links
  - Marijuana
  - FAQs
  - Staff Directory
  - Community Input Needed - Natural Hazards Mitigation Plan Renewal (highlighted)
  - Fee Schedule - All County Departments
- Contact Information:** Department of Planning & Development, Onno Husing, Director.
- Main Content:**
  - Community Input Needed - Natural Hazards Mitigation Plan Renewal:** A paragraph explaining the renewal process and a link to the survey.
  - Community Member Input:**
    - Community members are invited to provide feedback by submitting comments or questions by Friday, October 2nd using the survey link below.
    - Survey Link - CLICK HERE**
  - Natural Hazards Mitigation Plan - September 2020 Renewal Plan:**
    - The September 2020 page is separated down into 3 sections (I, II, III)
  - Volume I - Basic Plan**
  - Volume II - Jurisdictional Addenda:**
    - Depeo Bay
    - Lincoln City
    - Newport
    - Siletz
    - Toledo
    - Waldport
    - Yachats
    - Central Lincoln PUD
    - Lincoln Co. School District
    - Seal Rock Water District
  - Volume III - Appendices:**
    - CLICK HERE** for current plan - September 2015
  - Questions - need more information?**
    - Planning and Development Department - 541-265-4192
    - County Emergency Management - 541-265-4199
    - Michael Howard, Director for the Oregon Partnership for Disaster Resilience at [mrhoward@uooregon.edu](mailto:mrhoward@uooregon.edu)
  - Seal Rock Water District and Lincoln Co. School District addenda are forthcoming.
  - SUPPORTING DOCUMENTS:**
    - central\_lincoln\_pud\_addendum\_review\_draft.pdf (2 MB)
    - depeo\_bay\_addendum\_review\_draft.pdf (3 MB)
    - lincoln\_city\_addendum\_review\_draft.pdf (4 MB)
    - lincoln\_co\_nhmp\_-\_volume\_i\_review\_draft.pdf (5 MB)
    - lincoln\_co\_nhmp\_-\_volume\_ii\_review\_draft.pdf (8 MB)
    - newport\_addendum\_review\_draft.pdf (3 MB)
    - siletz\_addendum\_review\_draft.pdf (3 MB)
    - toledo\_addendum\_review\_draft.pdf (4 MB)
    - waldport\_addendum\_review\_draft.pdf (3 MB)
    - yachats\_addendum\_review\_draft.pdf (3 MB)
    - Media Release - Community Feedback Needed - Natural Hazards Mitigation Plan (17 KB)
    - seal\_rock\_wd\_addendum\_review\_draft.pdf (2 MB)
    - lincolnsd\_addendum\_review\_draft.pdf (5 MB)
  - WEB LINKS:**
    - September NHMP - Separated down into 3 sections (I, II, III)

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## ATTACHMENT C: ACTION ITEM FORM TEMPLATE

Mitigation Action: SRWD # (What do we want to do?)	Alignment with Plan Goals:	High Priority Action Item?
	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposal (Why is this important?):</b>		
<b>Ideas for Implementation (How will it get done?):</b>	<b>Action Status Report</b>	
<b>Champion/ Responsible Organization:</b>		
<b>Internal Partners:</b>	<b>External Partners:</b>	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		
<b>Action Item Status:</b>		

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# **Volume III: Appendices**

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#### Previous NHMP Actions Completed:

- (2015) MH #8 “Tie concept of operations planning (CONOPS) with mitigation” was completed.

#### Previous NHMP Actions Removed/Deleted:

- (2015) LS #3 “Evaluate and implement mitigation projects for areas of Highway 101 near Beverly Beach/ Spencer Creek that is slumping (near milepost 137) and section near Cape Foulweather that is prone to flooding (near milepost 133” was deleted since the Highway is owned and maintained by the Oregon DOT. See the State MNHMP for related actions.

#### **ALIGNMENT WITH EXISTING PLANS/POLICIES**

The County NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the County. Existing programs and other resources that might be used to implement these action items are identified. The County addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the County will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

#### **RATIONALE FOR PROPOSED ACTION ITEM**

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in this addendum and within Volume I, Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

#### **IDEAS FOR IMPLEMENTATION**

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

#### **COORDINATING (LEAD) ORGANIZATION:**

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.



**INTERNAL AND EXTERNAL PARTNERS:**

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project steering committee but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the County or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

**PLAN GOALS ADDRESSED:**

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

**TIMELINE:**

All broad scale action items have been determined to be ongoing, as opposed to short (1 to 4 years), medium (4-10 years), or long (10 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

**POTENTIAL FUNDING SOURCE**

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

**ESTIMATED COST**

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than \$50,000

Medium - \$50,000 – \$100,000

High - More than \$100,000

**STATUS**

The 2020 status of each action item is indicated: new actions were developed in 2020, ongoing actions are those carried over from the previous plan, and deferred actions are those that are carried over from the previous plan but had limited or no activity.

Action Item: Multi-hazard #1	Alignment with Plan Goals:				High Priority Action Item?
Consider Local Energy Assurance Planning for critical areas countywide	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>					
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats					
<b>Alignment with Existing Plans/Policies:</b>					
<b>Rationale for Proposed Action Item:</b>					
<p>The County relies on a range of energy sources to support and protect residents, businesses, and government facilities. Accordingly, secure supplies of energy (e.g., electricity, gasoline, diesel fuel, natural gas, propane) to critical facilities/infrastructure, especially during emergency events, are of crucial importance to all segments of the community. An energy assurance plan is essentially a plan for how the County will recover and restore energy services to critical functions and facilities/infrastructure within a predetermined time after a partial or complete energy supply interruption. The Plan identifies critical facilities and critical infrastructure needing back-up power generation capacity to ensure continued operation during emergency events. The Plan establishes short-term communication protocols, actions and priorities by which critical facilities/infrastructure will be re-energized after a disruption, as well as long-term strategies for making critical facilities and critical infrastructure less vulnerable to disruptions of mainline energy sources. Examples: <a href="#">Oregon LEAP</a> (2012), <a href="#">Salem LEAP</a> (2011)</p>					
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>		
Develop a Local Energy Assurance Plan			<u>2020 Update:</u> County has collected wind data related to this item No capacity/resources to complete this action during the implementation period.		
<b>Coordinating Organization:</b>		Emergency Management			
<b>Internal Partners:</b>			<b>External Partners:</b>		
Public Works, Planning, Roads			Utility Companies, U.S. DOE, OEM		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
FEMA PDM, U.S. Department of Energy's Local Energy Assurance Planning Initiative, other grants, Local Funding Resources			Low to Medium		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		2015 Lincoln County Steering Committee, revised 2020			
<b>Action Item Status:</b>		Deferred			

Action Item: Multi-hazard #2	Alignment with Plan Goals:	High Priority Action Item?
Improve technology capacity of communities, agencies and responders needed to adequately map hazard areas, broadcast warnings, inform, and educate residents and visitors of natural hazard dangers	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Lincoln County Risk Report, Comprehensive Plans,		
<b>Rationale for Proposed Action Item:</b>		
<p>The tsunami chapter of Lincoln County’s risk assessment identified people and properties located in low-lying areas near the ocean as being at risk from tsunami inundation. Dealing with evacuees would be a major challenge in the first days after the event. Improving technology, particularly GIS and communications, for the identification of response needs such as addressing the adequacy of evacuation routes in the event of a tsunami will help decrease their vulnerability to tsunami.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify how the community will continue to involve the public in the plan maintenance process [201.6(c)(4)(iii)]. Improving technology capacity will allow more widespread dissemination of information, thus assisting in keeping residents informed of what is being done with the plan, how the County is working to mitigate its risk to tsunami, and allowing for feedback and suggestions from the public for improving, updating, and maintaining the plan.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Improve and utilize tsunami information, utilize technology to assist in determining evacuation needs and concerns.</p> <p>Apply technology capabilities to other natural hazards to provide the same benefit to residents, and visitors.</p> <p>Utilize Risk Report and associated data to assist in determining mitigation strategies to address hazard risk and vulnerability.</p>	<p><u>2020 Update:</u>  County Emergency Management has implemented several Emergency Alert System (EAS) and Emergency Notification Upgrades to include hardware components and digital software redundancy and interoperability to reach community members for emergency notification messages. Lincoln Co. Parks has placed tsunami “You are here” and evacuation route signage at parks in the county including: Logan Road Wayside (Lincoln City), Drift Creek Park (Lincoln City), Mike Miller Park (Newport), Knight Park (Otis), Seal Rock Wayside (Seal Rock), Strome Park (Siletz), Itchwhit Park (Siletz), Brown Memorial Park (Siletz), Cannon Quarry Park (Toledo), and Don Lindly Park (Waldport).  Tsunami “blue line” and evacuation wayfinding signage have also been placed along unincorporated county roads (2018; See list below for details).</p> <p><u>2015 Update:</u>  DOGAMI completed new inundation mapping in 2013; mass notification system for all hazards</p>	

		(distant tsunami) warnings implemented in 2011; considerable public education including a post card mailing to all addresses in the inundation areas notifying them of the new maps and zones was completed in 2013; new evacuation signage installed 2013 – 2014; state developed hotel tsunami video's, public education brochures, website, smart phone, etc.; continued emergency readiness fairs and outreach continues; full time County EM position re-instated in 2011.	
<b>Coordinating Organization:</b>		Emergency Management	
<b>Internal Partners:</b>		<b>External Partners:</b>	
GIS, Cities		Radio, DOGAMI	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DOGAMI, DLCD, FEMA		Low to Medium	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

**Signage Placement Locations:**

County Section	QTY	Type	Location
North	1	Road Sign – Entering Tsunami Zone	Hwy & 3 Rocks North Lincoln City
North	4	Road Sign – Entering & Leaving (4)	Old Scenic Hwy 101/Otis
North	1	Road Sign – Entering zone	S Drift Creek Road
North	2	Road Sign – Entering & Leaving (2)	Immonen Road and South Immonen Road
North	2	Blue line	Gleneden Beach Loop (top of hill)
North	1	Blue Line	Gleneden Beach Loop at Wesler Street
North	1	Blue Line	Willow Street
North	1	Blue Line	Collins and Combs (closer to 101)
Central	1	Blue Line	North East Beverly Drive
Central	1	Road Sign – Entering	Yaquina Bay Road at Wayside near Terminals
Central	1	Road Sign - Leaving	Idaho Point – SE Leeks High Road
East	1	Blue Line	Yaquina Bay Road at MP 11.4ish per Roy
East	1	Blue Line	Yaquina Bay Rd at MP 12.1ish just past the port
East	1	Blue Line	Sturdevant Road at Toledo Elementary
East	1	Blue Line	Sturdevant Road at Toledo High
South	2	Blue Line – Both Directions	N Beaver Creek Rd just past S Beaver Creek Rd
South	1	Blue Line	Seal Rock – Art Street
South	1	Blue Line	Seal Rock – NW Seal Rock Street (Loop)
South	1	Road Sign Entering	So Beaver Creek Road
South	1	Road Sign Leaving	N Bayview Road
South	1	Blue Line	SW Wakonda Beach Road (put at end of zone)
South	1	Blue Line	NE Camp One Street
South	1	Blue Line	Yachats River Road at Lincoln Avenue

Action Item: Multi-hazard #3	Alignment with Plan Goals:	High Priority Action Item?
Develop, enhance, and implement strategies for debris management and/or removal after natural hazard events.	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Debris Management Plan		
<b>Rationale for Proposed Action Item:</b>		
<p>Lincoln County’s risk assessment identified debris during windstorm, winter storm, tsunami, and other natural hazards events as a risk to the county. During these hazard events debris has the potential to block roadways, leaving transportation routes impassable to emergency services. Having adequate resources after an event will prevent this.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Identifying a means of clearing roads after a windstorm can assist the County in decreasing its vulnerability to windstorm. A better identification of its windstorm vulnerability can assist the County in better identifying and prioritizing projects that can assist the County in mitigating its overall risk to natural hazards.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Develop coordinated management strategies for clearing roads of fallen trees, and clearing debris from public and private property;</p> <p>Coordinate with those local agencies responsible for debris removal and provide residents locations for debris disposal; and</p> <p>Notify area residents, business owners, and employees of alternative routes in case of road blockage.</p>	<p><u>2020 Update:</u> Debris management plan update is scheduled to be complete in December 2020. County EM Region 1 completed regional debris management plan updated in 2018.</p> <p><u>2015 Update:</u> It has been noted that a regional (6 county) debris management plan was developed in 2008 but it was never fully developed for specifics within the County. However, over the past 6 years since this plan was developed Lincoln County has been able to effectively manage all wind debris/landslide debris events effectively through implied processes and plans. Additional planning needs to be reviewed and documented with the County and City Public Works Departments and then articulated into final planning documents.</p> <p>Lincoln County underwent significant staffing and operational financial cutbacks from 2008 – 2011; the County EM position was consolidated into another full-time position in 2009 and was not re-instated</p>	

		until 2011. This severely dampened the planning and implementation of scenario specific annexes within emergency management program. Since the reinstatement time priority has had to be given to other scenario annexes due to the criticality of those plans.	
<b>Coordinating Organization:</b>		Emergency Management, Solid Waste District	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Public Works, ODOT, regional recycling facilities		ODOT, regional recycling facilities	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Lincoln County Board of Commissioners through Public Works Department has allocated \$18,000 from operational funds to contract with Ecology and Environment to develop a Debris Management plan with local stakeholders		Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Action Item: Multi-hazard #4	Alignment with Plan Goals:				High Priority Action Item?
Work with coastal communities, citizen groups, property owners, recreation areas, emergency responders, schools and businesses in promoting natural hazard mitigation opportunities.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>					
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats					
<b>Alignment with Existing Plans/Policies:</b>					
Lincoln County Risk Report					
<b>Rationale for Proposed Action Item:</b>					
<p>The natural hazard sections of Lincoln County’s risk assessment (Volume I, Section 2 and Volume II) identify vulnerable populations and property within the various identified hazard areas. Increasing public outreach to educate residents about their risk to natural hazards affecting their community as well as what to do in the event of a natural hazard will help decrease their vulnerability to natural hazards.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify how the community will continue to involve the public in the plan maintenance process [201.6(c)(4)(iii)]. Educating landowners on how to mitigate the effects of natural hazards helps keep the public informed of what is being done with the plan, how the County is working to mitigate its risk to natural hazards, and allows for feedback and suggestions from the public for improving, updating, and maintaining the plan.</p>					
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>		
<p>Distribution of natural hazard information describing dangers and evacuation routes for visitors at the coast and continued educational outreach for residents and business owners.</p> <p>Update brochures with new information provided as part of the Lincoln County Risk Report</p> <p>Identify and use existing mechanisms for public outreach (e.g., SWCD, NRCS, watershed councils, OSU Extension, etc.).</p> <p>Raise community awareness of water supply issues both during an emergency and long-term events by creating a community water resiliency education plan; implement an outreach plan.</p> <p>Conduct awareness campaigns to encourage home and business owners to perform seismic retrofits. The Risk Report findings indicate that seismic upgrades can significantly reduce losses to buildings.</p>			<p><u>2020 Update:</u></p> <p>The county engages the public during preparedness fairs and through ongoing outreach. Among other activities the County encourages home and business owners to perform seismic upgrades. Since 2012 Lincoln Co. has conducted 245 outreach events, including 157 presentations (117 for Cascadia and 12 for Wildfire). Nearly 6,000 people have attended the presentations.</p> <p>OEM has partnered with the county to conduct over 20 coastal resilience activities including those focused on earthquake and tsunami risk (see next page for more information).</p> <p>The County has installed Tsunami Blue Lines in high priority unincorporated areas and “you are here” evacuation signs at all county parks/boat ramps to aid in evacuation route finding.</p> <p><u>2015 Update:</u></p> <p>Lincoln County emergency management staff has been especially diligent in promoting tsunami awareness and evacuation. Newly published DOGAMI tsunami evacuation maps have been</p>		

		instrumental in educating the public on the need for pre-event and post-event preparedness. Lincoln County Planning and Development provides daily advice to customers on the extent and location of both local and distant tsunami zones. Public awareness continues to increase, but we need to make educational materials more widely available in public places.	
<b>Coordinating Organization:</b>		Planning and Development, Emergency Management	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Building, Public Works		Fire districts, school districts, builders' associations, developers, property owners, mortgage companies, ODF, IBHS, Red Cross, DOGAMI, FEMA, OEM, DLCDD, NOAA	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners, NOAA Coastal Resiliency Grant		Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

**OEM actions and collaborations to improve coastal resilience:**

- OEM/DOGAMI/Locals, 2008-2020, Tsunami Advisory Council
- OEM 2009 - 2019, Cascadia Roadshows and public outreach events
- OEM 2010 & 2011, Distant tsunami workshops
- OEM/Locals 2012-2020, Great Oregon ShakeOut
- OEM/FEMA/Locals 2013-2016, PDM grants, Newport Safe Haven Hill & Waldport High
- OEM/DOGAMI/Locals 2013-2016, Island mapping project
- OEM/DOGAMI/FEMA/Locals 2013 - 2020, Be 2 Weeks Ready public education campaign
- OEM/DarkHorse Comics 2013-214, Earthquake and tsunami comics
- OEM/DOGAMI/Locals 2013, Distant Tsunami Response guidebook & training
- OEM/DOGAMI/NOAA 2014, Maritime guidance document
- OEM 2014-2020, Hospitality Resources and Workshops and online module
- OEM/Locals 2014-2019, Tsunami Planning, Wayfinding, & Exercise Workgroup
- OEM/UO 2012-14, Up and Out Wayfinding study
- OEM/DOGAMI/Locals 2015 – 2020, Oregon Blue Line Project
- OEM/Locals 2016-2018, Signage -You are Here
- OEM/DOGAMI/FEMA/Locals 2016 & 2018, Oregon Tsunami Conference
- OEM/FEMA/CUSEC 2017, Post-Earthquake Building Assessment Mission Ready Package Workshop
- OEM/ODOT 2018-2019, Regional Resilience Assessment Program – Airports & Ports
- OEM/Locals 2018-2020, Tsunami Debris Workgroup and webinars
- OEM/DOGAMI/Locals 2018, Tsunami Evacuation Drill Guidance



<b>Action Item: Multi-hazard #5</b>		<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Encourage purchase of hazard insurance for business and homeowners by forming partnerships with the insurance and real estate industries.		<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>			
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats			
<b>Alignment with Existing Plans/Policies:</b>			
<b>Rationale for Proposed Action Item:</b>			
Lincoln County is rated as having high probability/ vulnerability to earthquake, tsunami, flood and other natural hazards. Increasing knowledge about the availability and coverage of insurance will assist in mitigating long-term risk from damage.			
<b>Ideas for Implementation:</b>		<b>Actions Taken Since 2009</b>	
Provide insurance information to Lincoln County residents; Make contacts with insurance industry representatives to keep current about their requirements, rates, and plans; and Work with real estate industry representatives to educate them about what types of structures are resistant to earthquakes.		<u>2020 Update:</u> Part of ongoing public outreach events, activities, and information. <u>2015 Update:</u> This is a standardized speaking point for emergency readiness fairs; radio show's and outreach events. The county invites local insurance agencies to participate in these events to help promote this preparedness effort	
<b>Coordinating Organization:</b>	Emergency Management		
<b>Internal Partners:</b>	<b>External Partners:</b>		
	Local insurance agencies, mortgage companies, insurance and real estate industries, DOGAMI, OEM, DLCD		
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>	
Local Funding Resources, OEM, DLCD, DOGAMI	Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Action Item: Multi-hazard #6</b>	<b>Alignment with Plan Goals:</b>	<b>High Priority Action Item?</b>
Integrate the NHMP into County and City comprehensive plans.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
County and City Comprehensive Plans and other natural hazards related plans; Lincoln County Risk Report		
<b>Rationale for Proposed Action Item:</b>		
<p>Comprehensive plans provide the framework for the physical design of a community. They shape overall growth and development while addressing economic, environmental and social issues. Oregon’s statewide goals are accomplished through local comprehensive plans. State Law requires local governments to adopt a comprehensive plan and the zoning and land-division ordinances needed to put the plan into action. Integration of NHMPs into comprehensive plans will help to reduce a community’s vulnerability to natural hazards, support in mitigation activities, help to increase the speed in which action items are implemented and therefore the speed in which communities recover from natural disasters.</p> <p>Integration of NHMPs into comprehensive plans gives the action items identified in the NHMP legal status for guiding local decision-making regarding land use and/ or capital expenditures. .</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Conduct a policy crosswalk of the NHMP and the comprehensive plan to identify areas of possible integration.</p> <p>Integrate natural hazards information and policies into the comprehensive plan.</p> <p>Engage in collaborative planning and integration.</p> <p>Coordinate future NHMP and comprehensive plan reviews and updates.</p> <p>Incorporate relevant aspects of the DLCDC Tsunami Land Use Guide (“Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities”)</p> <p>Incorporate relevant aspects of the DLCDC Landslide Land Use Guide (“<a href="#">Preparing for Landslide Hazards, A Land Use Guide for Oregon Communities</a>”)</p> <p>Consider implementing regulations in highly liquefiable soil zone areas or using planning to reduce risk.</p>	<p><u>2020 Update:</u></p> <p>County is in discussion to incorporate the NHMP into the comprehensive plan.</p>	

<b>Coordinating Organization:</b>	City and County Community Development and Planning	
<b>Internal Partners:</b>	<b>External Partners:</b>	
City and County Decision making bodies, Emergency Management	DLCD, OEM, FEMA, OPDR	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DLCD	Low	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Lincoln County Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

Action Item: Multi-hazard #7	Alignment with Plan Goals:	High Priority Action Item?
Prepare long-term catastrophic recovery plan	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plans, Emergency Operations Plans		
<b>Rationale for Proposed Action Item:</b>		
<p>Developing a post-disaster recovery plan will improve the county's resilience to natural hazards (i.e. the ability to survive future natural disasters with minimum loss of life and property).</p> <p>Decisions taken in the heat of the emergency period immediately following a disaster often compromise significant opportunities to rebuild a safer community for the future. The pressure exerted by residents and property owners to have their disaster-stricken community rebuilt to its pre-disaster form and condition as quickly as possible remains a powerful factor in local, state, and federal emergency management to this day. There are ways to restrain such pressures and maintain mitigation and other post-disaster goals as high priorities during the process of long-term reconstruction even as the ashes, the rubble, and the water are receding or being cleared away. The secret lies in identifying in advance those decisions that will need to be made after a disaster that are most likely to have long-term repercussions for hazard mitigation.</p> <p>Pre-disaster and post-disaster mitigation should be two parts of a seamless whole in a sound plan for post-disaster recovery and reconstruction. The only difference is one of scale, of accelerating the pace with which existing mitigation plans are implemented, as a result of the influx of outside assistance. What is important about planning for post-disaster hazard mitigation is that the additional resources that facilitate hazard mitigation in the aftermath of a disaster do not materialize by accident. Local governments manage to secure such resources in large part because they have planned to do so. (Source: FEMA, "Policies for Guiding Planning for Post-Disaster Recovery and Reconstruction")</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Develop a post-disaster recovery plan.</p> <p>Enhance resiliency of Lincoln County's water systems and ensure residents and visitors have access to water in the event of a disaster by developing a framework to address acute shocks (earthquakes, tsunamis) as well as long-term stresses (drought, climate change, etc.)</p> <p>Acquire and strategically locate community emergency supply pods to provide food, water, and other supplies (sheltering, etc.) post-disaster event; pods may be placed at tsunami assembly areas and in other areas within the county.</p> <p>Designate a recovery management team that is</p>	<p><u>2020 Update:</u></p> <p>No capacity/resources to complete this action during the implementation period.</p>	

empowered to monitor the process and implement the community's post-disaster recovery policies. This team should also serve as the post-disaster recovery planning team, and can/should include persons involved in pre-disaster mitigation planning efforts. Involve a wide range of stakeholders and community leaders/volunteers. Discuss post-disaster recovery planning at future mitigation plan meetings.		
<b>Coordinating Organization:</b>	Board of Commissioners/Policy Group	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Emergency Management, Planning and Development	DLCD, OEM, FEMA, North Coast Regional Solutions Team	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DLCD, OEM, NOAA Coastal Resiliency Grant	Low	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2014 Lincoln County Risk MAP Resilience Workshop, revised 2020	
<b>Action Item Status:</b>	Deferred	

Action Item: Multi-hazard #8	Alignment with Plan Goals:				High Priority Action Item?
Review recommended mitigation strategies identified in DOGAMI reports (including O-19-06, O-20-03, O-20-11) and make recommendations to BOC for consideration as long-term mitigation strategies.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>					
<input checked="" type="checkbox"/> Lincoln County	<input type="checkbox"/> Depoe Bay	<input type="checkbox"/> Lincoln City	<input type="checkbox"/> Newport	<input type="checkbox"/> Siletz	
	<input type="checkbox"/> Toledo	<input type="checkbox"/> Waldport	<input type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>					
Comprehensive Plans, Emergency Operations Plans					
<b>Rationale for Proposed Action Item:</b>					
<p>Tsunami evacuation analysis of Lincoln City and unincorporated Lincoln County: Building community resilience on the Oregon coast (DOGAMI, 2019, <a href="#">O-19-06</a>) includes recommended mitigation strategies to decrease travel time to high ground in areas vulnerable to tsunami. The unincorporated areas of Lincoln County are profiled in sections 3.1.2 (Siletz Bay, Gleneden Beach, and Lincoln Beach), 3.1.3 (South County including Beaver Creek, Seal Rock, Alsea Spit, Waldport East, Governor Patterson and Beachside state recreation areas, Tillicum Beach, and Yachats North).</p> <p>Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford (2020, <a href="#">O-20-03</a>) includes potential mitigation strategies.</p> <p>The Natural Hazard Risk Report for Lincoln County, Oregon (2020, O-20-11) provides communities within Lincoln County a detailed risk assessment of the natural hazards that affect them to enable them to compare hazards and act to reduce their risk. The risk assessments quantify the impacts of natural hazards to these communities and enhance the decision-making process in planning for disaster. Areas of risk vulnerability are identified, and some mitigation strategies are recommended.</p>					
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>		
<p>Review risk assessments and areas of mitigation interest, recommended mitigation strategies and determine which will be most cost effective to move forward for enhanced discussion.</p> <p>Prioritize mitigation strategies that will have the greatest benefit for the identified communities.</p>			<p><u>2020 Update:</u> New</p>		
<b>Coordinating Organization:</b>	Planning and Development				
<b>Internal Partners:</b>			<b>External Partners:</b>		
Emergency Management, Board of Commissioners/Policy Group			DLCD, DOGAMI, OEM, FEMA, North Coast Regional Solutions Team		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>	<b>Timeline:</b>	
Local Funding Resources, DLCD Technical Assistance			Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	

<b>Form Submitted by:</b>	2020 Lincoln County Risk MAP Resilience Workshop
<b>Action Item Status:</b>	New

Action Item: Coastal Erosion #1	Alignment with Plan Goals:	High Priority Action Item?
Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas.	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input type="checkbox"/> Lincoln City <input type="checkbox"/> Newport <input type="checkbox"/> Siletz <input type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Lincoln County Risk Report, Comprehensive Plans		
<b>Rationale for Proposed Action Item:</b>		
<p>The coastal erosion chapter of Lincoln County’s risk assessment identified the potential for coastal erosion to cause damage to buildings and infrastructure within Lincoln County: coastal erosion may cause road closures and interruptions to utility services. Increasing knowledge of coastal erosion hazards is important as it will assist the county in more accurately identifying vulnerability to damage and disruption from these hazards. Increasing global temperature is expected to cause an increase in the intensity of storm events, significant changes to the amount and pattern of precipitation, and an overall rise in sea level. These factors may increase Lincoln County’s risk of coastal erosion. The Disaster Mitigation Act of 2000 requires communities to identify the community’s vulnerability to natural hazards; incorporating best available information on the effects of climate change will allow a more accurate identification of vulnerability over time.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify the community’s vulnerability to natural hazards and recommends identifying the types and numbers of buildings and infrastructure that could be affected by hazards [201.6(c)(2)(ii)(A)]. Expanding the inventory of buildings that are vulnerable to coastal erosion helps the county assess its overall vulnerability to this hazard. A more accurate assessment of its coastal erosion vulnerability can assist the county in identifying and selecting appropriate methods for landslide risk mitigation.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
Incorporate the results of the DOGAMI coastal erosion hazard zone mapping and Risk Report effort into the comprehensive plan inventory. Monitor ground movement in high susceptible areas, especially during or after large storms. Identify the location and extent of hazard areas and establish a factual base to support implementation of future measures; Analyze the risk of these areas to life, property, and infrastructure; and Develop public information to emphasize economic risk when building on lands subject to coastal erosion Incorporate new scientific studies into the Lincoln County Natural Hazard Mitigation Plan Risk Assessment, and the comprehensive plan inventory.	<u>2020 Update:</u> The 2020 NHMP has incorporated the OCCRI report “Future Climate Projects: Lincoln County” into the 2020 NHMP update. Incorporated the results of the DOGAMI coastal erosion hazard zone mapping into the Risk Report (2020) and NHMP Risk Assessment. <u>2015 Update:</u> Lincoln County actively provides public information regarding risks associated with areas subject to coastal erosion hazards. Several departments including the Lincoln County Planning Department, the Public Works Department and the Department of Emergency Management are actively involved in such services. Planning and Development staff	



<p>Identify critical facilities and infrastructure near high coastal erosion areas. No facilities were within the zone according to the Risk Report (2020).          Incorporate the findings of the OCCRI report “Future Climate Projects: Lincoln County” into the NHMP.</p>	<p>carries out comprehensive plan requirements that structures constructed on oceanfront lots meet a coastal recession setback based on erosion rates identified on adopted environmental hazard inventory maps (Environmental Hazard Inventory of Lincoln County, RNKR Associates, 1978). Lincoln County zoning code section 1.1925 provides that a site-specific geotech report can be supplied in lieu of meeting required recession setbacks.          Continuing education and maintaining contact with local, state and federal agencies, and other partners who are directly involved with developing and understanding climate change issues and their potential impact.</p>	
<b>Coordinating Organization:</b>	Planning and Development	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Emergency Management, GIS, Public Works, Cities	DOGAMI	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners	Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

Action Item: Coastal Erosion #2	Alignment with Plan Goals:				High Priority Action Item?
Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>					
<input checked="" type="checkbox"/> Lincoln County	<input checked="" type="checkbox"/> Depoe Bay	<input checked="" type="checkbox"/> Lincoln City	<input type="checkbox"/> Newport	<input type="checkbox"/> Siletz	
	<input type="checkbox"/> Toledo	<input checked="" type="checkbox"/> Waldport	<input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>					
Comprehensive Plan					
<b>Rationale for Proposed Action Item:</b>					
DOGAMI has evaluated coastal erosion hazard zones along dune and bluff backed shorelines in Lincoln County, Oregon. These have resulted in two publications: Coastal Erosion Hazard Zones along Dune and Bluff-Backed Shorelines, Lincoln County, Cascade Head to Seal Rock (2004), and Seal Rock to Cape Perpetua (2007). These identified high risk coastal erosion hazard areas. The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Regulations and incentives based on relative risk from coastal erosion could help limit overall vulnerability of new development to coastal erosion.					
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>		
<p>Use DOGAMI hazard mapping (Open File Reports 0-04-09 and 0-07-01), Lincoln County Risk Report, as well as other sources as a potential basis for new code.</p> <p>Incorporate the use of financial incentives or disincentives to promote development outside the identified risk areas.</p> <p>Maintain erosion control structures that are already in place.</p> <p>Consider land value losses due to coastal erosion in future risk assessments.</p>			<p><u>2020 Update:</u></p> <p>The Risk Report (2020) included a quantitative risk assessment for this hazard and identified the risk to people and property based on available data. Several other DOGAMI reports are incorporated and cited in Section 2 of this NHMP.</p> <p><u>2015 Update:</u></p> <p>Coordination with DOGAMI is on-going. Lincoln County has continued to explore the feasibility of code amendments and incentive programs in conjunction with DOGAMI risk zone mapping</p>		
<b>Coordinating Organization:</b>		Planning and Development			
<b>Internal Partners:</b>			<b>External Partners:</b>		
Emergency Management, GIS, Public Works			DOGAMI		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners			Low		<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>		2009 Lincoln County Steering Committee, revised 2020			
<b>Action Item Status:</b>		Ongoing			

Action Item: Earthquake #I	Alignment with Plan Goals:	High Priority Action Item?
Integrate new earthquake hazard mapping data for Lincoln County and improve technical analysis of earthquake hazards.	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plan		
<b>Rationale for Proposed Action Item:</b>		
<p>In a hazard analysis, Lincoln County rated itself as having a high earthquake rating. Increasing knowledge about the extent of earthquake and making this information available through published maps and other documents will increase public awareness regarding the county’s vulnerability to future earthquakes. Lincoln County’s probability for, and vulnerability to, earthquake is addressed by the NHMP as being moderate or high. A GIS data repository and clearinghouse would allow agencies responsible for hazard mitigation to access the most current information, improving their ability to mitigate for earthquake hazards. This will assist the county in reducing its overall risk to earthquake.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Update Lincoln County earthquake HAZUS data using more localized data and the Lincoln County Risk Report; and</p> <p>Conduct risk analysis incorporating HAZUS data and the created hazard maps using GIS technology to identify risk sites and further assist in prioritizing mitigation activities and assessing the adequacy of current land use requirements.</p>	<p><u>2020 Update:</u> The Risk Report (2020) included a quantitative risk assessment for this hazard and identified the risk to people and property based on available data. Several other DOGAMI earthquake and tsunami reports are incorporated and cited within Section 2 of this NHMP.</p> <p><u>2015 Update:</u> A consortium of local, state, and federal agencies worked together between 2009 and 2012 to acquire lidar data. This improved topographic information allowed partner agencies to improve tsunami inundation models, slide information, flood zones, and earthquake hazards. Some of this came out in the DOGAMI Open-file report O-13-06 Ground motion, ground deformation, tsunami inundation, coseismic subsidence, and damage potential maps for the 2012 Oregon resilience plan for Cascadia subduction zone earthquakes. Updated flood maps are in draft. Information is widely available internally in the County as well being widely publicly distributed by partner agencies.</p> <p>Although this has largely been completed, there is</p>	

		always the potential to further increase resolution and extents or develop new models. We will continue to stay in communication with our partners, and if subsequent research becomes available, evaluate it.	
<b>Coordinating Organization:</b>	GIS		
<b>Internal Partners:</b>	<b>External Partners:</b>		
Public Works, Emergency Management, GIS	OSU, USGS, BLM, MWVCOG, OEM, FEMA, DOGAMI		
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>	
Local Funding Resources, FEMA, DOGAMI	Low	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Action Item: Earthquake #2	Alignment with Plan Goals:	High Priority Action Item?
Identify, inventory, and retrofit county controlled critical facilities for seismic and tsunami rehabilitation (consider both structural and non-structural retrofit options).	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input checked="" type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposed Action Item:</b>		
<p>"For governments, less damage to government structures will mean continued services and normal processes or at least minimal interruptions. If government structures come through an earthquake with little or no damage, agencies will not have to relocate services, and public officials can respond to the immediate and long-term demands placed on them by the event. In short, seismic rehabilitation as a pre-event mitigation strategy actually will improve post-event response by lessening life loss, injury, damage, and disruption." Source: FEMA. Chapter 1: Why Seismic Rehabilitation?</p> <p>Oregon Senate Bill 3 (2005) enables the Oregon Office of Emergency Management to develop a grant program to seismically rehabilitate critical public facilities. While the grant program is still being developed, the existing DOGAMI inventory of critical facilities is available to assist communities in obtaining funding once the grant program is in place.</p> <p>DOGAMI conducted a seismic needs assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. This inventory is almost 15 years old and needs to be updated to reflect changes.</p> <p>The county and cities' infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, and cell towers were identified by the steering committee as vulnerable assets. The county would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region wide.</p> <p>Priority facilities to retrofit include (location or jurisdiction):</p> <ul style="list-style-type: none"> <li>• Gleneden Beach Water Tower (Kernville-Gleneden Beach-Lincoln Beach Water District)</li> <li>• Lincoln County Port Facilities, floating docks, pilings, etc. (Lincoln County)</li> <li>• Depoe Bay RFPD Fire Station 2200 (Gleneden Beach) – seismic retrofit/relocate from tsunami zone</li> </ul> <p>The Risk Report (2020) addressed vulnerabilities of critical facilities. The report estimates that 89% of critical facilities (Appendix A: Community Risk Profiles) will be damaged by the CSZ event, which will have many direct and indirect negative effects on first response and recovery efforts. See the Risk Report for specific critical facilities vulnerable to earthquake, tsunami, and other hazards.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
Review the RVS data and revise the inventory of critical infrastructure and key resources and other community buildings and infrastructure: Perform	<u>2020 Update:</u> County is reconstructing new bridges to meet conventional seismic resilience standards.	

<p>seismic assessment on facilities not included in the 2007 RVS to determine which structures may be particularly vulnerable to earthquake damage. Seek funding to retrofit and/or re-build new structures. Create a local rehabilitation and retrofit program for existing buildings.</p> <p>Rehabilitate identified vulnerable schools, emergency facilities, and infrastructure</p> <p>Improved County EM website would allow for Improve opportunity to communicate to property owners who “want” new information; could subscribe to changing information, mitigation tips and tricks and “newsletter” style education.</p> <p>Explore options for including seismic retrofitting in existing programs such as low-income housing, insurance reimbursements, and pre- and post-disaster repairs.</p> <p>Inventory port facilities and determine appropriate mitigation measures to increase resilience to a tsunami event (improve functionality of pilings, etc.)</p>	<p>All new County buildings are built to current earthquake design standards (recent buildings include the Search and Rescue (SAR) building). HHS Behavioral Health has been moved out of the tsunami zone; animal shelter moved into a new modular building. See Section 2 and Volume II for more information.</p> <p><u>2015 Update:</u></p> <p>Critical infrastructure building owners are aware of the conditions of their buildings through their own evaluation process and DOGAMI rapid visual assessment surveys. County EM has developed a robust communication strategy to public, private and community partners in regard to any grant opportunities that may benefit them. This is now a common standard of practice for the office of County EM.</p> <p>Improvements that have been made in Lincoln County include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Relocation of all schools in the tsunami inundation areas.</li> <li>• Some seismic upgrades to some schools</li> <li>• Some water district seismic upgrades-</li> </ul>
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<b>Coordinating Organization:</b>		Emergency Management	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Planning, Building, County Assessor; City planning departments,		Water service providers; OAWU; school districts, hospitals, ODOT, colleges and universities; architects, Oregon Building Codes Division, local banks, credit unions, Rural Development (USDA), Business Oregon; FEMA, OEM	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Seismic Rehabilitation Grants (IFA), Local Funding Resources		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

<b>Action Item: Earthquake #3</b>		<b>Alignment with Plan Goals:</b>				<b>High Priority Action Item?</b>
Stay apprised of new earthquake and landslide data and perform mitigation of infrastructure where possible to increase resilience of critical transportation links to the valley and along the coast during earthquake events.		<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>						
<input checked="" type="checkbox"/> Lincoln County		<input checked="" type="checkbox"/> Depoe Bay		<input checked="" type="checkbox"/> Lincoln City		<input checked="" type="checkbox"/> Newport
		<input checked="" type="checkbox"/> Toledo		<input checked="" type="checkbox"/> Waldport		<input checked="" type="checkbox"/> Siletz
				<input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>						
Oregon Resiliency Plan, ODOT Seismic Safety Reports						
<b>Rationale for Proposed Action Item:</b>						
Essential to the county's viability, post-tsunami and to our planning for jurisdictions. Redevelopment of cities likely will follow transportation corridor. Access post-tsunami, how the coast connects to the rest of the state/ world – where will highway 101 be rebuilt (check to see if this is identified in the Oregon Resiliency Plan)						
<b>Ideas for Implementation:</b>				<b>Actions Taken Since 2009</b>		
Collaborate with ODOT to analyze and repair key bridges on major transportation routes Plan future routes/post recovery as applicable				<u>2020 Update:</u> County is reconstructing new bridges to meet conventional seismic resilience standards. Data provided by DOGAMI, ODOT, and others is incorporated and cited in Section 2 of this NHMP.		
<b>Coordinating Organization:</b>		Roads/Public Works				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Planning and Development, Emergency Management			ODOT, DLCD, DOGAMI, OEM			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, ODOT (Seismic Plus)			Low		<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>		2015 Lincoln County Risk Map Resilience Workshop, revised 2020				
<b>Action Item Status:</b>		Ongoing				

Action Item: Tsunami #1	Alignment with Plan Goals:	High Priority Action Item?
Relocate county controlled critical/essential facilities and key resources, and encourage the relocation of other critical facilities and key resources that house vulnerable populations (e.g., hospitals, nursing homes, etc.) that are within the tsunami inundation zone and likely to be impacted by tsunami.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input type="checkbox"/> Lincoln City <input type="checkbox"/> Newport <input type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plans, Development Codes, Lincoln County Risk Report, Tsunami Inundation Maps		
<b>Rationale for Proposed Action Item:</b>		
<p>The tsunami chapter of Lincoln County’s NHMP (Volume I and II) identified a significant tsunami event as having the potential to cause disruption of power, contamination of water supplies, loss of essential communication systems, a large amount of debris, and traffic congestion. A tsunami has the potential to damage critical buildings and infrastructure in the tsunami inundation zone. Lincoln County GIS has already identified all critical facilities in the tsunami inundation zone (this is updated with new TIMs created by DOGAMI). Mitigating the effects that a tsunami has on County assets is a high priority.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Assessing and evaluating needed mitigation for critical assets in the tsunami inundation zone, can assist the County in determining what further actions are needed to help mitigate Lincoln County’s risk to tsunami.</p> <p>Priority buildings include:</p> <ul style="list-style-type: none"> <li>• Waldport/Central Oregon Coast Fire Station 7200 (145 East Alsea Highway, Waldport)</li> <li>• Yachats/Yachats Rural Fire Protection (215 W 2nd St)</li> <li>• Gleneden Beach/ Depoe Bay Substation (6440 Gleneden Beach Loop Road)</li> <li>• Otis Fire Station/ N. Lincoln Fire Substation (381 North Old Scenic Highway 101)</li> <li>• Toledo/Toledo Police Department (250 W. Hwy. 20 Toledo)</li> <li>• Toledo State Airport</li> </ul>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Coordinate emergency response to disaster, enhance local mapping capabilities and forecasting, encourage tsunami evacuation training for emergency responders.</p> <p>Investigate relocation alternatives for critical facilities in the tsunami inundation zone.</p> <p>Consider relocating or retrofitting structures with vulnerable populations (e.g. schools, hospitals, and nursing homes) that are within high tsunami hazard zones.</p>	<p><u>2020 Update:</u> Lincoln Co. School District relocated schools and bus barn in Lincoln City from the tsunami inundation area (see their addendum for more information). Yachats Fire District relocated from tsunami inundation area.</p> <p><u>2015 Update:</u> DOGAMI finalized the remapping of the distant and local tsunami zones providing public, private and citizens with a clearly defined map of hazard areas. However, there was little to be done for the relocation of public safety buildings out of the</p>	



		<p>inundation areas. There are currently no grant sources to relocate these buildings. Public infrastructure organizations have made some improvements (utilities) in mitigation of utilities and cities have reviewed and evaluated possibilities.</p> <p>Funding is the largest obstacle for complete relocation of services; currently there are at least 3 fire stations/sub-stations and one police department that currently sits in the local inundation area with no funding to relocate.</p>	
<b>Coordinating Organization:</b>		Emergency Management	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Planning and Development,		DOGAMI, DLCD, North Coast Regional Solutions Team, Gleneden Beach Fire Department, North Lincoln Fire and Rescue	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Operational general funds, bond's, continued search for grant funding to relocate services.		High	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Action Item: Tsunami #2	Alignment with Plan Goals:	High Priority Action Item?
Implement land use strategies and options to increase community resilience	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input type="checkbox"/> Newport <input type="checkbox"/> Siletz <input type="checkbox"/> Toledo <input type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities, Comprehensive Plans, Development Codes		
<b>Rationale for Proposed Action Item:</b>		
<p>The Land Use Guidance prepared by the Oregon Department of Land Conservation and Development (DLCD), was released on January 15, 2014 and updated in April 2015. This tsunami land use guidance was originally developed by DLCD in partnership with a diverse and capable advisory committee comprised of representatives of local government and state agencies assisted by the consulting firm of Cogan Owens Cogan. Advisory committee members from local governments included representatives from the cities of Cannon Beach, Coos Bay, Depoe Bay, Lincoln City, Manzanita, Seaside, Waldport, Yachats, and also included Coos County. The purpose of the guidance is to assist vulnerable communities as they incorporate tsunami resilience measures into their local land use programs. The land use guide is designed to be tailored by communities to address their individual tsunami risk and location, and provides comprehensive information focused on land use planning approaches to reduce tsunami hazard risk and implement important land use resilience measures. The guidance includes sample tsunami related comprehensive land use plan text and policies, information on needed map amendments, a tsunami hazard overlay (THO) zone model to implement resilience measures, tsunami land use strategy financing and incentive concepts, a newly revised and comprehensive chapter 6 on tsunami evacuation facilities improvement planning, information relating to pre-disaster community land use planning for a Cascadia event tsunami, and web links to other helpful information. The guide’s model comprehensive plan, zoning code and other provisions are designed to be used with the new Department of Geology and Mineral Industries Tsunami Inundation Maps (TIMs). The guide is web based with links to other resources. DLCD was assisted by consultants Carole Connell and D.J. Heffernan in the development of the newly revised Chapter 6 as indicated above.</p> <p>The department has been and will continue to assist communities implement the guidance. Laren Woolley, DLCD’s Coastal Shores Specialist indicated that “The Japan earthquake and tsunami are what we can expect here in Oregon. This is a serious threat to our coast and we need to prepare now. We should have a sense of urgency! This information should be at the core of community preparation.” Mark Barnes, Planning Director for the City of Cannon Beach, added, “This is useful guidance for any coastal community; highly recommended.”</p> <p>Source: DLCD Website, <a href="http://www.oregon.gov/LCD/OCMP/Pages/TsunamiGuideIntro.aspx">http://www.oregon.gov/LCD/OCMP/Pages/TsunamiGuideIntro.aspx</a></p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
Utilize the Tsunami Land Use Guidance and determine appropriate strategies/ options to increase community resilience	<u>2020 Update:</u> County is evaluating options.	

<p>Incorporate relevant aspects of the DLCD Landslide Land Use Guide (“Preparing for Landslide Hazards, A land Use Guide for Oregon Communities”)</p> <p>Evaluate the community evacuation plan, including consideration for viable vertical evacuation options. Consider relocating or retrofitting structures with vulnerable populations (e.g. schools, hospitals, and nursing homes) that are within high tsunami hazard zones.</p>		
<b>Coordinating Organization:</b>	Planning and Development	
<b>Internal Partners:</b>	<b>External Partners:</b>	
	DLCD, OEM, FEMA	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources, DLCD	Low	<input type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input checked="" type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Lincoln County Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

Action Item: Flood #1	Alignment with Plan Goals:	High Priority Action Item?
Explore steps needed to qualify Lincoln County for participation in the NFIP Community Rating System (CRS)	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input type="checkbox"/> Depoe Bay <input type="checkbox"/> Lincoln City <input type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plan, Development Code		
<b>Rationale for Proposed Action Item:</b>		
<p>The NFIP Community Rating System is a voluntary incentive program that recognizes and encourages community flood plain management activities that exceed minimum NFIP requirements. The goals of the CRS are to reduce flood losses; facilitate accurate insurance rating; promote awareness of flood insurance. Community actions meeting these goals result in discounted flood insurance premiums. County participation in the CRS would thus both reduce risk and save money.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
Determine CRS eligibility requirements Document existing activities which are creditable under the CRS guidelines Complete and submit CRS application	<u>2020 Update:</u> No capacity/resources to complete this action during the implementation period. <u>2015 Update:</u> Lincoln County Planning and Development staff continues to research the potential for participation in the CRS program. Lincoln County continues and maintains all programs necessary for participation in the NFIP.	
<b>Coordinating Organization:</b>	Planning and Development	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Emergency Management, Public Works	DLCD, FEMA, Insurance Services Office (ISO)	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners.	Low to Medium	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020	
<b>Action Item Status:</b>	Deferred	

Action Item: Flood #2	Alignment with Plan Goals:				High Priority Action Item?
Update the Lower Siletz Flood Mitigation Action Plan; develop flood mitigation action plan(s) for the lower Alsea and Salmon River, and Drift Creek and other areas.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input type="checkbox"/> Yes
	<input checked="" type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>					
<input checked="" type="checkbox"/> Lincoln County	<input type="checkbox"/> Depoe Bay	<input type="checkbox"/> Lincoln City	<input type="checkbox"/> Newport	<input type="checkbox"/> Siletz	
	<input checked="" type="checkbox"/> Toledo	<input checked="" type="checkbox"/> Waldport	<input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>					
Lower Siletz Flood Mitigation Action Plan					
<b>Rationale for Proposed Action Item:</b>					
<p>The Lower Siletz Flood Mitigation Action Plan provides a successful model for flood hazard mitigation in a targeted area with high vulnerability to loss from recurring flood events. This plan should be updated to document implementation actions completed and identify additional activities to be addressed.</p> <p>Similar high vulnerability areas exist in the developed, flood prone areas along the lower Alsea River, Salmon River and Drift Creek. These areas could benefit from the development of similar mitigation plans.</p>					
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>		
Seek grant funding to update the existing Siletz plan and develop additional plans for identified areas on other rivers			<p><u>2020 Update:</u> No capacity/resources to complete this action during the implementation period.</p> <p><u>2015 Update:</u> Funding has not been secured to update the Lower Siletz Flood Mitigation Action Plan and so the project has not been initiated at this time.</p>		
<b>Coordinating Organization:</b>	Planning and Development				
<b>Internal Partners:</b>			<b>External Partners:</b>		
Emergency Management			OEM; FEMA Region X		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>	<b>Timeline:</b>	
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners			Low to Medium	<input type="checkbox"/> Ongoing <input checked="" type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)	
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020				
<b>Action Item Status:</b>	Deferred				

Action Item: Flood #3	Alignment with Plan Goals:	High Priority Action Item?
Work with affected property owners to elevate or relocate non-conforming, pre-FIRM structures in flood hazard areas	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input type="checkbox"/> Lincoln City <input type="checkbox"/> Newport <input type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Lincoln County Risk Report, Flood Insurance Study, FIRMs, Comprehensive Plan, Development Code		
<b>Rationale for Proposed Action Item:</b>		
<p>Concentrations of pre-FIRM structures in areas subject to flooding are present in several areas along the County’s major rivers. Experience with the floods of the late 1990s showed that properly elevated structures in the flood plain performed well during major flood events, most suffering minimal if any, damage. Especially in areas which may be subject to damage during relatively high frequency flood events, elevating structures in conformance with the County’s flood hazard area codes (lowest floor at least one foot above the base flood level) is a cost-effective way to reduce risk.</p> <p>According to the Risk Report (2020) residents and buildings located near the estuaries and coastal margins are at a greater risk from flood than other locations within the study area. Properties and areas of concern are noted in Section 2 of this NHMP. The following areas were identified by the steering committee as areas of greatest concern:</p> <ul style="list-style-type: none"> <li>• Elk City</li> <li>• Little Albany</li> <li>• Lower Siletz River</li> </ul>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Seek grant funding for structure elevation and relocation</p> <p>Establish eligibility criteria, focusing on repetitive loss properties and structures located at the lowest elevations</p> <p>Implement public outreach and information campaigns to identify and inform property owners of the program</p> <p>Relocate or elevate vulnerable structures above the estimated base flood elevation. In some cases, communities can use FEMA’s property acquisition or “buyout” program to remove structures that have repeatedly flooded in the past.</p> <p><a href="https://www.fema.gov/media-library-data/20130726-1507-20490-4551/fema_317.pdf">https://www.fema.gov/media-library-data/20130726-1507-20490-4551/fema_317.pdf</a>.</p>	<p><u>2020 Update:</u> No capacity/resources to complete this action during the implementation period.</p> <p><u>2015 Update:</u> Lincoln County Planning and Development has worked with Oregon Emergency Management staff to assist several homeowners over the years to mitigate flood risk and damage. Staff has administered one Hazard Mitigation Grant since 2009, resulting in the elevation of a structure classified as a severe repetitive loss. Ongoing public outreach and information campaigns, particularly following a flood event, continue to be necessary. County staff continues to develop outreach materials and print and electronic messaging</p>	
<b>Coordinating Organization:</b>	Planning and Development	

<b>Internal Partners:</b>		<b>External Partners:</b>	
Emergency Management,		OEM, DLCD, DOGAMI; FEMA Region X	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners. FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance (FMA) program, Community Development Block Grants (CDBG)		High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Action Item: Flood #4	Alignment with Plan Goals:	High Priority Action Item?
Continue compliance with the National Flood Insurance Program (NFIP).	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plans, Development Codes, Floodplain Ordinances, FIRMs, FIS, Lincoln County Risk Report		
<b>Rationale for Proposed Action Item:</b>		
<p>The National Flood Insurance Program (NFIP) provides communities with federally backed flood insurance, provided that communities develop and enforce adequate floodplain management measures. According to the NFIP, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.</p> <p>The Disaster Mitigation Act of 2000 requires that communities identify actions and projects that reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will diminish flood damage to new and existing buildings in communities while providing homeowners, renters, and business owners with additional flood insurance protection.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Actively participate with DLCD and FEMA during Community Assistance Visits. The Community Assisted Visit (CAV) is a scheduled visit to a community participating in the NFIP for the purpose of 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered.</p> <p>Assess Lincoln County floodplain ordinances to ensure they reflect current flood hazards.</p>	<p><u>2020 Update:</u> Updated FIRM's and County Flood Hazard Management Ordinance in 2019</p> <p><u>2015 Update:</u> Lincoln County continues to implement all required regulations necessary for successful participation in the NFIP. A community assistance visit did not occur during the reporting period, so there was no opportunity to actively participate in a CAV. Lincoln County staff has monitored changes in national regulation to ensure compliance with the NFIP. Products of the current Lincoln County Risk MAP project will provide Lincoln County with additional tools and accurate information on which to carry out the NFIP.</p> <p>This action item continues to be relevant. Ongoing, daily administration of the NFIP program will continue to be a priority of Lincoln County and its partners</p>	
<b>Coordinating Organization:</b>	Planning and Development	
<b>Internal Partners:</b>	<b>External Partners:</b>	



Public Works, Emergency Management, Building Departments, Cities	DLCD, FEMA, DOGAMI	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners.	Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

Action Item: Landslide #1	Alignment with Plan Goals:	High Priority Action Item?
Encourage construction, site location and design that can be applied to steep slopes to reduce the potential threat of landslides.	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
<b>Rationale for Proposed Action Item:</b>		
<p>The Landslide Annex of Lincoln County’s risk assessment identified the potential for landslides to cause damage to buildings and infrastructure within Lincoln County: landslides may cause road closures and interruptions to utility services. The annex also identified previous incidents of landslides that affected Lincoln County, including landslides that accompanied the 1996 storm event. Road closures forced residents to find alternate transportation routes. Working with Lincoln County Public Works and Lincoln County Planning and Development to implement building and construction practices that recognize slope and other landslide risk factors can help mitigate the county’s overall risk to landslides.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Adopting development ordinances that would regulate grading, excavation, development, and cut and fill activities could help limit development that would increase a slope’s vulnerability to landslides, or limit development that could increase the potential for loss of life or property due to landslides. Such actions would help the county mitigate its risk to landslides.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Encourage erosion control techniques, such as the temporary use of straw bales, diversion dams, or other physical changes to control storm water runoff during road and site construction;</p> <p>Suggest to property owners to reduce water input into slopes from building roof drains, storm drains, and surface runoff;</p> <p>Where appropriate, reduce the number of building sites and corresponding disruption of the natural contour and vegetation; and</p> <p>Increase communication and coordination between Lincoln County Public Works and Building Departments</p> <p>Incorporate relevant aspects of the DLCD Landslide Land Use Guide (“Preparing for Landslide Hazards, A land Use Guide for Oregon Communities”)</p>	<p><u>2020 Update:</u> DOGAMI published <a href="#">Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon</a> which maps existing landslide data for Lincoln Co.</p> <p><u>2015 Update:</u> Lincoln County Planning and Development staff requires geotechnical analysis in areas identified as being subject to landslides (on geologic hazard maps adopted as part of our comprehensive plan) prior to development, as required by provisions in our comprehensive plan and zoning ordinance. Lincoln County Building Division enforces Oregon Residential Specialty Code requirements that specify setbacks and clearances from slopes with potential for failure. A building may be exempt from these standards with the provision of a site-specific geotech report. Lincoln County staff provides homeowners with site-specific advice daily as part of our core services.</p>	

<b>Coordinating Organization:</b>		Planning and Development	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Emergency Management, Building, and Public Works, Cities		DLCD, DOGAMI	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners.		Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Action Item: Landslide #2	Alignment with Plan Goals:	High Priority Action Item?
Protect existing development in landslide-prone areas	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4 <input checked="" type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input type="checkbox"/> Depoe Bay <input type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input type="checkbox"/> Siletz <input type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plan, Development Code		
<b>Rationale for Proposed Action Item:</b>		
<p>The Landslide Annex of Lincoln County’s risk assessment identified the potential for landslides to cause damage to buildings and infrastructure within Lincoln County: landslides may cause road closures and interruptions to utility services. The annex also identified previous incidents of landslides that affected Lincoln County, including landslides that accompanied the 1996 storm event. Road closures forced residents to find alternate transportation routes. Reviewing and monitoring existing public infrastructure to identify specific exposure to landslide risk.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Identifying existing public infrastructure with exposure to landslide risk will allow the implementation of mitigation measures to reduce this risk.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Provide information to residents on landslide prevention. Publications such as FEMA’s Homeowners Landslide Guide for Hillside Flooding, Debris Flows, Erosion, and Landslide Control and FEMA’s Hillside Drainage flier have some ideas about reducing landslide susceptibility;</p> <p>Encourage easements to restrict certain activities on landslide-prone properties. Easements foregoing the right to develop a property can be either sold or granted to the county or other organizations by property owners;</p> <p>Construct debris flow diversions to protect existing properties;</p> <p>Monitor ground movement in high susceptibility areas;</p> <p>Ensure that ditches, stormwater facilities, and culverts are inspected and cleared prior to the wet season each year; and</p> <p>Encourage the placement of culverts built for 50 to 100-year flood events.</p>	<p><u>2020 Update:</u> Public Works is stabilizing existing landslides with the installation of horizontal dams.</p> <p><u>2015 Update:</u> Public education materials provided through Planning Department as appropriate with customer contact and through emergency readiness fairs.</p> <p>Public Works: Over the past 4-5 years larger culverts have been placed in part with OWEB for fish passage but the secondary benefit is to accommodate a surge in rainfall or small stream surge.</p> <p>Annually clear and/or mitigate the active landslide areas of potential drainage debris.</p> <p>Annually maintain already existing debris flow diversions, i.e., Siletz river that has the potential to create back-up in small water way’s or landslide areas.</p> <p>Annually clear debris from bridge areas as preseason mitigation effort</p>	

		<p>On an as needed basis, armor a slope that is down gradient, i.e., mitigation roadways from potential wash out by a fast moving stream</p> <p>Rip rap, gabian baskets and other mitigation efforts to stabilize banks on an as needed basis or as a concern is identified</p>	
<b>Coordinating Organization:</b>		Emergency Management, Public Works	
<b>Internal Partners:</b>		<b>External Partners:</b>	
Planning and Development, GIS		DLCD, OEM	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Local Funding Resources – general operational fund		Low to High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020		
<b>Action Item Status:</b>	Ongoing		

Action Item: Landslide #3		Alignment with Plan Goals:			High Priority Action Item?	
Collaborate with the Oregon Department of Geology and Mineral Industries to work on landslide risk reduction.		<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
		<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input checked="" type="checkbox"/> 8	
		<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>						
<input checked="" type="checkbox"/> Lincoln County		<input checked="" type="checkbox"/> Depoe Bay		<input checked="" type="checkbox"/> Lincoln City	<input checked="" type="checkbox"/> Newport	<input checked="" type="checkbox"/> Siletz
		<input checked="" type="checkbox"/> Toledo		<input checked="" type="checkbox"/> Waldport	<input checked="" type="checkbox"/> Yachats	
<b>Alignment with Existing Plans/Policies:</b>						
Lincoln County Risk Report; DOGAMI Landslide Studies						
<b>Rationale for Proposed Action Item:</b>						
<p>Lidar data is now available for the county. The Lincoln County Risk Report will provide additional analysis of the hazard and community vulnerability when complete in 2015.</p> <p>The Landslide Annex of Lincoln County’s risk assessment identified the potential for landslides to cause damage to buildings and infrastructure within Lincoln County: landslides may cause road closures and interruptions to utility services. The annex also identified previous incidents of landslides that affected Lincoln County, including landslides that accompanied the 1996 storm event. Road closures forced residents to find alternate transportation routes. Reviewing and monitoring existing public infrastructure to identify specific exposure to landslide risk.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Identifying existing public infrastructure with exposure to landslide risk will allow the implementation of mitigation measures to reduce this risk.</p>						
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>			
<p>Create modern landslide inventory and susceptibility maps and use in planning and regulations for future development. Use lidar data to map existing landslides. Model future landslide susceptibility. Perform landslide risk analysis. Use the new information to prioritize risk reduction actions. Perform risk reduction.</p> <p>Update/ develop Landslide Ordinances as applicable</p> <p>Incorporate relevant aspects of the DLCDC Landslide Land Use Guide (“Preparing for Landslide Hazards, A land Use Guide for Oregon Communities”)</p>			<p><u>2020 Update:</u> DOGAMI published <a href="#">Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon</a> which maps existing landslide data for Lincoln Co.</p>			
<b>Coordinating Organization:</b>		Planning and Development				
<b>Internal Partners:</b>			<b>External Partners:</b>			
Emergency Management			DOGAMI, DLCDC			
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>	
Local Funding Resources, DOGAMI, DLCDC,			Low		<input type="checkbox"/> Ongoing	

FEMA PDM, HMGP		<input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input checked="" type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2015 Lincoln County Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

Action Item: Severe Weather #1	Alignment with Plan Goals:	High Priority Action Item?
Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during severe weather events (windstorms, tornados, and winter storms).	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input checked="" type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input type="checkbox"/> 11	<input type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input type="checkbox"/> Depoe Bay <input type="checkbox"/> Lincoln City <input checked="" type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Development Code, Comprehensive Plan		
<b>Rationale for Proposed Action Item:</b>		
<p>Lincoln County’s risk assessment identified tree falls during windstorm events as a risk to the county. During a windstorm, tree falls have the potential to damage buildings and infrastructure, block roadways, and down overhead power lines, causing electric power failures. Tree pruning helps reduce the vulnerability of trees to windstorms, mitigating the potential damage they could cause to buildings and infrastructure during a windstorm.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on both new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing public/private partnerships to educate the public can help pool resources for mitigation. Tree pruning will help reduce the trees’ vulnerability to windstorms. Reducing tree vulnerability reduces the risk that trees will be downed in a windstorm, damaging buildings and infrastructure. Having pruning standards before tree pruning begins assists work crews responsible for pruning: standards allow work crews to know they are sufficiently completing pruning jobs the first time out, maximizing time, money, and other resources.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Partner with responsible agencies and organizations to design and disseminate education information to property owners to reduce risk from tree failure to life, property, commerce and utility systems;</p> <p>Develop partnerships between utility providers and county and local public works agencies to document known hazard areas and minimize risks;</p> <p>Identify and find solutions to potentially hazardous trees in urban areas, near utility corridors, and near vital infrastructure; and</p> <p>Partner with responsible agencies and organizations to develop landscaping and tree programs that have less impact on aboveground utility lines and roads.</p>	<p><u>2020 Update:</u> Public Works removes hazard trees when identified as part of a hazard removal effort on a continual basis.</p> <p><u>2015 Update:</u> Public Works has coordinated with timberland owners to ensure that hazard trees are not left near county roads and bridges following a harvest. Public Works trains its employees in hazard tree identification and removal along county road right of ways. Public Works coordinates with BLM, USFS, State Parks, local governments and the various utilities in the removal of hazard trees. Public Works coordinates with state and federal environmental agencies to ascertain detrimental impacts to endangered and threatened species when removing hazard trees and mitigates damages.</p>	



<b>Coordinating Organization:</b>	Public Works	
<b>Internal Partners:</b>	<b>External Partners:</b>	
Planning and Development, GIS, Public Works, Emergency Management, Cities	USFS, BLM, State Parks, utility providers	
<b>Potential Funding Sources:</b>	<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners	Low to High	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2020	
<b>Action Item Status:</b>	Ongoing	

Action Item: Severe Weather #2	Alignment with Plan Goals:	High Priority Action Item?
<p>Continue and enhance severe weather (windstorm, tornado, winter storm) resistant construction methods where possible to reduce damage to utilities and critical facilities from windstorms and winter storms (snow/ice). In part, this may be accomplished by encouraging electric utility providers to convert existing overhead lines to underground lines.</p>	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11	<input checked="" type="checkbox"/> Yes
<b>Affected Jurisdictions:</b>		
<input checked="" type="checkbox"/> Lincoln County <input checked="" type="checkbox"/> Depoe Bay <input checked="" type="checkbox"/> Lincoln City <input type="checkbox"/> Newport <input checked="" type="checkbox"/> Siletz <input checked="" type="checkbox"/> Toledo <input checked="" type="checkbox"/> Waldport <input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>		
Comprehensive Plan, Development Code, State Building Code		
<b>Rationale for Proposed Action Item:</b>		
<p>A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Although windstorms can affect the entirety of Lincoln County, they are especially dangerous in developed areas with significant tree stands and major infrastructure, especially above ground utility lines. A windstorm will frequently knock down trees and power lines, damage homes, businesses, public facilities, and create tons of storm related debris.</p> <p>The windstorm and winter storm hazard risk assessments rates Lincoln County as having a high vulnerability to the windstorm hazard and moderate vulnerability to winter storm hazard. The risk assessment also calculates a high probability of a future windstorm or winter storm occurring. Supporting and encouraging the electric utility providers (in particular the consumer-owned electric utility providers) to use underground construction methods to reduce power outages from storms will reduce the impact of future windstorms and winter storms.</p> <p>The risk is higher on the lines going to a mountaintop or peak. Most of the services at the top are communication sites. The communication sites are used by ODOT, State Police, county sheriff, emergency services, telephone utilities, and cell phone companies. During a disaster the sites are vital for communication. During winter storm access to the line by the utility is difficult and this difficulty delays the time for restoration of power to the services. Converting the lines to underground would remove the risk of damage from windstorms and winter storms.</p> <p>The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Having wind resistant critical facilities and utilities in the event of a windstorm can help decrease disruptions in services, mitigating the County’s risk to windstorms.</p>		
<b>Ideas for Implementation:</b>	<b>Actions Taken Since 2009</b>	
<p>Work with the consumer-owned electric utility providers to identify “undergrounding districts” so that they can plan for future investments in the area to be undergrounded. Utilize utility franchise fees, urban renewal funds and other resources, including grants, to underground existing overhead lines. Continue to require that utilities be undergrounded</p>	<p><u>2020 Update:</u> Public works collaborates with local utilities to permit the installation of underground utilities within the road right-of-way.</p> <p><u>2015 Update:</u> Lincoln County continues to administer Oregon building code requirements that structures be built</p>	

<p>with new subdivision approvals.</p> <p>In both rural and urban areas, identify overhead power circuits particularly vulnerable to downed trees (where are power outages are likely to occur). Areas that are difficult to access by power repair crews will be considered when prioritizing these areas for undergrounding power lines.</p> <p>Seek grants for increasing the use of underground utilities where possible;</p> <p>Provide guidance on wind-resistant construction methods.</p>		<p>to withstand identified wind loads. Planning staff continues to provide guidance on where to site utility facilities insofar as it pertains to zoning requirements, but has little involvement on undergrounding utilities</p> <p>The utility companies continue to pursue undergrounding of key utility lines that are vulnerable to windstorm, winter storm, and wildfire.</p>	
<b>Coordinating Organization:</b>	Public Works		
<b>Internal Partners:</b>		<b>External Partners:</b>	
Emergency Management, Planning and Development, City Community Development/ Planning, and Public Works		Central Lincoln People’s Utility District, Consumers Power, Inc.	
<b>Potential Funding Sources:</b>		<b>Estimated cost:</b>	<b>Timeline:</b>
Community and County funding sources, local general funds, public grants and private foundations. Local city/county/state and federal agencies and other partners. Community Development Block Grants (CDBG), FEMA PDM and HMGP		Low	<input checked="" type="checkbox"/> Ongoing <input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	Lincoln County Steering Committee, revised 2015		
<b>Action Item Status:</b>	Ongoing		

Action Item: Wildfire #1	Alignment with Plan Goals:				High Priority Action Item?
Implement actions identified within the Lincoln County Community Wildfire Protection Plan (CWPP) and continue to participate with ongoing maintenance and updates.	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input checked="" type="checkbox"/> 4	<input checked="" type="checkbox"/> Yes
	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	<input type="checkbox"/> 8	
	<input type="checkbox"/> 9	<input checked="" type="checkbox"/> 10	<input type="checkbox"/> 11		
<b>Affected Jurisdictions:</b>					
<input checked="" type="checkbox"/> Lincoln County	<input checked="" type="checkbox"/> Depoe Bay	<input checked="" type="checkbox"/> Lincoln City	<input checked="" type="checkbox"/> Newport	<input checked="" type="checkbox"/> Siletz	
	<input checked="" type="checkbox"/> Toledo	<input checked="" type="checkbox"/> Waldport	<input checked="" type="checkbox"/> Yachats		
<b>Alignment with Existing Plans/Policies:</b>					
Lincoln County CWPP, Comprehensive Plans, Development Codes, Westwide Wildfire Risk Assessment, Wildfire Risk Explorer					
<b>Rationale for Proposed Action Item:</b>					
Wildfire incidents are most likely to occur in wildland urban interface communities. 90% of Lincoln County is forestland; communities within these areas are therefore especially vulnerable to wildfire. In order to complete a more thorough risk assessment it is important that the County complete mitigation projects identified in the Community Wildfire Protection Plan.					
<b>Ideas for Implementation:</b>			<b>Actions Taken Since 2009</b>		
<p>Coordinate with local and regional fire departments, rural fire department districts and other fire protection agencies to complete mitigation actions identified in the CWPP.</p> <p>Update the CWPP to accommodate new fire risk data.</p> <p>Maintain building buffer areas from forestland, especially in the fire-prone wildland-urban interface.</p> <p>Reduce fuel loads in buffer areas that can act as firebreaks.</p> <p>Evaluate post-wildfire geologic hazards including flood, debris flows, and landslides.</p>			<p><u>2020 Update:</u> CWPP revised and adopted in 2018. Considerable Wildfire Prevention, Protection, Mitigation presentations and materials made available to community members 2019 – 2020, see County EM activities and outreach list.</p> <p><u>2015 Update:</u> Lincoln County Fire Districts and Oregon Department of Forestry has in place a Community Wildfire Protection Plan, 2010 (update expected in 2015/16). Other accomplishments related to this plan include but are not limited to: Firewise program implemented in Salishan Hills Fire reduction plan to be implemented with awarded grant funds in 2015 Mass notification system implemented in 2011 for the notification of full county burn ban, potential wildland threat, evacuation notice and reentry for citizens and businesses</p>		
<b>Coordinating Organization:</b>		Emergency Management			
<b>Internal Partners:</b>			<b>External Partners:</b>		
GIS, Planning and Development,			ODF, Lincoln County Fire Districts, City Fire Departments		
<b>Potential Funding Sources:</b>			<b>Estimated cost:</b>		<b>Timeline:</b>
Local Funding Resources, ODF, DLCD, FEMA			Low to High		<input checked="" type="checkbox"/> Ongoing

		<input type="checkbox"/> Short Term (1-4 years) <input type="checkbox"/> Medium Term (4-10 years) <input type="checkbox"/> Long-Term (10+ years)
<b>Form Submitted by:</b>	2009 Lincoln County Steering Committee, revised 2015	
<b>Action Item Status:</b>	Ongoing	

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# APPENDIX B: PLANNING AND PUBLIC PROCESS

## NHMP Update Changes

This memo describes the changes made to the 2015 Lincoln County Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP) during the 2020 NHMP update process.

### Project Background

Lincoln County, the cities of Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport, and Yachats, and the special districts of Central Lincoln PUD, Lincoln County School District, and Seal Rock Water District partnered with the Oregon Partnership for Disaster Resilience (OPDR) to update the multi-jurisdictional 2015 Lincoln County NHMP. The Disaster Mitigation Act of 2000 requires communities to update their NHMPs every five years to remain eligible for Pre-Disaster Mitigation (PDM) program funding, Flood Mitigation Assistance (FMA) program funding, and Hazard Grant Mitigation Program (HMGP) funding. A Federal Emergency Management Pre-Disaster Mitigation grant funded the work with non-federal match provided by Lincoln County.

OPDR and the committees made several changes to the previous NHMP to consolidate and streamline the NHMP. The City of Newport addendum was added to this version of the NHMP.

Major changes are documented and summarized in this memo.

### 2020 NHMP Update Changes

The sections below only discuss *major* changes made to the NHMPs during the 2020 NHMP update process. Major changes include the replacement or deletion of large portions of text, changes to the NHMP's organization, new mitigation action items, and the addition of the Lincoln County School District addendum to the NHMP (the Central Lincoln PUD and Seal Rock WD addenda were also reformatted). If a section is not addressed in this memo, then it can be assumed that no significant changes occurred.

The NHMP's format and organization have been altered to fit within OPDR's NHMP templates. Table B-1 lists the 2015 Lincoln County NHMP section names and the corresponding 2020 section names, as updated (major Volumes are highlighted in blue). This memo will use the 2020 NHMP update section names to reference any changes, additions, or deletions within the NHMP.

**Table B-I Changes to Organization**

2015 Lincoln County MNHMP	2020 Lincoln County MNHMP
Acknowledgements	Acknowledgements
Table of Contents	Table of Contents
Approval Letters and Resolutions	Approval Letters and Resolutions
FEMA Review Tool	FEMA Review Tool
<b>Volume I: Basic Plan</b>	<b>Volume I: Basic Plan</b>
Executive Summary	Plan Summary
Section 1: Introduction	Section 1: Introduction
Section 2: Risk Assessment	Section 2: Hazard Identification and Risk Assessment
<b>Volume II: Hazard Annexes</b>	
Section 3: Mitigation Strategy	Section 3: Mitigation Strategy
Section 4: Plan Implementation and Maintenance	Section 4: Plan Implementation and Maintenance
<b>Volume III: Jurisdictional Addenda</b>	<b>Volume II: Jurisdictional Addenda</b>
Depoe Bay	Depoe Bay
Lincoln City	Lincoln City
Newport	Newport
Siletz	Siletz
Toledo	Toledo
Waldport	Waldport
Yachats	Yachats
-	Central Lincoln PUD
-	Lincoln County School District
-	Seal Rock Water District
<b>Volume IV: Mitigation Resources</b>	<b>Volume III: Appendices</b>
Appendix A: Action Item Fprms	Appendix A: Action Item Forms
Appendix B: Planning and Public Process	Appendix B: Planning and Public Process
Appendix C: Community Profile	Appendix C: Community Profile
Appendix D: Economic Analysis of Natural Hazard Mitigation Projects	Appendix D: Economic Analysis of Natural Hazard Mitigation Projects
Appendix E: Grant Programs and Resources	Appendix E: Grant Programs and Resources
Appendix F: Risk MAP Implementation Report	-
-	Appendix F: Community Survey
-	Appendix G: Future Climate Projections

As the table indicates the structure of the NHMP has changed significantly. Content and changes are described below.

**Front Pages**

1. The NHMP’s cover has been updated.
2. Acknowledgements have been added to include the 2020 project partners and planning participants.
3. The FEMA approval letter, review tool, and county resolutions of adoption are included.

**Volume I: Basic Plan**

Volume I provides the overall NHMP framework for the 2020 Multi-jurisdictional NHMP update. Volume I includes the following sections:



## Plan Summary

The 2020 NHMP includes an updated NHMP summary that provides information about the purpose of natural hazard mitigation planning and describes how the NHMP will be implemented.

### Section 1: Introduction

Section 1 introduces the concept of natural hazard mitigation planning and answers the question, “Why develop a mitigation plan?” Additionally, Section 1 summarizes the 2020 NHMP update process and provides an overview of how the NHMP is organized. Major changes to Section 1 include the following:

- Section 1 of the 2020 update, outlines the layout of the NHMP update, which has been revised since the previous version of the plan as described herein.

### Section 2: Hazard Identification and Risk Assessment

This section consists of three phases: hazard identification, vulnerability assessment, and risk analysis. Hazard identification involves the identification of hazard geographic extent, its intensity, and probability of occurrence. The second phase attempts to predict how different types of property and population groups will be affected by the hazard. The third phase involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over time. Changes include:

- Moved applicable 2015 Volume II content to 2020 Section 2
- Added Tornado as a separately assessed hazard, and as a sub-hazard within the “Windstorm” section.
- Added OCCRI future climate change projections (see Appendix G)
- Added Risk Report quantitative hazard data
- Added earthquake and tsunami quantitative data from DOGAMI reports
- Hazard identification, characteristics, history, probability, vulnerability, and hazard specific mitigation activities were updated. Outdated and extraneous information was removed and links to technical reports were added as a replacement where applicable. With this update the Oregon NHMP and DOGAMI reports are cited heavily as a reference to the more technical hazard material.
- Links to specific hazard studies and data are embedded directly into the NHMP where relevant and available.
- NFIP information was updated.
- The hazard vulnerability analysis (Risk Assessment) has been updated for the county, cities, and special districts (see Volume II for more information).

### Section 3: Mitigation Strategy

This section provides the basis and justification for the mission, goals, and mitigation actions identified in the NHMP. The 2015 mission and goals were evaluated by the county, city, and special district Steering Committees and no changes were made. Major changes to the mitigation strategies (actions) include the following:

- **Priority actions were evaluated, and new priorities were assigned.** Priority actions are shown in Table 3-1 and within Volume III, Appendix A, and within each city and special district addendum (Volume II).
- **Actions evaluated for status and merit.** The county, city, and special district Steering Committees reviewed the previous actions and provided updates and edits

to the actions where applicable. Including, the revision of existing actions, lead and partners, timeframe, potential funding sources, and estimated cost. Prioritized actions are those that are achievable, high leverage activities over the next five-years and will receive each jurisdiction's focus based on resource availability. Updates and changes to actions are shown in each action item form, completed actions, and actions that were deleted are discussed in Volume III, Appendix A and Attachment A of each city or special district addendum.

#### Section 4: Plan Implementation and Maintenance

Lincoln County Planning and Emergency Management will continue to co-convene and coordinate the County Steering committee (Steering Committee). Documentation for the City Steering Committees is contained within each jurisdictional addendum (Volume II).

#### **Volume II: Jurisdictional Addenda**

The cities of Depoe Bay, Lincoln City, Newport, Siletz, Toledo, Waldport, and Yachats opted to participate and update their 2015 city addenda. The special districts of Central Lincoln PUD and Seal Rock WD were included in the 2017 NHMP revision, in the 2020 NHMP they developed separate addenda (Volume II). The Lincoln County School District developed their first addendum in the 2020 update of the NHMP (they have been an active participate in previous versions of the NHMP).

Where appropriate, information has been consolidated and a reference is provided within each addendum to the appropriate NHMP section. New data and hazard information was included for the participating cities and special districts (see Section 2 information above) and actions were reviewed, revised and prioritized as described in each addendum (see also Attachment A of each addendum).

#### **Volume III: Appendices**

Below is a summary of the changes to the appendices included in the 2020 NHMP:

##### Appendix A: Action Item Forms

County Action Item forms were updated as noted in the section above discussing Volume I, Section 3 and as shown in the preamble to this Appendix (including completed and deleted actions). Specific activities that have occurred are listed on each action item form.

##### Appendix B: Planning and Public Process

This planning and public process appendix reflects changes made to the Lincoln County NHMP and documents the 2020 planning and public process.

##### Appendix C: Community Profile

The community profile has been updated to conform to the OPDR template and consolidates information for Lincoln County, cities, and special districts. Additional community information is provided in each addendum within Volume II.

##### Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix provides an economic analysis of natural hazard mitigation projects and consolidates previous plan information into one appendix.

### Appendix E: Grant Programs and Resources

This appendix is new and provides information on grant programs and resources.

### Appendix F: Community Survey

This survey was conducted with the 2020 update of the NHMP and was utilized to inform the development of mitigation strategies and identification of community vulnerabilities. It is provided herein as documentation and to serve as a resource for future planning efforts.

### Appendix G: Future Climate Projections: Lincoln County

This appendix is new to the NHMP and includes a report produced by the Oregon Climate Change Research Institute (OCCRI). The report provides important information regarding the influence and impacts of climate change on existing natural hazards events such as coastal erosion and flooding, river flooding, ocean temperature and chemistry, loss of coastal wetland ecosystems, drought, heat waves, cold waves, wildfire, and air quality.

## **Public Participation Process**

Lincoln County is dedicated to directly involving the public in the review and update of the NHMP. Although members of the Steering committee represent the public to some extent, the residents of Lincoln County and participating cities and special districts were also given the opportunity to provide feedback about the NHMP. The NHMP will undergo review by the County NHMP Steering Committee on a semiannual basis and by the city and special district Steering Committees on an annual basis.

Lincoln County made the NHMP available via the County website:

<https://www.co.lincoln.or.us/planning/page/natural-hazards-mitigation-plan>. Cities and special districts also provided a copy of their addendum on their own websites. The draft NHMP was available for public review and comment through the FEMA review period.

## **Public Involvement Summary**

A survey was provided to the public during the early stages of the update cycle (Volume III, Appendix G). Information from this survey was used by the Steering Committee to help inform their risk assessment and mitigation strategies.

During the County public review period (see next page) there were 12 comments provided. Comments and responses to comments are provided herein.


See jurisdictional addenda (Volume II) for city and special district public involvement information.

Members of the Steering Committee provided edits and updates to the NHMP prior to the public review period as reflected in the final document.

# Website Posting

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## Planning & Development

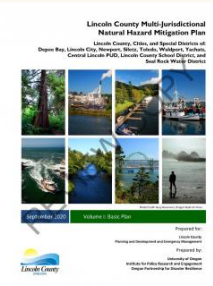


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- [Fee Schedule - All County Departments](#)

County Home > [Planning & Development Home](#) > [Community Input Needed - Natural Hazards Mitigation Plan Renewal](#)

### Community Input Needed - Natural Hazards Mitigation Plan Renewal

The first phase of the renewal process was to solicit feedback from community members to identify what is important to them regarding our local natural hazard risks and planning goals. This was completed in September of 2019. Since 2019 our Steering Committee made up of our local City, Tribal, Public Safety Agencies and our Addendum Partners have finalized our draft plan for our next renewal period. Our next step is to send our final draft to our community members for their feedback and input then to the State of Oregon, then to FEMA and lastly to our Lincoln County Board of Commissioners.



**Community Member Input:**

- Community members are invited to provide feedback by submitting comments or questions by Friday, October 2nd using the survey link below
- [Survey Link - CLICK HERE](#)

**Natural Hazards Mitigation Plan - September 2020 Renewal Plan:**

- [The September 2020 page is separated down into 3 sections \(I, II, III\)](#)

**Volume I - Basic Plan**

**Volume II - Jurisdictional Addenda**

- Depoe Bay
- Lincoln City
- Newport
- Siletz
- Toledo
- Waldport
- Yachats
- Central Lincoln PUD
- Lincoln Co. School District
- Seal Rock Water District

**Volume III - Appendices**

- [CLICK HERE](#) for current plan - September 2015

**Questions - need more information?**

- Planning and Development Department - 541-265-4192
- County Emergency Management - 541-265-4199
- Michael Howard, Director for the Oregon Partnership for Disaster Resilience at [mrhoward@uoregon.edu](mailto:mrhoward@uoregon.edu)

Seal Rock Water District and Lincoln Co. School District addenda are forthcoming.

**SUPPORTING DOCUMENTS**

- [central\\_lincoln\\_pud\\_addendum\\_review\\_draft.pdf](#) (2 MB)
- [depoe\\_bay\\_addendum\\_review\\_draft.pdf](#) (3 MB)
- [lincoln\\_city\\_addendum\\_review\\_draft.pdf](#) (4 MB)
- [lincoln\\_co\\_nhmp\\_-\\_volume\\_i\\_review\\_draft.pdf](#) (5 MB)
- [lincoln\\_co\\_nhmp\\_-\\_volume\\_iii\\_review\\_draft.pdf](#) (8 MB)
- [newport\\_addendum\\_review\\_draft.pdf](#) (3 MB)
- [siletz\\_addendum\\_review\\_draft.pdf](#) (3 MB)
- [toledo\\_addendum\\_review\\_draft.pdf](#) (4 MB)
- [waldport\\_addendum\\_review\\_draft.pdf](#) (3 MB)
- [yachats\\_addendum\\_review\\_draft.pdf](#) (3 MB)
- [Media Release - Community Feedback Needed - Natural Hazards Mitigation Plan](#) (17 KB)
- [seal\\_rock\\_wd\\_addendum\\_review\\_draft.pdf](#) (2 MB)
- [lincolnsd\\_addendum\\_review\\_draft.pdf](#) (5 MB)

**WEB LINKS**

- [September NHMP - Separated down into 3 sections \(I, II, III\)](#)

### Natural Hazard Mitigation Plan Public Feedback Survey

Please provide feedback for the September 2020 Natural Hazard Mitigation Plan Renewal in the box provided below.

Thank you.

Emergency Management  
541-265-4199

Natural Hazard Mitigation Plan Feedback

Name (Optional)

Contact Phone Number (optional)

Contact Email (optional)

Zip Code (Optional)

Send me a copy of my responses

## Public Comments and Responses

Listed below is the list of public comments shown in *italic text* followed by the County's response.

*Note: the public comment period opened shortly after the Echo Mountain Complex Fire which originated on September 7, 2020. There were additional comments provided that are not included here that are related to the wildfire response and will be addressed via the Echo Maintain Complex Fire after action report.*

### General Comments

Comment 1: [ZIP Code 97214]

*The existence of this document (obviously representing many hours of work from a wide variety of stakeholders) is a bright light of hope in this hard time. I believe we cannot prevent harm if we do not understand or agree on our shared risks. And we cannot understand our risks if we don't look to science and emerging climate models. Thanks for getting so many people around the metaphorical table to hash out some shared understanding of facts.*

*Seems like a solid plan; I like the identification of possible projects, the baked-in structure to keep the plan in motion and the tool kit of questions to update the plan as needed. May we have buy in and some budget to keep moving forward.*

*Although I don't live in Lincoln County, I have family connection there and I'm a nerd who cares about emergency planning...I read the whole thing. Thanks for this deep work.*

Response:

No substantive response necessary.

### Public Engagement

Comment 2: [ZIP Code 97367]

*The general public may not necessarily care about Sections I and II of this document. What they would care about is Sections III and IV where you identified action items and how they were prioritized. If you want helpful feedback, you might consider having a few public forums instead of relying on electronic feedback only as some of the public may not understand what the intent of this document is and what you're looking for. I am admittedly probably missing some of the point as well. It just seems there is a lot of fluff that one has to get through to find those things of interest. If it takes too long to get there people will tend to not respond.*

*Even the best laid plans are of no use if people are not informed. The recent wildfires here in the area identified things that were problematic and they (public) would like to know what is being done about them. For example, if there is no power, cell service or internet (as was the case), how were people supposed to find out about evacuation levels or wildfire updates? Radio station was offline as well so there was really no way of knowing. Even your own volunteers who are on the CERT were not aware of what was going on. My wife and I found out about level 3 purely by accident. In our view, that was totally unacceptable.*

*Alternate methods of alerting the public need to be considered. Emergency routes out of town that expedite getting public out of harms way would be a good thing to look at. We sat in our car for over 2 hours just a few blocks from our home waiting to proceed out of the area. These are infrastructure issues that need to be taken into consideration under your action items.*

Response:

County Emergency Management provided opportunities for the public to comment during the drafting of the NHMP at Readiness Fairs, providing a survey during the development of the updated NHMP, and with an opportunity to comment on the final draft. The County will continue to provide opportunities to participate and comment on the plan during the implementation and maintenance period. See Volume I, Section 4 and Appendix B for more information.

### Multi-Hazard

Comment 3: [ZIP Code 97367]

*The maps need to be better labeled with locations and street names. Also, the maps need to be higher resolution so when people zoom in they are not fuzzy. 1200 dpi would be ideal*

County Response:

The report seeks to balance the utility of providing maps while also maintaining a usable file size. Each map provides a hyperlink to the appropriate map data source (viewer) within instructions to click the hyperlink for more detailed analysis.

Comment 4: [ZIP Code 97394]

*What is the county and state doing to stop development in hazardous zones?*

*Why are we not moving to improve public transportation?*

County Response:

County development regulations and building code regulate development in Lincoln County. The County's flood damage prevention ordinance implements the NFIP and regulates development within mapped flood zones. Additional non-regulatory activities include providing information to property owners and developers regarding natural hazards that may impact their property (e.g., flood, tsunami, earthquake, wildfire, landslide, etc.).

Comment 8: [ZIP Code 97341]

*We need to mandate that electric lines and other utilities that present potential fire risk are shut down during dry season high wind events.*

*Map out what 'islands' will likely remain when The Big One (Cascadia earthquake and tsunami) hits and knocks out bridges. Each island should be equipped with a disaster cache. An illustration of the island and disaster cache location should be located near existing tsunami evacuation map signage.*

*Social media needs to be extensively used to provide public information during a disaster. During the Echo Mountain Fire event public agencies did not adequately disseminate safety information on social media in a timely fashion.*

County Response:

The Department of Geology and Mineral Industries (DOGAMI) has mapped out areas that are likely to be impacted by the Cascadia Subduction Zone earthquake and associated tsunami. See Section 2 – Risk Assessment for links to maps and reports.

The utilities within the County work with state and federal agencies to determine appropriate actions to take during hazard events.

## Coastal Erosion

Comment 9: [ZIP Code 97498]

*In the plan, mitigation measures include for "Coastal Erosion #1: Improve knowledge of effects of climate change and understanding of vulnerability and risk to life and property in hazard prone areas." and for "Coastal Erosion #2: Evaluate revising existing county coastal hazard area regulations based on the DOGAMI risk zone mapping."*

*This is totally insufficient. ODOT's April 2019 report shows at least 5% of US 101 is in peril right NOW from shore erosion. The County should immediately allow homeowners to protect their property with shore protection, and encourage ODOT to protect US 101 in vulnerable locations. Other infrastructure should be protected as well.*

*More regulations and more talk is not acceptable. Let homeowners and public agencies protect their assets and property.*

County Response:

ODOT has jurisdictional authority over state highways including US 101. Activities related to their infrastructure are included within the State Hazard Mitigation Plan. State land use goals express the state's policies on land use and are implemented through local comprehensive plans. Activities that may occur protect property and shores are outlined within Goal 17 (Coastal Shorelands) and Goal 18 (Beaches and Dunes).

## Earthquake and Tsunami Hazard

Comment 10: [ZIP Code: 97365]

*Most buildings at the Hatfield Marine Science Center are build from cinderblocks with very heavy "floating" roofs. In the event of an earthquake/tsunami these buildings are likely to succumb to the shaking before the tsunami ever reaches them. Two main concerns are; 1) the ability of faculty, students and staff to safely exit the older buildings on campus in order to reach evacuation zones in time, and 2) creating a high amount of debris that will be easily moved by rushing water. Another factor is the large amount of vessels in the bay directly adjacent to campus (i.e. large NOAA and OSU vessels parked at NOAA dock). I feel that more information is needed to help members of the Hatfield and South Beach community prepare for the amount of debris that will be swept up by the tsunami. For example, in the event of an earthquake, does sheltering in place apply to cinderblock buildings? Also, what hazards can we expect to encounter when the water has receded, like how will we safely get down*

*from the new earthquake evacuation building on campus, and where will we go from there, especially considering that most people live north of the bridge (which will no longer be accessible)? Will the bay be safe to cross in boats? Should our emergency preparedness kits include inflatable boats, life jackets ropes, etc.? Basically, what should we be prepared to do on our own, and what is the expected emergency response to the campus, and to the greater Newport area?*

County Response:

The County has a debris management plan that covers the county and cities and a regional debris management plan that includes regional counties. Evacuation plans for the area are in place and include a vertical evacuation structure and a site at Safe Haven Hill. Other emergency response and evacuation plans are in place and the County regularly provides information on hazards that could impact residents and tourists.

### Wildfire Hazard

Comment 11: [ZIP Code 97368]

*Being that I'm in the middle of the turmoil of getting things back to normal, I don't have time to read the whole document. This being said, I have a couple recommendations that if in place, they could have prevented the extensive damage incurred by my development.*

*1) Establish a permanent fire barrier, where possible, around developments. If that were in place, the Echo Mountain Complex fire would not have jumped Rt. 18 and traveled up through BLM land to wipe out a third of the Highland Estates development.*

*2) Better management of wooded areas to control the fuel available for rapidly expanding fires*

*3) Recognize wind patterns and devise corresponding policies. In my area, every year there are two times where we encounter winds of 50 mph or more. A couple days in September and a couple days in the Spring. In the fall the winds predictably come from the North East, In the spring they come from the ocean.*

Comment 12: [ZIP Code not provided]

*Need to look more at wildfire risk as climate changes are bringing longer dryer summers and fall into play. I worked in the forests a lot of years I seen the risk of fires becoming more higher every year since forest work decreased in the 90s allowing more fuels + under brush to increase with extended growing spring- summer seasons. Evac. plan worked fairly ok for Lincoln city but had its clicks too some of the north part could have burned whale some was waiting to get on main highway or stuck on back street lineups whale exiting. One major problem was backups at traffic lights and intersections.*

County Response:

Wildfire related actions are provided in the Community Wildfire Protection Plan. The existing actions include fuel reduction projects and defensible space strategies. The County will continue to work with regional fire agencies and forest managers to increase knowledge of these techniques. When the CWPP is next updated the Fire Districts and ODF will explore additional techniques for wildfire mitigation.



## Lincoln County Steering committee

Steering Committee members possessed familiarity with the Lincoln County community and how it's affected by natural hazard events. The Steering Committee guided the update process through several steps including goal confirmation and prioritization, action item review and development and information sharing to update the NHMP and to make the NHMP as comprehensive as possible. The Steering Committee met formally on the following dates:

### **Meeting #1: Steering Committee Kickoff, July 18, 2019**

During this meeting, the Steering Committee reviewed the previous NHMP, and were provided updates on hazard mitigation planning, the NHMP update process, and project timeline. They also provided updates on the history of hazard events in the county and cities, reviewed and revised the NHMP's mission and goals, and discussed progress made toward the previous NHMP's action items. The NHMP public outreach strategy was also discussed.

### **Meeting #2: Risk Assessment Data and Future Climate Projections, August 15, 2019**

During this meeting, the steering committee was provided a summary of the Future Climate Projections report by OCCRI (Appendix F) and a summary of the Natural Hazards Risk Report by IPRE as a preview for their risk assessment. This meeting was held remotely.

### **Meeting #3: Risk Assessment and Actions, September 19, 2019**

During this meeting, the Steering Committee reviewed the existing risk assessment including community vulnerabilities and hazard information. Information obtained during this meeting was used to inform the update of the hazard analysis. The Steering Committee also continued their review of their existing mitigation strategy (actions) and provided status updates.

### **Meeting #4: Risk Report and Resilient Oregon Coast, October 17, 2019**

During this meeting, the steering committee was provided a summary of the resilience work being conducted by Oregon State University and an overview of the draft Multi-hazard Risk Report by DOGAMI. The preliminary survey data (public outreach) was also presented and discussed.

### **Meeting #5: Actions and Implementation, February 13, 2020**

The Steering Committee completed their review of their existing mitigation strategy (actions). The previous NHMP's implementation and maintenance program was reviewed and any changes that were necessary were made as indicated in this appendix and Volume I, Section 4.

### **Jurisdictional Addenda Meetings:**

The participating cities and special district convened their steering committees during the County meeting processes described above. During these meetings, the Steering Committees for each jurisdiction provided comments on draft updates, revised and prioritized their actions, and reviewed the NHMP implementation and maintenance schedule. Additional meetings were held as described in Volume II for each jurisdiction.

In addition to the meetings listed above, there were numerous informal meetings and email exchanges between Steering Committee members, OPDR, the County, and other state agencies.

The following pages includes copies of meeting agendas and sign-in sheets.

# Lincoln County NHMP Update Kick-Off (July 18, 2019)



## AGENDA

**Meeting:** Lincoln County NHMP Update - Kickoff  
**Date:** July 18, 2019  
**Time:** 9:00am – 11:00am  
**Location:** Western Title Building, 255 SW Coast Highway, Newport

---

<b>I. Welcome and Background</b>	<b>10 minutes</b>
a. Introductions	
b. Project context	
<b>II. Intergovernmental Agreement and Cost Share</b>	<b>15 minutes</b>
<b>III. Natural Hazard Mitigation Planning</b>	<b>15 minutes</b>
a. Emergency Management Overview	
b. Natural Hazard Mitigation Plans (NHMP) Overview	
<b>IV. Existing NHMP Overview and Review</b>	<b>10 minutes</b>
<b>V. Community Profile Update</b>	<b>15 minutes</b>
a. Changes in development since previous plan	
b. Critical facilities	
<b>VI. Hazard History</b>	<b>15 minutes</b>
a. Hazard history since previous plan	
What are the critical hazard concerns for your community?	
Any changes since the previous plan?	
<b>VII. Mission and Goals review</b>	<b>10 minutes</b>
a. Visioning Exercise	
<b>VIII. Mitigation Actions Review</b>	<b>15 minutes</b>
a. Review previous action categories	
b. Feedback and broad new action ideas	
<b>IX. Public Outreach Strategy</b>	<b>10 minutes</b>
<b>X. Wrap Up and Next Steps</b>	<b>5 minutes</b>

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Initial	First Name	Last Name	E-mail Address	Company	Job Title
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	Adam	Denlinger	adenlinger@srwd.org	Seal Rock Water District	Director of Water District
	Allen	Middaugh	silezwaters@gmail.com	City of Siletz	Public Works Director
	Arlene	Inukai	planning@cityoftoledo.org	City of Toledo	Planner
	Brady	Weidner	weidner@cityofdepoebay.org	City of Depoe Bay	City Superintendent
	Bud	Shomake	info@portoftoledo.org	Port of Toledo	Director of the Port
	Carla	Duering	recorder@cityofdepoebay.org	City of Depoe Bay	PIO/City Recorder
EB	Eli	Grove	elig@ctsi.nsn.us	Confederated Tribes of Siletz Indians	Emergency Preparedness Coordinator Trainee
GM	Gail	Malcolm*	gmalcolm@cencoast.com	Central Lincoln PUD	Project Manager
	Ian	Keene	iank@ctsi.nsn.us	Confederated Tribes of Siletz Indians	Planing GIS
	Jenny	Demaris	vdemaris@co.lincoln.or.us	Lincoln County	Emergency Manager
	John	O'Leary	joleary@co.lincoln.or.us	Lincoln County	Planner
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	Onno	Husing	ohusing@co.lincoln.or.us	Lincoln County	Director of Planning and Development
PC	Rachel	Cotton	R.Cotton@newportoregon.gov	City of Newport	Planner
	Regina	Martinez	r.martinez@newportoregon.gov	City of Newport	EM Cordinator
	Roxie	Cuellar	rcuellar@portofalsea.com	Port of Alsea	Manager
	Roy	Kinion	rkinion@co.lincoln.or.us	Lincoln County	Public Works Director

Geology  
+ Coast Guard



# Lincoln County NHMP Update Meeting #2 (August 15, 2019)



## AGENDA

**Meeting:** Lincoln County NHMP Update: Meeting #2  
**Date:** August 15, 2019  
**Time:** 9:00am – 10:00am  
**Location:** Videoconference only: <https://zoom.us/j/840968054>

- 
- |  |                   |
|--|-------------------|
| <b>I. Welcome</b>  | <b>2 minutes</b>  |
| <b>II. Jurisdiction Specific Status Report</b>   | <b>13 minutes</b> |
| a. Intergovernmental Agreement and Cost Share  |                   |
| b. Action Items  |                   |
| c. Previous Meeting Worksheets (Hazard History, development, codes, critical and essential facilities)   |                   |
| <b>III. Future Climate Projections Report Overview</b>   | <b>30 minutes</b> |
| a. Meghan Dalton, Oregon Climate Change Research Institute   |                   |
| <b>IV. Natural Hazard Risk Report for Lincoln County</b>   | <b>10 minutes</b> |
| a. Purpose, timeline for feedback  |                   |
| b. Download report here (link expires 8/16/19):<br><a href="https://eftp.mbakerintl.com/message/S3t5mclVjhyLkCzbb9U20P">https://eftp.mbakerintl.com/message/S3t5mclVjhyLkCzbb9U20P</a>   |                   |
| <p>Please review with the following questions from FEMA in mind:</p> <ul style="list-style-type: none"><li>• The risk assessments have incorporated local assessor data. Do the results look accurate? Have we missed any critical facilities?</li><li>• Would you like to learn how they were developed using local building assessor data and other local datasets and ways that FEMA can support ongoing hazard mitigation planning and projects in your community?</li><li>• Is there any additional data or information that we could add to the Risk Report to help make the assessments more locally relevant or to improve your emergency management and land use planning processes, such as zoning or hazard mitigation?</li></ul> |                   |
| <b>V. Wrap Up and Next Steps</b>   | <b>5 minutes</b>  |
| a. September Meeting: Sept. 19, 9-11am   |                   |
| b. October Meeting: Oct. 17, 9-11am  |                   |

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ken murphy Adam Denlinger rkinion

15417652361

## Heavy Rains

*As the atmosphere warms and is able to hold more water vapor, the frequency and intensity of extreme precipitation events is expected to increase.*

### Change in Amount of Wettest 1-Day and 5-Day Precipitation Totals Lincoln County

Scenario	1-Day Change (%)	5-Day Change (%)
Lower (RCP 4.5)	-5	-10
Higher (RCP 8.5)	5	10

13 Participants

Share Chat Record

Invite Manage Participants

End Meeting

Participants (13)

- Find a participant
- IPRE (Host, me)
- Meghan Dalton
- Jenny Demaris
- 15415634447
- Gail Malcolm
- ken murphy
- Regina Martinez
- 15417652361
- Adam Denlinger
- Larry
- Iphipps
- Rachel Cotton
- rkinion

Mute All Unmute All More

# Lincoln County NHMP Update Meeting #3 (September 19, 2019)



UNIVERSITY OF  
OREGON



## AGENDA

**Meeting:** Lincoln County NHMP Update – Meeting #3: Risk Assessment and Actions  
**Date:** September 19, 2019  
**Time:** 9:00am – 11:00am  
**Location:** Western Title Building, 255 SW Coast Hwy, Newport

---

- |   |                   |
|---|-------------------|
| <b>I. Welcome and Meeting Goals</b>               | <b>5 minutes</b>  |
| <b>II. Survey Update – Preliminary Results</b>    | <b>10 minutes</b> |
| <b>III. Critical Facilities Update and Review</b> | <b>10 minutes</b> |
| <b>IV. Hazard Vulnerability Assessment</b>        | <b>30 minutes</b> |
| <b>V. Mitigation Strategy</b>                     | <b>60 minutes</b> |
| <b>VI. Wrap Up and Next Steps</b>                 | <b>5 minutes</b>  |
| a. Next Steps                                     |                   |
| b. Next Meeting: October 17: DOGAMI presentation  |                   |

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Meeting Sign-In

Lincoln NHMP Update:

Meeting #3: September 19, 2019



Name (Printed)	Signature	Representing
KEN MURPHY	<i>Ken Murphy</i>	CITY OF LINCOLN CITY
Sue Graves	<i>Sue Graves</i>	Lincoln County School DISTRICT
Alan Freudenthal	<i>Alan Freudenthal</i>	Oregon State Parks
Regina Martinez	<i>Regina Martinez</i>	City of Newport
Rachel Cotton	<i>Rachel Cotton</i>	City of Newport
Gail Malcolm	<i>Gail Malcolm</i>	Central Lincoln P.O.D
Undsey Sehmel	<i>Undsey Sehmel</i>	Lincoln City

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# Lincoln County NHMP Update Meeting #4 (October 17, 2019)



## AGENDA

**Meeting:** Lincoln County NHMP Update – Meeting #4: Risk Assessment (Part 2)  
**Date:** October 17, 2019  
**Time:** 9:00am – 11:00am  
**Location:** Western Title Building, 255 SW Coast Hwy, Newport

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- I. **Welcome and Meeting Goals**
- II. **Cost Share Information and Collection**
- III. **Risk Report Overview (Matt Williams, DOGAMI)**
- IV. **Envisioning a Resilient Oregon Coast (Jenna Tilt, OSU)**
- V. **Survey Update – Preliminary Results**
  - a. Readiness Fair/Community Survey
  - b. Jurisdiction Survey
- VI. **Wrap Up and Next Steps**
  - a. Next Meeting: January

INSTITUTE FOR POLICY RESEARCH AND ENGAGEMENT (*formerly Community Service Center*)  
1209 University of Oregon | Eugene, Oregon 97403 | T: 541.346.3889 | F: 541.346.2040 <https://ipre.uoregon.edu/>

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**Meeting Sign-In**

Lincoln NHMP Update:  
Meeting #4: October 17, 2019



Name (Printed)	Signature	Representing
Jenna Tilt	<i>Jenna Tilt</i>	OSU
Katherine Stanton	<i>Kate Stanton</i>	OSU
Roy Kinion	<i>Roy Kinion</i>	Lincoln County Public Works
RACHEL COTTON	<i>Rachel Cotton</i>	NEWPORT
Hui Rodomsky	<i>Hui Rodomsky</i>	DLCD
KEN MURPHY	<i>Ken Murphy</i>	LINCOLN CITY
John O'Leary	<i>John O'Leary</i>	Lincoln County
Jenny Demaris	<i>Jenny Demaris</i>	Lincoln County
Matt Williams	<i>Matt Williams</i>	DOGAMI
Gail Malcolm	<i>Gail Malcolm</i>	Central Lincoln PCD
Onno Husius	<i>Onno Husius</i>	LC Planning

# Lincoln County NHMP Update Meeting #5 (February 13, 2020)



## AGENDA

**Meeting:** Lincoln County NHMP Update – Meeting #5: Actions and Implementation  
**Date:** February 13, 2020  
**Time:** 10:00am – 12:00pm  
**Location:** Planning Conference Room, Lincoln County Planning, 210 SW 2<sup>nd</sup> Street, Newport

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- I. Welcome and Meeting Goals
- II. Cost Share Information and Collection
- III. Survey Update
- IV. Action Item Review and Prioritization
- V. Implementation and Maintenance
- VI. Wrap Up and Next Steps

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**Meeting Sign-In**  
 Lincoln NHMP Update:  
 Meeting #5: February 13, 2020



Name (Printed)	Signature	Representing
Justin Peterson		Toledo, Waldport, Yachats
Derek Tokos		NEWPORT
Hui Rodomsky		DLCD
Meg Reed		DL CD
Laura Gabel		DOGAMI
Gail Malcolm		Central Lincoln POD
John O'Leary		Lincoln County
KEN MURPHY		LINCOLN CITY
Regina Martinez		CITY OF NEWPORT
Onno Husing		Lincoln County Planning
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# APPENDIX C: COMMUNITY PROFILE

The following section describes the county from several perspectives in order to help define and understand the county’s sensitivity and resilience to natural hazards. Sensitivity and resilience indicators are identified through the examination of community capitals which include natural environment, social/demographic capacity, economic, physical infrastructure, community connectivity, and political capital. These community capitals can be defined as resources or assets that represent all aspects of community life. When paired together, community capitals can influence the decision-making process to ensure that the needs of the community are being met.<sup>1</sup>

Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards, (e.g., special populations, economic factors, and historic and cultural resources). Community resilience factors can be defined as the community’s ability to manage risk and adapt to hazard event impacts (e.g., governmental structure, agency missions and directives, and plans, policies, and programs).

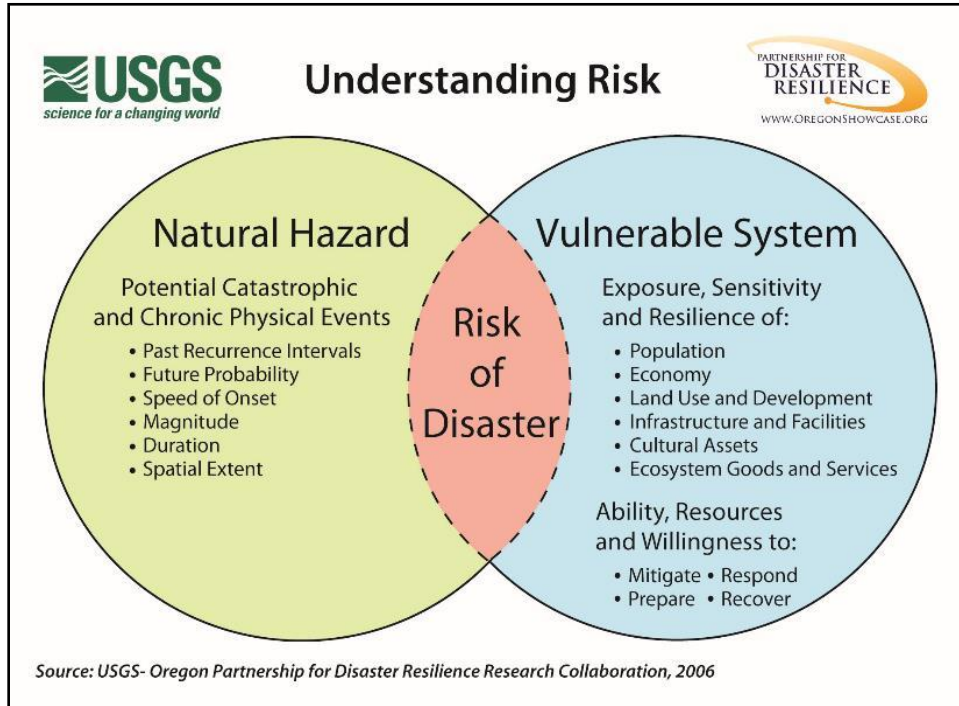
<b>Natural Environment Capacity .....</b>	<b>3</b>
<b>Social/Demographic Capacity .....</b>	<b>9</b>
<b>Economic Capacity .....</b>	<b>23</b>
<b>Physical Infrastructure Capacity .....</b>	<b>33</b>
<b>Community Connectivity Capacity .....</b>	<b>46</b>
<b>Political Capacity .....</b>	<b>53</b>

The Community Profile describes the sensitivity and resilience to natural hazards of Lincoln County, its Census Designated Places (CDPs), and its incorporated cities, as they relate to each capacity. It provides a snapshot in time when the plan was developed and will assist in preparation for a more resilient county. The information in this section, along with the hazard assessments located in Volume I, Section 2 should be used as the local level rationale for the risk reduction actions identified in Volume I, Section 3. The identification of actions that reduce the county’s sensitivity and increase its resiliency assist in reducing overall risk of disaster, the area of overlap in Figure C-1.

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<sup>1</sup> Mary Emery and others, “Using Community Capitals to Develop Assets for Positive Community Change,” *CD Practice* 13 (2006): 2

**Figure C-1 Understanding Risk**



Oregon Partnership for Disaster Resilience

Source:

The U.S. Census delineates areas of settled population concentrations that are identifiable by name but are not legally incorporated as Census Designated Places (CDPs). There are two CDPs in Lincoln County as shown in Table C-1. Other unincorporated areas that are not included in the Census data include: Bayshore, Burnt Woods, Eddyville, Gleneden Beach, Harlan, Logsdon, Otis, Otter Rock, Seal-Rock, Tidewater, and Wakonda Beach. In addition, the Confederated Tribes of Siletz Indians includes reservation and off-reservation trust lands within Lincoln County.

**Table C-1 Lincoln County, Cities, and Census Designated Places**

Incorporated Cities	Unincorporated Census Designated
Depoe Bay	Lincoln Beach
Newport	Rose Lodge
Lincoln City	
Siletz	
Toledo	
Waldport	
Yachats	

Source: Portland State University Population Research Center, U.S. Census Bureau Tiger Lines Files

The remainder of this appendix will provide detailed information for the unincorporated communities and summarized data for the incorporated cities. Detailed information for each incorporated city participating in this NHMP is provided within each city’s addendum (Volume II).



# Natural Environment Capacity

Natural environment capacity is recognized as the geography, climate, and land cover of the area such as, urban, water and forested lands that maintain clean water, air and a stable climate.<sup>2</sup> Natural resources such as wetlands and forested hill slopes play significant roles in protecting communities and the environment from weather-related hazards, such as flooding and landslides. However, natural systems are often impacted or depleted by human activities adversely affecting community resilience.

## Geography

Lincoln County is located on the Central Oregon Coast, and covers an approximate area of 992 square miles in size or 634,880 acres. The Pacific Ocean and the Coast Range of The Cascade mountains border the county. Five major rivers run through Lincoln County and empty into the Pacific Ocean. The five major rivers are the Alsea, Salmon, Siletz, Yachats, and Yaquina rivers<sup>3</sup>.

Lincoln County is located within a 3<sup>rd</sup> level tier ecoregion described by the (EPA) as the Coast Range. The Coast Range is Lincoln County's dominant ecoregion. Mountains in the Coast Range are low in elevation and high in precipitation, creating lush evergreen forests. The Coast Range's naturally occurring diverse forests have given way to mono-crop plantings for timber harvest. Sedimentary soils are prone more to failure following clear cuts and road building than areas with volcanic soils, which may be of concern as the commercial Douglas Fir forests located here are highly productive commercial logging areas. Landslides can impact the safety of nearby infrastructure and health of the region's waterways. The ecoregion's sedimentary soils can create more concerns for stream sedimentation than areas with volcanic soils. The Coast Range's lowlands include beaches, dunes, forests, lakes, marshes, and streams. Many wetlands in the ecoregion have been converted to dairy pastures.<sup>4</sup>

Lincoln County contains four sub eco-regions within the coast range: the Coastal Lowlands, the Coastal Uplands, the Volcanics, and the Mid-Coastal Sedimentary. The **Coastal Lowlands** is a diverse ecoregion and contains a variety of ecosystems and natural habitats. Typically the coastal lowlands are comprised of beaches, dunes, and marine terraces. Wet forests, lakes, estuarine marshes, and tea-colored streams characterize the landscape. The **Coastal Uplands** ecoregion is characterized by headlands and low mountains surrounding the Coastal Lowlands. The **Volcanics** and **Mid-Coastal Sedimentary** are mainly forest areas with dense coniferous forests, steep grades, and areas of unstable soils; it also features intense anthropomorphic disturbances such as frequent logging activity and other resource extraction. The slopes in these ecoregions are prone to failure when disturbed<sup>5</sup>.

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<sup>2</sup> Mayunga, J. 2007. Understanding and Applying the Concept of Community Disaster Resilience: A capital-based approach. Summer Academy for Social Vulnerability and Resilience Building.

<sup>3</sup> Economic Development Alliance of Lincoln County. (2014). General information on Lincoln County. Retrieved from [http://www.coastbusiness.info/general\\_info.htm](http://www.coastbusiness.info/general_info.htm)

<sup>4</sup> Ecoregions of Oregon. (n.d.). EPA. Retrieved March 8, 2014, from <http://www.epa.gov/wed>

<sup>5</sup> Thorson, T.D., Bryce, S.A., Lammers, D.A., Woods, A.J., Omernik, J.M., Kagan, J., Pater, D.E., and Comstock, J.A., 2003. Ecoregions of Oregon (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

## Potential impacts of global climate change

Climate refers to the temperatures, weather patterns, and precipitation in Lincoln County. This section covers historic climate information. Estimated future climate conditions and possible impacts are also provided (for a more detailed analysis refer to the State Risk Assessment.) Lincoln County receives high levels of precipitation during winter months. It does not receive much snow, except for high peaks, and the temperature is moderate around the county. These climate patterns could see changes in the future due to climate change, affecting the overall geological and natural processes of the coast range ecosystems, topography and habitats of the coast range ecoregion. Future climate projections indicate that the temperature is estimated warm 0.5 degrees Fahrenheit per decade. The Pacific Northwest is projected to have greater warming during summer than in the winter. Precipitation in the Pacific Northwest is expected to increase but to remain within historical ranges for rainfall. Winter precipitation is projected to increase, while summers will be longer and even drier than at present. Scientific data and research also anticipates an increase in intense precipitation events.<sup>6</sup>

There is a consensus among the scientific community that global climate change is occurring and will have important ecological, social, and economic consequences over the next decades and beyond.<sup>7</sup> Extensive research shows that Oregon and other Western states already have experienced noticeable changes in climate, and predicts that more change will occur in the future.<sup>8</sup>

In the Pacific Northwest, climate change is likely to (1) increase average annual temperatures, (2) increase the number and duration of heat waves, (3) increase the amount of precipitation falling as rain during the year, (4) increase the intensity of rainfall events, and 5) increase sea level. These changes are also likely to reduce winter snowpack and shift the timing of spring runoff earlier in the year.<sup>9</sup>

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<sup>6</sup> Oregon Wetlands Explorer. (2009). Coastal Climate Effects. Retrieved from <http://oregonexplorer.info/wetlands/ClimateChange/CoastalClimateEffects>

<sup>7</sup> Karl, T.R., J.M. Melillo, and T.C. Peterson, eds. 2009. *Global Climate Change Impacts in the United States*. U.S. Global Change Research Program. June. Retrieved June 16, 2009, from [www.globalchange.gov/usimpacts](http://www.globalchange.gov/usimpacts); and Pachauri, R.K. and A. Reisinger, eds. 2007. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*.

<sup>8</sup> Doppelt, B., R. Hamilton, C. Deacon Williams, et al. 2009. *Preparing for Climate Change in the Upper Willamette River Basin of Western Oregon*. Climate Leadership Initiative, Institute for a Sustainable Environment, University of Oregon. March. Retrieved June 16, 2009, from [http://climlead.uoregon.edu/pdfs/willamette\\_report3.11FINAL.pdf](http://climlead.uoregon.edu/pdfs/willamette_report3.11FINAL.pdf) and Doppelt, B., R. Hamilton, C. Deacon Williams, et al. 2009. *Preparing for Climate Change in the Rogue River Basin of Southwest Oregon*. Climate Leadership Initiative, Institute for a Sustainable Environment, University of Oregon. March. Retrieved June 16, 2009 from [http://climlead.uoregon.edu/pdfs/ROGUE\\_percent20WS\\_FINAL.pdf](http://climlead.uoregon.edu/pdfs/ROGUE_percent20WS_FINAL.pdf)

<sup>9</sup> Mote, P., E. Salathe, V. Duliere, and E. Jump. 2008. *Scenarios of Future Climate for the Pacific Northwest*. Climate Impacts Group, University of Washington. March. Retrieved June 16, 2009, from <http://cses.washington.edu/db/pdf/moteetal2008scenarios628.pdf>; Littell, J.S., M. McGuire Elsner, L.C. Whitely Binder, and A.K. Snover (eds). 2009. "The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate - Executive Summary." In *The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate*, Climate Impacts Group, University of Washington. Retrieved June 16, 2009, from [www.cses.washington.edu/db/pdf/wacciaexecsummary638.pdf](http://www.cses.washington.edu/db/pdf/wacciaexecsummary638.pdf); Madsen, T. and E. Figdor. 2007. *When it Rains, it Pours: Global Warming and the Rising Frequency of Extreme Precipitation in the United States*. Environment America Research & Policy Center and Frontier Group.; and Mote, P.W. 2006. "Climate-driven variability and trends in mountain snowpack in western North America." *Journal of Climate* 19(23): 6209-6220.

These anticipated changes point toward some of the ways that climate change is likely to impact ecological systems and the goods and services they provide. There is considerable uncertainty about how long it would take for some of the impacts to materialize, and the magnitude of the associated economic consequences. Assuming climate change proceeds as today's models predict, however, some of the potential economic impacts of climate change in the Pacific Northwest will likely include:<sup>10</sup>

## Potential impact on agriculture and forestry

Climate change may impact Oregon's agriculture through changes in: growing season, temperature ranges, and water availability. <sup>11</sup> Climate change may impact Oregon's forestry through increase in wildfires, decrease in the rate of tree growth, change in mix of tree species, and increases in disease and pests that damage trees. <sup>12</sup>

## Potential impact on tourism and recreation

Impacts on tourism and recreation may range from: (1) decreases in snow-based recreation if snow-pack in the Cascades decreases, (2) negative impacts to tourism along the Oregon Coast as a result of damage and beach erosion from rising sea levels<sup>13</sup>, (3) negative impacts on availability of water summer river recreation (e.g., river rafting or sports fishing) as a result of lower summer river flows, and (4) negative impacts on the availability of water for domestic and business uses.

## Temperature

Temperatures in Lincoln County are generally moderate<sup>14</sup>. The temperature in the Coastal Lowlands during the coldest winter months usually maintains a temperature around 36 to 50 degrees Fahrenheit. The summer months are warmer, in July the temperature in the coastal lowlands is between 52 and 68 degrees Fahrenheit. Table C-2 below describes the typical average temperatures during winter and summer with a mean annual rainfall amount for each sub-eco-region in Lincoln County. Temperatures generally increase inland to the east.

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<sup>10</sup> The issue of global climate change is complex and there is a substantial amount of uncertainty about climate change. This discussion is not intended to describe all potential impacts of climate change but to present a few ways that climate change may impact the economy of cities in Oregon and the Pacific Northwest.

<sup>11</sup> "The Economic Impacts of Climate Change in Oregon: A preliminary Assessment," Climate Leadership Initiative, Institute for Sustainable Environment, University of Oregon, October 2005.

<sup>12</sup> "Economic Impacts of Climate Change on Forest Resources in Oregon: A Preliminary Analysis," Climate Leadership Initiative, Institute for Sustainable Environment, University of Oregon, May 2007.

<sup>13</sup> "The Economic Impacts of Climate Change in Oregon: A preliminary Assessment," Climate Leadership Initiative, Institute for Sustainable Environment, University of Oregon, October 2005.

<sup>14</sup> Economic Development Alliance of Lincoln County. (2014). General information on Lincoln County. Retrieved from [http://www.coastbusiness.info/general\\_info.htm](http://www.coastbusiness.info/general_info.htm)

**Table C-2 Mean Precipitation and Temperature**

<b>Ecoregion</b>	<b>Mean Annual Rainfall Range (inches)</b>	<b>Mean Temperature Range (°F) January min/max</b>	<b>Mean Temperature Range (°F) July min/max</b>
Coastal Lowlands	60-85	36/50	52/68
Coastal Uplands	70-125	36/48	52/68
Volcanics	70-200	30/46	50/76
Mid-Coastal Sedimentary	60-130	32/48	48/78

Source: US EPA. Ecoregions of Oregon: [http://www.epa.gov/wed/pages/ecoregions/or\\_eco.htm](http://www.epa.gov/wed/pages/ecoregions/or_eco.htm)

## Precipitation and Snowpack

Lincoln County receives relatively high levels of precipitation when compared to Oregon as a whole, Oregon receives a mean annual precipitation amount of 37 to 50 inches, and Lincoln County's mean annual precipitation data indicates higher than average precipitation levels. In the lower elevations or coastal lowlands the normal annual precipitation is between 65 and 85 inches, while in the coastal uplands and inner areas precipitation rises precipitation levels are regularly over 85 inches annually. (See Figure C-2). November, December, and January are the rainiest months for which special attention should be paid to flood events during that time. In some locations, flood control dams have greatly reduced the incidence of damaging floods<sup>15</sup>.

Snowpack is scarce in the county and the area usually only receives one to three inches annually; however, elevations above 3,500 feet are prone to snowfall that occasionally lasts into late spring<sup>16</sup>. For example, in January of 1982, Laurel Mountain (elevation 3,589') received 55 inches of snow. At Mary's Peak (elevation 4,097'), the highest peak in the Coast Range, snow often lasts into May.<sup>17</sup>

## Projected Climate

The impacts of climate change in Oregon are largely driven by temperature and precipitation. Temperatures in the Pacific Northwest increased 1.3° Fahrenheit (F) over the historical period (1895-2011 observed period). Over the last 30 years, temperatures in Oregon have generally been above the 20th century average. The average annual temperatures in all but two years since 1998 have been above the average annual temperatures for the 20th century. Within the same historical time period, annual precipitation amounts fall within the normal range of natural annual variability.<sup>18</sup> Temperatures in the Pacific Northwest region increased in the 20th Century by about 1.5° F. Climate projection models indicate that temperatures could increasingly rise by an average

<sup>15</sup> Oregon Climate Service. (2014). Climate of Lincoln County. Retrieved from [http://www.ocs.oregonstate.edu/county\\_climate/Lincoln\\_files/Lincoln.html#top](http://www.ocs.oregonstate.edu/county_climate/Lincoln_files/Lincoln.html#top).

<sup>16</sup> Economic Development Alliance of Lincoln County. (2014). General information on Lincoln County. Retrieved from [http://www.coastbusiness.info/general\\_info.htm](http://www.coastbusiness.info/general_info.htm)

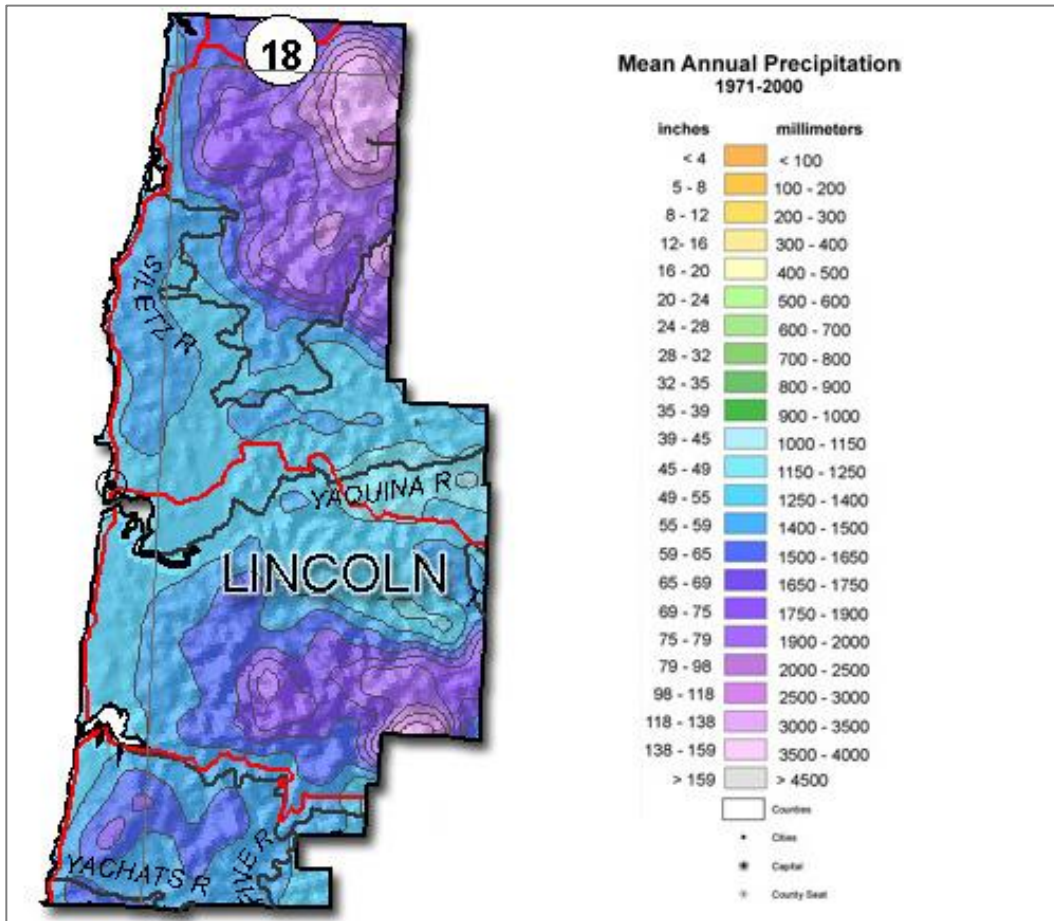
<sup>17</sup> Oregon Climate Service. (2014). Climate of Lincoln County. Retrieved from [http://www.ocs.oregonstate.edu/county\\_climate/Lincoln\\_files/Lincoln.html#top](http://www.ocs.oregonstate.edu/county_climate/Lincoln_files/Lincoln.html#top).

<sup>18</sup> Department of Land Conservation and Development. (2014). 2015 Oregon Natural Hazard Mitigation Plan. Retrieved from [http://www.oregon.gov/LCD/HAZ/docs/2\\_State\\_Risk\\_Assessment.pdf](http://www.oregon.gov/LCD/HAZ/docs/2_State_Risk_Assessment.pdf)

of 0.2° F to 1.0° F per decade. Average temperature change is projected to be 3.2° F by 2040 and 5.3° F by 2080. Temperature increases will occur throughout all seasons, with the greatest differences occurring in the summer months.<sup>19</sup>

Strong winds strike the Oregon Coast occasionally, in advance of winter storms. Wind speeds can exceed hurricane force, and in rare cases have caused significant damage to structures or vegetation. Damage is most likely at exposed coastal locations, but it may extend into inland valleys as well<sup>20</sup>.

**Figure C-2 Lincoln County Mean Annual Precipitation**



Source: Oregon Climate Service

## Synthesis

The physical geography, weather, climate, and land cover of an area represent various interrelated systems that affect overall risk and exposure to natural hazards.

Abundant rainfall during winter, several rivers across the county, topography, storm with strong winds and waves, climate change's impacts in the coast, land uses such as logging

<sup>19</sup> Climate Impacts Group, "Climate Change," <http://ces.washington.edu/cig/pnwc/cc.shtml#anchor6>, accessed February 2013.

<sup>20</sup> Oregon Climate Service. (2014). Climate of Lincoln County. Retrieved from [http://www.ocs.oregonstate.edu/county\\_climate/Lincoln\\_files/Lincoln.html#top](http://www.ocs.oregonstate.edu/county_climate/Lincoln_files/Lincoln.html#top).

and livestock. These factors combined with periods of population growth and development intensification can lead to increasing risk of hazards, threatening loss of life, property and long-term economic disruption if land management is inadequate.

High winds are also among the most destructive weather events in Oregon; they are especially common in the exposed coastal regions and in the mountains of the Coast Range. From unofficial, but reliable observations, it is reasonable to assume that gusts well above 100 mph occur several times each year across the higher ridges of the Coast and Cascades Ranges. At the most exposed Coast Range ridges, it is estimated, that wind gusts of up to 150 mph and sustained speeds of 110 mph will occur every five to ten years. Debris carried along by extreme winds can directly contribute to loss of life and indirectly to the failure of protective building envelope components. Upon impact, wind-driven debris can rupture a building, allowing more significant positive and internal pressures. When severe windstorms strike a community, downed trees, powerlines, and damaged property are major hindrances to response and recovery.<sup>21</sup>

In broad terms, climate in the Pacific Northwest is characterized by variability, and that variability is largely dominated by the interaction between the atmosphere and ocean in the tropical Pacific Ocean that is responsible for El Niño and La Niña. Human activities are changing the climate, particularly temperature, beyond natural variability. Climate change is already affecting Oregon communities and resources, and needs to be recognized in various planning efforts as an important stressor that significantly influences the incidence—and in some cases the location—of natural hazards and hazard events. Climate change is anticipated to affect the frequency and/or magnitude of some kinds of natural hazards in Oregon. On the coast, increasing deep-water wave heights in recent decades are likely to have increased the frequency of coastal flooding and erosion. In Oregon’s forested areas, large areas have been impacted by disturbances that include wildfire in recent years, and climate change is probably one major factor. Closer to home for some Oregonians, a three-fold increase in heat-related illness has been documented in Oregon with each 10 °F rise in daily maximum temperature. (Dalton et al 2013, OCCRI 2010).<sup>22</sup>

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<sup>21</sup> Oregon Natural Hazards Mitigation Plan (NHMP).

<sup>22</sup> Ibid

## Social/Demographic Capacity

Social/demographic capacity is a significant indicator of community hazard resilience. The characteristics and qualities of the community population such as language, race and ethnicity, age, income, educational attainment, and health are significant factors that can influence the community's ability to cope, adapt to and recover from natural disasters. Population vulnerabilities can be reduced or eliminated with proper outreach and community mitigation planning.

### Population

Lincoln County is composed of seven incorporated municipalities and two census designated places. A substantial portion of the county's population resides in unincorporated areas administered by Lincoln County. Lincoln County experienced modest population growth between 2012 and 2018 (Table C-3).

Lincoln County accounts for roughly 1% of Oregon's population. Newport and Lincoln City are the county's largest cities at roughly 10,000 people for Newport and 9,000 for Lincoln City. Toledo is the third largest city with about a third of the population of the two larger cities (approximately 3,500). The unincorporated area of the county accounts for about 42% of the overall population (20,340) and is growing faster than the incorporated cities (0.8% AAGR). The rural unincorporated area of Lincoln County has a dispersed population, largely located near the coastline, of over 17,000 people.

**Table C-3 Population Estimates and Change (2012 and 2018)**

Jurisdiction	2012		2018		Change (2012-2018)		AAGR
	Number	Percent	Number	Percent	Number	Percent	
Lincoln County	46,295	1%	48,210	1%	1,915	4%	0.7%
<b>Incorporated</b>	<b>26,950</b>	<b>58%</b>	<b>27,870</b>	<b>58%</b>	<b>920</b>	<b>3%</b>	<b>0.6%</b>
Depoe Bay	1,400	3%	1,440	3%	40	3%	0.5%
Lincoln City	7,965	17%	8,730	18%	765	10%	1.5%
Newport	10,150	22%	10,125	21%	-25	0%	0.0%
Siletz	1,225	3%	1,235	3%	10	1%	0.1%
Toledo	3,465	7%	3,490	7%	25	1%	0.1%
Waldport	2,040	4%	2,105	4%	65	3%	0.5%
Yachats	705	2%	745	2%	40	6%	0.9%
<b>Unincorporated</b>	<b>19,345</b>	<b>42%</b>	<b>20,340</b>	<b>42%</b>	<b>995</b>	<b>5%</b>	<b>0.8%</b>
Lincoln Beach CDP	1,982	4%	1,810	4%	-172	-9%	-1.5%
Rose Lodge CDP	1,819	4%	1,359	3%	-460	-25%	-4.7%
Other Unincorporated	15,544	34%	17,171	36%	1,627	10%	1.7%

Source: Portland State University, Population Research Center, "Annual Population Estimates", 2018. U.S. Census Bureau, 2018 and 2012 American Community Survey 5-Year Estimates.

### Tourists

Tourists are not counted in population statistics; and are therefore considered separately in this analysis. Table C-4 below shows the estimated number of person nights in private homes, hotels and motels, and other types of accommodations. The table shows that, between 2016-2018, approximately 13% of all visitors to Lincoln County lodged in private homes, with 53% staying in hotels/motels, the remaining visitors stay on other

accommodations (vacation homes/campgrounds). Tourists' lodging in hotels/motels suggests the prevalence of coastal tourism. For hazard preparedness and mitigation purposes, outreach to residents in Lincoln County will likely be transferred to these visitors in some capacity. Visitors staying at hotel/motels are less likely to benefit from local preparedness outreach efforts aimed at residents.

**Table C-4 Annual Visitor Estimates in Person Nights**

	2016		2017		2018	
	Person-Nights (000's)	Percent	Person-Nights (000's)	Percent	Person-Nights (000's)	Percent
<b>All Overnight</b>	4,981	100%	4,971	100%	5,029	100%
Hotel/Motel	2,644	53%	2,633	53%	2,672	53%
Private Home	625	13%	624	13%	634	13%
Other	1,712	34%	1,714	34%	1,723	34%

Source: Oregon Tourism Commission, Oregon Travel Impacts: 1991-2018p, Dean Runyan Associates

Tourists are specifically vulnerable due to the difficulty of locating or accounting for travelers within the region. Tourists are often at greater risk during a natural disaster because of unfamiliarity with evacuation routes, communication outlets, or even the type of hazard that may occur. Knowing whether the region's visitors are staying in friends/relative's homes in hotels/motels, or elsewhere can be instructive when developing outreach efforts.

## Vulnerable Populations

Vulnerable populations include those with access and functional needs and include may include seniors, disabled citizens, women, and children, as well those people living in poverty, often experience the impacts of natural hazards and disasters more acutely. Vulnerability exists for migrant short-term workers for fish processing plants in Lincoln County. Hazard mitigation that targets the specific needs of these groups has the potential to greatly reduce their vulnerability. Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural hazards identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

Population size itself is not an indicator of vulnerability. More important is the location, composition, and capacity of the population within the community. Research by social scientists demonstrates that human capital indices such as language, race, age, income, education and health can affect the integrity of a community. Therefore, these human capitals can impact community resilience to natural hazards.

Additional information on vulnerable populations is available via Lincoln County Public Health's [Community Health Assessment](#) and [Strategic Plan](#).



## Language Barriers

Special consideration should be given to populations who do not speak English as their primary language. Language barriers can be a challenge when disseminating hazard planning and mitigation resources to the general public, and it is less likely they will be prepared if special attention is not given to language and culturally appropriate outreach techniques.

There are various languages spoken across Lincoln County; the primary language is English. Approximately 8% of the Lincoln County population speaks a language other than English, and about 3% of the population is not proficient in English (Table C-5). Lincoln City (5%) and Newport (6%) have the highest percentage of residents who have limited or no English language proficiency. Outreach materials used to communicate with, plan for, and respond to non-English speaking populations should take into consideration the language needs of these populations. The Lincoln County School District reports over 24 languages spoken within the District including Spanish, Mam, Akateko, Kanjobal, and Nahuatl.

**Table C-5 Lincoln County Language Spoken at Home**

Jurisdiction	Population 5 years and over	English Only		Multiple Languages		Limited or No English	
		Number	Percent	Number	Percent	Number	Percent
<b>Lincoln County</b>	44,990	41,488	92%	3,502	8%	1,131	3%
<b>Incorporated</b>	26,868	23,904	89%	2,964	11%	1,028	4%
Depoe Bay	1,739	1,570	90%	169	10%	0	0%
Lincoln City	7,963	6,970	88%	993	12%	367	5%
Newport	9,695	8,106	84%	1,589	16%	611	6%
Siletz	1,403	1,371	98%	32	2%	14	1%
Toledo	3,325	3,261	98%	64	2%	0	0%
Waldport	2,109	2,066	98%	43	2%	4	< 1%
Yachats	634	560	88%	74	12%	32	5%
<b>Unincorporated</b>	18,122	17,584	97%	538	3%	103	1%
Lincoln Beach	1,546	1,464	95%	82	5%	37	2%
Rose Lodge	1,436	1,376	96%	60	4%	6	< 1%
Other Unincorporated	15,140	14,744	97%	396	3%	60	< 1%

Source: Social Explorer, U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Table 16001.

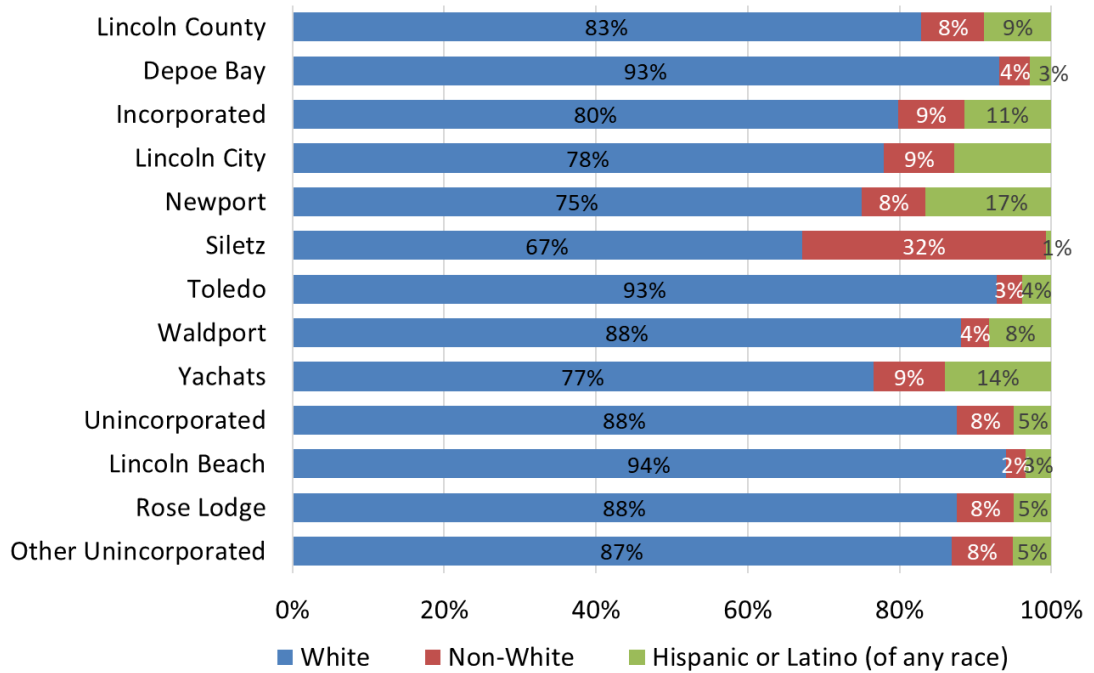
## Race and Ethnicity

The impact in terms of loss and the ability to recover may also vary among minority population groups following a disaster. Studies have shown that racial and ethnic minorities can be more vulnerable to natural disaster events. This is not reflective of individual characteristics; instead, historic patterns of inequality along racial or ethnic divides have often resulted in minority communities that are more likely to have inferior building stock, degraded infrastructure, or less access to public services. Figure C-3 displays Lincoln County's population by race and Hispanic or Latino ethnicity.

Most of the population in Lincoln County is racially white (83%); Siletz and the other incorporated areas of the County have the largest percentages of non-white population. About 32% of Siletz, and approximately 9% of Lincoln City, Newport, and Yachats are Hispanic or Latino. About 17% of Siletz' population is American Indian, overall the County includes approximately 1,348 American Indians (2% of the population). The Confederated

Tribes of Siletz' Indians include a population of approximately 675 on their Reservation and off-Reservation Trust lands, 57% identify as American Indian.

**Figure C-3 White, Non-White, and Hispanic or Latino**



Source: Social Explorer, Table T14, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

It is important to identify specific ways to support all portions of the community through hazard mitigation, preparedness, and response. Culturally appropriate, and effective outreach can include both methods and messaging targeted to diverse audiences. For example, connecting to historically disenfranchised populations through already trusted sources or providing preparedness handouts and presentations in the languages spoken by the population will go a long way to increasing overall community resilience.

## Gender

Lincoln County has slightly more females than males (Female 52%, Male: 48%). Yachats, (64%), Siletz (55%), and Newport (55%) have the highest female to male ratios comprising their populations.<sup>23</sup> It is important to recognize that women tend to have more institutionalized obstacles than men during recovery due to sector-specific employment, lower wages, and family care responsibilities.

## Age

Of the factors influencing socio demographic capacity, the most significant indicator in Lincoln County may be age of the population. Depicted in Table C-6 as of 2017, 26% of the county population is over the age of 64, a percentage that is projected to rise to 31% by 2040. The Lincoln County age dependency ratio is 67.6 (Yachats has the largest age

<sup>23</sup> Social Explorer, U.S. Census Bureau, 2013-2017 American Community Survey Estimates Table A02002.

dependency ratio at 138.1). The age dependency ratio indicates a higher percentage of dependent aged people to that of working age. The age dependency ratio for Lincoln County is expected to rise to 77.5 in 2040, largely because of the rise in the older age cohorts (population 65+, 31% in 2040). With a higher age-dependency ratio there will be fewer people of working age who can support mitigation and recovery from a natural disaster. In addition, as the population ages, the County may need to consider different mitigation and preparedness actions to address the specific needs of this group.

**Table C-6 Population by Vulnerable Age Groups, 2017 and 2040 Forecast**

Jurisdiction	Total	< 15 Years Old		> 64 Years Old		15 to 64 Years Old	Age Dependency Ratio
		Number	Percent	Number	Percent		
<b>2017</b>							
<b>Lincoln County</b>	47,307	6,814	14%	12,271	26%	28,222	67.6
<b>Incorporated</b>	28,477	4,445	16%	6,971	24%	17,061	66.9
Depoe Bay	1,760	94	5%	628	36%	1,038	69.6
Lincoln City	8,541	1,354	16%	2,153	25%	5,034	69.7
Newport	10,274	1,705	17%	2,399	23%	6,170	66.5
Siletz	1,526	263	17%	235	15%	1,028	48.4
Toledo	3,514	607	17%	631	18%	2,276	54.4
Waldport	2,200	353	16%	610	28%	1,237	77.8
Yachats	662	69	10%	315	48%	278	138.1
<b>Unincorporated</b>	18,830	2,369	13%	5,300	28%	11,161	68.7
Lincoln Beach CDP	1,571	109	7%	723	46%	739	112.6
Rose Lodge CDP	1,478	155	10%	367	25%	956	54.6
Other Unincorporated	15,781	2,105	13%	4,210	27%	9,466	66.7
<b>2040</b>							
<b>Oregon</b>	5,398,800	904,800	17%	1,192,233	22%	3,301,767	63.5
<b>Lincoln County</b>	54,004	7,075	13%	16,511	31%	30,418	77.5

Source: Social Explorer, U.S. Census Bureau, 2013-2017 American Community Survey Estimates Table A01001. Portland State University, Population Research Center, "Population Forecasts", 2017.

The age profile of an area has a direct impact both on what actions are prioritized for mitigation and how response to hazard incidents is carried out. School age children rarely make decisions about emergency management. Therefore, a larger youth population in an area will increase the importance of outreach to schools and parents on effective ways to teach children about fire safety, earthquake response, and evacuation plans. Furthermore, children are more vulnerable to the heat and cold, have few transportation options and require assistance to access medical facilities. Older populations may also have special needs prior to, during and after a natural disaster. Older populations may require assistance in evacuation due to limited mobility or health issues. Additionally, older populations may require special medical equipment or medications, and can lack the social and economic resources needed for post-disaster recovery.

## Families and Living Arrangements

Two ways the census defines households are by type of living arrangement and family structure. A householder may live in a "family household" (a group related to one another by birth, marriage or adoption living together); in a "nonfamily household" (a group of unrelated people living together); or alone. Table C-7 shows that Lincoln County is

predominately comprised of family households (60%). Of all households, 32% are one-person non-family households (householder living alone). Countywide about 16% of householders live alone and are age 65 or older.

**Table C-7 Household by Type, Including Living Alone**

Jurisdiction	Total Households	Family Households		Householder Living Alone		Householder Living Alone (age 65+)	
	Estimate	Estimate	Percent	Estimate	Percent	Estimate	Percent
<b>Lincoln County</b>	20,674	12,372	60%	6,598	32%	3,347	16%
<b>Incorporated</b>	12,364	7,183	58%	4,171	34%	2,165	18%
Depoe Bay	856	502	59%	329	38%	169	20%
Lincoln City	3,785	2,086	55%	1,298	34%	728	19%
Newport	4,520	2,573	57%	1,605	36%	774	17%
Siletz	541	366	68%	152	28%	69	13%
Toledo	1,348	924	69%	312	23%	135	10%
Waldport	970	558	58%	326	34%	184	19%
Yachats	344	174	51%	149	43%	106	31%
<b>Unincorporated</b>	8,310	5,189	62%	2,427	29%	1,182	14%
Lincoln Beach CDP	849	386	45%	416	49%	239	28%
Rose Lodge CDP	690	349	51%	245	36%	81	12%
Other Unincorporated	6,771	4,454	66%	1,766	26%	862	13%

Source: Social Explorer, Table 165, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

Table C-8 shows household structures for families with children. Nearly 11% of all households within the county are married family households that have children. Siletz (18%) and Newport (12%) have the highest percentage of single-parent households. These populations will likely require additional support during a disaster and will inflict strain on the system if improperly managed.

**Table C-8 Married-Couple and Single Parent Families with Children**

Jurisdiction	Total Households Estimate	Married-Couple with Children		Single Parent with Children	
		Estimate	Percent	Estimate	Percent
<b>Lincoln County</b>	20,674	2,208	11%	1,886	9%
<b>Incorporated</b>	12,364	1,372	11%	1,288	10%
Depoe Bay	856	60	7%	33	4%
Lincoln City	3,785	430	11%	352	9%
Newport	4,520	527	12%	522	12%
Siletz	541	66	12%	100	18%
Toledo	1,348	205	15%	154	11%
Waldport	970	76	8%	99	10%
Yachats	344	8	2%	28	8%
<b>Unincorporated</b>	8,310	836	10%	598	7%
Lincoln Beach CDP	849	5	1%	58	7%
Rose Lodge CDP	690	90	13%	41	6%
Other Unincorporated	6,771	741	11%	499	7%

Source: U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Table DP02.

## Income

Household income and poverty status are indicators of socio demographic capacity and the stability of the local economy. Household income can be used to compare economic areas but does not reflect how the income is divided among the area residents. Table C-9 shows the distribution of household income for 2012 and 2017.

**Table C-9 Household Income**

Household Income	2012 <sup>^</sup>		2017		Change in Share	
	Households	Percent	Households	Percent	Households	Percent
<b>Less than \$15,000</b>	3,153	15%	2,857	14%	-296	-1.2%
<b>\$15,000-\$29,999</b>	4,106	20%	4,497	22%	391	2.2%
<b>\$30,000-\$44,999</b>	3,216	15%	3,335	16%	119	0.8%
<b>\$45,000-\$59,999</b>	2,559	12%	2,888	14%	329	1.8%
<b>\$60,000-\$74,999</b>	2,204	10%	1,978	10%	-226	-0.9%
<b>\$75,000-\$99,999</b>	2,433	12%	2,255	11%	-178	-0.7%
<b>\$100,000-\$199,999</b>	2,922	14%	2,427	12%	-495	-2.1%
<b>\$200,000 or more</b>	445	2%	437	2%	-8	0.0%

Source: Social Explorer, Table 56, U.S. Census Bureau, 2013-2017 American Community Survey and 2008-2012 American Community Survey.

Note: <sup>^</sup> - 2012 dollars adjusted for 2017 via Social Explorer's Inflation Calculator

Countywide, between 2012 and 2017 all income cohorts increased or decreased to differing degrees. For example, the share of households making more than \$15,000-\$29,000 increased from 20% 22% while households making \$100,000-\$199,999 decreased from 14% to 12%. For the same period the share of total households remained relatively stable for all

income cohorts, although there was movement at the poorer and wealthier ends of the range.

The 2017 median household income across Lincoln County is \$43,291; this is lower than the inflation adjusted 2012 figure, representing a 4% decrease in real incomes (Table C-10). Depoe Bay has the highest median household income while Lincoln City has the lowest median household income (but the largest gain). The Table C-11 below shows decreases and gains, in real incomes, across most of Lincoln County.

**Table C-10 Median Household Income**

Jurisdiction	Median Household Income		Percent Change
	2012 <sup>^</sup>	2017	
<b>Lincoln County</b>	\$44,960	\$43,291	-4%
<b>Incorporated</b>	\$41,209	\$41,676	1%
<b>Depoe Bay</b>	\$46,444	\$53,150	14%
<b>Lincoln City</b>	\$31,781	\$37,898	19%
<b>Newport</b>	\$50,606	\$39,870	-21%
<b>Siletz</b>	\$39,813	\$39,044	-2%
<b>Toledo</b>	\$48,422	\$48,281	0%
<b>Waldport</b>	\$38,422	\$45,000	17%
<b>Yachats</b>	\$45,388	\$43,125	-5%
<b>Unincorporated</b>	\$57,623	\$38,429	-33%
<b>Lincoln Beach CDP</b>	\$56,596	\$38,859	-31%
<b>Rose Lodge CDP</b>	\$63,492	\$37,935	-40%

Source: Social Explorer, Table 57, U.S. Census Bureau, 2013-2017 American Community Survey Estimates and 2008-2012 American Community Survey Estimates.

Note: <sup>^</sup> - 2012 dollars adjusted for 2017 via Social Explorer's Inflation Calculator

Table C-11 identifies the percentage of individuals and cohort groups that are below the poverty level in 2017. It is estimated that about 18% of individuals, 30% of children under 18, and 8% of seniors live below the poverty level across the county. Siletz (24%) and Lincoln City (23%) have the highest total population poverty rates. All cities, except for Depoe Bay, have poverty rates of 30% to 36% for children under 18. Lincoln City (15%) has the highest poverty rate for adults age 65 and older.

Affluent communities are more likely to have both the collective and individual capacity to more quickly rebound from a hazard event, while impoverished communities and individuals may not have this capacity –leading to increased vulnerability. Wealth can help those affected by hazard incidents to absorb the impacts of a disaster more easily. Conversely, poverty, at both an individual and community level, can drastically alter recovery time and quality.<sup>24</sup>

<sup>24</sup> Statewide Supplemental Nutrition Assistance Program Activity - Nov. 2014 (SSP, APD, and AAA combined); P. 3 of report. Temporary Assistance for Needy Families One and two Parent Families Combined; P. 3 of report. <http://www.oregon.gov/dhs/assistance/Pages/data/main.aspx>

**Table C-II Poverty Rates**

	Total Population in Poverty		Children Under 18 in Poverty		18 to 64 in Poverty		65 or over in Poverty	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<b>Lincoln County</b>	8,578	18%	2,418	30%	5,153	19%	1,007	8%
<b>Incorporated</b>	5,565	20%	1,630	31%	3,188	20%	747	11%
Depoe Bay	194	11%	15	12%	124	12%	55	9%
Lincoln City	1,963	23%	439	30%	1,216	25%	308	15%
Newport	1,944	19%	649	32%	1,093	19%	202	9%
Siletz	363	24%	113	30%	221	24%	29	12%
Toledo	665	19%	252	34%	337	16%	76	12%
Waldport	345	16%	134	32%	143	12%	68	11%
Yachats	91	14%	28	36%	54	20%	9	3%
<b>Unincorporated</b>	3,013	16%	788	29%	1,965	18%	260	5%
Lincoln Beach CDP	159	10%	10	9%	143	19%	6	1%
Rose Lodge CDP	273	18%	34	18%	202	22%	37	10%
Other Unincorporated	2,581	17%	744	30%	1,620	18%	217	5%

Source: Social Explorer Tables 114, 115, 116, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

Federal assistance programs such as food stamps are another indicator of poverty or lack of resource access. Statewide social assistance programs like the Supplemental Nutritional Assistance Program (SNAP) and Temporary Assistance for Needy Families (TANF) aid individuals and families. In Lincoln County, TANF reaches approximately 265 families per month and SNAP helps to feed about 9,698 people per month.<sup>25</sup> Those reliant on state and federal assistance are more vulnerable in the wake of disaster because of a lack of personal financial resources and reliance on government support.

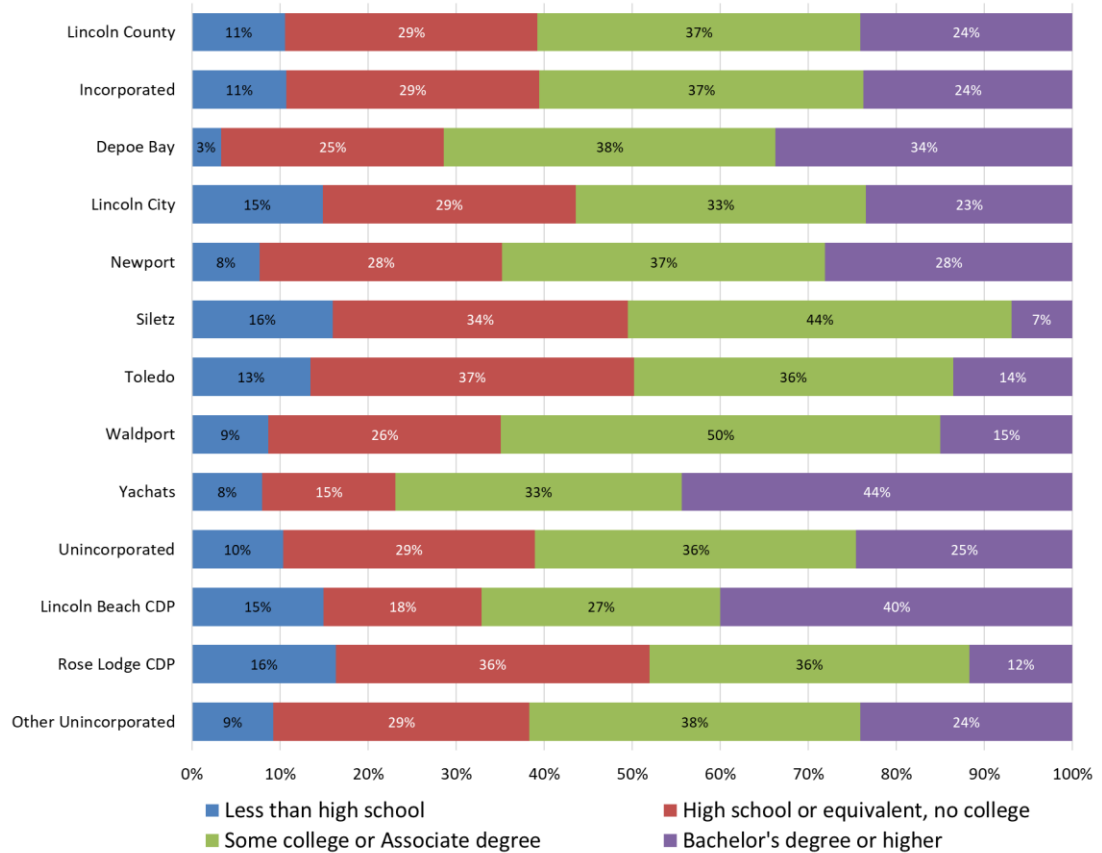
## Education

Educational attainment of community residents is also identified as an influencing factor in socio demographic capacity. Educational attainment often reflects higher income and therefore higher self-reliance. Widespread educational attainment is also beneficial for the regional economy and employment sectors as there are potential employees for professional, service and manual labor workforces. An oversaturation of either highly educated residents or low educational attainment can have negative effects on the resiliency of the community.

Approximately 11% of the Lincoln County population over 25 years does not have a high school degree or equivalent, while 29% have a high school degree or equivalent but do not have college experience. An additional 37% have some college or an Associate degree and 24% have earned a bachelor's degree or higher (Figure C-4). Siletz and the unincorporated areas have the lowest percentages of high school graduates. Yachats and Lincoln Beach have the highest percentages of people with a bachelor's degree or higher.

<sup>25</sup> Sabatino, J. (2016). Oregon TANF Caseload FLASH, "One and Two Parent Families Combined", District 15; February 2018 data, and Sabatino, J. (2018). Oregon SNAP Program Activity, "SSP, APD and AAA Combined", District 15; February 2018 data. Retrieved from State of Oregon Office of Business Intelligence website: <http://www.oregon.gov/DHS/ASSISTANCE/Pages/Data.aspx>, accessed March 21, 2018.

**Figure C-4 Educational Attainment**



Source: Social Explorer, Table 25, U.S. Census Bureau, 2013-2017 American Community Survey Estimates

## Health

Individual and community health play an integral role in community resiliency, as indicators such as health insurance, people with disabilities, dependencies, homelessness and crime rate paint an overall picture of a community’s well-being. These factors translate to a community’s ability to prepare, respond to, and cope with the impacts of a disaster.

The Resilience Capacity Index recognizes those who lack health insurance or are impaired with sensory, mental or physical disabilities, have higher vulnerability to hazards and will likely require additional community support and resources. Lincoln County has 12% of its population without health insurance; Depoe Bay (17%) and Toledo (14%) have the highest percentages (Table C-12). The percentage of uninsured changes with age, the highest rates of uninsured are within the 18 to 64-year cohort; Depoe Bay, Toledo, and Lincoln City have



about 15% of this age cohort that is uninsured. The ability to provide services to the uninsured populations may burden local providers following a natural disaster.

**Table C-12 Health Insurance Coverage**

Jurisdiction	Total Population	Without Health Insurance							
		Total		Under 18 years		18 to 64 years		65+	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
<b>Lincoln County</b>	46,983	5,498	12%	634	1%	4,823	10%	41	<1%
<b>Incorporated</b>	28,162	3,137	11%	298	1%	2,798	10%	41	<1%
Depoe Bay	1,760	302	17%	36	2%	266	15%	0	0%
Lincoln City	8,476	1,058	12%	48	1%	976	12%	34	<1%
Newport	10,024	924	9%	125	1%	799	8%	0	0%
Siletz	1,526	165	11%	31	2%	134	9%	0	0%
Toledo	3,514	487	14%	42	1%	445	13%	0	0%
Waldport	2,200	143	7%	6	0%	137	6%	0	0%
Yachats	662	58	9%	10	2%	41	6%	7	1%
<b>Unincorporated</b>	18,821	2,361	13%	336	2%	2,025	11%	0	0%
Lincoln Beach CDP	1,571	62	4%	0	0%	62	4%	0	0%
Rose Lodge CDP	1,478	388	26%	58	4%	330	22%	0	0%
Other Unincorporated	15,772	1,911	12%	278	2%	1633	10%	0	0%

Source: Social Explorer, Table 146, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

Table C-13 describes disability status of the population. Approximately 22% of the Lincoln County civilian non-institutionalized population identifies with one or more disabilities. Waldport and Siletz have the highest percentage of their total population with a disability (33% and 32%), as well as individuals under 18 and 65 years and older with a disability.

**Table C-13 Disability Status by Age Group**

Jurisdiction	Population Estimate <sup>^</sup>	With a disability		Under 18 years with a disability		65 years and over with a disability	
		Estimate	Percent	Estimate	Percent**	Estimate	Percent**
<b>Lincoln County</b>	46,983	10,186	22%	549	7%	4,750	39%
<b>Incorporated</b>	28,162	5,878	21%	349	7%	2,563	37%
Depoe Bay	1,760	369	21%	4	3%	166	26%
Lincoln City	8,476	1,784	21%	74	5%	808	39%
Newport	10,024	1,544	15%	29	1%	741	31%
Siletz	1,526	482	32%	43	11%	138	59%
Toledo	3,514	819	23%	83	11%	322	51%
Waldport	2,200	718	33%	116	28%	287	47%
Yachats	662	162	24%	0	0%	101	32%
<b>Unincorporated</b>	18,821	4,308	23%	200	7%	2,187	41%
Lincoln Beach CDP	1,571	373	24%	0	0%	263	36%
Rose Lodge CDP	1,478	415	28%	9	5%	248	68%
Other Unincorporated	15,772	3,520	22%	191	8%	1,676	40%

Source: Social Explorer, U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Table B18101.

Notes: <sup>^</sup> Non-institutionalized civilian population, \*\* Percent of age group

Table C-14 displays disability status of the population by type and age. Older populations tend to have more disabilities than younger populations in Lincoln County. Approximately 23% of the population 65 and over has an ambulatory disability, 18% have a hearing disability, and 12% have an independent living disability. Depending on the type of disability outreach, mitigation, and response efforts may need to be adjusted.

**Table C-14 Disability Type by Age Group – Lincoln County**

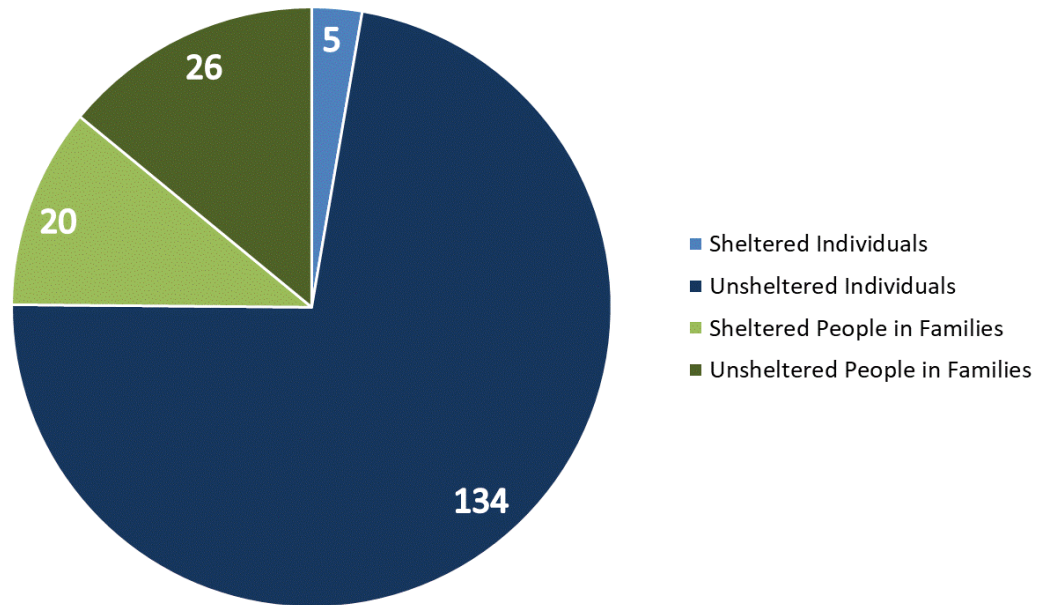
	Hearing Disability	Vision Disability	Cognitive Disability	Ambulatory Disability	Self-Care Disability	Independent Living Disability
Total Population^	7%	3%	8%	12%	4%	9%
Under 18*	1%	1%	7%	<1%	1%	-
18 to 64*	19%	3%	8%	10%	3%	8%
65 and over*	18%	7%	9%	23%	8%	12%

Source: Social Explorer, U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Tables B18102 through B18106.

Notes: ^ Non-institutionalized civilian population age 5 years and older, except for Independent Living Disability which is age 18 years and older., \* Percent of age group

In 2017, Oregon Housing and Community Services (OHCS) conducted a point-in-time homeless count to identify the number of homeless, their age and their family type. As Figure C-5 displays, the OHCS study found that 185 individuals and persons in families in Lincoln County identify as homeless; 25 people, were sheltered (5 individuals and 20 persons in families), and 160 people, were unsheltered (134 individuals and 26 persons in families).

**Figure C-5 Lincoln County PIT Homeless Count (2017)**



Source: Oregon Housing and Community Services, 2017 Point-in-Time Homeless Count

The homeless have little resources to rely on, especially during an emergency. It will likely be the responsibility of the county, cities, and local non-profit entities to provide services such as shelter, food and medical assistance. Therefore, it is critical to foster collaborative

relationships with agencies that will provide additional relief such as the American Red Cross and homeless shelters. It will also be important to identify how to communicate with these populations, since traditional means of communication may not be appropriate or available.

## Household Characteristics – Vehicles Available

Countywide 8% of all occupied households, and 17% of renter-occupied households, have no vehicle available (Table C-15). The percentage of all households without a vehicle available is greatest in Waldport (17%) and Yachats (16%); for renter occupied households the percentage is greatest in Waldport (39%), Yachats (35%), Toledo (24%), and Lincoln City (22%). Household access to a vehicle is key to evacuating quickly and safely. Households that have no access to a vehicle or limited vehicles available may face delays, or need assistance, to evacuate. Lincoln County Transit District provides service to communities throughout Lincoln County to adjacent transit networks in Tillamook, Benton, Yamhill, and Lane counties.

**Table C-15 Vehicles Available (All Households and Renter Occupied)**

Jurisdiction	Occupied Housing			Renter Occupied Housing		
	Housing Units	No Vehicle (Percent)	One Vehicle (Percent)	Housing Units	No Vehicle (Percent)	One Vehicle (Percent)
<b>Lincoln County</b>	20,674	8%	37%	7,529	17%	45%
<b>Incorporated</b>	12,364	10%	41%	5,770	19%	47%
Depoe Bay	856	3%	38%	307	7%	46%
Lincoln City	3,785	13%	45%	2,000	22%	49%
Newport	4,520	8%	46%	2,220	13%	54%
Siletz	541	5%	40%	194	9%	51%
Toledo	1,348	10%	26%	533	24%	26%
Waldport	970	17%	26%	363	39%	26%
Yachats	344	16%	42%	153	35%	44%
<b>Unincorporated</b>	8,310	4%	32%	1,759	10%	39%
Lincoln Beach CDP	849	5%	57%	185	13%	67%
Rose Lodge CDP	690	11%	36%	187	21%	25%
Other Unincorporated	6,771	3%	28%	1,387	9%	37%

Source: Social Explorer, Tables 182 and 199, U.S. Census Bureau, 2013-2017 American Community Survey Estimates

## Synthesis

Socio demographic capacity is a significant indicator of county hazard resiliency. Lincoln County is not the largest county in the state of Oregon, in terms of population. With 46,983 residents, resiliency and hazard mitigation efforts can be a lot harder to manage. The characteristics and qualities of the community population such as age, race, education, income, and health and safety are significant factors that can influence the county’s ability to cope, adapt to, and recover from natural disasters. The current status of socio demographic capacity indicators can have long term impacts on the economy and stability ultimately affecting future resiliency of Lincoln County.

One important thing to consider is that there are several residents who are not proficient in English. Language barriers will often make it difficult to reach populations of residents who don’t speak English. Resiliency efforts need to focus on targeting these populations as they

will be most vulnerable and may have trouble knowing what to do in the event of a disaster. It is also important to think about the county's population in terms of its age groups; it is important to cater information towards each of these populations individually, as it is necessary to be able to reach out to all age groups. In 2017, the percentage of residents age 65 and older was 26%; by 2040, that percentage is expected to increase to 31%. While disasters don't affect certain age groups more than others, information can be dispersed and catered depending on who may be the most vulnerable.

Lincoln County socio-economic factors to consider include:

- The median household income across the county has increased to \$43,291. "Real" median household incomes are decreasing in all unincorporated communities.
- 18% of the population is considered in poverty; the rates are highest in Siletz and Lincoln City.
- Children in poverty is greatest in Yachats, Toledo, Waldport, and Newport.
- 22% of the population has a disability, 39% of this population is 65 years or older

Highlighting the above socio-economic factors and looking at the Socio Demographic Capacity of the county is important as it affects the resiliency of the county and helps determine target areas and potential vulnerable populations for increased notification on mitigation and resiliency efforts.

## Economic Capacity

Economic capacity refers to the financial resources present and revenue generated in the community to achieve a higher quality of life. Income equality, housing affordability, economic diversification, employment and industry are measures of economic capacity. However, economic resilience to natural disasters is far more complex than merely restoring employment or income in the local community. Building a resilient economy requires an understanding of how the component parts of employment sectors, workforce, resources and infrastructure are interconnected in the existing economic picture. Once any inherent strengths or systematic vulnerabilities become apparent, both the public and private sectors can act to increase the resilience of the local economy.

## Regional Affordability

The evaluation of regional affordability supplements the identification of social/demographic capacity indicators, i.e. median income, and is a critical analysis tool to understanding the economic status of a community. This information can capture the likelihood of individuals' ability to prepare for hazards, through retrofitting homes or purchasing insurance. If the community reflects high-income inequality or housing cost burden, the potential for homeowners and renters to implement mitigation can be drastically reduced. Therefore, regional affordability is a mechanism for generalizing the abilities of community residents to get back on their feet without Federal, State or local assistance.

## Income Equality

Income equality is a measure of the distribution of economic resources, as measured by income, across a population. It is a statistic defining the degree to which all persons have a similar income. The table below illustrates the county and cities level of income inequality. The Gini index is a measure of income inequality. The index varies from zero to one. A value of one indicates perfect inequality (only one household has any income). A value of zero indicates perfect equality (all households have the same income).<sup>26</sup>

Table C-16 shows that the countywide income inequality coefficient is 0.44. The areas of greatest income inequality are Yachats (0.46), Stafford (0.45), and the unincorporated communities (0.53, 0.54). The areas of greatest income equality are Siletz (0.35), and Waldport (0.37). Based on social science research, the region's cohesive response to a hazard event may be affected by the distribution of wealth in communities that have less income equality<sup>27</sup>.

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<sup>26</sup>University of California Berkeley. Building Resilient Regions, Resilience Capacity Index. <http://brr.berkeley.edu/rci/>.

<sup>27</sup> Susan Cutter, Christopher G. Burton, and Christopher T. Emrich. 2010. "Disaster Resilience Indicators for Benchmarking Baseline Conditions," *Journal of Homeland Security and Emergency Management* 7, no.1: 1-22

**Table C-16 Regional Income Inequality**

<b>Jurisdiction</b>	<b>Income Inequality Coefficient</b>
<b>Lincoln County</b>	0.44
<b>Depoe Bay</b>	0.41
<b>Newport</b>	0.44
<b>Lincoln City</b>	0.40
<b>Siletz</b>	0.35
<b>Toledo</b>	0.45
<b>Waldport</b>	0.37
<b>Yachats</b>	0.46
<b>Lincoln Beach CDP</b>	0.53
<b>Rose Lodge CDP</b>	0.54

Source: Social Explorer, Table 157, U.S. Census Bureau, 2013-2017 American Community Survey Estimates

## Housing Affordability

Housing affordability is a measure of economic security gauged by the percentage of an area’s households paying less than 30% of their income on housing.<sup>28</sup> Households spending more than 30% are considered housing cost burdened. Table C-17 displays the percentage of homeowners and renters reflecting housing cost burden across the region.

Countywide roughly 23% of homeowners with a mortgage have a housing cost burden, compared to over 47% of renters. The communities of Depoe Bay (39%), “Other” unincorporated areas (39%), Lincoln Beach (27%), Waldport (26%), and Yachats (25%) have the highest rates of owners with a mortgage with a housing cost burden. Amongst renters, Yachats, Lincoln City, and Lincoln Beach have more than 50% with a housing cost burden. In general, the population that spends more of their income on housing has proportionally fewer resources and less flexibility for alternative investments in times of crisis.<sup>29</sup> This disparity imposes challenges for a community recovering from a disaster as housing costs may exceed the ability of local residents to repair or move to a new location. These populations may live paycheck to paycheck and are extremely dependent on their employer, in the event their employer is also impacted it will further the detriment experienced by these individuals and families.

<sup>28</sup> University of California Berkeley. Building Resilient Regions, Resilience Capacity Index. <http://brr.berkeley.edu/rci/>.

<sup>29</sup> Ibid.

**Table C-17 Households Spending > 30% of Income on Housing**

Jurisdiction	Owners		Renters
	With Mortgage	Without Mortgage	
<b>Lincoln County</b>	23%	6%	47%
<b>Incorporated</b>	41%	17%	47%
Depoe Bay	39%	8%	38%
Lincoln City	23%	9%	50%
Newport	20%	9%	46%
Siletz	12%	8%	47%
Toledo	20%	6%	41%
Waldport	26%	0%	49%
Yachats	25%	16%	59%
<b>Unincorporated</b>	41%	11%	46%
Lincoln Beach CDP	27%	1%	61%
Rose Lodge CDP	19%	8%	38%
Other Unincorporated	39%	12%	45%

Source: Social Explorer, Tables 103 and 109, U.S. Census Bureau, 2013-2017 American Community Survey Estimates.

## Economic Diversity

Economic diversity is a general indicator of an area's fitness for weathering difficult financial times. One method for measuring economic diversity is through use of the Herfindahl Index, a formula that compares the composition of county and regional economies with those of states or the nation. Using the Herfindahl Index, a diversity ranking of 1 indicates the county with the most diverse economic activity compared to the state, while a ranking of 36 corresponds with the least diverse county economy. The table below describes the Herfindahl Index Scores for counties in the region.

Table C-18 shows that Lincoln County has an economic diversity rank of 33 as of 2016, this is on a scale between all 36 counties in the state where 1 is the most diverse economic county in Oregon and 36 is the least diverse. The county's ranking has risen from 30 since 2013.

**Table C-18 Regional Herfindahl Index Scores**

County	2013			2016		
	Employment	Number of Industries	State Rank	Employment	Number of Industries	State Rank
Lincoln	13,491	179	30	14,023	182	33
Benton	25,247	201	21	27,115	198	22
Tillamook	6,687	150	24	7,469	148	24

Source: Oregon Employment Department

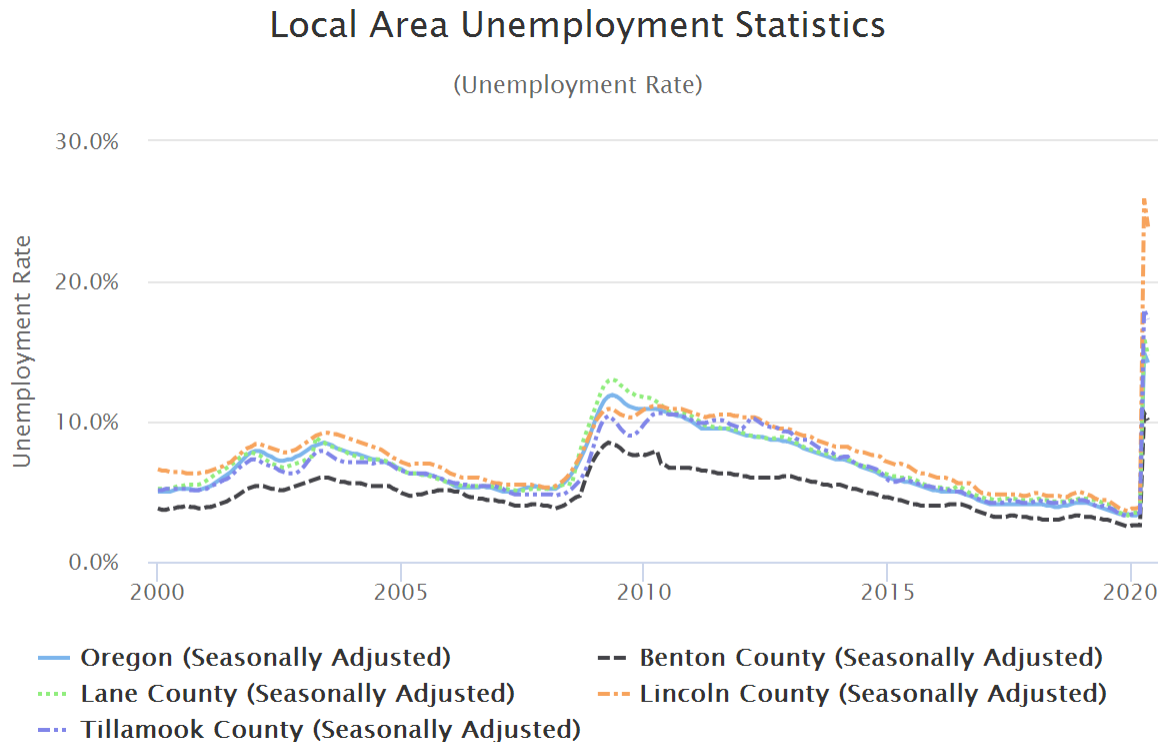
While illustrative, economic diversity is not a guarantor of economic vitality or resilience. Lincoln County, as of March 2019, is listed as an economically distressed community as prescribed by Oregon Law. The economic distress measure is based on indicators of

decreasing new jobs, average wages and income, and is associated with an increase of unemployment.<sup>30</sup>

## Employment and Wages

According to the Oregon Employment Department (Figure C-6), unemployment in Lincoln County has declined since 2009 but remains at a rate similar to but still higher than the State of Oregon and other counties in the region. Note: there has been a spike in unemployment related to the COVID-19 pandemic.

**Figure C-6 Unemployment Rate**



Source: Oregon Employment Department Qualityinfo.org  
Source: Oregon Employment Department, "Local Area Employment Statistics", Qualityinfo.org .

## Labor and Commute Shed

Most hazards can happen at any time during the day or night. It may be possible to give advance warning to residents and first responders who can take immediate preparedness and protection measures, but the variability of hazards is one part of why they can have such varied impact. A snowstorm during the workday will have different impacts than one that comes during the night. During the day, a hazard has the potential to segregate the population by age or type of employment (e.g., school children at school, office workers in downtown areas). This may complicate some aspects of initial response such as transportation or the identification of wounded or missing. Conversely, a hazard at midnight may occur when most people are asleep and unable to receive an advance warning through

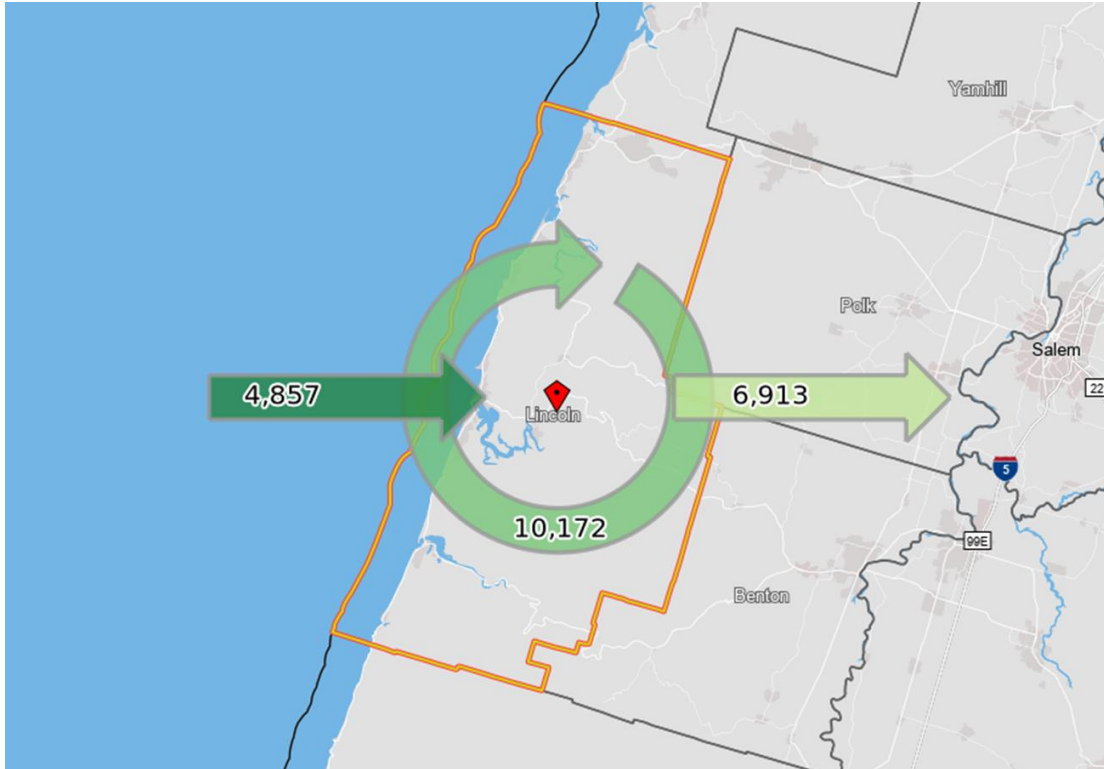
<sup>30</sup> Business Oregon – Oregon Economic Data "Distressed Communities List", <http://www.oregon4biz.com/Publications/Distressed-List/>



typical communication channels. The following labor shed and commute shed analysis is intended to document where county residents work and where people who work in Lincoln County reside.

Lincoln County employers draw in more than 4,857 workers from outside the county. The Lincoln County economy is a cornerstone of regional economic vitality. Figure C-7 shows the county's laborshed; the map shows that about 46% of workers live and work in the county (10,172), 22% of workers come from outside the county (4,857), and about 32% of residents work outside of the county (6,913).

**Figure C-7 Lincoln County Laborshed**



Source: U.S. Bureau of the Census, [On The Map](#).

Table C-19 shows where workers commute to, who reside in Lincoln County. Of 18,704 jobs, approximately two-thirds of Lincoln County employed residents work inside of the County; 7% work in Multnomah County, 6% in Marion County, and 5% work in Washington County.

**Table C-19 Commute Shed (Where Workers are Employed who Live in Lincoln County), 2016**

Jurisdiction	Number of Jobs	Share
All Jurisdictions	18,704	100%
Lincoln County, OR	11,144	59.6%
Multnomah County, OR	1,346	7.2%
Marion County, OR	1,149	6.1%
Washington County, OR	979	5.2%
Clackamas County, OR	562	3.0%
Linn County, OR	507	2.7%
Benton County, OR	470	2.5%
Clark County, WA	268	1.4%
Clatsop County, OR	265	1.4%
Tillamook County, OR	264	1.4%
All Other Locations	1,750	9.4%

Source: U.S. Bureau of the Census, [On The Map](#).

Table C-20 shows where workers live who work in Lincoln County. Approximately 67% of Lincoln County workers live inside of the County; 4% live in Lane County, 3% in Benton County, and 3% live in Marion County.

**Table C-20 Labor Shed (Where Workers Live who are Employed in Lincoln County), 2016**

Jurisdiction	Number of Jobs	Share
All Jurisdictions	16,527	100%
Lincoln County, OR	11,144	67.4%
Lane County, OR	703	4.3%
Benton County, OR	467	2.8%
Marion County, OR	444	2.7%
Linn County, OR	412	2.5%
Multnomah County, OR	402	2.4%
Tillamook County, OR	302	1.8%
Washington County, OR	302	1.8%
Yamhill County, OR	252	1.5%
Clackamas County, OR	235	1.4%
All Other Locations	1,864	11.3%

Source: U.S. Bureau of the Census, [On The Map](#).

Workers can be impacted during a disaster to varying levels based upon their means of transportation to work. Commuters who use motorized vehicles and public transportation that rely upon maintained roads, bridges, and other infrastructure may be delayed or unable to travel if infrastructure is impacted during an event (for example, earthquakes or heavy winter storms). Table C-21 shows that 86% of Lincoln County commuters utilized motorized vehicles (cars, trucks, vans, or motorcycles) and an additional 2% use public transportation.

5% of commuters bike or walk to work, and 7% work from home. Yachats (17%), Lincoln City (9%), Siletz (8%), and “other” unincorporated (8%) have the highest percentage of workers who work from home.

**Table C-21 Means of Transportation to Work**

Jurisdiction	Workers (16 and older)	Motorized Vehicle <sup>^</sup> (Percent)	Public Transportation (Percent)	Bike/Walked (Percent)	Other (Percent)	Worked at Home (Percent)
<b>Lincoln County</b>	18,471	86%	2%	5%	1%	7%
<b>Incorporated</b>	11,533	83%	2%	8%	1%	6%
Depoe Bay	855	85%	2%	5%	<1%	7%
Lincoln City	3,433	78%	3%	10%	<1%	9%
Newport	4,416	84%	2%	8%	1%	5%
Siletz	513	88%	3%	1%	0%	8%
Toledo	1,420	90%	1%	3%	3%	4%
Waldport	699	90%	0%	8%	0%	2%
Yachats	197	65%	0%	18%	0%	17%
<b>Unincorporated</b>	6,938	90%	1%	2%	1%	8%
Lincoln Beach CDP	443	92%	2%	1%	0%	5%
Rose Lodge CDP	554	94%	5%	0%	0%	2%
Other Unincorporated	5,941	89%	1%	2%	1%	8%

Source: Social Explorer, Table 128, U.S. Census Bureau, 2013-2017 American Community Survey Estimates

Notes: ^ - includes car, truck, van, or motorcycle

Mitigation activities are needed at the business level to ensure the health and safety of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from all over the surrounding area to industrial and business centers. As daily transit rises, there is an increased risk that a natural hazard event will disrupt the travel plans of residents across the region and seriously hinder the ability of the economy to meet the needs of Lincoln County residents and businesses.

## Industry

Key industries are those that represent major employers and are significant revenue generators. Different industries face distinct vulnerabilities to natural hazards, as illustrated by the industry specific discussions below. Identifying key industries in the region enables communities to target mitigation activities towards those industries’ specific sensitivities. It is important to recognize that the impact that a natural hazard event has on one industry can reverberate throughout the regional economy.

This is of specific concern when the businesses belong to the basic sector industry. Basic sector industries are those that are dependent on sales outside of the local community; they bring money into a local community via employment. The farm and ranch, information, and wholesale trade industries are all examples of basic industries. Non-basic sector industries are those that are dependent on local sales for their business, such as retail trade, construction, and health services.

## Employment by Industry

Economic resilience to natural disasters is particularly important for the major employment industries in the region. If these industries are negatively impacted by a natural hazard, such that employment is affected, the impact will be felt throughout the regional economy. Thus, understanding and addressing the sensitivities of these industries is a strategic way to increase the resiliency of the entire regional economy.

Table C-22 identifies Employment by industry. The industry sectors in Lincoln County with the highest percentage of the workforce are Other Services (25%), Trade, Transportation & Utilities (18%), Local Government (17%), Retail Trade (15%), and Leisure and Hospitality (11%).

**Table C-22 Total Non-Farm Employment by Industry 2018, Expected Growth 2024**

Employment Sector	2018				Percent Change in Employment (2014-2018)	Employment Forecast* (2017-2027)
	Firms	Employees	Percent Workforce	Average Wage		
<b>Total Payroll Employment</b>	<b>1,916</b>	<b>18,515</b>	<b>100%</b>	<b>\$38,608</b>	<b>6.2%</b>	<b>7%</b>
<b>Total Private</b>	<b>1,792</b>	<b>14,804</b>	<b>80%</b>	<b>\$35,263</b>	<b>8.7%</b>	<b>8%</b>
Natural Resources and Mining	80	306	2%	\$52,370	-1.6%	5%
Construction	175	814	4%	\$44,604	22.6%	13%
Manufacturing	57	1,098	6%	\$59,689	-3.0%	5%
Trade, Transportation & Utilities	364	3,358	18%	\$30,063	3.0%	4%
Wholesale Trade	37	162	1%	\$51,678	11.7%	1%
Retail Trade	277	2,855	15%	\$27,526	2.6%	4%
Information	51	341	2%	\$41,039	2.1%	2%
Financial Activities	26	149	1%	\$39,158	-19.9%	5%
Professional and Business Services	126	615	3%	\$41,207	10.6%	15%
Education and Health Services	204	1,055	6%	\$39,765	10.8%	11%
Leisure and Hospitality	122	2,117	11%	\$50,000	26.0%	10%
Other Services	329	4,658	25%	\$23,057	10.1%	4%
Private Non-Classified	296	620	3%	\$24,232	-3.9%	-
Unclassified	11	14	0%	\$128,705	-	-
<b>Government</b>	<b>125</b>	<b>3,711</b>	<b>20%</b>	<b>\$51,953</b>	<b>-2.9%</b>	<b>4%</b>
Federal	20	319	2%	\$78,122	-3.3%	-1%
State	21	292	2%	\$56,399	-59.4%	7%
Local	84	3,100	17%	\$48,842	11.8%	4%
Tribal Government	6	1,019	6%	\$40,042	-1.0%	-

Source: Oregon Employment Department, "2014 and 2018 Covered Employment and Wages Summary Reports" and "Regional Employment Projections by Industry & Occupation 2017-2027". <http://www.qualityinfo.org>.

Basic industries encourage growth in non-basic industries and bring wealth into communities from outside markets. However, a high dependence on basic industries can lead to severe difficulties when recovering from a natural disaster if vital infrastructure or primary resource concentrations have been greatly damaged. While Lincoln County has some basic industries, such as Trade and Leisure Hospitality, five out of the six largest industrial sectors are of the non-basic nature and thus they rely on local sales and services. Trending towards basic industries can lead to higher community resilience.

## High Revenue Sectors

Table C-23 shows the revenue generated by each reported economic sector (not all sectors are reported). In 2012, the three sectors with the highest revenue, each with revenues over \$10 million, were Real Estate, Transportation and Warehousing, and Professional/Scientific services. All the reported sectors combined generated more than \$98.81 million in revenue for the county in 2012.

**Table C-23 Revenue of Top Sectors in Lincoln County 2007 and 2012**

Sector Meaning (NAICS code)	Firms		Sector Revenue		Percent Change in Revenue (2007 to 2012)
	2007	2012	2007 <sup>^</sup> (\$1,000)	2012 (\$1,000)	
Wholesale trade	598	563	\$5,858,741	\$5,388,581	-8%
Manufacturing	619	553	\$6,274,736	\$5,371,545	-14.4%
Retail trade	1,269	1,188	\$5,641,022	\$5,125,309	-9.1%
Health care and social assistance	963	1,136	\$1,884,376	\$2,424,207	28.6%
Professional, scientific, and technical services	1,238	1,231	\$0	\$1,215,906	-
Accommodation and food services	775	777	\$672,441	\$637,512	-5.2%
Administrative and support and waste management and remediation services	644	616	\$530,543	\$522,126	-1.6%
Transportation and warehousing(104)	-	276	-	\$491,387	-
Real estate and rental and leasing	693	564	\$623,345	\$451,887	-27.5%
Arts, entertainment, and recreation	147	150	\$120,817	\$104,327	-13.6%
Educational services	81	100	\$73,487	\$39,646	-46.1%
Utilities	-	16	-	Q	-
Information	167	165	\$0	N	-
Finance and insurance	-	700	-	N	-
Other services (except public administration)	660	677	\$348,086	D	-
<b>Total</b>	<b>7,854</b>	<b>8,712</b>	<b>\$22,027,594</b>	<b>\$21,772,433</b>	<b>-1.2%</b>

Source: U.S. Census Bureau, 2007 and 2012 Economic Census, Table EC1200A1.

<sup>^</sup> 2007 dollars are adjusted for 2012 using the Social Explorer Inflation Calculator.

Lincoln County relies on both basic and non-basic sector industries and it is important to consider the effects each may have on the economy following a disaster. Basic sector businesses have a multiplier effect on a local economy that can spur the creation of new jobs, some of which may be non-basic. The presence of basic sector jobs can help speed the local recovery; however, if basic sector production is hampered by a natural hazard event, the multiplier effect could be experienced in reverse. In this case, a decrease in basic sector purchasing power results in lower profits and potential job losses for the non-basic businesses that are dependent on them.

If any of these primary sectors are impacted by a disaster, Lincoln County may experience a significant disruption of economic productivity.

## Future Employment in Industry

Table C-22 shows that between 2014 and 2018, the sectors that experienced the largest percent growth were Leisure and Hospitality (26%), Construction (23%), Local Government (12%), Wholesale Trade (12%), and Education and Health Services (11%). Some of these sectors often require more training and education, while others require less education and have lower wages.

Sectors that are anticipated to be major employers in the future also warrant special attention in the hazard mitigation planning process. Table C-22 shows that, between 2017

and 2027, the largest employment growth in the region is anticipated within Professional and Business Services (15%), Construction (13%), Education and Health Services (11%), and Leisure and Hospitality (10%). Mitigation activities that respond to the needs of these sectors may help to ensure the resilience of the economy and help the community stay open for business following a disaster.

## **Synthesis**

Regional economic capacity refers to the present financial resources and revenue generated in the community to achieve a higher quality of life. Forms of economic capital include income equality, housing affordability, economic diversifications, employment, and industry. The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families, and the county to absorb disaster impacts for a quick recovery.

The current and anticipated financial conditions of a community are strong determinants of community resilience, as a strong and diverse economic base increases the ability of individuals, families and the community to absorb disaster impacts for a quick recovery. The county's economy is expected to grow by 2027. It is important to consider what might happen to the county economy if the largest revenue generators and employers are impacted by a disaster. Strategies and actions to reduce vulnerability from an economic focus are imperative and should focus on risk management for the county's dominant industries.

Several industries, including Construction, Professional and Business Services, and Other Services, saw significant increases in employment from 2014 to 2018. While relying heavily on its top revenue-producing industries, real estate, transportation and warehousing, and professional/scientific services, it is important for the county to consider the economic impacts that affect its residents in the event of a disaster. Strategies and actions to reduce vulnerability from an economic focus are imperative and should focus on risk management for the county's dominant industries.

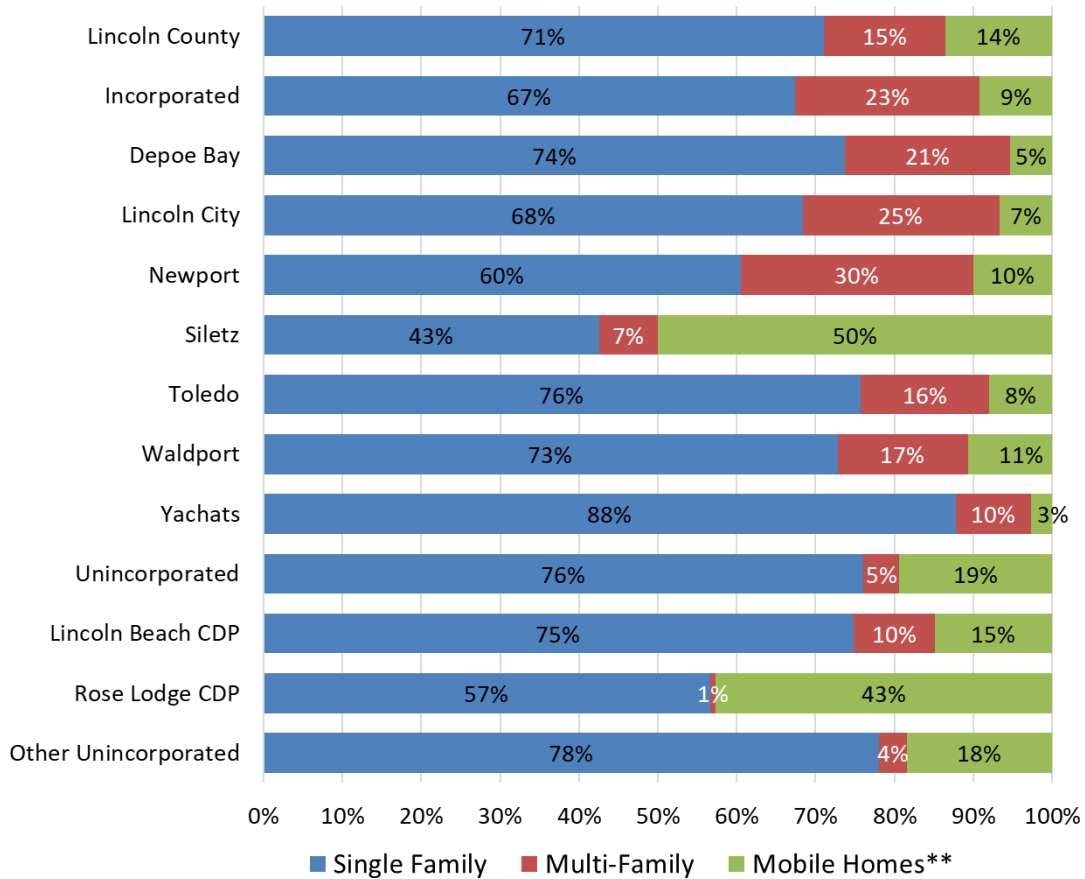
# Physical Infrastructure Capacity

Physical infrastructure capacity refers to the built environment and infrastructure that supports the community. The various forms, quantity, and quality of built capital mentioned above contribute significantly to community resilience. Physical infrastructures, including utility and transportation lifelines, are critical during a disaster and are essential for proper functioning and response. The lack or poor condition of infrastructure can negatively affect a community’s ability to cope, respond and recover from a natural disaster.

## Housing

The Figure C-8 below identifies the types of housing most common throughout the county. Of interest are mobile homes, which account for about 14% of the housing countywide; and a full 50% in Siletz and 43% in the Rose Lodge CDP. Mobile homes are particularly vulnerable to certain natural hazards, such as windstorms, and special attention should be given to securing the structures, because they are more prone to wind damage than wood-frame construction. In other natural hazard events, such as earthquakes and floods, moveable structures like mobile homes are more likely to shift on their foundations and create hazardous conditions for occupants.

**Figure C-8 Housing Profile**



Source: Social Explorer, Table 97, U.S. Census Bureau, 2013-2017 American Community Survey

Aside from location and type of housing, the year structures were built has implications. In the 1970's, FEMA began assisting communities with floodplain mapping as a response to administer the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Upon receipt of floodplain maps, communities started to develop floodplain management ordinances to protect people and property from flood loss and damage. Housing within the floodplain is generally less vulnerable to flood if it was built after the implementation of floodplain development ordinances.

The National Flood Insurance Program's (NFIP's) Flood Insurance Rate Maps (FIRMs) delineate flood-prone areas. They are used to assess flood insurance premiums and to regulate construction so that in the event of a flood, damage minimized. The current FIRMs were developed for Lincoln County as part of a FEMA RiskMAP program. For more information about the flood hazard, NFIP, and FIRMs, please refer to Flood Hazard section of the Risk Assessment.

Seismic building standards were codified in Oregon building code starting in 1974; more rigorous building code standards were passed in 1993 that accounted for the Cascadia earthquake fault.<sup>31</sup> Therefore, homes built before 1993 are more vulnerable to seismic events. DOGAMI's interpretation of state building code histories and evolution as described by Judson (2012), Oregon Building Codes Division (2002, 2010) and Business Oregon (2015) is shown in Table C-24.

**Table C-24 Oregon's Seismic Design Level Benchmark Years**

Building Type	Year Built	Design Level	Basis
Single Family Dwelling (including Duplexes)	prior to 1976	Pre Code	Interpretation of Judson (2012)
	1976-1991	Low Code	
	1992-2003	Moderate Code	
	2004-present	High Code	
Manufactured Housing	prior to 2003	Pre Code	Interpretation of Oregon Manufactured Dwelling Special Codes (Oregon Building Codes Division, 2002)
	2003-2010	Low Code	Interpretation of Oregon Manufactured Dwelling Special Codes Update (Oregon Building Codes Division, 2010)
	2011-present	Moderate Code	
All other buildings	prior to 1976	Pre Code	Interpretation of Oregon Benefit-Costs Analysis Tool (Business Oregon, 2015, p. 24)
	1976-190	Low Code	
	1991-present	Moderate Code	

Source: DOGAMI, Lower Columbia-Sandy Watershed Natural Hazard Risk Report (March 2018 Draft), Table 10.1.

The Oregon Department of Geology and Mineral Industries (DOGAMI) conducted a multi-hazard risk assessment (DOGAMI, [O-20-11](#)) for Lincoln County including the unincorporated communities. The study was funded through the FEMA Risk MAP program and was published in 2020. The Risk Report provides a quantitative risk assessment that informs communities of their risks related to the following natural hazards: Cascadia Subduction Zone earthquake, flooding, landslide susceptibility, coastal erosion, and wildfire.

<sup>31</sup> State of Oregon Building Codes Division. *Earthquake Design History: A summary of Requirements in the State of Oregon*, February 7, 2012. [http://www.oregon.gov/OMD/OEM/osspace/docs/history\\_seismic\\_codes\\_or.pdf](http://www.oregon.gov/OMD/OEM/osspace/docs/history_seismic_codes_or.pdf)



Within the Risk Report DOGAMI assigned a seismic design level to each building within the County, summarized the number of buildings and building value as shown in Table C-25.

**Table C-25 Building Statistics by Seismic Design Level**

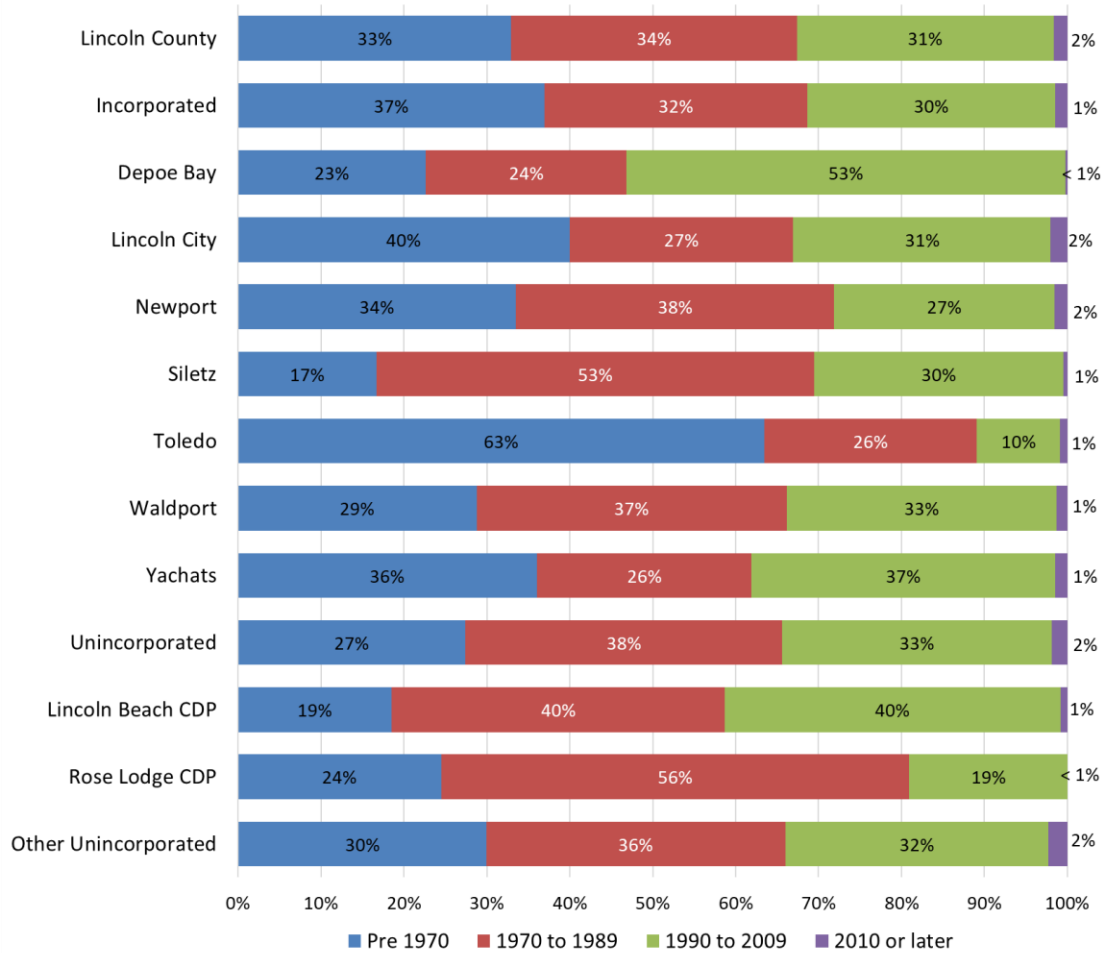
Community	Total Number of Buildings	Pre Code		Low Code		Moderate Code		High Code	
		#	%	#	%	#	%	#	%
<b>Total Lincoln County</b>	<b>42,052</b>	<b>23,313</b>	<b>55%</b>	<b>7,469</b>	<b>18%</b>	<b>7,203</b>	<b>17%</b>	<b>4,067</b>	<b>10%</b>
<b>Incorporated</b>	<b>19,228</b>	<b>11,119</b>	<b>58%</b>	<b>3,113</b>	<b>16%</b>	<b>3,005</b>	<b>16%</b>	<b>1,991</b>	<b>10%</b>
Depoe Bay	1,337	566	42%	294	22%	316	24%	161	12%
Lincoln City	6,687	3,664	55%	1,020	15%	1,252	19%	751	11%
Newport	5,602	3,516	63%	872	16%	601	11%	613	11%
Siletz	716	402	56%	180	25%	110	15%	24	3%
Siletz Tribe	184	164	89%	13	7%	6	3%	1	1%
Toledo	1,954	1,385	71%	226	12%	285	15%	58	3%
Waldport	1,698	932	55%	308	18%	277	16%	181	11%
Yachats	1,050	490	47%	200	19%	158	15%	202	19%
<b>Unincorporated</b>	<b>22,824</b>	<b>12,194</b>	<b>53%</b>	<b>4,356</b>	<b>19%</b>	<b>4,198</b>	<b>18%</b>	<b>2,076</b>	<b>9%</b>
Unincorp. County (rural)	12,637	7,199	57%	2,206	17%	2,318	18%	914	7%
Otis - Rose Lodge	1,747	1,078	62%	322	18%	256	15%	91	5%
Otter Rock	634	381	60%	89	14%	97	15%	67	11%
Salishan - Lincoln Beach	2,847	1,246	44%	788	28%	636	22%	177	6%
Seal Rock - Bayshore	3,345	1,282	38%	804	24%	660	20%	599	18%
Wakonda Beach	1,614	1,008	62%	147	9%	231	14%	228	14%

Source: DOGAMI, Natural Hazard Risk Report for Lincoln County (O-20-11).

Figure C-9 shows that, countywide, 33% of the housing stock was built prior to 1970, before the implementation of floodplain management ordinances; Toledo has over one-half of its housing units built prior to 1970.

Countywide, 67% of the housing stock was built before 1990 and the codification of stricter seismic building standards (Table C-24). Lincoln City (2%), Newport (2%), and the “other” unincorporated areas (2%) have had the largest percent growth since 2010.

**Figure C-9 Year Structure Built**



Source: U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Table B25034

## Infrastructure Profile

Physical infrastructure such as dams, roads, bridges, railways, and airports support Lincoln County communities and economies. Critical facilities are those facilities that are vital in government response and recovery activities and are important to consider as there can be serious secondary impacts to such facilities when disrupted. Critical facilities and infrastructure can be a wide range of things depending on the social, environmental, economic, and physical makeup of the area under consideration. Such facilities can include emergency services, communication services, transportation systems, government facilities, healthcare and public health facilities, information technology, water services, and energy generation and transmission. Due to the fundamental role that infrastructure plays both pre- and post-disaster, special attention in the context of creating more resilient communities is important. The information provided in this section will outline important infrastructures throughout the county which will help provide a basis for informed decisions about how to reduce the county’s infrastructural vulnerabilities to natural hazards.

## Utility Lifelines

Utility lifelines are the resources that the public relies on daily such as, electricity, fuel and communication lines. If these lines fail or are disrupted, the essential functions of the community can become severely impaired. Utility lifelines are closely related to physical infrastructures, like dams and power plants, as they transmit the power generated from these facilities.

Northwest Natural has a high-pressure transmission pipeline that traverses the northern half of Lincoln County. The pipeline enters the county along Highway 18, turns south along the eastern edge of Devils Lake, cuts over the mountains to Siletz and proceeds south to Toledo. In Toledo the pipeline serves the paper mill for their processing, turns west, and terminates at the liquid natural gas (LNG) plant in Yaquina Bay.

This pipeline serves the residential and industrial gas needs in northern Lincoln County, and the LNG Plant. The LNG Plant was originally built to serve as an export facility, to load onto ships for transport across the Pacific. This market never developed, so the plant is now used for peak-shaving as an overflow capacity storage facility. In the summer months, Northwest Natural sends gas south to the plant for storage during low demand periods. In the winter, gas is pressurized and placed back in the pipeline to travel north to Salem and Portland to handle additional demands for gas heating and cooking and other needs that peak during the winter months.

Lincoln County has 11 rural water districts serving areas of Beverly Beach, Car-Mel Beach, Devils Lake (2), Kernville, Lower Siletz, Otter Rock, Panther Creek, Roads End, Seal Rock, and Southwest Lincoln. Pipelines often are in or near the public road right-of-way.

## Energy Generation

Oregon is one of the nation's leading generators of hydroelectric power, ranking second, after Washington, in net electricity generation from conventional hydroelectric power in 2013. In 2013, 70% of Oregon's net electricity generation was from conventional hydroelectric power plants and other renewable energy resources. Oregon's abundant hydroelectric power contributes to residential electricity prices that are well below the national median.<sup>32</sup>

There are no major energy producing dams in the Oregon Coast region. A biomass facility in Toledo operated by The Georgia-Pacific Toledo Mill generates approximately 31.8 MW of net summer energy capacity production utilizing forest product materials.

### *Lincoln County Power Generation*

Consumers Power, Inc., Central Lincoln People's Utility District (PUD), and Pacific Power provide electrical service to Lincoln County. Consumers Power is a privately owned non-profit rural electric cooperative with approximately 16,000 members in six counties including eastern Lincoln County. Central Lincoln PUD is the largest PUD in Oregon, with over 30,000 residential customers and over 5,000 commercial customers. Pacific Power is a for profit utility serving parts of Oregon (including the Lincoln City area), Washington, and California. Powerlines are generally above ground suspended between wooden single poles

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<sup>32</sup> US Energy Information Administration. July 2014. <http://www.eia.gov/state/?sid=OR>

fixed with cross arm and post insulators, and perhaps at least one wooden H-frame suspension structure.

To facilitate Central Lincoln PUD's own communications and to enhance the reliability of the PUD's electric power switching network, the PUD installed a fiber optic network from Lincoln Beach to Reedsport, and from Newport to Toledo. The cable is buried generally in or near highway right-of-way. Due to the economies of scale, the PUD's fiber network has significant amounts of excess capacity. Through an intergovernmental agreement, the Economic Development of Alliance of Lincoln County has leased capacity and developed CoastNet to promote economic development and employment opportunities in Lincoln County. Lincoln County in May 2001 joined other governmental entities that belong to the Fiber South Consortium, which contracts with PCI NW (Preferred Connections, Inc.) as the service vendor.

## Dams

These critical infrastructure pieces not only protect water resources that are used for drinking, agriculture, and recreation, but they protect downstream development from inundation. Dams may also be multifunction, serving two or more of these purposes.

The National Inventory of Dams, NID, which is maintained by the United States Army Corps of Engineers, is a database of approximately 76,000 dams in the United States. The NID does not include all dams in the United States. Rather, the NID includes dams that are deemed to have a high or significant hazard potential and dams deemed to pose a low hazard if they meet inclusion criteria based on dam height and storage volume.

This NID potential hazard classification is solely a measure of the probable impacts if a dam fails. Thus, a dam classified as High Potential Hazard does not mean that the dam is unsafe or likely to fail. The level of risk (probability of failure) of a given dam is not even considered in this classification scheme. Rather, the High Potential Hazard classification simply means that there are people at risk downstream from the dam in the inundation area, if the dam were to fail.

Dams assigned to the significant hazard potential classification are those where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities. Significant hazard potential dams are often located in predominantly rural or agricultural areas.

Dams assigned to the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life. Failure of dams in the high classification will generally also result in economic, environmental or lifeline losses, but the classification is based solely on probable loss of life.

The Oregon Water and Resources Department maintains an inventory of all dams located in Oregon. There is a total of five high hazard dams located in Lincoln County (Table C-26).

**Table C-26 Lincoln County Dam Inventory**

<b>Threat Potential</b>	<b>Number of Dams</b>	<b>Dam Name</b>
High	5	<i>Big Creek #1 &amp; #2 (Big Creek), Olalla (W. Olalla Creek), Mill Creek (Mill Creek), Spring Lake</i>
Significant	0	-
Low	0	-
<b>Total</b>	<b>5</b>	-

Source: Oregon Water Resources Department, "Dam Inventory Query"

Dam failures can occur at any time in a dam's life; however, failures are most common when water storage for the dam is at or near design capacity. At high water levels, the water force on the dam is higher and several of the most common failure modes are more likely to occur. Correspondingly, for any dam, the probability of failure is much lower when water levels are substantially below the design capacity for the reservoir.

Dam failures can occur rapidly and with little warning. Fortunately, most failures result in minor damage and pose little or no risk to life safety. However, the potential for severe damage still exists.

More information on Dams can be found in the [Risk Assessment for Region 1, Oregon Coast, Oregon SNHMP \(2020\)](#).

### Railroads

Railroads are major providers of regional and national cargo trade flows. The Willamette and Pacific Railroad or (WPRR) is a subsidiary rail line of the Portland and Western Railroad, it is designated as non-class 1 railway with approximately 24,327 carloads and a revenue stream of over 13 million dollars in 2011. Most of the line located within Lincoln County runs through the northern extreme border and terminates in Toledo.<sup>33</sup>

Rails are sensitive to icing from winter storms that can occur in the Southeast Oregon region. For industries in the region that utilize rail transport, these disruptions in service can result in economic losses. The potential for rail accidents caused by natural hazards can also have serious implications for the local communities if hazardous materials are involved.

### Airports

Lincoln County has four public airports, two private heliports, and one private airport. Of the two private heliports both are operated by the county's hospitals.<sup>34</sup> Samaritan Pacific Communities and Samaritan North Lincoln hospitals both maintain a heliport for emergency airlifting of critically injured patients. Newport operates a municipal airport and the other airports are relatively small facilities operated by The Oregon Department of Aviation. There is no commercial service airport in the County. Access to these facilities could become closed in the event of natural hazards. Another important consideration in identifying area

<sup>33</sup> Oregon. Department of Transportation (2014). DRAFT Oregon State Rail Plan: Freight and Passenger Rail Inventory. Salem, Oregon. Oregon Department of Transportation.

<sup>34</sup> FAA Airport Facilities Data. 2014. [http://www.faa.gov/airports/airport\\_safety/airportdata\\_5010/menu/](http://www.faa.gov/airports/airport_safety/airportdata_5010/menu/) Accessed August 2014.

air resources is the type and condition of runway surfaces at these various facilities, as they will impact the ability to utilize the airport.

[Newport Municipal Airport \(KONP\)](#)

The Newport airport provides facilities for the US Coast Guard that allow helicopters to respond more quickly to maritime emergencies than if the crews were dispatched from North Bend. The [master plan](#) incorporates a FEMA staging area designation. At elevation 157 feet, is located on 700 acres approximately 3 miles south of Newport off Highway 101. Runway 16/34 is 6000 feet in length and 150 feet wide with asphalt pavement and is lighted. Runway 2/20 is 3000' feet long and 75 feet wide, also asphalt and lighted. Aircraft based on the field are 23 single engine airplanes, 2 multi- engine airplanes, 1 jet airplane, 3 helicopters, and 1 military aircraft. Aircraft operations: average 66 per day, including 58 percent transient general aviation, 21 percent local general aviation, 12 percent military, 6 percent commercial, and 3 percent air taxi. Newport Municipal Airport in past years supported commercial commuter shuttle operations, serving Corvallis and Portland.<sup>35</sup>

*Siletz Bay State Airport (S45)*

This is listed as a Category 4 airport. Category 4 airports serve the needs of general and business aviation users and activities within the local area. The Salishan Resort is one-third of a mile away. The airports have the airfield facilities and services necessary to accommodate general aviation users, in light single and multi-engine aircraft weighing 12,500 pounds and less (11,000 pounds single wheel). The Siletz Bay State Airport, at elevation 62 feet, has a 3300-foot-long and 60-foot-wide asphalt runway (17/35) with pilot controlled lighting. Aircraft operations average 57 per week with 61 percent transient general aviation, 32 percent local general aviation, and 7 percent air taxi. There are approximately 17 single engine airplanes, including one ultralight, based at the field, which is unattended.

*The Toledo State Airport (5S4)*

at elevation 7 feet, is located approximately 1 mile southwest of Toledo. Runway 13/31 is 1695 feet long and 40 feet wide with asphalt pavement. The airport is unattended. Aircraft based on the field are six single engine airplanes, including two ultralights. Aircraft operations average 22 per week, with 96 percent transient general aviation and 4 percent local general aviation.

*The Wakonda Beach State Airport (OR04)*

At elevation 41 feet, is located approximately 3 miles south of Waldport. Runway 16/34 is 2000 feet long by 50 feet wide with a turf surface. The airport is unattended. Aircraft based on the field are three single engine airplanes, including one ultralight. Aircraft operations average 69 per month, with 90 percent transient general aviation and 10 percent local general aviation

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<sup>35</sup> Lincoln County Transportation System Plan. 2007. Prepared by CH2MHill.  
[http://www.co.lincoln.or.us/planning/transportation/Lincoln\\_County\\_Transportation\\_System\\_Plan%20Oct%2007.pdf](http://www.co.lincoln.or.us/planning/transportation/Lincoln_County_Transportation_System_Plan%20Oct%2007.pdf)

## Ports

Deep-water ports are important facilities for the Oregon Coast as they facilitate the transportation of goods and are an integral component of the fishing industry in the area. These ports are important to identify because of the potential threat of considerable damage a result of winter storms or a major tsunami event.

There are three functioning port districts within Lincoln County and one harbor in the City of Depoe Bay. The port facilities include the Port of Newport, the Port of Alsea, and the Port of Toledo. Fish and shellfish make up most of the cargo unloaded at these port facilities, and the Port of Newport has a large commercial fishing fleet. The Port of Newport is a deep channel port that allows ocean-going vessels to dock. The harbor in Depoe Bay is home to a small fishing fleet consisting of both commercial and recreational boats. Separate commissions or city councils govern all four facilities. Local streets connecting to US 101, US 20, and OR 34 provide overland freight connections.<sup>36</sup>

## Roads

The county's major expressway is Highway 101. It runs North/South through Lincoln County and is one of the main passages for automobiles, buses, and trucks traveling through the Coastal area of the state. Other highways that service Lincoln County include:

- Oregon Route 18: connects Lincoln City to the Willamette Valley
- US Route 20: connects Newport, Toledo, and Siletz to the Willamette Valley
- Oregon Route 34: connects Waldport to the Willamette Valley
- Oregon Route 229: runs north and south between Kernville and Toledo. Provides access to interior communities in Lincoln County.
- Oregon Route 410 (Logsdon Road): runs east to west connecting Siletz to Nashville and Benton County.

Daily transportation infrastructure capacity throughout Lincoln County is stressed by maintenance, congestion, and oversized loads. Natural hazards can further disrupt automobile traffic and create gridlock and will make evacuations difficult.

## Bridges

Because of earthquake risk, the seismic vulnerability of the county's bridges is an important issue. Non-functional bridges can disrupt emergency operations, sever lifelines, and disrupt local and freight traffic. These disruptions may exacerbate local economic losses if industries are unable to transport goods. The county's bridges are part of the state and interstate highway system that is maintained by the Oregon Department of Transportation (ODOT) or that are part of regional and local systems that are maintained by the region's counties and cities.

Table C-27 shows the structural condition of bridges in the region. A distressed bridge is a condition rating used by the Oregon Department of Transportation (ODOT) indicating that a bridge has been identified as having a structural or other deficiency, while a deficient bridge is a federal performance measure used for non-ODOT bridges; the ratings do not imply that

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<sup>36</sup> Lincoln County Transportation System Plan. 2007. Prepared by CH2MHill.  
[http://www.co.lincoln.or.us/planning/transportation/Lincoln\\_County\\_Transportation\\_System\\_Plan%20Oct%2007.pdf](http://www.co.lincoln.or.us/planning/transportation/Lincoln_County_Transportation_System_Plan%20Oct%2007.pdf)

a bridge is unsafe.<sup>37</sup> The table shows that overall 24% of the county owned bridges are distressed, compared to 100% of the city owned bridges and 31% of State Owned (ODOT) bridges. There are 9 historic bridges in the County, all owned by the state.

**Table C-27 Bridge Inventory**

Bridge Owner	Number	Distressed	Percent Distressed	Historic
State	68	21	31%	9
County	85	20	24%	0
City	2	2	100%	N/A
<b>Total</b>	<b>155</b>	<b>43</b>	<b>28%</b>	<b>9</b>

Source: Oregon Department of Transportation, 2014; Oregon Department of Transportation (2013), Oregon’s Historic Bridge Field Guide

Note: ODOT bridge classifications overlap and sum-total is not used to calculate percent distressed, calculation for ODOT distressed bridges accounts for this overlap.

The bridges in Lincoln County require ongoing management and maintenance due to the age and types of bridges. Modern bridges, which require minimum maintenance and are designed to withstand earthquakes, consist of pre-stressed reinforced concrete structures set on deep steel piling foundations.

Seismic lifeline

Seismic lifeline routes help maintain transportation facilities for public safety and resilience in the case of natural disasters. Following a major earthquake, it is important for response and recovery agencies to know which roadways are most prepared for a major seismic event. The Oregon Department of Transportation has identified lifeline routes to provide a secure lifeline network of streets, highways, and bridges to facilitate emergency services response after a disaster.<sup>38</sup>

System connectivity and key geographical features were used to identify a three-tiered seismic lifeline system. Routes identified as Tier 1 are considered the most significant and necessary to ensure a functioning statewide transportation network. The Tier 2 system provides additional connectivity to the Tier 1 system, it allows for direct access to more locations and increased traffic volume capacity. The Tier 3 lifeline routes provide additional connectivity to the systems provided by Tiers 1 and 2.

The Coast Geographic Zone is the most seismically vulnerable of all the geographic zones and the most difficult to access due to geographic constraints. While one could argue that the region’s critical post-earthquake needs should dictate that all routes be Tier 1, the reality is that the vulnerabilities in the Coast Geographic Zone are so extensive that the majority of the cost to make the entire lifeline system resilient would be incurred for repairs done within this region. Furthermore, because of the high vulnerability of the zone, it is paramount that emergency services and recovery resources can reach this zone from other zones.

<sup>37</sup> Oregon. Bridge Engineering Section (2012). 2012 Bridge Condition Report. Salem, Oregon: Bridge Section, Oregon Department. of Transportation.

<sup>38</sup> CH2MHILL, Prepared for Oregon Department of Transportation. Oregon Seismic Lifeline Routes Identification Project, *Lifeline Selection Summary Report*, May 15 2012.



The bulleted list below describes the tiered system for the coastal geographic zone of seismic lifelines.

The Tier 1 system in the Coast Geographic Zone consists of three access corridors:

- OR 30 from Portland to Astoria
- OR 18 from the Valley to US 101 and north and south on US 101 from Tillamook to Newport
- OR 38 from I-5 to US 101 and north and south on US 101 from Florence to Coos Bay

The Tier 2 system in the Coast Geographic Zone consists of three access corridors:

- US 26 from OR-217 in Portland to US 101 and north and south on US 101 from Seaside to Nehalem
- OR 126 from the Valley to US 101 at Florence
- US 101 from Coos Bay to the California border

The Tier 3 system in the Coast Geographic Zone consists of the following corridors:

- US 101 from Astoria to Seaside
- US 101 from Nehalem to Tillamook
- OR 22 from its junction with OR 18 to the Valley
- OR 20 from Corvallis to Newport
- OR 42 from I-5 to US 101
- US 199 from I-5 to the California border

### Telephone Communications

Pioneer Telephone Cooperative provides telephone service to southern Lincoln County while Century Telephone provides service to northern Lincoln County. Underground telephone lines are generally located in or near highway right-of-way. Most telephone lines are above ground and suspended between single poles maintained by the cooperative or electric utility. DSL service is available for internet connections from these phone companies via CoastNet.<sup>39</sup>

### Critical Facilities

Critical facilities are those facilities that are essential to government response and recovery activities (e.g., polices and fire stations, public hospitals, public schools). It is important that these facilities are the most resilient to natural hazards as interruption or destruction of these facilities could restrict response efforts and time needed to assist those in danger.

### Law Enforcement

Lincoln County is served by the Lincoln County Sheriff's office, as well as individual city law enforcement teams and Oregon State Patrol. The County Sheriff's office provides services to unincorporated parts of the county. There are 10 structural fire agencies in Lincoln County.<sup>40</sup> Aside from just extinguishing fires, each fire district and department provides essential

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<sup>39</sup> Lincoln County Transportation System Plan. 2007. Prepared by CH2MHill.  
[http://www.co.lincoln.or.us/planning/transportation/Lincoln\\_County\\_Transportation\\_System\\_Plan%20Oct%2007.pdf](http://www.co.lincoln.or.us/planning/transportation/Lincoln_County_Transportation_System_Plan%20Oct%2007.pdf)

<sup>40</sup> Lincoln County Community Wildfire Protection Plan (2018).

public services in the communities they serve, including emergency medical services, search and rescue, and fire prevention education.<sup>41</sup>

### Hospitals and Clinics

Lincoln County has two hospitals, one in Newport (Samaritan Pacific Communities Hospital) and the other in Lincoln City (Samaritan North Lincoln Hospital). In addition, there are several clinics in the County including Samaritan Depoe Bay Clinic (Depoe Bay), Samaritan Coastal Clinic (Lincoln City), Samaritan Women’s Health Center (Lincoln City), and Samaritan Toledo Clinic (Toledo).

### Schools

The Lincoln County School District has 11 schools in four regions throughout the County. There are an additional three charter schools connected to the school district. See the Lincoln County School District addendum for more information.

### Dependent Facilities

Facilities which have patients that are dependent on continued support and care include long term care (skilled, assistive), senior residential facilities, residential mental health facilities, and psychiatric hospitals. In the event of a disaster, these facilities may also act as secondary medical facilities as they are equipped with nurses, medical supplies, and beds.

### Correctional Facilities

Correctional facilities are incorporated into physical infrastructure as they play an important role in everyday society by maintaining safe separation from the public. There are two correctional facilities located in Lincoln County. The Lincoln County Jail and the Lincoln County Juvenile Department are both located in Newport. While correctional facilities are built to code to resist structural failure, they typically have backup power to sustain regulation of inmates following the immediate event of an emergency. It is when the impacts of the event continue over a long duration, that logistical planning of these facilities becomes a challenge.

## **Synthesis**

Built capacity refers to the built environment and infrastructure that support a community. The various forms of built capital mentioned above will play significant roles in the event of a disaster. Physical infrastructures, along with utility and transportation lifelines are critical during a disaster and are essential for proper functioning and response. Community resilience is directly affected by the quality and quantity of built capital and lack of, or poor condition of, infrastructure can negatively affect a community’s ability to cope, respond, and recover from a natural disaster. Initially following a disaster, communities may experience isolation from surrounding cities and counties due to infrastructure failure. These conditions will force communities to rely on local and immediate resources, so it is important to identify critical infrastructures throughout the county as they may play crucial roles in the mitigation and recovery stages of a disaster.

It is important for the county to consider these numbers when producing mitigation and educational outreach materials as it is important to reach all populations, especially the

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<sup>41</sup> Ibid.

ones who face a higher risk of damage. There are five (5) dams throughout the county classified with a high threat potential. There are a variety of critical facilities located throughout county limits that in the event of a disaster can make communication efforts challenging. Several major highways run throughout the county, giving residents several alternative routes that may provide service access, or serve as evacuation routes, yet if these roads are destroyed it can isolate communities and make rescue efforts more challenging.

## Community Connectivity Capacity

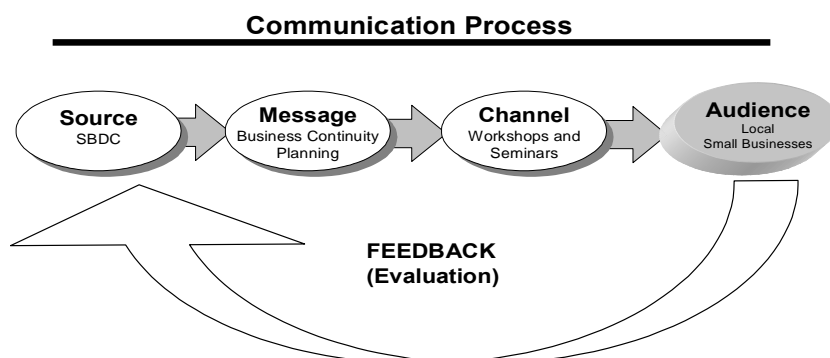
Community connectivity capacity places strong emphasis on social structure, trust, norms, and cultural resources within a community. In terms of community resilience, these emerging elements of social and cultural capital will be drawn upon to stabilize the recovery of the community. Social and cultural capitals are present in all communities; however, it may be dramatically different from one city to the next as these capitals reflect the specific needs and composition of the community residents.

## Social Systems and Service Providers

Social systems include community organizations and programs that provide social and community-based services, such as employment, health, senior and disabled services, professional associations and veterans' affairs for the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income, etc.). The county can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on several issues, one of which could be natural hazard preparedness and mitigation. The presence of these services is more predominantly located in urbanized areas of the county, this is synonymous with the general urbanizing trend of residents.

Figure C-10 displays the NHMP's communication process. It is followed by a brief explanation of how the communication process works and how the community's existing social service providers could be used to provide natural hazard related messages to their clients.

**Figure C-10 Communication Process**



Source: Adapted from the U.S. Environmental Protection Agency Radon Division's outreach program

- There are five essential elements for communicating effectively to a target audience:
- The source of the message must be credible,
- The message must be appropriately designed,
- The channel for communicating the message must be carefully selected,
- The audience must be clearly defined, and

- The recommended action must be clearly stated and a feedback channel established for questions, comments and suggestions.

The following list highlights organizations that are active within the community and may be potential partners for implementing mitigation actions. The three involvement methods are defined below.

**Education and outreach** – organization could partner with the community to educate the public or provide outreach assistance on natural hazard preparedness and mitigation.

**Information dissemination** – organization could partner with the community to provide hazard-related information to target audiences.

**Plan/project implementation** – organization may have plans and/or policies that may be used to implement mitigation activities, or the organization could serve as the coordinating or partner organization to implement mitigation actions.

The following organizations are active within the community and may be potential partners for implementing mitigation actions:

- Federal Emergency Management Agency Region X
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Coast Guard
- U.S. Department of Agriculture
- Department of Land Conservation and Development
- Oregon Department of Environmental Quality
- Oregon Department of Fish and Wildlife
- Oregon Department of Forestry
- Oregon Department of Geology and Mineral Industries
- Oregon Department of Transportation
- Division of State Lands
- Oregon Department of Parks and Recreation
- Oregon Office of Emergency Management
- Oregon State Building Codes
- Local Fire Districts
- Local Sewer and Water Districts
- Lincoln County Emergency Management
- Lincoln County Public Works Department
- Lincoln County Department of Information Technology
- Lincoln County Department of Planning and Development
- Lincoln County Community Emergency Response Team (CERT)
- Local Utility Providers
- City Governments and Departments
- Chamber of Commerce Office
- Insurance Companies
- Local Hospitals
- Oregon Coast Community College
- Central Oregon Coast Association (Travel Oregon)

- Hatfield Marine Science Center
- City Community/Recreational Centers
- Lincoln County School District
- Lincoln County Community Health Center
- Central Coast Economic Development Alliance
- Confederated Tribes of Siletz Indians

## Civic Engagement

Civic engagement and involvement in local, state and national politics are important indicators of community connectivity. Those who are more invested in their community may have a higher tendency to vote in political elections. The 2016 Presidential General Election resulted in 82% voter turnout in the county.<sup>42</sup> These results are relatively equal to voter participation reported across the State (81%).<sup>43</sup> Other indicators such as volunteerism, participation in formal community networks and community charitable contributions are examples of other civic engagement that may increase community connectivity.

## Cultural Resources

### Libraries and Museums

Libraries and museums develop cultural capacity and community connectivity as they are places of knowledge and recognition, they are common spaces for the community to gather, and can serve critical functions in maintaining the sense of community during a disaster. They are recognized as safe places and reflect normalcy in times of distress. There are currently four community libraries in Lincoln County located in Newport, Siletz, Toledo and Lincoln City. There are two museums in Lincoln County, which have an emphasis on the history of The Oregon Coast and the marine and fishing history of the region.

### Cultural Events

Other such institutions that can strengthen community connectivity are the presence of festivals and organizations that engage diverse cultural interests. Examples of events and institutions include the Celtic Heritage Festival and Highland games and events at The Pacific Maritime & Heritage Center. Not only do these events bring revenue into the community, they have potential to improve cultural competence and enhance the sense of place. Cultural connectivity is important to community resilience, as people may be more inclined to remain in the community because they feel part of the community and culture.

### Historic Places

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources for tourism revenue. Protecting these resources from the impact of disasters is important because they have an important role in defining and supporting the community. According to the National Register Bulletin, “a contributing resource is a building, site, structure, or object adds to the historic associations, historic

<sup>42</sup> Oregon Blue Book, Voter Participation, <http://sos.oregon.gov/elections/Documents/statistics/participation-stats-11-2016.pdf>

<sup>43</sup> Ibid.

architectural qualities, or archeological values for which a property is significant because it was present during the period of significance, related to the documented significance of the property, and possesses historical integrity or is capable of yielding important information about the period; or it independently meets the National Register criteria.”<sup>44</sup> If a structure does not meet these criteria, it is considered to be non-contributing.

Table C-28 identifies the number of eligible/significant (ES), eligible/contributing (EC) historical sites, and non-eligible historic sites in Lincoln County. The table also shows how many ES and EC sites are listed on the National Register and are located and in incorporated cities, and how many contributing and non-contributing resources are located at ES and EC sites. Overall, there are a total of 35 historically registered places in Lincoln County.

**Table C-28 Lincoln County Historic Places**

<b>Eligible Sites</b>	<b>Total Sites</b>	<b>Located in Incorporated Cities</b>
Eligible Significant	43	60%
Eligible Contributing	79	97%
Not Eligible / Contributing	85	96%
Not Eligible / Out of Period	14	100%
<b>Nationally Registered</b>	<b>35</b>	<b>88%</b>

Source: Oregon Historic Sites Database

Table C-29 displays the nationally registered historic places in Lincoln County. Many of the locations are restricted addresses because of the sensitivity of the sites, additionally some sites do not denote a date of construction because it is a natural feature or the date of the site is not known.

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<sup>44</sup> U.S. Department of the Interior, National Park Service, Cultural Resources, National Register Bulletin 16A: "How to Complete the National Register Registration Form".

**Table C-29 Lincoln County Nationally Registered Historic Places**

Nationally Registered Site	Address	City	Date Constructed
Archeological Site (35-LNC-48)	Address Restricted	Address Restricted	-
Archeological Site (35-LNC-54)	Address Restricted	Address Restricted	-
Archeological Site (35-LNC-63)	Address Restricted	Address Restricted	-
Archeological Site (35-LNC-68)	Address Restricted	Address Restricted	-
Boiler Bay Site (35-LNC-63)	Address Restricted	Address Restricted	-
Cape Creek Site (35-LNC-57)	Address Restricted	Address Restricted	-
Cape Perpetua Shelter & Parapet	Waldport Ranger District	Yachats vcty	1933
Chitwood Bridge	Yaquina River	Toledo vcty	1926
Depoe Bay Bridge	Hwy 101	Depoe Bay	1927
Depoe Bay Ocean Wayside	119 SW Hwy 101	Depoe Bay	1956
Devils Punch Bowl	-	-	-
Dorchester House, The	2701 NW Hwy 101	Lincoln City	1929
Fisher School Bridge	Crab Creek Rd	Fisher	1919
Good Fortune Cove Site (35-LNC-56)	Address Restricted	Address Restricted	-
Good Fortune Point Site (35-LNC-55)	Address Restricted	Address Restricted	-
Government Point Site	Address Restricted	Address Restricted	-
New Cliff House	267 NW Cliff St	Newport	1911
North 804 Midden (35-LNC-72)	Address Restricted	Address Restricted	-
North Fork Of The Yachats Bridge	North Fork Yachats River	Yachats vcty	c.1938
Old Yaquina Bay Lighthouse	Yaquina Bay State Park	Newport	1871
Pacific Spruce Saw Mill Tenant Houses	146-192 NE 6th St	Toledo	1920
Rocky Creek Bridge	Otter Crest Loop Rd	Otter Rock vcty	1927
Rocky Creek Site (35-LNC-43)	Address Restricted	Address Restricted	-
Roper, Charles & Theresa, House	620 SW Alder St	Newport	1913
Seal Rock	-	-	-
Siletz Agency Site		Siletz	c.1856
Smelt Sands Midden (35-LNC-65)	Address Restricted	Address Restricted	-
St John's Episcopal Church	110 NE Alder St	Toledo	1937
Ten Mile Creek Bridge	Hwy 101	Yachats	1931
The Ahnkuti Site (35-LNC-76)	Address Restricted	Address Restricted	-
Tradewinds Kingfisher (Cruiser)	Port Of Depoe Bay Basin; Port of Newport	Depoe Bay	1941
Trail 804 Midden #3 (35-LNC-73)	-	-	-
US Spruce Production Railroad XII, Spur 5	[Linear District]	Yachats vcty	1925
Yachats Trail 804 Midden (35-LNC-66)	Address Restricted	Address Restricted	-
Yaquina Bay Bridge	Hwy 101	Newport	1936
Yaquina Head Lighthouse	Yaquina Head	Newport vcty	1872

Source: Oregon Historic Sites Database



## Community Stability

Community stability is a measure of rootedness in place. It is hypothesized that resilience to a disaster stems in part from familiarity with place, not only for navigating the community during a crisis, but also accessing services and other supports for economic or social challenges.<sup>45</sup>

### Residential Geographic Stability

Table C-30 estimates residential stability across the region. It is calculated by the number of people who have lived in the same house and those who have moved within the same county a year ago, compared to the percentage of people who have migrated into the region. Lincoln County overall has a geographic stability rating of about 93% (i.e., 93% of the population lived in the same house or moved within the county). Siletz and Waldport have the highest geographic stability (97%) while Lincoln Beach has the lowest (77%).

**Table C-30 Regional Residential Stability**

Jurisdiction	Population	Geographic Stability	Same House	Moved Within Same County
<b>Lincoln County</b>	46,920	93%	84%	9%
<b>Incorporated</b>	28,220	92%	82%	9%
Depoe Bay	1,760	93%	84%	10%
Lincoln City	8,446	94%	83%	11%
Newport	10,191	89%	78%	11%
Siletz	1,484	97%	94%	2%
Toledo	3,502	94%	84%	10%
Waldport	2,189	97%	91%	6%
Yachats	648	92%	90%	2%
<b>Unincorporated</b>	18,700	93%	86%	8%
Lincoln Beach CDP	1,551	77%	68%	10%
Rose Lodge CDP	1,478	94%	90%	4%
Other Unincorporated	15,671	95%	87%	8%

Source: Social Explorer, Table 130, U.S. Census Bureau, 2013-2017 American Community Survey Estimates

### Homeownership

Housing tenure describes whether residents rent or own the housing units they occupy. Homeowners are typically more financially stable but are at risk of greater property loss in a post-disaster situation. People may rent because they choose not to own, they do not have the financial resources for home ownership, or they are transient.

Collectively, about 42% of the occupied housing units in Lincoln County are owner-occupied; about 24% are renter occupied (Table C-31). Siletz (62%), Rose Lodge CDP (57%), and “other” unincorporated areas (54%) have the highest rate of owner-occupied units.

<sup>45</sup> Cutter, Susan, Christopher Burton, Christopher Emrich. “Disaster Resilience Indicators for Benchmarking Baseline Conditions”. Journal of Homeland Security and Emergency Management.

Seasonal or recreational housing accounts for a large amount of housing units in Lincoln County. Approximately 27% of the county’s housing stock is considered “seasonal” housing, these are homes that are either occupied by the owner part of the year or are used as vacation rentals.<sup>46</sup> Lincoln Beach CDP (58%), Yachats (51%), Lincoln City (35%), and Depoe Bay (33%) have the highest seasonal housing percentages. The incorporated areas have a higher rate of renter-occupied households. Toledo (12%) and Rose Lodge (15%) have the highest vacancy rates within the county.

**Table C-31 Housing Tenure and Vacancy**

Jurisdiction	Housing Units	Owner-occupied		Renter-occupied		Seasonal <sup>^</sup>		Vacant <sup>^^</sup>	
		Estimate	Percent	Estimate	Percent	Estimate	Percent	Estimate	Percent
<b>Lincoln County</b>	31,200	13,145	42%	7,529	24%	8,456	27%	2,070	7%
<b>Incorporated</b>	17,954	6,594	37%	5,770	32%	4,319	24%	1,271	7%
Depoe Bay	1,444	549	38%	307	21%	475	33%	113	8%
Lincoln City	6,535	1,785	27%	2,000	31%	2,296	35%	454	7%
Newport	5,723	2,300	40%	2,220	39%	865	15%	338	6%
Siletz	564	347	62%	194	34%	0	0%	23	4%
Toledo	1,620	815	50%	533	33%	75	5%	197	12%
Waldport	1,199	607	51%	363	30%	165	14%	64	5%
Yachats	869	191	22%	153	18%	443	51%	82	9%
<b>Unincorporated</b>	13,246	6,551	49%	1,759	13%	4,137	31%	799	6%
Lincoln Beach CDP	2,464	664	27%	185	8%	1,431	58%	184	7%
Rose Lodge CDP	890	503	57%	187	21%	67	8%	133	15%
Other Unincorporated	9,892	5,384	54%	1,387	14%	2,639	27%	482	5%

Source: Social Explorer, Tables 94, and 95, U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Table B25004

<sup>^</sup> = Seasonal, recreational, or occasional housing units. <sup>^^</sup> = Functional vacant units, computed after removing seasonal, recreational, or occasional housing units from vacant housing units.

According to Cutter, wealth increases resiliency and recovery from disasters. Renters often do not have personal financial resources or insurance to assist them post-disaster. On the other hand, renters tend to be more mobile and have fewer assets at risk of natural hazards.<sup>47</sup> In the most extreme cases, renters lack enough shelter options when lodging becomes uninhabitable or unaffordable post-disaster.

## Synthesis

Lincoln County has distinct social and cultural resources that work in favor to increase community connectivity and resilience. Sustaining social and cultural resources, such as social services and cultural events, may be essential to preserving community cohesion and a sense of place. The presence of larger communities makes additional resources and services available for the public. However, it is important to consider that these amenities may not be equally distributed to the rural portions of the county and may produce implications for recovery in the event of a disaster.

In the long-term, it may be of specific interest to the county to evaluate community stability. A community experiencing instability and low homeownership may hinder the effectiveness of social and cultural resources, distressing community coping and response mechanisms.

<sup>46</sup> U.S. Census Bureau, 2013-2017 American Community Survey Estimates, Table B25004.

<sup>47</sup> Cutter, S. L. (2003). Social Vulnerability to Environmental Hazards. *Social Science Quarterly*.

## Political Capacity

Political capacity is recognized as the government and planning structures established within the community. In terms of hazard resilience, it is essential for political capital to encompass diverse government and non-government entities in collaboration; as disaster losses stem from a predictable result of interactions between the physical environment, social and demographic characteristics and the built environment.<sup>48</sup> Resilient political capital seeks to involve various stakeholders in hazard planning and works towards integrating the Natural Hazard Mitigation Plan with other community plans, so that all planning approaches are consistent.

## Government Structure

Lincoln County government provides services citizens value and desire. The governance of Lincoln County is by three elected commissioners. The Board of County Commissioners manage Lincoln County affairs, in conjunction with other elected officials and Department heads. Figure C-11 is an organization chart illustrating county operations. See the appropriate city addendum for incorporated community government structure.

## Existing Plans & Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.<sup>49</sup>

The Lincoln County multi-jurisdictional Natural Hazard Mitigation Plan includes a range of recommended action items that, when implemented, will reduce the County's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the County's existing plans and policies. Linking existing plans and policies to the Natural Hazard Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and getting updated and maximizes the county's resources.

Table C-32 existing plans related to Natural Hazards that are already in place within Lincoln County. For local plans see appropriate addendum in Volume II.

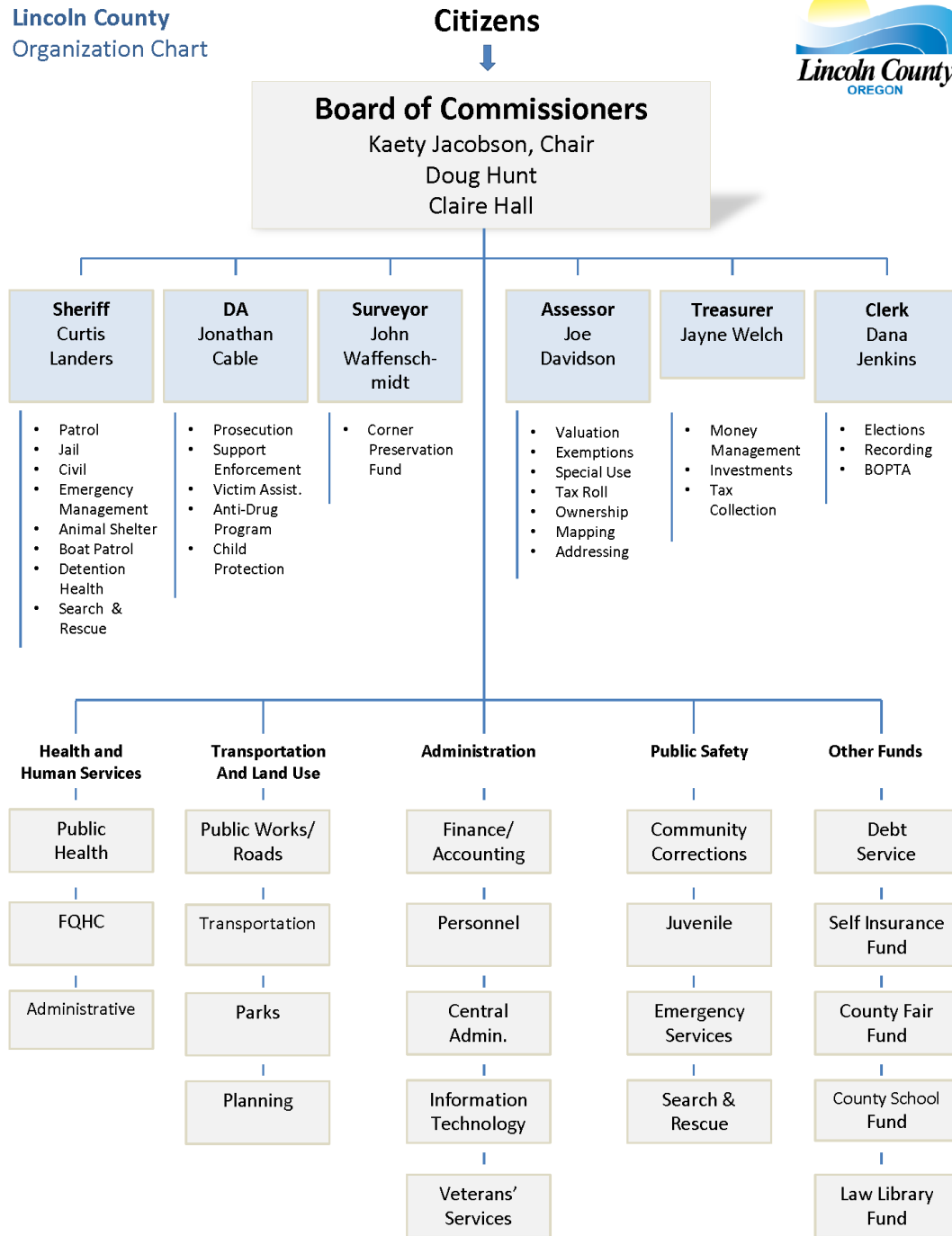
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<sup>48</sup> Mileti, D. 1999. *Disaster by Design: a Reassessment of Natural Hazards in the United States*. Washington D.C.: Joseph Henry Press.

<sup>49</sup> Burby, Raymond J., ed. 1998. *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*.

**Figure C-II Lincoln County Organization Chart**

Lincoln County  
Organization Chart



Source: Lincoln County

**Table C-32 Existing Plans**

Name	Author/ Owner	Description	Relation to Natural Hazard Mitigation
Lincoln County Land Use Code (2018)	Lincoln County Department of Planning and Development	Administer Development Code and zoning ordinance governing land uses in Lincoln County	Land use ordinances may be used or developed to direct future development away from known hazard areas.
Lincoln County Comprehensive Land Use Plan (2007)	Lincoln County Department of Planning and Development	To anticipate and plan for future land use within Lincoln County in accordance with Statewide Land Use Planning Program	Section VII "Natural Disasters and Hazards Goal" outlines limitations and regulations abided by in regard to flooding, earthquakes, erosion and deposition (landslides), wildfires, and the exposure of hazardous soils and soil conditions. It concludes with the statement that developments shall not be planned in areas known to be subject to these threats without appropriate safeguards. The identification and prioritization of specific areas subject to each hazard can help in creating action items.
Lincoln County Community Wildfire Protection Plan, updated (2018)	Lincoln County Fire Defense Board (Lincoln County)	Assists Lincoln County clarify and refine priorities for protection of life, property, and critical infrastructure in the wildland-urban interface on public and private lands.	Enhances the NHMP risk assessment, identification of hazard zones, and includes mitigation actions to reduce risk to wildfire.

Name	Author/ Owner	Description	Relation to Natural Hazard Mitigation
Lincoln County Economic Development Strategic Plan, updated (2011)	Lincoln County Economic Development Alliance	The purpose of this document is to guide the activities of the Lincoln County Economic Development Council for the years of 2000 to 2020. The Plan should ensure that these activities are articulated to the residents of Lincoln County	An Economic Development Strategic Plan can be utilized to implement mitigation measures aimed at creating a disaster resilient economy.
Lincoln County Transportation System Plan (2007 - 2027)	Prepared by Lincoln County Planning and Development Dept., Angelo Planning Group, and CH2M Hill	The Lincoln County Transportation System Plan (TSP) addresses the County's anticipated transportation needs. It has been prepared to meet state and federal regulations that require urban areas to conduct long-range planning. The long-range planning is intended to serve as a guide for Lincoln County in managing their existing transportation facilities and developing future transportation facilities.	The Transportation Plan may be a resource to identify which roads and transportation systems are most vulnerable to natural disasters. Likewise, the TSP can be utilized to implement mitigation measures aimed at protecting "transportation disadvantaged" populations in emergency situations. When updated, the TSP can also include mitigation elements in its implementation considerations.

Name	Author/ Owner	Description	Relation to Natural Hazard Mitigation
At Home in Lincoln County 2.0 Lincoln County Ten-Year Housing Plan (2012)	Lincoln County Commissioners	A plan to set the communities of Lincoln County on a path that will one day see homelessness disappear and every citizen has a decent, safe and affordable place to call home.	The Plan includes Planning and Zoning Policies: The County Planning Commission will review recommendations in the Ten-Year Plan addressing planning, zoning and fee issues related to housing creation and make recommendations to the Board of Commissioners for potential changes. The development of affordable housing needs to take into account high risk/vulnerability areas.
Bayshore Dune Management Plan (Background Report) (2012)	Lincoln County/ Terra Firma Geologic Services	Addresses requirements of Statewide Planning Goal 18: Beaches and Dunes.	Manages the dune at Bayshore on Alsea Spit, and area that was committed to development in the 1960s.

Source: Oregon Partnership for Disaster Resilience

## Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by the community in an effort to reduce the community's overall risk to natural hazards. Documenting these efforts can assist participating jurisdictions in better understanding risk and can assist in documenting successes. Three County Departments are principally engaged in mitigation activities:

The **Lincoln County Department of Planning and Development** administers the Lincoln County Comprehensive Plan and Land Use Code, the State Structural Specialty Code (Building Division), and locally administers the Department of Environmental Quality On-Site Waste Management Program. Mitigation is approached in two ways- from a regulatory standpoint and by public outreach and education.

The mission of the **Lincoln County Department of Emergency Management** is to coordinate and facilitate emergency plans, preparedness, response and recovery within the County. The Lincoln County Department of Emergency Management engages in quarterly educational programs, exercises, drills, and training, in emergency management job functions and materials and activities that promote public awareness and educate audiences about all phases of natural hazards. Their function is also to support government agencies, volunteer organizations, private sector and organizations with special needs.

The **Lincoln County Department of Public Works** is responsible for most of the physical assets of Lincoln County. It is the philosophy of the department that preventative maintenance is cost effective and preferable to repair or reconstruction.

Widely applied ongoing mitigation activities are described below.

The **Lincoln County Code** contains plan policies and zoning regulations addressing the following areas: LCC Section 1.005(3) Natural hazards, LCC Section 1.0010/0015: Land Use Planning Goals and Policies, LCC Section 1.0050/0055 Natural Hazards Goals and Policies, LCC Section 1.0060/0065 Forest Land Goals and Policies, LCC Section 1.0090/0095 Coastal Shorelands Goals and Policies, LCC Section 1.0100/1015 Beaches and Dunes Goals and Policies, LCC Section 1.1375 Timber Conservation Zone, LCC Section 1.1381 Coastal Shorelands Overlay Zone, LCC Section 1.1395 Flood Hazard Overlay Zone, LCC Section 1.1925 Geologic Hazards, and LCC Section 1.1930 Beaches and Dunes. The objective of implementing development standards pursuant to the above criteria is to mitigate for activities occurring in areas subject to a variety of natural hazards. In addition, the Lincoln County Department of Planning and Development makes available and distributes to the public a manual prepared by the Oregon Department of Geology and Mineral Industries in 199 entitled "Special Paper 31 Mitigating Geologic Hazards in Oregon: A Technical Reference manual". This manual takes a multi-hazard approach and covers a wide variety of topics ranging from characterizing hazards to legal considerations. A copy of this manual is included in Appendix E- Resource Directory. Finally, The Office of Information Technology produced a Geographic Information System map identifying the location of a variety of assets such as communications, education, medical, care, and utility facilities in relation to mapped 100-year flood and the tsunami inundation zones. This map is available for review at the Lincoln County Department of Planning and Development.

Lincoln County, in partnership with other local agencies and the American Red Cross, developed a booklet entitled, "Disaster Preparedness for You and Your Household- June



2007". A copy can be found on Appendix E-Resource Directory. Also, the Office of Emergency Services has developed a program with the local fishing fleet and charter boats to assist in response and recovery in the event of a natural disaster. This is an on-going program that will continue to evolve. The Radio Auxiliary Communications Specialists (RATS) are an emergency communications unit that provides Lincoln County with a variety of unpaid professional skills, including administrative, technical and operational support for governmental communications systems. The RATS work as staff under the direct supervision of the Office of Emergency Services. The Office of Emergency Services makes regular appearances on radio broadcasts to educate and inform the public about all natural hazards potentially affecting the population and community of Lincoln County.

In addition to the above activities, Lincoln County is continuously engaged in a rigorous public awareness outreach campaign with regards to flood and coastal erosion hazards, earthquake and tsunami preparedness and annual windstorm activity. Lincoln County's website, [www.co.lincoln.or.us](http://www.co.lincoln.or.us), contains an abundance of information and links to other sites with respect to natural hazards in our coastal environment. The entire Lincoln County Code, including the Lincoln County Comprehensive Plan and Land Use Code, is accessible on the website. Special attention is paid to Flood, Earthquake and Tsunami preparedness on the Office of Emergency Services webpage. Numerous maps, explanations and evacuation routes are provided on this page.

Other current mitigation activities employed by these departments are described below.

## **Coastal Erosion**

### **Lincoln County Department of Planning and Development**

Lincoln County land use regulations addresses development on lands subject to ocean erosion. Section 1.1925 of the land use code establishes requirements for ocean front setbacks for new development designed to compensate for identified shoreline recession. In addition, Section 1.1930 establishes standards for development in beach and dune areas intended to prevent development in identified critical hazard areas and reduce adverse impacts of development on shoreline stability.

As previously noted, coastal erosion hazards are identified in Environmental Hazard Inventory of Lincoln County, RNKR Associates, 1978, and in DOGAMI Open File Reports 0-04-09 and 0-07-01. Maps included in these studies are available at the Lincoln County Department of Planning and Development.

A copy of the Environmental Hazard Inventory for coastal Lincoln County can be found in Appendix E-Resource Directory. In addition, the Building Division applies requirements in areas subject to coastal erosion in accordance with the State Structural Specialty Code.

## **Drought**

Lincoln County currently addresses the drought hazard through water conservation measures and water monitoring.

## Drought Council

The Drought Council is responsible for assessing the impact of drought conditions and making recommendations to the Governor's senior advisors. The Water Availability Committee, a subcommittee of technical people who monitor conditions throughout the state and report these conditions monthly, advises the Drought Council. In this manner the Drought Council keeps up-to-date on water conditions.

## Natural Resources Conservation Service

The United States Department of Agriculture Natural Resources Conservation Service (NRCS) has a regional service center located in Redmond (another is located in Warm Springs). The NRCS is dedicated to three main priorities involving resource preservation one among them is water quantity and quality. The NRCS incorporates a conservation implementation strategy to preserve natural resources into the future.<sup>50</sup>

## Earthquake

### Lincoln County Department of Planning and Development

The Oregon State Building Codes Division adopts statewide standards for building construction that are administered by the state, cities and counties throughout Oregon. The codes apply to new construction and to the alteration of, or addition to, existing structures. Within these standards are six levels of design and engineering specifications for seismic safety that are applied to areas according to the expected degree of ground motion and site conditions.

The structural code requires a site-specific seismic hazard report for critical facilities such as hospitals, fire and police stations, emergency response facilities, and special occupancy structures, such as schools and prisons. The seismic hazard report required by the structural code for essential facilities and special occupancy structures considers factors such as the seismic zone, soil characteristics including amplification and liquefaction potential, any known faults, and potential landslides. The findings of the seismic hazard report must be considered in the design of the building. The residential code incorporates prescriptive requirements for foundation reinforcement and framing connections based on the applicable seismic zone for the area.

Retrofitting of existing buildings may be required when such buildings are altered or their occupancy is changed. Requirements vary depending on the type and size of the alteration and whether there is a change in the use of the building that is considered more hazardous.

The Lincoln County Department of Planning and Development also makes available an informational hand-out entitled "Protect Your Home Against Earthquake Damage" produced by the Institute for Business and Home Safety. A copy can be found in Appendix E-Resource Directory.

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<sup>50</sup> NRCS – Lincoln County "Information for Partners and Participants," <http://www.or.nrcs.usda.gov>

## Department of Emergency Management

The Department of Emergency Management works with the local community and coordinates with a variety of agencies, the business community, emergency responders, and institutions in outreach, education and exercises regarding earthquake preparedness. They also make regular appearances on radio broadcasts to educate and inform the public about earthquake preparedness.

## Department of Public Works

Once an earthquake occurs, an evaluation of roadways and bridges for damages will occur. Initial damage assessment will be logged and a plan of action developed. Life-line routes (arterial routes) have been identified and will receive priority. It is expected that inter-agency support will be critically needed. Lincoln County Public Works participates in inter-agency drills intended to improve capability to respond to events such as earthquakes.

Lincoln County bridges are inspected every two years. Bridges are inspected in accordance with National Bridge Inspection Standards (NBIS). The County uses the NBIS inspections to guide bridge maintenance work. In the event of a critical finding, emergency repair work may be initiated. Bridges found to be incapable of carrying legal loads are posted with load limits.

Geographic Information Systems (GIS) for Lincoln County has also mapped all of the critical facilities and major public buildings so that inspections of these facilities can be assigned quickly when an earthquake occurs.

## **Tsunami (local and distant)**

### Lincoln County Department of Planning and Development

The department maintains the latest edition of Department of Geology and Mineral Industries' tsunami inundation zone map. The Building Division administers the State Structural Specialty Code which regulates construction or alteration of certain critical facilities and structures located within the Tsunami Inundation Zone. These regulations can be found in Oregon Revised Statute 455.

## Department of Emergency Management

The Department of Emergency Management works with the local community and coordinates with a variety of agencies, the business community, emergency responders, and institutions in outreach, education and exercises regarding earthquake preparedness. They also make regular appearances on radio broadcasts to educate and inform the public about tsunami preparedness.

## Department of Public Works

Once a tsunami occurs, an evaluation of roadways and bridges for damages will occur. Initial damage assessment will be logged and a plan of action developed. Life-line routes (arterial routes) have been identified and will receive priority. It is expected that inter-agency

support will be critically needed. Lincoln County Public Works Department participates in inter-agency drills intended to improve capability to respond to events such as a tsunami.

Lincoln County bridges are inspected for structural integrity every two years. Bridges are inspected in accordance with National Bridge Inspection Standards (NBIS). The County uses the NBIS inspections to guide bridge maintenance work. In the event of a critical finding, emergency repair work may be initiated. Bridges found to be incapable of carrying legal loads are posted with load limits.

## **Flood**

### **Lincoln County Department of Planning and Development**

Lincoln County administers the Comprehensive Plan and Land Use Code implementing land use regulations in compliance with ORS 197 and the Statewide Planning Goals. The County participates in the National Flood Insurance Program in accordance with FEMA requirements. Lincoln County Code Section 1.1395, Flood Hazard Overlay Zone, administers the NFIP at the local level. The purpose of the Flood Hazard Overlay Zone is to promote the public health, safety and welfare, and to minimize public and private losses due to flood conditions in specific areas, all in accordance with LCDC Statewide Planning Goal 7 and Lincoln County Comprehensive Plan Natural Hazard Policies. The zone applies to all areas within the 100-year flood boundary as identified on the Flood Boundary and Floodway Maps and the Flood Insurance Rate Maps (FIRM) as published by FEMA. The regulations are designed to reduce the risk of flood damage to new and substantially improved structures within known flood hazard areas. The County regularly distributes informational hand-outs, along with copies of LCC Section 1.1395 to the public, agencies, insurance companies, lenders, among others. The County keeps detailed records of permit activity within flood hazard areas. The County also distributes several FEMA generated informational hand-outs, including but not limited to “Questions and Answers on the National Flood Insurance Program”, and “Protect Your Home from Flood Damage- Mitigation Ideas for Reducing Flood Losses”. A copy of the Lincoln County Comprehensive Plan and Land Use Code can be found in Appendix E: Resource Directory. Also in Appendix E is a copy of each of the informational hand-outs and permit forms and FEMA generated hand-outs referenced above.

### **Lower Siletz Flood Mitigation Project**

Following the November 1999 flood, the County worked with Oregon Emergency Management and FEMA Region 10 to apply for and secure grant funds for flood mitigation activities. These grants may be used to fund mitigation activities that will reduce damage potential from future flood events. The first grants were secured in March 1999, with subsequent funding for further work received in both 2001 and 2002. The final grant-funded mitigation projects were completed in early 2003. Activities supported by this grant funding included the development of the Lower Siletz Flood Mitigation Plan along with mitigation activities pursuant to the plan on individual properties, primarily in the form of structure elevations. A copy of the Lower Siletz Flood Mitigation Plan and Final Report can be found in Appendix E: Resource Directory.

## Digitized Flood Hazard Area Map

As part of the development of the County's Geographic Information System (GIS), the County has completed the digitizing of the Flood Insurance Rate Maps (FIRM) and the Flood Boundary and Floodway maps. This digital layer is now applied in conjunction with the County's digital tax lot layer to more readily identify individual properties and structures in relation to the mapped flood hazard area boundaries. It should be noted that this digital layer has no official status for regulatory or insurance purposes; the FIRMs are the officially adopted maps for these purposes. And, since the original source of this digital layer (the FIRMs) was produced at a large scale and low level of detail, the overlay of this information on the County's more geodetically accurate tax lot layer must be viewed as an approximation of the flood hazard area boundary. Nonetheless, this information has proven to be a very useful tool in assisting planners and property owners in generally identifying flood prone properties, and especially in identifying areas where more detailed field reconnaissance (e.g. elevation survey) is needed.

## Department of Emergency Management

Lincoln County Emergency Management maintains a phone list for selected owners and residents of properties in flood hazard areas along the County's major rivers. In most cases, these contacts are for residents and owners of homes in the lowest elevation portions of the flood plain, and thus the first to be threatened in the event of a flood. When a flood event is predicted, Emergency Services contacts these affected homeowners and advises them of the forecasted conditions. These owners participate in a phone tree and make additional calls within their neighborhood to advise other property owners of the probable timing and extent of flooding in their area. Throughout a flood event, Emergency Services maintains contact with these selected owners and residents as they monitor current and forecasted conditions.

## Department of Public Works

Lincoln County Road Department, using the culvert inventory, annually inspects and cleans culverts on county roads. Culverts needing to be replaced are identified and targeted for replacement. Culverts during past flooding events that could not handle the flow are identified for replacement with a larger capacity culvert.

County bridges have a structural inspection performed by an outside consulting firm every two years. The Lincoln County Public Works Department visually inspects bridges every six months. During flood events crews keep a visual check on bridges for drift buildup. After a major flood, crews are dispatched to recheck bridges for flood damage.

## Landslide

### Lincoln County Department of Planning and Development

The department maintains maps of areas subject to geologic hazards, including landslides. These maps include Oregon Department of Geology and Mineral Industries (DOGAMI) publications addressing the identification of areas subject to landslide hazard for Lincoln County: Environmental Geology of Lincoln County (Bulletin 81, 1973) and Evaluation of

Coastal Erosion Hazard Zones in Lincoln County, Oregon (Open File Reports 0-04-01 and 0-07-01).

In addition, as part of the Lincoln County Comprehensive Plan, hazards along the developed coastal area were identified and mapped in Environmental Hazard Inventory of Coastal Lincoln County, RNKR Associates, 1978. Hazard areas may also be determined by other means including site specific geotechnical reports. Maps included in the RNKR study are part of the Lincoln County Comprehensive Plan Inventory and are available at the Department of Planning and Development.

Lincoln County addresses development in areas subject to geologic hazards in Section 1.1925 of the Lincoln County Code. This section outlines standards for development in identified landslide areas, including requirements for site specific engineering geologic reports.

In addition, the Building Division applies requirements in landslide prone areas in accordance with the State Structural Specialty Code. The Lincoln County Planning Department also provides a informational hand-out to the public entitled "Homeowner's Landslide Guide- For Hillside Flooding, Debris Flows, Erosion and Landslide Control" prepared by FEMA and OEM. A copy can be found in Appendix E-Resource Directory.

## Department of Public Works

Lincoln County Public Works Department monitors areas in the county road system susceptible to landslide. Where feasible, the department will attempt to stabilize failing slopes with the use of rip rap, jersey barriers or other appropriate means. Likewise, trees within a slide area that are determined to be hazardous are removed. Once stable, hydro-seeding occurs to restart vegetation growth.

As noted, landslides usually occur during high precipitation events. Maintenance of culverts and other components of drainage systems are critical in preventing slope and road bed failures, and are monitored closely during storm events.

In the case of large landslides, such as the one that occurred on Immonen Road in the fall of 2006, the Public Works Department attempts keep the road open to vehicular traffic. If this is not possible, the department attempts to provide a detour route. Large landslides generally cannot be "fixed." As they stabilize over time, the department makes repairs to the road. Large, stabilized landslides are monitored for new movement.

## Severe Weather (Windstorm/Winter Storm)

### Lincoln County Department of Planning and Development

The Oregon building code prescribes standards for structures which require specific design for identified wind load, with additional requirements addressing high exposure areas.

### Department of Emergency Management

The Department of Emergency Management makes regular appearances on radio broadcasts to educate and inform the public about preparedness over annual windstorm

activity. The department keeps weather watches and in the event of high winds or an impending storm, radio announcements are made on all local stations.

## Department of Public Works

Lincoln County Public Works faces a variety of winter related storms. The primary goal is to keep the roads open for emergency vehicles. Information is passed to different crews by radio. The county has two repeater sites and can communicate with Lincom (dispatch service) as to emergency calls received. Lincoln County Road Dept. has access to the National Weather Service, which provides us with updated information.

Inter-agency agreements exist to coordinate services, manpower and equipment during major events. Managers constantly monitor weather reports during the late fall, winter and early spring seasons.

The Lincoln County Public Works Department works collaboratively with the Central Lincoln People's Utility District to identify and remove potentially hazardous trees near utility corridors, along roads, and near vital infrastructure. This often involves working with abutting property owners. This work is scheduled throughout the year in an attempt to reduce storm related events. However, in Lincoln County there are a great many trees and the problem can never be eliminated. Public Works also works collaboratively with the Lincoln County Solid Waste District in debris removal after a windstorm.

When a windstorm is forecasted, as one was in 2007, the road crew is placed on alert and assigned to different locations throughout the county for quick response. Each crew is in radio contact and notified when a hazard has occurred. Each crew carries a power saw for removal of trees that have blown over. The vehicle (pickup) is equipped with a snowplow that allows the crew to quickly push the tree off of the road. This reduces the amount of time exposed to additional trees blowing over and opens the road quickly and efficiently. Crews must evaluate each occurrence as to the possibility of down power lines and the potential for additional blow down.

## Wildfire

### Lincoln County Department of Planning and Development

Lincoln County has enacted a Comprehensive Land Use Plan and implementing land use regulations in compliance with ORS 197 and the Statewide Planning Goals. As a part of the comprehensive plan, the county has placed large portions of the county in farm and forest use zones, which serves to limit most forms of development in rural portions of the county, development that would likely increase wildfire hazard.

In addition, the county has enacted land use regulations which address fire protection for new development in both urban and rural settings, and include provisions for access, water supply, fuel breaks and similar fire safety issues.

The Lincoln County Planning Department makes available and readily distributes a manual prepared by the Oregon Department of Forestry entitled "Planning for Survival- How to protect your home from wildfire" Revised March 1988. A copy of the manual can be found in Appendix E- Resource Directory. The County is in the process of obtaining more current

information available from Oregon Department of Forestry and local fire districts, which will be made available for public dissemination.

## **Lincoln County Emergency Management**

Lincoln County partners with other agencies in the area of wildfire management (ODF) and was involved in the development of the Community Wildfire Protection Plan (2018). The Oregon Department of Forestry is involved with local fire chiefs and fire departments as well as rural fire protection districts to provide training. Firefighters get a broad range of experience from exposure to wildland firefighting. Local firefighters can also obtain their red card (wildland fire training documentation) and attend extensive workshops combining elements of structural and wildland firefighting, defending homes, and operations experience. ODF has been involved with emergency managers to provide support during non-fire events as well as working with industrial partners such as timber companies to share equipment in extremely large events.

## **Synthesis**

As addressed above, many governmental entities are responsible for work relevant to hazards planning; however, from this perspective it is challenging to decipher whether these structures work collaboratively in practice towards improving hazard mitigation. On a similar note, in short of reviewing each of the relevant policy documents it is questionable whether the documents effectively integrate hazard initiatives into implementation policy. Further analysis is needed to evaluate the effectiveness of political capital in terms of community resilience.



# Appendix D: Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Oregon Partnership for Disaster Resilience at the University of Oregon's Institute for Policy Research and Engagement (IPRE). It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon Military Department – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigation*. This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how an economic analysis can be used to evaluate mitigation projects.

## Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred. Evaluating possible natural hazard mitigation activities provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, law enforcement, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value from a public policy perspective, in assessing the positive and negative impacts from mitigation activities and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

# Mitigation Strategy Economic Analyses Approaches

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. The distinction between the three methods is outlined below:

## Benefit/Cost Analysis

Benefit/cost analysis is a key mechanism used by the state Oregon Office of Emergency Management (OEM), the Federal Emergency Management Agency (FEMA), and other state and federal agencies in evaluating hazard mitigation projects and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, to avoid disaster-related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoiding future damages, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (i.e., the net benefits will exceed the net costs) to be eligible for FEMA funding. Unless an alternate approach is approved by FEMA, jurisdictions must use the latest available approved FEMA benefit/cost analysis (BCA) toolkit. Alternate approaches should be used with consultation from the State Hazard Mitigation Officer. See <https://www.fema.gov/benefit-cost-analysis> for more information.

## Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

## Investing in Public Sector Mitigation Activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

## Investing in Private Sector Mitigation Activities

Private sector mitigation projects may occur based on one or two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or

landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost-effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchases. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

## **STAPLE/E Approach**

Considering detailed benefit/cost or cost-effectiveness analysis for every possible mitigation activity could be very time consuming and may not be practical. There are some alternate approaches for conducting a quick evaluation of the proposed mitigation activities which could be used to identify those mitigation activities that merit more detailed assessment. One of those methods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees in a synthetic fashion. This set of criteria requires the Steering Committee to assess the mitigation activities based on the Social, Technical, Administrative, Political, Legal, Economic and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in your community. The second chapter in FEMA's How-To Guide "Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies" as well as the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process" outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E approach from the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process."

**Social:** Community development staff, local non-profit organizations, or a local planning board can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

**Technical:** The city or county public works staff and building department staff can help answer these questions.

- Will the proposed action work?

- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action considering other community goals?

**Administrative:** Elected officials or the city or county administrator, can help answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

**Political:** Consult the mayor, city council or city board of commissioners, city or county administrator, and local planning commissions to help answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

**Legal:** Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

**Economic:** Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private?)
- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?

- Does the action contribute to other community goals, such as capital improvements or economic development?
- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

**Environmental:** Watershed councils, environmental groups, land use planners and natural resource managers can help answer these questions.

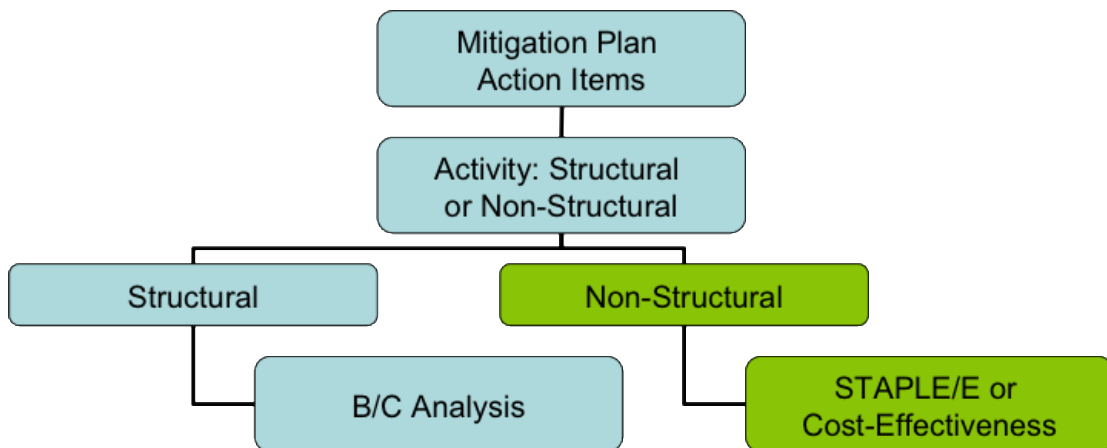
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed benefit/cost analyses.

## When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. The following figure is to serve as a guideline for when to use the various approaches.

**Figure D-I Economic Analysis Flowchart**



Source: Oregon Partnership for Disaster Resilience. 2005.

## Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether to implement a mitigation activity. A framework for evaluating

mitigation activities is outlined below. This framework should be used in further analyzing the feasibility of prioritized mitigation activities.

## 1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards but do so at varying economic costs.

## 2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- **Estimate the benefits.** Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.
- **Consider costs and benefits to society and the environment.** These are not easily measured but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- **Determine the correct discount rate.** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

## 3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate and

identifying the present and future costs and benefits of the project calculates the net present value of projects.

- **Internal rate of return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked based on economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

## **Economic Returns of Natural Hazard Mitigation**

The estimation of economic returns, which accrue to building or land owners because of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over time.

## **Additional Costs from Natural Hazards**

Property owners should also assess changes in a broader set of factors that can change because of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports

- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

## **Additional Considerations**

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, small business development, critical infrastructure, and transportation projects among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.



## Resources

CUREe Kajima Project, *Methodologies for Evaluating the Socio-Economic Consequences of Large Earthquakes*, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley Team, Robert A. Olson, VSP Associates, Team Leader; John M. Eiding, G&E Engineering Systems; Kenneth A. Goettel, Goettel and Associates, Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997

Federal Emergency Management Agency, *Benefit/Cost Analysis of Hazard Mitigation Projects*, Riverine Flood, Version 1.05, Hazard Mitigation Economics, Inc., 1996

Federal Emergency Management Agency, [Report on the Costs and Benefits of Natural Hazard Mitigation](#). Publication 331, 1996.

Goettel & Horner Inc., *Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in the City of Portland*, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel & Horner Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects Volume V, Earthquakes*, Prepared for FEMA's Hazard Mitigation Branch, October 25, 1995.

Horner, Gerald, *Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures*, Robert Olsen Associates, Prepared for Oregon Military Department – Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000.)

Risk Management Solutions, Inc., *Development of a Standardized Earthquake Loss Estimation Methodology*, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., *A Benefit/Cost Model for the Seismic Rehabilitation of Buildings*, Volumes 1 & 2, Federal Emergency management Agency, FEMA Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects*, 1993.

VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model*, Volume 1, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

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# APPENDIX E: GRANT PROGRAMS AND RESOURCES

## Introduction

There are numerous local, state and federal funding sources available to support natural hazard mitigation projects and planning. The following section includes an abbreviated list of the most common funding sources utilized by local jurisdictions in Oregon. Because grant programs often change, it is important to periodically review available funding sources for current guidelines and program descriptions.

## Post-Disaster Federal Programs

### Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP involves a paper application which is first offered to the counties with declared disasters within the past year, then becomes available statewide if funding is still available.

<http://www.fema.gov/hazard-mitigation-grant-program>

### Physical Disaster Loan Program

When physical disaster loans are made to homeowners and businesses following disaster declarations by the U.S. Small Business Administration (SBA), up to 20% of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters. <http://www.sba.gov/category/navigation-structure/loans-grants/small-business-loans/disaster-loans>

## Pre-Disaster Federal Programs

### Building Resilient Infrastructure and Communities Grant Program

The Building Resilient Infrastructure and Communities (BRIC) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. BRIC grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. The BRIC grant program is offered annually; applications are submitted online. Applicants need a user profile approved by the State Hazard Mitigation Officer, which should be garnered well before the application period opens. <https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>

## Flood Mitigation Assistance Program

The overall goal of the Flood Mitigation Assistance (FMA) Program is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other National Flood Insurance Program (NFIP) insurable structures. This specifically includes:

- Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;
- Encouraging long-term, comprehensive hazard mitigation planning;
- Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities; and
- Complementing other federal and state mitigation programs with similar, long-term mitigation goals.

<http://www.fema.gov/flood-mitigation-assistance-program>

Detailed program and application information for federal post-disaster and pre-disaster programs can be found in the FY15 Hazard Mitigation Assistance Unified Guidance, available at: <https://www.fema.gov/media-library/assets/documents/103279>. Note that guidance regularly changes. Verify that you have the most recent edition. Flood mitigation assistance is usually offered annually; applications are submitted online. Applicants need a user profile approved by the State Hazard Mitigation Officer, which should be garnered well before the application period opens.

For Oregon Office of Emergency Management (OEM) grant guidance on Federal Hazard Mitigation Assistance, visit:

<https://www.oregon.gov/OEM/emresources/Grants/Pages/HMA.aspx>

Contact: Amie Bashant, [amie.bashant@state.or.us](mailto:amie.bashant@state.or.us) or [shmo@mil.state.or.us](mailto:shmo@mil.state.or.us)

## State Programs

### Special Public Works Fund

The Special Public Works Fund (SPWF) provides funds for publicly owned facilities that support economic and community development in Oregon. Funds are available to public entities for: planning, designing, purchasing, improving and constructing publicly owned facilities, replacing publicly owned essential community facilities, and emergency projects as a result of a disaster. Public agencies that are eligible to apply include: cities, counties, county service districts, (organized under ORS Chapter 451), tribal councils, ports, districts as defined in ORS 198.010, and airport districts (ORS 838). Facilities and infrastructure projects that are eligible for funding are: airport facilities, buildings and associated equipment, levee accreditation, certification, and repair, restoration of environmental conditions on publicly-owned industrial lands, port facilities, wharves, and docks, the purchase of land, rights of way and easements necessary for a public facility, telecommunications facilities, railroads, roadways and bridges, solid waste disposal sites, storm drainage systems, wastewater systems, and water systems. <https://www.orinfrastructure.org/Infrastructure-Programs/SPWF/>

## **Seismic Rehabilitation Grant Program**

The Seismic Rehabilitation Grant Program (SRGP) provides state funds to strengthen public schools and emergency services buildings so they will be less damaged during an earthquake. Reducing property damage, injuries, and casualties caused by earthquakes is the goal of the SRGP. <http://www.orinfrastructure.org/Infrastructure-Programs/Seismic-Rehab/>

## **Community Development Block Grant Program**

The Community Development Block Grant Program promotes viable communities by providing: 1) decent housing; 2) quality living environments; and 3) economic opportunities, especially for low- and moderate-income persons. Eligible activities most relevant to natural hazards mitigation include: acquisition of property for public purposes; construction/reconstruction of public infrastructure; community planning activities. Under special circumstances, CDBG funds also can be used to meet urgent community development needs arising in the last 18 months which pose immediate threats to health and welfare.

[http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/comm\\_planning/communitydevelopment/programs](http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs)

## **Oregon Watershed Enhancement Board**

While OWEB's primary responsibilities are implementing projects addressing coastal salmon restoration and improving water quality statewide, these projects can sometimes also benefit efforts to reduce flood and landslide hazards. In addition, OWEB conducts watershed workshops for landowners, watershed councils, educators, and others, and conducts a biennial conference highlighting watershed efforts statewide. Funding for OWEB programs comes from the general fund, state lottery, timber tax revenues, license plate revenues, angling license fees, and other sources. OWEB awards approximately \$20 million in funding annually. More information at: <http://www.oregon.gov/OWEB/Pages/index.aspx>

# **Federal Mitigation Programs, Activities & Initiatives**

## **Basic & Applied Research/Development**

National Earthquake Hazard Reduction Program (NEHRP), National Science Foundation.

Through broad based participation, the NEHRP attempts to mitigate the effects of earthquakes. Member agencies in NEHRP are the US Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute for Standards and Technology (NIST). The agencies focus on research and development in areas such as the science of earthquakes, earthquake performance of buildings and other structures, societal impacts, and emergency response and recovery. <http://www.nehrp.gov/>

Decision, Risk, and Management Science Program, National Science Foundation.

Supports scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society. Disciplinary and interdisciplinary research, doctoral dissertation research, and workshops are funded in the areas of judgment and decision making; decision analysis and decision aids; risk analysis,

perception, and communication; societal and public policy decision making; management science and organizational design. The program also supports small grants for exploratory research of a time-critical or high-risk, potentially transformative nature.

[http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5423](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423)

## **Hazard ID and Mapping**

### **National Flood Insurance Program: Flood Mapping; FEMA**

Flood insurance rate maps and flood plain management maps for all NFIP communities.

<http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping>

### **National Map: Orthoimagery, DOI – USGS**

Develops topographic quadrangles for use in mapping of flood and other hazards.

<https://nationalmap.gov/ortho.html>

### **Mapping Standards Support, DOI-USGS**

Expertise in mapping and digital data standards to support the National Flood Insurance Program. <http://ncgmp.usgs.gov/standards.html>

### **Soil Survey, USDA-NRCS**

Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigation or related purposes. [http://soils.usda.gov/survey/printed\\_surveys/](http://soils.usda.gov/survey/printed_surveys/)

## **Project Support**

### **Coastal Zone Management Program, NOAA**

Provides grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration.

<http://coastalmanagement.noaa.gov/>

### **Community Development Block Grant Entitlement Communities Program, US Department of Housing and Urban Development**

Provides grants to entitled cities and urban counties to develop viable communities (e.g., decent housing, a suitable living environment, expanded economic opportunities), principally for low- and moderate- income persons.

[http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/comm\\_planning/communitydevelopment/programs/entitlement](http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/entitlement)

### **National Fire Plan (DOI – USDA)**

The NFP provides technical, financial, and resource guidance and support for wildland fire management across the United States. This plan addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability.

<http://www.forestsandrangelands.gov/>

## Assistance to Firefighters Grant Program, FEMA

FEMA AFGM grants are awarded to fire departments to enhance their ability to protect the public and fire service personnel from fire and related hazards. Three types of grants are available: Assistance to Firefighters Grant (AFG), Fire Prevention and Safety (FP&S), and Staffing for Adequate Fire and Emergency Response (SAFER).

<http://www.fema.gov/welcome-assistance-firefighters-grant-program>

## Emergency Watershed Protection Program, USDA-NRCS

Provides technical and financial assistance for relief from imminent hazards in small watersheds, and to reduce vulnerability of life and property in small watershed areas damaged by severe natural hazard events.

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp>

## Rural Development Assistance – Utilities, USDA

Direct and guaranteed rural economic loans and business enterprise grants to address utility issues and development needs.

[http://www.rurdev.usda.gov/Utilities\\_Programs\\_Grants.html](http://www.rurdev.usda.gov/Utilities_Programs_Grants.html)

## Rural Development Assistance – Housing, USDA

The RDA program provides grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster necessary. <http://www.rurdev.usda.gov/HAD-HCFPGGrants.html>

## Public Assistance Grant Program, FEMA

The objective of FEMA Public Assistance (PA) Grant Program is to aid State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. <http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit>

## National Flood Insurance Program, FEMA

The NFIP makes available flood insurance to residents of communities that adopt and enforce minimum floodplain management requirements. <http://www.fema.gov/national-flood-insurance-program>

## HOME Investments Partnerships Program, HUD

The HOME IPP provides grants to states, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons. <http://www.hud.gov/offices/cpd/affordablehousing/programs/home/>

## Disaster Recovery Initiative, HUD

The DRI provides grants to fund gaps in available recovery assistance after disasters (including mitigation).

[http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/comm\\_planning/communitydevelopment/programs/dri](http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/dri)

## Emergency Management Performance Grants, FEMA

EMPG grants help state and local governments to sustain and enhance their all-hazards emergency management programs. <http://www.fema.gov/fy-2012-emergency-management-performance-grants-program>

## Partners for Fish and Wildlife, DOI – FWS

The PFW program provides financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats. <http://www.fws.gov/partners/>

## North American Wetland Conservation Fund, DOI-FWS

NAWC fund provides cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats. <http://www.fws.gov/birdhabitat/Grants/index.shtm>

## Federal Land Transfer / Federal Land to Parks Program, DOI-NPS

Identifies, assesses, and transfers available federal real property for acquisition for State and local parks and recreation, such as open space. <http://www.nps.gov/ncrc/programs/flp/index.htm>

## Wetlands Reserve program, USDA-NCRS

The WR program provides financial and technical assistance to protect and restore wetlands through easements and restoration agreements. <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands>

## Secure Rural Schools and Community Self-Determination Act of 2000, US Forest Service

Reauthorized for FY2012, it was originally enacted in 2000 to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. Funds have been used for improvements to public schools, roads, and stewardship projects. Money is also available for maintaining infrastructure, improving the health of watersheds and ecosystems, protecting communities, and strengthening local economies. <http://www.fs.usda.gov/pts/>



# APPENDIX F: COMMUNITY SURVEY

## Survey Purpose and Use

The purpose of this survey was to gauge the overall perception of natural disasters, determine a baseline level of loss reduction activity for residents in the community and assess citizen's support for different types of individual and community risk reduction activities.

Data from this survey directly informs the natural hazards mitigation planning process. Lincoln County can use this survey data to enhance action item rationale and ideas for implementation. Other community organizations can also use survey results to inform their own outreach efforts. Data from the survey provides the County with a better understanding of desired outreach strategies (sources and formats) and a baseline understanding of community perceptions of natural hazards and resilience.

## Key Takeaways

In general, the survey responses reinforced information collected by the plan update team (Steering Committee and consultant).

- Community respondents and jurisdiction leaders agree that the offshore earthquake and local tsunami is the hazard of most concern. Coastal erosion, windstorm, and wildfire were other hazards rated with high concern. Community respondents provided additional open-ended responses that included that climate change, sea level rise, and water availability were amongst their concerns.
- Infrastructure (damage or loss of bridges, utilities, schools, etc.), human (loss of life and/or injuries), and economic (business closures and/or job losses) assets were rated as the most vulnerable to natural hazards faced by the county.
- Community members and jurisdiction leaders rated major bridges, police/fire stations, and hospitals as the most important community assets. These were also rated as the most important planning priorities.
- Respondents to the surveys perceived the county and cities most prepared for windstorms, earthquakes, drought, winter storms, and distant tsunamis. Fewer respondents perceived the county to be prepared for wildfire, coastal erosion, and volcanic events.
- Community respondents secure water heater, bookcases, and other objects that may fall in an earthquake, maintain a "defensible space" clear of vegetation and flammable materials, clear debris from storm drains, and regularly trim trees to reduce individual and family risk.
- Community respondents have signed up for public alerts, store emergency food and water, have emergency kits at home, know where to go during an emergency, and have a contact outside the area they can contact during an emergency. Fewer respondents work with neighbors on emergency preparedness or have participated in community/neighborhood volunteer emergency training exercises.

- Lack of money was the primary reason given for not preparing for an emergency by individuals and community leaders. Not having enough space to store emergency supplies was given as a reason by some community respondents.
- Power outages, water system damages, bridge and road closures were listed by community respondents as the things that would most impact them during an emergency. Jurisdiction respondents also mentioned damage to fuel and natural gas infrastructure and sewer system damage as impacts.
- Community respondents preferred email, websites, television, print media, and social media as methods to receive information on natural hazards.
- Most respondents with flood insurance purchase it voluntarily and rather than because it is mandated by their mortgage carrier. Those who have other insurance primarily have earthquake, weather, and fire insurance.

## Background

Citizen involvement is a key component in the NHMP planning process. Citizens should have the opportunity to voice their ideas, interests and concerns about the impact of natural disasters on their communities.

According to Bierle<sup>1</sup>, the benefits of citizen involvement include the following: (1) educate and inform public; (2) incorporate public values into decision making; (3) substantially improve the quality of decisions; (4) increase trust in institutions; (5) reduce conflict; and (6) ensure cost effectiveness.

The NHMP planning process provided opportunities for the public to engage through an on-line survey disseminated by Lincoln County.

## Methodology

In the summer of 2019, the Oregon Partnership for Disaster Resilience (OPDR) administered the survey via the on-line tool (Qualtrics). The survey was distributed via city and county social media and websites in Lincoln County. Survey responses were received from a total of 379 respondents (256 responses were complete, and 123 responses were partially complete). An additional 42 surveys were collected at a Readiness Fair held in Newport on September 21, 2019. This survey included 10 questions that were also included on the online survey. The results of the Readiness Fair survey were combined with the online survey responses where applicable (see notes under tables for more information). A separate survey was distributed to jurisdiction leaders (employees and elected officials of the county, cities, and special districts); a total of 26 leaders responded to the survey (12 complete, 14 partial) representing all participating cities, several unincorporated communities, and three special districts. The jurisdiction leader responses follow the community responses for each question that was in that survey.

The survey consisted of 34 questions. Lincoln County designed the survey to determine public perceptions and opinions regarding natural hazards and mitigation priorities.

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<sup>1</sup> Bierle, T. 1999. Using social goals to evaluate public participation in environmental decisions. *Policy Studies Review*. 16(3/4), 75-103.

The intent of this survey was not to be statistically valid but instead to gain the perspective and opinions of residents regarding natural hazards in the region. Our assessment is that the results reflect a range attitudes and opinions of residents throughout the county. Results are provided below for the County; specific results are provided for each city as applicable.

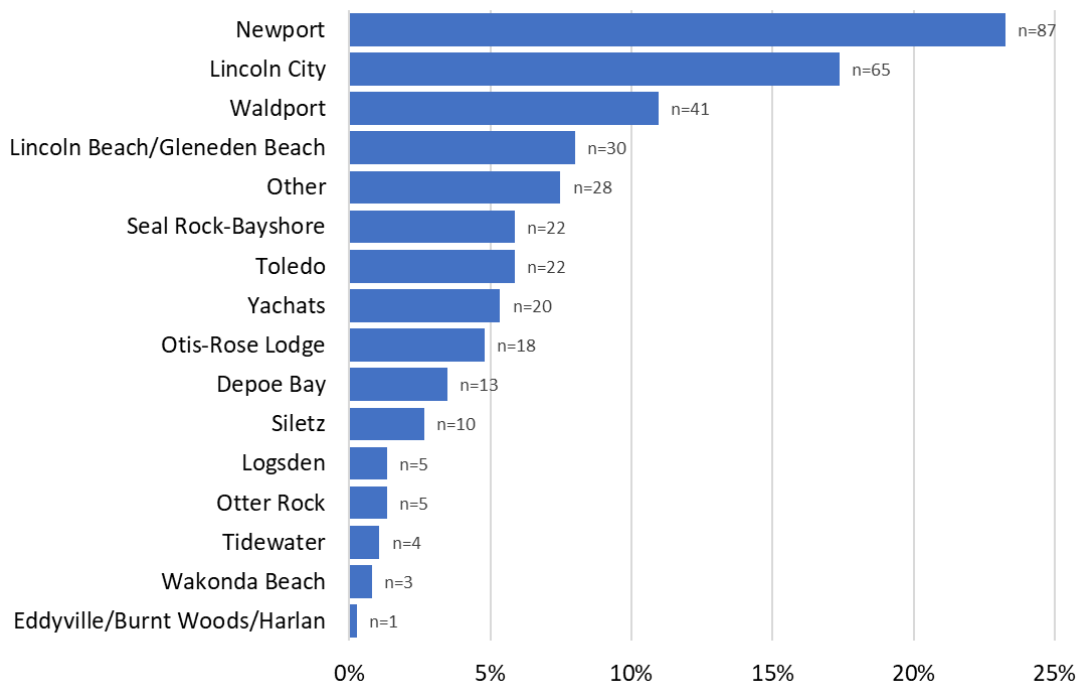
## Survey Results

This section presents the compiled data and analysis for the 2019 Lincoln County NHMP Community Survey.

### Respondent Characteristics

More than half of the respondents live either in Newport (87), Lincoln City (65), or Waldport (41). Lincoln Beach/Gleneden Beach (30) had the most respondents from unincorporated communities. The respondents at the Newport Readiness Fair were largely from Newport, and surrounding unincorporated areas. There were 26 responses to the jurisdiction survey including responses from city managers, mayors, law enforcement, utility workers, fire chiefs, county commissioners, and facilities and logistic managers.

**Figure F-1 Respondent Place of Residence (374 respondents)**



Source: 2019 NHMP Community Survey, analysis by OPDR; Q1 - In which Lincoln County community do you live?

The following were provided as responses to the “other” category: Seal rock (x2), Bayshore, South Beach (x7), Neotsu (x3), Gleneden Beach (x2), Roads End area, County between Newport and Toledo, East Devils Lake Rd./Park Lane, Between Yachats and Waldport (x2), Nashville, just north of Patterson State Park, Kernville, None - work in Lincoln Cty (Newport office), Beverly Beach.

## Natural Hazard Information

This section reports the experiences of survey respondents involving natural hazards and their exposure to preparedness information.

The survey asked respondents to indicate their level of concern about natural hazards that impact Lincoln County. Table F-1 shows that respondents were “very concerned” about earthquake (offshore) (51%), earthquake (onshore) (47%), and tsunami (local)(59%). There top three “somewhat concerned” responses were regarding tsunami (distant) (53%), coastal erosion (47%), and windstorm (45%). Respondents were least concerned about volcanic event, winter storm, drought, and flood.

Jurisdiction responses: Jurisdiction leaders were most concerned with the offshore earthquake and associated local tsunami, wildfire, windstorm, and onshore earthquakes. They were least concerned about the volcanic event and drought hazards.

**Table F-1 Hazards that Concern Respondent the Most**

Hazard	Very Concerned	Somewhat Concerned	Not Very Concerned	Not Concerned	Total Responses
Coastal Erosion	29%	47%	18%	6%	387
Drought	19%	33%	25%	23%	386
Earthquake (Offshore)	51%	40%	7%	2%	401
Earthquake (Onshore)	47%	35%	14%	4%	398
Flood	15%	41%	32%	12%	393
Landslide	23%	42%	28%	7%	395
Tsunami (Local)	59%	33%	6%	2%	401
Tsunami (Distant)	26%	53%	18%	4%	394
Volcanic Event	5%	20%	40%	35%	382
Wildfire	30%	38%	25%	7%	395
Windstorm	26%	45%	22%	7%	392
Winter Storm (Snow/Ice)	13%	35%	36%	17%	391
Other:	3%	2%	1%	3%	34

Source: 2019 NHMP Community Survey and Readiness Fair Survey, analysis by OPDR; Q2 - Please indicate your level of concern about the following natural hazards affecting the community you live in.

The following were provided as responses to the “other” category: heat waves, Excessive Heat/Temps, Sea level rise, Climate change/global warming (x3), Climate change Induced Societal Breakdown, water shortage due to climate change, Water Supply in emergency and blackouts, Water availability, Its just part of living in Newport, falling trees, river bank erosion Yaquina, Feeding vacationer during a disaster, injuries from downed electrical lines that try to re-energize without power company shutting down in time, Siletz River bank erosion, Bridge and road closure, Air quality from fires outside Lincoln County, Solar Storm, Human safety in the nearshore ocean, Accurate information everyone has a different theory on "how bad", hazard announcement to public, Concerns about escaping the actual beach in a tsunami threat , Beach grass and dunes should be maintained so departing beach under tsunami threat is as easy as possible.

## Community Assets Vulnerable to Hazards

The survey addressed the issue of which community assets respondents felt were most vulnerable to natural hazards. Shown below in Table F-2, 95% of respondents perceived that infrastructure is very vulnerable or somewhat vulnerable to hazards. Furthermore, 89% of respondents ranked human assets, and 88% governance, as very vulnerable or somewhat vulnerable. Cultural/historic assets were considered least vulnerable.

Jurisdiction responses: Jurisdiction leaders agreed with the community and rated infrastructure as the most vulnerable, followed by human and economic assets. Cultural and historic assets were considered the least vulnerable.

**Table F-2 Community Assets Vulnerable to Hazards**

Assets	Very Vulnerable	Somewhat Vulnerable	Neutral	Not Very Vulnerable	Not Vulnerable	Total
Human	44%	46%	8%	2%	1%	360
Economic	49%	32%	13%	5%	1%	357
Infrastructure	80%	15%	3%	1%	0%	357
Cultural/Historic	21%	41%	28%	9%	1%	357
Environmental	39%	43%	12%	6%	1%	358
Governance	52%	36%	8%	3%	1%	358

Source: 2019 NHMP Community Survey, analysis by OPDR; Q3 - Please tell us how vulnerable you feel each of the following categories of community assets are to the natural hazard impacts in the community you live in.

## Mitigation Efforts

The survey asked respondents to indicate what types of community assets are most important to them (Table F-3). Major Bridges (98%), police/fire stations (97%), and hospitals (96%) were among the most rated as very important. Parks (52%) and museums/historic buildings (51%) were listed as the least important.

**Table F-3 Community Assets Ranked by Level of Importance to Respondent**

Question	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important	Total Responses
Assisted Living & Skilled Nursing Care	32%	36%	21%	8%	3%	350
Hospitals	84%	12%	2%	1%	1%	354
Schools (K-12)	43%	30%	18%	6%	3%	350
Schools (College/University)	18%	40%	29%	9%	4%	345
Major Bridges	87%	12%	1%	0%	0%	355
Small Businesses	35%	45%	17%	2%	1%	350
Large Businesses	25%	44%	25%	5%	1%	350
City Hall/Courthouse/Tribal Administration	28%	43%	22%	4%	2%	348
Fire/Police Stations	86%	11%	2%	0%	1%	357
Parks	17%	35%	30%	14%	4%	351
Museums/Historic Buildings	13%	38%	32%	13%	4%	349
Other:	47%	13%	22%	1%	17%	134

Source: 2019 NHMP Community Survey, analysis by OPDR; Q4 - Next we would like to know what specific types of community assets are most important to you.

Jurisdiction responses: Jurisdiction leaders rated police/fire stations (93% of respondents), hospitals (87% of respondents), and major bridges (80% of respondents) as very important. Museums/historic buildings (54% of respondents), colleges/universities (33% of respondents), and parks (31% of respondents) were rated as not very important or not important.

The following were provided as responses to the “other” category: recreation/fitness centers (x2), Open spaces/nature trails, Beaches, people's houses!, all development in tsunami zone, Marine Science Center, Infrastructure, Roads (x6), erosion of US101 at Beverly Beach, Closed off street, Bike lanes, Bridges, Highways (34/101) (x5), Port facilities, Marine Infrastructure, Coast guard, Evacuation Services by Boat or Helicopter, Construction equipment, Emergency Responders – Medical, CERT, Ambulance (all 1st responders, People who care, not just paid to care, Evacuation Services for Pets, Shelter if homes are destroyed or deemed unsafe, Local farms, Environment, Internet availability, Communication, Radio communications (no telephones), Drinking water infrastructure (x11), Electric power/grid (x6), Utilities (x5), Food source/security (x3), Gasoline/utility (x2), Sewer (x3), Performing arts, Community cultural centers, Veterinary/Animal Care, Yachats commons, mental health services, Senior Center, churches, Child Care, Health Care Offices, Library, Museums (OCA) - its own category, [concern about neighborhood watch effectiveness], Small neighborhoods.

## Priorities Planning for Natural Hazards

Table F-4 shows respondent priorities regarding planning for natural hazards. Protecting critical facilities such as transportation networks, hospitals, and fire stations (99%), protecting and reducing damage to utilities (96%), strengthening emergency services such as police, fire, and ambulance (95%), and promoting cooperation among public agencies, citizens, non-profit organizations and business were ranked very important or somewhat important. Protecting historical and cultural landmarks was considered least important, however, more than 60% of respondents still considered it to be very important or somewhat important.

**Table F-4 Priorities Planning**

Planning for Natural Hazards: Priorities	Very or Somewhat		Not Very	Total Responses
	Important	Neutral	or Not Important	
Protecting private property	83%	13%	4%	349
Protecting critical facilities	99%	1%	1%	350
Preventing development in hazard areas	85%	11%	4%	348
Enhancing the function of natural features	81%	13%	6%	346
Protecting historical and cultural landmarks	61%	29%	11%	347
Protecting and reducing damage to utilities	96%	3%	1%	350
Strengthening emergency services	95%	4%	1%	352
Disclosing natural hazard risks during real estate transactions	85%	11%	3%	350
Promoting cooperation among public agencies, citizens, non-profit organizations, and businesses	93%	5%	2%	350

Source: 2019 NHMP Community Survey, analysis by OPDR; Q5 - Natural hazards can have a significant impact on

a community, but planning for these events can help lessen the impacts. The following statements will help determine priorities for planning for natural hazards.

Jurisdiction responses: Jurisdiction leaders agreed that strengthening emergency services (93% of respondents), protecting critical facilities (93% of respondents), protecting and reducing damages to utilities (87% of respondents), and promoting cooperation (71% of respondents) were either very important or somewhat important.

## Awareness of County/City Preparedness for Natural Hazards -

Table F-5 shows Lincoln County residents' opinions on the county and city preparedness for different types of natural hazards. Not many respondents rated Lincoln county or cities as very prepared, but over half of respondents said that they believe the county and cities were somewhat prepared for earthquakes (offshore, 63%, onshore, 58%), tsunamis (local, 60%, distant, 61%), windstorms (58%), floods (56%), and wildfires (53%). Respondents also noted that Lincoln County is not very prepared or not prepared for volcanic events (78%) and droughts (61%).

Jurisdiction responses: Like the community survey jurisdiction leaders did not perceive the county and cities to be very prepared for most hazards. However, the respondents perceived the county and cities to be somewhat prepared for windstorms (69%), earthquakes (offshore, 69%, onshore, 63%), drought (57%), winter storms (56%), and distant tsunamis (56%). Only 38% if jurisdiction respondents perceived communities to be prepared for wildfires. The respondents perceived the county and cities to be least prepared for volcanic events, coastal erosion, and wildfire.

**Table F-5 Preparedness for Natural Hazards**

Hazard	Very Prepared	Somewhat Prepared	Not Very Prepared	Not Prepared	Total Responses
Coastal Erosion	2%	42%	41%	15%	262
Drought	2%	37%	41%	19%	239
Earthquake (Offshore)	7%	63%	22%	8%	298
Earthquake (Onshore)	6%	58%	24%	11%	298
Flood	5%	56%	29%	10%	264
Landslide	5%	45%	39%	12%	264
Tsunami (Local)	9%	60%	20%	12%	309
Tsunami (Distant)	10%	61%	20%	8%	299
Volcanic Event	2%	20%	38%	39%	214
Wildfire	7%	53%	28%	13%	272
Windstorm	15%	58%	21%	7%	277
Winter Storm (Snow/Ice)	6%	49%	31%	13%	285
Other:	0%	29%	14%	57%	14

Source: 2019 NHMP Community Survey, analysis by OPDR; Q6 - In your opinion, how prepared is Lincoln County to respond to natural hazard events?

The following were provided as responses to the "other" category:

- The truth is, I really don't know how well [our] county is prepared for any of these events. They do a good job of holding preparedness drills for the community, but I

know little about how our County is prepared - how prepared rescue services, law enforcement preparedness, medical providers, etc. how prepared are they? I don't know.

- I know work has been done on preparedness but I don't know the extent of it
- Grid failure
- disclosing hazards to visitors with truth
- Utilities (drinking water) (x3)
- Rarely is there de-icer on tide slick roads in Otis, Lincoln City early mornings.
- Dead bodies after event
- Evacuation
- Maintaining and stocking water and food sources, power, water, sewer
- I heard from county we are each on our own
- Our hill is moving down
- Solar Storm

Table F-6 shows respondent level of awareness of activities that Lincoln County is taking to reduce individual risk (life/property) from specific natural hazards. The table shows that respondents are extremely aware of activities around local (27% of respondents) and distant (23% of respondents) tsunamis and offshore (20% of respondents) and onshore (19% of respondents) earthquakes. Respondents are least aware of activities taken regarding volcanic events (77% of respondents), landslides (71% of respondents), drought (71% of respondents), and coastal erosion (70% of respondents).

Jurisdiction responses: Like the community survey jurisdiction leaders were most aware of activities related to local (47% of respondents) and distant tsunami (47% of respondents), offshore (47% of respondents) and onshore (40% of respondents) earthquakes, and windstorm (33% of respondents) hazards. They were least aware of activities related to volcanic events, winter storm, coastal erosion, and landslide.

**Table F-6 Awareness of Lincoln County action to reduce individual risk (life/property) from specific natural hazards**

Hazard	Extremely Aware	Moderately Aware	Somewhat Aware	Slightly Aware	Total Responses
Coastal Erosion	3%	27%	43%	27%	191
Drought	4%	25%	45%	27%	164
Earthquake (Offshore)	20%	37%	30%	13%	297
Earthquake (Onshore)	19%	35%	33%	13%	285
Flood	6%	35%	41%	18%	223
Landslide	3%	26%	44%	27%	194
Tsunami (Local)	27%	42%	22%	10%	307
Tsunami (Distant)	23%	43%	23%	11%	299
Volcanic Event	3%	20%	47%	30%	120
Wildfire	9%	32%	37%	22%	249
Windstorm	10%	35%	33%	22%	222
Winter Storm (Snow/Ice)	6%	33%	37%	24%	216
Other:	0%	30%	50%	20%	10

Source: 2019 NHMP Community Survey, analysis by OPDR; Q7. How aware are you of mitigation activities that Lincoln County is taking to reduce individual risk (life or property) from the following natural hazards?



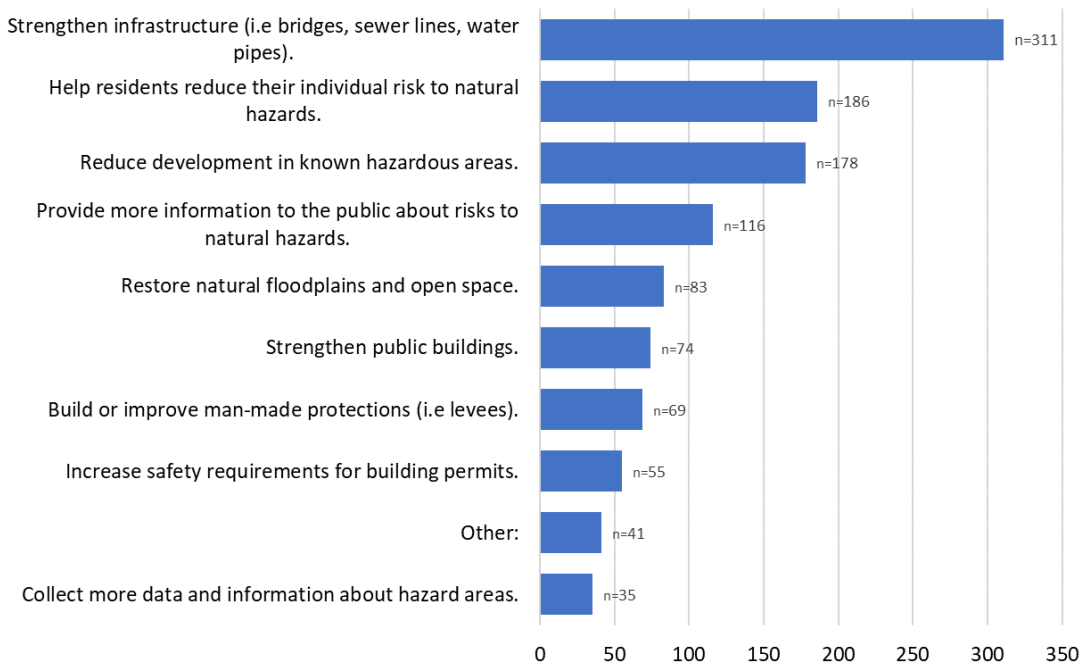
The following were provided as responses to the “other” category:

- Grid failure
- vehicle exit route guaranteed
- evacuation
- Utilities (drinking water)
- Emergency signal warning
- maintaining stock of water, food, power, water, sewer
- Solar Storm

Figure F-2 shows respondent preference for activities the County should take to reduce risk from natural hazards. Respondents preferred the County strengthen infrastructure (311 respondents), assist residents reduce their risk to natural hazards (186 respondents), reduce development in known hazard areas (178 respondents), and provide more information to the public about the risks from natural hazards (116 respondents).

Jurisdiction responses: Jurisdiction leaders considered strengthening infrastructure (14 respondents), assisting residents reduce their risk to natural hazards (8 respondents), providing more information to the public about the risks from natural hazards (7 respondents), and strengthening public buildings (7 respondents) to be most important.

**Figure F-2 Most important things that should be done to reduce risk from natural hazards**



Source: NHMP Community Survey and Readiness Fair Survey, analysis by OPDR; Q8 - What are the three (3) most important things your community should do to reduce risk from natural hazards?

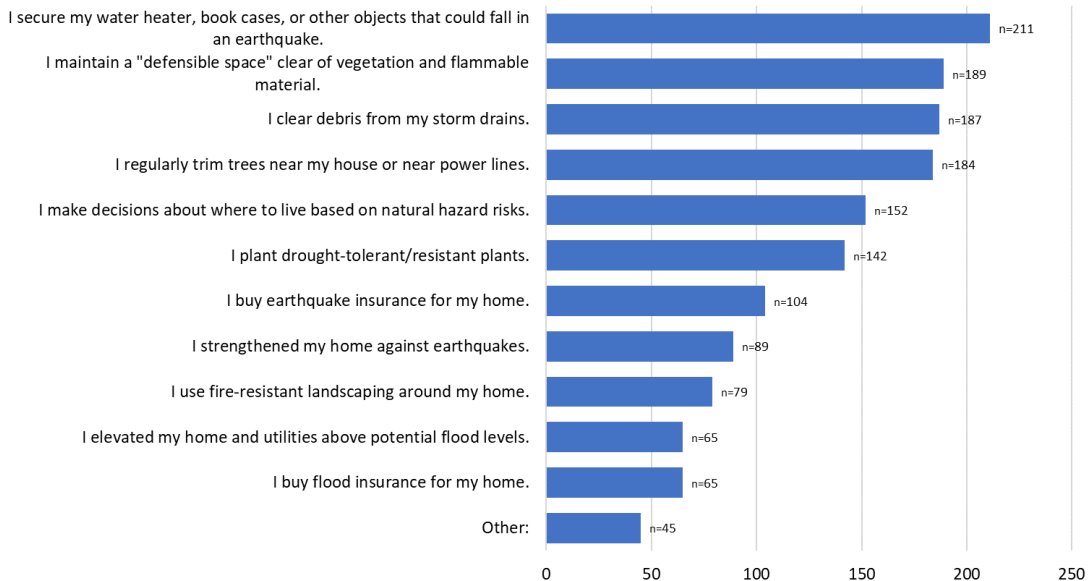
The following were provided as responses to the “other” category:

- Establish communication methods / facilitate neighborhood links in the event of natural disaster

- Prepare for roads, electricity, and internet failure.
- Reduce regulations that hinder building away from hazards
- Inform residents about what to do after a natural disaster.
- Figure out how tourists will be educated and cared for
- Water storage for human consumption after a major earthquake / tsunami
- Underground utilities
- Further education on tsunami escape routes
- provide absolute guaranteed exits paths for cars out of coastal areas
- Make access from beach to tsunami safe zones as easy as possible. Eliminate beach grass and level sand dunes
- Provide REALISTIC info to public on likely scenario of Cascadia event AFTERMATH.
- Promote and support Emergency Managers
- Most important (not even on this list) roads going out of the area – west to east.
- All of the above
- Make VRD owners responsible for the people they bring into the hazard zone
- Improve emergency services, especially fire. Often there are only 2 firefighters on duty for Newport and South Beach. They rely on volunteers to respond and often enough no one shows up.
- None of these things are much of an issue and some of these ideas are equivocally WRONG. Additional regulation is never the answer. Figuring out how to do your job better is. My main request as a concerned citizen: Don't live in a bubble. Travel to, interview and research how other state's counties handle emergency management. Primary example: I know for a fact, your department does not understand the proper use of the WEA and EAS systems. That alone is a massive issue that is easily solved.
- Evacuation
- Access to fuel for emergency generators
- Have a rotating stock of water, food, waste disposal
- Dredge the Siletz Bay and river unto the highway 101 Bridge
- Map your neighborhood
- Have more people attend CERT training
- Hill on Williams Ave is sliding down
- Improve roadways, construct bridges
- Plan for the natural disasters.
- Emergency Siren needs to be erected again! Was disabled when City Hall moved from old building!
- Show area escape routes
- Identify medical personnel and other leaders in the community and have kits ready for them. I worry about lack of medicines available
- Strengthen utilities facilities such as electricity, water, sewer and telephone.
- Prepare our emergency agency to deal with outcomes, most individuals will never prepare anyway.
- Diversity of approaches
- STOP development in the tsunami zone
- integrate carbon neutral goals into all policies
- Provide community members with information on how to prepare for natural hazards

Figure F-3 shows activities that respondents take to improve the safety of themselves and families in the event of a disaster. The highest number of respondents secure water heater, bookcases, and other objects that may fall in an earthquake (211), followed by those who maintain a “defensible space” clear of vegetation and flammable materials (189), those who clear debris from storm drains (187), and those who regularly trim trees (184). Fewer respondents have bought flood insurance (65), elevated their homes from flood hazards (65), use fire resistant landscaping (79), strengthen home against earthquakes (89), or purchase earthquake insurance (104).

**Figure F-3 Steps taken to reduce individual/family risk from disaster event**



Source: NHMP Community Survey and Readiness Fair Survey, analysis by OPDR; Q9 - What steps do you take to improve the safety of yourself and your family in the event of a disaster?

The following were provided as responses to the “other” category:

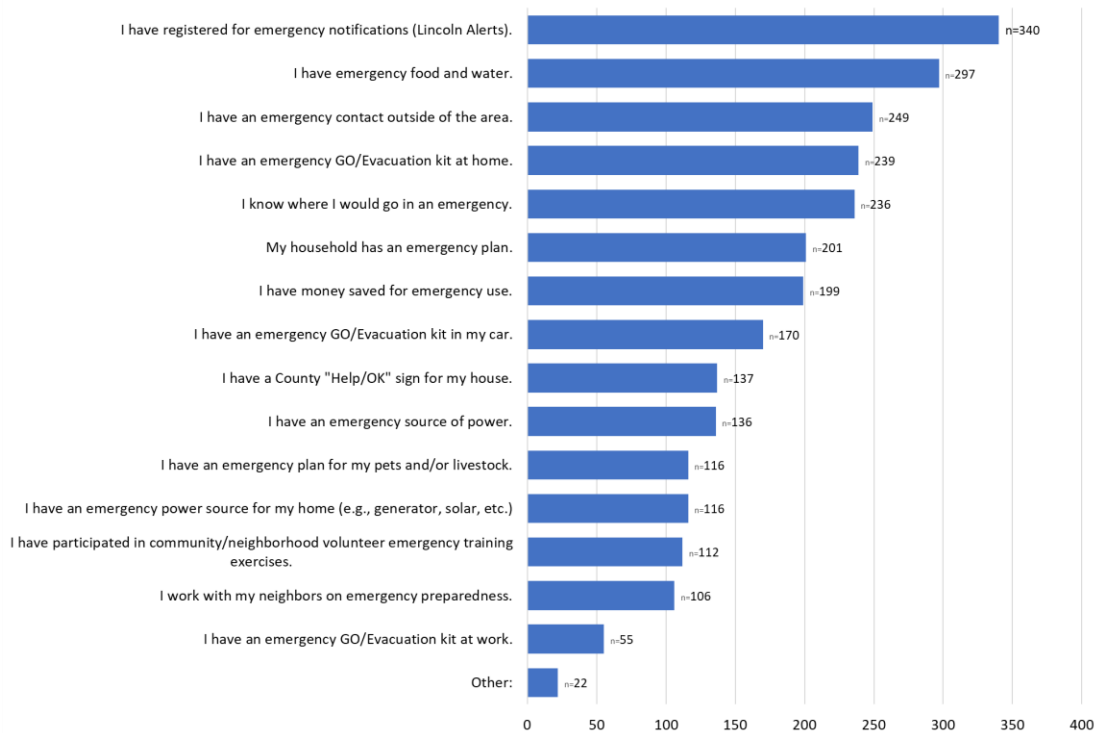
- Need to get busy!
- I don't care
- I purchased earthquake insurance (x2)
- Since in tsunami zone, insurance won't cover.
- Cannot get insurance
- Have not taken action on earthquake issues b/c I believe Cascadia destruction will be total. Have not seen info on plants/landscaping for drought/fire.
- I bought a home outside the tsunami zone and built after seismic codes became decent in 2001.
- I consider what emergency food and lighting I have at home. I consider areas in my home that are safest in case of earthquake.
- I have disaster supplies and equipment to shelter in place for an indefinite period.
- Food caches, water purification devices, supplies and equipment : all for long term lack-of-available resources
- Water / food supply

- I would have food & water to live on for several weeks and enough food to share with others
- Have water holding tanks and generator on property
- Store food, water and other emergency supplies
- store drinkable water
- Purchased water filtration capability and have some water storage
- Emergency kits.
- Have emergency supplies stored outside.
- CERT trained, CPR trained
- have a practi[c]ed EDITH plan in place
- Have a home evacuation plan and meeting place. Along with food, water, medicine, protective cover, EPIRB and NOAA radio.
- I have attended 3 CERT sessions and have go bags in vehicles and have supplies at home. I have organized neighborhood meetings
- I am a renter. My scope of prepar[e]dness is limited to what I can do without altering the property.
- I do not own a home too expensive
- Rent home away from & above inundation zone
- Rental, cant do any of the above
- live in mobile park
- don't own a home, but rent
- We live in an apartment building so we are at the mercy of the building owners and w[h]ether they a[r]e willing to prepare our building and grounds! Of course if they did take pre-cautions and improvements to make us safer they woul[d] only pass that expense on to us and raise the rent! A catch 22 for us!
- Renters don't have all theses options
- I rent so Can't take actions I would if I owned my home. But I do what I can with my personal space.
- I live in a condo, there's not much I can do.
- I live in a rv park
- I live in an RV and am ready to move.
- Packed a bag for me and my cat. am a renter and have no say so about how to improve on my safety.
- I have firearms to defend myself against the vigilante neighborhood watch group that will no doubt come for my assets during a disaster.
- safety film on glass
- Planned, we do not currently own
- Building a tsunami escape path up the hill behind my house
- I am involved in my community's emergency management. It's MY LIFE and no one has to tell me to do so. I DON'T want more excessive regulation requiring me to do ANYTHING - period.
- I remove flammable materials around the house on a continual basis
- Self-educate
- Note: I live in Benton Cty; work in Lincoln Cty

Figure F-4 shows additional steps that individuals have taken to be prepared for an emergency. Among the most responses were registering for Public Alerts (340), having emergency food and water (297), having an emergency contact who lives outside of the

area (249), having an emergency kit at home (239), and knowing where to go in an emergency (236). Fewer respondents have an emergency kit at work (55), work with neighbors on emergency preparedness (106), have participated in community/neighborhood volunteer emergency training exercises (112), or have an emergency power backup source for home (116); note: another response option was “I have an emergency source of power”, it is possible that differentiating those two responses may have led to confusion by respondents.

**Figure F-4 Steps taken to be prepared for an emergency**



Source: NHMP Community Survey and Readiness Fair Survey, analysis by OPDR; Q10 - Have you taken steps to be prepared for an emergency?

The following were provided as responses to the “other” category:

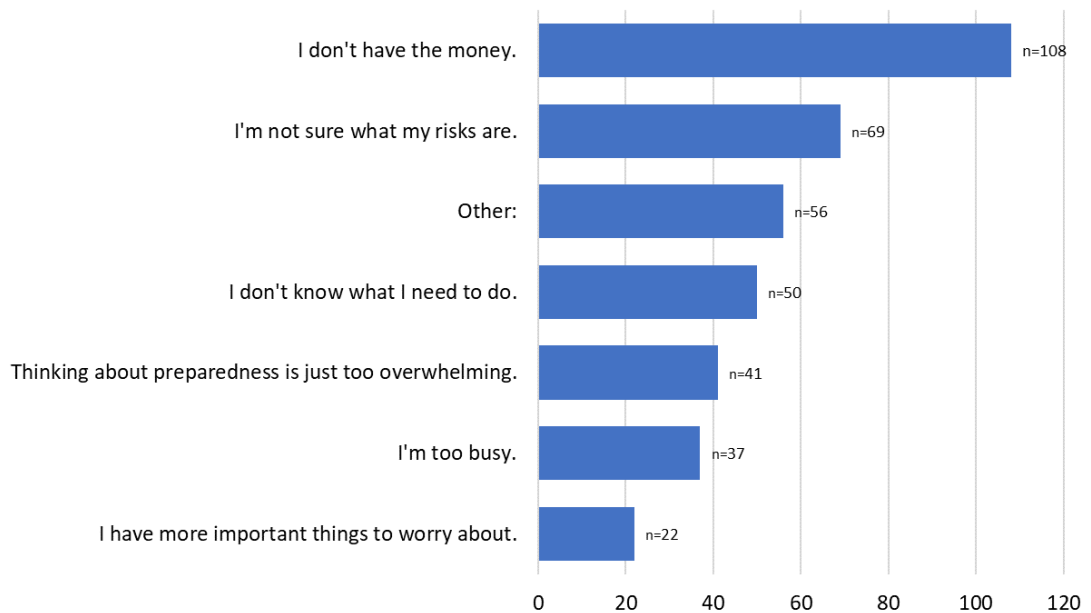
- Need to get busy!
- crank radio/charger; solar charger for cell phone (if working)
- It's all a hoax
- I am a member of CERT (x2).
- I encourage neighbors to attend CERT
- Tsunami Maps posted
- I live close to north end of Lincoln City and worry about the low areas between home and highway 18
- have back-up battery chargers for cell phones
- attended County emergency preparedness fairs
- It's just a partial kit in my car. I doubt it would hold everything needed and still have room for passengers.
- house retrofitted, safety film on glass, water tanks

- Satellite & short-range radio communications
- Emergency ham operations
- South Beach beyond Survivors Hill does not have a Conex box, yet the airport is designated on maps as an assembly area. People assembling there will find nothing and may get in the way.
- Own a gun and have carry permit.
- I am retired
- Plan for leaving the area immediately after the event as there won't be any resour[c]es or inf[ra]structure for 2 years
- I am moving out of this area to a safer place
- Bicycles at work and home

Figure F-5 shows the things that make it hard for respondents to prepare for an emergency. Among the most responses were not having the money (96), not knowing what their risk are (64), and not knowing what to do (48).

Jurisdiction responses: Jurisdiction leaders perceived not having the money (15 respondents) and being too busy (5 respondents) were the leading things making it hard for jurisdictions to prepare for emergencies.

**Figure F-5 Things that make it hard to prepare for an emergency**



Source: NHMP Community Survey and Readiness Fair Survey, analysis by OPDR; Q11 - Do any of these things make it hard for you to prepare for emergencies?

The following were provided as responses to the "other" category:

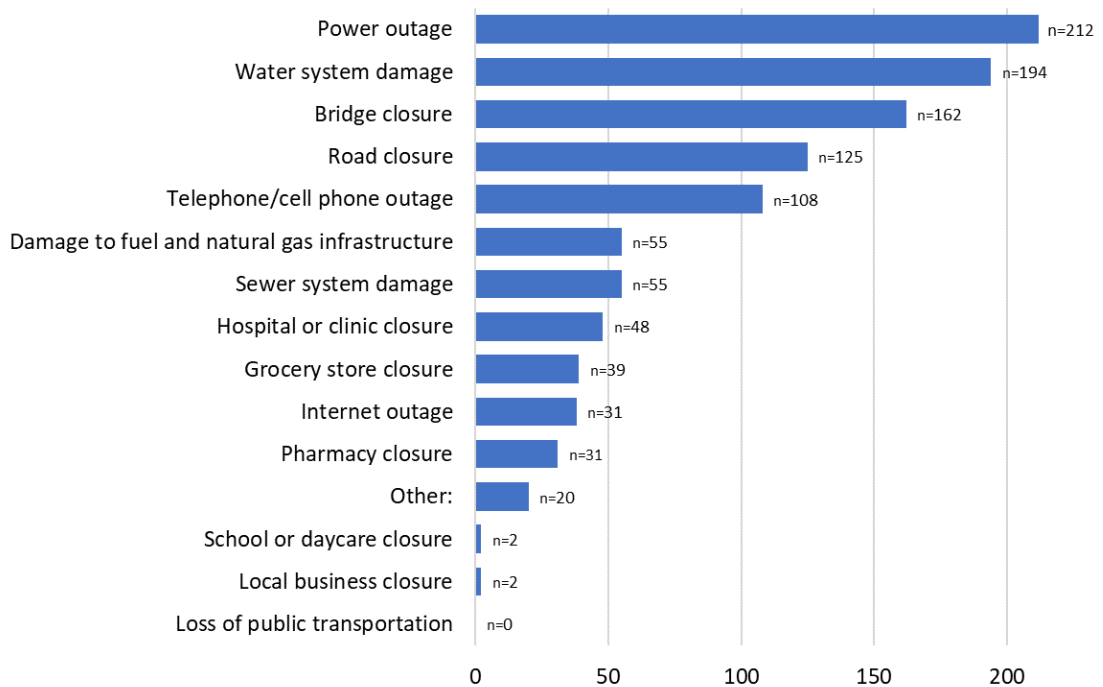
- In process of preparing
- Different needs @ work vs home
- Fake news
- No, I've prioritized it.
- Regulations, Building - zoning restrictions etc. make prepar[e]dness more expensive

- I am a renter.
- Meet other locals doing this.
- The city's plan for my neighborhood (evacuate to small sand pile near bridge) is dangerous and foolhardy. We (SE 35th So Beach) need access to OCCC without going through high tension wires.
- Lack of a known city / county plan for food / water distribution after a major earthquake / tsunami.
- I live outside the tsunami zone, closer to lake than ocean
- Always be prepared
- Not sure county/cities have addressed how we survive if transportation from the valley is cut off
- Not sure what good it would do!
- Not much more I can do as an individual
- Would like a recommendation for a good weather alert radio.
- Waste of storing extra food, water, medicine, that will expire.
- Room to store supplies
- The Cascadia scenario is foremost on my mind when I think about potential disasters. From what I've read, which is quite a bit, the destruction will be total. I would not want to experience the aftermath, and I'm hoping not to survive the event. I guess you could say that I'm not preparing because I'm fatalistic and a pessimist.
- Difficult to know just how to prioritize
- Not enough space in which to safely store
- Lack of space to store emergency supplies
- I don't have the space to store emergency supplies in my apartme[n]t
- I do prepare.
- age
- The fact that the most important issues (like roads out of here) are not being addressed by the government.
- I think we are okay.
- Cannot get insurance
- Our neighborhood has tried to establish resources and involve others. Most don't participate.
- My neighbors refuse to plan for emergencies
- I'm quite prepared. My neighbors are not.
- I think I'm pretty well prepared
- There are some disasters living here that you can't really be fully prepared for with the location.
- Unable to get the medicine I need to live in a long-term emergency.
- My county doesn't provide the necessary training to it's staff and therefore I can't rely on things I am used to relying on in other state's / counties. Such as: The WEA and EAS system
- I procrastinate
- Physical limitations
- Saving eme[r]gency food for cats & enough water is a problem
- just taking the time to get it done
- I am prepared for 2 weeks without help

- Let's face it, a Cascadia event will ruin the coastline cities so we are leaving immediately with food and water and walking east to Corval[l]is. Maybe the city should plan for that
- Constantly hav[i]ng to refresh the things in my go bad like food expiration and medication
- Would raise house if had money.
- Don't know if the structure I live in is going to remain standing
- Second home. Not there often enough
- I am a part-time resident.
- Landslide is imminent and it isn't up to us to fix it.
- Laziness
- I need more information about my area about water usage and sanitation plans in case of earthquake disaster.
- Need "Help in a box" to be available to buy
- Exercises are too infrequent and not detailed enough
- I don't think I have enough time to evacuate to safe area
- Don't feel there are good community meeting places in case of emergency (they all fall/burn too).
- Just moved to the area and am in process of developing emergency supplies

Figure F-6 shows the things that would most impact the respondent the most during an emergency. Among the most responses were power outages (212), water system damage (194), bridge closures (162), road closures (125), and telephone/cell phone outages (108).

**Figure F-6 Things that would impact respondent the most during an emergency**



Source: NHMP Community Survey and Readiness Fair Survey, analysis by OPDR; Q12 - Select three (3) things that would impact you the most.



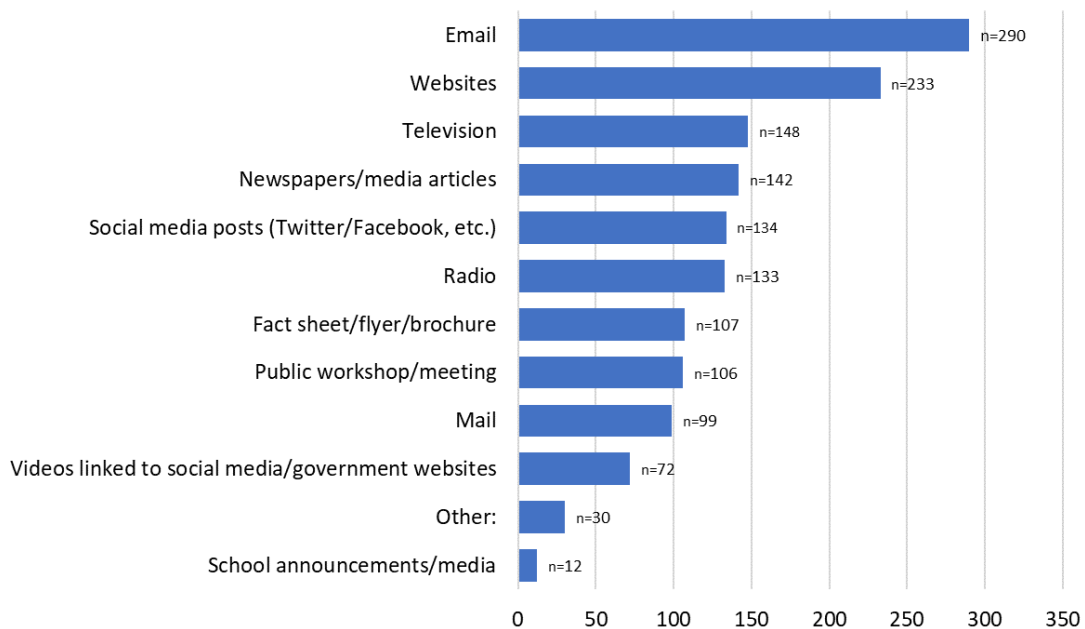
Jurisdiction responses: Jurisdiction leaders listed bridge closure (11 respondents), water system damage (11 respondents), damage to fuel and natural gas infrastructure (6 respondents), power outages (5 respondents), sewer system damage (4 respondents), and road closures (4 respondents) as the top six things that would impact their jurisdiction the most.

The following were provided as responses to the “other” category:

- If the bridge was down in Newport I am concerned how I could get home south in seal rock . Does the county have a plan for this?
- No beer
- Loss of my home
- water and sewer can be lumped into the same category for me.
- Water, sewer, electricity, internet and road and bridge closures... we have food and bottled water.
- Lack of emergency cell phone notification when they're is a potential danger to my life.
- flood of low land
- theft from the homeless
- All are equally important
- Too many to pick just 3
- Safety issues. I feel vulnerable as a single senior
- No fuel available

Figure F-7 shows the preferred methods that respondents wish to receive information on how to protect their households and property from natural hazards. Among the most responses were email (290), websites (233), television (148), newspapers (142), social media posts (134), and radio (133).

**Figure F-7 Preferred method to receive information**



Source: 2019 NHMP Community Survey, analysis by OPDR; Q45 - What are your most preferred ways to receive information on how to protect your household and property from damage due to natural hazards?

The following were provided as responses to the “other” category:

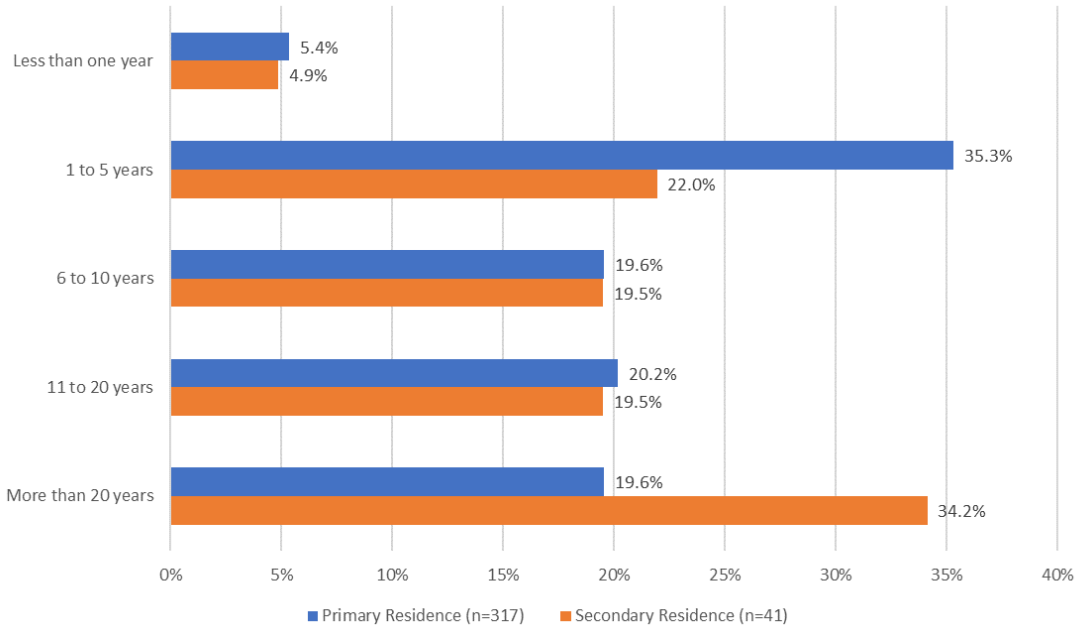
- Text messages/Automated emergency cell phone alert (x14)
- Emergency alert apps specific to area/Nixle (x2)
- Landline (x2)
- Emergency radio (x2)
- Websites/online/NewsLincolnCounty.com (x2)
- Until there is access to high ground in my neighborhood there is only planning for death by drowning.
- outreach
- I wish we had a local news station.
- Discussions with friends
- Police or Fire Department Public address sirens
- Lectures by experts

## **Primary or Secondary Residence**

Almost all respondents (93%) either own or rent a primary residence in Lincoln County (316 of 340). Of those respondents who provided the zip code of their primary home (121), 22% were from Newport, 21% from Lincoln City, and 11% from Waldport. Additionally, 22% of respondents provided their primary home zip code from unincorporated areas of the county (primarily from Seal Rock, Otis, Gleneden Beach, and South Beach). About 12% (41 total) of respondents own at least one secondary residence in Lincoln County (nine of these residences are in Newport, three in the unincorporated county, and three each in Waldport and Yachats. Of those with a secondary residence, 49% use it as their secondary residence and 36% use it as a rental or investment property. Other responses for primary use of their vacation home included: businesses, ranch helper & nurse, second residence on same property (x2), intend to move, and for family member.

Of those who have a primary residence in Lincoln County about one-third (35%) have lived in the residence between 1 to 5 years (Figure F-8). Of those who own a secondary residence about 34% have owned the residence more than 20 years.

**Figure F-8 Length of residence in primary, or ownership of secondary, residence in Lincoln County**



Source: 2019 NHMP Community Survey, analysis by OPDR; Q15 - How long have you had a primary residence in Lincoln County? Q22 - How long have you owned a secondary residence in Lincoln County?

Table F-7 shows the percent of respondents who have a primary or secondary residence in the County that report that their primary or secondary residence is at risk to the listed natural hazards. Respondents with primary and/or secondary residences were most likely to report that their residences are at risk to windstorm, earthquake (onshore and offshore), winter storm, and windstorm. Secondary residence owners were more likely to report that their secondary residences are at risk to tsunami (local and distant).

About 88% of respondents indicate that their primary residence, is at risk to windstorm, compared to 83% of secondary residence owners. Eighty six percent (86%) of respondents indicate that their primary residence is at risk to onshore earthquakes (compared to 66% perceived risk to offshore earthquakes). Secondary residence owners perceive the risk to be 80% and 73% respectively. The percent of respondents who perceive their home is vulnerable to local or distance tsunamis is greater for secondary residence owners (76% and 61% respectively) than for primary residences (57% and 40% respectively).

**Table F-7 Is Primary Home at Risk to the following natural hazards**

Hazard	Primary Residence			Secondary Residence		
	Yes	Not Sure	Total Responses	Yes	Not Sure	Total Responses
Coastal Erosion	20%	9%	282	29%	10%	41
Drought	40%	17%	289	32%	18%	38
Earthquake (Offshore)	66%	17%	300	73%	15%	41
Earthquake (Onshore)	86%	10%	307	80%	12%	41
Flood	27%	13%	284	41%	10%	41
Landslide	41%	13%	289	43%	13%	40
Tsunami (Local)	57%	7%	300	76%	5%	42
Tsunami (Distant)	40%	12%	287	61%	12%	41
Volcanic Event	15%	41%	282	23%	38%	40
Wildfire	66%	15%	298	55%	20%	40
Windstorm	88%	7%	304	83%	8%	40
Winter Storm (Snow/Ice)	70%	9%	293	68%	10%	41
Other:	40%	60%	10	100%	0%	1

Source: 2019 NHMP Community Survey, analysis by OPDR; Q16 - Is your primary residence at risk to any of the following natural hazards? Q23 - Is one or more of your secondary residence(s) at risk to any of the following natural hazards?

The following were provided as responses to the “other” category:

- None of these
- Creek/River erosion
- Solar Storm
- Beach grass [and] sand dunes. Not legal for me to eliminate around my house
- Basic necessities, power, water, sewer (x2)
- road outages
- Potential for Looting

### Flood and Other Hazard Insurance

Fifty-nine respondents (19%) have flood insurance for their primary residence and nine respondents (22%) for their secondary residence(s); ten percent of respondents were unsure if their primary or secondary residences had flood insurance. Of those with flood insurance about 20% of respondents with a primary or secondary residence stated that it was required (about 77% purchase flood insurance voluntarily). Additionally, 43% of primary residence respondents (135 respondents) purchase other hazard insurance. Just over 38% of respondents who have secondary residences (16 respondents) purchase other hazard insurance. The most common insurance policy for respondents with primary and/or secondary residences is earthquake, but some also mention having fire, wind, and storm insurance.

# Demographics of survey respondent

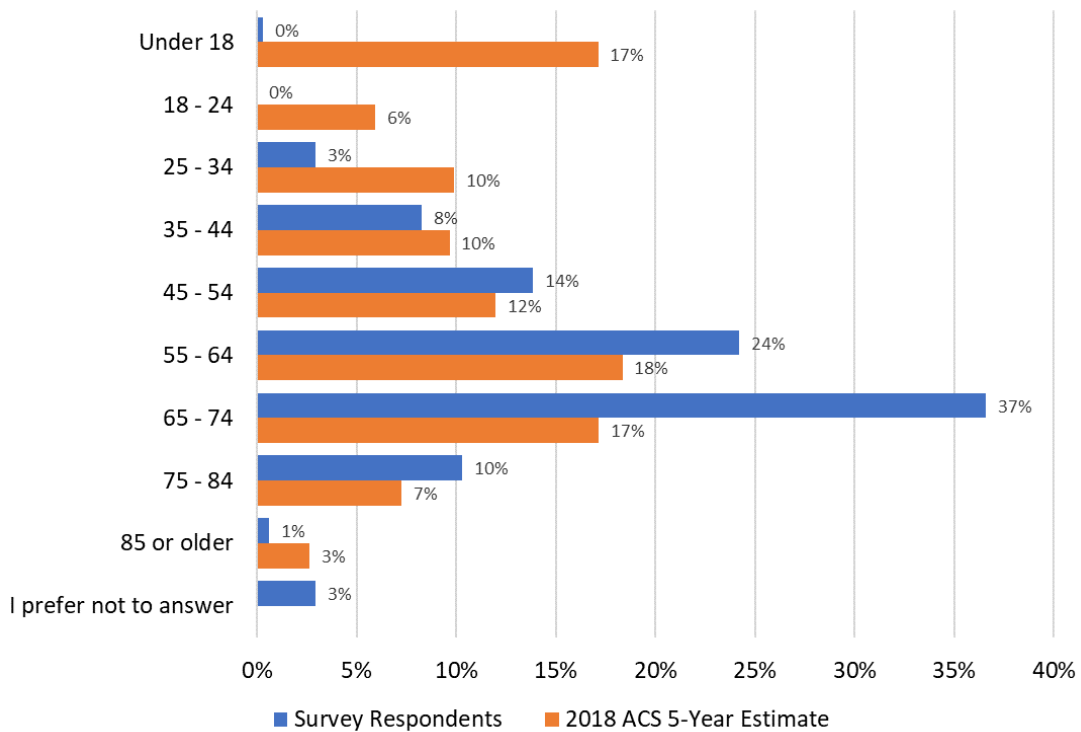
## Gender

Just over 37% of survey respondents reported their gender as male, 57% female, and 6% chose not to provide an answer. The 2014-2018 American Community Survey 5-Year Estimates (2018 ACS 5-Year Estimates) reports the gender mix as 48% male and 52% female. The sampling for this survey was weighted towards females.

## Age

Figure F-9 shows that the largest respondent group was in the 65 to 74 age group (37%). The survey respondents represented older age cohorts than the population estimated age cohorts provided by the American Community Survey in the 45-84 age categories and less in the 0-34 age categories.

**Figure F-9 Respondent Age Groups**

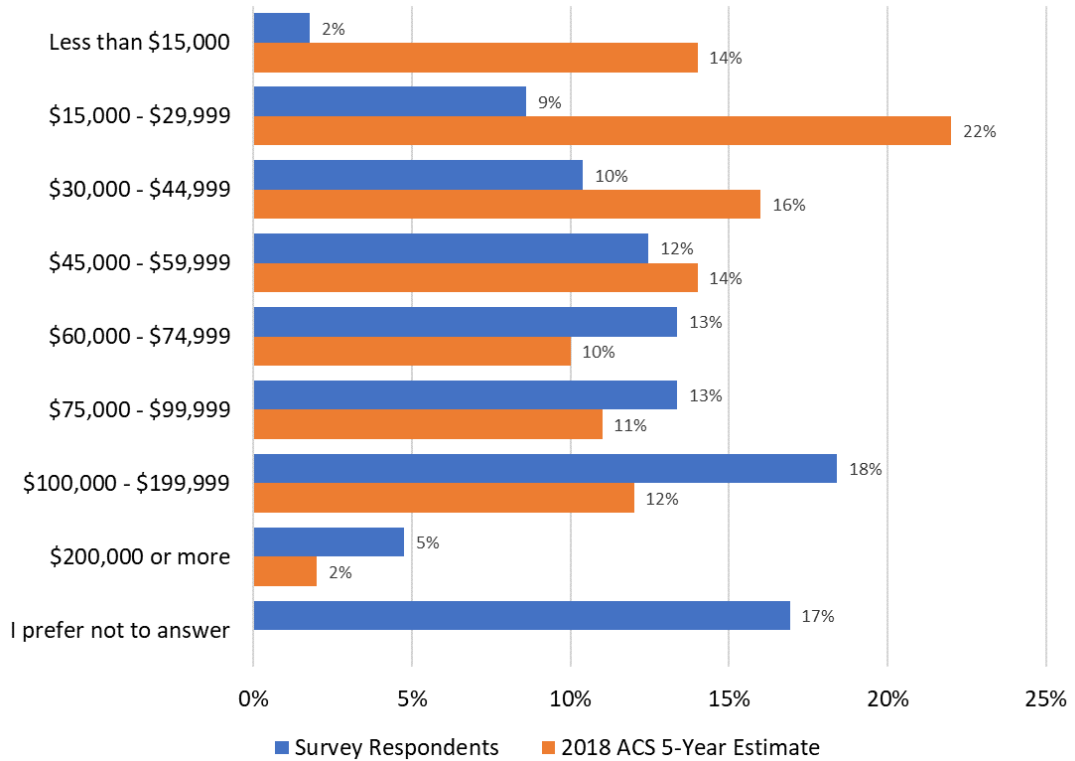


Source: 2019 NHMP Community Survey, analysis by OPDR, Q28 - *What age group best describes you?*; US Census, 2014-2018 American Community Survey, 5-Year Estimates

## Income

Figure F-10 shows the income groups for respondents. About 25% of respondents had household incomes of \$100,000 or more and almost 25% prefer not to provide an answer. Less than 10% of respondents had household incomes below \$30,000.

**Figure F-10 Household Income**

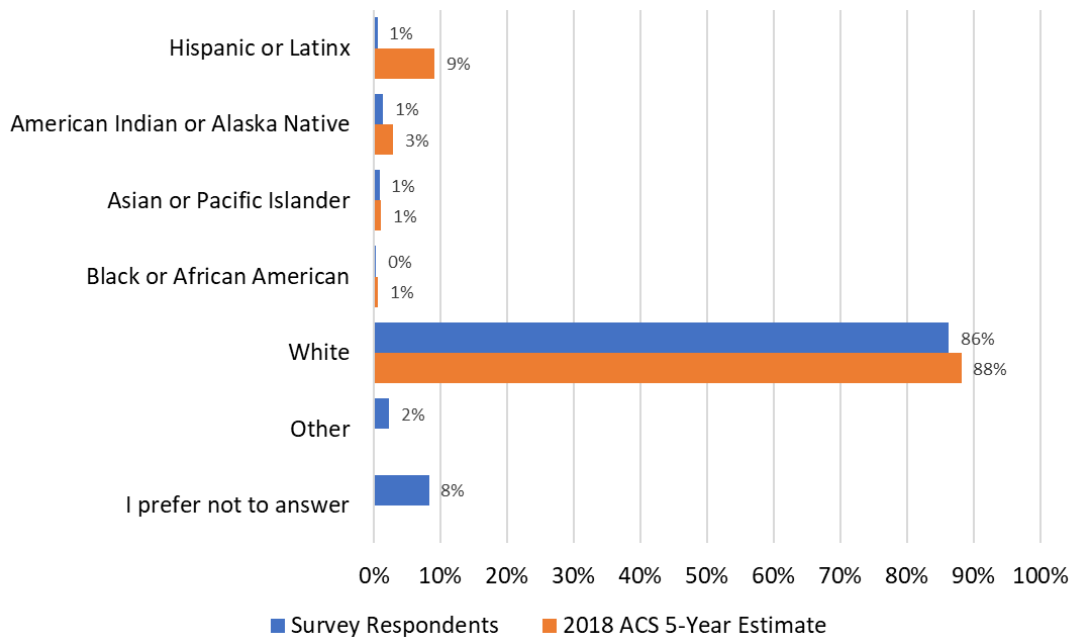


Source: 2019 NHMP Community Survey, analysis by OPDR

**Race/Hispanic or Latinx**

Almost 86% of respondents reported that they were white (Figure F-11).

**Figure F-11 Race and Hispanic or Latinx background**



Source: 2019 NHMP Community Survey, analysis by OPDR; Q30 - Which best describes your race or ethnic background? Select all that apply; US Census, 2014-2018 American Community Survey, 5-Year Estimates

Eight percent (8%) of respondents did not provide an answer. The survey sample matches the 2018 ACS 5-Year Estimates for those who report their race to be White; however, the survey appears to under sample those who report their ethnicity to be Hispanic or Latinx. Those who reported "other" included Amerasian and Native American.

## Other comments:

Respondents were provided an opportunity to provide additional comments. Listed below are their responses:

- I added future heat waves as a real concern; this must be added to your plans.
- This is a great survey and seems well constructed. Thanks for conducting it. Please consider providing a s of results to respondents and/or the community and/or those invited to participate.
- Concerned re: probable isolation from emergency services with hwy. 101 impassable and bridges down in a Cascadian event
- Please step up support for CERT in fire departments, especially in communities that don't yet have it, such as Seal Rock.
- Strengthening infrastructure should be the priority. Electric grid, water system, bridges and roads, airports, as first priority. Then hospitals - schools. then sewage sanitation etc. Firehalls and police stations will be worthless by the third day of a natural catastrophe if food and water are not available.
- Access to better and more information about how to prepare for the natural disasters in my area would be a great. It can be via a website or mail or something easier than googling it and hoping I got the right one for my area.
- The realities of our times are the hard truths about converging environmental, financial, political and social unraveling. Overwhelming as it is we must try to prepare. I believe we need many more one on one local meetings. There may be such groups where I live but I am unaware of them.
- I think that the transient (tourist) population has not been planned for adequately (especially as they are currently located in residential neighborhoods in short term rentals).
- Overall I think Lincoln County and associated cities are doing a good job of disaster preparation and providing information to the residents. However I do believe there is a lack of detailed planning, and explanation to the citizens as to the plans for providing access to food / water for an extended period after a major disaster. And any plan details for evacuation people and their pets (if any) to other locations if it is too difficult to provide water / food in Lincoln County. Assuming that most if not all of the bridges will be out, food / water / et. would have to be flown in or brought by boat. So are there any coordinated plans with other agencies to get the food / water to Newport and to provide distribution to the folks in Lincoln County? And if there are - what are the details?
- Thanks for making the community more aware; Everyone should take the [REDACTED] preparedness class. It was great. Keep on informing us.
- I live alone with no family within 100 miles. I have one cat. My home was built in '96, my single car is garaged year round. My roof is in good condition and I keep the gutters cleaned out. There are large trees in the area but not real close and I keep the ivy off of the one that could reach my home if it fell my direction. Ivy is a real issue in our Lincoln City area that needs to be addressed!"

- I live between the lake 5 blocks away, and the ocean 1 mile away as the crow flies.
- People on or near beach should have unencumbered access to safe areas. Most beach grass should be eliminated
- Need to continually maintain and improve the North Beaver Creek road to Toledo in anticipation of bridge closure in Waldport and Newport. This should be a county priority.
- need better notices if something happens. i cant hear the sirens which are suppose to go off when they did a test in depoe bay didnt hear a peep of a sound."
- I live in a trailer park right on the beach in Taft.
- The great shakeout needs to be mandatory in schools and heavily promoted in vulnerable areas. Emergency supplies and lists should be posted in stores. Coastal cities should be able to purchase sandbags, water collection, etc. At a discount or government issued. In a town without police or emergency services, ensuring boots on ground to speak to neighbors and educate us about should something happening regularly. Many of my neighbors are elderly and unaware of their physical needs to find the "meeting place". Many of us would lose cell service without WiFi. Where are emergency call boxes? Emergency water supply?
- I find it very annoying that the emphasis on preparedness is having enough food and water for weeks or months rather than on how to get out of the area as quickly as possible. We as individuals have no control over easy access to move inland if there is an earthquake or Tsunami. Why aren't there more East/West roads between the coast and the valley being developed? and why aren't there more plans for GETTING OUT? Are there arrangements with cruise ships etc to come and get people if there is no access out by land? I have plenty of money and places I could move to, but not if there aren't any available roads and bridges. We all know the roads and bridges in Oregon are very inadequate if there was a Tsunami or earthquake. I live in an ocean front condo and feel like it would be better to be swept away in a Tsunami then deal with the horrible aftermath of being stuck here.
- Newport is NOT prepared at all for the any future disaster. I tried to notify those in my neighborhood and only 2 families out of 32 were interested. Not enough PUBLIC information on how to prepare and not enough interest in the general public.
- East Lincoln county is the poor stepchild for emergency services, needs better coverage for fire & medical. There's more to the county than the coast...
- A series of short instructional videos would be extremely helpful for understanding risks and how to prepare to survive them. Pictures worth a 1,000 words. Nothing better to become fully informed.
- While I consider the local tsunami preparations to be fairly good, I feel that local tsunamis have moved the earthquake and the associated extensive landslides, liquefaction, and destruction of buildings and infrastructure to the ""back burner"". People need to understand that people on the coast will be isolated for weeks and there is very limited heavy-lift capabilities. Reliance seems to be on heavy-lift helicopters when it probably should be on short takeoff & landing (STOL), fixed-wing, heavy-lift aircraft (e.g., C-130 or its modern replacement) which can land on gravel runways (gravel runways can be repaired quickly, asphalt runways cannot) that can be fairly quickly built (or repaired) with strategically stored bulldozers or other earthmoving equipment (consider a monetary enticement to contractors to store some equipment in safe zones when not in use). Also, during a catastrophic full-rip Mw9 megathrust earthquake with associated tectonic and very localized



tsunamis resulting from landslides and splay faulting (remember the 1964 Mw9.2 Alaska megathrust earthquake and tsunamis [plural], information collection and information dissemination will be critical. Perhaps this has been considered but it might be useful to employ amateur drone operators with short-range radios clustered in a "cell" around ham radio operators that could be used to obtain damage and SAR information that could be relayed to the ham operators who, in turn, could contact those emergency response teams that remain active after the disaster. Finally, potable water is always a problem. Certainly filter straws, etc. work for the individual; however, larger filtration systems that can filter out protozoans, bacteria, AND viruses should be distributed to neighborhoods. These are hand-powered, jerry-can type, filtration systems that can purify several gallons of water per hour. The people in Puerto Rico should not have died from Leptospirosis by drinking stream water. Simple filter straws could have been airdropped from helicopters (without parachutes) and widely distributed to these people. While I do not think Leptospirosis is a problem in temperate climates, there are undoubtedly other zoonotic diseases that can cause problems."

- Lincoln County needs to act on having a robust infrastructure -- roads, bridges, fuel lines.
- The biggest health problem is being the Homeless warming shelter that was added at the North end of Lincoln City. They walk up Voyage to the houses and ask for cans and money. They talk to my kids to get them to come inside and get them cans. They leave trash all over and now I am getting the hell out of this place.
- Glad to see someone is being proactive regarding natural hazards and their impact on the community.
- VRD's, airBnB's, and long term rentals bring thousands of people into the tsunami inundation zone annually. These visitors are, for the most part, completely unprepared for an emergency of almost any sort. The rentals provide no To Go Bag, emergency information, or emergency food supplies. That's ethically, morally, and, I would think, legally, wrong.
- These are pretty general answers
- It is highly important that our systems be brought up to date. We are decades behind in Lincoln County! The biggest issue is the massive influx of outside tourists and how a 100% opt-in system effects them or rather leaves them completely in the dark!
- There are federal systems available to our community that aren't being used / used properly due 100% to lack of training. The current / up-to-date and standard use of these systems is expected to occur by our tourists and those (like me) who have recently moved to the community. It is expected, because nearly everyone in the country is used to emergency alerts functioning in a certain fashion from living in any number of other areas of the country. It is taken for granted, and therefore everyone assumes these are things that are in place. Because they are not in place, no one will be proactive and in the event of real emergencies, we are risking loss of life that could have been avoided.
- I do not know where to go in case of a tsunami or earthquake other than get in my car and head for Salem.
- Certainly won't be able to get to high ground from my residence nor will my kitty or order dog.

- I live in Upper Bayshore, directly over hwy 101 on the east side of the highway. I am not very concerned for myself, I have what I think is an adequate plan. My biggest concern relates to lower Bayshore on the west side of 101, There are 1,000 homes there and only ONE road out. All of the feeder streets connect to this one road. There is no way that all of these people will be able to evacuate in a timely manner. At a recent preparedness event, we were told that we would have ten minutes to get to higher ground. I'm at 125 feet of elevation, but much of lower Bayshore is barely above sea level. How will these people reach safety? And what happens if the Waldport and Newport bridges go down? All medical care is across those two bridges. I'm 79 so this fact is important to me. I hope that you have some answers to these questions. Thanks for asking our input.
- Downed power lines crossing roads (Waldport's Range Drive and Crestline drive) that supply access to local Emergency Operations Center at the Waldport Public Works Bldg. Lack of fuel access for emergency generators. Waldports local fuel stations are in flood plain and have no emergency power to operate."
- we are shocked at the lack of rotating potable water and food storage in all cities. locations such as Walmart etc could do this (buy two bottles, sell one, buy two, sell one, buy one, sell one to build rotating stock. we are shocked at the lack of power protection, water source, and sewer preparation in all cities. we are shocked at the lack of information sent to residents regarding downed power lines, the potential for auto re-energizing. we are shocked at the lack of underground utilities in Lincoln county. we are shocked at the lack of planning for downed utility lines and poles after the event.
- Part of the problem for ME is inconsistency. Every time I have tried to attend some sort of preparedness class or drill, everyone that claims to be an expert and those ""experts"" all seem to have different theories/opinions on ""how bad"" the quake and resulting tsunami will impact the coast. I have friends who are geologists and work for USGS and they predict (no one can claim to know with certainty) should a magnitude 9 or 9.5 hit Cascadia, the resulting tsunami could generate waves of 50,75, 100 feet. Lincoln County never claims anything above 25 feet which kind of leaves folks with a false sense of security if they live/work above that 25 foot line. The quake that sort of kicked off preparedness for Cascadia...the Quake off the coast of Japan was recorded of being 128 feet and rolled in as far as 6-10 miles. I know some people who are leaders in Lincoln County who are steadfast and firm in their belief that places like the Casino (major employer) are safe from a tsunami, being too high up. They most assuredly are not. Consistency and obtaining help and advise from the REAL experts and then reporting that in an unbiased way to the general public would go a long way."
- Thank you for all you do to protect our communities.
- Bring back the tsunami siren in Waldport
- I have never seen any information on where locally to get help in a disaster if no power, roads damaged, limited or no communications available. Where do nearest larger communities plan to have action centers/outposts to help those in need?
- Thank you for getting information that will help manage Lincoln County
- Is there an alarm/siren to notify neighborhoods of tsunami activity? Will there be continuing workshops for emergency plans? Is it correct that Lincoln City has a storage facility for citizen storage of emergency clothings/supplies?"

- We had the local emergency mgt person tell us it wasn't her job to see people got to work. If the bridge went out in an event that wasn't her problem. Pretty much that's how we feel about everything here. We have to take care of ourselves. The city/county is going to take care of themselves and those of us in the outskirts are on our own. nice...
- The community, as a whole, is not prepared for any type of natural disaster. It will be a disaster, no pun intended.
- I am amazed at the lack of preparedness for Newport. Painting tsunamis signs on the road is great but not nearly enough. The entire west coast and valley are unprepared. The fuel depot for OR is not stabilized Hosp and schools built in Tsunami zones because of cost to move them to appropriate places. Bridges not secured for earthquakes. Roads not fixed or moved to places that are not constantly unstable 101 for example. Bridges that are old and unstable. Evacuation routes compromised by poor infrastructure of roads and bridges. Power and water will be unavailable. I know the Navy practiced evacuation and bringing of food/water after the event but not enough is being done for the size of the communities on the coast. Bldgs are not being reinforced in our cities. Portland for example has 1800 or more bldgs that will just collapse in downtown alone. Fuel tanks are not being structurally enforced as not to just tip over into the river and pollute the environment and will not be available for use to people after the event. There is only 1 fuel depot in Portland for the entire state. Hospitals are not built to withstand earthquakes. Japan has made great strides in this type of safety in bldg structure and infrastructure. The USA is sadly behind and ignorant. I for one do not wish to remain here and caught in the CF that will happen and I am moving to another country that is safer. Plus to get away from Trump the idiot. I could go on and on. It is a sad state of affairs that our government cares more about money than lives.
- We should make sure emergency responders/local officials have access to keys for locked logging roads to help establish alternative evacuation/resource transport routes in case of severe damage to main roads
- We live on the big hill overlooking Depoe Bay - on Williams near the big green water tank - and have a large & growing crack in the driveway, patio and foundation. The greatest fear we have is a major earthquake will trigger a massive landslide. We are seniors who rent and cannot make the city put up the necessary retaining walls that might stop the landslide. You all should know this: If the hill behind us does slide and besides burying us - it would also close off the Coast Highway as well as Williams Ave. This would prevent all others who need highway access emergency services. It really should be looked at by city, county and state soils engineers as well as the Emergency Services of LC. It might not be too late to fix it.
- Bring back the Emergency Siren! Even Depoe Bay has them!
- I live in Sandpiper Village and I have no idea if there are any plans for water and sanitation in case of a major earthquake and tsunami. Also there is no way out of our area in a extra large event.
- Otter Rock does not have a tsunami map. We seem to be left out. There are a lot more people living in this area now. WE NEED evacuation maps or more community outreach from the county,
- Continued development in the tsunami zone is completely stupid. Even more stupid is the legislation passed in Oregon in 2019 to allow critical facilities to be built in tsunami zones and to gut the regulatory power of the Oregon Dept. of Geology and

Mineral Industries. Oregon State University deserves a major prize for stupidity for rebuilding the Hatfield Marine Science Center in the tsunami zone. While the design might save the lives of people who flee to the top level escape area, the quake and tsunami will destroy much of South Beach and its infrastructure, leaving the new center perhaps standing but surrounded by a sea of mud. OSU ignored its geology department's advice in pursuing this project. Thousands of people will die in Oregon when the next Cascadia subduction zone M9 quake occurs, mainly people in the tsunami zones. Public officials must change policy, engage in long-term planning and start discouraging development in the tsunami zone through a variety of public policies. Or will they wait until the tsunami completely wipes out low-lying areas of Lincoln County, including the Salishan spit and Bayshore Gardens, Yachats, Waldport, Lincoln Beach and Coronado Shores, Depoe Bay, and low-level parts of Lincoln City and Newport such as the Bayfront and Nye Beach?"

- Hwy 101 is gridlock on a typical summer day, evacuation would be impossible.
- I feel Emergency Management in LC has done an amazing job getting the word out, CERT training and support and Readiness Fairs. I attend as many as possible to learn more. I also share what I learn with family, neighbors and friends. Thank you!
- "Severely Medically Fully Disabled must be self-reliant as times have changed and there are no True services to help in a disaster. As in a disaster triage I would be the one that is not attended to and I have much more chance of survival by being emergency prepped and self-reliant. From medical supplies that feed me enterally and medications (which I wish I could have a better back up supply but with new laws the meds I have taken for 30 yrs are not allowed to be dispensed in quantity for back up emergency needs). I have a built in back up generator and WC designed home and ceiling lift. My electrician is my neighbor and I have other lifelong neighbors aware of my medical needs. I keep them in the loop. I have a lifetime around the clock careprovider. No local facility will accept me as they have in the past in case of an emergency due to the fact that my medical condition is far from the abilities of local nursing homes. Even local medical care fears my health care needs so I have traveled to Peace Health for many years to receive appropriate health care services. In the past 10 yrs I have only needed care from a hospital once due to my insurance cutting my life sustaining meds off, in which I won those meds / coverage back with the help of Peace Health Staff and advocacy. Samaritan has failed me to many times to count. "

**Appendix G:  
Future Climate Projections  
Lincoln County**

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# Future Climate Projections Lincoln County

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February 2020

*A Report to the Oregon Department of Land Conservation and Development*

*Prepared by  
The Oregon Climate Change Research Institute*



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# Future Climate Projections: Lincoln County

A report to the Oregon Department of Land Conservation and Development

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February 2020

















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## Executive Summary

Climate change is expected to increase the occurrence of most climate-related risks considered in this report. The risks of heat waves are projected to increase with very high confidence due to strong evidence in published literature, model consensus, and robust theoretical principles for continued increasing temperatures. The majority of risks expected to increase with climate change have high or medium confidence due to moderate to strong evidence and consensus yet they are influenced by multiple secondary factors in addition to increasing temperatures. Risks with low confidence, while important, show relatively little to no changes due to climate change or the level of evidence is limited. The projected direction of change along with the level of confidence in the direction of change for each climate change-related risk is summarized in Table 1.

**Table 1 Summary of projected direction of change along with the level of confidence in climate change-related risk of natural hazard occurrence. Very high confidence means all models agree on the direction of change and there is strong evidence in the published literature. High confidence means most models agree on the direction of change and there is strong to medium evidence in the published literature. Medium confidence means that there is medium evidence and consensus on the direction of change with some caveats. Low confidence means the direction of change is small compared to the range of model responses or there is limited evidence in the published literature.**

	Low Confidence	Medium Confidence	High Confidence	Very High Confidence
Risk Increasing 	 Poor Air Quality	 Drought   Increased Invasive Species Risk	 Heavy Rains Flooding  Wildfire  Loss of Wetland Ecosystems  Ocean Temp & Chemistry Changes  Coastal Hazards 	 Heat Waves
Risk Unchanging =	 Windstorms			
Risk Decreasing 				 Cold Waves

This report presents future climate projections for Lincoln County relevant to specific natural hazards for the 2020s (2010–2039 average) and 2050s (2040–2069 average) relative to the 1971–2000 average historical baseline. The projections were analyzed for a lower greenhouse gas emissions scenario as well as a higher greenhouse gas emissions scenario, using multiple global climate models. This summary lists only the projections for the 2050s under the higher emissions scenario. Projections for both time periods and both emissions scenarios can be found within relevant sections of the main report.



**Heat Waves**

Extreme heat events are expected to increase in frequency, duration, and intensity due to continued warming temperatures.

In Lincoln County, the frequency of hot days per year with temperatures at or above 90°F is projected to increase on average by 4 days, with a range of 1 to 8 days, by the 2050s under the higher emissions scenario relative to the historical baselines.

In Lincoln County, the temperature of the hottest day of the year is projected to increase on average by about 6°F, with a range of about 2 to 9°F, by the 2050s under the higher emissions scenario relative to the historical baselines.



**Cold Waves**

Cold extremes are still expected to occur from time to time, but with less frequency and intensity as the climate warms.

In Lincoln County, the temperature of the coldest night of the year is projected to increase on average by about 5°F, with a range of about 1 to 10°F, by the 2050s under the higher emissions scenario relative to the historical baselines.



**Heavy Rains**

The intensity of extreme precipitation events is expected to increase in the future as the atmosphere warms and is able to hold more water vapor.

In Lincoln County, the frequency of days with at least ¾” of precipitation is not projected to change substantially. However, the magnitude of precipitation on the wettest day and wettest consecutive five days per year is projected to increase on average by about 13% (with a range of about 4% to 28%) and about 10% (with a range of about -3% to 22%), respectively, by the 2050s under the higher emissions scenario relative to the historical baselines.

In Lincoln County, the frequency of days exceeding a threshold for landslide risk, based on 3-day and 15-day precipitation accumulation, is not projected to change substantially. However, landslide risk depends on a variety of factors and this metric may not reflect all aspects of the hazard.



### **River Flooding**

Coastal rain-dominated watersheds, such as the Siletz River, may experience an increase in winter flood risk due to projected greater winter precipitation and warmer winter temperatures causing precipitation to fall more as rain and less as snow, in addition to increases in the frequency and intensity of flood-producing atmospheric river events.



### **Drought**

Drought conditions, as represented by low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation are projected to become more frequent in Lincoln County by the 2050s.



### **Wildfire**

Wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase under future climate change. In Lincoln County, the frequency of very high fire danger days per year is projected to increase on average by about 37% (with a range of -12 to +97%) by the 2050s under the higher emissions scenario compared to the historical baseline.



### **Air Quality**

Under future climate change, the risk of wildfire smoke exposure is projected to increase in Lincoln County. The number days with high concentrations of wildfire-specific particulate matter is projected to increase by 7% while the intensity of particulate matter concentrations is projected to increase by 89% by 2046–2051 under a medium emissions scenario compared with 2004–2009.



### **Coastal Erosion & Flooding**

The risk of coastal erosion and flooding hazards on the Oregon coast is expected to increase with climate change due to sea level rise and changing wave dynamics. In Lincoln County, local sea level is projected to rise by 1.7 to 5.7 feet by 2100. At these levels, the multi-year likelihood of a flood event reaching four feet above mean high tide is virtually certain to occur by 2100.



### **Ocean Temperature & Chemistry**

Ocean warming, ocean acidification, and decreasing dissolved oxygen levels are leading to alterations in marine ecosystems affecting coastal communities. The chemistry of the waters off the Oregon coast has already reached a threshold harmful to calcifying organisms and negative impacts are already evident. Reductions in calcifying organisms at the base of the marine food web could have cascading effects on higher trophic marine fish, birds, mammals, and the people who rely on this resource. In addition, warming ocean waters have altered marine species composition with greater prevalence of warm-water species expected during marine heat waves.



### **Windstorms**

Limited research suggests very little, if any, change in the frequency and intensity of windstorms in the Pacific Northwest as a result of climate change.



### **Increased Invasive Species Risk**

Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species establishment, insect and plant pests and diseases for forests and cropping systems. Invasive species populations are expected to expand in extent (northward in latitude, higher in elevation) with warmer temperatures.



### **Loss of Coastal Wetland Ecosystems**










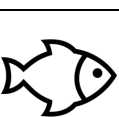


Coastal wetland ecosystems are sensitive to rising sea levels, increases in coastal storms and wave height, warming air and water temperatures, changing precipitation patterns and freshwater runoff, saltwater intrusion, and ocean acidification, which can lead to changes in biological, chemical, and physical processes; shifts in species and biodiversity loss; and altered location and spatial extent of tidal wetlands.

## Introduction

Industrialization has given rise to increasing amounts of greenhouse gas emissions worldwide, which is causing the Earth’s climate to warm (IPCC, 2013). The effects of which are already apparent here in Oregon (Dalton *et al.*, 2017; Mote *et al.*, 2019). Climate change is expected to influence the likelihood of occurrence of existing natural hazard events such as heavy rains, river flooding, drought, heat waves, cold waves, wildfire, air quality, and coastal erosion and flooding.

Oregon’s Department of Land Conservation and Development (DLCD) contracted with the Oregon Climate Change Research Institute (OCCRI) to perform and provide analysis of the influence of climate change on natural hazards. The scope of this analysis is limited to the geographic area encompassed by the four Oregon counties that are part of the Pre-Disaster Mitigation (PDM) 17 grants DLCD received from FEMA. Those counties include: Lincoln, Clatsop, Baker, and Grant. Outcomes of this analysis include county-specific data, graphics, and text summarizing climate change projections for climate metrics related to each of the natural hazards listed in Table 2. This information will be integrated into the Natural Hazards Mitigation Plan (NHMP) updates for the four counties, and can be used in other county plans, policies, and programs. In addition to the county reports, sharing of data, and other technical assistance will be provided to the counties. This report covers climate change projections related to natural hazards relevant to Lincoln County.

**Table 2 Natural hazards and related climate metrics evaluated in this project.**

 <p><b>Heavy Rains</b> Wettest Day ♦ Wettest Five Days Landslide Threshold Exceedance</p>	 <p><b>Heat Waves</b> Hottest Day ♦ Warmest Night “Hot” Days ♦ “Warm” Nights</p>
 <p><b>River Flooding</b> Annual maximum daily flows Atmospheric Rivers Rain-on-Snow Events</p>	 <p><b>Cold Waves</b> Coldest Day ♦ Coldest Night “Cold” Days ♦ “Cold” Nights</p>
 <p><b>Drought</b> Summer Flow ♦ Spring Snow Summer Soil Moisture Summer Precipitation</p>	 <p><b>Air Quality</b> Unhealthy Smoke Days</p>
 <p><b>Wildfire</b> Fire Danger Days</p>	 <p><b>Coastal Erosion &amp; Flooding</b> Sea Level Rise ♦ Waves</p>
 <p><b>Windstorms</b></p>	 <p><b>Ocean Temperature &amp; Chemistry</b></p>
 <p><b>Increased Invasive Species Risk</b></p>	 <p><b>Loss of Wetland Ecosystems</b></p>

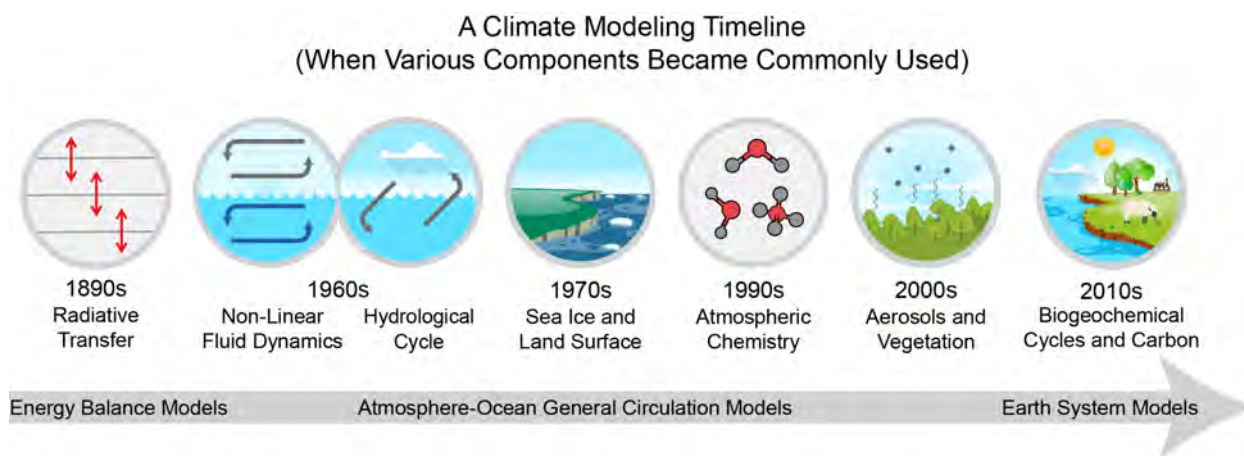
## Future Climate Projections Background

### Introduction

The county-specific future climate projections prepared by OCCRI are derived from 10–20 global climate models (GCM) and two scenarios of future global greenhouse gas emissions. Future climate projections have been “downscaled”—that is, made locally relevant—and summaries of projected changes in the climate metrics in Table 2 are presented for an early 21<sup>st</sup> century period and a mid 21<sup>st</sup> century period relative to a historical baseline. (Read more about the data sources in the Appendix.)

### Global Climate Models

Global climate models are sophisticated computer models of the Earth’s atmosphere, water, and land and how these components interact over time and space according to the fundamental laws of physics (Figure 1). GCMs are the most sophisticated tools for understanding the climate system, but while highly complex and built on solid physical principles, they are still simplifications of the actual climate system. There are several ways to implement such simplifications into a GCM, which results in each one giving a slightly different answer. As such, it is best practice to use at least ten GCMs and look at the average and range of projections across all of them. (Read more about GCMs and uncertainty in the Appendix.)



**Figure 1** As scientific understanding of climate has evolved over the last 120 years, increasing amounts of physics, chemistry, and biology have been incorporated into calculations and, eventually, models. This figure shows when various processes and components of the climate system became regularly included in scientific understanding of global climate calculations and, over the second half of the century as computing resources became available, formalized in global climate models. (Source: [science2017.globalchange.gov](http://science2017.globalchange.gov))

### Greenhouse Gas Emissions

When used to project future climate, scientists give the GCMs information about the quantity of greenhouse gases that the world would emit, then the GCMs run simulations of what would happen to the air, water, and land over the next century. Since the precise amount of greenhouse gases the world will emit over the next century is unknown, scientists use several scenarios of different amounts of greenhouse gas emissions based on plausible societal trajectories. The future climate projections prepared by OCCRI uses

emissions pathways called Representative Concentration Pathways (RCPs). There are several RCPs and the higher global emissions are, the greater the expected increase in global temperature (Figure 2). OCCRI considers a lower emissions scenario (RCP 4.5) and a higher emissions scenario (RCP 8.5) because they are the most commonly used scenarios in published literature and the downscaled data is available for these scenarios. (Read more about emissions scenarios in the Appendix.)

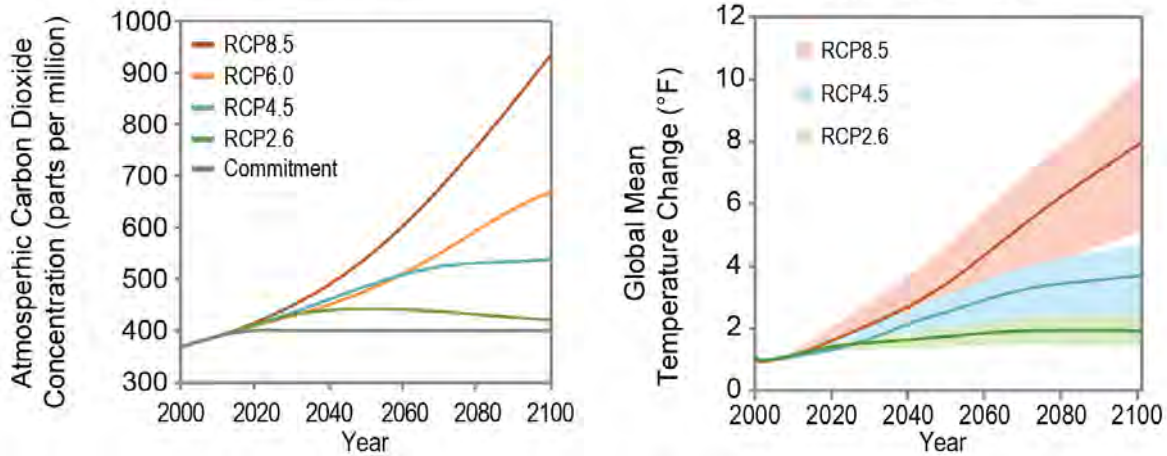


Figure 2 Future scenarios of atmospheric carbon dioxide concentrations (left) and global temperature change (right) resulting from several different emissions pathways, called Representative Concentration Pathways (RCPs), which are considered in the fourth and most recent National Climate Assessment. (Source: [science2017.globalchange.gov](http://science2017.globalchange.gov))

### Downscaling

Global climate models simulate the climate across adjacent grid boxes the size of about 60 by 60 miles. To make this coarse resolution information locally relevant, GCM outputs have been combined with historical observations to translate large-scale patterns into high-resolution projections. This process is called statistical downscaling. The future climate projections produced by OCCRI were statistically downscaled to a resolution with grid boxes the size of about 2.5 by 2.5 miles (Abatzoglou and Brown, 2012). (Read more about downscaling in the Appendix.)

### Future Time Periods

When analyzing global climate model projections of future climate, it is best practice to compare the average across at least a 30-year period in the future simulations to an average across at least a 30-year period in the historical simulations. The average over a 30-year period in the historical simulations is called the *historical baseline*. For the future climate projections in this report, two 30-year future periods are analyzed in comparison with a 30-year historical baseline (Table 3).

Each of the twenty global climate models simulates historical and future climate slightly differently. Thus, each global climate model has a different historical baseline from which future projections are compared. Because each climate model’s historical baseline is slightly different, this report presents the average and range of projected *changes* in the variables relative to each model’s own historical baseline (rather than the average and



range of future projected absolute values). The average of the twenty historical baselines, called the *average historical baseline*, is also presented to aid in understanding the relative magnitude of projected changes. The average historical baseline can be combined with the average projected future change to infer the average projected future absolute value of a given variable. However, the average historical baseline cannot be combined with the range of projected future changes to infer the range of projected future absolute values.

**Table 3 Historical and future time periods for presentation of future climate projections**

Historical Baseline	Early 21 <sup>st</sup> Century "2020s"	Mid 21 <sup>st</sup> Century "2050s"
1971–2000	2010–2039	2040–2069

### How to Use the Information in this Report

Given the changing climate, anticipating future outcomes by considering only past trends may become increasingly unreliable. Future projections from GCMs provide an opportunity to explore a range of plausible outcomes taking into consideration the climate system’s complex response to increasing concentrations of greenhouse gases. It is important to be aware that GCM projections should not be thought of as predictions of what the weather will be like at some specified date in the future, but rather viewed as projections of the long-term statistical aggregate of weather, in other words, "climate", if greenhouse gas concentrations follow some specified trajectory.<sup>1</sup>

The projections of climate variables in this report, both in the direction and magnitude of change, are best used in reference to the historical climate conditions under which a particular asset or system is designed to operate. For this reason, considering the projected changes between the historical and future periods allows one to envision how current systems of interest would respond to climate conditions that are different from what they have been. In some cases, the projected change may be small enough to be accommodated within the existing system. In other cases, the projected change may be large enough to require adjustments, or adaptations, to the existing system. However, engineering or design projects would require a more detailed analysis than what is available in this report.

The information in this report can be used to:

- Explore a range of plausible future outcomes taking into considering the climate system’s complex response to increasing greenhouse gases
- Envision how current systems may respond under climate conditions different from those the systems were designed to operate under
- Evaluate potential mitigation actions to accommodate future conditions
- Influence the risk assessment in terms of the likelihood of a particular climate-related hazard occurring.

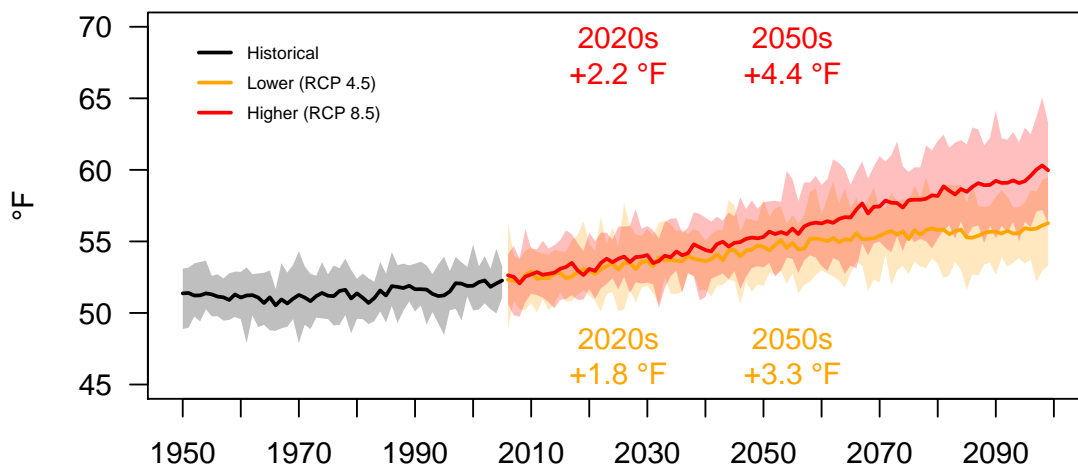
<sup>1</sup> Read more: <https://nca2014.globalchange.gov/report/appendices/faqs#narrative-page-38784>

## Average Temperature

Oregon’s average temperature warmed at a rate of 2.2°F per century during 1895–2015. Average temperature is expected to continue warming during the 21<sup>st</sup> century under scenarios of continued global greenhouse gas emissions; the rate of warming depends on the particular emissions scenario (Dalton *et al.*, 2017). By the 2050s (2040–2069) relative to the 1970–1999 historical baseline, Oregon’s average temperature is projected to increase by 3.6 °F with a range of 1.8°–5.4°F under a lower emissions scenario (RCP 4.5) and by 5.0°F with a range of 2.9°F–6.9°F under a higher emissions scenario (RCP 8.5) (Dalton *et al.*, 2017). Furthermore, summers are projected to warm more than other seasons (Dalton *et al.*, 2017).

Average temperature in Lincoln County is projected to warm during the 21<sup>st</sup> century at a similar rate to Oregon as a whole (Figure 3). Projected increases in average temperature in Lincoln County relative to each global climate model’s 1971–2000 historical baseline range from 1.0–3.5°F by the 2020s (2010–2039) and 1.4–6.3°F by the 2050s (2040–2069), depending on emissions scenario and climate model (Table 4).

**Annual Average Temperature Projections  
Lincoln County**



**Figure 3 Annual average temperature projections for Lincoln County as simulated by 20 downscaled global climate models under a lower (RCP 4.5) and a higher (RCP 8.5) greenhouse gas emissions scenario. Solid line and shading depicts the 20-model mean and range, respectively. The multi-model mean differences for the 2020s (2010–2039 average) and the 2050s (2040–2069 average) relative to the average historical baseline (1971–2000 average) are shown.**

**Table 4 Average and range of projected future changes in Lincoln County's average temperature relative to each global climate model’s (GCM) historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 GCMs.**

	Change by Early 21 <sup>st</sup> Century “2020s”	Change by Mid 21 <sup>st</sup> Century “2050s”
Higher (RCP 8.5)	+2.2°F (1.4 to 3.5)	+4.4°F (2.6 to 6.3)
Lower (RCP 4.5)	+1.8°F (1.0 to 3.0)	+3.3°F (1.4 to 4.6)



## Heat Waves

Extreme heat events are expected to increase in frequency, duration, and intensity in Oregon due to continued warming temperatures. In fact, the hottest days in summer are projected to warm more than the change in mean temperature over the Pacific Northwest (Dalton *et al.*, 2017). This report presents projected changes for three metrics of heat extremes for both daytime (maximum temperature) and nighttime (minimum temperature) (Table 5).

**Table 5 Heat extreme metrics and definitions**

<b>Metric</b>	<b>Definition</b>
Hot Days	Number of days per year maximum temperature is greater than or equal to 90°F
Warm Nights	Number of days per year minimum temperature is greater than or equal to 65°F
Hottest Day	Annual maximum of maximum temperature
Warmest Night	Annual maximum of minimum temperature
Daytime Heat Waves	Number of events per year with at least 3 consecutive days with maximum temperature greater than or equal to 90°F
Nighttime Heat Waves	Number of events per year with at least 3 consecutive days with minimum temperature greater than or equal to 65°F

In Lincoln County, the frequency of extreme heat days (i.e., Hot Days and Warm Nights) and magnitude of extreme heat (i.e., Hottest Day and Warmest Night) are projected to increase by the 2020s (2010–2039) and 2050s (2040–2069) under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 6). For example, for the 2050s under the higher emissions scenario climate models project that the number of hot days greater than or equal to 90°F per year, relative to each model’s 1971–2000 historical baseline, would increase by as little as 1 day to as much as 8 days. The average projected increase in the number of hot days per year is 4 days above the average historical baseline of virtually zero days.

Likewise, the temperature of the hottest day of the year is projected to increase by as little as 1.8°F to as much as 8.6°F by the 2050s under the higher emissions scenario relative to the models’ historical baselines. The average projected increase is 5.7°F above the average historical baseline of 83.3°F. In other words, hot days are projected to become more frequent and the hottest days are projected to become even hotter.

Projected changes in the frequency of extreme heat days (i.e., Hot Days and Warm Nights) are shown in Figure 4. Projected changes in the magnitude of heat records (i.e., Hottest Day and Warmest Night) are shown in Figure 5. Projected changes in the frequency of extreme heat events (i.e., Daytime Heat Waves and Nighttime Heat Waves) are shown in Figure 6.

Table 6 Mean and range of projected future changes in extreme heat metrics for Lincoln County relative to each global climate model's (GCM) historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 GCMs. The average historical baseline across the 20 GCMs is also presented and can be combined with the average projected future change to infer the average projected future absolute value of a given variable. However, the average historical baseline cannot be combined with the range of projected future changes to infer the range of projected future absolute values.

	Average Historical Baseline	Change by Early 21 <sup>st</sup> Century "2020s"		Change by Mid 21 <sup>st</sup> Century "2050s"	
		Lower	Higher	Lower	Higher
<b>Hot Days</b>	0.5 days	+0.6 days (0.1–1.3)	+0.9 days (0.4–1.6)	+2.0 days (0.7–4.0)	+3.6 days (0.8–8.3)
<b>Warm Nights</b>	0.1 days	+0.1 days (-0.0–0.3)	+0.2 days (0.0–1.0)	+0.6 days (0.1–2.1)	+1.3 days (0.2–4.6)
<b>Hottest Day</b>	83.3°F	+2.1°F (0.6–3.3)	+2.9°F (1.1–4.8)	+4.2°F (1.5–6.6)	+5.7°F (1.8–8.6)
<b>Warmest Night</b>	58.8°F	+1.8°F (-0.1–3.6)	+2.5°F (0.8–3.9)	+3.8°F (2.2–6.4)	+5.1°F (2.6–8.2)
<b>Daytime Heat Waves</b>	0.1 events	+0.1 events (-0.0–0.2)	+0.1 events (0.0–0.2)	+0.3 events (0.1–0.6)	+0.6 events (0.1–1.1)
<b>Nighttime Heat Waves</b>	0.0 events	+0.0 events (-0.0–0.0)	+0.0 events (-0.0–0.2)	+0.1 events (-0.0–0.3)	+0.2 events (-0.0–0.5)

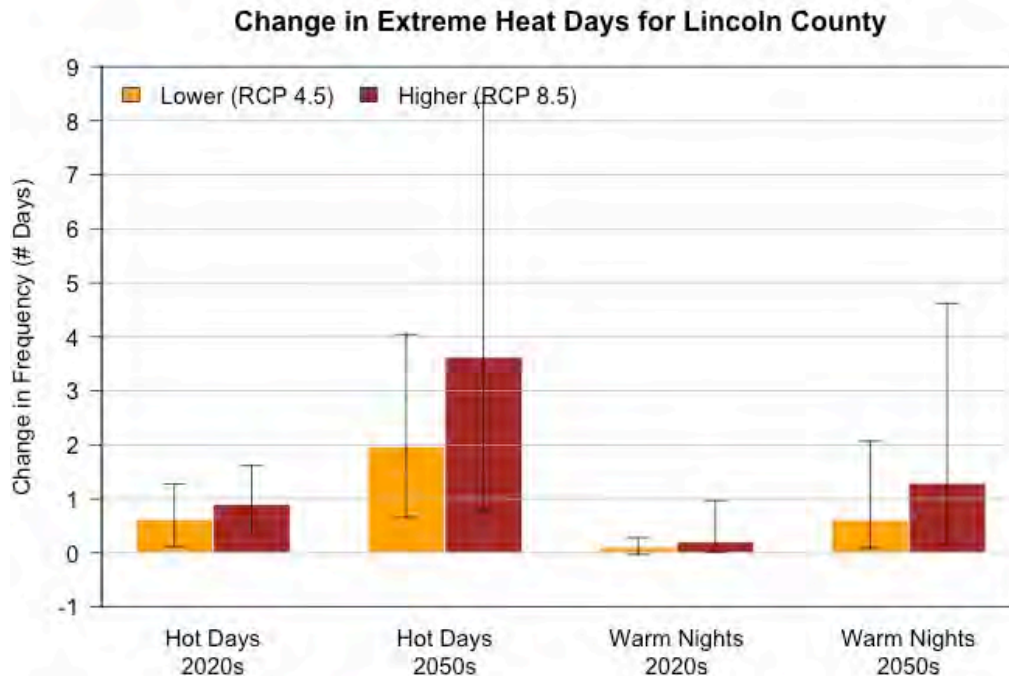


Figure 4 Projected future changes in the number of hot days (left two sets of bars) and number of warm nights (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline. Hot days are defined as days with maximum temperature of at least 90°F; warm nights are defined as days with minimum temperature of at least 65°F.

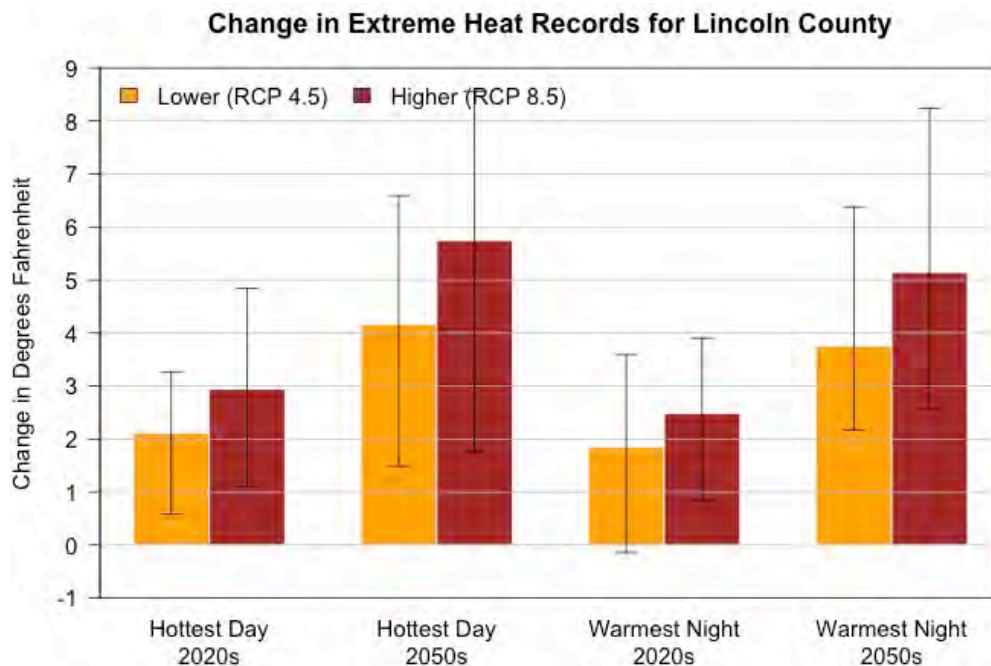


Figure 5 Projected future changes in the hottest day of the year (left two sets of bars) and warmest night of the year (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline.

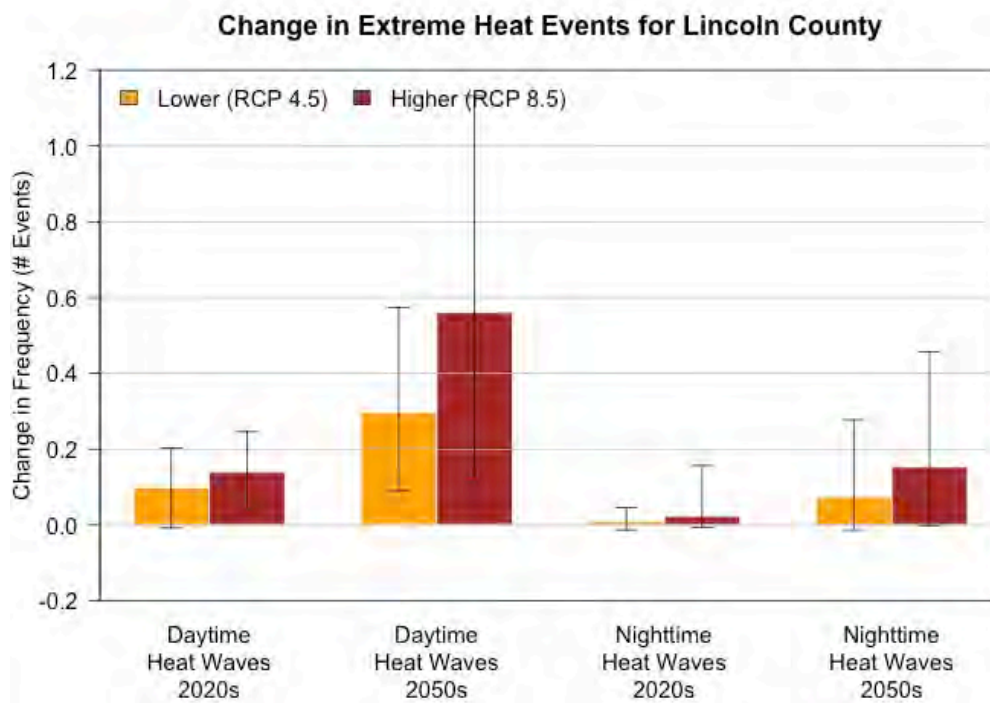


Figure 6 Projected future changes in the number of daytime heat waves (left two sets of bars) and number of nighttime heat waves (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline. Daytime heat waves are defined as events with three or more consecutive days with maximum temperature of at least 90°F; nighttime heat waves are defined as events with three or more consecutive days with minimum temperature of at least 65°F.

**Key Messages:**

- ⇒ Extreme heat events are expected to increase in frequency, duration, and intensity due to continued warming temperatures.
- ⇒ In Lincoln County, the frequency of extreme heat days and magnitude of extreme heat metrics are projected to increase by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 6).
- ⇒ In Lincoln County, the frequency of hot days per year with temperatures at or above 90°F is projected to increase on average by 4 days, with a range of 1 to 8 days, by the 2050s under the higher emissions scenario relative to the historical baselines.
- ⇒ In Lincoln County, the temperature of the hottest day of the year is projected to increase on average by about 6°F, with a range of about 2 to 9°F, by the 2050s under the higher emissions scenario relative to the historical baselines.



## Cold Waves

Over the past century, cold extremes have become less frequent and severe in the Northwest; this trend is expected to continue under future global warming of the climate system (Vose *et al.*, 2017). This report presents projected changes for three metrics of cold extremes for both daytime (maximum temperature) and nighttime (minimum temperature) (Table 7).

**Table 7 Cold extreme metrics and definitions**

<b>Metric</b>	<b>Definition</b>
Cold Days	Number of days per year maximum temperature is less than or equal to 32°F
Cold Nights	Number of days per year minimum temperature is less than or equal to 0°F
Coldest Day	Annual minimum of maximum temperature
Coldest Night	Annual minimum of minimum temperature
Daytime Cold Waves	Number of events per year with at least 3 consecutive days with maximum temperature less than or equal to 32°F
Nighttime Cold Waves	Number of events per year with at least 3 consecutive days with minimum temperature less than or equal to 0°F

In Lincoln County, the coldest days and nights are projected to become less cold by the 2020s (2010–2039) and 2050s (2040–2069) under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 8). For example, by the 2050s under the higher emissions scenario the temperature of the coldest night of the year is projected to increase by at least 0.5°F to at most 9.6°F relative to the models’ historical baselines. The average projected increase is 5.0°F above the average historical baseline of 21.7°F. However, the frequency of cold days and nights and cold wave events defined in (Table 7) is not projected to change very much given that such days are rare in Lincoln County (Table 8).

Projected changes in the frequency of extreme cold days (i.e., Cold Days and Cold Nights) are shown in Figure 7. Projected changes in the magnitude of cold records (i.e., Coldest Day and Coldest Night) are shown in Figure 8. Projected changes in the frequency of extreme cold events (i.e., Daytime Cold Waves and Nighttime Cold Waves) are shown in Figure 9.

Table 8 Mean and range of projected future changes in extreme cold metrics for Lincoln County relative to each global climate model's (GCM) historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 GCMs. The average historical baseline across the 20 GCMs is also presented and can be combined with the average projected future change to infer the average projected future absolute value of a given variable. However, the average historical baseline cannot be combined with the range of projected future changes to infer the range of projected future absolute values.

	Average Historical Baseline	Change by Early 21 <sup>st</sup> Century "2020s"		Change by Mid 21 <sup>st</sup> Century "2050s"	
		Lower	Higher	Lower	Higher
<b>Cold Days</b>	0.6 days	-0.0 days (-0.5 to 0.6)	-0.2 days (-0.5 to 0.4)	-0.3 days (-0.6 to 0.2)	-0.4 days (-0.6 to 0.2)
<b>Cold Nights</b>	0.0 days	+0.0 days (-0.0 to 0.1)	+0.0 days (-0.0 to 0.0)	+0.0 days (-0.0 to 0.0)	+0.0 days (-0.0 to 0.1)
<b>Coldest Day</b>	36.0°F	+1.0°F (-2.6 to 3.0)	+2.1°F (-1.6 to 4.2)	+3.6°F (-0.4 to 6.9)	+4.7°F (0.4 to 8.0)
<b>Coldest Night</b>	21.7°F	+1.2°F (-2.1 to 3.9)	+2.2°F (-0.4 to 5.0)	+3.9°F (0.7 to 7.1)	+5.0°F (0.5 to 9.6)
<b>Daytime Cold Waves</b>	0.1 events	-0.0 events (-0.1 to 0.1)	-0.0 events (-0.1 to 0.1)	-0.0 events (-0.1 to 0.0)	-0.0 events (-0.1 to 0.0)
<b>Nighttime Cold Waves</b>	0.0 events	0.0 events (0.0 to 0.0)	0.0 events (0.0 to 0.0)	0.0 events (0.0 to 0.0)	0.0 events (0.0 to 0.0)



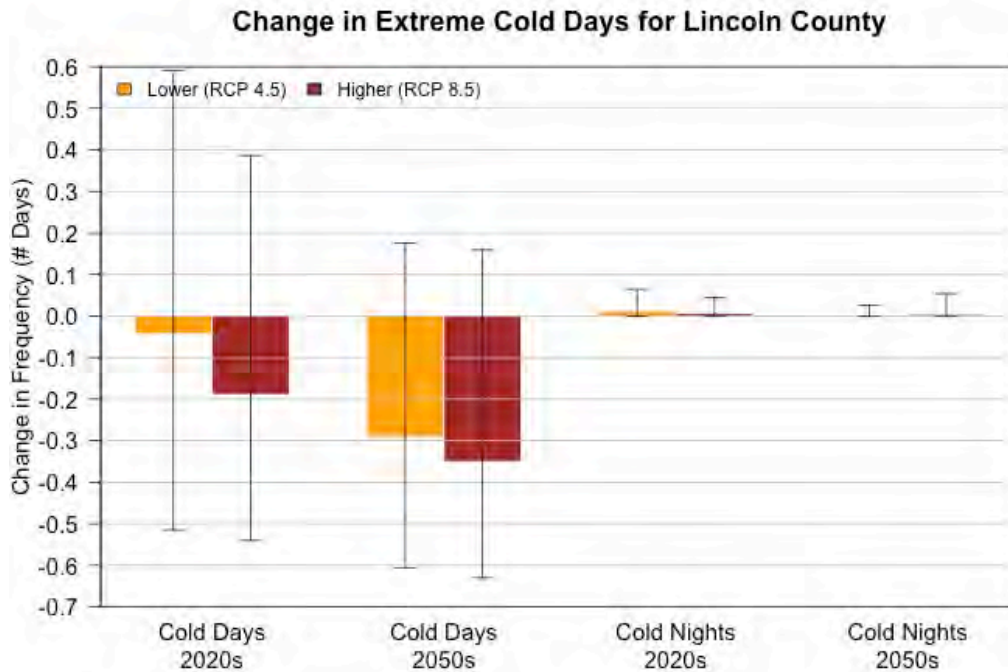


Figure 7 Projected future changes in the number of cold days (left two sets of bars) and number of cold nights (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline. Cold days are defined as days with maximum temperature at or below 32°F; cold nights are defined as days with minimum temperature at or below 0°F.

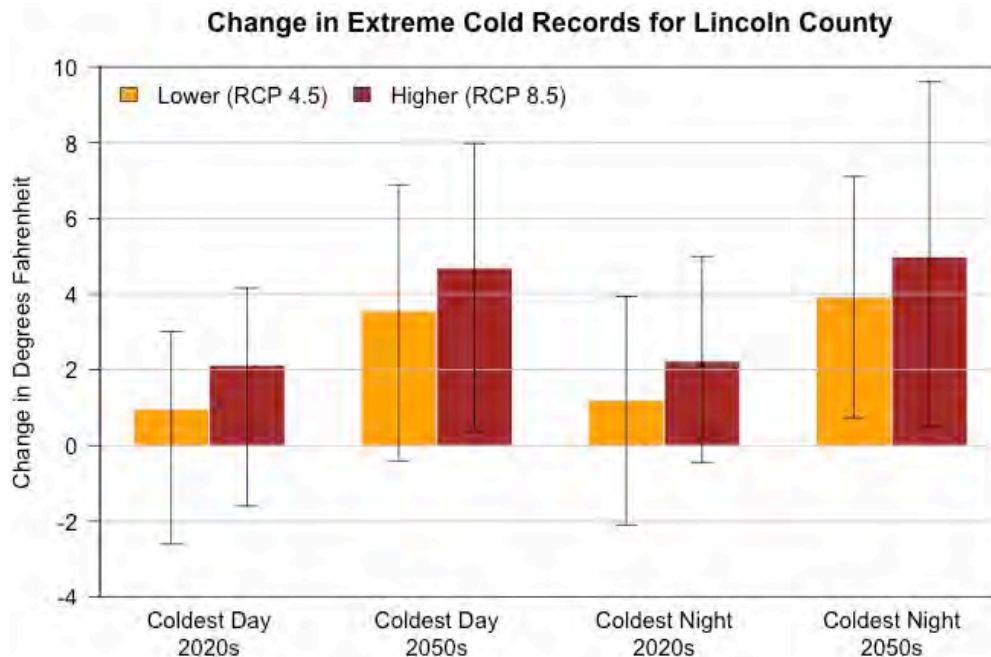


Figure 8 Projected future changes in the coldest day of the year (left two sets of bars) and coldest night of the year (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline.

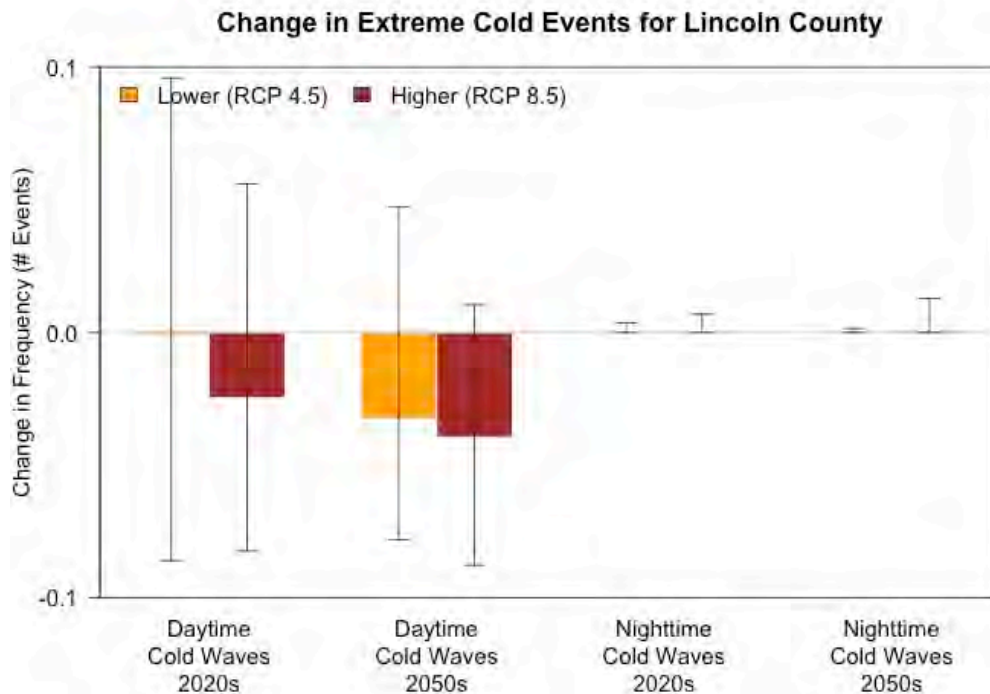


Figure 9 Projected future changes in the number of daytime cold waves (left two sets of bars) and number of nighttime cold waves (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline. Daytime cold waves are defined as events with three or more consecutive days with maximum temperature at or below 32°F; nighttime cold waves are defined as events with three or more consecutive days with minimum temperature at or below 0°F.

**Key Messages:**

- ⇒ Cold extremes are still expected to occur from time to time, but with less frequency and intensity as the climate warms.
- ⇒ In Lincoln County, the temperature of the coldest night of the year is projected to increase on average by about 5°F, with a range of about 1 to 10°F, by the 2050s under the higher emissions scenario relative to the historical baselines.



## Heavy Rains

There is greater uncertainty in future projections of precipitation-related metrics than temperature-related metrics. This is because of the large natural variability in precipitation patterns and the fact that the atmospheric patterns that influence precipitation are manifested differently across GCMs. From a global perspective, mean precipitation is likely to decrease in many dry regions in the sub-tropics and mid-latitudes and increase in many mid-latitude wet regions (IPCC, 2013). That boundary between mid-latitude increases and decreases in precipitation is positioned a little differently for each GCM, which results in some models projecting increases and others decreases in Oregon (Mote *et al.*, 2013).

In Oregon, observed precipitation is characterized by high year-to-year variability and future precipitation trends are expected to continue to be dominated by this large natural variability. On average, summers in Oregon are projected to become drier and other seasons to become wetter resulting in a slight increase in annual precipitation by the 2050s. However, some models project increases and others decreases in each season (Dalton *et al.*, 2017).

Extreme precipitation events in the Pacific Northwest are governed both by atmospheric circulation and by how it interacts with complex topography (Parker and Abatzoglou, 2016). Atmospheric rivers—long, narrow swaths of warm, moist air that carry large amounts of water vapor from the tropics to mid-latitudes—generally result in coherent extreme precipitation events west of the Cascade Range, while closed low pressure systems often lead to isolated precipitation extremes east of the Cascade Range (Parker and Abatzoglou, 2016).<sup>2</sup>

Observed trends in the frequency of extreme precipitation events across Oregon have depended on the location, time frame, and metric considered, but overall the frequency has not changed substantially. As the atmosphere warms, it is able to hold more water vapor that is available for precipitation. As a result, the frequency and intensity of extreme precipitation events are expected to increase in the future (Dalton *et al.*, 2017), including atmospheric river events (Kossin *et al.*, 2017). In addition, regional climate modeling results suggest a weakened rain shadow effect in winter projecting relatively larger increases in precipitation east of the Cascades and smaller increases west of the Cascades in terms of both seasonal precipitation totals and precipitation extremes (Mote *et al.*, 2019).

This report presents projected changes for four metrics of precipitation extremes (Table 9).

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<sup>2</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

Table 9 Precipitation extreme metrics and definitions

Metric	Definition
Wettest Day	Annual maximum 1-day precipitation per water year
Wettest Five-Days	Annual maximum 5-day precipitation total per water year
Wet Days	Number of days per year with precipitation greater than 0.75 inches
Landslide Risk Days	Number of days per water year exceeding the USGS landslide threshold <sup>3</sup> : <a href="https://pubs.er.usgs.gov/publication/ofr20061064">https://pubs.er.usgs.gov/publication/ofr20061064</a> <ul style="list-style-type: none"> <li>○ <math>P3/(3.5-.67*P15)&gt;1</math>, where:                             <ul style="list-style-type: none"> <li>▪ P3 = Previous 3-day precipitation accumulation</li> <li>▪ P15 = 15-day precipitation accumulation prior to P3</li> </ul> </li> </ul>

In Lincoln County, the magnitude of precipitation on the wettest day and wettest consecutive five days is projected to increase on average by the by the 2020s (2010–2039) and 2050s (2040–2069) under both the lower and higher emissions scenarios (Table 10). However, some models project decreases in these metrics for certain time periods and scenarios.

For the 2050s under the higher emissions scenario, climate models project that the magnitude, or amount, of precipitation on the wettest day of the year, relative to each model’s 1971–2000 historical baseline, would increase by as little as 3.8% to as much as 28.3%. The average projected percent increase in the amount of precipitation on the wettest day of the year is 13.4% above the average historical baseline of 3.34 inches.

For the magnitude of precipitation on the wettest consecutive five days of the year, some models project decreases by as much as 2.8% while other models project increases by as much as 21.9% for the 2050s under the higher emissions scenario. The average projected percent change in the amount of precipitation on the wettest consecutive five days is an increase of 10.1% above the average historical baseline of 8.56 inches.

The average number of days per year with precipitation greater than ¾” isn’t projected to change substantially. For example, by the 2050s under the higher emissions scenario, climate models project a range of changes in frequency of wet days from five fewer days to five more days per year.

Landslides are often triggered by rainfall when the soil becomes saturated. This report analyzes a cumulative rainfall threshold based on the previous 3-day and 15-day precipitation accumulation as a surrogate for landslide risk. For Lincoln County, the average number of days per year exceeding the landslide risk threshold is projected to remain about the same with a range of five fewer days to three more days by the 2050s under the higher emissions scenario. Landslide risk depends on a variety of site-specific factors and this metric may not reflect all aspects of the hazard. It is important to note that

<sup>3</sup> This threshold was developed for Seattle, Washington and may or may not have similar applicability to other locations.

this particular landslide threshold was developed for Seattle, Washington and may or may not have similar applicability to other locations.

Projected changes in the magnitude of extreme precipitation events (i.e., Wettest Day and Wettest Five-Days) are shown in Figure 10. Projected changes in the frequency of extreme precipitation events (i.e., Wet Days and Landslide Risk Days) are shown in Figure 11.

Table 10 Mean and range of projected future changes in extreme precipitation metrics for Lincoln County relative to each global climate model’s (GCM) historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 GCMs. The average historical baseline across the 20 GCMs is also presented and can be combined with the average projected future change to infer the average projected future absolute value of a given variable. However, the average historical baseline cannot be combined with the range of projected future changes to infer the range of projected future absolute values.

	Average Historical Baseline	Change by Early 21 <sup>st</sup> Century “2020s”		Change by Mid 21 <sup>st</sup> Century “2050s”	
		Lower	Higher	Lower	Higher
<b>Wettest Day</b>	3.34 inches	+5.8% (-7.7 to 14.9)	+6.2% (-6.0 to 21.9)	+10.9% (2.0 to 19.9)	+13.4% (3.8 to 28.3)
<b>Wettest Five-Days</b>	8.56 inches	+4.9% (-4.2 to 20.9)	+4.2% (-6.0 to 23.0)	+8.4% (-0.9 to 19.1)	+10.1% (-2.8 to 21.9)
<b>Wet Days</b>	39.3 days	+0.0 days (-2.3 to 2.7)	-0.5 days (-5.2 to 1.9)	+0.5 days (-4.0 to 4.2)	+0.2 days (-5.0 to 4.6)
<b>Landslide Risk Days</b>	38.8 days	-0.2 days (-3.9 to 4.0)	-0.3 days (-2.9 to 4.1)	-1.3 days (-4.9 to 2.7)	-0.8 days (-5.2 to 3.4)

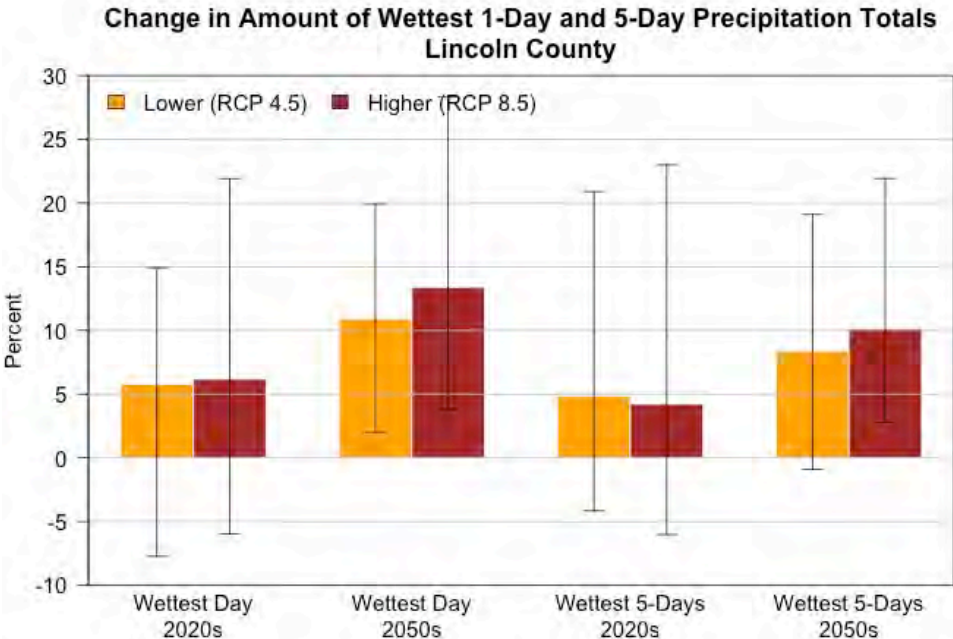


Figure 10 Projected future changes in the wettest day of the year (left two sets of bars) and wettest consecutive five days of the year (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline.

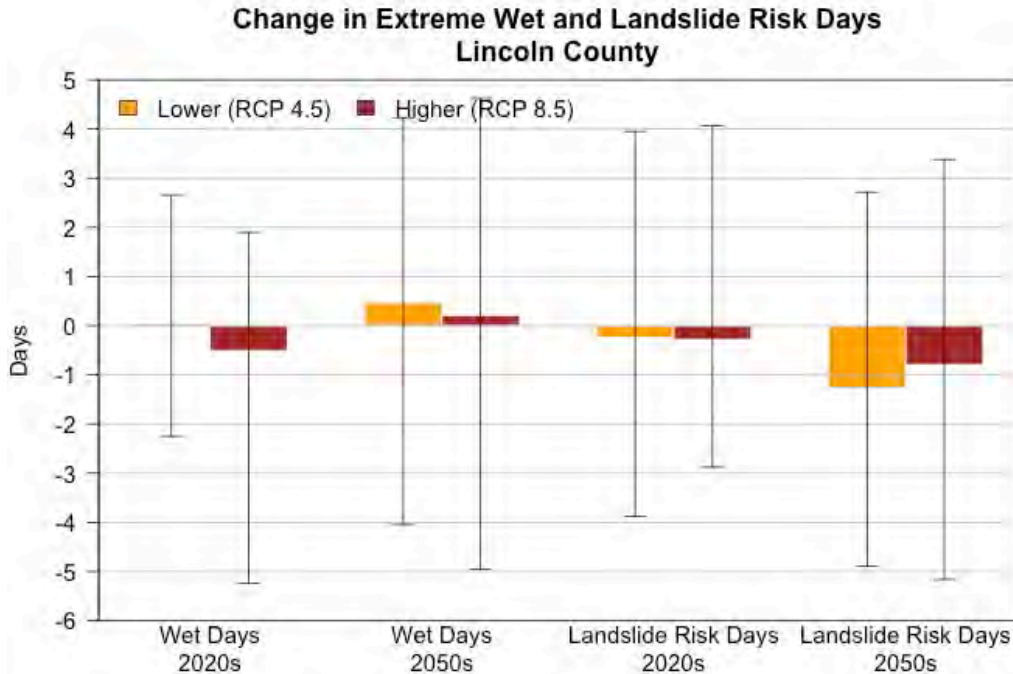


Figure 11 Projected future changes in the frequency of wet days (left two sets of bars) and landslide risk days (right two sets of bars) for Lincoln County relative to the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 20 global climate models (GCMs). The bars and whiskers display the mean and range, respectively, of changes across the 20 GCMs relative to each GCM’s historical baseline.

**Key Messages:**

- ⇒ The intensity of extreme precipitation events is expected to increase in the future as the atmosphere warms and is able to hold more water vapor.
- ⇒ In Lincoln County, the frequency of days with at least ¾” of precipitation is not projected to change substantially. However, the magnitude of precipitation on the wettest day and wettest consecutive five days per year is projected to increase on average by about 13% (with a range of about 4% to 28%) and about 10% (with a range of about -3% to 22%), respectively, by the 2050s under the higher emissions scenario relative to the historical baselines.
- ⇒ In Lincoln County, the frequency of days exceeding a threshold for landslide risk, based on 3-day and 15-day precipitation accumulation, is not projected to change substantially. However, landslide risk depends on a variety of factors and this metric may not reflect all aspects of the hazard.



## River Flooding

Future streamflow magnitude and timing in the Pacific Northwest is projected to shift toward higher winter runoff, lower summer and fall runoff, and an earlier peak runoff, particularly in snow-dominated regions (Raymondi *et al.*, 2013; Naz *et al.*, 2016).<sup>4</sup> These changes are expected to result from warmer temperatures causing precipitation to fall more as rain and less as snow, in turn causing snow to melt earlier in the spring; and in combination with increasing winter precipitation and decreasing summer precipitation (Dalton *et al.*, 2017; Mote *et al.*, 2019).

Streamflow in rain-dominated watersheds reflects the seasonal pattern of precipitation, with peak flows occurring during the winter and low flows occurring during the summer.<sup>5</sup> Coastal rain-dominated watersheds, like those in Lincoln County, have received very little attention in the published literature in regards to how streamflow is expected to change under future climate. A recent study on coastal watersheds in the Western US featuring the Siletz River shows projected increases in streamflow during winter (November–March) relative to historic streamflow for the Siletz River (Burke and Ficklin, 2017) (Figure 12). By the late-21<sup>st</sup> century compared to the historical baseline, winter streamflow is projected to increase by about 18% on average, though projected changes were only statistically significant for the months of November, December, and March (Burke and Ficklin, 2017).

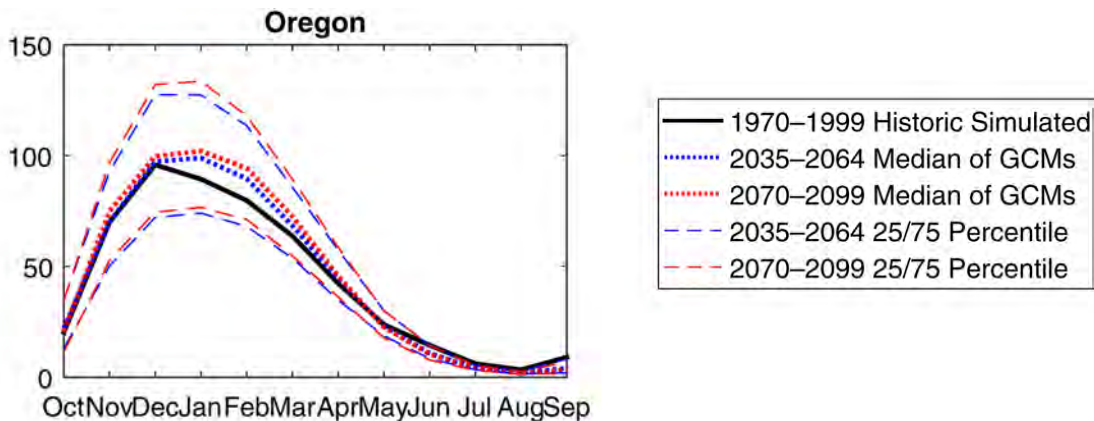


Figure 12 Median, 25<sup>th</sup> percentile, and 75<sup>th</sup> percentile streamflow based on RCP 8.5 for historic (1970–1999), mid-21<sup>st</sup> century (2035–2065), and late-21<sup>st</sup> century (2070–2099) periods. Source: Burke and Ficklin, 2017.

Warming temperatures and increased winter precipitation are expected to increase flood risk for many basins in the Pacific Northwest, particularly mid- to low-elevation mixed rain-snow basins with near freezing winter temperatures (Tohver *et al.*, 2014). The greatest changes in peak streamflow magnitudes are projected to occur at intermediate elevations in the Cascade Range and the Blue Mountains (Safeeq *et al.*, 2015). Recent advances in regional hydro-climate modeling support this expectation, projecting increases in extreme high flows for most of the Pacific Northwest, especially west of the Cascade Crest (Salathé *et al.*, 2014; Najafi and Moradkhani, 2015; Naz *et al.*, 2016). One study, using a single climate model, projects flood risk to increase in the fall due to earlier, more extreme storms, including atmospheric river events, and to a shift of precipitation from

<sup>4</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>5</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

snow to rain (Salathé *et al.*, 2014).<sup>6</sup>

The projected increase in peak winter flows in the Siletz River (Burke and Ficklin, 2017), although small percentage-wise, could potentially increase the risk of flooding, yet that is dependent on the timing and amount of precipitation. In fact, the Alsea River has seen a decrease in annual maximum streamflows between 1940 and 2007, possibly due to decreasing frequency of rain-on-snow events as snow becomes scarce (Jefferson, 2011).

However, across the western US, the 100-year and 25-year peak flow magnitude is projected to increase at a majority of streamflow sites by the 2070–2099 period compared to the 1971–2000 historical baseline under the higher emissions scenario (RCP 8.5) (Maurer *et al.*, 2018). For the Siletz River, the 25-year and 100-year peak flow magnitudes are projected to increase by about 16% and 19%, respectively, by the 2070–2099 period compared to the historical baseline (Table 11). This corresponds with the magnitude of the 25-year and 100-year peak flow events becoming the 13-year and 36-year events, respectively (Maurer *et al.*, 2018). It is important to note that Maurer *et al.* (2018) do not consider these projected changes to be statistically significant by their threshold (p-val < 0.05).

**Table 11 Percent change in the 100-year and 25-year recurrence interval flows for the Siletz River between 2070–2099 and 1971–2000 and the return period in 2070–2099 of the flow with a magnitude equal to that of the 100-year and 25-year flow as determined fro 1971–2000. (Source: Maurer *et al.*, 2018, personal communication)**

Return Period (Probability in a given year)	Percent Change in N-Year Peak Flow 2070–2099 vs. 1971–2000	Return Period of N-Year Peak Flow (2070–2099)
25-Year (4%)	15.86% (p-val=0.064)	12.8-Year (7.8%)
100-Year (1%)	18.55% (p-val=0.055)	36.47-Year (2.7%)

Some of the Pacific Northwest’s largest floods occur when copious warm rainfall from atmospheric rivers combine with a strong snowpack, resulting in rain-on-snow flooding events (Safaeq *et al.*, 2015).<sup>7</sup> The frequency and intensity—amount of transported moisture—of atmospheric river events is projected to increase along the West Coast in response to rising atmospheric temperatures (Kossin *et al.*, 2017). This larger moisture transport of atmospheric rivers would lead to greater likelihoods of flooding along the West Coast (Konrad and Dettinger, 2017).

Future changes in rain-on-snow events as a result of climate warming depend on elevation. At lower elevations, the frequency of rain-on-snow events is projected to decrease due to decreasing snowpack, whereas at high elevations the frequency of rain-on-snow events is projected to increase due to the shift from snowy to rainy days (Surfleet and Tullos, 2013; Safaeq *et al.*, 2015; Musselman *et al.*, 2018). How such changes in rain-on-snow frequency would affect high streamflow events is varied. For example, projections for the Santiam

<sup>6</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>7</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)



River, OR, show an increase in annual peak daily flows with moderate return intervals (<10 years) but a decrease at higher (> 10-year) return intervals (Surfleet and Tullos, 2013). For northern coastal Oregon watersheds, average runoff from rain-on-snow events is projected to decline in the future due to depletion of snow (Musselman *et al.*, 2018), which may imply that flood potential in these areas shift from being driven by rain-on-snow events to extreme rainfall events that exceed soil capacity (Berghuijs *et al.*, 2016; Musselman *et al.*, 2018).

**Key Messages:**

- ⇒ Coastal rain-dominated watersheds, such as the Siletz River, may experience an increase in winter flood risk due to projected greater winter precipitation and warmer winter temperatures causing precipitation to fall more as rain and less as snow, in addition to increases in the frequency and intensity of flood-producing atmospheric river events.



Across the western US, mountain snowpack is projected to decline leading to reduced summer soil moisture in mountainous environments (Gergel *et al.*, 2017). Coastal Oregon is also projected to experience a decrease in summer soil moisture, but to a lesser degree than the Oregon Cascades. Climate change is expected to result in lower summer streamflows in snow-dominated basins across the Pacific Northwest as snowpack melts off earlier due to warmer temperatures and summer precipitation decreases (Dalton *et al.*, 2017; Mote *et al.*, 2019).

Watersheds in Lincoln County are largely rain-dominated systems, meaning the drivers of drought and water scarcity are different than across much of the western US, where mountain snowpack contributes to streamflow (Dalton *et al.*, 2017; Mote *et al.*, 2019). As with the rest of the Pacific Northwest, Lincoln County typically experiences wet winters and dry summers. This seasonal cycle of precipitation means that severe drought is rare during the rainy winters on the mid-Oregon coast, but the region is prone to periods of summertime water scarcity, especially when precipitation is lower than average in the shoulder seasons (e.g., spring, fall). This is exacerbated by the lack of natural storage (e.g., snowpack) and built storage (e.g., reservoirs).

This report presents future changes in five variables indicative of drought conditions—low spring snowpack, low summer soil moisture<sup>8</sup>, low summer runoff, low summer precipitation, and high summer evaporation—in terms of a change in the frequency of the historical baseline 1-in-5 year event (that is, an event having a 20% chance of occurrence in any given year). The future projections, displayed in the orange and brown bars of Figure 13, are the frequency in the future period of the magnitude of the event that has a 20% frequency in the historical period.

In Lincoln County, spring snowpack (that is, the snow water equivalent on April 1), summer runoff, summer soil moisture, and summer precipitation are projected to decline while summer evaporation is projected to increase under both lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios by the 2050s (2040–2069). This leads to the magnitude of low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation expected with a 20% chance in any given year of the historical period being projected to occur much more frequently by the 2050s under both emissions scenarios (Figure 13). The 2020s (2010–2039) were not evaluated in this drought analysis due to data limitations, but can be expected to be similar but of smaller magnitude to the changes for the 2050s.

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<sup>8</sup> Soil moisture projections are for the total moisture in the soil column from the surface to 140 cm below the surface.

### Drought Metrics for Lincoln County

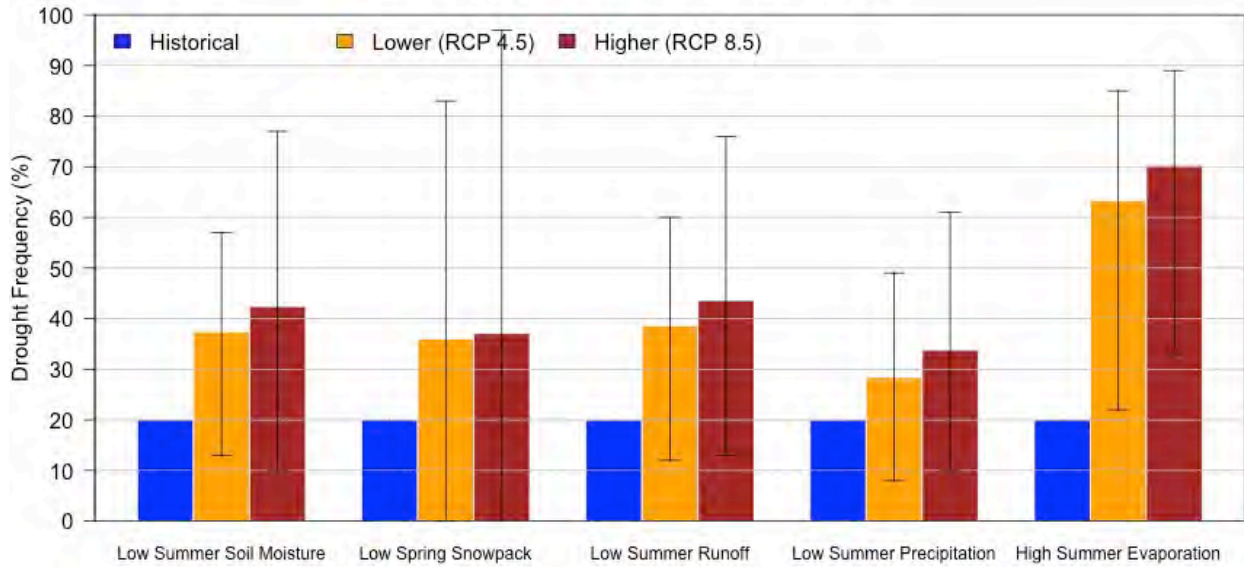


Figure 13 Frequency of the historical baseline (1971–2000) 1-in-5 year event (by definition 20% frequency) of low summer soil moisture (average of June-July-August), low spring snowpack (April 1 snow water equivalent), low summer runoff (total of June-July-August), low summer precipitation (total for June-July-August), high summer evaporation (total for June-July-August) for the future period 2040–2069 for lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios. The bar and whiskers depict the mean and range across ten global climate models. (Data Source: Integrated Scenarios of the Future Northwest Environment, <https://climate.northwestknowledge.net/IntegratedScenarios/>)

#### Key Messages:

- ⇒ Drought conditions, as represented by low summer soil moisture, low spring snowpack, low summer runoff, low summer precipitation, and high summer evaporation are projected to become more frequent in Lincoln County by the 2050s.



Over the last several decades, warmer and drier conditions during the summer months have contributed to an increase in fuel aridity and enabled more frequent large fires, an increase in the total area burned, and a longer fire season across the western United States, particularly in forested ecosystems (Dennison *et al.*, 2014; Jolly *et al.*, 2015; Westerling, 2016; Williams and Abatzoglou, 2016). The lengthening of the fire season is largely due to declining mountain snowpack and earlier spring snowmelt (Westerling, 2016). Recent wildfire activity in forested ecosystems is partially attributed to human-caused climate change: during the period 1984–2015, about half of the observed increase in fuel aridity and 4.2 million hectares (or more than 16,000 square miles) of burned area in the western United States were due to human-caused climate change (Abatzoglou and Williams, 2016). Under future climate change, wildfire frequency and area burned are expected to continue increasing in the Pacific Northwest (Barbero *et al.*, 2015; Sheehan *et al.*, 2015),<sup>9</sup> even in the climatologically wet areas in western Oregon (Mote *et al.*, 2019).

As a proxy for wildfire risk, this report considers a fire danger index called 100-hour fuel moisture (FM100), which is a measure of the amount of moisture in dead vegetation in the 1–3 inch diameter class available to a fire. It is expressed as a percent of the dry weight of that specific fuel. FM100 is a common index used by the Northwest Interagency Coordination Center to predict fire danger. A majority of climate models project that FM100 would decline across Oregon by the 2050s (2040–2069) under the higher (RCP 8.5) emissions scenario (Gergel *et al.*, 2017). This drying of vegetation would lead to greater wildfire risk, especially when coupled with projected decreases in summer soil moisture. This report defines a “very high” fire danger day to be a day in which FM100 is lower (i.e., drier) than the historical baseline 10<sup>th</sup> percentile value. By definition, the historical baseline has 36.5 “very high” fire danger days annually. The future change in wildfire risk is expressed as the average annual number of additional “very high” fire danger days for two future periods under two emissions scenarios compared with the historical baseline (Figure 14). The impacts of wildfire on air quality are discussed in the following section on Air Quality.

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<sup>9</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

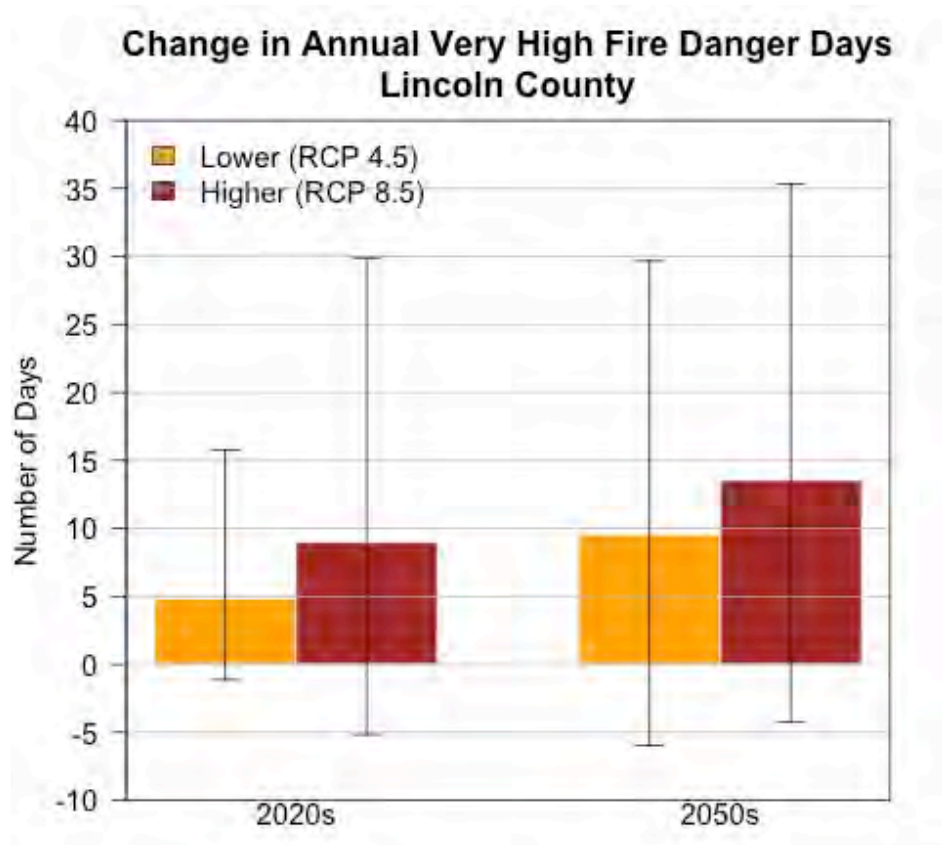


Figure 14 Projected future changes in the frequency of very high fire danger days for Lincoln County from the historical baseline (1971–2000 average) for the 2020s (2010–2039 average) and 2050s (2040–2069 average) under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario based on 18 global climate models. The bars and whiskers display the mean and range, respectively, of changes across the 18 GCMs. (Data Source: Northwest Climate Toolbox, [climatetoolbox.org/tool/Climate-Mapper](http://climatetoolbox.org/tool/Climate-Mapper))

**Key Messages:**

- ⇒ Wildfire risk, as expressed through the frequency of very high fire danger days, is projected to increase under future climate change in Lincoln County.
- ⇒ In Lincoln County, the frequency of very high fire danger days per year is projected to increase on average by about 14 days (with a range of -4 to +35 days) by the 2050s under the higher emissions scenario compared to the historical baseline.
- ⇒ In Lincoln County, the frequency of very high fire danger days per year is projected to increase on average by about 37% (with a range of -12 to +97%) by the 2050s under the higher emissions scenario compared to the historical baseline.



## Air Quality

Climate change is expected to worsen outdoor air quality. Warmer temperatures may increase ground level ozone pollution, more wildfires may increase smoke and particulate matter, and longer, more potent pollen seasons may increase aeroallergens. Such poor air quality is expected to exacerbate allergy and asthma conditions and increase respiratory and cardiovascular illnesses and death (Fann *et al.*, 2016).<sup>10</sup> In addition to increasing health risks, wildfire smoke impairs visibility and disrupts outdoor recreational activities (Nolte *et al.*, 2018). This report presents quantitative projections of future air quality measures related to fine particulate matter (PM<sub>2.5</sub>) from wildfire smoke.

Climate change is expected to result in a longer wildfire season with more frequent wildfires and greater area burned (Sheehan *et al.*, 2015). Wildfires are primarily responsible for days when air quality standards for PM<sub>2.5</sub> are exceeded in western Oregon and parts of eastern Oregon (Liu *et al.*, 2016), although woodstove smoke and diesel emissions are also main contributors (Oregon DEQ, 2016). Across the western United States, PM<sub>2.5</sub> levels from wildfires are projected to increase 160% by mid-century under a medium emissions pathway<sup>11</sup> (SRES A1B) (Liu *et al.*, 2016). This translates to a greater risk of wildfire smoke exposure through increasing frequency, length, and intensity of “smoke waves”—that is, two or more consecutive days with high levels of PM<sub>2.5</sub> from wildfires (Liu *et al.*, 2016).<sup>11</sup>

The change in risk of poor air quality due to wildfire-specific PM<sub>2.5</sub> is expressed as the number of “smoke wave” days within a six-year period and the average intensity—concentration of particulate matter—of smoke wave days in the present (2004–2009) and mid-century (2046–2051) under a medium emissions pathway<sup>12</sup> (Figure 15). See Appendix for description of methodology and access to the Smoke Wave data.

In Lincoln County the frequency of “smoke wave” days is expected to change little, however, the intensity—the concentration of particulate matter—of “smoke wave” days is expected to increase.

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<sup>10</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>11</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>12</sup> The medium emissions pathway used is from an earlier generation of emissions scenarios. Liu *et al.* (2016) used SRES-A1B, which is most similar to RCP 6.0 from Figure 2.

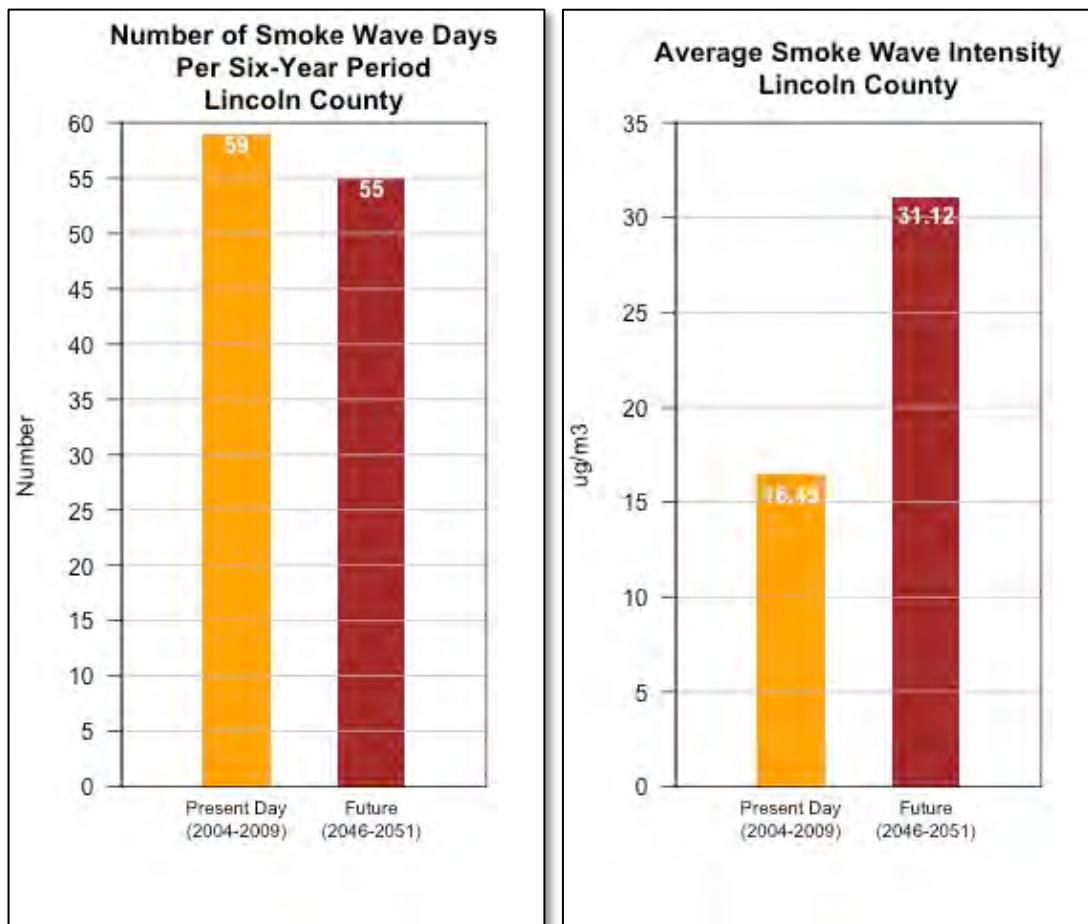


Figure 15 Simulated present day (2004–2009) and future (2046–2051) frequency (left) and intensity (right) of “smoke wave” days for Lincoln County under a medium emissions scenario<sup>11</sup>. The bars display the mean across 15 GCMs. (Data source: Liu et al. 2016, <https://khanotations.github.io/smoke-map/>)

**Key Messages:**

- ⇒ Under future climate change, the risk of wildfire smoke exposure is projected to increase in Lincoln County.
- ⇒ In Lincoln County, the number of “smoke wave” days is projected to decrease by 7% while the intensity of “smoke waves” is projected to increase by 89% by 2046–2051 under a medium emissions scenario compared with 2004–2009.



## Coastal Erosion & Flooding

The risk of coastal erosion and flooding hazards is expected to increase with climate change due to sea level rise and other factors including changing wave dynamics.

### Sea Level Rise

Changes in global sea levels occur due to ocean thermal expansion, glacier and ice sheet mass loss, and land water storage. Regional and local sea levels on the Pacific Northwest's coast are governed by the global mean sea level, but also by natural variability (El Niño–Southern Oscillation affects ocean currents and wind fields), by vertical land motions from subducting ocean plates, and by post-glacial isostatic adjustment (Reeder *et al.*, 2013).<sup>13</sup>

Global average sea level has risen by about 7–8 inches (about 16–21 cm) since 1900, with almost half this rise occurring since 1993 as oceans have warmed and land-based ice has melted. Relative to the year 2000, sea level is very likely to rise 1 to 4 feet (0.3 to 1.3 m) by the end of the 21<sup>st</sup> century.

Emerging science regarding Antarctic ice sheet stability suggests that, for higher scenarios, a rise exceeding 8 feet (2.4 m) by 2100 is physically possible, although the probability of such an extreme outcome cannot currently be assessed<sup>14</sup> (Hayhoe *et al.*, 2018) (Figure 16). A crucial point about the melting ice sheets in both Greenland and Antarctica is that even after global temperatures are stabilized, melting would continue until a new equilibrium is reached thousands of years later (Mote *et al.*, 2019). This has implications for coastal development in that sea level would continue to rise for millennia after 2100 (Clark *et al.*, 2018; Mote *et al.*, 2019).

Local sea level at Newport, OR<sup>15</sup> has risen about four inches during 1967–2013 and is projected to rise by 1.7 to 5.7 feet by 2100 (*Coastal Risks for Lincoln County, OR*, 2019) based on the Intermediate-Low and Intermediate-High global sea level scenarios used in the 2018 U.S. National Climate Assessment (Sweet *et al.*, 2017a). This range of sea level rise scenarios is similar to the *very likely* range projected for the higher emissions scenario, RCP8.5, by 2100 (Figure 16). Table 12 shows the median projected local sea level rise at Newport, OR for each scenario and decade from 2030 to 2100 relative to the 1992 mean high tide line. These local sea level projections include vertical land movement trend estimates derived from GPS measurements and tide gauge platforms (Sweet *et al.*, 2017b). This means that the future sea level rise projections are relative to the future land position as opposed to the existing land position.

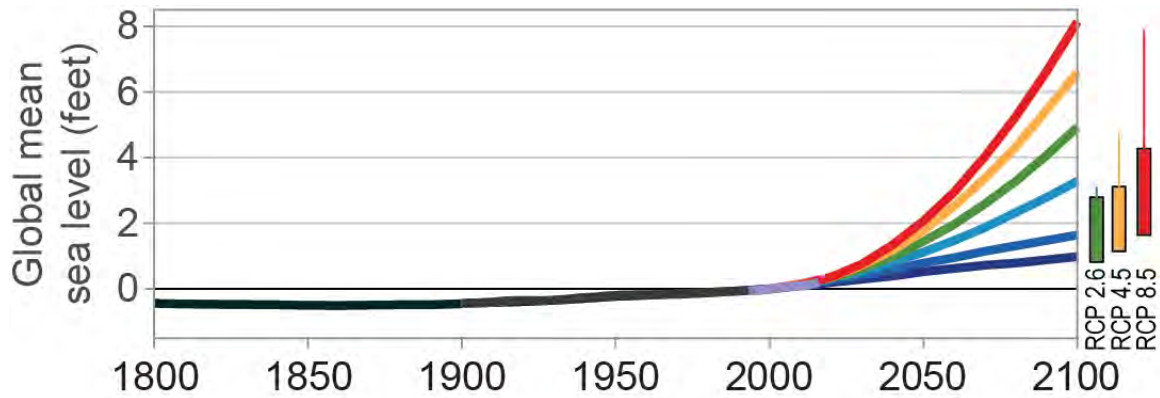
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<sup>13</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>14</sup> Verbatim from the Fourth National Climate Assessment Report (Hayhoe *et al.*, 2018)

<sup>15</sup> NOAA water level station at South Beach–Yaquina River





Scenario	RCP2.6	RCP4.5	RCP8.5
Low (1 ft)	94%	98%	100%
Intermediate-Low (1.6 ft)	49%	73%	96%
Intermediate (3.3 ft)	2%	3%	17%
Intermediate-High (4.9 ft)	0.4%	0.5%	1.3%
High (6.6 ft)	0.1%	0.1%	0.3%
Extreme (8.2 ft)	0.05%	0.05%	0.1%

Figure 16 (Top) Global mean sea level rise from 1800 to 2100 based on tide gauge-based reconstruction (black), satellite-based reconstruction (purple), and six future scenarios (navy blue, royal blue, cyan, green, orange, red) used in the Fourth National Climate Assessment (NCA4). The *very likely* ranges in 2100 for different RCPs (colored boxes), and lines augmenting the very likely ranges by accounting for various estimates of Antarctic contributions. (Bottom) Probability of exceeding each NCA4 global mean sea level scenario in 2100 under three RCPs. New evidence regarding the Antarctic ice sheet, if sustained, may significantly increase the probability of the intermediate-high, high, and extreme scenarios, particularly under the higher emissions scenario (RCP8.5), but these results have not yet been incorporated into a probabilistic analysis (Source: Sweet et al., 2017a, <https://science2017.globalchange.gov/chapter/12/>)

Table 12 Median local sea level projections for Newport, OR (NOAA water level station at South Beach) based on scenarios used in the 2018 U.S. National Climate Assessment. Sea level rise is feet above a 1992 baseline. Projections include vertical land movement trend estimates. (Source: Climate Central Surging Seas Risk Finder, [https://riskfinder.climatecentral.org/county/lincoln-county.or.us?comparisonType=place&forecastName=Basic&forecastType=NOAA2017\\_extreme\\_p50&level=4&unit=ft&zillowPlaceType=postal-code](https://riskfinder.climatecentral.org/county/lincoln-county.or.us?comparisonType=place&forecastName=Basic&forecastType=NOAA2017_extreme_p50&level=4&unit=ft&zillowPlaceType=postal-code))

Scenario	2030	2040	2050	2060	2070	2080	2090	2100
L	0.4	0.5	0.6	0.8	0.9	1.0	1.1	1.2
I-L	0.5	0.6	0.8	1.0	1.2	1.3	1.5	1.7
I	0.6	0.9	1.2	1.6	2.0	2.4	2.9	3.5
I-H	0.9	1.3	1.8	2.4	3.0	3.8	4.7	5.7
H	1.1	1.7	2.5	3.4	4.3	5.5	6.8	8.4
E	1.3	2.0	2.9	4.1	5.3	6.8	8.4	10.3

## Wave Climate

Wave heights have increased in the northeast Pacific over the past several decades (Reeder *et al.*, 2013), as have extreme wave events (Bromirski *et al.*, 2013); such waves have been largely responsible for recent increases in coastal flooding and erosion (Ruggiero, 2013). However, attributing increasing wave heights to climate change may not be possible until the second half of the 21st century because natural variability is quite large (Dobrynin *et al.*, 2014). Future projections of average and extreme wave heights along the West Coast are mixed (Wang *et al.*, 2014; Erikson *et al.*, 2015) as they rely on predictions that are difficult to make about extratropical storms and extreme winds (Vose *et al.*, 2014).<sup>16</sup> Coastal water levels and wave heights are also affected by major El Niño-Southern Oscillation (ENSO) events. During El Niño events the Pacific Northwest's coast can experience elevated sea levels, but both the top six El Niño and top five La Niña events during 1979–2016 amplified coastal erosion and wave energy in the Pacific Northwest (Barnard *et al.*, 2015, 2017).<sup>17</sup>

## Coastal Erosion & Flooding Hazards

Tall waves, intense storms, and ENSO events can combine with sea level rise to produce coastal erosion and inundation hazards (Reeder *et al.*, 2013).<sup>18</sup> The majority of Lincoln County's coastline has generally been in an erosional regime on average since the 1960s, particularly in the Beverly littoral cell between Yaquina Head and Cape Foulweather in which more than half of transects are eroding at rates faster than -1 m/yr (Ruggiero *et al.*, 2013) (Figure 17). This may be a reflection of positive relative sea level trends in this region unlike other coastal segments of Oregon in which vertical uplift rates are higher than relative sea level change (Ruggiero *et al.*, 2013). The projected increase in local sea levels along the Oregon coast raises the starting point for storm surges and high tides making coastal hazards more severe and more frequent in the future (*Coastal Risks for Lincoln County, OR*, 2019).

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<sup>16</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>17</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>18</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

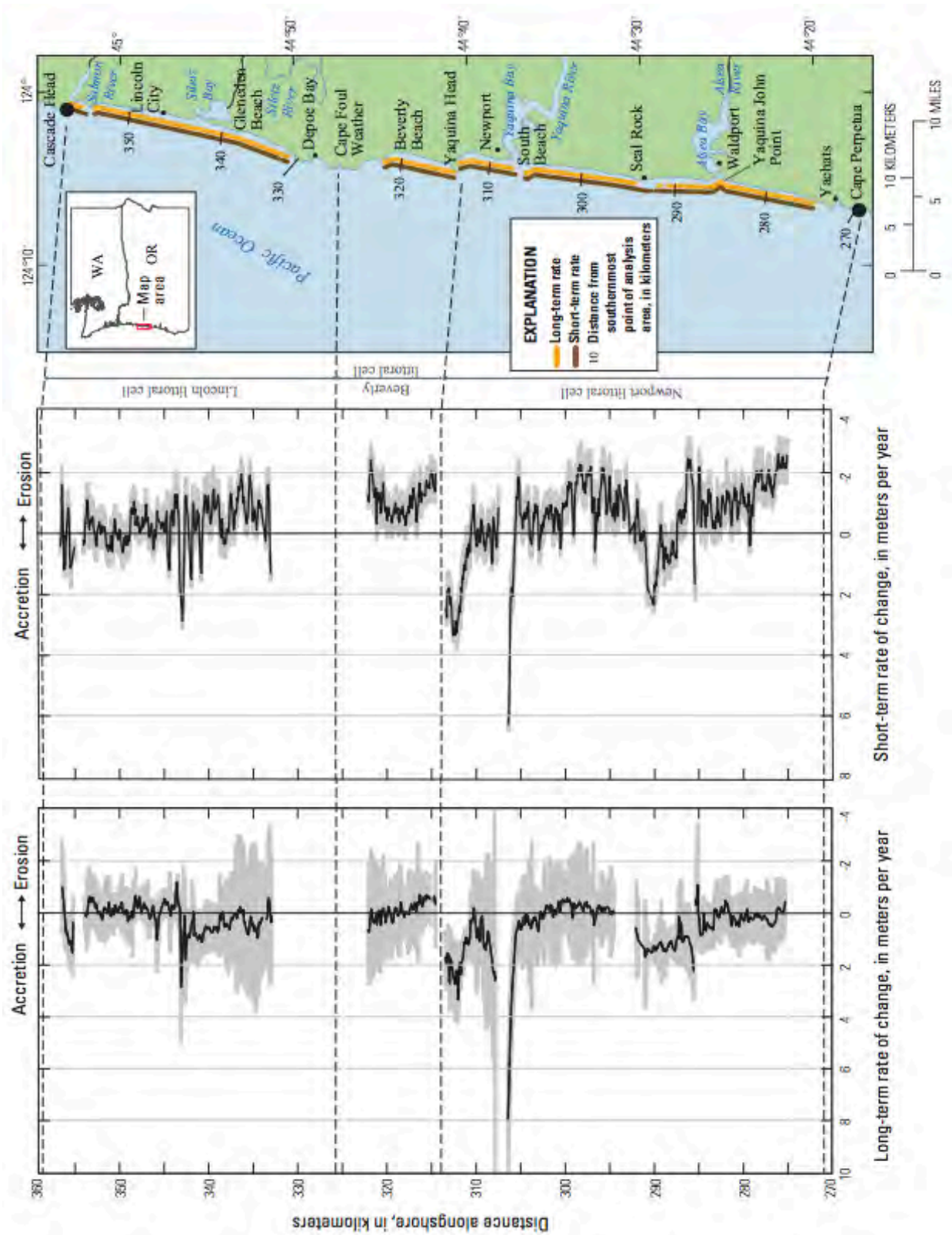


Figure 17 Long- (1800s through 2002) and short-term (1960s through 2002) shoreline change rates (black lines on plots) for the Lincoln County analysis region in Oregon. The location of the region is shown in figure 1. Shaded gray area behind long- and short-term rate line represents uncertainty associated with rate calculation. (Source: Ruggiero et al., 2013)

Assuming the Intermediate-Low to Intermediate-High sea level scenarios for Newport, OR (Table 12), the multi-year likelihood of a 4-foot flood event—water reaching four feet above mean high tide—ranges from 45%–83% by the 2030s, 93%–100% by the 2050s, and 100% by 2100 (*Coastal Risks for Lincoln County, OR, 2019*). Table 13 shows the multi-year risk of flooding above 4 feet above mean high tide, that is, the risk of at least one such flood from 2016 through each year, for each sea level rise scenario. For historical perspective, the highest observed flood in the area between 1967 and 2013 was 3.9 feet above mean high tide and the statistical 1-in-100 year flood height is 3.9 feet (*Coastal Risks for Lincoln County, OR, 2019*).

These projections represent a real, eventual future flood risk for people and assets within the 4-foot flood area. According to Climate Central’s Surging Seas Risk Finder, 406 people and \$63 million in property value are in areas of Lincoln County that are within 4 feet above mean high tide and not potentially protected by levees or other features (Table 14) (*Coastal Risks for Lincoln County, OR, 2019*).

**Table 13 Risk (% Likelihood) of at least one flood exceeding 4 feet above mean high tide between 2016 through each year shown based on median local sea level projections for Newport, OR (Table 12).** (Source: Climate Central Surging Seas Risk Finder, [https://riskfinder.climatecentral.org/county/lincoln-county.or.us?comparisonType=place&forecastType=NOAA2017\\_intlo\\_p50&level=4&unit=ft&zillowPlaceType=postal-code](https://riskfinder.climatecentral.org/county/lincoln-county.or.us?comparisonType=place&forecastType=NOAA2017_intlo_p50&level=4&unit=ft&zillowPlaceType=postal-code))

Scenario	2030	2040	2050	2060	2070	2080	2090	2100
L	35%	59%	80%	94%	99%	100%	100%	100%
I-L	45%	74%	93%	99%	100%	100%	100%	100%
I	60%	91%	100%	100%	100%	100%	100%	100%
I-H	83%	100%	100%	100%	100%	100%	100%	100%
H	96%	100%	100%	100%	100%	100%	100%	100%
E	99%	100%	100%	100%	100%	100%	100%	100%

**Table 14 Total population and property value below 4 feet above mean high tide for Lincoln County and select towns.** Values exclude sub-4 foot areas potentially protected by levees or other features. (Source: Climate Central Risk Finder, 2019, <http://www.riskfinder.org/>)

Town	Total Population below 4 feet	Total Property Value below 4 feet
Yachats	11	\$0
Waldport	19	\$0
Newport	22	\$19 million
Toledo	34	\$11 million
Depoe Bay	10	\$0
Lincoln Beach	5	\$2 million
Lincoln City	76	\$10 million
Rose Lodge	34	\$0
Lincoln County	406	\$138 million

The Oregon Coastal Management Program (OCMP) completed a sea level rise exposure inventory for Oregon’s estuaries in 2017, including five major estuaries in Lincoln County (Sepanik *et al.*, 2017). The sea level rise and flooding scenarios considered in the OCMP analysis are summarized for Lincoln County and compared with the sea level rise and flooding scenarios from the 2018 NCA and Climate Central in Table 15 in order to place the OCMP analysis in context with the more recent sea level rise scenarios presented earlier in this section. The OCMP sea level rise scenarios are taken from the upper range of projections for Newport, OR in *Sea-Level Rise for Coasts of California, Oregon, and Washington* (National Research Council, 2012). OCMP’s scenarios for the 2030s and 2050s most closely align with the 2018 NCA 83<sup>rd</sup> Percentile of the Intermediate Scenario. OCMP’s sea level scenario for 2100 most closely aligns with the 2018 NCA 17<sup>th</sup> Percentile of the Intermediate-High Scenario (Table 15). The 1% and 50% chance flood levels from Appendix A of OCMP’s analysis are 4.0 feet and 2.6 feet, respectively, averaged across the five estuaries in Lincoln County (Sepanik *et al.*, 2017). These levels are analogous to Climate Central’s estimates for Newport’s (i.e., South Beach water level station) “mild” flood level (2.6 feet) and “major” flood level (3.9 feet) (Table 15).

**Table 15 Key to compare Oregon Coastal Management Program (OCMP) sea level rise (SLR) and flooding scenarios with Climate Central SLR and flooding scenarios based on the 2018 U.S. National Climate Assessment (NCA) SLR scenarios. (Source: Sepanik et al., 2017; Climate Central Surging Seas Risk Finder for Clatsop County, OR, <https://riskfinder.climatecentral.org>)**

OCMP SLR Scenario <sup>19</sup>	2018 NCA SLR Scenario
2030 (0.75 feet)	2030 (0.8 feet) <sup>20</sup>
2050 (1.57 feet)	2050 (1.5 feet) <sup>21</sup>
2100 (4.66 feet)	2100 (4.6 feet) <sup>22</sup>
OCMP Flood Scenario <sup>23</sup>	Climate Central Flood Scenario <sup>24</sup>
1% chance (4.0 feet)	“major flood” (3.9 feet)
50% chance (2.6 feet)	“mild flood” (2.6 feet)

<sup>19</sup> The OCMP analysis used the upper end of the range of sea level rise projections for Newport, OR from *Sea-Level Rise for Coasts of California, Oregon, and Washington* (NRC, 2012).

<sup>20</sup> The 2018 NCA sea level rise scenario for Newport, OR that most closely aligns with the OCMP 2030 sea level rise scenario is the 83<sup>rd</sup> Percentile of the Intermediate scenario.

<sup>21</sup> The 2018 NCA sea level rise scenario for Newport, OR that most closely aligns with the OCMP 2050 sea level rise scenario is the 83<sup>rd</sup> Percentile of the Intermediate scenario.

<sup>22</sup> The 2018 NCA sea level rise scenario for Newport, OR that most closely aligns with the OCMP 2100 sea level rise scenario is the 17<sup>th</sup> Percentile of the Intermediate-High scenario.

<sup>23</sup> The OCMP analysis used NOAA extreme water levels to calculate the 1% and 50% chance flood levels. Values in the table are averages across the values given in Appendix A of OCMP’s report for five estuaries in Lincoln County.

<sup>24</sup> Climate Central computed extreme water levels for South Beach water level station only to represent Lincoln County

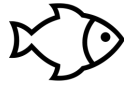
Using the OCMP combined sea level rise and flooding scenarios, we identify an analogous combined scenario from the Climate Central analysis and assign one to each OCMP combined scenario. With these analogs between the two sets of sea level and flooding scenarios, we can assign likelihoods of single and multi-year flood risks from Climate Central’s analysis to OCMP’s analysis (Table 16). For example, OCMP’s “2050 + 50%” scenario has a 64% likelihood of exceeding 4 feet above mean high tide in any single year by the 2050, but has a 100% likelihood of exceeding 4 feet at some point between 2016 and 2050 (Table 16). For OCMP’s most extreme scenario considered, “2100 + 1%”, the likelihood of exceeding 8 feet above mean high tide in any single year by 2100 is 9% where as the likelihood of exceeding 8 feet at some point between 2016 and 2100 is 31% (Table 16). However, by 2120, there is a 100% likelihood of exceeding 8 feet according to Climate Central’s extended analysis.

**Table 16 Analogs between the Oregon Coastal Management Program (OCMP) combined sea level rise (SLR) and flooding scenarios and the Climate Central combined SLR and flooding scenarios. The Climate Central Single Year and Flood Risk indicates the likelihood in any single year that water will exceed the floor of the given water level (e.g., the floor is determined by dropping the numbers after the decimal; the flood of 4.4 feet is 4 feet). The Multi-Year Flood Risk indicates the likelihood that water will exceed the floor of the given water level at some point during the given time period. The OCMP SLR + Flood Water Levels in Column 2 are averaged over the five Lincoln County estuaries analyzed by OCMP. Water levels in columns 2 and 3 are derived by combining the relevant sea level and flood scenarios from Table 15. (Source: Sepanik et al., 2017; Climate Central Surging Seas Risk Finder for Lincoln County, OR, <https://riskfinder.climatecentral.org>)**

OCMP SLR + Flood Scenarios	OCMP SLR + Flood Water Level	Climate Central Equivalent SLR + Flood Water Level	Climate Central Estimated Single Year Flood Risk	Climate Central Estimated Multi-Year Flood Risk
2030 + 50%	3.4 feet	3.4 feet	87%	100%
2030 + 1%	4.8 feet	4.7 feet	14%	76%
2050 + 50%	4.2 feet	4.1 feet	64%	100%
2050 + 1%	5.6 feet	5.4 feet	5%	33%
2100 + 50%	7.3 feet	7.2 feet	79%	100%
2100 + 1%	8.7 feet	8.6 feet	9%	31%

Table 17 summarizes the assets exposed to OCMP’s “2050 + 50%” and “2100 + 1%” sea level and flooding scenarios for the five estuaries analyzed in Lincoln County. Under the “2050 + 50%” scenario, which is virtually certain to occur at least once by 2050, total exposed assets in Lincoln County include: 9.1 miles of state, county, and local roads, one airport, half a mile of railway, one municipal drinking water source, one potential contaminant source, and 585 buildings (Table 17). Under the “2100 + 1%” scenario, which has a 31% likelihood of occurring at least once by 2100 and is virtually certain to occur at least once by 2120, total exposed assets in Lincoln County are much more numerous, including: 56.4 miles of state, county, and local roads, one airport, 9.1 miles of railway, six critical facilities, one municipal drinking water source, two wastewater treatment plants, two potential contaminant source, and 2715 buildings (Table 17).





## Ocean Temperature & Chemistry

As a result of increasing human-caused emissions of carbon dioxide (CO<sub>2</sub>) in the atmosphere, the world's ocean is warming, acidifying, and deoxygenating. These changes are leading to alterations in marine ecosystems affecting coastal communities across the globe (Pershing *et al.*, 2018).

Warming is the most obvious and well-documented impact of climate change on the ocean. Ocean surface waters have warmed on average  $1.3^{\circ} \pm 0.1^{\circ}\text{F}$  ( $0.7^{\circ} \pm 0.08^{\circ}\text{C}$ ) per century globally between 1900 and 2016, and more than 90% of the extra heat linked to carbon emissions is contained in the ocean.<sup>25</sup> The coastal waters off the Northwest US have warmed at a rate of  $1.15^{\circ} \pm 0.54^{\circ}\text{F}$  ( $0.64^{\circ} \pm 0.30^{\circ}\text{C}$ ) per century during the same period (Jewett and Romanou, 2017).

The world's ocean have absorbed 29% of all CO<sub>2</sub> emitted to the atmosphere since the beginning of the Industrial Revolution leading to a fundamental shift in ocean chemistry (Jewett and Romanou, 2017). When CO<sub>2</sub> dissolves in seawater, it changes three aspects of ocean chemistry [collectively referred to as "ocean acidification" (OA)]. First, it increases dissolved CO<sub>2</sub> and bicarbonate ions, which are used by algae and plants as the fuel for photosynthesis, potentially benefiting many of these species. Second, it increases the concentration of hydrogen ions, acidifying the water. Acidity is measured with the pH scale, with lower values indicating more acidic conditions. Third, it reduces the concentration of carbonate ions. Carbonate is a critical component of calcium carbonate, which is used by many marine organisms to form their shells or skeletons.<sup>26</sup>

Increased CO<sub>2</sub> levels in the atmosphere are also causing a decline in ocean oxygen concentrations. Deoxygenation is linked to ocean warming through the direct influence of temperature on oxygen solubility (warm water holds less oxygen). Warming of the ocean surface creates an enhanced vertical density contrast, which reduces the transfer of oxygen below the surface.<sup>27</sup>

These change in ocean temperature and chemistry are already transforming ocean ecosystems and the economy, coastal communities, cultures, and businesses that depend on them (Pershing *et al.*, 2018). Ecosystem disruption will intensify as ocean warming, acidification, deoxygenation, and other aspects of climate change increase. In the absence of significant reductions in carbon emissions, transformative impacts on ocean ecosystems cannot be avoided.<sup>28</sup> Some of the most vulnerable organisms include: clams, oysters, scallops, mussels, corals, starfish, sea urchins, sea butterflies, and shell-forming algae and amoebas. In addition, warming ocean waters and altered ocean chemistry is expected to promote shifts in marine species assemblages along the waters of the West Coast (Somero *et al.*, 2016). Ocean warming over the past half century has contributed to changes in biogeography and community composition of marine species, and altered interactions between species (Bindoff *et al.*, 2019). Fisheries catches since the 1970s have become increasingly dominated by warm-water species (Bindoff *et al.*, 2019). This is exemplified by

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<sup>25</sup> Verbatim from the Fourth National Climate Assessment, Volume 2, Chapter 9 (Pershing *et al.*, 2018)

<sup>26</sup> Verbatim from the Fourth National Climate Assessment, Volume 2, Chapter 9 (Pershing *et al.*, 2018)

<sup>27</sup> Verbatim from the Fourth National Climate Assessment, Volume 2, Chapter 9 (Pershing *et al.*, 2018)

<sup>28</sup> Verbatim from the Fourth National Climate Assessment, Volume 2, Chapter 9 (Pershing *et al.*, 2018)



recent marine heat wave events in which warm-water species, not normally present, were found along the West Coast and Alaska (Bond *et al.*, 2015; Peterson *et al.*, 2017).

Under a higher scenario [RCP8.5], a global increase in average sea surface temperature of  $4.9^\circ \pm 1.3^\circ\text{F}$  ( $2.7^\circ \pm 0.7^\circ\text{C}$ ) by 2100 is projected, with even higher changes in some U.S. coastal regions.<sup>29</sup> Northwest US coastal water are projected to warm by  $5.0^\circ \pm 1.1^\circ\text{F}$  ( $2.8^\circ \pm 0.6^\circ\text{C}$ ) by 2100 under RCP8.5 (Jewett and Romanou, 2017). The marine heat wave in the northeastern Pacific Ocean occurring between 2014 and 2016—coined “the Blob”—produced exceptionally warm waters that were more than  $3.6^\circ\text{F}$  above the normal range (Pershing *et al.*, 2018). This event triggered a coast-wide harmful algal bloom that affected commercial, recreation, and tribal subsistence fisheries off the Northwest coast (May *et al.*, 2018). This event provided a glimpse into the conditions and challenges likely to become more commonplace in the future under warmer ocean conditions.

Under a higher scenario [RCP8.5], open-ocean surface pH is projected to decline from 8.1 to 7.8 by 2100, representing a doubling in the ocean’s average acidity (Jewett and Romanou, 2017). Although it negatively affects some physiological processes, pH may not be the most useful number by which to monitor the biological effects of OA, particularly on calcifying organisms (Waldbusser *et al.*, 2015; Chan *et al.*, 2016). Furthermore, biologically-relevant thresholds of mineral carbonate saturation state are expected to be crossed much sooner than pH thresholds for some organisms (Waldbusser *et al.*, 2015). Even before it declines enough to corrode calcium carbonate shells, a lowered carbonate saturation state can “make it more difficult and energetically costly for larval bivalves to build shells” (Waldbusser *et al.*, 2015). Reductions in calcifying organisms at the base of the marine food web could have cascading effects on higher trophic marine fish, birds, mammals, and the people who rely on this resource. In a simple projection of ocean water saturation state changes, the mean annual surface seawater aragonite saturation state off the Oregon coast is projected to reach a threshold known to disrupt calcification and development in larval bivalves by the 2030s (Ekstrom *et al.*, 2015). However, the West Coast has already reached a threshold and negative impacts are already evident, such as dissolved shells in pteropod populations (Feely *et al.*, 2016) and impaired oyster hatchery operations (Barton *et al.*, 2012).<sup>30</sup>

Hypoxic—low oxygen—waters along the West Coast have expanded upward into shallower depths and are already affecting marine ecosystems (Somero *et al.*, 2016). Natural climate variability exercises strong control on dissolved oceanic oxygen levels, but detection of a deoxygenation trend beyond natural variability may be possible by the 2030s and 2040s in the north Pacific Ocean and along the US West Coast according to earth system modeling results (Long *et al.*, 2016).<sup>31</sup> Declines in ocean oxygen concentrations are projected to be about 3.5% on average under RCP8.5 by 2100, but much larger (17%) in the North Pacific Ocean (Jewett and Romanou, 2017).

On the West Coast, OA and hypoxia tend to co-occur as they are both driven by increased atmospheric CO<sub>2</sub> levels and local nutrient and organic carbon inputs and the combined

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<sup>29</sup> Verbatim from the Fourth National Climate Assessment, Volume 1, Chapter 13 (Jewett and Romanou, 2017)

<sup>30</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

<sup>31</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)

effects can be worse than the effects either of hypoxia or acidification independently (Chan *et al.*, 2016). The West Coast of North America is one of the first places in the world to experience severe environmental, ecological, and economic consequences of OA and hypoxia largely due to the naturally occurring CO<sub>2</sub>-enriched, low-oxygen deep water that wells up along the continental shelf of the West Coast (Chan *et al.*, 2016). How the region manages these ongoing changes will likely influence management choices of other coastal regions of the world. OA is a global problem, and reducing global levels of CO<sub>2</sub> emissions will be the most effective strategy to lessen the effect of OA (Chan *et al.*, 2016). However, better management of local nutrient and organic matter inputs to the coastal environment can lessen exposure to OA where those local stressors are having impacts. Furthermore, managing ecosystems to increase resilience—the ability to withstand impacts—to OA represent an important path for local adaptation actions. Time is of the essence because delayed action will reduce management options in the future and more greatly diminish ecosystem services (Chan *et al.*, 2016).<sup>32</sup>

**Key Messages:**

⇒ Ocean warming, ocean acidification, and decreasing dissolved oxygen levels are leading to alterations in marine ecosystems affecting coastal communities. The chemistry of the waters off the Oregon coast has already reached a threshold harmful to calcifying organisms and negative impacts are already evident. Reductions in calcifying organisms at the base of the marine food web could have cascading effects on higher trophic marine fish, birds, mammals, and the people who rely on this resource. In addition, warming ocean waters have altered marine species composition with greater prevalence of warm-water species expected during marine heat waves.

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<sup>32</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017)



## Loss of Coastal Wetland Ecosystems

Oregon's coastal wetlands play key roles in major ecological processes and provide a number of essential ecosystem services such as providing habitat for fish, wildlife, and aquatic plants; serving as breeding and nursery grounds for rockfish, juvenile salmon, other fish, crustaceans, and mollusks; buffering wave damage during storms; and improving water quality (Oregon Department of Fish and Wildlife, (n.d.)). Climate change stands to affect Oregon coastal estuaries and tidal wetlands through rising sea levels, increases in coastal storms and wave height, warming air and water temperatures, changing precipitation patterns and freshwater runoff, saltwater intrusion, and ocean acidification, which can all act to exacerbate existing threats from human activities and invasive species (Oregon Department of Fish and Wildlife, (n.d.)).

Coastal wetlands may experience changes in biological, chemical, and physical processes as well as shifts in species and biodiversity loss as the climate changes (Oregon Department of Fish and Wildlife, (n.d.)). In addition, sea level rise is likely to alter the location and spatial extent of tidal wetlands. Some tidal wetlands may remain in place if the rate of accretion keeps pace with sea level rise, otherwise wetlands will need to migrate upslope if possible (Brophy *et al.*, 2017).

In a recent study that projected potential tidal wetland area under multiple sea level rise scenarios for 23 estuaries in Oregon, the general pattern across estuaries showed slight rises in potential tidal wetland areas for sea level rise scenarios up to 2.5 feet as tidal inundation spreads onto slightly higher land surfaces (Brophy *et al.*, 2017). However, starting at 4.7 feet of sea level rise, potential tidal wetland area declines sharply with a 21% loss and increases to 45% loss at 8.2 feet and 60% loss at 11.5 feet of sea level rise (Brophy *et al.*, 2017). Six estuaries in Lincoln County were included in the study: Salmon River, Siletz Bay, Yaquina Bay, Beaver Creek, Alsea Bay, Yachats River.

Salmon River, Siletz Bay, Beaver Creek, and Alsea Bay followed the general pattern of slight increases in potential tidal wetland area with up to 2.5 feet of sea level rise and sharper decreases with 4.7 feet of sea level rise and greater (Brophy *et al.*, 2017). These levels of sea level rise corresponds to the upper end of the projected range of sea level rise for 2050 and 2100, respectively, for Newport, Oregon provided by the West Coast Sea Level Rise study (National Research Council, 2012). The 2.5 feet sea level rise scenario is analogous to the relative sea level rise projections in Table 12 for the Intermediate Scenario by the 2080s, the Intermediate-High Scenario by the 2060s, the High Scenario by the 2050s, and the Extreme Scenario by the 2040s to 2050s. The 4.7 feet sea level rise scenario is analogous to the relative sea level rise projections in Table 12 for the Intermediate-High Scenario by the 2090s, the High Scenario by the 2070s to 2080s, and the Extreme Scenario by the 2060s to 2070s. Figure 18 through Figure 21 show the potential future extent of tidal wetlands and areas likely to be lost with sea level rise of 4.7 feet for Salmon River, Beaver Creek, and Alsea Bay estuaries.

The Yaquina Bay Estuary, with one of the most confined river valleys, is projected to lose potential tidal wetland area with greater losses as sea level increases (Brophy *et al.*, 2017). Figure 22 shows the potential future extent of tidal wetlands and areas likely to be lost with sea level rise of 4.7 feet for Yaquina Bay Estuary. On the other hand, the Yachats River Estuary is projected to gain potential tidal wetland area with greater gains as sea level

increases, although the absolute area of future wetland area is relatively small (Brophy *et al.*, 2017). Figure 23 shows the potential future extent of tidal wetlands and areas likely to be lost with sea level rise of 4.7 feet for Yachats River Estuary.

Potential future tidal wetlands and mudflats/open water at 4.7 ft SLR, versus areas currently within tidal wetland elevation range (see legend for details)

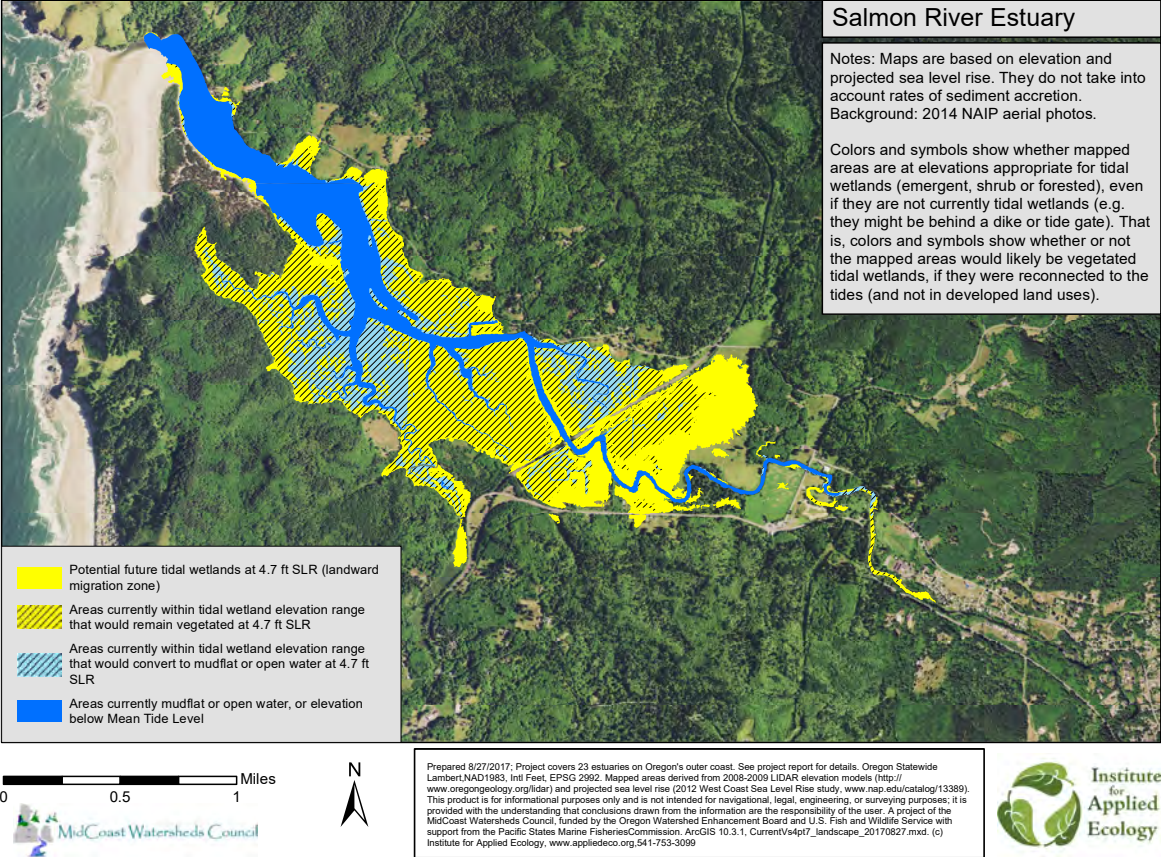


Figure 18 Potential tidal wetlands and mudflats/open water at 4.7 feet sea level rise, versus areas currently within tidal wetland elevation range for the Salmon River Estuary. Source: Brophy *et al.*, 2017.

Potential future tidal wetlands and mudflats/open water at 4.7 ft SLR, versus areas currently within tidal wetland elevation range (see legend for details)

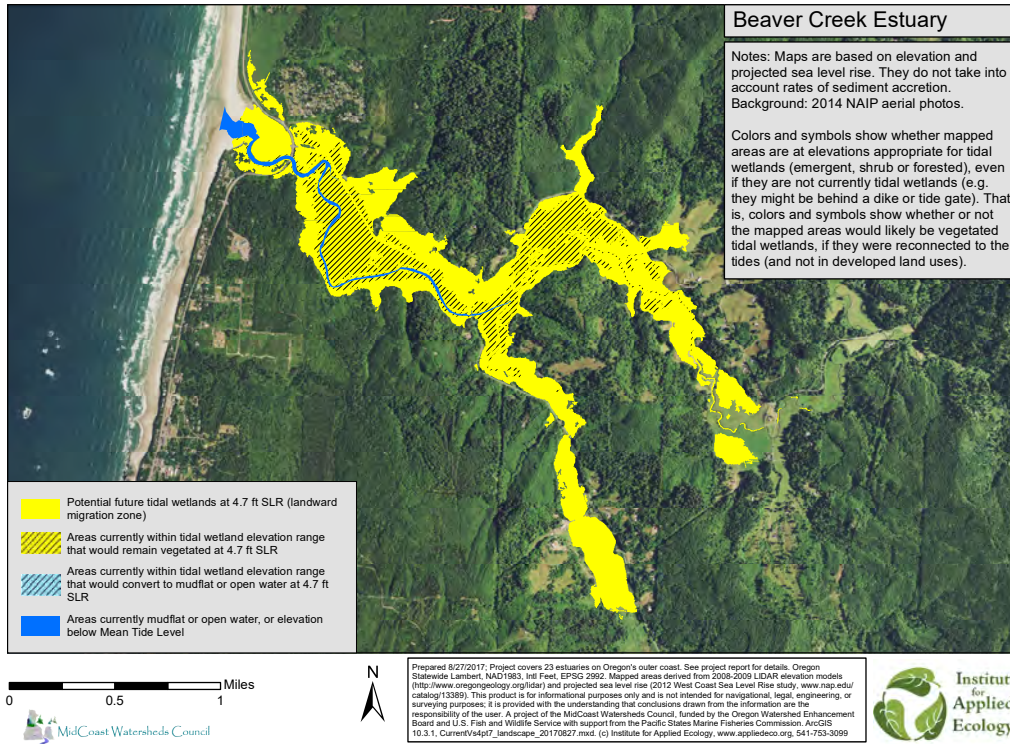


Figure 19 Potential tidal wetlands and mudflats/open water at 4.7 feet sea level rise, versus areas currently within tidal wetland elevation range for the Beaver Creek Estuary. Source: Brophy et al., 2017.

Potential future tidal wetlands and mudflats/open water at 4.7 ft SLR, versus areas currently within tidal wetland elevation range (see legend for details)

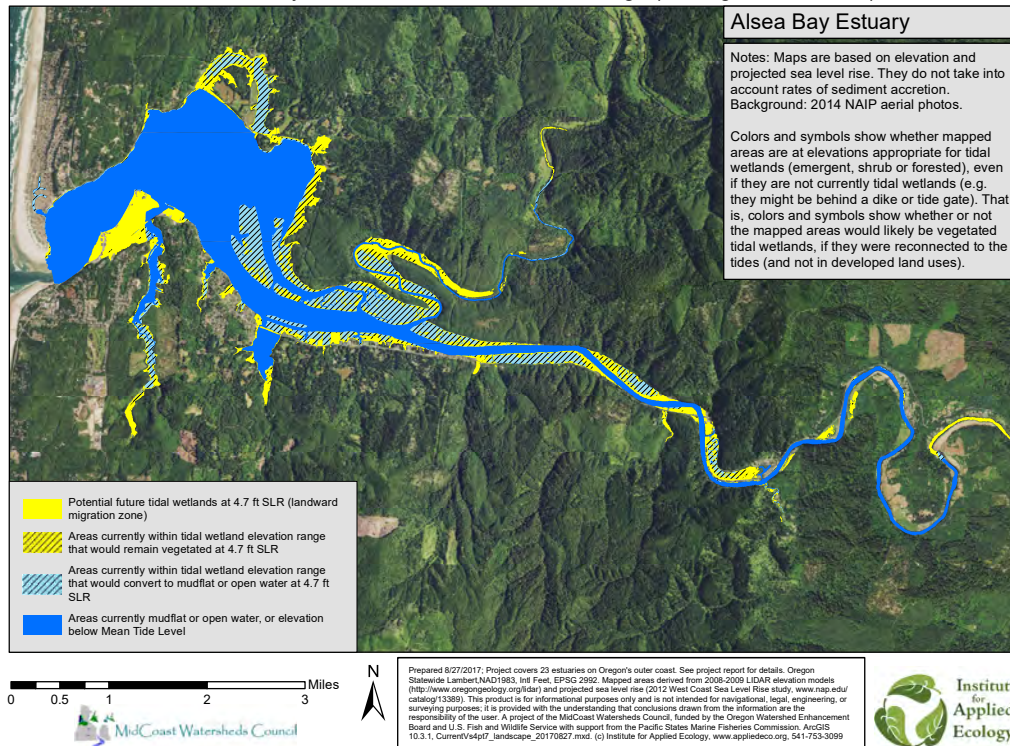


Figure 20 Potential tidal wetlands and mudflats/open water at 4.7 feet sea level rise, versus areas currently within tidal wetland elevation range for the Alsea Bay Estuary. Source: Brophy et al., 2017.

Potential future tidal wetlands and mudflats/open water at 4.7 ft SLR, versus areas currently within tidal wetland elevation range (see legend for details)

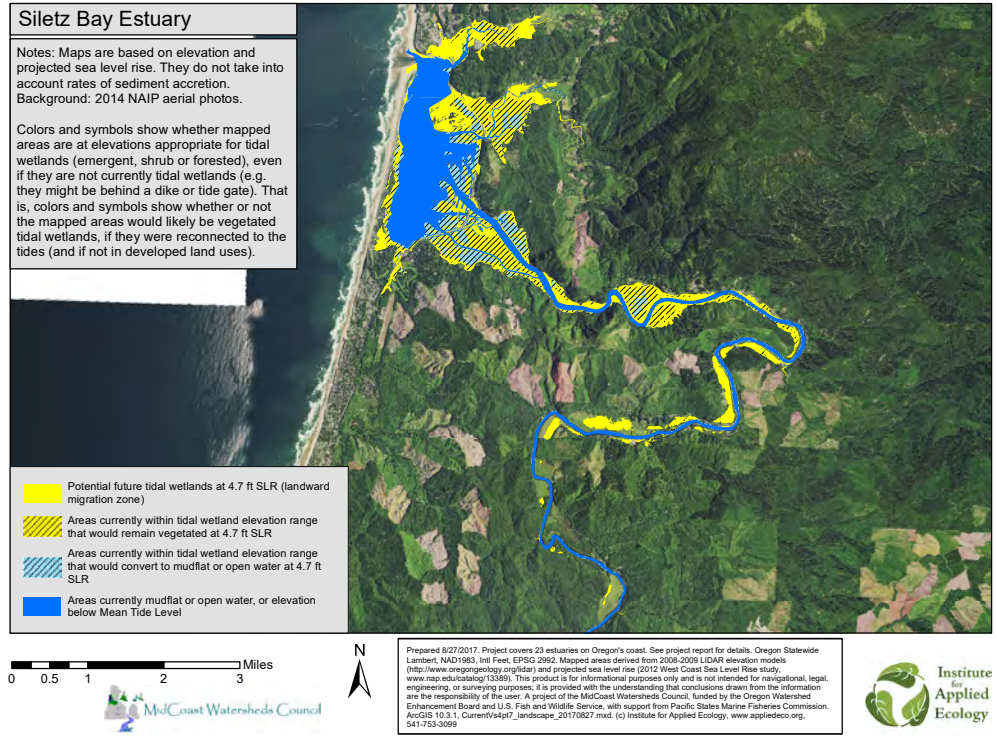


Figure 21 Potential tidal wetlands and mudflats/open water at 4.7 feet sea level rise, versus areas currently within tidal wetland elevation range for Siletz Bay Estuary. Source: Brophy et al., 2017.

Potential future tidal wetlands and mudflats/open water at 4.7 ft SLR, versus areas currently within tidal wetland elevation range (see legend for details)

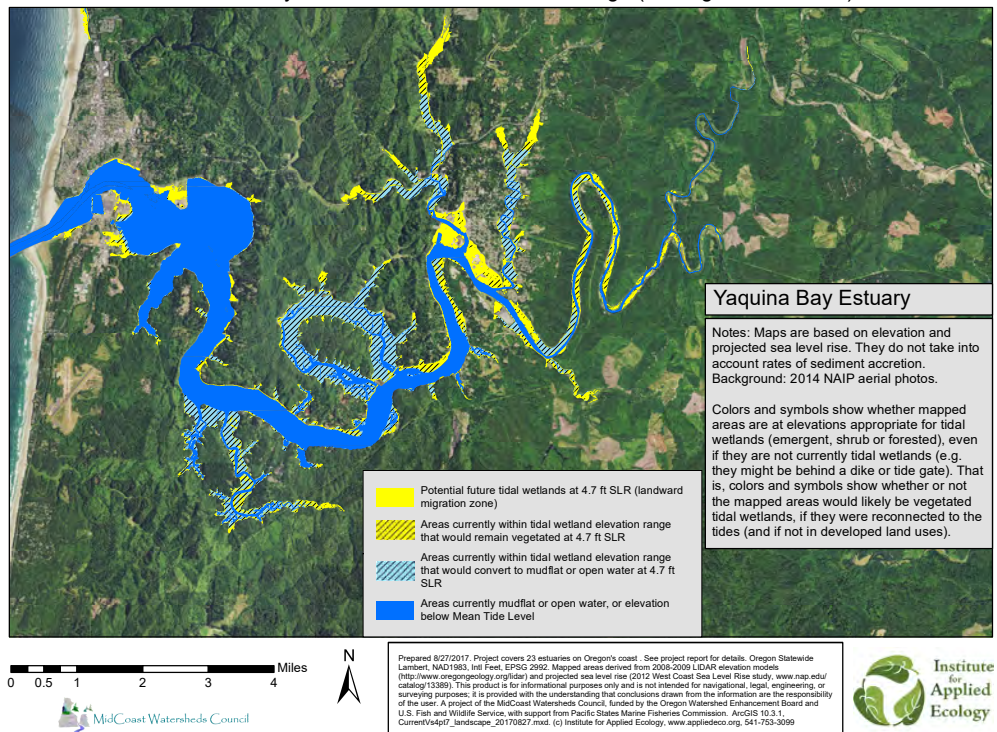


Figure 22 Potential tidal wetlands and mudflats/open water at 4.7 feet sea level rise, versus areas currently within tidal wetland elevation range for Yaquina Bay Estuary. Source: Brophy et al., 2017.

Potential future tidal wetlands and mudflats/open water at 4.7 ft SLR, versus areas currently within tidal wetland elevation range (see legend for details)

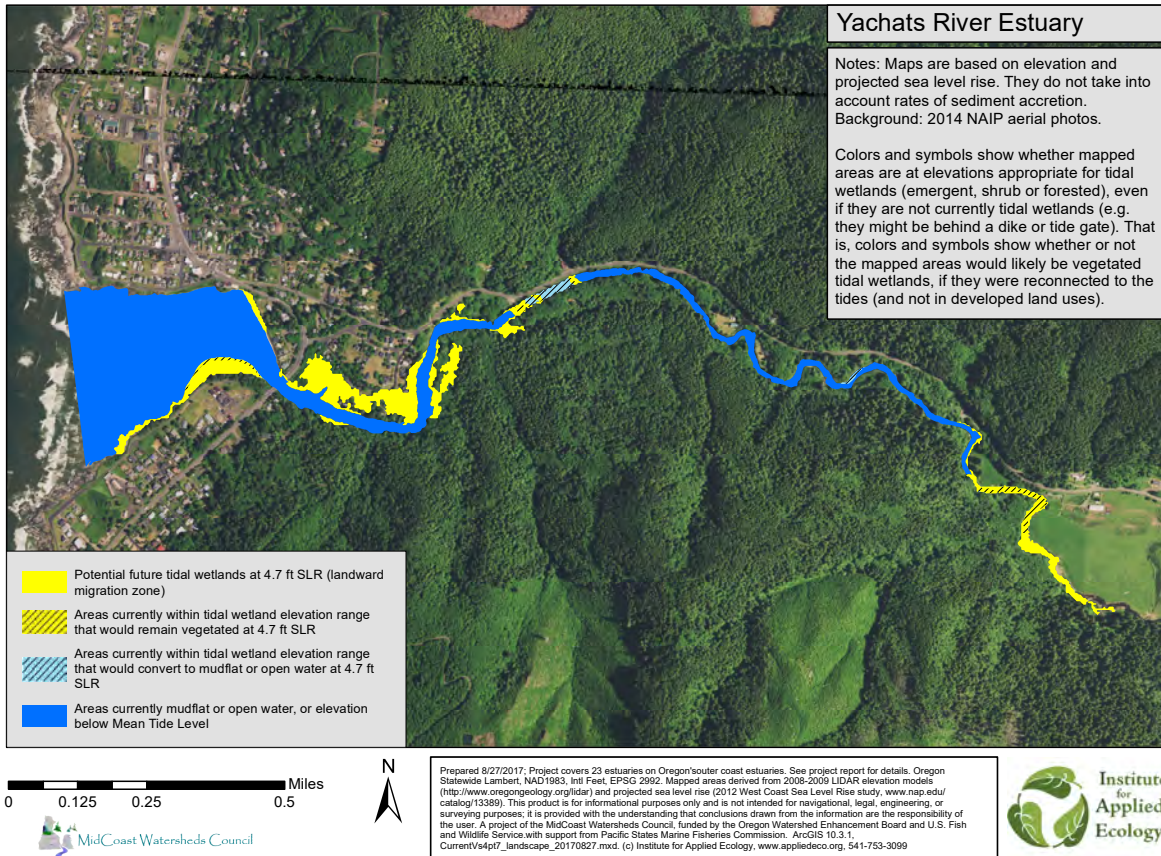


Figure 23 Potential tidal wetlands and mudflats/open water at 4.7 feet sea level rise, versus areas currently within tidal wetland elevation range for Yachats River Estuary. Source: Brophy et al., 2017

**Key Messages:**

- ⇒ Coastal wetland ecosystems are sensitive to rising sea levels, increases in coastal storms and wave height, warming air and water temperatures, changing precipitation patterns and freshwater runoff, saltwater intrusion, and ocean acidification, which can lead to changes in biological, chemical, and physical processes; shifts in species and biodiversity loss; and altered location and spatial extent of tidal wetlands.
- ⇒ Salmon River, Siletz Bay, Beaver Creek, and Alsea Bay estuaries are projected to experience modest increases (sharp decreases) in potential tidal wetland area under lower (higher) sea level rise projections. Yaquina Bay Estuary is projected to sustain continuous losses in potential tidal wetland area as sea level rises where as Yachats River Estuary is projected to gain potential tidal wetland area as sea level rises.



Climate change has the potential to alter surface winds through changes in the large-scale free atmospheric circulation and storm systems, and through changes in the connection between the free atmosphere and the surface. West of the Cascade Mountains in the Pacific Northwest, changes in surface wind speeds tend to follow changes in upper atmosphere winds associated with extratropical cyclones (Salathé *et al.*, 2015). Winter extratropical storm frequency in the northeast Pacific exhibited a positive, though statistically not significant, trend since 1950 (Vose *et al.*, 2014). However, there is a high degree of uncertainty in future projections of extratropical cyclone frequency (IPCC, 2013).

Future projections indicate a slight northward shift in the jet stream and extratropical cyclone activity, but there is as yet no consensus on whether or not extratropical storms (Vose *et al.*, 2014; Seiler and Zwiers, 2016; Chang, 2018) and associated extreme winds (Kumar *et al.*, 2015) will intensify or become more frequent along the Northwest coast under a warmer climate. Therefore, no descriptions of future changing conditions are included in this report.

**Key Messages:**

- ⇒ Limited research suggests very little, if any, change in the frequency and intensity of windstorms in the Pacific Northwest as a result of climate change.





## Increased Invasive Species Risk

Warming and more frequent drought will likely lead to a greater susceptibility among trees to insects and pathogens, a greater risk of exotic species establishment, more frequent and severe forest insect outbreaks (Halofsky and Peterson, 2016), and increased damage by a number of forest pathogens (Vose *et al.*, 2016).<sup>33</sup>

Certain tree diseases with known climate associations are also expected to increase in the future (Littell *et al.*, 2013). One such disease is Swiss needle cast (*Phaeocryptopus gaeumannii*), which affects Douglas-fir and can have significant economic impacts. In the Oregon Coast Range, warmer temperatures and increasing spring precipitation has contributed to a greater severity and distribution of Swiss needle cast (Littell *et al.*, 2013). The distribution of Swiss needle cast increased from about 205 square miles in 1996 to about 922 square miles of affected trees in 2015 in the Coast Range (Ritóková *et al.*, 2016). Swiss needle cast stunts Douglas-fir growth by 23% on average (Ritóková *et al.*, 2016). Swiss needle cast disease severity is expected to increase with warmer winters at higher elevation coastal sites and at inland sites where fungal growth is currently limited by cold winter temperatures (Lee *et al.*, 2013). The changing incidence of Swiss needle cast can affect mixed-species forest stands by allowing increased western hemlock (*Tsuga heterophylla*) growth in stands where severe Swiss needle cast affects Douglas-fir growth (Zhao *et al.*, 2014).<sup>34</sup>

Climate change—increasing temperature, altered precipitation patterns, increasing atmospheric carbon dioxide—may increase the likelihood of invasion by non-native plant species through increased photosynthesis of weedy plants, climate-facilitated range expansion, and establishment after climate-related disturbances (Kerns and Guo, 2012).

Crop pests and pathogens may continue to migrate poleward under global warming as has been observed globally for several types since the 1960s (Bebber *et al.*, 2013). Much remains to be learned about which pests and pathogens are most likely to affect certain crops as the climate changes, and about which management strategies will be most effective.<sup>35</sup>

### Key Messages:

- ⇒ Warming temperatures, altered precipitation patterns, and increasing atmospheric carbon dioxide levels increase the risk for invasive species establishment, insect and plant pests and diseases for forests and cropping systems. Invasive species populations are expected to expand in extent (northward in latitude, higher in elevation) with warmer temperatures.

<sup>33</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p. 49

<sup>34</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p. 51

<sup>35</sup> Verbatim from the Third Oregon Climate Assessment Report (Dalton *et al.*, 2017), p. 67

## Appendix

### Future Climate Projections Background

Read more about emissions scenarios, global climate models, and uncertainty in the Climate Science Special Report, Volume 1 of the Fourth National Climate Assessment (<https://science2017.globalchange.gov>).

Emissions Scenarios: <https://science2017.globalchange.gov/chapter/4#section-2>

Global Climate Models & Downscaling:  
<https://science2017.globalchange.gov/chapter/4#section-3>

Uncertainty: <https://science2017.globalchange.gov/chapter/4#section-4>

### Climate & Hydrological Data

Statistically downscaled GCM output from the Fifth phase of the Coupled Model Intercomparison Project (CMIP5) served as the basis for future projections of temperature, precipitation, and hydrology variables. The coarse resolution of GCMs output (100–300 km) was downscaled to a resolution of about 6 km using the Multivariate Adaptive Constructed Analogs (MACA) method, which has demonstrated skill in complex topographic terrain (Abatzoglou and Brown, 2012). The MACA approach utilizes a gridded training observation dataset to accomplish the downscaling by applying bias-corrections and spatial pattern matching of observed large-scale to small-scale statistical relationships. (For a detailed description of the MACA method see: <https://climate.northwestknowledge.net/MACA/MACAMethod.php>.)

This downscaled gridded meteorological data (i.e., MACA data) is used as the climate inputs to an integrated climate-hydrology-vegetation modeling project called Integrated Scenarios of the Future Northwest Environment (<https://climate.northwestknowledge.net/IntegratedScenarios/>). Snow dynamics were simulated using the Variable Infiltration Capacity hydrological model (VIC version 4.1.2.1; (Liang *et al.*, 1994) and updates) run on a 1/16<sup>th</sup> x 1/16<sup>th</sup> (6 km) grid.

Simulations of historical and future climate for the variables maximum temperature (*tasmax*), minimum temperature (*tasmin*), and precipitation (*pr*) are available at the daily time step from 1950 to 2099 for 20 GCMs and 2 RCPs (i.e., RCP4.5 and RCP8.5). Hydrological simulations of snow water equivalent (*SWE*) are only available for the 10 GCMs used as input to VIC. Table 18 lists all 20 CMIP5 GCMs and indicates the subset of 10 used for hydrological simulations. Data for all the models available was obtained for each variable from the Integrated Scenarios data archives in order to get the best uncertainty estimates.

**Table 18 The 20 CMIP5 GCMs used in this project. The subset of 10 CMIP5 GCMs used in the Integrated Scenarios: Hydrology dataset are noted with asterisks.**

<b>Model Name</b>	<b>Modeling Center</b>
BCC-CSM1-1 BCC-CSM1-1-M*	Beijing Climate Center, China Meteorological Administration
BNU-ESM	College of Global Change and Earth System Science, Beijing Normal University, China
CanESM2*	Canadian Centre for Climate Modeling and Analysis
CCSM4*	National Center for Atmospheric Research, USA
CNRM-CM5*	National Centre of Meteorological Research, France
CSIRO-Mk3-6-0*	Commonwealth Scientific and Industrial Research Organization/Queensland Climate Change Centre of Excellence, Australia
GFDL-ESM2G GFDL-ESM2M	NOAA Geophysical Fluid Dynamics Laboratory, USA
HadGEM2-CC* HadGEM2-ES*	Met Office Hadley Center, UK
INMCM4	Institute for Numerical Mathematics, Russia
IPSL-CM5A-LR IPSL-CM5A-MR* IPSL-CM5B-LR	Institut Pierre Simon Laplace, France
MIROC5* MIROC-ESM MIROC-ESM-CHEM	Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The University of Tokyo), and National Institute for Environmental Studies
MRI-CGCM3	Meteorological Research Institute, Japan
NorESM1-M*	Norwegian Climate Center, Norway

All simulated climate data and the streamflow data have been bias-corrected using quantile-mapping techniques. Only SWE is presented without bias correction. Quantile mapping adjusts simulated values by creating a one-to-one mapping between the cumulative probability distribution of simulated values and the cumulative probability distribution of observed values. In practice, both the simulated and observed values of a variable (e.g., daily streamflow) over the some historical time period are separately sorted and ranked and the values are assigned their respective probabilities of exceedence. The bias corrected value of a given simulated value is assigned the observed value that has the

same probability of exceedence as the simulated value. The historical bias in the simulations is assumed to stay constant into the future; therefore the same mapping relationship developed from the historical period was applied to the future scenarios. For MACA, a separate quantile mapping relationship was made for each non-overlapping 15-day window in the calendar year. For streamflow, a separate quantile mapping relationship was made for each calendar month.

Hydrology was simulated using the Variable Infiltration Capacity hydrological model (VIC; Liang et al. 1994) run on a 1/16<sup>th</sup> x 1/16<sup>th</sup> (6 km) grid. To generate daily streamflow estimates, runoff from VIC grid cells was then routed to selected locations along the stream network using a daily-time-step routing model. Where records of naturalized flow were available, the daily streamflow estimates were then bias-corrected so that their statistical distributions matched those of the naturalized streamflows.

The wildfire danger day metric was computed using the same MACA climate variables to compute the 100-hour fuel moisture content according to the equations in the National Fire Danger Rating System.

### Smoke Wave Data

Abstract from Liu et al. (2016):

Wildfire can impose a direct impact on human health under climate change. While the potential impacts of climate change on wildfires and resulting air pollution have been studied, it is not known who will be most affected by the growing threat of wildfires. Identifying communities that will be most affected will inform development of fire management strategies and disaster preparedness programs. We estimate levels of fine particulate matter (PM<sub>2.5</sub>) directly attributable to wildfires in 561 western US counties during fire seasons for the present-day (2004–2009) and future (2046–2051), using a fire prediction model and GEOS-Chem, a 3-D global chemical transport model. Future estimates are obtained under a scenario of moderately increasing greenhouse gases by mid-century. We create a new term “Smoke Wave,” defined as  $\geq 2$  consecutive days with high wildfire-specific PM<sub>2.5</sub>, to describe episodes of high air pollution from wildfires. We develop an interactive map to demonstrate the counties likely to suffer from future high wildfire pollution events. For 2004–2009, on days exceeding regulatory PM<sub>2.5</sub> standards, wildfires contributed an average of 71.3 % of total PM<sub>2.5</sub>. Under future climate change, we estimate that more than 82 million individuals will experience a 57 % and 31 % increase in the frequency and intensity, respectively, of Smoke Waves. Northern California, Western Oregon and the Great Plains are likely to suffer the highest exposure to wildfire smoke in the future. Results point to the potential health impacts of increasing wildfire activity on large numbers of people in a warming climate and the need to establish or modify US wildfire management and evacuation programs in high-risk regions. The study also adds to the growing literature arguing that extreme events in a changing climate could have significant consequences for human health.

Data can be accessed here: <https://khanotations.github.io/smoke-map/>

For the DLCD project, we looked at the variables “Total # of SW days in 6 yrs” and “Average SW Intensity”. The first variable tallies all the days within each time period in which the fine particulate matter exceeded the threshold defined as the 98<sup>th</sup> quantile of the

distribution of daily wildfire-specific PM<sub>2.5</sub> values in the modeled present-day years, on average across the study area. The second variable computes the average concentration of fine particulate matter across identified “smoke wave” days within each time period. Liu et al. (2016) used 15 GCMs from the Third Phase of the Coupled Model Intercomparison Project (CMIP3) under a medium emissions scenario (SRES-A1B). The data site only offers the multi-model mean value (not the range), which should be understood as the aggregate direction of projected change rather than the actual number expected.

### **Sea Level Rise & Coastal Flooding Data**

For the DLCDC project, we used the sea level rise projections for the United States (Sweet *et al.*, 2017b) developed for the 2018 National Climate Assessment (Sweet *et al.*, 2017a) as accessed from Climate Central Surging Seas Risk Finder ([riskfinder.climatecentral.org](http://riskfinder.climatecentral.org)). The amount of global mean sea level rise by 2100 (GMSL) defines each scenario. This tool gives corresponding local projections also provided by NOAA, which vary due to local factors such as rising or sinking land. Low, middle, and high sub-scenarios give a range of possible local outcomes (17th, 50th and 83rd percentiles) given each main scenario. Overall, lower emissions of heat-trapping pollution increase the chances for lower scenarios, and higher emissions point toward higher scenarios. The "Low" scenario assumes that sea level rise rates from the last 30 years continue unchanged, whereas the "Extreme" scenario assumes accelerated ice sheet loss in Antarctica.

Flood likelihoods and assets at risk were based on these sea level change scenarios and accessed directly from the Climate Central Surging Seas Risk Finder data visualization tools ([riskfinder.climatecentral.org](http://riskfinder.climatecentral.org)).

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