

City of Molalla Addendum to the Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan



Photo Credit: City of Molalla

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Prepared for
The City of Molalla



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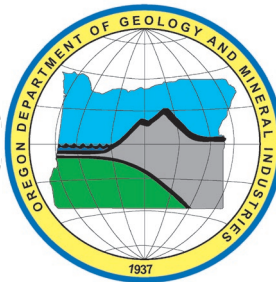


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Table of Contents

PURPOSE	1
NHMP PROCESS, PARTICIPATION AND ADOPTION	1
<i>Convener</i>	1
NHMP IMPLEMENTATION AND MAINTENANCE	2
<i>Implementation through Existing Programs</i>	3
CAPABILITY ASSESSMENT	3
<i>Existing Authorities</i>	4
<i>Policies and Programs</i>	5
<i>Personnel</i>	6
<i>Capital Projects</i>	7
<i>Mitigation Successes</i>	8
<i>Capital Resources</i>	8
<i>Findings</i>	8
MITIGATION PLAN MISSION	9
MITIGATION PLAN GOALS.....	9
MITIGATION STRATEGY	10
Action Items	11
RISK ASSESSMENT	15
<i>Hazard Analysis</i>	15
<i>Community Characteristics</i>	17
<i>Community Lifelines</i>	20
<i>Hazard Characteristics</i>	23
Drought	23
Earthquake (Cascadia Subduction Zone).....	24
Earthquake (Crustal).....	25
Flood.....	30
Landslide	32
Severe Weather	34
Extreme Heat.....	34
Windstorm	35
Winter Storm (Snow/Ice)	36
Volcanic Event	37
Wildfire.....	37
ATTACHMENT A: ACTION ITEM CHANGES.....	40
ATTACHMENT B: PUBLIC INVOLVEMENT SUMMARY	41

List of Tables

Table MO-1 Action Items.....	12
Table MO-2 Hazard Analysis Matrix – Molalla.....	16
Table MO-3 Community Characteristics.....	19
Table MO-4 Critical Facilities in Molalla	20
Table MO-5 Rapid Visual Survey Scores	27
Table MO-6 Expected damages and casualties for the CSZ fault and Portland Hills fault: earthquake, soil moisture, and event time scenarios.....	29
Table MO-7 Status of All Hazard Mitigation Actions in the Previous Plan	40

List of Figures

Figure MO-1: Understanding Risk	15
Figure MO-2 Cascadia Subduction Zone Expected Shaking.....	25
Figure MO-3 Active Crustal Faults, Epicenters (1971-2008), and Soft Soils	26
Figure MO-4 Special Flood Hazard Area	31
Figure MO-5 Landslide Susceptibility Exposure.....	34
Figure MO-6 Overall Wildfire Risk	38

Purpose

This is an update of the Molalla addendum to the Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP). 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 Molalla’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.

Molalla adopted their addendum to the Clackamas County Multi-jurisdictional NHMP on [DATE TBD, 2024]. FEMA Region X approved the Clackamas County NHMP on [DATE TBD, 2024] and the City’s addendum on [DATE TBD, 2024]. 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 [DATE TBD-1, 2024].

NHMP Process, Participation and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 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 Oregon Office of Emergency Management (OEM), Clackamas County, and Molalla to update their NHMP.

The Clackamas County NHMP, and Molalla addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. The Molalla HMAAC guided the process of developing the NHMP.

Convener

The Molalla City Manager or designee serves as the NHMP addendum convener. The convener of the NHMP will take the lead in implementing, maintaining, and updating the addendum to the Clackamas County NHMP in collaboration with the designated convener of the Clackamas County NHMP (Clackamas County Resilience Coordinator).

Representatives from the City of Molalla HMAC met formally and informally, to discuss updates to their addendum (Updated Appendix). The HMAC reviewed and revised the City's addendum, 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 Clackamas County Resilience Coordinator, and the OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include a revision of the City's risk assessment and hazard identification sections, NHMP mission and goals, action items, and community profile.

The Molalla HMAC was comprised of the following representatives:

City of Molalla:

- Convener, City Manager, Dan Huff
- PW Operations Manager, Andy Peters
- PW Maintenance Section Manager, Adam Shultz
- Police Lieutenant, Bobby Call
- Police Chief, Chris Long
- Waste Water Treatment Manager, Seth Kelly
- Water Treatment Manager, Katie Niece
- Assistant City Manager, Mac Corthell
- Healthy Sustainable Communities, Jon Legarza (Consultant)

Molalla Fire District:

- Chief, Vince Stafford
- Fire Lieutenant, Mike Everhart
- Fire Lieutenant, Mike Penunuri

Molalla River School District:

- Superintendent, Tony Mann
- Finance Director, Keith McClung

Clackamas County Emergency Management:

- Daniel Nibouar
- Molly Caggiano

Molalla Buckeroo Association:

- Board Chair, Tim Anderson

South Clackamas Transit District:

Executive Director, Mike Strauch

The HMAC served as the local review body for the NHMP update.

NHMP Implementation and Maintenance

The City Council will be responsible for adopting the Molalla addendum to the Clackamas County NHMP. This addendum designates a HMAC 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 HMAC will convene after re-adoption of the Molalla NHMP addendum on an annual schedule. The County is meeting on a semi-annual basis and will

provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The convener will serve as the conveners and will be responsible for assembling the HMAC. The HMAC 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 HMAC 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;
- Evaluating effectiveness of the NHMP at achieving its purpose and goals (use Table 26, Volume I, Section 4, as one tool to help measure effectiveness); and
- Documenting successes and lessons learned during the year.

The HMAC will be responsible for the following activities described in detail in Volume I, Section 4:

The jurisdiction will utilize the same implementation and maintenance process identified in Volume I, Section 4.

The jurisdiction will provide continued public participation during the plan maintenance process through periodic presentations to elected officials, public meetings, postings on social media, and/or through interactive content on the jurisdiction's website (for more information see Volume I, Section 4).

The jurisdiction will utilize the same action item prioritization process as the County (for more information see Volume I, Section 4 and Volume III, Appendix E).

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 Clackamas 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 city. Plans and policies already in existence have support from residents, businesses, and policy makers. Where possible, Molalla 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.

Capability Assessment

The Capability Assessment identifies and describes the ability of the City of Molalla to implement the mitigation strategy and associated action items. Capabilities can be evaluated through an examination of broad categories, including: existing authorities, policies, programs, funding, and resources.

Existing Authorities

Hazard mitigation can be executed at a local scale through three (3) methods: integrating hazard mitigation actions into other local planning documents (i.e., plan integration), adopting building codes that account for best practices in structural hardening, and codifying land use regulations and zoning designations that prescribe mitigation into development requirements. The extent to which a municipality or multi-jurisdictional effort leverages these approaches is an indicator of that community's capabilities.

Comprehensive Plan

Oregon's Statewide Planning Goal 7 requires comprehensive planning within every jurisdiction that is designed to reduce risks to people and property from natural hazards.

Molalla addresses Statewide Planning Goal 7 Natural Hazards as part of their Comprehensive Plan Element, Natural Hazards. This plan was adopted in 2014. It identifies three potential natural hazards – flooding associated with the Molalla River, slope hazards, and earthquakes, associated with weak foundation soils. The Natural Hazard Policies recognize the adoption of the joint Molalla/Clackamas County Hazard Mitigation Plan. Hazard assessments and mapping from the NHMP are used to help determine the suitability of a location for development. Policy #5 states that “the City shall continue to work cooperatively with Clackamas County to implement that plan.”

Planned updates to the jurisdiction's Goal 7 element or its broader comprehensive plan will reflect the data and findings within this NHMP and integrate analyses of future climate and natural hazard impacts into the community's long-range plans.

Land Use Regulations

Existing land use policies that define zoning and address hazardous conditions provide another source of mitigation capability.

Title 13 – Public Services

The City of Molalla Municipal Code, Title 13-Public Services provides requirements for the protection of the City's storm drainage system by reducing illegal discharge and cross connections.

Title 17 – Development Code

The City of Molalla completed and adopted revisions to the City of Molalla Development Code on October 11, 2017. Code sections uphold water quality efforts, protect, and enhance significant wetlands and floodplains in the Molalla Natural Features Inventory (Water Resources Overlay, 17-2.4.030), and establish requirements for development on steep slopes and expansive soils. Subdivision regulations are also part of this code, which requires adequate drainage to reduce exposure to flood damage and improve water quality (17-4.3) and avoidance of natural hazards in master plan layout (17.4.8-040). Their flood prevention code section is based on the Oregon Model Flood Hazard Prevention code, which includes provisions addressing substantial improvement/substantial damage.

Title 21 – Additional Regulations

The City of Molalla Municipal Code, Title 21-Additional Regulations includes provisions for excavation, fills, grading, and erosion control.

The Community Development Department is composed of the Planning, Parks & Recreation, Public Works, Economic Development and Code Compliance. The Molalla Community Development Department is the oversight entity for all matters related to long range planning, development review, and code enforcement. It is responsible for the administration of state, county, and local land use policies and

regulations as they relate to the preservation and quality development of property lying within the city limits and urban growth boundary (UGB). The Planning Division is also responsible for administering and maintaining the Molalla Comprehensive Plan and Community Development Code. They work closely with the County and neighboring jurisdictions to ensure plans are aligned.

Structural Building Codes

The Oregon Legislature recently adopted updated building codes for both residential (2023 adoption) and commercial structures (2022) since the last update of this Plan. These building codes are based on the 2021 version of the International Building Code, International Fire Code, and International Existing Building Code.

The Molalla Community Development Department contracts with the Clackamas County Building Department to administer and enforce the 2022 Oregon Structural Specialty Code. The Molalla Fire District administers the 2022 Oregon Fire Code. As a result, both new residential and commercial structures will be required to build according to the latest seismic and wind hardening standards in addition to requiring fire resistant building materials for those structures constructed in proximity or within the WUI.

Public Works

The City of Molalla Public Works Division is part of the Community Development Department, and is composed of the Engineering Section, the Maintenance Section, the Water Section, and the Wastewater Section. They are responsible for surface water management, water treatment and delivery, wastewater collection and treatment, street maintenance, and public facilities maintenance. Much of their work is associated with the reduction of hazards to the community and the implementation of resilience measures.

2017 Molalla Standard Specifications for Public Works Construction

Public Works standards are part of the regulatory policies used to implement many resilience measures, including Erosion Prevention and Sediment Control (1.18.4), General Design Requirements (Stormwater (3.1.2), Water Quality Facility Design Standards (3.5.1), etc.

City Administration

The City Council of Molalla has the responsibility of developing and adopting the annual city budget. Integrating hazard mitigation goals and projects into the annual budget is key to implementing the plan. The City Council tries to broadly address resilience planning needs while it determines city and departmental priorities and looks for multiple-impact projects wherever possible. They also work with staff to apply for federal and state grant funding to pursue larger projects that are outside of general fund capacity.

Policies and Programs

This Plan directs Molalla and Clackamas County to explore integration into other planning documents and processes. Molalla has made significant progress in integrating the NHMP into its portfolio of planning processes and programs over the last five years.

Transportation System Plan (2018)

Goals include: minimize and/or mitigate the effects of transportation projects and systems on natural resources and systems; preserve and maintain the existing transportation system assets to extend their useful life; and address existing and potential future safety issues.

Wastewater Facility and Collection System Master Plan (2018)

This document updated the City's most recent Wastewater Facility Plan, adopted in 2000. It was necessary to satisfy conditions stipulated in a Mutual Agreement Order with the Oregon Department of Environmental Quality (DEQ) over violations of the City's NPDES permit. It quantifies existing loads, evaluates existing infrastructure, identifies deficiencies, and contains a comprehensive Capital Improvement Plan for the next twenty years.

Water Management, Conservation and Water System Master Plan (2021)

This Water Management, Conservation and Water System Master Plan (WMCWSMP) was compiled to provide guidance to address the City of Molalla's future water needs. This Plan summarizes the components of the existing water distribution system, analyzes local water demand patterns, evaluates the performance of the water system with respect to critical service standards, and identifies the improvements necessary to remedy system deficiencies and accommodate future growth. This Plan recommends specific projects to the water distribution system for inclusion in the City of Molalla's Capital Improvement Plan (CIP).

Capital Improvement Plan (2022-2027)

The Capital Improvement Plan (CIP) is the primary tool used by the City in determining the Capital Improvement Fund Budget Proposal. The 5-year CIP is created using the master planning documents from each system, staff knowledge of needs that have arisen since master plan adoption, and community input as provided by the City Council. The CIP is essentially a tool that the Council uses to provide staff with marching orders for Capital Improvements; it aids staff in planning, budgeting, and managing growth and development of the City's infrastructure systems in accordance with best practices and community need.¹

TMDL Plan (2022)

The City maintains a Total Maximum Daily Load (TMDL) Plan (updated in 2022). The Total Maximum Daily Load (TMDL) program is intended to comply with the Willamette Basin TMDL order and to meet pollutant load allocations for the Molalla-Pudding Subbasin. The goal of this Implementation Plan is to minimize and reduce temperature, bacteria, and mercury contributions to surface waters within Molalla. The NHMP actions are incorporated into this document as appropriate. Example projects include participation in regional stormwater outreach projects, staff training on pollution control, and street cleaning after major storm events.

Community Wildfire Protection Plan (2024)

The Clackamas County Community Wildfire Protection Plan (CWPP) will be incorporated into this Plan as a functioning annex and into the City's Capital Improvement Plan. The CWPP is expected to be adopted in early 2024.

Personnel

The following Molalla personnel have assignments related to natural hazard mitigation planning and implementation:

Emergency Management: City Manager

Public Information Officer: City Manager

Floodplain Manager: Community Development Director

¹ City of Molalla Staff Report, Resolution 2022-03 Adopting a 5-year Capital Improvement Plan (CIP), dated April 27, 2022.

Grant writing (for Public Works or emergency management): Community Development Director

Capital improvement planning: Community Development Director

Capital improvement execution: Engineering Section Manager

Molalla does not have any employees solely designated to Emergency Management or Mitigation. These personnel integrate hazards and resilience planning into their greater work programs to the best of their abilities. However, there is limited capacity to expand upon their capabilities or workloads.

Capital Projects

Molalla has implemented recommendations from the last NHMP into its capital improvement projects over the last 5 years, including:

The following mitigation-related or resilience projects have been completed since 2018²

- Transportation System Master Plan Update (2018)
- Recycled Water Reuse Plan Update (2018)
- Wastewater Facility and Collection System Master Plan Update (2018)
- WWTP O&M Manual Update (2019)
- Fenton Avenue Sewer Replacement (2019)
- Fenton Avenue Sewer Replacement (2020)
- Patrol Street Sewer Replacement (2020)
- WWTP New Headworks Screen (2020)
- Molalla Ave PS Sewer Replacement (2021)
- Sewer Line installation on S Leroy Ave (2022)
- City Hall Public Sewer Line Replacement (2022)
- Molalla Avenue Waterline Improvements (2018)
- WTP Security Fencing and Gate Improvements (2018)
- Faurie Avenue Waterline Replacement (2018)
- Fenton Avenue Waterline Replacement Ph 1 (2019)
- Fenton Avenue Waterline Replacement Ph 2 (2020)
- Patrol Street Waterline Replacement Ph 2 (2020)
- Trout Creek Monitoring Station (2020)
- WTP New 2MGD Filtration Unit (2021)
- WTP Sodium Hypochlorite and SCADA Upgrades (2021)
- Water Management, Conservation, and Water System Master Plan (2021)
- Comprehensive Leak Analysis (2021)
- Water Main Upsize at Cascade Center (2022)
- City Shops/Elementary School to WWTP Waterline Replacement (2022) Stormwater
- Molalla Avenue Stormwater Improvements (2018)
- Ross Street Stormwater Improvements (2018)
- 5 YR TMDL Implementation Plan (2018)
- City Shops Bioswale (2020)
- Creamery Creek Storm Culvert Improvement (2021)
- Mercury TMDL Implementation Plan (2022)
- Clark Park Improvements Phase 4 (2022)
- Public Works Shops (2020)
- City Hall Remodel – Phase 3 (2021)
- New Police Facility Land Acquisition (2021)

² City of Molalla 2022-2026 Capital Improvement Plan, adopted by Resolution 2022-03.

- City Hall Remodel – Phase 4 (2022)
- Civic Center Remodel – Phase 1 (2022)

Ongoing projects that enhance the City’s resilience include:

- Wastewater Treatment Plant Upgrade
- New Police Facility
- Undergrounding of all new utilities

Proposed projects that relate to hazard mitigation and resilience within the next five years include:

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Pump station improvements • New raw water intake • Tank replacement (2 million gallon reservoir) | <ul style="list-style-type: none"> • Stormwater Master Plan Update • Parks Master Plan Update • Seismic retrofit of 1.5 million gallon reservoir structure |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Mitigation Successes

The community has several examples of mitigation success including the following projects funded through FEMA [Hazard Mitigation Assistance](#) and the Oregon Infrastructure Finance Authority’s [Seismic Rehabilitation Grant Program](#)³.

FEMA Funded Mitigation Successes

- None identified

Seismic Rehabilitation Grant Program Mitigation Successes

- 2019: Clarkes Elementary School (\$2,498,235)
- 2017: Molalla Fire District Station 82 (\$1,189,967)

Capital Resources

Molalla maintains several capital resources that have important roles to play in the implementation of the natural hazard mitigation plan.

- Critical facilities with power generators for use during emergency blackouts: 3 lift stations, water treatment plant, wastewater treatment plant, City Hall
- Food pantries: Foothill Church, Molla River School District
- Fueling storage: 2,000 gallon diesel fueling storage bladder at Public Works Shop

Findings

Several important findings from this capability assessment informed the design of the Plan’s mitigation strategy and aided in prioritizing action items.

Staffing Limitations and Capacity

Molalla staff are assigned hazard mitigation responsibilities as a (small) part of their larger job responsibilities. Restricted capacity reduces the breadth of the programming the community can

³ 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.

undertake in any year. The city relies upon its relationships with the County and other cities within its region to expand its operations.

Reliance upon outside funding streams and local match requirements

Molalla operates on a limited budget with many conflicting priorities. This leaves few opportunities for using local financial resources to implement hazard mitigation work. They lean heavily upon state and federal grant funds as the primary means for securing mitigation funding. Hazard mitigation grants such as HMGP and BRIC require 10-25% local funding match, as well as extra staff capacity and expertise to navigate the application process and manage the funding.

Leveraging Partnerships with Public and Nonprofit Entities

Regional planning displayed in Community Wildfire Protection Planning process demonstrates the City's ability to effectively share information and identify priority needs.

Mitigation Plan Mission

The 2024 HMAC reviewed the previous NHMP Mission and Goals in comparison to the State NHMP Goals and determined that they would make necessary updates to include references to community lifelines and to advance equity and inclusion in hazard mitigation.

The NHMP mission states the purpose and defines the primary functions of 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 mission of the NHMP is to:

Enhance county resiliency and capacity to address natural hazards by promoting sound public policy and effective mitigation strategies designed to equitably reduce risk and impacts on community members, community lifelines, historic and cultural resources property, and ecological systems.

This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the county towards building a safer, more sustainable community.

Mitigation Plan Goals

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

Meetings with the HMAC, previous hazard event reports, and the previous NHMPs served as methods to obtain input and identify priorities in developing goals for reducing risk and preventing loss from natural hazards.

All the 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 Property

- Develop and implement mitigation and climate adaptation projects and policies that aid in protecting lives by making homes, businesses, community lifelines, and other property more resilient to natural hazards and impacts from climate change.
- Establish mitigation projects and policies that minimize losses and repetitive damages from recurring disasters while promoting insurance coverage for severe hazards.
- Improve hazard identification and risk assessment information to inform and provide recommendations for enhanced resilience in new development decisions and promote preventative measures for existing development in areas vulnerable to natural hazards.

Goal 2: Enhance Natural Systems

- Incorporate natural hazard mitigation planning and activities into watershed planning, natural resource management, natural systems enhancement, and land use planning to protect life, property, and ecological system.

Goal 3: Augment Emergency Services

- Strengthen emergency operations by enhancing communication, collaboration, and coordination of natural hazard mitigation activities and policies across agencies at all levels and regions of government, sovereign tribal nations, and the private sector.

Goal 4: Encourage Partnerships for Implementation

- Improve communication, coordination, and participation among and with public agencies, community members, community lifelines, and private sector organizations to prioritize and implement hazard mitigation activities and policies.
- Enhance efforts toward identifying and optimizing opportunities across state agencies, surrounding communities, and private entities for resource sharing, mutual aid, and funding sources/support.

Goal 5: Promote Public Awareness

- Build community resilience and awareness and reduce the effects of natural hazards and climate change through community-wide engagement, collaboration, resource-sharing, learning, leadership-building, and identifying mitigation project-related funding opportunities.

Goal 6: Advance Equity and Inclusion

- Mitigate the inequitable impacts of natural hazards by prioritizing the directing of resources and efforts to build resilience and engagement in the most vulnerable communities least able to prepare, respond, and recover.
- Strengthen efforts aimed at increasing engagement, outreach, and collaboration with community and cultural organizations and agencies that are dedicated to providing services and support to vulnerable and underserved communities.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

The City’s mitigation strategy (action items) was first developed during the 2009 NHMP planning process and revised during subsequent NHMP updates. During these processes, the HMAC assessed the City’s risk, identified potential issues, and developed a mitigation strategy (action items).

During the 2023 update process, the City re-evaluated their mitigation strategy (action items). During this process action items were updated, noting if the action is complete, not complete and whether the

actions were still relevant; any new action items were identified at this time (see Attachment B for more information on changes to action items).

Action Items

Table MO-1 documents the title of each action along with, the lead organization, partners, timeline, cost, and potential funding resources. The HMAC 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 with orange 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 HMAC in terms of implementation, the HMAC 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 changes to actions since the previous NHMP.

Table MO-1 Action Items

Action Item #	Statement	Impacted Hazard									Implementation and Maintenance			
		Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm	Lead	Timeline	Potential Funding Source	Estimated Cost
1	Develop and conduct public education and outreach, with a focus on wildfire, water system improvements, and critical redundant systems to support the community.	X	X	X	X	X	X	X	X	X	City Manager and Community Development Department	Short	Local Resources. DLCDC TA, FEMA HMA	Medium
2	Integrate the goals and action items from the City of Molalla NHMP into existing Capital Improvement Plan and programs.	X	X	X	X	X	X	X	X	City Manager and Community Development Department	Ongoing	Local Resources. DLCDC TA, FEMA HMA	Low	
3	Improve vegetation management throughout the city. Work with code enforcement to reduce the risk of wildfire and to improve the resiliency with the community around parks, trails, transportation corridors to ensure necessary protection from natural hazard events.	X		X	X			X	X	Code Enforcement	Short	Local Resources. DLCDC TA, FEMA HMA	High	
4	Identify and map evacuation routes for all hazards. Create update mapping system to be accessible for residents through mobile applications for hazard incidents.		X		X	X		X		GIS	Ongoing	Local Resources. DLCDC TA, FEMA HMA	Low	
5	Reduce hazardous fuels from vegetation in the city parks and trails to mitigate risk from drought and wildfires.	X						X		Community Development	Ongoing	Local, State, Federal Grants and BRIC	High	

Action Item #	Statement	Impacted Hazard									Implementation and Maintenance			
		Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm	Lead	Timeline	Potential Funding Source	Estimated Cost
6	Identify planning and capital funding for 2 MG Treated Water Tank (including Land Acquisition and installation of Water Storage Seismic valves on existing tank and new tank) per Water Master Plan. Estimated \$7 million project cost.	X	X					X			City Manager/ Community Development	Ongoing	Local, State and Federal Grants and BRIC	High
7	Conduct building assessments on all city facilities to identify seismic and landslide hazards and recommend capital improvements for facilities based on the ASTM. Ensure recommendations for structural and non-structural seismic retrofits are included in the capital improvement plan.		X			X					Community Development	Long	Local and State	Medium
8	Conduct infrastructure improvements to reduce flood risk from Bear Creek.				X						Community Development/ Public Works	Medium	Local Resources, FEMA HMA (FMA)	Medium
9	Install emergency generators to provide redundant power in five pump station locations Estimate at \$250,000 each for a total project cost of \$1,250,000.		X			X	X	X	X	X	Community Development/ Public Works	Ongoing	Local, State, Federal Grants and BRIC	High
10	Acquire emergency equipment to help with tree removal and snow removal following severe storms (snow, ice, wind, etc.). Estimate equipment cost of \$150,000.								X	X	Community Development/ Public Works	Ongoing	Local Resources, FEMA HMA (FMA)	High

Action Item #	Statement	Impacted Hazard									Implementation and Maintenance			
		Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm	Lead	Timeline	Potential Funding Source	Estimated Cost
11	Identify Capital Funding for permanent water intake. The existing city intake structure is “temporary” in nature and has become susceptible to low river flows due to changes in river hydrology over time. Water resiliency is critical to development of the city and mitigation of drought and extreme heat effects. Additionally, Molalla’s water supply has been the primary resource for fighting wildfires on BLM, National Forest, and Private Timber lands in and around the Molalla River Corridor.	X	X	X	X	X		X			City Manager/ Community Development	Short	Local Resources, FEMA TA, FEMA HMA	High
12	Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.							X		Community Development/ Public Works	Ongoing	Local Resources, FEMA HMA, CWDG	Low to High	
13	Install pressure reducing valves to increase system redundancy. The city has one main line that is stressed during periods of drought. Additional capacity is also needed for fire protection. Conservation of water is critical. Estimated \$1.5 million project cost.	X	X	X			X		X	Community Development/ Public Works	Medium	Local Resources, FEMA HMA	High	

Source: Molalla NHMP HMA, updated 2023

Cost: Low (less than \$50,000), Medium (\$50,000-\$100,000), High (more than \$100,000)

Timing: Ongoing (continuous), Short (1-2 years), Medium (3-5 years), Long (5 or more years)

Priority Actions: Identified with orange highlight

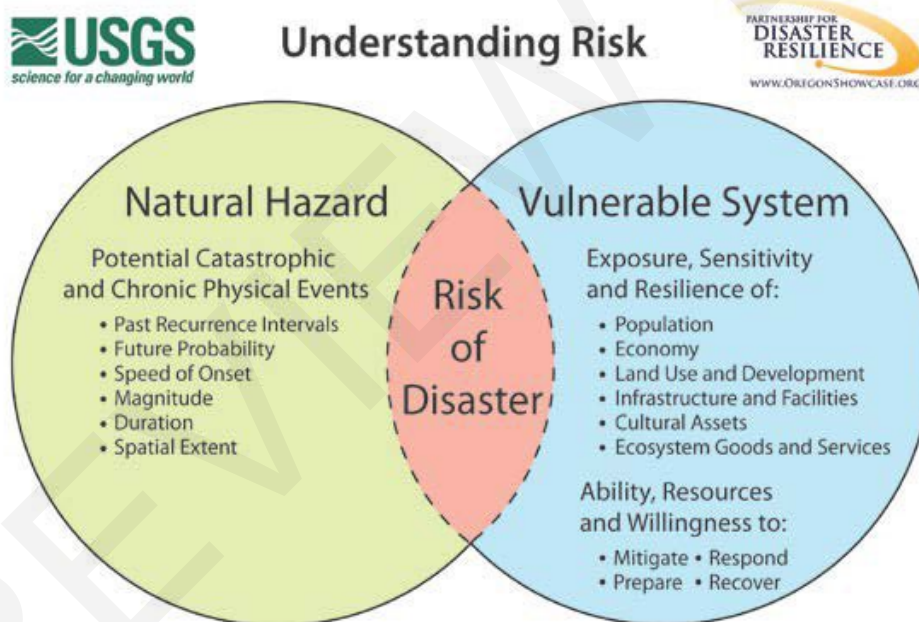
Risk Assessment

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 3 and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure MO-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure MO-1: Understanding Risk



Source: USGS- Oregon Partnership for Disaster Resilience Research Collaboration, 2006

Hazard Analysis

The Molalla HMA developed their hazard vulnerability assessment (HVA), using their previous HVA and the County’s HVA as a reference. Changes from their previous HVA and the County’s HVA were made where appropriate to reflect distinctions in vulnerability and risk from natural hazards unique to Molalla, which are discussed throughout this addendum.

Table MO-2 shows the HVA matrix for Molalla listing each hazard in order of rank from high to low. 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. Two catastrophic hazards (Cascadia Subduction Zone earthquake and Crustal earthquake) and two chronic hazards (wildfire, winter storm, and drought) rank as the top hazard threats to the City (Top Tier). Windstorm, extreme heat event, and flood comprise the next highest ranked hazards (Middle Tier), while volcanic event and landslide comprise the lowest ranked hazards (Bottom Tier).

Table MO-2 Hazard Analysis Matrix – Molalla

Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Rank	Hazard Tiers
Earthquake - Cascadia	2	45	100	35	182	1	<i>Top Tier</i>
Wildfire	6	40	80	56	182	2	
Earthquake - Crustal	6	50	100	21	177	3	
Winter Storm	10	35	70	49	164	4	
Drought	10	35	60	56	161	5	
Windstorm	10	35	50	35	130	6	<i>Middle Tier</i>
Extreme Heat Event	10	15	50	35	110	7	
Flood	6	25	40	35	106	8	
Volcanic Event	2	25	50	7	84	9	<i>Bottom Tier</i>
Landslide	16	20	30	14	80	10	

Source: Molalla HMA, 2023.

Community Characteristics

Table MO-3 and the following section provides 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.

The city has three drainage basins: Molalla River basin, Creamery Creek basin, and Bear Creek basin. Located at 371 feet above sea level, Molalla's climate is consistent with a Mediterranean climate zone, with warm summers and cool, wet winters. Molalla receives most of its rainfall between October and May, and averages 42 inches of rain, and around 6 inches of snow, per year.⁴

Population, Housing, and Income

Molalla has grown substantially since its incorporation in 1913 and has an area today of 2.26 square miles. It is in the south-central region of Clackamas County, located approximately 29 miles southeast of the City of Portland. The City is within the Molalla River watershed, with the Molalla River about a mile east of the UGB.⁵

Between 2016 and 2022 the City grew by 1,213 people (13%; as of 2022 the population is 10,298) and median household income increased by about 20%. Between 2022 and 2045 the population is forecast to grow by 13% to 11,618.

Most of the population is White/Caucasian (89%) and about 18% of the population is Hispanic or Latino. The poverty rate is 8% (7% of children under 18, 11% for people 65 and older), 5% do not have health insurance, and 50% of renters pay more than 30% of their household income on rent (28% for owners). About 16% of the population has a bachelor's degree or higher (6% do not have a high school degree). Approximately 14% of the population lives with a disability (41% of population 65 and older), and 35% are either below 15 (24%) or over 65 (11%) years of age. About 9% of the population are 65 or older and living alone and 17% are single parents.

The City includes a diversity of land uses but is zoned primarily residential. About 72% of housing units are single-family, 24% are multifamily, and 5% are mobile homes. Less than one-fifth of homes (17%) were built before 1970 and 61% were built after 1990. Newer homes are more likely to be built to current seismic, flood, wildfire, and other hazard standards. Almost two-thirds (64%) of housing units are owner occupied, 34% are renter occupied, 1% are seasonal homes, and 1% are vacant.

The City is pursuing an urban growth boundary expansion within the next five years that may expand development into areas that are at greater risk to landslide and other hazards.

Transportation and Infrastructure

Molalla is roughly 29 miles from Portland and is connected to surrounding communities by two state highways that run through the downtown area. Highway 211 runs east-west and connects Molalla to Interstate 5 and 99E. Highway 213 runs north-south through the City and connects it to both Silverton and Oregon City. Molalla's proximity to Portland and Salem has enabled residents to live in town and work elsewhere.

⁴ "[Monthly Average for Molalla, OR](#)" The Weather Channel Interactive, Inc. Retrieved March 10, 2018.

⁵ [Annual Water Quality Report](#) (2017). City of Molalla. Retrieved March 10, 2019.

Motor vehicles represent the dominant mode of travel through and within Molalla. Twenty-three percent (23%) of renters and 3% of owners do not have a vehicle. Most workers drive alone to work (78%); 9% carpool, 1% use public transit, 3% either walk or use a bicycle, and 9% work at home. The South Clackamas Transportation District (SCTD) is the bus service that provides public transit to the City. There are no port services available on Molalla River, a tributary of the Willamette River, but there are recreational areas along the river.

Economy

Molalla's proximity to major transportation routes and access to rail has made it a desirable place for commercial and industrial development. Historically Molalla's economy focused on forestry and farming, which is still has a major presence in the workforce. About 51% of the resident population 16 and over is in the labor force (5,083 people) and are employed in a variety of occupations including construction, extraction, and maintenance (18%), office and administrative (17%), professional (16%), management, business, and financial (12%), and production (9%) occupations.

Molalla has an economic advantage due to its location at the north end of the Willamette Valley and its proximity to Portland. A significant portion of the land available for industrial development in Clackamas County is in the Molalla area. There are new expansions in existing industries currently underway with available industrial land in the Industrial Parks.⁶

Most workers residing in the city (91%, 4,277 people) travel outside of the city for work primarily to Portland and surrounding areas.⁷ A significant population of people travel to the city for work, (80% of the workforce, 2,063 people) primarily from Portland and surrounding areas.⁸

⁶ Economic Development (2019). City of Molalla. <https://www.cityofmolalla.com/ed>

⁷ U.S. Census Bureau. LEHD Origin-Destination Employment Statistics (2002-2021). Longitudinal-Employer Household Dynamics Program, accessed on December 18, 2023 at <https://onthemap.ces.census.gov>.

⁸ Ibid.

Table MO-3 Community Characteristics

Population Characteristics		Population	Household Characteristics	
		Growth		
2016 Population Estimate	9,085		Housing Units	
2022 Population Estimate	10,298	13%	Single-Family (includes duplexes)	2,740 72%
2045 Population Forecast*	11,618	13%	Multi-Family	909 24%
Race			Mobile Homes (includes RV, Van, etc.)	178 5%
American Indian and Alaska Native		< 1%	Household Type	
Asian		1%	Family Household	2,456 66%
Black/ African American		< 1%	Married couple (w/ children)	1,167 31%
Native Hawaiian and Other Pacific Islander		0%	Single (w/ children)	628 17%
White		89%	Living Alone 65+	320 9%
Some Other Race		0%	Year Structure Built	
Two or More Races		1%	Pre-1970	640 17%
Hispanic or Latino/a (of any race)			1970-1989	853 22%
		18%	1990-2009	2,101 55%
Limited or No English Spoken			2010 or later	233 6%
	122	1%	Housing Tenure and Vacancy	
Vulnerable Age Groups			Owner-occupied	2,441 64%
Less than 5 Years	626	6%	Renter-occupied	1,296 34%
Less than 15 Years	2,400	24%	Seasonal	45 1%
65 Years and Older	1,144	11%	Vacant	45 1%
85 Years and Older	92	1%	Vehicles Available (Occupied Units)	
Age Dependency Ratio		0.54	No Vehicle (owner occupied)	69 3%
Disability Status (Percent age cohort)			Two+ vehicles (owner occupied)	1,992 82%
Total Disabled Population	1,363	14%	No Vehicle (renter occupied)	297 23%
Children (Under 18)	111	4%	Two+ vehicles (renter occupied)	613 47%
Working Age (18 to 64)	800	13%	Employment Characteristics	
Seniors (65 and older)	452	41%	Labor Force (Population 16+)	
Income Characteristics			In labor Force (% Total Population)	5,083 51%
Households by Income Category			Unemployed (% Labor Force)	325 6%
Less than \$15,000	199	5%	Occupation (Top 5) (Employed 16+)	
\$15,000-\$29,999	483	13%	Construction, Extraction, & Maint.	912 18%
\$30,000-\$44,999	291	8%	Office & Administrative	853 17%
\$45,000-\$59,999	439	12%	Professional	820 16%
\$60,000-\$74,999	460	12%	Management, Business, & Financial	610 12%
\$75,000-\$99,999	628	17%	Production	471 9%
\$100,000-\$199,999	1,123	30%	Health Insurance	
\$200,000 or more	114	3%	No Health Insurance	485 5%
Median Household Income			Public Health Insurance	3,075 31%
	\$74,718		Private Health Insurance	7,485 75%
Gini Index of Income Inequality			Transportation to Work (Workers 16+)	
	0.37		Drove Alone	3,927 78%
Poverty Rates (Percent age cohort)			Carpooled	457 9%
Total Population	815	8%	Public Transit	68 1%
Children (Under 18)	186	7%	Motorcycle	0 0%
Working Age (18 to 64)	509	8%	Bicycle/Walk	150 3%
Seniors (65 and older)	120	11%	Work at Home	440 9%
Housing Cost Burden (Cost > 30% of household income)				
Owners with a Mortgage	557	28%		
Owners without a Mortgage	51	11%		
Renters	654	50%		

Source: U.S. Census Bureau, 2016-2021 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2016 & 2022; Portland State University, Population Research Center, "Population Forecast Tables", (2023, [Preliminary](#)).

Note: ACS 5-year estimates represent average characteristics from 2012-2016 or 2017-2021. Sampling error may result in low reliability of data. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user. Refer to the original source documentation to better understand the data sources, results, methodologies, and limitations of each dataset presented.

Community Lifelines

This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of the city. Community Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Mitigating these facilities will increase the community’s resilience.

The community lifelines identified below were identified by the City of Molalla. This integrated network of assets, services, and capabilities are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function. Decisive intervention (e.g., rapid re-establishment or employment of contingency response solutions) is required to maintain/reestablish these facilities and services following a hazard incident.

Critical Facilities

Facilities that are critical and/or essential to government response, and recovery activities (i.e. life, safety, property, and environmental protection). These facilities include: 911 Centers, Emergency Operations Centers, Police, and Fire Stations, Public Works facilities, sewer, and water facilities, hospitals, bridges, roads, shelters, and more. Table MO-4 includes critical facilities identified in the DOGAMI Risk Report (2024) and assumed impact from individual hazards.

Table MO-4 Critical Facilities in Molalla

Critical Facilities by Community	Flood 1% Annual Chance	CSZ 9.0 Earthquake Moderate to Complete Damage	Canby-Molalla Fault Mw-6.8 Moderate to Complete Damage	Landslide High and Very High Susceptibility	Wildfire High or Moderate Risk
	Exposed	>50% Prob.	>50% Prob.	Exposed	Exposed
Far Horizons Academy	-	-	-	-	-
Molalla Elementary School	-	-	X	-	-
Molalla High School	-	-	X	-	-
Molalla Civic Center (EOC temporary)	-	-	tbd	-	-
Molalla Police Department & City Hall	-	-	X	-	-
Molalla Public Works	-	-	X	-	-
Molalla RFPD 73 - Station 382	-	-	X	-	-
Molalla River Middle School	-	X	X	-	-
Molalla Water Treatment Plant	-	tbd	tbd	-	X
Molalla Sewage Treatment Plant	-	X	X	-	-
Molalla Urgent Care	-	X	X	-	-

Source: DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon* (O-24-XX, September 2023 Draft), Table A-24.

Note: Police Facility to be constructed per local bond, estimated completion 2025.

Highlighted cells are tentative and to be confirmed by DOGAMI in their final risk report (expected April 2024)

Additional Critical Facilities not included in the DOGAMI Risk Report:

- Fleet Services
- Water Treatment Plant
- Hospitals**
- Providence Medical

Potential Shelter Sites

- Molalla Adult Community Center

Critical Infrastructure

Infrastructure that provides necessary services for emergency response include:

Arterials

*designates road maintained by others

- Highway 213*
- Highway 211*

Bridges

- Bridge over the Molalla River
- Feyer Park Bridge
- Milk Creek Bridge
- Mulino Bridge*
- Pudding River Bridge
- Wagon Wheel Park Bridge

Other Critical Infrastructure

- Communication Towers
- NW Natural Pipelines
- Power Substations
- Sewage Infrastructure
- Water Distribution/Drainage Infrastructure

Essential Facilities

Facilities that are essential to the continued delivery of key government services, and/or that may significantly impact the public's ability to recover from the emergency. These facilities may include: community gathering places, commercial centers, and other public facilities such as school fields.

Granges

- Molalla Grange

Churches

- Church of Christ of Latter-Day Saints
- Church of the Nazarene
- Country Church
- Foothills Community Church
- Grace Lutheran Church
- Molalla Assembly of God
- Molalla Christian Church
- Molalla Church of Christ
- Saint James Catholic Church
- Seventh-Day Adventist
- United Methodist Church

Food Providers

- Safeway
- Grocery Outlet

Other Essential Facilities

- High School Football Field
- Masonic Lodge
- Molalla Aquatic Center
- Molalla Communications Company
- Molalla Public Library
- Moose Lodge
- Safeway
- Skydive Oregon Airport

Environmental Facilities

Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic and functional ecosystem service for the community include: Bear Creek Byway, Billy Sheets Field, Bohlander

Field, Clark Park, High School Sports Complex, Ivor Davies Trail Park, Leonard Long Park, Rosse Posse Acres (Elk Farm), Sally Fox Park, and the Molalla BMX Track.

Vulnerable Populations

Vulnerable populations, including seniors, disabled citizens, women, and children, as well those people living in poverty, often experience the impacts of natural hazards and disasters more acutely. Populations that have special needs or require special consideration include:

Assisted Living Facilities

- Evergreen Court
- Molalla Manor
- Pheasant Pointe
- Twin Firs Mobile Home Park

Child Care Centers

- 24 Hours Child Care/Preschool
- Early Horizons Preschool Childcare, Inc.

Schools

- Molalla Elementary School
- Molalla High School
- Molalla River Middle School
- Rural Dell Elementary

Other Vulnerable Populations

- Cole Apartments (Spanish speaking)
- Molalla Adult Community Center
- Molalla Mobile Manor
- Plaza Los Robles (Spanish speaking)

Hazardous Materials

Facilities that, if damaged, could cause serious secondary impacts may also be considered “critical.” Hazardous materials sites are particularly vulnerable to earthquake, landslide, volcanic event, wildfire, and winter storm hazards. A hazardous material facility is one example of this type of critical facility. Those sites that store, manufacture, or use potentially hazardous materials include: Gas Stations, IXL Propane, IDMS, Molalla Aquatic Center, Molalla Wastewater Treatment Plant, Molalla Water Treatment Plant, and Pacer Propane.

Economic Assets/Population Centers

Economic assets include businesses that employ large numbers of people and provide an economic resource to the city of Happy Valley. If damaged, the loss of these economic assets could significantly affect economic stability, and prosperity. Population Centers usually are aligned with economic centers, and are a concern during evacuation/notification during a hazard event include:

Economic Centers

- Brentwood Corporation
- Bus Company – First Student
- Cascade Center(Grocery Outlet/Goodwill)
- Cash Ice
- Coors Tech
- Fountain Valley Dental
- International Forest Products Limited
- IXL Propane
- Molalla Buckaroo
- Molalla Dental Clinic
- Molalla Market Center
- Molalla Redi-Mix
- Molalla Square (Bi-Mart)
- Northwest Polymers
- Pacer Propane
- Safeway Shopping Center

Population Centers

- Bear Creek Apartments
- Bear Creek Subdivision
- Big Meadows Subdivision
- Colima Apartments
- Fir Crest Apartments
- Lexington Estates
- Molalla School District
- Rondel Court
- Schools
- Shel Mar Estates
- Stone Place Apartments
- Sunrise Acres
- Toliver Terrace
- Twin Meadows Subdivision

Cultural and Historic Assets

The cultural and historic heritage of a community is more than just tourist charm. For families that have lived in the city for generations and new resident alike, it is the unique places, stories, and annual events that makes the community an appealing place to live. The cultural and historic assets are both intangible benefits and obvious quality-of-life- enhancing amenities. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important.

An example of the types of properties that should be considered before, during, and after an event include the following properties identified on the National Register of Historic Places within Molalla:

- Horace and Julia Ann Von der Ahe House and Summer Kitchen
- Dibble House, 616 Molalla Avenue

Hazard Characteristics

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 the City refer to Volume I, Section 2 and the [Risk Assessment for Region 2, Northern Willamette Valley/Portland Metro, of the Oregon NHMP \(2020\)](#).

Drought

The HMAC determined that the City's probability for drought is **high** and that their vulnerability to drought is **moderate**. *The probability rating increased and the vulnerability rating did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of drought hazards, history, as well as the location, extent and probability of a potential event. Due to the climate of Clackamas County, past and present weather conditions have shown an increasing potential for drought.

The City of Molalla Public Works Department manages Molalla's water supply. Molalla houses one large water intake facility and water treatment plant, which provides water to the City of Molalla. The City draws its water supply from the Molalla River and serves approximately 10,335 residents.⁹ There are potential contamination sources within Molalla's drinking water protection area from agriculture, managed forest land, and other sources.

There is an action item to construct a second accessible water source for the City in case of contamination or drought.

⁹ Population Research Center, "Annual Population Estimates", 2023

Vulnerability Assessment

Due to insufficient data and resources, Molalla is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets section and Table MO-4.

Future Projections

According to the Oregon Climate Change Research Institute “Future Climate Projections, Clackamas County,”¹⁰ drought, as represented by low summer soil moisture, low spring snowpack, low summer runoff, and low summer precipitation, is projected to become more frequent in Clackamas County by the 2050s.

Increasingly frequent droughts will have economic and social impacts upon those who depend upon predictable growing periods (ranches, farms, vineyards, gardeners) as well as upon the price and availability of fresh vegetables. It may also stress local jurisdiction’s ability to provide water for irrigation or commercial and household use.

Earthquake (Cascadia Subduction Zone)

The HMAC determined that the City’s probability for a Cascadia Subduction Zone (CSZ) earthquake is **moderate** and that their vulnerability to a CSZ earthquake is **high**. *These ratings did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of earthquake hazards, history, as well as the location, extent, and probability of a potential event. Generally, an event that affects the County is likely to affect Molalla as well. The causes and characteristics of an earthquake event are appropriately described within Volume I, Section 2 as well as the location and extent of potential hazards. Previous occurrences are well documented within Volume I, Section 2 and the community impacts described by the County would generally be the same for Molalla as well.

Figure MO-2 displays relative shaking hazards from a Cascadia Subduction Zone earthquake event. As shown in the figure, most of the city is expected to experience very strong shaking (orange), while areas around the city will experience severe shaking (light red) (shown by the red northeast corner) in a CSZ event.

Within the Northern Willamette Valley/Portland Metro Region, three potential faults and/or zones can generate high-magnitude earthquakes. These include the Cascadia Subduction Zone, Gales Creek-Newberg-Mt Angel Structural Zone, Portland Hills Fault Zone, and the Canby-Molalla Fault Zone (discussed in the crustal earthquake section).

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year. Scientists have found evidence that 11 large, tsunami-producing earthquakes have occurred off the Pacific Northwest coast in the past 6,000 years. These earthquakes took place roughly between 300 and 5,400 years ago with an average occurrence interval of about 510 years. The most recent of these large earthquakes took place in approximately 1700 A.D.¹¹

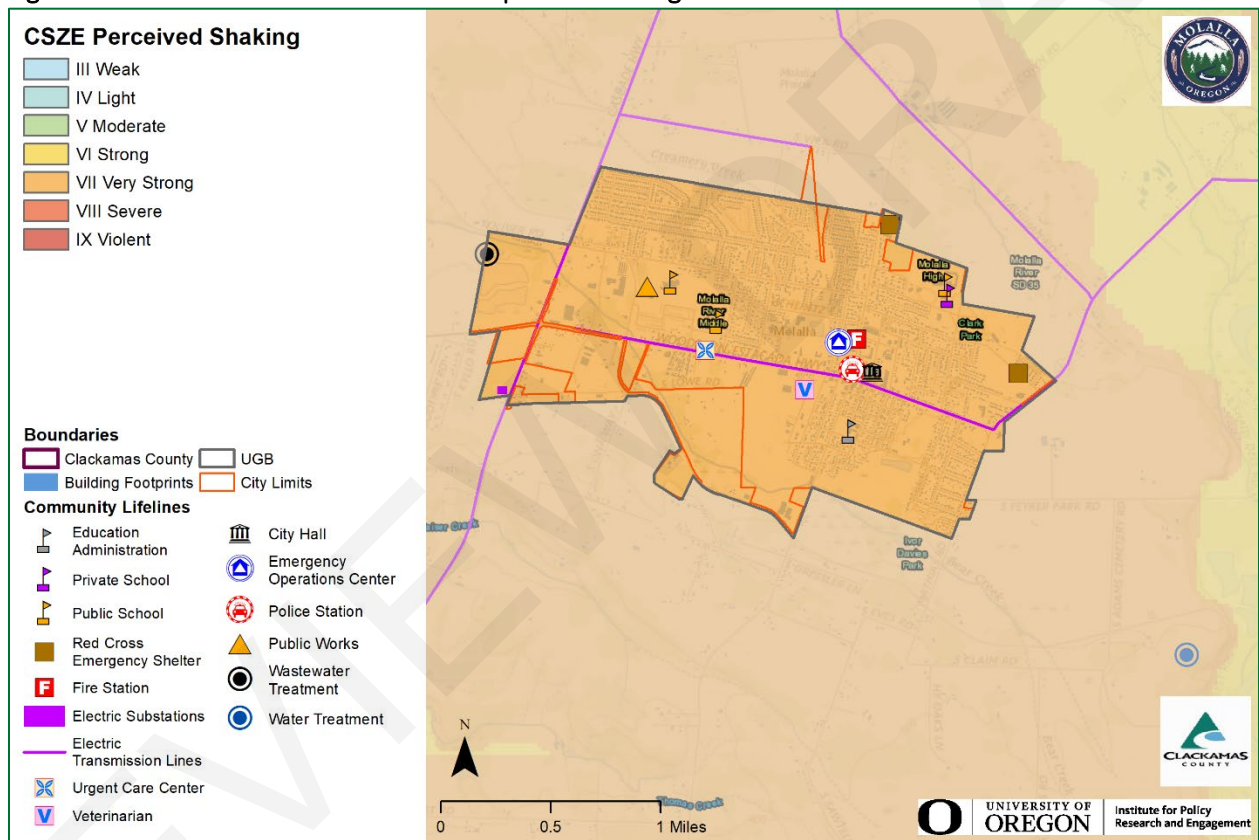
¹⁰ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

¹¹ The Cascadia Region Earthquake Workgroup, 2005. Cascadia Subduction Zone Earthquakes: A magnitude 9.0 earthquake scenario. <http://www.crew.org/PDFs/CREWSubductionZoneSmall.pdf>

The city'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 city a high-risk profile. Due to the expected pattern of damage resulting from a CSZ event, the Oregon Resilience Plan divides the State into four distinct zones and places the city predominately within the "Valley Zone" (Valley Zone, from the summit of the Coast Range to the summit of the Cascades). Within the Northwest Oregon region, damage and shaking is expected to be strong and widespread - an event will be disruptive to daily life and commerce and the main priority is expected to be restoring services to business and residents.

The City is not within the severe shaking area, though there is significant area around the City that have severe and very severe shaking if a large earthquake were to occur. These areas include Highway 211 and Highway 213, which could result in Molalla having access issues from emergency vehicles and other response efforts.

Figure MO-2 Cascadia Subduction Zone Expected Shaking



Source: Map created by Oregon Partnership for Disaster Resilience.

Data: Oregon Department of Geology and Mineral Industries. Preparedness Framework Implementation Team (IRIS v3).

Note: To view hazard detail click this [link](#) to access Oregon HazVu

Earthquake (Crustal)

The HMAC determined that the City's probability for a crustal earthquake is **low** and that their vulnerability to crustal earthquake is **high**. *These ratings did not change since the previous version of this NHMP.*

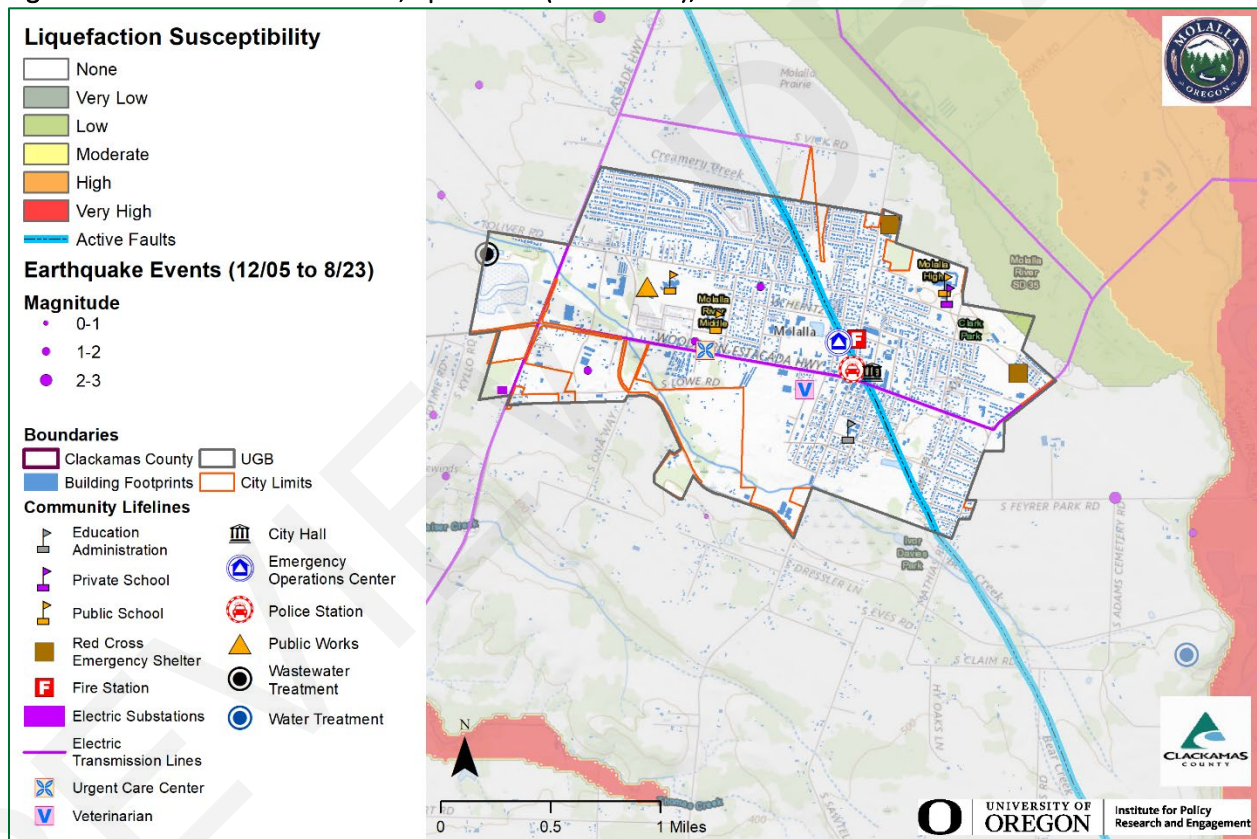
Volume I, Section 2 describes the causes and characteristics of earthquake hazards, history, as well as the location, extent, and probability of a potential event. Generally, an event that affects the County is likely to affect Molalla as well. Figure MO-3 shows a generalized geologic map of the Molalla area that includes

the areas for potential regional active faults, earthquake history (1971-2008), and soft soils (liquefaction) hazard. The figure shows the areas of greatest concern within the City limits as red and orange.

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 Canby-Molalla Fault runs through the center of the City and can generate high- magnitude earthquakes. The City is also 15 miles away from the Portland Hills Fault Zone (discussed in greater detail below). Historical records count over 56 earthquakes in the Portland-metro area. The more severe ones occurred in 1877, 1880, 1953 and 1962. The most recent severe earthquake was the March 25, 1993, Scotts Mills quake. It was a 5.6 magnitude quake with aftershocks continuing at least through April 8. In December 2017 a 4.0 tremor was felt in Molalla along the same epicenter as the 5.6 quake; this time, no damage occurred.

Figure MO-3 Active Crustal Faults, Epicenters (1971-2008), and Soft Soils



Source: Map created by Oregon Partnership for Disaster Resilience.

Data: Oregon Department of Geology and Mineral Industries. Preparedness Framework Implementation Team (IRIS v3).

Note: To view hazard detail click this [link](#) to access Oregon HazVu

Canby-Molalla Fault Zone

The Canby-Molalla Fault Zone is a series of NE-trending fault that vertically displace the Columbia River Basalt with discontinuous aeromagnetic anomalies that represent significant offset of Eocene basement and volcanic rocks. The fault zone extends for 31 miles from the vicinity of Tigard south through the towns of Canby and Molalla in northern Oregon.

Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years ago) sediment. The fault zone extends along the eastern margin of the Portland Hills for 25 miles and lies about 15 miles northeast of Molalla.

Vulnerability Assessment

In 2018 the Department of Geology and Mineral Industries (DOGAMI) completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults ([O-18-02](#)). Findings from that report are provided at the end of the crustal earthquakes hazard section.

Seismic 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 profile, approximately 36% 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 MO-5; each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI using their Rapid Visual Survey (RVS), zero (0) have a very high (100% chance) collapse potential and zero (0) have a high (greater than 10% chance) collapse potential.

For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets Section and Table MO-4.

Table MO-5 Rapid Visual Survey Scores

Facility	Site ID*	Level of Collapse Potential			
		Low (<1%)	Moderate (>1%)	High (>10%)	Very High (100%)
Schools					
Molalla Elementary (910 Toliver Rd)	Clac_sch32	X			
Molalla River Middle (318 Leroy Ave)	Clac_sch33	X			
Molalla High (357 Francis St)	Clac_sch68	X			
Fire Facilities					
Molalla RFPD #73 – Station 82 EOC (320 N Molalla Ave)	Clac_fir18	X			
See Mitigation Successes					
Law Enforcement Facilities					
City Hall/Police Department (117 N Molalla Ave)	Clac_pol10	X			

Source: [DOGAMI 2007. Open File Report O-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment.](#)

“*” – Site ID is referenced on the [RVS Clackamas County Map](#)

In addition to building damages, utility (electric power, water, wastewater, natural gas) and transportation systems (bridges, pipelines) are also likely to experience significant damage. There is a low probability that a major earthquake will result in failure of upstream dams.

Utility systems will be significantly damaged, including damaged buildings and damage to utility infrastructure, including water treatment plants and equipment at high voltage substations (especially 230 kV or higher which are more vulnerable than lower voltage substations). Buried pipe systems will suffer extensive damage with approximately one break per mile in soft soil areas. There would be a much lower rate of pipe breaks in other areas. Restoration of utility services will require substantial mutual aid from utilities outside of the affected area.

Earthquake Regional Impact Analysis

In 2018 DOGAMI completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults (O-18-02). Their study focused on damage to buildings, and the people that occupy them, and on two key infrastructure sectors: electric power transmission and emergency transportation routes. Each earthquake was studied with wet and dry soil conditions and for events that occur during the daytime (2 PM) and nighttime (2 AM). Impacts to buildings and people were tabulated at the county, jurisdictional (city), and neighborhood unit level. Estimated damage varied widely across the study area depending on local geology, soil moisture conditions, type of building, and distance from the studied faults. In general, damage from the Cascadia Subduction Zone scenario was greater in the western portion of the study area, however, damage could still be significant in some areas east of the Willamette River. The report found that damage to high-value commercial and industrial buildings was high since many of these facilities are in areas of high to very high liquefaction hazard. Casualties were higher during the daytime scenario (generally double) since more people would be at work and occupying non-wood structures that fare worse in an earthquake.

The Portland Hills fault scenario created greater damages than the Cascade Subduction Zone scenario due primarily to its placement relative to population centers and regional assets; however, at distances 15 or more miles from the Portland Hills fault the damages from the Cascadia Subduction Zone scenario generally were higher. In both the Cascadia Subduction Zone and Portland Hills Fault scenarios it is forecasted that emergency transportation routes will be fragmented, affecting the distribution of goods and services, conditions are worse under the Portland Hills Fault scenario. Portions of the electric distribution system are also expected to be impacted under both scenarios; however, the impact is considerably less than it is to the transportation routes. Additional capacity or redundancy within the electric distribution network may be beneficial in select areas that are likely to have greater impacts.

Table MO-6 shows the permanent resident population that are vulnerable to injury or death (casualty) and the buildings in the City that are susceptible to liquefaction and landslides, it does not predict that damage will occur in specific areas due to either liquefaction or landslide. More population and property are exposed to higher degrees of expected damage or casualty under the Portland Hills Fault “wet” scenario than in any other scenario.

The critical facilities at most risk within Molalla are the middle school, sewer treatment plan, water treatment plan, and Molalla Urgent Care.

Table MO-6 Expected damages and casualties for the CSZ fault and Portland Hills fault: earthquake, soil moisture, and event time scenarios

	Cascadia Subduction Zone (M9.0)		Portland Hills Fault (M6.8)	
	"Dry" Soil	"Wet" Saturated Soil	"Dry" Soil	"Wet" Saturated Soil
Number of Buildings	3,176	3,176	3,176	3,176
Building Value (\$ Million)	854	854	854	854
Building Repair Cost (\$ Million)	21	21	37	37
Building Loss Ratio	2%	2%	4%	4%
Debris (Thousands of Tons)	11	11	14	16
Long-Term Displaced Population	8	8	17	17
Total Casualties (Daytime)	12	12	17	17
Level 4 (Killed)	0	0	1	1
Total Casualties (Nighttime)	3	3	7	7
Level 4 (Killed)	0	0	0	0

Source: DOGAMI, Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon (2018, O-18-02), Tables 12-8, 12-9, 12-10, and 12-11.

Cascadia Subduction Zone Scenario

The City of Molalla is expected to have a 2% building loss ratio with a repair cost of \$21 million under the CSZ “dry” scenario, and under the CSZ “wet” scenario.¹² The city is expected to have around 12 daytime or 3 nighttime casualties during the CSZ “dry” scenario and 12 daytime or 3 nighttime casualties during the CSZ “wet” scenario. It is expected that there will be a long-term displaced population of around 8 for the CSZ “dry” scenario and 8 for the CSZ “wet” scenario.¹³ (See Risk Report content for additional information.)

Portland Hills Fault Scenario

The City of Molalla is expected to have a 4% building loss ratio with a repair cost of \$37 million under the CSZ “dry” scenario, and under the CSZ “wet” scenario.¹⁴ The long-term displaced population and casualties are greatly increased for all the Portland Hills Fault scenarios. The city is expected to have around 17 daytime or 7 nighttime casualties during the Portland Hills Fault “dry” scenario and 17 daytime or 7 nighttime casualties during the Portland Hills Fault “wet” scenario. It is expected that there will be a long-term displaced population of around 17 for the Portland Hills Fault “dry” scenario and 17 for the Portland Hills Fault “wet” scenario.¹⁵

Recommendations from the DOGAMI report included topics within Planning, Recovery, Resiliency: Buildings, Resiliency: Infrastructure Improvements, Resiliency: Essential and Critical Facilities, Enhanced Emergency Management Tools, Database Improvements, Public Awareness, and Future Reports. The recommendations of this study are largely incorporated within this NHMPs mitigation strategies (Table MO-1 and Volume I, Section 3). For more detailed information on the report, the damage estimates, and the recommendations see: *Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon* (2018, [O-18-02](#)).

¹² DOGAMI, Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon (2018, O-18-02), Tables 12-8 and 12-9.

¹³ Ibid, Tables 12-8 and 12-9.

¹⁴ Ibid, Tables 12-10 and 12-11.

¹⁵ Ibid, Tables 12-10 and 12-11.

Natural Hazard Risk Report for Clackamas County

The Risk Report (DOGAMI, O-24-XX)¹⁶ provides hazard analysis summary tables that identify populations and property countywide that are vulnerable to the earthquake hazard.

According to the Risk Reports the following population and property within the study area may be impacted by the profiled events:

Cascadia Subduction Zone event (M9.0 Deterministic): 47 buildings, including 3 critical facilities are expected to be damaged for a total potential loss of \$27.6 million (a loss ratio of 2.7%). About 10 residents may potentially be displaced.

Crustal event (Canby-Molalla fault M6.8 Deterministic): 528 buildings are expected to be damaged, 8 critical facilities, for a total potential loss of \$150.8 million (a loss ratio of 15%). About 409 residents may be displaced.

Future Projections

Future development (residential, commercial, or industrial) within Clackamas County will be at risk to earthquake impacts, although this risk can be mitigated by the adoption and enforcement of high development and building standards. Reducing risks to vulnerable populations should be considered during the redevelopment of existing properties.

Flood

The HMAC determined that the City's probability of flooding is **moderate** and that their vulnerability to flooding is **moderate**. *These ratings did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of flood hazards, history, as well as the location, extent, and probability of a potential event. Figure MO-4 illustrates the flood hazard area for Molalla.

The latest flooding incident was in February 2014 when Main Street was flooded. While Molalla does not show any areas within the FEMA mapped special flood hazard areas (100- year flood vulnerability), the city regularly experiences urban flooding. This is primarily due to inadequate storm drainpipes, and culverts that are too small. Molalla also has clay soils, which means that the percolation rate is very slow, and the water table is very high.

Additionally, the extent of flooding will vary depending on climatic conditions and precipitation levels. Areas within Molalla that are frequently impacted by urban flooding events include: the intersection of South Cole and Main Street; East 3rd Street; Mathias Road south of 8th Street; areas south of 7th Street; and Highway 213 south of Toliver Road.

Typically, roads are covered with water in urban flooding events, and water will occasionally overflow manholes in some parts of the city. Newer homes are built on higher ground to avoid flooding issues, and many older homes have pumps within their crawlspaces to avoid flood events.

Future Projections

According to the Oregon Climate Change Research Institute "Future Climate Projections, Clackamas County,"¹⁷ winter flood risk at mid- to low elevations in Clackamas County, where temperatures are near freezing during winter and precipitation is a mix of rain and snow, is projected to increase as winter temperatures increase. The temperature increase will lead to an increase in the percentage of

¹⁶ DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon (O-24-XX, September 2023 Draft)*, Table A-23.

¹⁷ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

may also be at relatively high risk from over bank flooding from streams too small to be mapped by FEMA or from local storm water drainage.

The extent of flooding hazards in Molalla primarily depends on climate and precipitation levels. Additionally, withdrawals for irrigation and drinking water, as well as stream and wetland modifications or vegetation removal can influence water flow. The only public infrastructure at risk to direct flooding are the City's surface water intake areas. In the past flooding has occurred along Main Street and other roadways due to urban flooding. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets Section and Table MO-5.

Natural Hazard Risk Report for Clackamas County

The **Risk Report** (DOGAMI, O-24-XX)¹⁸ provides hazard analysis summary tables that identify populations and property countywide that are vulnerable to the flood hazard.

The Risk Report did not identify population or property within the study area that may be impacted by the profiled flood hazard.

National Flood Insurance Program (NFIP)

FEMA's Flood Insurance Study (FIS), and Flood Insurance Rate Maps (FIRMs) are effective as of June 17, 2008. The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program, although the City does not have a delineated Special Flood Hazard Area (SFHA). Molalla has not had a Community Assistance Visit (CAV) and does not participate in the Community Rating System (CRS). The Community Repetitive Loss record does not identify any Repetitive Loss Properties¹⁹ or Severe Repetitive Loss Properties²⁰.

Landslide

The HMAC determined that the City's probability for landslide is **low** and that their vulnerability to landslide is **moderate**. *The probability rating did not change and the vulnerability rating increased since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of landslide hazards, history, as well as the location, extent, and probability of a potential event within the region. Molalla does not have a history of landslides. This is due to the relatively flat topography within the UGB as well as the City's requirements of geological analysis on slopes of 25% or greater, usually located along stream embankments, before extensive tree removal, excavation, or construction occurs.

Although landslides have not occurred in Molalla, in 1996 a landslide upstream of Molalla dammed the Molalla River for about 6 or 7 hours and destroyed the City's intake valves. A dammed river is the City's biggest vulnerability to landslide hazards, which could also damage Highway 211 and 213 bridges.

¹⁸ DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon* (O-24-XX, September 2023 Draft), Table A-23.

¹⁹ 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.

²⁰ 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.

Landslide susceptibility exposure for Molalla is shown in Figure MO-5. Most of Molalla demonstrates a low landslide susceptibility exposure. There are no areas within Molalla that have very high or high landslide susceptibility exposure, while approximately 4% show moderate landslide susceptibility exposure.²¹

Note that even if a jurisdiction 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.

Vulnerability Assessment

DOGAMI completed a statewide landslide susceptibility assessment in 2016 ([O-16-02](#)), general findings from that report are provided above and within Figure MO-5.

Natural Hazard Risk Reports for Clackamas CountyThe **Risk Report** (DOGAMI, O-24-XX) provides hazard analysis summary tables that identify populations and property countywide that are vulnerable to the landslide hazard.

The Risk Report did not identify population or property within the study area that may be impacted by the profiled landslide hazard.

Figure MO-5.

Potential landslide-related impacts are adequately described within Volume I, Section 2, 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, and thoroughfares beyond City limits are susceptible to obstruction as well. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets Section and Tables Table MO-5.

The most common type of landslides are slides caused by erosion. Slides move in contact with the underlying surface, are generally slow moving, and can be deep. Rainfall-initiated landslides tend to be smaller; while earthquake induced landslides may be quite large. All soil types can be affected by natural landslide triggering conditions.

The City currently has little risk to landslides; however, if the urban growth boundary is expanded to the south east, new development could be within or close to areas vulnerable to landslides.

Natural Hazard Risk Report for Clackamas County

The **Risk Report** (DOGAMI, O-24-XX)²² provides hazard analysis summary tables that identify populations and property countywide that are vulnerable to the landslide hazard.

The Risk Report did not identify population or property within the study area that may be impacted by the profiled landslide hazard.

Future Projections

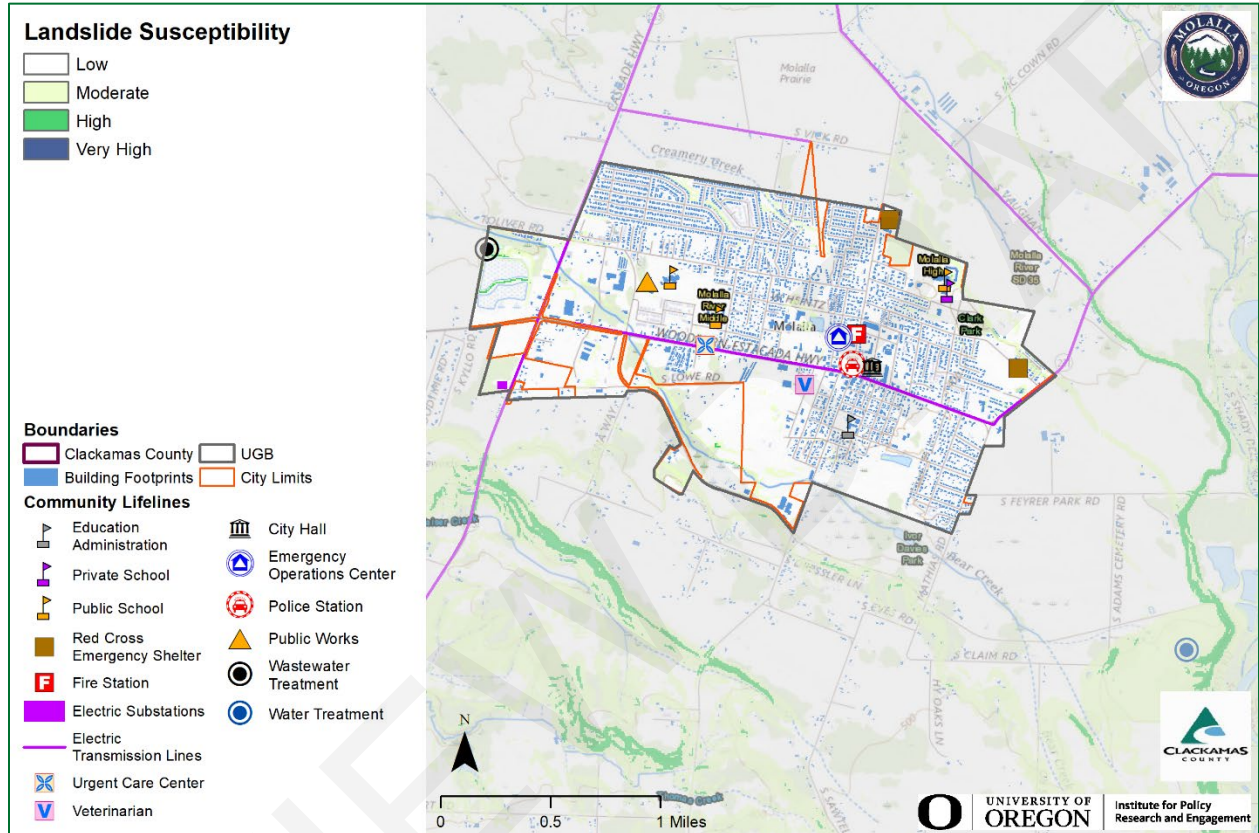
Landslides are often triggered by rainfall when the soil becomes saturated. As a surrogate measure of landslide risk, the Oregon Climate Change Research Institute report presents a threshold based on recent precipitation (cumulative precipitation over the previous 3 days) and antecedent precipitation (cumulative precipitation on the 15 days prior to the previous 3 days). By the 2050s under the higher

²¹ DOGAMI. [Open-File Report, O-16-02](#), *Landslide Susceptibility Overview Map of Oregon* (2016)

²² DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon* (O-24-XX, [September 2023 Draft](#)), Table A-23.

emissions scenario, the average number of days per year in Clackamas County on which the landslide risk threshold is exceeded is not projected to change substantially. However, landslide risk depends on multiple factors, and this metric, which is based on precipitation, does not reflect all aspects of the hazard. Additional triggers, such as earthquakes, wildfires, or development, can increase risks of landslides. Future development along slopes or adjacent to riverbanks will be a greater risk of impact from this hazard.

Figure MO-5 Landslide Susceptibility Exposure



Source: Map created by Oregon Partnership for Disaster Resilience.

Data: Oregon Department of Geology and Mineral Industries. Preparedness Framework Implementation Team (IRIS v3).

Note: To view hazard detail click this [link](#) to access Oregon HazVu

Severe Weather

Severe weather can account for a variety of intense, and potentially damaging hazard events. These events include extreme heat, windstorms, and winter storms. The following section describes the unique probability, and vulnerability of each identified weather hazard.

Extreme Heat

The HMAC determined that the City's probability for extreme heat events is **moderate** and that their vulnerability is **low**. *The probability rating did not change and the vulnerability rating increased since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of extreme heat, history, as well as the location, extent, and probability of a potential event within the region. Generally, an event that affects the County is likely to affect the City as well.

A severe heat episode or "heat wave" occurs about every two to three years, and typically lasting two to three days but can last as many as five days. A severe heat episode can be defined as consecutive days of upper 90s to around 100. Severe heat hazard in the Portland metro region can be described as the average number of days with temperatures greater than or equal to 90-degrees, or 100-degrees, Fahrenheit. On average the region experiences 13.6 days with temperatures above 90-degrees Fahrenheit, and 1.4 days above 100-degrees Fahrenheit, based on new 30-year climate averages (1981-2010) from the National Weather Service – Portland Weather Forecast Office.

The City of Molalla has not experienced any life-threatening consequences from the few historical extreme heat events, although changes in climate indicate that the area should expect to see more extreme heat events. resulting from hazards.

Future Projections

According to the Oregon Climate Change Research Institute "Future Climate Projections, Clackamas County,"²³ the number, duration, and intensity of extreme heat events will increase as temperatures continue to warm. In Clackamas County, the number of extremely hot days (days on which the temperature is 90°F or higher) and the temperature on the hottest day of the year are projected to increase by the 2020s and 2050s under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios. The number of days per year with temperatures 90°F or higher is projected to increase by an average of 12 (range 3–21) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario. The temperature on the hottest day of the year is projected to increase by an average of about 7°F (range 2–11°F) by the 2050s. Higher temperatures and longer/more extreme heat events will have negative impacts upon vulnerable populations such as those over 65+, children, those living in older or temporary housing, and field workers.

Windstorm

The HMAC determined that the City's probability for windstorm is **moderate** and that their vulnerability to windstorm is **moderate**. *The probability rating decreased and the vulnerability rating did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of windstorm hazards, history, as well as the location, extent, and probability of a potential event within the region. Because windstorms typically occur during winter months, they are sometimes accompanied by flooding and winter storms (ice, freezing rain, and very rarely, snow). Other severe weather events that may accompany windstorms, including thunderstorms, hail, lightning strikes, and tornadoes are generally negligible for Molalla.

Volume I, Section 2 describes the impacts caused by windstorms, including power outages, downed trees, heavy precipitation, building damages, and storm-related debris.

Additionally, transportation, and economic disruptions result as well. Damage from high winds generally has resulted in downed utility lines, and trees usually limited to several localized areas. Electrical power can be out anywhere from a few hours to several days. Outdoor signs have also suffered damage. If the high winds are accompanied by rain (which they often are), blowing leaves, and debris clog drainage-ways, which in turn may cause localized urban flooding.

Future Projections

Limited research suggests little if any change in the frequency and intensity of windstorms in the Northwest as a result of climate change. Those impacted by windstorms at present, including older

²³ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

residential or commercial developments with above-ground utilities, poor insulation or older construction, heavy tree canopies, or poor storm drainage, will continue to be impacted by windstorms in the future.

Winter Storm (Snow/Ice)

The HMAC determined that the City's probability for winter storm is **moderate** and that their vulnerability to winter storm is **moderate**. *The probability rating decreased and the vulnerability rating did not change since the previous version of this NHMP.*

Volume I, Section 2 describes the characteristics of winter storm hazards, history, as well as the location, extent, and probability of a potential event within the region. 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 November through March.

The biggest impact of winter storms is congestion on roadways. In January 2007 the City experienced freezing temperatures and high winds caused a tree to fall on the main fire station and blocked some of the roads.

Most winter storms typically do not cause significant damage, they are frequent, and have the potential to impact economic activity. Road and rail closures due to winter weather are an uncommon occurrence but can interrupt commuter, and commercial traffic as noted above.

Future Projections

According to the Oregon Climate Change Research Institute "Future Climate Projections, Clackamas County,"²⁴ cold extremes will become less frequent and intense as the climate warms. In Clackamas County, the number of cold days (maximum temperature 32°F or lower) per year is projected to decrease by an average of 6 (range -3– -8) by the 2050s, relative to the 1971–2000 historical baselines, under the higher emissions scenario. The temperature on the coldest night of the year is projected to increase by an average of 6°F (range 0– 11°F) by the 2050s.

The intensity of extreme precipitation is expected to increase as the atmosphere warms and holds more water vapor. In Clackamas County, the number of days per year with at least 0.75 inches of precipitation is not projected to change substantially. However, by the 2050s, the amount of precipitation on the wettest day and wettest consecutive five days per year is projected to increase by an average of 15% (range 0–31%) and 10% (range -1–26%), respectively, relative to the 1971–2000 historical baselines, under the higher emissions scenario.

Vulnerable populations will be more likely to experience the negative impacts of winter storms in the future, particularly the unhoused and the elderly.

Vulnerability Assessment

Due to insufficient data and resources, Molalla is currently unable to perform a quantitative risk assessment, or exposure analysis, for the extreme heat, windstorm, and winter storm hazards. For a list of facilities and infrastructure vulnerable to these hazards see the Community Assets Section and Table MO-5.

²⁴ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

Volcanic Event

The HMAC determined that the City's probability for a volcanic event is **low** and that their vulnerability to a volcanic event is **moderate**. *The probability rating did not change and the vulnerability rating increased since the previous version of this NHMP.*

Volcanoes are located near Molalla, the closest of which are Mount Hood, Mount Adams, Mount Saint Helens, Mount Rainier, and the Three Sisters.

Vulnerability Assessment

Due to Molalla's relative distance from volcanoes, the city is unlikely to experience the immediate effects that eruptions have on surrounding areas (i.e., mud and debris flows, or lahars). Depending on wind patterns and which volcano erupts, however, the city may experience ashfall. The eruption of Mount St. Helens in 1980, for example, coated the Willamette Valley with a fine layer of ash. If Mount Hood erupts, however, the city could experience a heavier coating of ash.

Natural Hazard Risk Report for Clackamas County

The **Risk Report** (DOGAMI, O-24-XX)²⁵ provides hazard analysis summary tables that identify populations and property countywide that are vulnerable to the volcanic event (lahar) hazard.

The Risk Report did not identify population or property within the study area that may be impacted by the profiled volcanic event (lahar) hazard.

Future Projections

Although the science of volcano predictions is improving, it remains challenging to predict a potential volcanic event. Ash fall, which will be the greatest impact, will impact the entire County. Impacts will be felt hardest by property managers (ranches, farmers, etc.) and by those relying upon clean surface water (for drinking water production and irrigation).

Wildfire

The HMAC determined that the City's probability for wildfire is **high**, and that their vulnerability to wildfire is **high**. *The probability rating increased and the vulnerability rating did not change since the previous version of this NHMP.*

The [Clackamas County Community Wildfire Protection Plan](#) (CWPP) is hereby incorporated into this NHMP addendum by reference, and it will serve as the wildfire section for this addendum. The following presents a summary of key information; refer to the full CWPP for a complete description, and evaluation of the wildfire hazard. Information specific to Molalla is found in the following chapter: Chapter 9.9: Molalla Rural Fire Protection District #73.

Volume I, Section 2 describes the characteristics of wildland fire hazards, history, as well as the location, extent, and probability of a potential event within the region. The location, and extent of a wildland fire vary depending on fuel, topography, and weather conditions.

Weather and urbanization conditions are primarily at cause for the hazard level. Molalla has not experienced a wildfire within City limits, but the city has abundant wooded areas that are a concern in the case of a wildfire event. Figure MO-6 shows overall wildfire risk in Molalla per the state's evaluation. However, as the community had to be evacuated during the wildfire season of 2020 due to the proximity

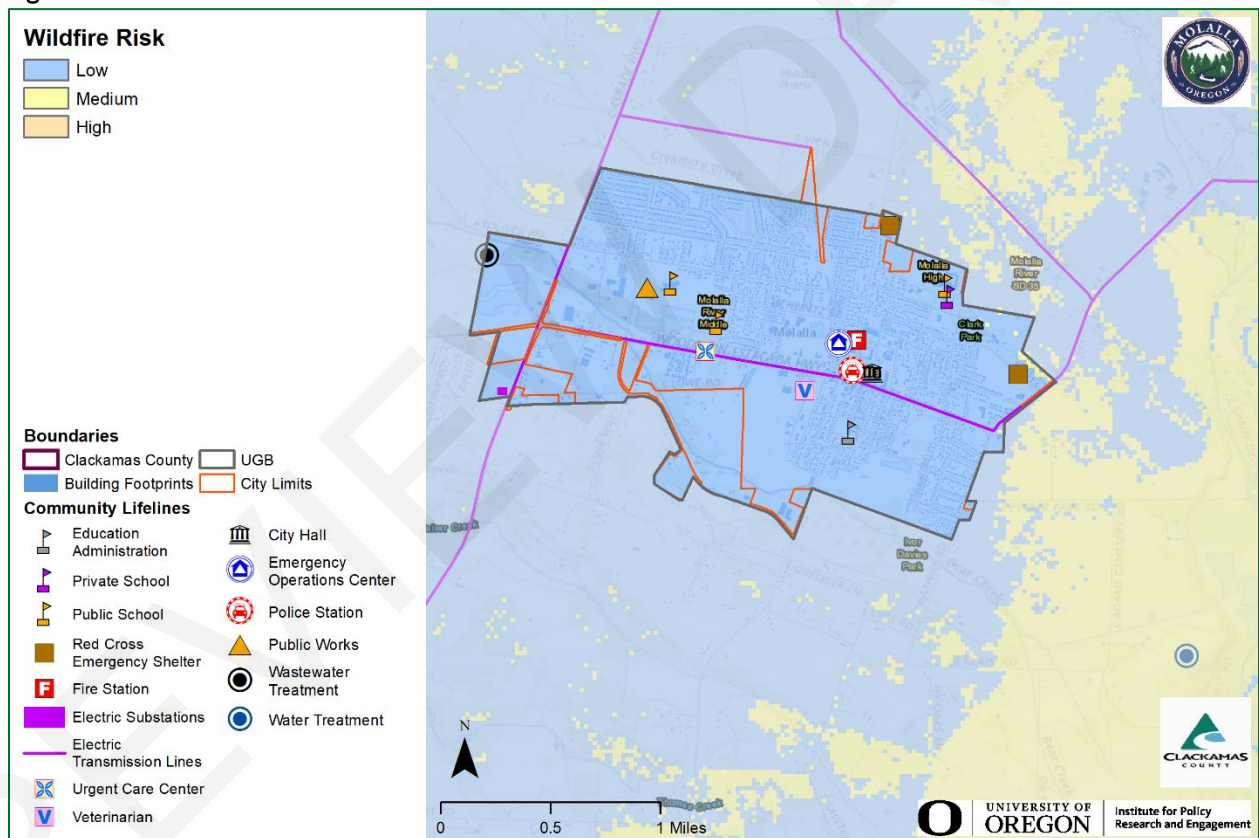
²⁵ DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon* (O-24-XX, September 2023 Draft), Table A-23.

of adjacent wildfires and their unpredictable nature, wildfire has been elevated in the priority ranking for this NHMP.

Clackamas County has two major physiographic regions: the Willamette River Valley in western Clackamas County and the Cascade Range Mountains in eastern and southern Clackamas County. The Willamette River Valley, which includes Molalla, is the most heavily populated portion of the county and is characterized by flat or gently hilly topography. The Cascade Range has a relatively small population and is characterized by heavily forested slopes. Eastern Clackamas County is at higher risk to wildfire than western portions of the county due to its dense forest land. Human caused fires are responsible for most fires in Clackamas County.

The City of Molalla, Oregon, is working to update its Emergency Operations Plan (EOP) the current plan was completed in 2011. However, after experiencing devastating wildfires in both 2020 and 2022, as well as severe ice storms, the city's proactive management recognized the need for a comprehensive and up-to-date plan. The city is committed to ensuring its residents' safety and well-being in an emergency, and Phase 1 of the EOP update is a crucial step toward achieving that goal.

Figure MO-6 Wildfire Risk



Molalla is surrounded mostly by farmlands which creates a buffer from the forested areas. There are some areas of heavy tree coverage in the northeast and southern portions of the City. Identified High and

Medium Priority Communities at Risk (CARs) are all located outside of the City limits.²⁶ Wildfires are not a frequent occurrence within the city, but regional wildfires occasionally introduce pollutants within the city. Molalla sits in the bottom of a valley, and pollution from regional fires settles in the area, causing health concerns for residents.

Most of the city has less severe (moderate or less) wildfire burn probability that includes expected flame lengths less than four feet under normal weather conditions.²⁷ However, 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.

Vulnerability Assessment

The potential community impacts, and vulnerabilities described in Volume I, Section 2 are generally accurate for the City as well. Molalla's fire response is addressed within the CWPP which assesses wildfire risk, maps wildland urban interface areas, and includes actions to mitigate wildfire risk. The City will update the City's wildfire risk assessment if the fire plan presents better data during future updates (an action item is included to participate in future updates to the CWPP).

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).

Natural Hazard Risk Reports for Clackamas County

The **Risk Report** (DOGAMI, O-24-XX)²⁸ provides hazard analysis summary tables that identify populations and property countywide that are vulnerable to the wildfire hazard.

According to the Risk Report 147 buildings are exposed to the *high and (or) moderate (medium) risk wildfire* hazard for a total exposure of \$34.5 million (a building exposure ratio of 3.3%). About 505 residents may be displaced by wildfires (a population exposure ratio of 5.1%).

Future Projections

According to the Oregon Climate Change Research Institute "Future Climate Projections, Clackamas County,"²⁹ wildfire frequency, intensity, and area burned are projected to continue increasing in the Northwest. Wildfire risk, expressed as the average number of days per year on which fire danger is very high, is projected to increase in Clackamas County by 14 (range -6– 34) by the 2050s, relative to the historical baseline (1971–2000), under the higher emissions scenario. Similarly, the average number of days per year on which vapor pressure deficit is extreme is projected to increase by 29 (range 10–44) by the 2050s. Communities at risk to wildfire include those within the urban wildfire interface or along river or creek corridors, where fire can travel quickly. Communities will need to address growing wildfire risks if populations are not restricted from expanding further into higher risk areas.

²⁶ Clackamas County Community Wildfire Protection Plan, *Molalla Fire Department* (2018), Table 10.13-1.

²⁷ [Oregon Wildfire Risk Explorer](#), date accessed November 9, 2018.

²⁸ DOGAMI, *Multi-Hazard Risk Report for Clackamas County, Oregon* (O-24-XX, September 2023 Draft), Table A-23.

²⁹ Oregon Climate Change Research Institute, *Future Climate Projections, Clackamas County, Oregon*. February 2023.

Attachment A: Action Item Changes

Table MO-7 is an accounting of the status (complete or not complete) and major changes to actions since the previous NHMP. All actions were renumbered in this update to be consistent with other jurisdictions that are participating in the multi-jurisdictional NHMP. All actions marked not complete are ongoing, are still relevant, and are included in the updated action plan (Table MO-1).

Previous NHMP Actions that are Complete:

Flood #2, “Minimize overall impervious cover and disconnect impervious areas.” Complete. Stormwater management plan adopted.

Wildfire #1, “Promote fire-resistant strategies for new and existing developments.” Complete. Part of existing code.

Previous NHMP Actions that are Not Complete and No Longer Relevant:

None identified.

Table MO-7 Status of All Hazard Mitigation Actions in the Previous Plan

2018 Action Item	2024 Action Item	Status	Still Relevant? (Yes/No)
Multi-Hazard #1	#1	Not Complete	Yes
Multi-Hazard #2	#2	Not Complete	Yes
Multi-Hazard #3	#3	Not Complete	Yes
Multi-Hazard #4	#4	Not Complete	Yes
Severe Weather #1	#5	Not Complete, revised	Yes
-	#6	New	-
Earthquake #1	#7	Not Complete, revised	Yes
Flood #1	#2, #8	Not Complete, revised	Yes
Flood #2	-	Complete	No
-	#8	New	-
-	#9	New	-
Severe Weather #1	#9, #10	Not Complete, revised	Yes
Landslide #1	#11	Not Complete, revised	Yes
Wildfire #1	-	Complete	No
Wildfire #2	#12	Not Complete	Yes

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 below) was provided from January XX through January XX on the City's website. The plan was also posted and announced on the County's website. There were X comments provided that have been reviewed and integrated into the NHMP as applicable. Additional opportunities for stakeholders and the public to be involved in the planning process are addressed in Volume III, Appendix B.

A diverse array of agencies and organizations were provided an opportunity to provide input to inform the plan's content through a variety of mechanisms including the opportunity for comment on the draft plan. The agencies and organizations represent local and regional agencies involved in hazard mitigation activities, those that have the authority to regulate development, neighboring communities, representatives of businesses, academia, and other private organizations, and representatives of nonprofit organizations, including community-based organizations, that work directly with and/or provide support to underserved communities and socially vulnerable populations. For more information on the engagement strategy see Volume III, Appendix B.

Website Posting

To be provided

HMAC

The Hazard Mitigation Advisory Committee (HMAC) members possessed familiarity with the community and how it is affected by natural hazard events. The HMAC 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 date:

Meeting #1: May 30, 2023

During this meeting, the HMAC:

- Reviewed the previous NHMP, and were provided updates on hazard mitigation planning, the NHMP update process, and project timeline.
- Updated recent history of hazard events in the city.
- Reviewed and confirmed the County NHMP's mission and goals.
- Reviewed and provided feedback on the draft risk assessment update including community vulnerabilities and hazard information.
- Reviewed and updated their existing mitigation strategy (actions).
- Reviewed and updated their implementation and maintenance program.
- Discussed the NHMP public outreach strategy.

Meeting #2: November 20, 2023 (via remote conference)

During this meeting, the HMAC:

- Confirmed and provided feedback on the final draft risk assessment update including community vulnerabilities and hazard information provided by DOGAMI (Risk Report).
- Reviewed and confirmed the city's capabilities assessment.
- Reviewed, confirmed, and prioritized the city's mitigation strategies.