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

Photo Credit: Jason Faucera

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Volume II: Oregon City Addendum

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City of Oregon City

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Purpose

This is an update of the Oregon City 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 Oregon City's addendum are further discussed throughout the NHMP and within Volume III, Appendix B, which provides an overview of alterations to the document that took place during the update process.

Oregon City adopted their addendum to the Clackamas County Multi-jurisdictional NHMP on **September 4, 2019.** FEMA Region X approved the Clackamas County NHMP on April 12,2019 and the City's addendum on **September 4, 2019.** With approval of this NHMP theCity is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through **April 11, 2024.**

Mitigation Plan Mission

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

The City concurs with the mission statement developed during the Clackamas County planning process (Volume I, Section 3):

> ***Promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards.***

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 Clackamas County citizens, and public, and private partners can take while working to reduce the City's risk from natural hazards. These statements of direction form a bridge between the broad mission statement, and serve as checkpoints, as agencies, and organizations begin implementing mitigation action items.

The City concurs with the goals developed during the Clackamas County planning process (Volume I, Section 3). All NHMP goals are important and are listed below in no order of priority. Establishing community priorities within action items neither negates nor eliminates any goals, but it establishes which action items to consider implementing first, should funding become available.

Below is a list of the NHMP goals:

GOAL #1: PROTECT LIFE AND PROPERTY

- Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to natural hazards.
- Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.
- Improve hazard assessment information to make recommendations for discouraging new development and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

GOAL #2: ENHANCE NATURAL SYSTEMS

- Balance watershed planning, natural resource management, and land use planning with natural hazards mitigation to protect life, property, and the environment.
- Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

GOAL #3: AUGMENT EMERGENCY SERVICES

- Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.
- Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, and business, and industry.
- Coordinate and integrate natural hazards mitigation activities, where appropriate, with emergency operations plans and procedures.

GOAL #4: ENCOURAGE PARTNERSHIPS FOR IMPLEMENTATION

- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.
- Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazard mitigation activities.

GOAL #5: PROMOTE PUBLIC AWARENESS

- Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
- Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

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.*

Oregon City first developed an addendum to Clackamas County's Natural Hazards Mitigation Plan in 1998, but the plan did not meet FEMA criteria and did not get adopted, this also happened when Oregon City tried again for the 2002 addendum. Oregon City's Plan was finally approved and adopted in 2009 with updates in 2012 and now in 2018. The last update of the Oregon City addendum to the Clackamas County NHMP was approved by FEMA on April 8, 2013.

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 Oregon City to update their NHMP. This project is funded through the Federal Emergency Management Agency's Pre-Disaster Mitigation (PDM) Competitive Grant Program EMS-2017-PC-0005 (PDMC-PL-10-OR-2016-001). Members of the Oregon City NHMP Hazard Mitigation Plan Committee also participated in the County NHMP update process (Volume III, Appendix B).

The Clackamas County NHMP and Oregon City addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector and regional organizations. The Oregon City Hazard Mitigation Advisory Committee (HMAC) guided the process of developing the NHMP.

Convener

Oregon City's Public Works Director served as the designated convener of the NHMP update and 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 Oregon City HMAC met formally and informally, to discuss updates to their addendum (Volume III, Appendix B). 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 Oregon City HMAC was comprised of the following representatives:

- Convener, John Lewis, Public Works Director
- Martin Montalvo, Public Works Operations Manager (*former*)
- Kelly Reid, Planner
- Vance Walker, Assistant Public Works Director

Public participation was achieved with the establishment of the HMAC, which was comprised of City officials representing different departments and sectors and members of the public. The HMAC served as the local review body for the NHMP's development. Community members were provided an opportunity for comment via the NHMP review process, and through a survey administered by Clackamas County (Volume III, Appendix G).

NHMP Implementation and Maintenance

The City Commission will be responsible for adopting the Oregon City addendum to the Clackamas County NHMP. This addendum designates the 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 Oregon City 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 Public Works Director will serve as the convener 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; and
- Documenting successes, and lessons learned during the year.

The convener will also remain active in the County's implementation, and maintenance process (Volume I, Section 4).

The City will utilize the same action item prioritization process as the County (Volume I, Section 4).

Implementation through Existing Programs

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, and Building Codes, as well as the 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, Oregon City will implement the NHMP's recommended actions through existing plans and policies. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Future development without proper planning may result in worsening problems associated with natural hazards. Metro, the regional government for Clackamas, Multnomah, and Washington counties, determines many land use laws for the tri-county region and sets the urban growth boundary. The entire Portland Metro area is subject to tremendous growth pressures due to its desirable location and the restrictions on urban sprawl placed by urban growth boundary requirements.

Oregon City's acknowledged comprehensive plan is the Oregon City Comprehensive Plan (1982, updated June 2004). The Oregon Land Conservation and Development Commission first acknowledged the plan in 1982. The City implements the plan through the development regulations (zoning, subdivision and related ordinances).

Oregon City currently has the following plans that relate to natural hazard mitigation. For a complete list visit the City's website:

- Comprehensive Plan (1982, amended 2004)
  - Comprehensive Plan Map
- Oregon City Municipal Code (revised 7/2018)
  - Title 12 Streets, Sidewalks and Public Places, Chapter 12.08 Public and Street Trees
  - Title 15 Buildings and Construction
  - Title 17 Zoning, Chapter 17.40 Historic Overlay District
  - Title 17 Zoning, Chapter 17.41 Tree Protection Standards
  - Title 17 Zoning, Chapter 17.42 Flood Management Overlay District
  - Title 17 Zoning, Chapter 17.44 US Geologic Hazards
  - Title 17 Zoning, Chapter 17.47 Erosion and Sediment Control
  - Title 17 Zoning, Chapter 17.49 Natural Resource Overlay Zone
- Building Code, 2017 Oregon State Code based on 2015 International Residential Code (IRC) and 2012 International Building Code
- Downtown Community Plan
- Oregon City Operations Facilities Plan
- Transportation System Plan
- Portland Metro 2014 Regional Transportation Plan
- Sanitary Sewer Master Plan
- Stormwater Plans
  - Erosion Prevention and Sediment Control Planning and Design Manual
  - Drainage Master Plan
  - South End Basin Master Plan
  - Caulfield Basin Master Plan
  - Park Place Basin Master Plan

- Water Master Plan
- Willamette Falls Legacy Project Master Plan

Government Structure

The City Commission is the policy making body for Oregon City. The commission is composed of a mayor and four commissioners, all of whom are elected from the city at large. The Mayor and Commissioners in turn appoint the city manager, who serves as the administrative head of the city's government.

The following departments within the city have a role in natural hazards mitigation:

The **Community Development Department** is responsible for guiding growth and development in the city. The department includes three divisions:

- **Building** is responsible for plan review and inspections on commercial, industrial and residential developments, as well as fire life and safety plan review.
- **Planning** is responsible for all long range and current planning for new development, as well as the city's natural resource, geologic hazard and floodplain overlay zones. It is also responsible for implementation of the Oregon City Comprehensive Plan.
- **Geographic Information Services (GIS)** supplies mapping services to the public, city planners, engineers, public works, and other departments.

The **Public Works Department** operates and maintains existing infrastructure, plans and constructs capital improvements, and enforces the municipal code. The public works department includes six divisions:

- **Engineering Services** reviews and approves development applications to ensure they are up-to-date on policies and engineering standards. It provides professional engineering services and consultation to various city departments and the public for private development.
- **Water Operations** distributes and maintains the potable water supply.
- **Wastewater Operations** provides wastewater utility by maintaining and improving the wastewater collection system. They also respond to emergency system bypasses to reduce hazards to human health and the environment.
- **Stormwater Division** provides a safe and reliable stormwater system and implements watershed protection and restoration actions that promote surface water quality and stream health.
- **Streets Division** maintains Oregon City's transportation system.

The **Finance Department** manages the city budget, information systems, and accounting. Tasks of the department include utility billing, accounts payable and receivable, payroll, budget development and management, and internal auditing.

The **Public Safety Department** is committed to providing quality public safety services to the Oregon City community. Police services are provided by the Oregon City Police Department and fire services are provided by Clackamas Fire District #1.

- **Code Enforcement** provides prompt, effective and efficient enforcement of the Oregon City Municipal Code.

The **Community Services Department** focuses on increasing, improving, and facilitating communication between the city and its residents. The department supports Oregon City Neighborhood Associations, the Citizen Involvement Committee, and numerous other citizen involvement committees. The department also manages the Library, Senior Center, and Parks and Recreation.

Continued Public Participation

An open public involvement process is essential to the development of an effective NHMP. To develop a comprehensive approach to reducing the effects of natural disasters, the planning process shall include opportunities for the public, neighboring communities, local, and regional agencies, as well as, private, and non-profit entities to comment on the NHMP during review.[1] Keeping the public informed of efforts to reduce its risk to future natural hazard events is important for successful NHMP implementation, and maintenance. As such, the City is committed to involving the public in the NHMP review and update process (Volume I, Section 4). The City posted the plan update for public comment before FEMA approval, and after approval will maintain the plan on the City's website: https://www.orcity.org/publicworks/natural-hazards-mitigation-plan

NHMP Maintenance

The Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan and City addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the County NHMP update process, the City will also review and update its addendum (Volume I, Section 4). The convener will be responsible for convening the HMAC to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the NHMP was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the NHMP accurately address the impacts of this event?

These questions will help the HMAC determine what components of the mitigation plan need updating. The HMAC will be responsible for updating any deficiencies found in the NHMP.

[1] Code of Federal Regulations, Chapter 44. Section 201.6, subsection (b). 2015

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) were first developed during the 2009 NHMP planning process (actions from earlier versions mitigation plans that were not formally adopted were reviewed at this time). During this process, the HMAC assessed the City's risk, identified potential issues and developed a mitigation strategy (action items).

During the 2018 update process the City re-evaluated their mitigation strategy (action items). During this process action items were updated, noting what accomplishments had been made and whether the actions were still relevant; any new action items were identified at this time (see Volume III, Appendix B for more information on changes to action items).

Priority Action Items

Table OC-1 presents a list of mitigation actions. 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 in **bold** text with grey highlight. The City will focus their attention, and resource availability, upon these achievable, high leverage, activities over the next five-years. Although this methodology provides a guide for the 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 detailed information for each action. Full text of the plan goals referenced in Table OC-1 is located on page OC-2.

Table OC-1 Oregon City Action Items

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Internal Partners	Timing	Plan Goals Addressed				
					Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
MH#1	Maintain Certification and coordinate with Clackamas County and regional partners to identify and coordinate building officials that are qualified to conduct damage assessments.	Oregon City Emergency Management	Building	Ongoing	✓		✓	✓	
MH#2	Integrate the goals and action items from the Oregon City Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.	Community Development	Public Works, City Commission	Ongoing	✓	✓	✓	✓	✓
MH#3	Develop, enhance, and implement education programs aimed at mitigating natural hazards, and reducing risk.	Community Development	Public Works, CFD #1	Ongoing	✓		✓	✓	✓
MH#4	Improve vegetation management throughout Oregon City.	Community Services	Community Development, Code Enforcement, Parks and Recreation, Public Works	Ongoing			✓		✓
EQ#1	**Conduct seismic evaluations on identified community assets and 'high risk' school and emergency service buildings and implement appropriate structural and non-structural mitigation strategies.**	**Oregon City Emergency Management**	**Community Development, Public Works**	**Long Term**	✓		✓	✓	
FL#1	Promote and protect the use of naturally flood prone open space or wetlands as flood storage areas.	Community Development	Public Works	Ongoing	✓	✓		✓	✓

Natural Hazard Action ID	Action Item	Coordinating Organization (Lead)	Internal Partners	Timing	Plan Goals Addressed				
					Goal 1	Goal 2	Goal 3	Goal 4	Goal 5
FL#2	Continue participating in the National Flood Insurance Program and develop strategies to reduce property damage and related financial impacts due to flooding.	Community Development	Public Works	Ongoing	✓			✓	
FL#3	**Complete periodic updates of the Surface Water Management Master Plan.**	**Public Works**	**Community Development**	**Ongoing**	✓	✓	✓	✓	
LS#1	**Continue to implement municipal codes and policies mitigating future landslide damage.**	**Public Works**	**Community Development**	**Ongoing**	✓	✓		✓	✓
LS#2	Maintain an inventory of streets and properties threatened by landslides.	Mapping/GIS	Community Development, Public Works	Ongoing	✓	✓		✓	✓
SW#1	Reduce frequency and duration of power outages from the severe wind and winter storm hazards where possible.	Public Works	Community Development	Ongoing	✓	✓	✓	✓	✓
WF#1	**Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan**	**Clackamas Fire District #1**	**Community Development, Public Works**	**Ongoing**	✓	✓	✓	✓	✓
WF#2	**Complete periodic updates of the Water Master Plan.**	**Public Works**	**Community Development**	**Ongoing**	✓	✓	✓	✓	✓
WF#3	Promote fire-resistant strategies and the use of non-combustible roofing materials by evaluating and making recommendations to current code to encourage noncombustible roofing standards in high fire-hazard areas.	Community Development	Public Works; Clackamas Fire District #1	Ongoing	✓	✓	✓	✓	✓

Source: Oregon City HMAC, 2018.
Note: Full text of the plan goals referenced in this table is located on page OC-2.

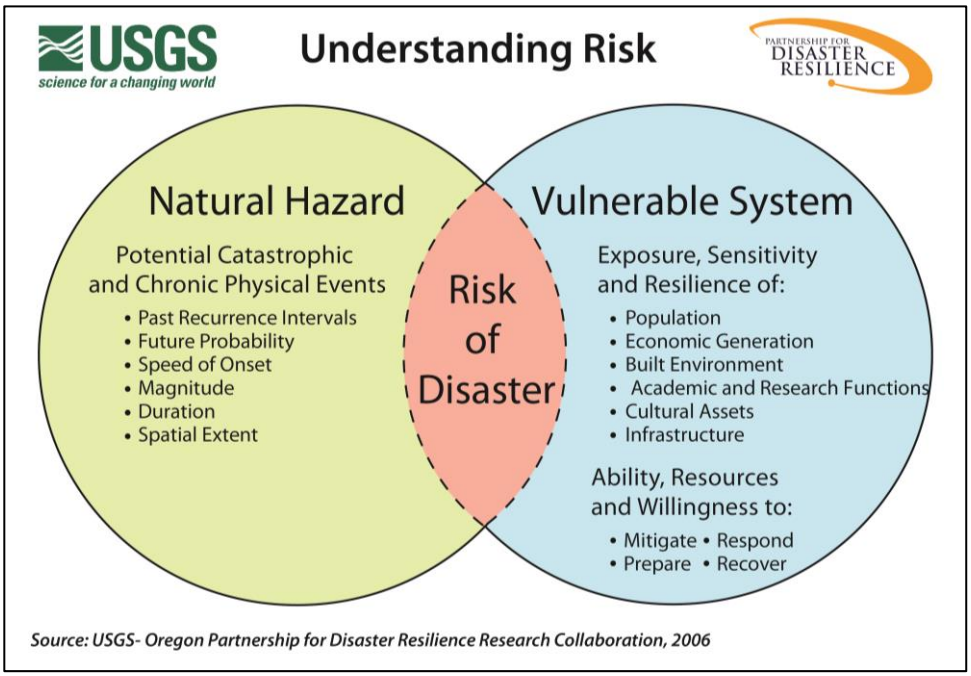
Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets, and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places, and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Volume I, Section 2, and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure OC-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure OC-1 Understanding Risk



Hazard Analysis

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

Table OC-2 shows the HVA matrix for Oregon City 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 sense of hazard priorities but does not predict the occurrence of a particular hazard.

Two catastrophic hazards (Cascadia Subduction Zone earthquake and a Crustal earthquake event such as from the Portland Fault) and two chronic hazards (winter storm and flood) rank as the top hazard threats to the City (Top Tier). The landslide, wildfire, extreme heat, and drought hazards comprise the next highest ranked hazards (Middle Tier), while the windstorm and volcanic event hazards comprise the lowest ranked hazards (Bottom Tier).

Table OC-2 Hazard Analysis Matrix – Oregon City

Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Rank	Hazard Tiers
Earthquake - Cascadia	4	45	100	49	198	#1	*Top Tier*
Earthquake - Crustal	6	50	100	21	177	#2	
Winter Storm	18	30	70	49	167	#3	
Flood	16	20	70	56	162	#4	
Landslide	14	35	30	63	142	#5	*Middle Tier*
Wildfire	12	25	70	21	128	#6	
Extreme Heat	16	15	40	56	127	#7	
Drought	10	15	50	42	117	#8	
Windstorm	14	15	30	42	101	#9	*Bottom Tier*
Volcanic Event	2	15	50	7	74	#10	

Source: Oregon City HMAC, 2018.

Table OC-3 categorizes the probability, and vulnerability scores from the hazard analysis for the City and compares the results to the assessment completed by the Clackamas County HMAC. Variations between the City, and County are noted in **bold** text within the city ratings.

Table OC-3 Probability and Vulnerability Comparison

Hazard	Oregon City		Clackamas County	
	Probability	Vulnerability	Probability	Vulnerability
Drought	**Moderate**	Low	High	Low
Earthquake - Cascadia	Moderate	High	Moderate	High
Earthquake - Crustal	Low	High	Low	High
Extreme Heat	**High**	**Low**	Low	High
Flood	High	Moderate	High	Moderate
Landslide	High	**Moderate**	High	Low
Volcanic Event	Low	**Low**	Low	Moderate
Wildfire	**Low**	Moderate	High	Moderate
Windstorm	Moderate	Low	Moderate	Low
Winter Storm	Moderate	Moderate	Moderate	Moderate

Source: Oregon City HMAC, 2018.

Community Characteristics

Table OC-4 and the following section provides information on City specific demographics and assets. For additional information on the characteristics of Oregon City, in terms of geography, environment, population, demographics, employment and economics, as well as housing and transportation see Volume I, Section 2. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the City specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2010 and 2016 the City grew by 2,245 people[2] (7%; as of 2018 the population was 34,860) and median household income increased by 6%.[3] Between 2018 and 2040 the population is forecast to grow by 20% to 41,857.[4] In 2017, the Park Place annexation on the south side of Holcomb Blvd brought 92 acres into the City. New development has complied with the standards of the Oregon Building Code and the city's development code.

Transportation/Infrastructure

In the Oregon City, transportation has played a major role in shaping the community. Oregon City has three state highways and one interstate. State Highway 99E (or McLoughlin Blvd.), runs along the western border of the city; Highway 213 runs north to south through the eastern part of the city; Highway 43 enters at the northwest border of the city, and Interstate 205 runs along the northern border.

Today, mobility plays an important role in Oregon City and the daily experience of its residents and businesses as they move from point A to point B. Motor vehicles represent the dominant mode of travel through, and within the city. Oregon City public transportation is serviced by Tri-Met which provides daily local bus services to numerous community transit centers, including downtown Oregon City and the Clackamas County College Campus. The Canby Area Transit (CAT) additionally serves Oregon City with service to Canby, Aurora, Hubbard and Woodburn, while the South Clackamas Transportation District (SCTD) provides transportation between Clackamas Community College south to Molalla. Oregon City is also accessed by the Union Pacific Railroad main line and Amtrak, which travels northeast to southwest carrying both passengers and freight.

Economy

Oregon City is located near the greater Portland region, resulting in easy access to downtown Portland and surrounding communities. Historically, Oregon City had a strong mill and timber economic presence. Now, Oregon City residents are mostly employed in professional and related occupations.[5] In 2016, the average per capita income for residents is $28,232.[6] The top economic sectors are Educational Services, and Health Care and Social Assistance; Retail Trade; and Manufacturing.[7]

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[2] Portland State University, Population Research Center, "Annual Population Estimates", 2016 & 2018.
[3] Social Explorer, Table T57, U.S. Census Bureau, 2006-2010 and 2012-2016 American Community Survey Estimates.
[4].Metro, 2040 Distributed Forecast (2016).
[5] Social Explorer, Table T50, U.S. Census Bureau, 2012-2016 American Community Survey Estimates.
[6] Ibid. Table T83.
[7] Ibid. Table T49.

Table OC-4 Community Characteristics

Population Characteristics		
2010 Population	31,995	
2016 Population [2018 Population]	34,240	[34,860]
2040 Forecasted Population*	41,857	
Race (non-Hispanic) and Ethnicity (Hispanic)		
White		86%
Black/ African American		1%
American Indian and Alaska Native		1%
Asian		1%
Native Hawaiian and Other Pacific Islander		< 1%
Some Other Race		< 1%
Two or More Races		3%
Hispanic or Latino		8%
Limited or No English Spoken		3%
Vulnerable Age Groups		
Less than 15 Years	7,200	21%
65 Years and Over	4,455	13%
Disability Status		
Total Population	4,141	12%
Children	263	3%
Seniors	1,691	40%

Income Characteristics		
Households by Income Category		
Less than $15,000	1,110	9%
$15,000-$29,999	1,193	9%
$30,000-$44,999	1,893	15%
$45,000-$59,999	1,457	11%
$60,000-$74,999	1,668	13%
$75,000-$99,999	2,097	16%
$100,000-$199,999	3,047	24%
$200,000 or more	302	2%
Median Household Income	$65,548	
Poverty Rates		
Total Population	4,835	14%
Children	1,076	13%
Seniors	299	7%
Housing Cost Burden		
Owners with Mortgage	2,802	33%
Renters	2,029	48%

Source: U.S. Census Bureau, 2012-2016 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2016 & 2018. Metro, 2040 Distributed Forecast. Note: * = Population forecast within Metro UGB

Housing Characteristics		
Housing Units		
Single-Family	10,097	76%
Multi-Family	2,731	21%
Mobile Homes	418	3%
Year Structure Built		
Pre-1970	3,517	27%
1970-1989	3,199	24%
1990 or later	6,530	49%
Housing Tenure and Vacancy		
Owner-occupied	8,545	65%
Renter-occupied	4,222	32%
Seasonal	0	0%
Vacant	479	4%

Oregon City is near the southern limits of the Portland metro-area and is the County Seat of Clackamas County. The City has benefited from its natural setting. Its location on the Willamette and Clackamas Rivers supplied an abundant power source and bolstered an economy based on manufacturing, timber, and commerce. This prime location drew settlers from around the nation and helped Oregon City become the first incorporated city in Oregon. In the shadow of Mount Hood and surrounded by forests, Oregon City is a scenic settlement built on the "solid ground" of the valleys and hillsides.

The City has grown in land area over the years. As of 2015, Oregon City occupies 6,467 acres. Urbanization at the edge of Oregon City is constrained by the Willamette River and the City of West Linn to the west, Clackamas River and the City of Gladstone to the north, and steep topography to the south and east.

Oregon City's temperatures range from monthly average lows of 36°F in the winter months (December/January coldest) to average highs of 82°F in the summer months (July/August hottest). The average annual precipitation is 46 inches.[8]

For more information see Volume I, Section 2.

[8] Western Regional Climate Center, Oregon City, Oregon. Retrieved November 16, 2018.

Community Assets

This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of Oregon City. It is important to note that the facilities identified as "critical" and "essential" are characterized differently than the structural code that identifies buildings as "essential" and "non-essential." The structural code uses different language and criteria and therefore have completely different meanings than the buildings identified in this addendum.

Critical Facilities

Facilities that are critical 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 OC-5 Critical Facilities in Oregon City

Facility	Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm
Critical Facilities									
Fire and Police Stations: Main Fire Station is the EOC									
Station 9 – Holcomb (built in 1974)		X							
Station 15 – John Adams (remodeled 1998)									
Station 16 – Hilltop (rebuilt 2018)									
Station 17 – South End (built in 2004)									
Police Department		X							
Other Critical Facilities									
Providence Willamette Falls Hospital		X			X		X		X
Public Works Operations Center		X					X		
C-COM (9-1-1; *County facility*)									
Clackamas County EOC (*County facility)*									
PGE Substation - Canemah		X		X			X		
PGE Substation - 18th Street		X		X			X		

Hazardous Materials:

Facilities that, if damaged, could cause serious secondary impacts may also be considered "critical." A hazardous material facility is one example of this type of critical facility. Those sites that store, manufacture, or use potentially hazardous materials include:

- Clackamas Community College
- Benchmade
- Metro South Transfer Station
- Miles Fiberglass
- Railroad
- Rossman Landfill

Click here for a map of hazardous materials sites found on the city website: Hazardous Materials Sites Map.

Critical Infrastructure:

Infrastructure that provides necessary services for emergency response include:

Table OC-6 Critical Infrastructure in Oregon City

Facility	Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm
Critical Infrastructure									
Natural Gas System									
Electrical Power System		X						X	X
Tri City Wastewater Treatment Plant		X		X					
Wastewater Collection System		X		X	X				
Hunter Pump Station									
Mountain View Pump Station									
Barlow Crest Reservoir									
Boynton Standpipe Reservoir and Pump Station		X							
Henrici Reservoir		X							
Mountainview Reservoir #1 (2 MG)									
Mountainview Reservoir #2 (10.5 MG)									
North Fork Water Transmission Pipe		X			X				
South Fork Water Filter Plant									
South Fork Water Intake				X					
South Fork/Division Street Pump Station		X							
Clackamas River Water/South Fork Water Intertie									
South Fork Water Transmission Line		X			X				
Metro South Transfer Station									
PGE Dam									
Water Distribution System		X		X	X				

Additionally, the following transportation infrastructure is considered vulnerable (hazards noted where applicable):

- 5th Street
- 7th Street
- Abernethy Road (flood)
- Abernethy Creek Culvert at McLoughlin Blvd.
- Anchor Way
- Anchor Way Bridge at Abernethy Creek
- Beavercreek Road (flood)
- Central Point Road
- Division Street
- George Abernethy Bridge (I-205 at Willamette)
- Glen Oak Road
- High Street
- Highway 43 Arch Bridge
- Highway 213
- Holcomb Boulevard
- Redland Road overcrossing on Hwy 213

- I-205 over Clackamas River
- Interstate 205
- Leland Road
- Linn Avenue (flood)
- Main Street (7th to McLoughlin Blvd)
- Main Street overcrossing at I-205
- Maple Lane Road
- McLoughlin Blvd Viaduct
- Main St. extension overcrossing at McLoughlin Blvd.
- McLoughlin Blvd/Highway 99E
- McLoughlin Blvd Tunnel at UPRR
- Meyers Road (flood)
- Molalla Ave
- OR City Gladstone Bridge 99
- HWY 213 overcrossing at Holcomb Blvd
- Pedestrian Bridge to Gladstone
- Redland Road
- South End Road
- Warner Milne Road
- Warner Parrott Road
- Washington Street overcrossing on Hwy 213
- Washington Street Bridge (at Abernethy Creek)

Essential Facilities and Infrastructure

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: City buildings such as the Public Services Building, the City Hall, and other public facilities such as schools.

Table OC-7 Essential Facilities in Oregon City

Facility	Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm
Essential Facilities									
Churches^ (Potential Shelter Sites)		X		X	X		X	X	X
Schools: Potential Shelter Sites									
Gaffney Lane Elementary		X							
Holcomb Elementary		X							X
John McLoughlin Elementary		X							
King Elementary Charter		X							
Mt. Pleasant Elementary									
Park Place Elementary									
Gardiner Middle (to be rebuilt)		X							
Ogden Middle		X			X		X		
Oregon City High									
Jackson Campus - CAIS		X			X				
Clackamas Community College									
Eastham Community School		X							
Other Facilities									
City Hall		X							
Pioneer Community Center									
Community Development Building		X							
Clackamas County Jail									

Facility	Drought	Earthquake	Extreme Heat	Flood	Landslide	Volcanic Event	Wildfire	Windstorm	Winter Storm
Essential Facilities									
Clackamas County Roads Services									
Veterans of Foreign Wars Post 1324									

Note: ^ Churches include: First Presbyterian, First United Methodist Church, Light on the Hill Fellowship, Logan Community Church, Maranatha Baptist Church, Mountain View Community Church, North Clackamas Christian, Oregon City Christian, Oregon City Church of the Nazarene, Oregon City Evangelical, St. John the Apostle Catholic Church, St. Paul's Episcopal Church, St. Philip Benizi Church, Trinity Lutheran Church, Victorious Faith Family Church

Essential infrastructure includes:

- Cellular Tower System
- Telephone System
- Amanda Lift Station
- Barclay Hills Lift Station
- Brendon Estates Lift Station
- Canemah Lift Station
- Cook Street Lift Station
- Hilltop Acres Lift Station
- Parrish Road Lift Station
- Pease Road Lift Station
- Hidden Creek Lift Station
- Nobel Ridge Lift Station
- Newell Crest Lift Station
- Boynton Lift Station
- Livesay Pump Station
- Fairway Downs Pump Station
- Settler's Point Pump Station
- Stormwater Management System

Economic Assets/Population Centers:

Economic assets include businesses that employ large numbers of people and provide an economic resource to the city of Oregon City. 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.

Environmental Assets:

Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic, and functional ecosystem services for the community include Clackamette Park and Mill Creek Canyon.

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 child care facilities and adult care facilities.

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 make Oregon City 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. The following historic resources can be found in Oregon City:

- 7th Street Historic Fire Station
- 90 Historic Homes in Canemah, a National Registered Historic District
- 376 Individually Designated Historic Homes in McLoughlin Historic Conservation District
- 98 Individually Designated Historic Homes Outside of a Historic District
- Barclay House
- Carnegie Center
- Carnegie Library
- Clackamas County Courthouse
- End of the Oregon Trail Interpretive Center
- Ermatinger House
- McLoughlin House
- McLoughlin Promenade
- Museum of the Oregon Territory
- Oregon City Municipal Elevator
- Rose Farm
- Stevens-Crawford House
- Willamette Falls Locks
- Oregon City/West Linn (Hwy. 43) Bridge

The city's Historic Review Board reviews new development in the McLoughlin and Canemah historic districts and the city has adopted a Historic Overlay District to ensure that new development is compatible with existing historically designated structures.

Hazard Characteristics

Drought

The HMAC determined that the City's probability for drought is **moderate** and that their vulnerability to drought is **low**. *The probability rating increased and the vulnerability rating decreased since the previous version of this NHMP addendum.*

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.

Oregon City provides water to most of its residents within a service area of approximately 4,134 acres; residents not within the services area are served by the Clackamas River Water District. Oregon City draws its main water supply comes from the Clackamas River which is supplied by the South Fork Water Board (a wholesale water supplier that is equally owned

by Oregon City and West Linn). Water is provided via an intake and pumping station just to the north of the Oregon City boundary limits which is delivered to the SFWB water treatment plant located in the Park Place area. The City has a current surplus of 4.99 million gallons (MG), however, the city's Water Master Plan has identified the need for an additional storage to meet anticipated growth. To meet these needs the city plans to build two new ground level storage reservoirs (one 2 MG storage reservoir just beyond the Henrici Reservoir, and the other 3 MG storage reservoir near Holly Lane); additional storage will be needed if/when CRW facilities are incorporated into the City). The City has identified areas that will need to replace existing pipelines to meet the demand and flow requirements. For more information on the future of Oregon City's water supply visit their website: https://www.orcity.org/publicworks/about-oregon-city-water-division

Vulnerability Assessment

Due to insufficient data and resources, Oregon City 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 Tables OC-5 through OC-7.

Mitigation Activities

The existing drought hazard mitigation activities are conducted at the county, regional, state, and federal levels and are described in the Clackamas County NHMP.

Please review Volume I, Section 2 for additional information on this hazard.

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**. *The probability rating did not change, and the vulnerability rating increased, since the previous version of this NHMP addendum. Previously, the earthquake hazard profile was a single risk assessment, which is now divided into two separate earthquake hazards: Cascadia Subduction Zone (CSZ) earthquake and Crustal earthquake.*

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 Oregon City as well. The causes and characteristics of an earthquake event are appropriately described within the 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 Oregon City as well.

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, Portland Hills Fault Zone, and Gales Creek-Newberg-Mt. Angel Structural Zone (discussed in the crustal earthquake section).

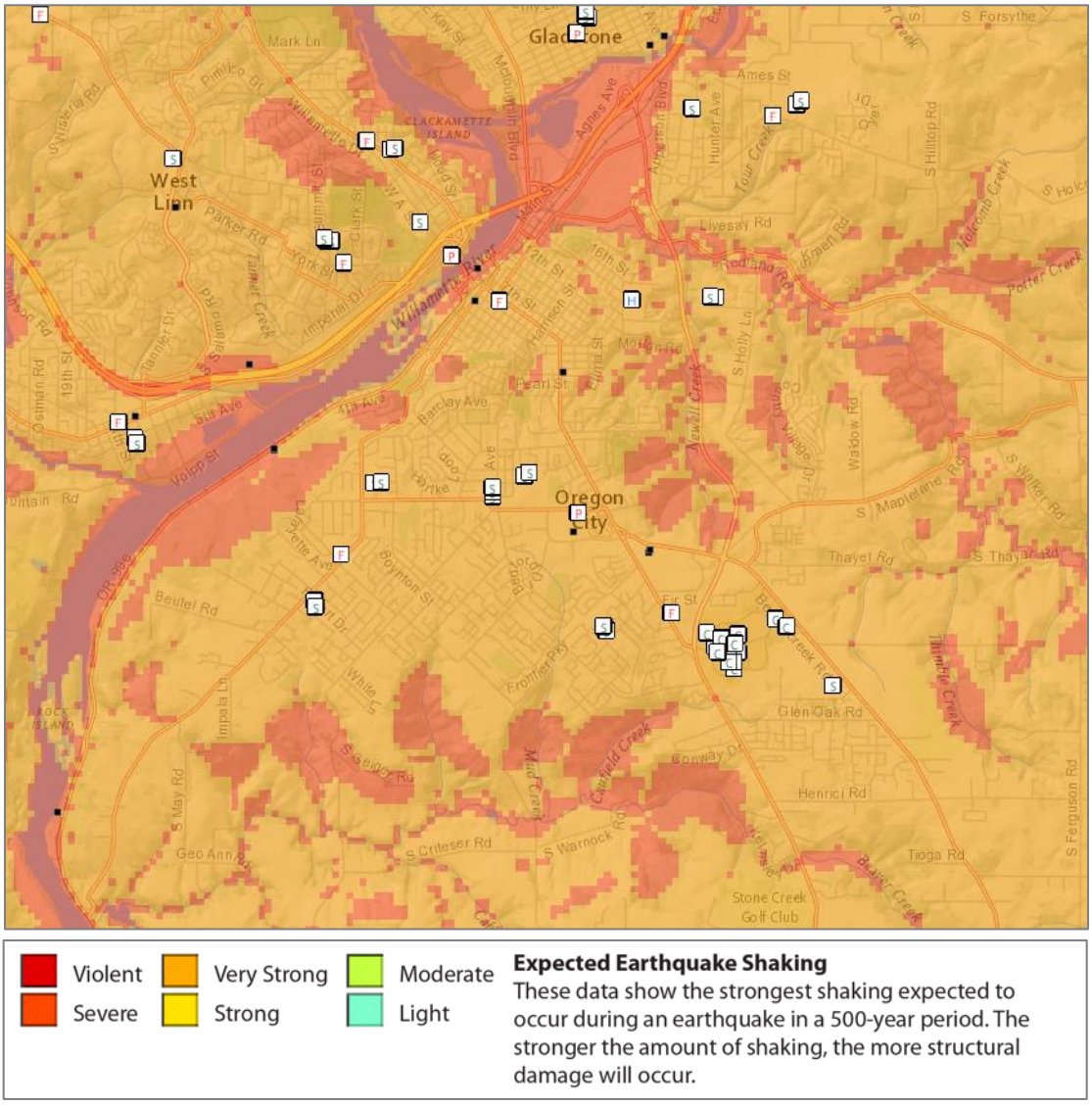
Cascadia Subduction Zone

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.[9]

Figure OC-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 near rivers and streams will experience severe (light red) to violent (dark red) shaking in a CSZ event.

Figure OC-2 Cascadia Subduction Zone Expected Shaking



Source: [Oregon HazVu: Statewide Geohazards Viewer (DOGAMI)]
Note: To view detail click the link above to access Oregon HazVu.

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

An additional earthquake hazard map is available via the City website: Earthquake Hazard Map and DOGAMI's Geologic Report and Map (GMS-119). Ground shaking can mix groundwater and soil, liquefying and weakening the ground that supports buildings and severing utility lines. This is a special problem in low lying areas adjacent to rivers where the water table is shallow and the soils are subject to liquefaction. For example, the fine-grained alluvial soils along the banks of the Willamette and Clackamas Rivers and Abernethy Creek are likely subject to this hazard.

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.

Older buildings and the sewer system in the city are most vulnerable to damage. Earthquakes shift soil that could cause landslides. Transportation routes and economics within the City can also be affected. Demand on resources such as Police, Fire and Public Works would also increase.

Vulnerability Assessment

Due to insufficient data and resources, Oregon City is currently unable to perform a quantitative risk assessment for this hazard. However, 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 51% of residential buildings (primarily single-family residential) were built prior to 1990 (27% before 1970), 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 OC-8; each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI using their Rapid Visual Survey (RVS), one (1) has a very high (100% chance) collapse potential and two (2) have a high (greater than 10% chance) collapse potential. *Note: one fire station and two schools have been, or are scheduled to be, rebuilt and/or renovated.*

For a list of additional facilities and infrastructure vulnerable to this hazard see the Community Assets section and Tables OC-5 through OC-7. 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.

Table OC-8 Rapid Visual Survey Scores

Facility	Site ID*	Level of Collapse Potential			
		Low (<1%)	Moderate (>1%)	High (>10%)	Very High (100%)
Schools					
Jackson Campus: CAIS (ca. 1939) (19761 Beavercreek Rd)	None	*2007 RVS report did not include structural appendix for this facility. Facility built 1939.*			
Gaffney Ln Elementary (ca. 1965) (13521 S Gaffney Ln)	Clac_sch44	X		X	
Gardiner Middle (ca. 1954) (180 Ethel St)	**Clac_sch49**	**School to be rebuilt per 2018 school bond.**			
Holcomb Elementary (ca. 1966) (14625 S Holcomb)	Clac_sch43	X	X		
John McLoughlin Elem. (ca. 1975) (19230 S End Rd)	Clac_sch91	X		X	
King Campus: OCSLA (ca. 1959) (995 S End Rd)	Clac_sch46			X,X	
Mt Pleasant Elementary (1232 Linn Ave) - CLOSED	*Clac_sch47*		*X*	*X*	*X*
Ogden Middle (ca. 1965) (14133 S Donovan Rd)	**Clac_sch50**	**Renovation planned per 2018 school bond.**		**X,X**	
Oregon City High (ca. 2003) (19761 S Beavercreek Rd)	Clac_sch51	X			
Alliance Charter Academy (16075 S Front Ave)	Clac_sch48			X	
Clackamas Community College (19600 S Molalla Ave)	Varies	See Note 2 below.			
Clackamas Fire District					
Station 9 – Holcomb (300 Longview Wy)	Clac_fir29	X			
Station 15 – John Adams (624 W 7th St)	Clac_fir35	X			
Station 16 – Hilltop (19340 S Molalla Ave)	Clac_fir36	**Mitigated per 2013-2014 SRGP grant.**			
Station 17 – South End (19001 South End)	Clac_fir51	X			
Police					
Police Department (320 Warner Milne Rd)	Clac_pol11	X			
Hospital					
Providence Willamette Falls (1500 Division St)	Clac_hos4			X	

Source: DOGAMI 2007. Open File Report 0-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment. "*" – Site ID is referenced on the RVS Clackamas County Map
Note 1: **Bold** indicates facilities that have been seismically retrofitted or rebuilt.

Note 2: Clackamas Community College buildings with 'very high' collapse potential include: Dye Learning Center, Family Residential Center, Gregory Forum ; and with 'high' collapse potential include: McLoughlin Hall, Pauling Center (east and south), Randall Hall (mitigated per 2015-2017 SRGP grant), and Streeter Hall.

Mitigation Activities

Many buildings in Oregon City have been seismically upgraded including the Carnegie Center, fire station #15 (John Adams, ca. 1998), the 10.5 million-gallon Mountainview drinking water reservoir, and numerous buildings at Clackamas Community College. New public buildings built for seismic activity include Oregon City High School and all water pump stations. Additionally, new water lines with flexible couplings at the joints were installed near the Newell Creek Apartments. Seismic retrofit grant awards per the Seismic Rehabilitation Grant Program[10] have been funded to retrofit Clackamas Fire District's Hilltop Fire Station #16 (2013-2014 grant award, $483,062) and Clackamas Community College's Randall Hall (Phase Two of 2015-2017 grant award, $1,500,000). A $158 million bond was passed in 2018 to improve security, address overcrowding, and finance and construction including the replacement of Gardiner Middle School and renovation of Ogden Middle School. The school district recently received a $25,000 Seismic Assessment Grant from the Oregon Department of Education's Office of School Facilities Technical Assistance Program for seismic assessments at Barclay School, Eastham Community Center and Park Place School. Clackamas Community College has seismically assessed their buildings.

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**. *The probability rating decreased, and the vulnerability rating increased, since the previous version of this NHMP addendum. Previously, the earthquake hazard profile was a single risk assessment, which is now divided into two separate earthquake hazards: Crustal earthquake, and Cascadia Subduction Zone (CSZ) earthquake.*

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 Oregon City as well. Figure OC-3 shows a generalized geologic map of the Oregon City 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. An additional earthquake hazard map is available via the City website: Earthquake Hazard Map.

There are two potential crustal faults and/or zones near the City that can generate high-magnitude earthquakes. These include the Gales Creek-Mt. Angel Structural Zone and Portland Hills Fault Zone (discussed in greater detail below). Other nearby faults include the Bolton fault and Oatfield faults which run through the city west and east side respectively, Canby-Molalla structural zones located west of the city, and the Mt. Hood Fault in eastern Clackamas County. 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

[10] 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.

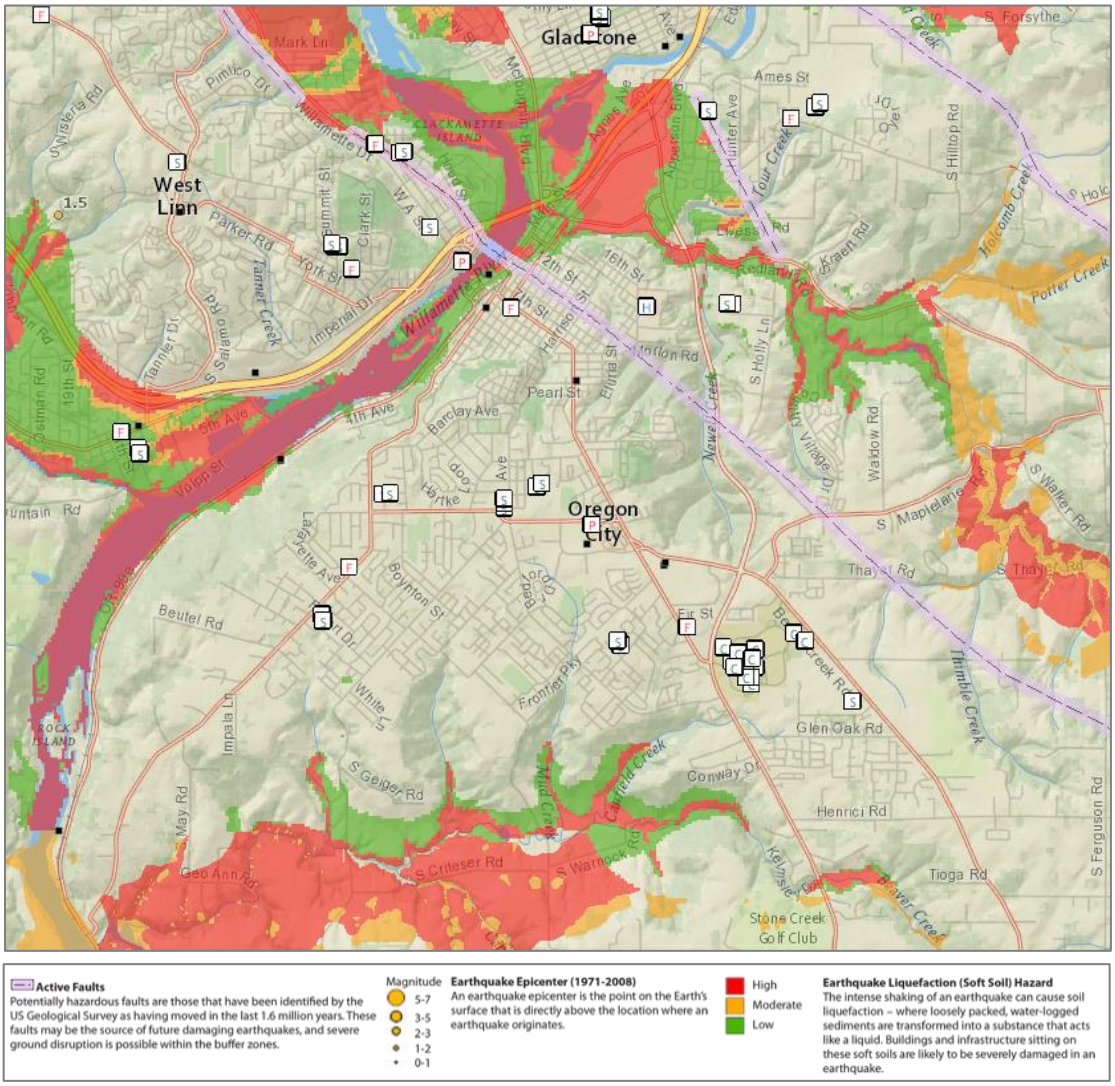
earthquake was the March 25, 1993 Scotts Mills quake. It was a 5.6 magnitude quake with aftershocks continuing at least through April 8.

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.

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 11 miles northeast of Oregon City.

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



Source: Oregon HazVu: Statewide Geohazards Viewer (DOGAMI)
Note: To view detail click the link above to access Oregon HazVu

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 to 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 night time (2 AM). Impacts to buildings and people were tabulated at the county, jurisdictional (city), and neighborhood unit level. Estimated damaged 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 OC-9 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.

Table OC-9 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	12,641	12,641	12,641	12,641
Building Value ($ Million)	4,190	4,190	4,190	4,190
Building Repair Cost ($ Million)	277	342	1,319	1,422
Building Loss Ratio	7%	8%	31%	34%
Debris (Thousands of Tons)	148	170	496	525
Long-Term Displaced Population	102	307	2,983	3,827
Total Casualties (Daytime)	258	318	1,286	1,364
Level 4 (Killed)	14	18	80	85
Total Casualties (NIghttime)	38	57	383	448
Level 4 (Killed)	1	2	11	13

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

Oregon City is expected to have a 7% building loss ratio with a repair cost of $277 million under the CSZ "dry" scenario, and an 8% building loss ratio with a repair cost of $170 million under the CSZ "wet" scenario.[11] The city is expected to have around 258 daytime or 33 nighttime casualties during the CSZ "dry" scenario and 318 daytime or 57 nighttime casualties during the CSZ "wet" scenario. It is expected that there will be a long-term displaced population of around 102 for the CSZ "dry" scenario and 307 for the CSZ "wet" scenario.[12]

Portland Hills Fault Scenario

Oregon City is expected to have a 31% building loss ratio with a repair cost of $1,32 billion under the CSZ "dry" scenario, and a 34% building loss ratio with a repair cost of $1.42 billion under the CSZ "wet" scenario.[13] The long-term displaced population and casualties are greatly increased for all the Portland Hills Fault scenarios. The city is expected to have around 1,286 daytime or 383 nighttime casualties during the Portland Hills Fault "dry" scenario and 1,364 daytime or 448 nighttime casualties during the Portland Hills Fault "wet" scenario. It is expected that there will be a long-term displaced population of around 2,983 for the Portland Hills Fault "dry" scenario and 3,827 for the Portland Hills Fault "wet" scenario.[14]

Recommendations from the 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 OC-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).

Please review Volume I, Section 2 for additional information on this hazard.

Flood

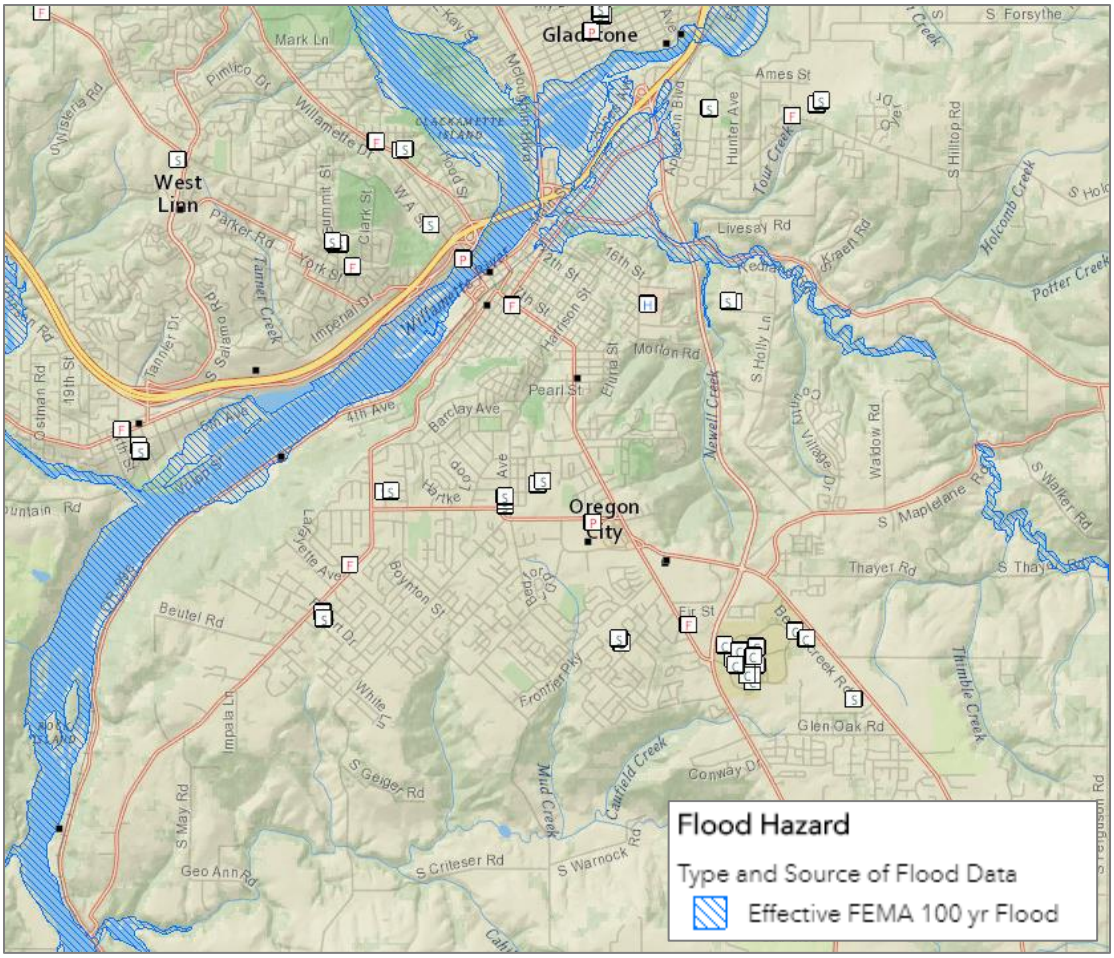
The HMAC determined that the City's probability for flood is **high** and that their vulnerability to flood is **moderate**. *These ratings did not change since the previous version of this NHMP addendum.*

Volume I, Section 2 describes the characteristics of flood hazards, history, as well as the location, extent and probability of a potential event. Portions of Oregon City have areas of floodplains (special flood hazard areas, SFHA). These include areas include along Willamette River, Clackamas River, and Abernethy Creek (Figure OC-4). Additional flood hazard maps are available via the City website: 100 Year Floodplain and 1996 Flood Area, Water Quality and Flood Management Areas. Other portions of Oregon City, outside of the mapped floodplains, are also subject to flooding from local storm water drainage. Not all flood prone

[11] DOGAMI, Earthquake regional impact analysis for Clackamas, Multnomah, and Washington Counties, Oregon (2018, O-18-02), Tables 12-8 and 12-9.
[12] Ibid, Tables 12-8 and 12-9.
[13] Ibid, Tables 12-10 and 12-11
[14] Ibid, Tables 12-10 and 12-11.

areas are subject to damage. Several valleys, such as the upper reaches of Abernethy Creek, are still in or near their natural state. Flooding of such areas causes no damage to human development and may help the riparian habitat.

Figure OC-4 Special Flood Hazard Area



Source: [Oregon HazVu: Statewide Geohazards Viewer (DOGAMI)]
Note: To view detail click the link above to access Oregon HazVu

Vulnerability Assessment

Due to insufficient data and resources, Oregon City is currently unable to perform a quantitative risk assessment for this hazard. Floods can have a devastating impact on almost every aspect of the community, including private property damage, public infrastructure damage and economic loss from business interruption. It is important for the City to be aware of flooding impacts and assess its level of risk. The City has been proactive in mitigating flood hazards by purchasing floodplain property.

The economic losses due to business closures often total more than the initial property losses that result from flood events. Business owners and their employees are significantly impacted by flood events. Direct damages from flooding are the most common impacts, but indirect damages, such as diminished clientele, can be just as debilitating to a business.

For mitigation planning purposes, it is important to recognize that flood risk for a community is not limited only to areas of mapped floodplains. Other portions of Oregon City

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

The Willamette and Clackamas Rivers both flooded in January 1997 and from December 28th, 2005 to January 1st, 2006 following severe winter storms. The high water caused bank erosion and cleanup was required at Clackamette Park, for which FEMA provided some funding.

From January 1st to 2nd, 2009 a severe winter storm dropped over 3.5 inches of rain over a 24-hour period. The event led to localized flooding, land movement, traffic delays, and sewer line back-ups. Sections of Meyers Road, Beavercreek Road, Linn Avenue, Abernethy Road, and Van Buren Street were closed because of the storm. Additional significant floods occurred in December 2015 and March 2017.

Finally, there is a rainfall pattern known as the "Pineapple Express" which brings very heavy and warm rains from the southwest. These warm rains begin their journey from parts of the Pacific near Hawaii, holding their heat and moisture until making landfall along the Oregon coast.

Most of the buildings affected by flooding are in the lowest part of the city, where the three waterways converge. The Floodplain Map shows 12.7 miles of the transportation network could be affected in a flood. For a list of facilities and infrastructure vulnerable to this hazard see the Community Assets section and Tables OC-5 through OC-7.

National Flood Insurance Program (NFIP)

FEMA updated the Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) in 2018 (effective January 19, 2018). Table OC-10 shows that as of July 2018, Oregon City has 38 National Flood Insurance Program (NFIP) policies in force. Of those, 24 are for properties that were constructed before the initial FIRM. The last Community Assistance Visit (CAV) for Oregon City was on April 26th, 2016. Oregon City's Class Rating within the Community Rating System (CRS) is 7. The table shows that the majority of flood insurance policies are for residential structures, primarily single-family homes. There has been a total of 18 paid claims for $1,467,600. The City complies with the NFIP through enforcement of their flood damage prevention ordinance and their floodplain management program.

The Community Repetitive Loss record for Oregon City identifies one (1) Repetitive Loss Properties (RL)[15] which is also considered a Severe Repetitive Loss Property (SRL)[16]. The SRL property is non-residential, located in zone A21, and has had two claims for a total of $51,162.53. For additional detail and a map of its general location see Volume I, Section 2 and Figure 2-13.

[15] 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.

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

Table OC-10 Flood Insurance Detail

	Clackamas County	Oregon City
Effective FIRM and FIS	6/17/2008	6/17/2008
InitialFIRM Date	-	2/15/1980
Total Policies	1,957	38
Pre-FIRM Policies	1,086	24
Policies by Building Type		
Single Family	1,761	16
2 to 4 Family	30	1
Other Residential	58	0
Non-Residential	9	0
Minus Rated A Zone	123	0
Insurance in Force	$541,833,400	$13,060,400
Total Paid Claims	590	18
Pre-FIRM Claims Paid	450	17
Substantial Damage Claims	83	3
Total Paid Amount	$20,830,662	$1,467,600
Repetitive Loss Structures	51	1
Severe Repetitive Loss Properties	4	1
CRS Class Rating	-	7
Last Community Assistance Visit	-	4/26/2016

Source: Information compiled by Department of Land Conservation and Development, July 2018.
Note: The portion of the cities of Portland and Tualatin that are within Clackamas County are not included in this table.

Mitigation Activities

Oregon City employs several mitigation strategies to reduce the city's risk to flood events. The city development code includes policies and regulations for flood prone areas including the Flood Management Overlay District (Chapter 17.42), stormwater master plans (Erosion Prevention and Sediment Control Planning and Design Manual, Drainage Master Plan, South End Basin Master Plan, Caulfield Basin Master Plan, and Park Place Basin Master Plan). Development review practices and conditions of development require developers to account for stormwater management onsite to reduce the risks of urban flooding in the future. Oregon City regularly inspects and maintains the stormwater facilities. Enclosed pipe sections and catch basins are routinely cleaned and inspected using the combination truck, and a regular street sweeping program reduces the amount of debris and contaminants entering the stormwater system. The Greater Oregon Watershed Council did plantings along Abernethy Creek. Sediment is regularly removed from culverts around the city to allow for better water flow. River bank stabilization and restoration work was done along the Willamette River at Jon Storm Park.

Please review Volume I, Section 2 for additional information on this hazard.

Landslide

The HMAC determined that the City's probability for landslide is **high** 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 addendum.*

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. The potential for landslide in Oregon City is high and the City's wastewater main lines, major water lines and fiber optic lines. The flooding of 1996 caused numerous landslide events in Oregon City. One of these events caused a sanitary sewer pump to begin sliding downhill. A report by Portland State University found that half of the 48 landslides that occurred in the region in 1996 were considered "natural," while the others were triggered by human activity. Oregon City experienced another series of landslides because of the December 28th, 2005 to January 1st, 2006 storm and flood on Trillium Drive, Morton Road, near the football field at Oregon City High School Jackson Campus, Newell Crest Drive and Newell Creek Village Apartments. In December 2015 landslides impacted the Forest Edge Apartment Complex, forcing the evacuation of all 41 apartments. Landslides in 2017 impacted Trillium Park, South End Road, Center Street, and OR-224.

Landslides destroy or damage anything on the sliding hillside or in the path of the slide. This includes buildings, houses and streets. Sometimes, a small amount of settlement occurs, giving the owner time to shore up or retrofit the building to prevent further damage. Many property owners in Oregon City have built retaining walls and replaced slide prone soils with rock to help prevent landslides. However, if an entire hillside fails, the buildings may be destroyed and the streets washed out or covered in debris.

Landslide susceptibility exposure for Oregon City is shown in Figure OC-6. Most of Oregon City demonstrates a moderate to high susceptibility to landslide exposure. Approximately 12% of Oregon City has very high or high and approximately 16% moderate, landslide susceptibility exposure.[17]

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

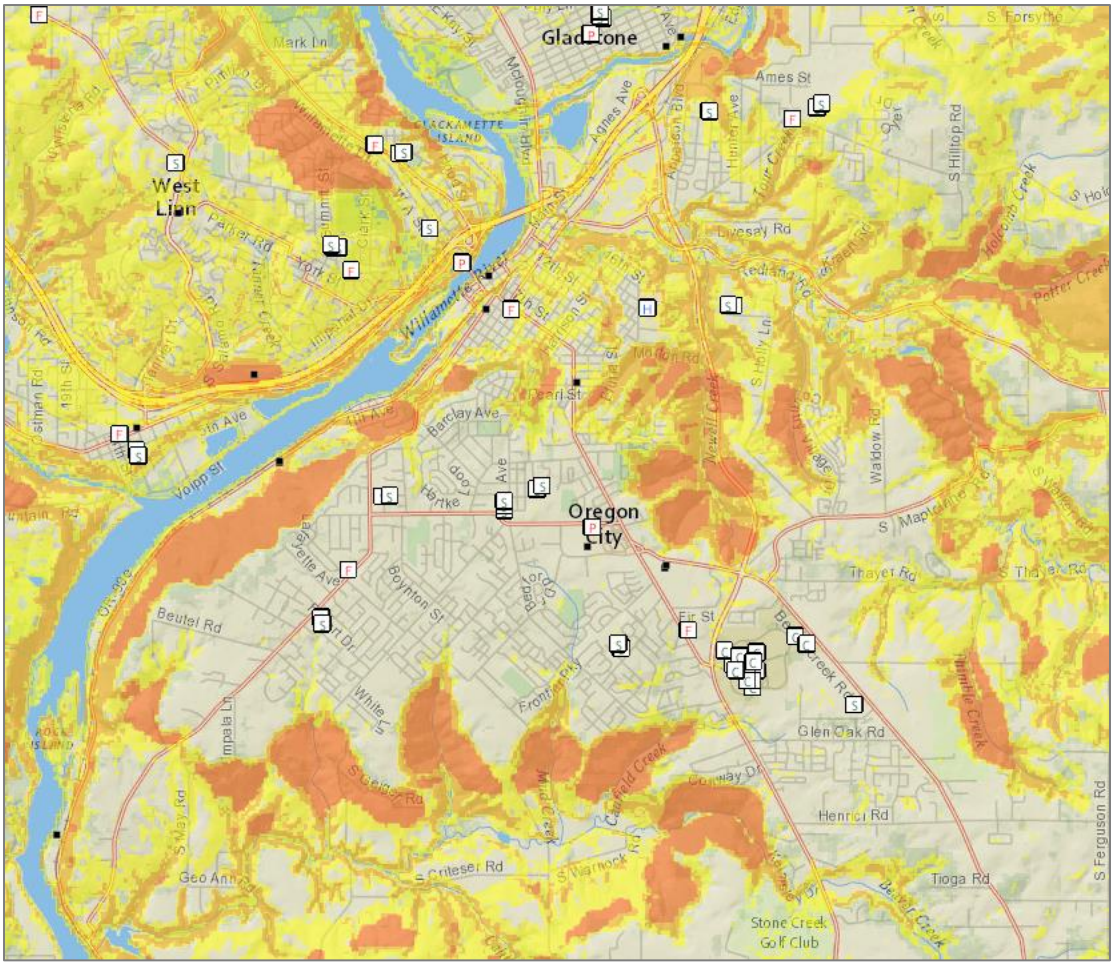
Due to insufficient data and resources, Oregon City is currently unable to perform a quantitative risk assessment for this hazard. However, DOGAMI completed a statewide landslide susceptibility assessment in 2016 (O-16-02), general findings from that report are provided above and within Figure OC-5. Additional landslide hazard maps are available via the City website: Geological Hazards Map (adopted by ordinance 10-1003), Slope Map, and DOGAMI's Landslide Inventory Maps.

Potential landslide-related impacts are adequately described within Volume I, Section 2 and include infrastructural damages, economic impacts (due to isolation and/or arterial road closures), property damages and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Clackamas County and

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

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 OC-5 through OC-7.

Figure OC-5 Landslide Susceptibility Exposure



Low — **Landsliding unlikely.** Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low.

Moderate — **Landsliding possible.** Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.

High — **Landsliding likely.** Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.

Very High — **Existing landslides** Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Source: Oregon HazVu: Statewide Geohazards Viewer (DOGAMI)
Note: To view detail click the link above to access Oregon HazVu

The most common type of landslides in Clackamas County are slides caused by erosion and flooding. 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.

Mitigation Activities

Oregon City works to mitigate future landslide hazards. Oregon City uses percent slope as an indicator of hill slope stability. The city uses a 25% or greater threshold to identify potentially unstable hill slopes. Approximately, 518 acres in the city exceeds this 25% slope threshold (about 8.25% of the land in Oregon City). The city development code includes policies and regulations for landslide prone areas including Chapter 15.48 (Grading, Filling, and Excavating), Chapter 17.44 (US Geologic Hazards), and Chapter 17.47 (Erosion and Sediment Control).

After the 1996 landslide events, 20 of the 48 landslides were repaired by the city, meaning reconstruction or mitigation took place. These fixes varied and included constructing retaining walls, installing rockfill, and moving structures. The sanitary sewer pump station that began sliding downhill had seismic isolation piles installed under the foundation of the building to mitigate future slides.

Repairs and mitigation after the December 28th, 2005 to January 1st, 2006 landslides included:

- The storm sewer manhole that failed on Trillium Drive was repaired. The city installed monitoring wells with inclinometers to allow the city to continue to monitor the slope.
- The owner of the Morton Road apartment building installed a crib wall.
- A homeowner on Newell Crest Drive constructed a retaining wall, costing approximately $100,000.
- Newell Creek Apartments had the most mitigation work done. The city temporarily repaired one of the water lines and permanently abandoned the waterline on the slope and reconfigured the second water line. The repaired line that remained at risk was later replaced with a new water line with flexible couplings at the joints. The city required relocation and reconstruction of the apartment complex's private sanitary sewer pump station.

The city additionally has many ongoing mitigation actions including a water pipe line leak detection system and annual assessments of slide hazard areas.

Please review Volume I, Section 2 for additional information on this hazard.

Severe Weather

Severe weather in can account for a variety of intense and potentially damaging weather events. These events include windstorms and winter storms. The following section describes the unique probability and vulnerability of each identified weather hazard. Other more abrupt or irregular events such as hail are also described in this section.

Extreme Heat

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

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 we have temperatures greater than or equal to 90-degrees Fahrenheit and 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 Oregon City has not experienced any life-threatening consequences from the few extreme heat events in the past, though with the changing climate expect to see more extreme heat events with potentially greater risk to the City's population.

Please review Volume I, Section 2 for additional information on this hazard.

Windstorm

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

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. On December 11th, 1995, a windstorm hit Oregon. Oregon City was one of the most severely damaged cities in Clackamas County. Winds tore off roofs from buildings, uprooted or damaged trees, and knocked out electrical and telephone service. Because windstorms typically occur during winter months, they are sometimes accompanied by ice, freezing rain, flooding and very rarely, snow. Other severe weather events that may accompany windstorms, including thunderstorms, hail, lightning strikes and tornadoes are generally negligible for Oregon City. Wind storms also impacted Oregon City in December 2015 and during December 2016 and January 2017 including cold weather and damaging winds.

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 causes localized urban flooding.

Please review Volume I, Section 2 for additional information on this hazard.

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 decrease and vulnerability rating did not change since the previous version of the 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.

Major winter storms can and have occurred in the Oregon City area. From January 9th to 12th, 1998, a severe winter storm included freezing rain and snow and was accompanied by high winds for two days. Most of the city lost power due to downed electrical lines and malfunctioning transformers. One emergency shelter was opened for those who could not stay in their homes. Off-duty firefighters were called in to help respond to the increased number of calls. Another winter storm happened in January 2009, which resulted in over 3.5 inches of rain in a 24-hour period. The snow and rain led to localized flooding, land movement, traffic delays, and sewer line back-ups. Sections of Meyers Road, Beavercreek Road, Linn Avenue, Abernethy Road, and Van Buren Street were closed due to the effects of the storm. The storm led to significant power outages, eight water main breaks, and hazardous road conditions. The City contracted forces to assist in snow removal efforts. Another winter storm impacted the City during December 2016 and January 2017 including cold weather and damaging winds.

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.

Vulnerability Assessment

Due to insufficient data and resources, Oregon City 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 Tables OC-5 through OC-7.

Mitigation Activities

Mitigating severe weather can be difficult because storms affect all areas of the city, but Oregon City has made progress to reduce the effects of storms. Oregon City has a snow route priorities map. This map informs Public Works which roads should be cleared first and what roads require closure. The plan even includes sign placement procedures. The city has uses a combination of sand and a de-icing compound for use on its streets. The city has installed emergency generators for sanitary sewer pump stations in susceptible hazard areas. In winter storms, it is difficult for the city to bring portable generators to those sites. Most utilities are underground and all new utilities are required to be undergrounded, but in case of power outages the city's critical facilities have back up power generation. Clackamas County Public Health operates heating and cooling centers for the region.

Please review Volume I, Section 2 for additional information on this hazard.

Volcanic Event

The HMAC determined that the City's probability for a volcanic event is **low** (which is the same as the County's rating) and that their vulnerability to a volcanic event is **low**. *These ratings did not change since the previous version of this NHMP addendum.*

Volume I, Section 2 describes the characteristics of volcanic hazards, 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 Oregon City as well. Oregon City is very unlikely to experience anything more than volcanic ash during a volcanic event.

Vulnerability Assessment

Due to insufficient data and resources, Oregon City 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 Tables OC-5 through OC-7.

Due to Oregon City'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.

Mitigation Activities

The existing volcano hazard mitigation activities are conducted at the county, regional, state, and federal levels and are described in the Clackamas County NHMP.

Please review Volume I, Section 2 for additional information on this hazard.

Wildfire

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

The 2017 Clackamas County Community Wildfire Protection Plan (CWPP) was completed in May 2018. The 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: https://www.clackamas.us/dm/CWPP.html. Fire protection in Oregon City is provided by Clackamas Fire District #1, information specific to the fire district and Oregon City is found in the following chapter: Chapter 10.3: Clackamas Fire District #1.

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. Oregon City does not regularly experience wildfire within City limits, but the city has abundant wooded areas that are a concern in the case of a wildfire event. However, a major fire broke out near Rosemont Ridge in September 1967. The fire burned 300 acres and cut telephone

and electrical service, but fire fighters were able to save all threatened homes. Less than two weeks later another fire destroyed 500 acres. This fire took the efforts of over 150 firefighters to save the homes.

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 Oregon City, 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. In Oregon City most instances of fire have been started by the railroads and I-5 but the fires have been small enough to contain quickly and easily.

The forested hills within, and surrounding Oregon City are interface areas. One area that's particularly susceptible to fires is the Canemah Bluffs area. This area has heavy tree coverage and a dense neighborhood sits atop a steep wooded area, increasing the threat of wildfire. In August 2005, a wildfire on the Canemah Bluffs burned down a non-occupied historic structure. Another fire began in this same area in 2007. The 2007 fire began at Highway 99E and spread up the rock cliff face. Two additional areas that are particularly susceptible to wildfires: Newell Creek Canyon and the Waterboard Park. Newell Creek Canyon is open space located outside the Metro UGB and is not part of a master plan. This area is a major wildland urban interface and has the potential for a catastrophic fire. Transients often have campfires in this area, creating a potential for fire to start. Highway 213 runs through this area and a cigarette thrown from a car is another potential source of ignition. If a fire were to break out along the highway, firefighters would have to fight it from the highway as there is limited access to the canyon. The Barclay Hills residential development on the west side of the canyon has very poor access, with only one way in and one way out. Waterboard Park is located along the bluff below Promontory Avenue. This area is considered a charter park, meaning trees and brush cannot be cut to reduce fuel load. Like Newell Creek Canyon, Waterboard Park is home to many transients and campfires pose a threat to igniting a fire. High and medium Priority Communities at Risk (CARs) within the City include: Canemah Bluffs (high) and Holcomb (medium).[18]

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.[19] 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

Due to insufficient data and resources, Oregon City is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. For a list of facilities and

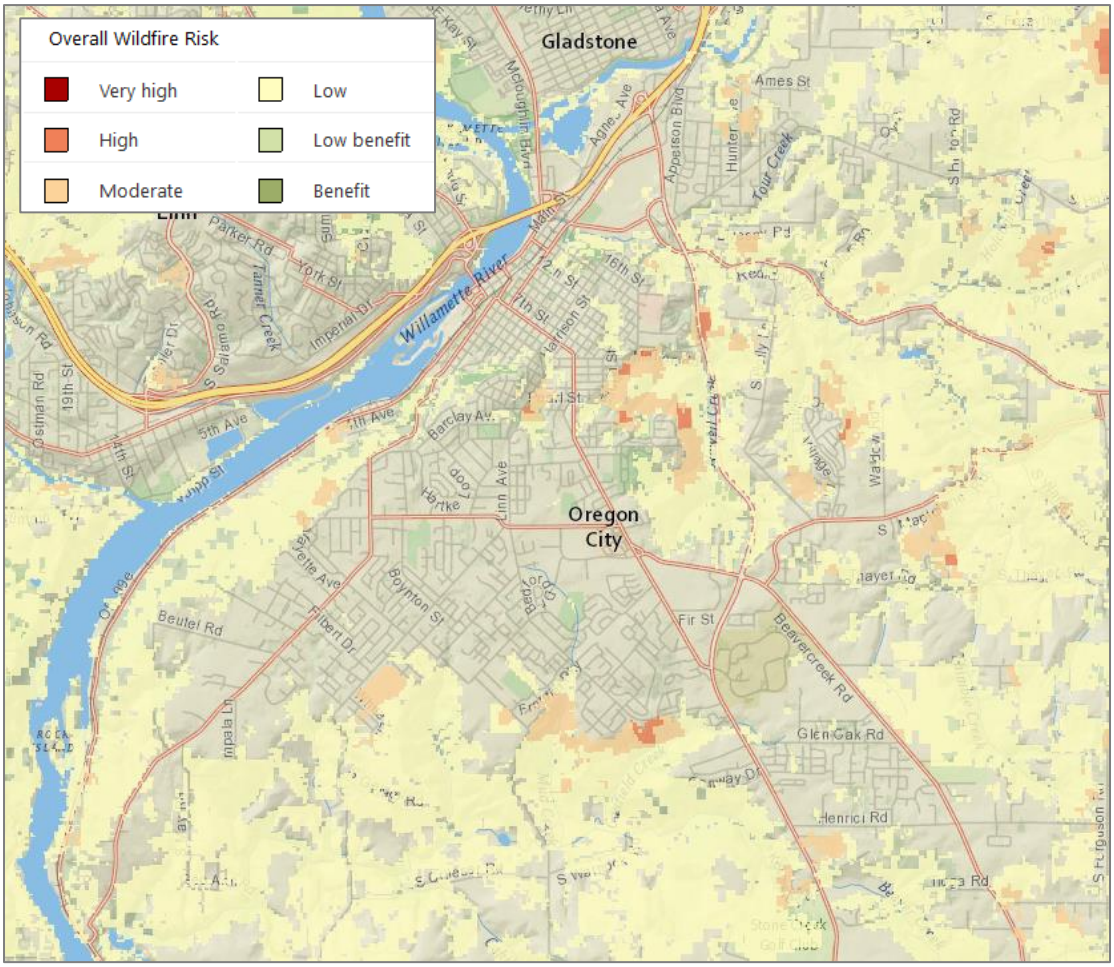
[18] Clackamas County Community Wildfire Protection Plan, *Clackamas Fire District #1* (2018), Table 10.3-1.

[19] Oregon Wildfire Risk Explorer, date accessed November 19, 2018.

infrastructure vulnerable to this hazard see the Community Assets section and Tables OC-5 through OC-7.

The potential community impacts, and vulnerabilities described in Volume I, Section 2 are generally accurate for the City as well. Oregon City's fire response is addressed within the CWPP which assesses wildfire risk, maps wildland urban interface areas, and includes actions to mitigate wildfire risk. Figure OC-6 shows overall wildfire risk in Oregon City. 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).

Figure OC-6 Overall Wildfire Risk



Source: Oregon Wildfire Risk Explorer, date accessed November 19, 2018.

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).

Mitigation Activities

Oregon City uses several mitigation tools to reduce the city's risk to wildfires. Oregon City's Fire Department, Clackamas County Fire District #1, has a Fire Prevention Division dedicated

to protecting and preserving life and property through education, engineering, and enforcement. The Fire Prevention Division offers numerous education opportunities including school programs, public presentations, media events, and safety fairs. They review pre-construction plans and develop fire codes. Additionally, this division inspects buildings for fire code compliance, enforces open burning regulations, and offers juvenile fire setter counseling and follow-up.

The Clackamas Fire District #1 (CFD #1) serves the cities of Happy Valley, Johnson City, Milwaukie, and Oregon City and the unincorporated areas of Barton, Beavercreek, Boring, Carus, Carver, Central Point, Clackamas, Clarkes, Damascus, Eagle Creek, Highland, Hillsview, Holcomb, Kelso, Jennings Lodge, Oak Grove, Redland, South End, Sunnyside, and Westwood. For more information on the fire district see their addendum.

Please review the 2017 Clackamas County Community Wildfire Protection Plan (CWPP), Volume I, Section 2, and the Clackamas Fire District #1 Addendum in Volume II for additional information on this hazard.

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ATTACHMENT A: ACTION ITEM FORMS

ACTION ITEM FORMS

** - Priority Action Item*

Note: The HMAC decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity.

Summary of Action Changes

Below is a list of changes to the action items since the previous plan.

Previous NHMP Actions: Completed

Multi-Hazard Action #8 (2012): "Update and maintain the Oregon City Emergency Operations Plan to provide a comprehensive multi-hazard emergency response program" is considered complete (last updated in 2017). In addition, the plan is routinely updated and the HMAC does not consider it necessary to retain the action in the mitigation plan that deals with ongoing hazards response planning.

See 2018 status identified in each action for activities that have been completed since the previous plan.

Previous NHMP Actions: Removed

Multi-Hazard Action #4 (2012): "Continue to update and improve hazard assessments in the Oregon City Natural Hazards Mitigation Plan Addendum" was removed from the list since it was determined by the steering committee that this is a function of their Implementation and Maintenance Plan and did not need to be included as an action.

Multi-Hazard Action #5 (2012): "Identify and pursue funding opportunities to develop and implement hazard mitigation activities" was removed from the list since it was determined by the steering committee that this is a function of their Implementation and Maintenance Plan and did not need to be included as an action.

Flood Action ST-FL #2 (2012): "Continue to implement and enhance the flood public education program designed to inform local residents about:" was removed from the list of actions. This action is included within MH #3.

Landslide Action ST-LS #3 (2012): "Educate the community about landslides, their associated risks and ways of reducing vulnerability" was removed from the list of actions. This action is included within MH #3.

Wildfire Action WF #1 (2012): "Enhance outreach and education programs aimed at mitigating wildfire hazards and reducing or preventing public exposure to hazards" was removed from the list of actions. This action is included within MH #3.

Note: 2012 Actions MH #3, MH #5, MH #7, ST-FL #1, ST-FL #3, LT-FL #1, ST-LS #1, and ST-LS #2 were renumbered to 2019 Actions MH #2, MH #3, MH #4, FL #1, FL #2, FL #3, LS #1, and LS #2 respectively.

New NHMP Actions (2019):

- Wildfire Action #3

See action item forms below for detail.

Action Item Forms

Each action item has a corresponding action item worksheet describing the activity, identifying the rationale for the project, identifying potential ideas for implementation, and assigning coordinating and partner organizations. The action item worksheets can assist the community in pre-packaging potential projects for grant funding. The worksheet components are described below.

ALIGNMENT WITH EXISTING PLANS/POLICIES

The Clackamas County NHMP includes a range of action items that, when implemented, will reduce loss from hazard events in the County, participating cities, and special districts. Within the plan, FEMA requires the identification of existing programs that might be used to implement these action items. The City addresses statewide planning goals and legislative requirements through its comprehensive land use plan, capital improvements plan, mandated standards and building codes. To the extent possible, the City will work to incorporate the recommended mitigation action items into existing programs and procedures. Each action item identifies related existing plans and policies.

STATUS/RATIONALE FOR PROPOSED ACTION ITEM

Action items should be fact-based and tied directly to issues or needs identified throughout the planning process. Action items can be developed at any time during the planning process and can come from several sources, including participants in the planning process, noted deficiencies in local capability, or issues identified through the risk assessment. The rationale for proposed action items is based on the information documented in Section 2. The worksheet provides information on the activities that have occurred since the previous plan for each action item.

IDEAS FOR IMPLEMENTATION

The ideas for implementation offer a transition from theory to practice and serve as a starting point for this plan. This component of the action item is dynamic, since some ideas may prove to not be feasible, and new ideas may be added during the plan maintenance process. Ideas for implementation include such things as collaboration with relevant organizations, grant programs, tax incentives, human resources, education and outreach, research, and physical manipulation of buildings and infrastructure.

COORDINATING (LEAD) ORGANIZATION:

The coordinating organization is the public agency with the regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring and evaluation.

INTERNAL AND EXTERNAL PARTNERS:

The internal and external partner organizations listed in the Action Item Worksheets are potential partners recommended by the project HMAC but not necessarily contacted during the development of the plan. The coordinating organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and/or resources toward completion of the action items.

Internal partner organizations are departments within the City or other participating jurisdiction that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization.

External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations.

PLAN GOALS ADDRESSED:

The plan goals addressed by each action item are identified as a means for monitoring and evaluating how well the mitigation plan is achieving its goals, following implementation.

TIMELINE:

All broad scale action items have been determined to be ongoing, as opposed to short-term (0 to 2 years) or long-term (3 or more years). This is because the action items are broad ideas, and although actions may be implemented to address the broad ideas, the efforts should be ongoing.

POTENTIAL FUNDING SOURCE

Where possible potential funding sources have been identified. Example funding sources may include: Federal Hazard Mitigation Assistance programs, state funding sources such as the Oregon Seismic Rehabilitation Grant Program, or local funding sources such as capital improvement or general funds. An action item may include several potential funding sources.

ESTIMATED COST

A rough estimate of the cost for implementing each action item is included. Costs are shown in general categories showing low, medium, or high cost. The estimated cost for each category is outlined below:

Low - Less than $50,000
Medium - $50,000 – $100,000
High - More than $100,000

Multi-Hazard #1

Proposed Action Item:	Alignment with Plan Goals:
Maintain Certification and coordinate with Clackamas County and regional partners to identify and coordinate building officials that are qualified to conduct damage assessments.	Protect Life and Property; Augment Emergency Services; Encourage Partnerships for Implementation

Alignment with Existing Plans/Policies:

2018 Status/Rationale for Proposed Action Item:
• 2018 Status: Oregon City continues to have trained personnel in the ATC 20 and 45 courses, which focus on the basic building assessments after hazard events.

Ideas for Implementation:
• Maintain certification in the ATC 20 and 45 courses.

Coordinating Organization:	Oregon City Emergency Management

Internal Partners:	External Partners:
Building	Clackamas County, Clackamas Fire District #1

Potential Funding Sources:	Estimated cost:	Timeline:
General Fund	Low	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing action item
Priority:	Medium

Multi-Hazard #2

Proposed Action Item:	Alignment with Plan Goals:
Integrate the goals and action items from the Oregon City Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.	Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Encourage Partnerships for Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:
Comprehensive Plan, Zoning Ordinance, Emergency Operations Plan

2018 Status/Rationale for Proposed Action Item:
• The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Incorporating natural hazards plans into comprehensive plans, local ordinances, and land-use regulations will ensure that communities implement the proper mitigation measures for their community. • 2018 Status: The City last amended their development code in 2017. The floodplain ordinance was last updated in 2002 (new FIRMs are preliminary and effective maps are expected January 2019). The City updated their comprehensive plan in April 2012.

Ideas for Implementation:
• Use the mitigation plan to help the City's Comprehensive Land Use Plan meet State Land Use Planning Goal 7, designed to protect life and property from natural disasters and hazards through planning strategies that restrict development in areas of known hazards; • Use zoning codes to regulate development in hazard-prone areas; • Integrate the city's mitigation actions into the current emergency operations plan and capital improvement plans (where appropriate); • Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant at the state level; • Use citizen input for the creation of appropriate ordinances; and • Use the natural hazard mitigation planning to learn how to better integrate the NHMP into existing documents and programs.

Coordinating Organization:	Community Development

Internal Partners:	External Partners:
Public Works, City Commission	Department of Land Conservation and Development, Department of Geology and Mineral Industries, Oregon Department of Transportation, Department of Environmental Quality

Potential Funding Sources:	Estimated cost:	Timeline:
General Fund, DLCD Technical Assistance Grant	Low to Moderate	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing action item
Priority:	Medium

Multi-Hazard #3

Proposed Action Item	Alignment with Plan Goals:
Develop, enhance, and implement education programs aimed at mitigating natural hazards, and reducing risk.	Protect Life and Property; Augment Emergency Services; Encourage Partnerships for Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:

2018 Status/Rationale for Proposed Action Item:
• Conducting public outreach campaigns raises awareness about natural hazards and helps illustrate what residents and businesses can do to reduce the impact of a natural disaster on their properties, thereby reducing the impact of natural hazards on Oregon City. • The Disaster Mitigation Act of 2000 requires that communities continue to involve the public beyond the original planning process [201.6(c)(4)(ii)]. Developing public education programs for hazard risk mitigation would be a way to keep the public informed of, and involved in, the county's actions to mitigate hazards. • 2018 Status: The City maintains a CERT, and utilizes the city's website to provide information on natural hazards: https://www.orcity.org/community/emergency-preparedness and hazards mitigation: https://www.orcity.org/publicworks/natural-hazards-mitigation-plan

Ideas for Implementation:
• Maintain hazard related information and public information materials and disseminate to public through existing resources (newsletter, Trail News, website, social media, etc.); • Conduct public education as hazard seasons approach; • Target neighborhood associations to sponsor CERT teams; • Add emergency preparedness and response curriculum to school programs; • Partner with Clackamas County and other jurisdictions to develop public education flyers for all hazards; • Utilize Community Rating System publications for guidance on preparing effective public information; • Include hazard information on the city website; and • Include insurance information in public outreach and education materials.

Coordinating Organization:	Community Development

Internal Partners:	External Partners:
Public Works	Clackamas County, Community Organizations Active in Disaster (COAD), Clackamas Fire District #1

Potential Funding Sources:	Estimated cost:	Potential Funding Sources:
General Fund	Low	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing action item
Priority:	Medium

Multi-Hazard #4

Proposed Action Item:	Alignment with Plan Goals:
Improve vegetation management throughout Oregon City.	Augment Emergency Services; Promote Public Awareness

Alignment with Existing Plans/Policies:
Parks Master Plan

2018 Status/Rationale for Proposed Action Item:
• Landscaping and vegetation make a difference in mitigating the impacts of natural hazards. Trees break the force of the wind and stabilize the soil. Wetlands absorb much of the overflow from stream channels. Fire-resistant vegetation can retard the spread of wildfires toward vulnerable buildings. Limiting or regulating the amount of vegetation cleared off a hillside lot reduces the risk of increasing the number of landslide-prone areas in a community. Planting vegetation or maintaining slope terraces can also reduce slope- runoff. Planners can use landscaping requirements to preserve or enhance he protection such natural features afford. These requirements may be part of site plan reviews or a separate set of zoning regulations and environmental performance standards. • 2018 Status: City properties actively managed, have a tree mitigation program (used for Friends of Trees), enforce requirements.

Ideas for Implementation:
• Partner with Union Pacific and ODOT to control vegetation along transportation corridors; • Identify appropriate practices for eliminating English ivy and other invasive species; • Maintain healthy urban canopy; • Maintain vegetation coverage for slope stability; • Identify hazardous trees for remediation or removal; • Develop a written set of procedures to minimize damage from wildfires erosion, and downed power lines; and • Coordinate with Greater Oregon City Watershed Council and others.

Coordinating Organization:	Community Services

Internal Partners:	External Partners:
Community Development, Public Works, Parks and Recreation, Code Enforcement	Clackamas Fire District #1, Oregon Department of Forestry, US Forestry Service, Clackamas County, Great Oregon City Watershed Council, Union Pacific Railroad, Oregon Department of Transportation

Potential Funding Sources:	Estimated cost:	Timeline:
General Fund, Parks SDC	Low to Moderate	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing action item
Priority:	Medium

Earthquake #1*

Proposed Action Item:	Alignment with Plan Goals:
Conduct seismic evaluations on identified community assets and 'high risk' school and emergency service buildings and implement appropriate structural and non-structural mitigation strategies.	Protect Life and Property; Augment Emergency Services; Encourage Partnerships for Implementation

Alignment with Existing Plans/Policies:

2018 Status/Rationale for Proposed Action Item:

- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that are being considered by the community to reduce the effect that natural hazards will have on the community [201.6(c)(3)(ii)]. Developing and implementing programs to reduce the potential for earthquakes to cause damage can assist a community in mitigating its overall risk to earthquakes.
- Pre-disaster mitigation strategies will reduce post-disaster response needs by lessening life loss, injury, damage, and disruption.
- Refer to risk assessment, and DOGAMI's rapid visual assessment scores
- 2018 Status: Many buildings in Oregon City have been seismically upgraded including: Carnegie Center, CFD John Adams Fire Station #15, CFD Hilltop Fire Station #16, the 10.5 million-gallon Mountainview drinking water reservoir, and numerous buildings at Clackamas Community College. New public buildings built for seismic activity include Oregon City High School and all water pump stations. Additionally, new water lines with flexible couplings at the joints were installed near the Newell Creek Apartments. A $158 million bond was passed in 2018 to replace Gardiner Middle School and renovate Ogden Middle School.

Ideas for Implementation:

- Obtain funding to perform seismic evaluations;
- Conduct seismic evaluations on identified community assets (including shelters) for implementing appropriate structural and non-structural mitigation strategies;
- Prioritize seismic upgrades based on criticality of need and population served;
- Seismically retrofit critical government facilities to guarantee continuous operation during and after a natural disaster;
- Partner with appropriate organizations to implement seismic upgrades; and
- Create damage assessment procedures.

Coordinating Organization:	Oregon City Emergency Management

Internal Partners:	External Partners:
Community Development, Public Works	DOGAMI, Clackamas Fire District #1, Clackamas County

Potential Funding Sources:	Estimated cost:	Potential Funding Sources:
General Fund, Seismic Rehabilitation Grant Program, Hazard Mitigation Assistance Grants	Low to Moderate	☐ Short Term (0-2 years) X Long Term (2-4+ years) ☐ Ongoing

Form Submitted by:	Existing action item
Priority:	Medium

** - High Priority Action Item*

Flood #I

Proposed Action Item:	Alignment with Plan Goals:
Promote and protect the use of naturally flood prone open space or wetlands as flood storage areas.	Protect Life and Property; Enhance Natural Systems; Encourage Partnerships for Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:
Flood Ordinance; Zoning Code, FEMA FIRMs, Comprehensive Plan, Parks and Recreation Master Plan

2018 Status/Rationale for Proposed Action Item:
• One of the goals of the National Flood Insurance Program is to protect the natural and beneficial functions of floodplains. Natural and beneficial floodplain functions include both the natural infiltration capacities of floodplains, as well as minimizing the pollutants that can enter waters from floodplain development activities. A number of options local governments can choose from are: 1) Prohibit all activities in the floodplain that may be hazardous to public health or water quality (e.g. septic systems, storage of hazardous materials) 2) Require new floodplain developments to avoid or minimize disruption to stream channels and stream banks 3) Adopt regulations pursuant to a Habitat Conservation Plan approved by the US Fish and Wildlife Service or the National Marine Fisheries Service. • 2018 Status: The city continues to monitor the water quality and volume. The action item wording was updated.

Ideas for Implementation:
• Develop and implement flood protection alternatives for properties within and adjacent to the 100-year floodplain by considering city codes related to the floodplain. • Gain support for protecting naturally flood prone open space by educating the public of its importance

Coordinating Organization:	Community Development

Internal Partners:	External Partners:
Public Works	Clackamas Soil and Water Conservation District, Division of State Lands, Johnson Creek Watershed Council, Clackamas River Basin Council

Potential Funding Sources:	Estimated cost:	Timeline:
General Fund, Capital Funds, FEMA HMA, OWEB	Low to High	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

Flood #2

Proposed Action Item:	Alignment with Plan Goals:
Continue participating in the National Flood Insurance Program and develop strategies to reduce property damage and related financial impacts due to flooding.	Protect Life and Property; Enhance Natural Systems; Encourage Partnerships for Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:

Flood Ordinance; Zoning Code, FEMA FIRMs, Comprehensive Plan

2018 Status/Rationale for Proposed Action Item:

- The National Flood Insurance Program provides communities with federally backed flood insurance to homeowners, renters, and business owners, if communities develop and enforce adequate floodplain management ordinances. The benefits of adopting NFIP standards for communities are a reduced level of flood damage in the community and stronger buildings that can withstand floods.
- The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Continued participation in the NFIP will help reduce the level of flood damage to new and existing buildings in communities while providing homeowners, renters and business owners additional flood insurance protection.
- 2018 Status: The city continues to comply with the NFIP. New Flood Insurance Rate Maps (FIRMs). The City currently has a CRS Class 7 rating.

Ideas for Implementation:

- Continue to develop strategies to improve the city's current rating in the National Flood Insurance Program's Community Rating System;
- Community Assistance Visits (CAV) are scheduled visits to communities participating in the NFIP for the purpose of: 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered. Actively participate with DLCD and FEMA during Community Assistance Visits.
- Assess the floodplain ordinances to ensure they reflect current flood hazards and situations and meet NFIP requirements.
- Mitigate areas that are prone to flooding and/or have the potential to flood.

Coordinating Organization:	Community Development

Internal Partners:	External Partners:	
Public Works	Department of Land Conservation and Development; Association of State Floodplain Managers	
Potential Funding Sources:	**Estimated cost:**	**Timeline:**
General Fund	Low	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

Flood #3*

Proposed Action Item:	Alignment with Plan Goals:
Complete periodic updates of the Surface Water Management Master Plan.	Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Encourage Partnerships for Implementation

Alignment with Existing Plans/Policies:
Stormwater Master Plans, Flood Ordinance; Zoning Code, FEMA FIRMs, Comprehensive Plan

2018 Status/Rationale for Proposed Action Item:
• The Surface Water Management Master Plan developed Capital Improvement Projects to address deficiencies in the stormwater system; • The Surface Water Management Master Plan promotes proper watershed management; and • Stormwater management is a key element in maintaining and enhancing a community's livability. There is a direct link between stormwater and a community's surface and ground waters. Protecting these waters is vital for a great number of uses, including fish and wildlife habitat, recreation, and drinking water. • 2018 Status: The city expects the Surface Water Management Master Plan to be completed in 2019.

Ideas for Implementation:
• Identify staff or community members to lead participation efforts.

Coordinating Organization:	Public Works

Internal Partners:	External Partners:
Community Development	Clackamas County Water Environment Services, METRO, Department of Environmental Quality, Department of Land Conservation and Development, Department of State Lands

Potential Funding Sources:	Estimated cost:	Potential Funding Sources:
General Fund	Moderate	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

** - High Priority Action Item*

Landslide #1*

Proposed Action Item:	Alignment with Plan Goals:
Continue to implement municipal codes and policies mitigating future landslide damage.	Protect Life and Property; Enhance Natural Systems; Encourage Partnerships for Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:

U.S. Geologic Hazards (Chapter 17.44), Erosion and Sediment Control (Chapter 17.47), Natural Resource Overlay Zone (Chapter 17.49), Comprehensive Plan

2018 Status/Rationale for Proposed Action Item:

- The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Developing and implementing programs to reduce the potential for landslides to cause damage can assist a community in mitigating its overall risk to landslide events.
- 2018 Status: Through city code 17.44, Oregon City's Overlay District has been greatly expanded.

Ideas for Implementation:

- Projects should be carefully engineered so:
  - The most appropriate measures are used;
  - Environmental impacts are avoided;
  - There are no adverse impacts on other properties.
- Obtain funding to be engaged in more pro-active bank stabilization projects;
- Limit construction in known landslide areas;
- Regular water distribution system leak detection in geologic hazard areas.

Coordinating Organization:	Public Works

Internal Partners:	External Partners:
Community Development	DOGAMI, Oregon Department of Transportation

Potential Funding Sources:	Estimated cost:	Potential Funding Sources:
General Fund, Capital Funds	Low	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

** - High Priority Action Item*

Landslide #2

Proposed Action Item:	Alignment with Plan Goals:
Maintain an inventory of streets and properties threatened by landslides.	Protect Life and Property; Enhance Natural Systems; Encourage Partnerships for Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:

U.S. Geologic Hazards (Chapter 17.44), Erosion and Sediment Control (Chapter 17.47), Natural Resource Overlay Zone (Chapter 17.49), Comprehensive Plan

2018 Status/Rationale for Proposed Action Item:

- The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)]. Developing an inventory of landslide areas can help a community identify which streets might be more vulnerable to damage. Such information can help a community in better identifying and prioritizing projects that can assist a community in mitigating its overall risk to landslides.
- 2018 Status: City adopted new maps. DOGAMI completed a landslide susceptibility report in 2016 using LiDAR (O-16-02); the data from the report is available to the City of Oregon City.

Ideas for Implementation:

- Conduct a study to identify appropriate mitigation strategies for problem areas including buildings and infrastructure in the problem areas;
- Develop public information to emphasize economic risk when building on potential or historical landslide areas;
- Update the landslide hazard map when LIDAR data becomes available; and
- Review the planning and building codes and make updates or changes, if necessary.

Coordinating Organization:	Mapping/GIS

Internal Partners:	External Partners:
Public Works, Community Development	DOGAMI, USGS, Clackamas County GIS

Potential Funding Sources:	Estimated cost:	Timeline:
Capital Funds	Low	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

Severe Weather #1

Proposed Action Item:	Alignment with Plan Goals:
Reduce frequency and duration of power outages from the severe wind and winter storm hazards where possible.	Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Encourage Partnerships & Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:

2018 Status/Rationale for Proposed Action Item:

- The Disaster Mitigation Act of 2000 requires communities to identify and analyze a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with emphasis on new and existing buildings and infrastructure[201.6(c)(3)(ii)]. Developing and implementing programs to reduce the potential for wind and winter storms to cause power outages can assist a community in mitigating its overall risk to wind and winter storms.
- 2018 Status: This is a regular activity of the City and PGE. All new power lines are required to be underground.

Ideas for Implementation:

- Reduce power outages by partnering with PGE to obtain funding to bury power lines subject to frequent failures;
- Encourage burial of power lines for existing development;
- Ensure that there are back up underground lines to major businesses & employers;
- Develop partnerships to implement programs to keep trees from threatening lives, property, and public infrastructure;
- Continue regular tree trimming practices;
- Partner with PGE to continue hazardous tree inventory and mitigation programs;
- Create sheltering programs; and
- Promote safe installation and use of generators.

Coordinating Organization:	Public Works

Internal Partners:	External Partners:	
Community Development	PGE, Bonneville Power Administration, private landowners	
Potential Funding Sources:	**Estimated cost:**	**Timeline:**
Capital Funds	Low to High	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

Wildfire #1*

Proposed Action Item:	Alignment with Plan Goals:
Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.	Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Encourage Partnerships & Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:
Clackamas County Community Wildfire Protection Plan (2018)
2018 Status/Rationale for Proposed Action Item:
The wildfire mitigation action items provide direction on specific activities that organizations and residents in Oregon City can take to reduce wildfire hazards. 2018 Status: CWPP updated in 2018.
Ideas for Implementation: CWPP Identified Focus Areas and Priority Actions
Wildfire Risk Assessment (Ch. 4): 1. Maintain and update the Fuels Reduction (FR) and Communities at Risk (CAR) maps and databases. 2. Continue to track structure vulnerability data throughout the County through structural triage assessments. 3. Update the Overall Wildfire Risk Assessment as new data becomes available. Hazardous Fuels Reduction and Biomass Utilization (Ch. 5): 1. Develop and maintain an inventory of potential and successful FR projects by meeting with parks and natural lands managers quarterly. 2. Continue securing funding to implement projects/hire seasonal ODF staff. Emergency Operations (Ch. 6): 1. Develop and FDB Communications Works Group. 2. Conduct a Conflagration Exercise. Education and Community Outreach (Ch. 7): 1. Develop Firewise toolkit for CAR's. 2. Create incentives for fuels reduction. 3. Update and distribute the Burn Permitting and Fire Restrictions Brochure. 4. Continue to improve address signage throughout the County. Structural Ignitability Policies and Programs (Ch. 8): • Identify a DTD representative for the WFEPC. • Improve coordination with Rural Fire Agencies. • Integrate WU into Plan Map and include a public outreach strategy.

Coordinating Organization:	Clackamas Fire District #1

Internal Partners:	External Partners:
Public Works, Community Development	Clackamas Fire Defense Board, ODF, U.S. Forest Service, public land management agencies

Potential Funding Sources:	Estimated cost:	Timeline:
ODF, operating budgets	Low to High	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	New Action Item
Priority:	High (*CWPP identified priority actions listed above*)

** - High Priority Action Item*

Wildfire #2*

Proposed Action Item:	Alignment with Plan Goals:
Complete periodic updates of the Water Master Plan.	Protect Life and Property; Enhance Natural Systems; Augment Emergency Services; Encourage Partnerships for Implementation

Alignment with Existing Plans/Policies:
Water Distribution System Master Plan, Clackamas County Community Wildfire Protection Plan (2018), Comprehensive Plan

2018 Status/Rationale for Proposed Action Item:
• 2018 Status: The water master plan was last updated in 2012.

Ideas for Implementation:
• Maintain inventory of water lines and fire hydrants and continue to prioritize improvements based on criticality of need for fire protection; • Implement standards to ensure appropriate sizing of water lines for efficient and effective use of fire hydrants; and • Complete periodic rate studies and implement rate increases as necessary.

Coordinating Organization:	Public Works

Internal Partners:	External Partners:
Community Development	Clackamas Fire District #1

Potential Funding Sources:	Estimated cost:	Potential Funding Sources:
General Fund	Low to Medium	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

** - High Priority Action Item*

Wildfire #3

Proposed Action Item:	Alignment with Plan Goals:
Promote fire resistant strategies and the use of non-combustible roofing materials by evaluating and making recommendations to current code to encourage noncombustible roofing standards in high fire-hazard areas.	Protect Life and Property; Enhance Natural Systems; Encourage Partnerships for Implementation; Promote Public Awareness

Alignment with Existing Plans/Policies:

2018 Status/Rationale for Proposed Action Item:

- The City and Clackamas Fire District #1 already encourage the use of non-combustible roofing materials. They also encourage neighborhood associations to stop requiring cedar shake roofs.
- Programs focus on fuel reduction and defensible space.
- 2018 Status: The Oregon City building code continues to be updated every 3 years in alignment with the State Building Code updates.

Ideas for Implementation:

- Require fuel breaks in site plans, describe the procedures for ongoing maintenance, and place information on the Oregon City website for public view;
- Review street designs that facilitate the movement of fire fighting equipment;
- Review roofing standards and develop recommendations for promoting non-combustible roofing;
- Promote use of sprinkler systems in residential construction; and
- Maintain awareness of potential City growth into the wildland urban interface.

Coordinating Organization:	Community Development

Internal Partners:	External Partners:
Public Works	Clackamas Fire District #1

Potential Funding Sources:	Estimated cost:	Timeline:
General Fund	Low	☐ Short Term (0-2 years) ☐ Long Term (2-4+ years) X Ongoing

Form Submitted by:	Existing Action Item
Priority:	Medium

ATTACHMENT B:
PUBLIC INVOLVEMENT SUMMARY

Members of the HMAC 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, announcements (see below) were provided on the city's website and social media pages including a method for the public to provide comment.

During the public review period there were comments provided at a city commission hearing and through Facebook. The City addressed comments via Facebook and at the city commission meeting. It should be noted that the City has two action items intended to address landslide issues in the City via implementation of landslide municipal codes and developing and maintaining inventories of at risk properties.

In addition to the web site news posting, Oregon City staff reviewed the addendum, held meetings with the Oregon City School District and Clackamas Community College. The school district and Clackamas Community College provided updates on their hazard assessments and seismic resiliency work that they have performed.

Public Comment - City Commission, May 1, 2019

Oregon City Addendum to the NHMP
Public Comment Given at City Commission on May 1, 2019
[Synopsis of Verbal Comments]

Christine Kazinski – lives in Clackamas County [25:31-30:15]

- Saw news page notice of Oregon City addendum to the NHMP request for public comment on the Oregon City web page.
- She gave a copy of the draft Oregon City Addendum to the NHMP to the City Commission.
- She stated that she is interested in annexation and has reviewed every concept plan – plans do not meet annexation factors, specifically Land Use Goal 7 which is designed to protect life and property from natural disasters and hazards. City answered in staff report by stating that the Land Use Goal 7 had been met and sent to LCDC.
    - Page 46 of OC Addendum – Ideas for Implementation
    - First bullet states to use the mitigation plan to help the City's Comprehensive Land Use Plan meet State Land Use Planning Goal 7 – has Goal 7 been met or not?
- How does this NHMP link to equitable housing?
- Has given two testimonies in the last two months regarding landslides and the catastrophic losses borne by property owners from these landslides.
- Has requested that Oregon City have tougher standards regarding slopes. Current slopes of 25% or greater are regulated, but there is proof that landslides in Oregon City happen on slopes of 5%-18%.
- Requesting that Oregon City has policies governing the requirements of Land Use Goal 7. Homeowners should be notified if they are living in a landslide area. There is no landslide insurance in the United States. Losses are borne by the property owners. They need to be notified before they buy the property.

Press Release

CITY OF OREGON CITY

625 Center Street
P. O. Box 3040
Oregon City, Oregon 97045

503.657.0891
www.orcity.org

PRESS RELEASE

For Immediate Release
April 17, 2019

Contact: Kristin Brown
Communications Coordinator
503.496.1547
kbrown@orcity.org

Oregon City seeks additional public input on update to Natural Hazard Mitigation Plan

(Oregon City, OR) – Oregon City is in the process of updating their existing Natural Hazard Mitigation Plan (NHMP). This work is being performed in cooperation with the University of Oregon's Institute for Policy Research and Engagement - Oregon Partnership for Disaster Resilience and the Oregon Military Department's Office of Emergency Management utilizing funds obtained from the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation Grant Program. With re-adoption of the plan this spring, Oregon City will maintain its eligibility to apply for federal funding towards natural hazard mitigation projects. This local planning process includes a wide range of representatives from city and county government, emergency management personnel, and outreach to members of the public.

A natural hazard mitigation plan provides communities with a set of goals, action items, and resources designed to reduce risk from future natural disaster events. Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced loss of life, property, essential services, critical facilities, and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.
An electronic version of the updated draft Oregon City NHMP addendum will be available, for two weeks, formal public comment beginning **April 18, 2019**. To view the draft please visit:
https://www.orcity.org/publicworks/what-do-you-think-about-natural-hazard-mitigation-plan
To see the previously adopted NHMP https://www.orcity.org/publicworks/natural-hazards-mitigation-plan
If you have any questions or comments regarding the Oregon City NHMP addendum or the update process in general, please email Oregon City Public Works at pharris@orcity.org; or Michael Howard, Assistant Program Director for the Oregon Partnership for Disaster Resilience at (541) 346-8413 or mrhoward@uoregon.edu.

###

Oregon City Website: April 17 & May 9 (posted twice)

Public Works

What do you think about the Natural Hazard Mitigation Plan?

Oregon City Public Works is seeking public comment regarding an update to the Natural Hazard Mitigation Plan (NHMP). Many jurisdictions have worked to update this document, but we would like to know what you think. Please review the NHMP (link below) and let us know if you have any suggestions to make it even better. We will be collecting public comments for two weeks: April 17 - May 2, 2019.

This plan provides our community with a set of goals, action items, and resources designed to reduce the risk from future natural disaster events. Preparation and mitigation for these types of events is our best defense to protect our community in the event of natural disasters.

If you have any questions or comments regarding the Oregon City NHMP addendum or the update process in general, please email Oregon City Public Works at pharris@orcity.org; or Michael Howard, Assistant Program Director for the Oregon Partnership for Disaster Resilience at (541) 346-8413 or mrhoward@uoregon.edu.

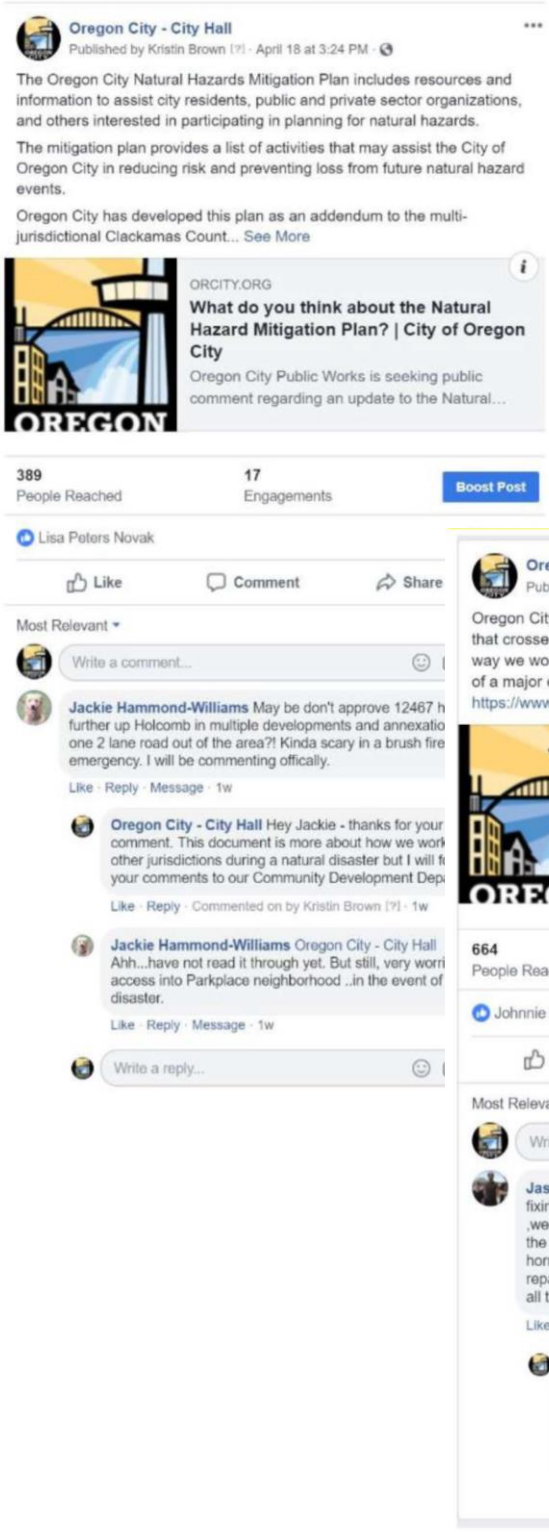
feedback

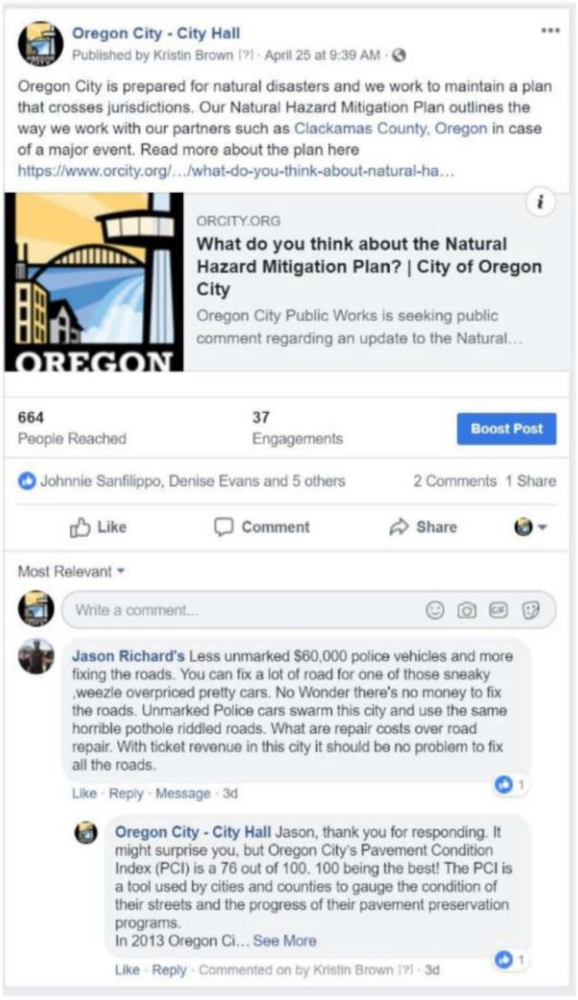
Supporting Documents

Oregon City Addendum to the Natural Hazard Mitigation Plan (NHMP) (3 MB)

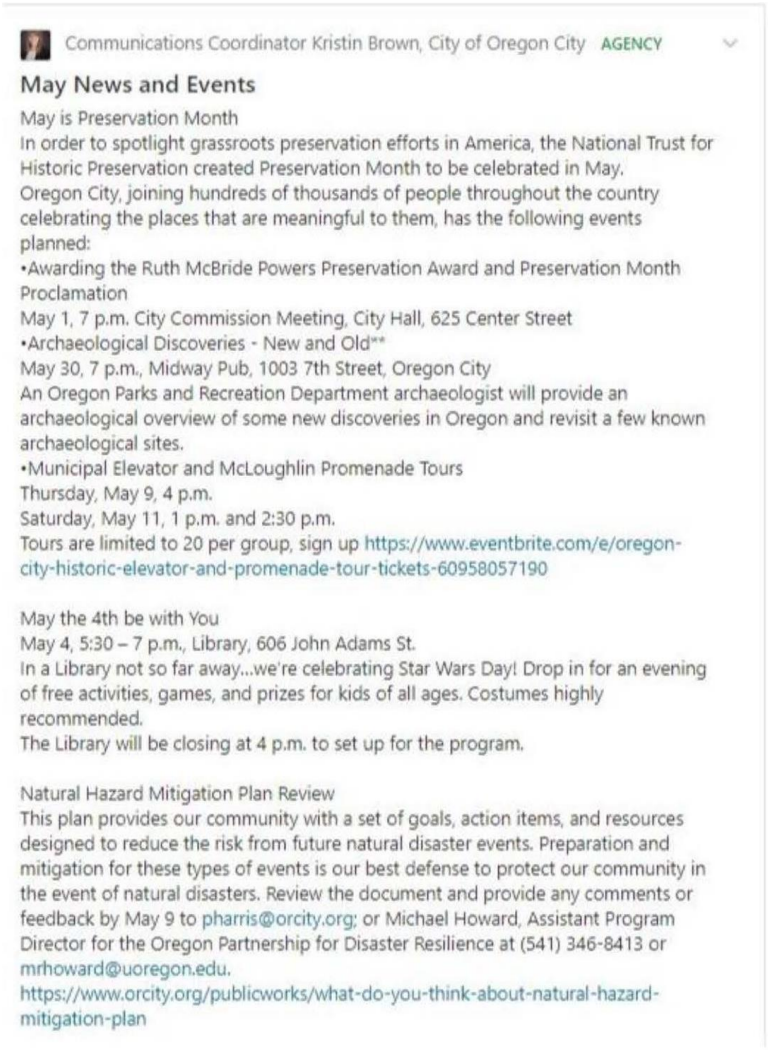
Press Release - Oregon City 2019 NHMP Addendum (22 KB)

Social Media Posts: Facebook: April 18 & 25 (posted twice)





Social Media Posts: NextDoor



Communications Coordinator Kristin Brown, City of Oregon City AGENCY

May News and Events

May is Preservation Month
In order to spotlight grassroots preservation efforts in America, the National Trust for Historic Preservation created Preservation Month to be celebrated in May. Oregon City, joining hundreds of thousands of people throughout the country celebrating the places that are meaningful to them, has the following events planned:
•Awarding the Ruth McBride Powers Preservation Award and Preservation Month Proclamation
May 1, 7 p.m. City Commission Meeting, City Hall, 625 Center Street
•Archaeological Discoveries - New and Old**
May 30, 7 p.m., Midway Pub, 1003 7th Street, Oregon City
An Oregon Parks and Recreation Department archaeologist will provide an archaeological overview of some new discoveries in Oregon and revisit a few known archaeological sites.
•Municipal Elevator and McLoughlin Promenade Tours
Thursday, May 9, 4 p.m.
Saturday, May 11, 1 p.m. and 2:30 p.m.
Tours are limited to 20 per group, sign up https://www.eventbrite.com/e/oregon-city-historic-elevator-and-promenade-tour-tickets-60958057190

May the 4th be with You
May 4, 5:30 – 7 p.m., Library, 606 John Adams St.
In a Library not so far away...we're celebrating Star Wars Day! Drop in for an evening of free activities, games, and prizes for kids of all ages. Costumes highly recommended.
The Library will be closing at 4 p.m. to set up for the program.

Natural Hazard Mitigation Plan Review
This plan provides our community with a set of goals, action items, and resources designed to reduce the risk from future natural disaster events. Preparation and mitigation for these types of events is our best defense to protect our community in the event of natural disasters. Review the document and provide any comments or feedback by May 9 to pharris@orcity.org; or Michael Howard, Assistant Program Director for the Oregon Partnership for Disaster Resilience at (541) 346-8413 or mrhoward@uoregon.edu.
https://www.orcity.org/publicworks/what-do-you-think-about-natural-hazard-mitigation-plan

Social Media Posts: Twitter

City of Oregon City @orcity · Apr 18

Oregon City has developed the Natural Hazards Mitigation Plan as an addendum to the multi-jurisdictional Clackamas County Natural Hazards Mitigation Plan, please review and provide us with feedback. orcity.org/publicworks/wh...

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