

Annex G: City of Tigard

1. Introduction

1.1. Planning Process Contact

The point of contact during the Washington County Natural Hazard Mitigation Plan (NHMP) planning process for the City of Tigard was the Emergency Services Coordinator.

1.2. Annex Organization

This annex has six sections that satisfy mitigation requirements in the Code of Federal Regulations (CFR) Title 44, Part 201 (44 CFR §201):

- **Section 1:** Introduction
- **Section 2:** Planning Process
- **Section 3:** Hazard Identification and Risk Assessment
- **Section 4:** Capability Assessment
- **Section 5:** Mitigation Strategy
- **Section 6:** Action Items

The information provided in this annex is for the City of Tigard alone. All pertinent information that is not identified in this annex is identified in other sections of this NHMP or within the respective appendices.

1.3. NHMP Adoption Process

Once the Washington County NHMP received the designation “Approvable Pending Local Adoption” from the Federal Emergency Management Agency (FEMA), the City presented the plan to City Council for final public comment and local adoption. A copy of the adoption resolution was inserted into the NHMP and is held on file in the City of Tigard and Washington County.

2. Planning Process

(In compliance with 44 CFR §201.6(c)(1))

2.1. Development and Adoption Process

To apply for certain types of federal aid, technical assistance, and most post-disaster funding, local jurisdictions and special districts must comply with 44 CFR §201.3, which sets forth the requirement that communities develop a plan outlining their present and proposed efforts to mitigate risks from natural hazards.

City officials recognize the benefits of having a long-term, all-hazards approach to mitigating natural hazards. This approach has been implemented through the NHMP and five-year NHMP updates as required by law. This has led to a gradual decrease of hazard-associated impacts by building on risk reduction measures outlined in previous iterations of the NHMP. The City's involvement in the Washington County NHMP represents the collective efforts of the Hazard Mitigation Steering Committee members, participating local Technical Committee members, the public, and stakeholders.

The City of Tigard developed this annex in accordance with guidance outlined in 44 CFR §201.6(c)(5) of DMA 2000. The complete NHMP and this annex identify hazards and mechanisms to minimize damages associated with these hazards as they occur in the geographical area of the City.

2.2. Organizing the Planning Effort

A comprehensive approach was taken in developing this NHMP. An open involvement process was established for the public and all stakeholders, which provided an opportunity for everyone to be involved in the planning process and make their views known.

Two teams worked simultaneously on this mitigation plan:

1. **Hazard Mitigation Steering Committee:** This committee consisted of points of contact from each plan participant. The group met to discuss countywide topics, including hazards and mitigation strategies. The points of contact were the leads of their local Technical Committee.
2. **Local Technical Committee:** Each plan participant had a Technical Committee that consisted of the Steering Committee representative for that jurisdiction or special district as well as designated representatives from within the organization. This team met to assess capabilities, hazards, and mitigation strategies within the planning area.

2.2.1. City of Tigard Technical Committee

This annex within the NHMP was developed by the City of Tigard's local Technical Committee with support from IEM, a consulting firm hired to assist with the planning process. The efforts of the committee were led by the City's Emergency Services Coordinator throughout 2022.

Table 231: City of Tigard Technical Committee Members for the 2023 NHMP

Position	Department	Role in Committee and Planning Process
Emergency Services Coordinator	Public Works, Emergency Management Program	General oversight, hazard identification, and plan development
Assistant Public Works Director	Public Works	Hazard identification and plan development
City Engineer	Public Works	Hazard identification and plan development
Senior Project Planner	Public Works	Hazard identification and plan development
Street Supervisor	Public Works	Hazard identification and plan development
Wastewater Supervisor	Public Works	Hazard identification and plan development
Green Team Supervisor	Public Works	Hazard identification and plan development

Position	Department	Role in Committee and Planning Process
Water Operations Supervisor	Public Works	Hazard identification and plan development
City Building Official	Community Development, Building Services Division	Hazard identification and plan development.
Assistant Community Development Director	Community Development	Hazard identification and plan development.
Geographic Information System (GIS) Technician	Information Technology	Hazard identification and plan development
GIS Coordinator	Information Technology	Hazard identification and plan development.
Facilities Services Supervisor	Facilities and Fleet	Hazard identification and plan development.
Fleet and Facilities Operations Manager	Facilities and Fleet	Hazard identification and plan development.
Commander and Emergency Operations Center Manager	Police and Emergency Operations Center	Hazard identification and plan development
Community Engagement Program Coordinator	Public Works	Hazard identification and plan development.
Digital Communication Coordinator	Community Development	Hazard identification and plan development.

IEM also supported or led the following activities associated with the development, approval, and adoption of the plan:

1. Facilitated the NHMP update process.
2. Based on committee direction and stakeholder and community input, prepared the first draft of the plan and provided technical writing assistance for plan review, editing, and formatting.
3. Submitted the proposed plan to the State of Oregon Department of Emergency Management (OEM) and FEMA for review and approval; and completed edits or revisions requested by these organizations.
4. Coordinated the plan adoption processes with the City, Washington County, OEM, and FEMA.

2.3. Public Participation

Public participation is an important component of this NHMP and also a required element as outlined in 44 CFR §201.6(c)(5), FEMA's mitigation planning guidance. Public participation offered community members the opportunity to voice their ideas, interests, and opinions about hazards that affect them and the best way to mitigate hazard impacts. As the City implements the mitigation actions identified in this annex, there will be additional opportunities for public participation.

Plan participants used a survey to collect information about community perceptions of natural hazards and priorities. The Steering and Technical Committees used the results to inform their risk assessments and mitigation strategies. Community members were also provided an opportunity to comment on a draft of the NHMP. See Appendix B of the NHMP for additional information about the survey and opportunities for public comment.

3. Hazard Identification and Risk Assessment

(In compliance with 44 CFR §201.6(c)(2)(i), §201.6(c)(2)(ii), §201.6(c)(2)(ii)(A), §201.6(c)(2)(ii)(B), §201.6(c)(2)(ii)(C), §201.6(c)(2)(iii), and §201.6(c)(3)(ii))

The following information serves to assist the City in determining and prioritizing appropriate mitigation action items to reduce losses from identified hazards.

3.1. Changes in Development Since Adoption of the 2017 NHMP

(In compliance with 44 CFR §201.6(d)(3))

The population of the City of Tigard has grown approximately 13% since 2015, and the number of people per square mile increased by almost 600. As of 2019, there are more millennials than baby boomers living in the City, and there was an increase in single adults living alone.⁴⁷³ More immigrant families were moving to the City, and there was a record number of multigenerational households.⁴⁷⁴

There has been an increase in housing to meet the demand of population growth, with a focus on middle housing. This type of housing decreases the average square footage and footprint of homes and groups homes together on one or more lots. Areas with middle housing options are often designed differently than traditional suburban or urban residential neighborhoods, so the unique features and needs of these communities should be a mitigation planning consideration.

Automobile traffic density has also grown significantly since the 2017 NHMP update. This has created several high-traffic intersections and frequently congested highways and main thoroughfares. The City of Tigard is working to increase multimodal transportation options to mitigate congestion. Heavy vehicle traffic should also be a mitigation planning consideration.

Tigard is focusing future residential development/growth into the River Terrace, and projected growth is around 4,500 units in the next 10 years. The Tigard Triangle area is projected to grow by over 400 multi-family units over the next decade, and downtown Tigard will also likely be a focus area for future development.

3.2. Community Profile

This section provides information on City-specific characteristics. Additional discussion of the planning area's community characteristics is outlined in Volume III, Appendix A of the NHMP.

Some community characteristics may suggest how natural hazards may impact communities and how communities choose to plan for natural hazard mitigation. Identifying and considering the Tigard-specific assets during the planning process may assist in identifying appropriate measures for natural hazard mitigation.

Table 232 below reflects the community demographics and vulnerable populations in Tigard. This information was gathered from the U.S. Census, Portland State University, and the City of Tigard.

⁴⁷³ City of Tigard. (n.d.). Housing and Demographic Trends, Planning for Housing Choice in Tigard. <https://www.tigard-or.gov/home/showpublisheddocument/1422/637697292819400000>

⁴⁷⁴ City of Tigard. (n.d.). Housing and Demographic Trends, Planning for Housing Choice in Tigard. <https://www.tigard-or.gov/home/showpublisheddocument/1422/637697292819400000>

Table 232: Community Demographics*

Population	Total	Percent Change
2010 population ⁴⁷⁵	48,035	
2021 population ⁴⁷⁶	55,854	+16%
2035 forecasted population ⁴⁷⁷	60,213	+8%
Race and Ethnicity ⁴⁷⁸	Total	Percent of Population
White alone	43,457	80%
Hispanic/Latino/a/x of any race	6,453	12%
Asian alone	4,618	9%
Two or more races	3,961	7%
Black or African American alone	543	1%
American Indian and Alaska Native alone	213	0.4%
Native Hawaiian and Other Pacific Islander alone	325	0.6%
Language Spoken at Home ⁴⁷⁹	Percent of Population	
English only	81%	
Asian and Pacific Island languages	7%	
Spanish	6%	
Indo-European languages	5%	
Other languages	2%	
Vulnerable Age Groups ⁴⁸⁰	Percent of Population	
Less than 15 years of age	12%	
65 years and older	16%	

⁴⁷⁵ United States Census Bureau. (2010, April 1). QuickFacts Tigard City, Oregon. Accessed October 3, 2022, from <https://www.census.gov/quickfacts/fact/table/tigardcityoregon/PST045221>

⁴⁷⁶ Portland State University Population Research Center. (2022). Population Estimate Reports. 2021 Certified Population Estimates,, July 1. <https://www.pdx.edu/population-research/population-estimate-reports>

⁴⁷⁷ Oregon Metro. (2013, January 15). 2035 Forecast of Population by City and County. https://www.oregonmetro.gov/sites/default/files/2014/05/29/population_housing_forecasts_by_city_county.pdf

⁴⁷⁸ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Demographic and Housing Estimates,, Table DP05. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon&tid=ACSDP5Y2020.DP05>

⁴⁷⁹ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Language Spoken at Home Table S1601. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20language>

⁴⁸⁰ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Age and Sex Estimates,, Table S0101. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20age&tid=ACSST1Y2021.S0101>

Disability Status of Non-Institutional Civilians ⁴⁸¹	Percent of Population
Total	11%
Less than 17 years of age	8%
65 years and older	65%

* Due to how respondents identify and answer questions, there may be overlapping responses, and results may equal greater than 100% of the population. Percentages are rounded.

3.2.1. Geography, Topography, and Climate

Tigard is in eastern Washington County, adjacent to Portland's southwestern border. The City of Tigard has an area of 11.71 square miles. Situated in the Willamette Valley, the climate in the City is relatively mild throughout the year, characterized by cool, wet winters and warm, dry summers. The valley's weather is characterized by a predominant winter rainfall climate, with about 50% of the total annual precipitation falling between December and February each year. Average temperatures range from the low 80s in the summer down to about 40 degrees in the coldest months. Tigard is predominately urban and abuts open green space to the east and lies in the Tualatin River watershed.

3.2.2. Transportation, Infrastructure, and Housing

3.2.2.1. Transportation

Oregon Highways 99W and 217 and Interstate 5 are predominant transportation features in the City. Other major roads include Boones Ferry Road, Hall Boulevard, and Oregon Route 210.

The City's central location means that thousands of non-Tigard residents travel through the City each day. Heavy automobile traffic regularly occurs in the City, which is an important consideration for evacuation routes and procedures. Per the Tigard Transportation System Plan, connectivity in the City is severely challenged by Highway 217, Interstate 5, and the railroad, as well as Fanno Creek, Bull Mountain, and other natural features.⁴⁸² Approximately 21,000 residents commute out of the city for work, and around 44,000 employees commute into the City. Major visitor destinations in Tigard include Washington Square Mall and Bridgeport Village.

The Tri-County Metropolitan Transit District (TriMet) provides public transportation through eight bus lines and the Westside Express Service commuter rail line, which connects Tigard to the City of Wilsonville to the south and the City of Beaverton to the northwest. Due to Tigard's central location, much of the City's transportation system has regional significance, and there are two transit centers within the City that provide regional bus and commuter rail services. The City has been focusing on increasing multimodal transportation options, including biking and walking trails, notably the regional Fanno Creek Trail.

The Portland & Western Railroad (PNWR) runs through Tigard, and trains mostly ship woodchips, paper, agriculture goods, and aggregates. PNWR and TriMet share the same track.

The City of Tigard includes a diversity of land uses, including commercial, residential, and industrial. Tigard is primarily residential, with almost 70% of the land area zoned for residential use. In 2018, City Council approved code amendments to the Tigard Development Code, allowing for a wider range of housing types within the City, including middle housing. These houses generally consist of smaller

⁴⁸¹ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Disability Characteristics Estimates, Table S1810. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20disability>

⁴⁸² City of Tigard. (2022, January). Tigard On the Move: Transportation System Plan. <https://www.tigard-or.gov/home/showpublisheddocument/1875/637792201890230000>

housing units with a limited footprint that are sometimes grouped together on one or more lots. This allows more people to live in Tigard and increases walkability; however, it also increases population and built environment density and should be a planning consideration when creating and implementing a mitigation strategy.

Special districts that operate within the City's boundaries are Tualatin Valley Fire & Rescue, Clean Water Services, and Tualatin Valley Water District.

3.2.2.2. Infrastructure

The City of Tigard critical and vulnerable facilities listed below in Table 233 may be vulnerable to one or more natural hazards.

Table 233: Critical Facility and Asset Inventory

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
City of Tigard Facilities Operations Building	Infrastructure or Facility	8955 SW Burnham Street	Not vulnerable to landslides; leased facility
Just Compassion Shelter	Infrastructure or Facility	12280 SW Hall Boulevard	Not vulnerable to flooding; nonprofit-owned and -operated.
Transportation Portland Western Railroad	Infrastructure or Facility	7787 SW Tech Center Drive	Freight railroad line
TriMet Transportation Westside Express Service	Infrastructure or Facility	7787 SW Tech Center Drive	Commuter rail line
Tualatin Valley Fire & Rescue Station 50	Infrastructure or Facility	12617 SW Walnut Street	
Tualatin Valley Fire & Rescue Station 51	Infrastructure or Facility	8935 SW Burnham Street	
Tualatin Valley Fire & Rescue Command & Business Operations Center	Infrastructure or Facility	11945 SW 70th Avenue, Portland, 97223	
Tigard City Hall & Police Department	Infrastructure or Facility	13125 SW Hall Boulevard	
City of Tigard Public Works Building	Infrastructure or Facility	8777 SW Burnham Street	
City of Tigard Streets and Parks Operations Building	Infrastructure or Facility	13125 SW Hall Boulevard	
City of Tigard Permit Center	Infrastructure or Facility	13125 SW Hall Boulevard	
City of Tigard Senior Center	Infrastructure or Facility	8815 SW Omara Street, Portland, 97223	
City of Tigard Library	Infrastructure or Facility	13500 SW Hall Boulevard	Alternate Emergency Operations Center
Niche	Infrastructure and Facility	8720 SW Burnham Street	City's GIS and IT facility

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Washington Square	Infrastructure or Facility	9585 SW Washington Square Road, Portland, 97223	Shopping mall
Lincoln Center	Infrastructure or Facility	10200 SW Greenburg Road	Office building
Suburban Propane	Infrastructure or Facility	10075 SW Cascade Avenue	Hazardous materials
The Pool and Spa House	Infrastructure or Facility	13025 SW Pacific Highway	Hazardous materials
Alberta Rider Elementary School	Infrastructure or Facility	14850 SW 132nd Avenue	
Gaarde Christian School	Infrastructure or Facility	11265 SW Gaarde Street	
Islamic School of Muslim Educational Trust (MET) (Ismet)	Infrastructure or Facility	10330 SW Scholls Ferry Road	
James Templeton Elementary School	Infrastructure or Facility	9500 SW Murdock Street	
Guidepost Montessori at Tigard	Infrastructure or Facility	10540 SW Hall Boulevard	
Tigard High School	Infrastructure or Facility	9000 SW Durham Road	
Twality Middle School	Infrastructure or Facility	14650 SW 97th Avenue	
Durham Elementary School	Infrastructure or Facility	7980 SW Durham Road	
Fowler Middle School	Infrastructure or Facility	10865 SW Walnut Street	
Charles F. Tigard Elementary School	Infrastructure or Facility	12855 SW Grant Avenue	
Mary Woodward Elementary School	Infrastructure or Facility	12325 SW Katherine Street	

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Metzger Elementary School	Infrastructure or Facility	10350 Lincoln Street	
St. Anthony Roman Catholic School	Infrastructure or Facility	12645 SW Pacific Highway, Portland, 97223	
Deer Creek Elementary School	Infrastructure or Facility	16155 SW 131st Avenue	
Mitch Charter School	Infrastructure or Facility	19550 SW 90th Court	
Westgate Christian School	Infrastructure or Facility	12930 SW Scholls Ferry Road	
Tigard–Tualatin School District Administration Building	Infrastructure or Facility	6960 SW Sandburg Street	
Student Transportation of America	Infrastructure or Facility	13000 SW Hall Boulevard	
Tigard–Tualatin School District Bus Yard	Infrastructure or Facility	18340 SW Pacific Highway	
Providence Immediate Care –Bridgeport	Infrastructure or Facility	18040 SW Lower Boones Ferry Road, Suite 100A	
Providence Bridgeport Family Medicine	Infrastructure or Facility	18040 SW Lower Boones Ferry Road, Suite 304	
Providence Immediate Care –Scholls	Infrastructure or Facility	12442 SW Scholls Ferry Road, Suite 100	
Providence St. Vincent Urgent Care Clinic	Infrastructure or Facility	12442 SW Scholls Ferry Road, Suite 100	
Metropolitan Pediatrics: Bridgeport	Infrastructure or Facility	7213 SW Hazel Fern Road	
Bridgeport Family Medicine	Infrastructure or Facility	16083 SW Upper Boones Ferry Road, Suite 130	Formerly Tigard Family Medical Center
The Portland Clinic – Tigard	Infrastructure or Facility	9250 SW Hall Boulevard	

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Rise Church (Calvin Presbyterian Church)	Infrastructure or Facility	10445 SW Canterbury Lane	Potential shelter site
Hall Boulevard Baptist Church	Infrastructure or Facility	14145 SW Hall Boulevard	Potential shelter site
Christ the King Lutheran Church	Infrastructure or Facility	11305 SW Bull Mountain Road	Potential shelter site
Good Neighbor Center	Infrastructure or Facility	11130 SW Greenburg Road	Potential shelter site for single mothers and children
St. Anthony Catholic Church	Infrastructure or Facility	9905 SW McKenzie Street	
Southwest Church of Christ	Infrastructure or Facility	9725 SW Durham Road	
Tigard First Church of Christ	Infrastructure or Facility	14325 SW 112th Avenue	
Tigard Church of God	Infrastructure or Facility	15670 SW 98th Avenue	
St. James Episcopal	Infrastructure or Facility	11511 SW Bull Mountain Road	
Grace Point Community Church	Infrastructure or Facility	11075 SW Gaarde Street	Potential shelter site
Horizon Community Church	Infrastructure or Facility	23370 SW Boones Ferry Road	
Tigard First Church of Christ	Infrastructure or Facility	14325 SW 112th Avenue	Potential shelter site
Tigard Covenant Church	Infrastructure or Facility	11321 SW Naeve Street	
The Church of Jesus Christ of Latter-day Saints	Infrastructure or Facility	11065 SW North Dakota Street	
Tigard First Church of Christ	Infrastructure or Facility	14325 SW 112th Avenue	

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Tigard Community Friends Church	Infrastructure or Facility	15800 SW Hall Boulevard	
Faith Journey Church	Infrastructure or Facility	11265 SW Gaarde Street	
Tigard United Methodist	Infrastructure or Facility	9845 SW Walnut Place	
Transportation networks in the City	Infrastructure or Facility	Throughout the City	<ul style="list-style-type: none"> • State Highway 99W • State Highway 217 • Hall Boulevard • Durham Road • 72nd Avenue • Interstate 5 • Walnut Street • Gaarde Street • Bull Mountain Road • Beef Bend Road • Scholls Ferry Road • Bonita Road • Greenberg Road • McDonald Street

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Water facilities in the City	Infrastructure or Facility	Throughout the City	<ul style="list-style-type: none"> • 12 city reservoirs • 7 pump stations • 1 river intake pump station – West Linn (Lake Oswego (LO)-Tigard Water Partnership) • 5 wells: 2 capped and 3 active • 2 SCADA systems • 36” main • 24” mains (2) • Double sewerage siphon structure • 1 sewer lift station • ASR 3 • Clean Water Services Treatment Plant • 1 water treatment plant in L/O (LO-Tigard Water Partnership)
Private utilities in the City	Infrastructure or Facility	Throughout the City	<ul style="list-style-type: none"> • 2 NW Natural Gas Pipelines • 5 Portland General Electric Substations • 2 Verizon Central Switch Offices • 3 Communication Towers • 1 Kinder Morgan Liquid Petroleum Line
Phil Lewis School	Historical Property		
Shaver–Bilyeu House	Historical Property	16445 SW 92nd Avenue	
Windmill	Historical Property	12130 SW Katherine Street, Portland, 97223	
John Tigard House Museum	Cultural Resource	14601 SW 103rd Avenue	
Crescent Grove Cemetery	Cultural Resource	9925 SW Greenberg Road	
St. Anthony’s Cemetery and Columbarium	Cultural Resource	11585 SW Gaarde Street	

Name of Infrastructure, Facility, or Resource	Type of Asset	Address	Comments
Sunset Pioneer Tigard Evangelical Cemetery	Cultural Resource	State Highway 99W and SW Canterbury Lane 45.4230016, 122.7784192	
Dirksen Nature Park	Natural Resource	11450 SW Winter Lake Drive	
Starks Reservoir	Natural Resource	11450 SW Winter Lake Drive	
Scoggins Dam/Henry Hagg Lake	Natural Resource	City of Forest Grove, 45.472845, -123.203958	

3.2.2.3. Housing

Housing characteristics are an important factor in mitigation planning. The information below shows that most housing units are owner-occupied and consist of one-unit buildings built before 1999. The older the housing, the more at risk it can be to damage from natural hazards such as earthquakes and windstorms, including tornadoes.

Table 234: Housing Characteristics*

Households	Total
Total households ⁴⁸³	21,257
Units in Housing Structure ⁴⁸⁴	Percent of Housing
One-unit structures	68%
Structures with two or more units	32%
Manufactured homes and all other types	.6%
Year Housing Structure Built ⁴⁸⁵	Percent of Housing
Pre-1979	39%
1980–1999	42%
2000 to present	19%
Housing Tenure and Vacancy	Percent of Housing
Owner-occupied ⁴⁸⁶	63%
Renter-occupied ⁴⁸⁷	37%
Vacant ⁴⁸⁸	5%

* Due to how respondents answer questions, there may be overlapping responses, and results may equal greater than 100%. Percentages are rounded.

⁴⁸³ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20housing>

⁴⁸⁴ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20housing&tid=ACSST5Y2020.S1101>

⁴⁸⁵ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Physical Housing Characteristics for Occupied Housing Units Table S2504. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20housing&tid=ACSST5Y2020.S2504>

⁴⁸⁶ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20housing&tid=ACSST5Y2020.S1101>

⁴⁸⁷ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Households and Families, Table S1101. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20housing&tid=ACSST5Y2020.S1101>

⁴⁸⁸ United States Census Bureau. (2021, July 1). 2020 Decennial Census Occupancy Status, Table H1. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20housing&tid=DECENNIALPL2020.H1>

3.2.3. Economy

Tigard is home to around 3,400 businesses from a variety of industries, employing around 45,000 workers from around the region.⁴⁸⁹ The top employment sectors in the City are management and professional, administrative services, manufacturing and supply chain, and consumer-related.⁴⁹⁰ The vast majority of firms in the City are small businesses with one to four employees.⁴⁹¹

Major employment and commercial centers include Lincoln Tower, Washington Square Mall, 72nd Industrial Corridor, the Highway 99W commercial and transportation corridor, and the heavy rail switching yard off Hall Blvd at Wall Street. Nike and Intel Corporations also have a heavy economic presence in the City. Essential businesses identified by the Technical Committee include Costco, WinCo Foods, Fred Meyer, Safeway, Walmart, Home Depot, and Lowes.

The number of full-time, year-round workers earning \$100,000 or more per year increased by 26% between 2012 and 2017.⁴⁹² Meanwhile, the number of workers earning \$25,000 or less per year declined by 3%.⁴⁹³

Table 235: Income Characteristics^{494*}

Households by Income Category	Percent of Households
Less than \$5,000	2%
\$5,000 to \$9,999	1%
\$10,000 to \$14,999	3%
\$15,000 to \$19,999	3%
\$20,000 to \$24,999	4%
\$25,000 to \$34,999	6%
\$35,000 to \$49,999	9%
\$50,000 to \$74,999	16%
\$75,000 to \$99,999	14%
\$100,000 to \$149,999	20%
\$150,000 or more	22%
Median Household Income	
\$86,757	

* Due to how respondents answer questions, there may be overlapping responses, and results may equal greater than 100%. Percentages are rounded.

⁴⁸⁹ City of Tigard. (n.d.). Tigard Economy: At A Glance. <https://www.tigard-or.gov/business-development/economic-development/tigard-economy-at-a-glance#ad-image-0>

⁴⁹⁰ City of Tigard. (n.d.). Tigard Economy: At A Glance. <https://www.tigard-or.gov/business-development/economic-development/tigard-economy-at-a-glance#ad-image-0>

⁴⁹¹ City of Tigard. (n.d.). Tigard Economy: At A Glance. <https://www.tigard-or.gov/business-development/economic-development/tigard-economy-at-a-glance#ad-image-0>

⁴⁹² City of Tigard. (n.d.). Tigard Economy: At A Glance. <https://www.tigard-or.gov/business-development/economic-development/tigard-economy-at-a-glance#ad-image-0>

⁴⁹³ City of Tigard. (n.d.). Tigard Economy: At A Glance. <https://www.tigard-or.gov/business-development/economic-development/tigard-economy-at-a-glance#ad-image-0>

⁴⁹⁴ United States Census Bureau. (2021, July 1). 2016–2020 American Community Survey 5-Year Estimates, Financial Characteristics, Table S2503. Accessed October 3, 2022, from <https://data.census.gov/cedsci/table?q=Tigard%20oregon%20income&tid=ACSST5Y2020.S2503>

3.3. Natural Hazard Profiles

The City of Tigard's Technical Committee utilized the OEM's hazard analysis methodology to examine hazard vulnerability and probability by collecting information about history, probability, vulnerability, and maximum threat for each hazard that impacts the City. This methodology does not compare hazards to each other or rank hazards against each other. Instead, this process provides a sense of hazard priorities or relative risk and allows comparison of the same hazard across participants. The score range for this methodology is 24 (lowest possible) to 240 (highest possible).

Each of the hazards examined by this analysis was scored using a formula that incorporates the four rating criteria, a weight factor, and three levels of severity: low, medium, and high. The score range for this methodology is 24 (lowest possible) to 240 (highest possible). For additional detail about the OEM risk and hazard analysis methodology, see Volume I, Section 2.

The scores for each hazard that impact the City are presented below. All natural hazards included in the NHMP have the potential to impact the City.

Table 236: Natural Hazard Risk Scores

Natural Hazard	History	Vulnerability	Maximum Threat	Probability	Score
Dam failure	Low	Medium	Medium	Medium	95
Drought	High	Medium	Medium	High	167
Earthquake	Low	High	High	Medium	203
Extreme heat	High	Medium	Medium	High	162
Flooding, including channel migration and streambed erosion	High	Medium	Medium	High	162
Landslide	Low	Medium	Low	Low	73
Volcanic ash	Low	Medium	Medium	Medium	137
Wildland fire	Medium	Medium	High	Medium	168
Windstorm, including tornado	High	Medium	High	High	205
Winter storm	High	Medium	High	High	205

Full descriptions of each hazard are provided in Volume I, Section 2. The potential effects of climate change on the magnitude and frequency of natural hazard events are described in each hazard description in this annex and in Volume I, Section 2.

The timeframe of data collected during the planning process for the City of Tigard was from November 1, 2016, to February 22, 2022. Hazard events that occurred during this period and were deemed significant by the City's Technical Committee are included in this annex's hazard profiles.

The following hazard profiles are in alphabetical order and include a brief hazard description, significant events since adoption of the 2017 NHMP, if applicable, and potential impacts and vulnerabilities. The potential impacts for each hazard are presented in the same order, as applicable: populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments.

3.3.1. Dam Failure

The City of Tigard has two potential dams of concern: the Stark Reservoir and Scoggins Dam. Stark Reservoir may present a high water threat; however, the risk associated with this threat is low because a spillover was installed that mitigates any potential catastrophic impacts. A Scoggins Dam failure could affect South Tigard, Tualatin Riverbank neighborhoods, Tualatin, and Clean Water Services, depending on the time of year. If Scoggins Dam failed, it is estimated that there would be 10-foot surge. Potential impacts of and vulnerabilities to dam failure are identified below.

3.3.1.1. Potential Impacts

The potential impacts from a dam failure event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Public health concerns, such as the spread of infectious diseases, exposure to hazardous materials and debris, and water quality issues.
- Need for widespread search and rescue operations, including water rescues.
- Displaced residents in need of sheltering.
- Reduction or loss of water supply.
- Water use restrictions and lack of potable and irrigation water supplies.
- Delayed emergency response times and disruption of traffic due to high water, debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Economic impacts, including loss of local revenue due to business and property tax losses, agriculture production losses, and reduced recreation and tourism activity. Interruptions to commercial transportation routes could take an economic toll on the County. Scoggins Valley Park receives one million visitors a year and could be severely damaged by a dam failure.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal economic impacts from loss of income and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.
- Erosion and flooding.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, and parks.

3.3.1.2. Vulnerabilities

Built environment, critical facility, infrastructure, and natural environment vulnerabilities to a dam failure event include:

- If Scoggins Dam were to fail, areas in the southern portions of the City could be affected. The expected surge would be 10 feet; however, a Scoggins Dam failure is also considered a low risk.
- Clean Water Services has a facility in the inundation zone of Scoggins Dam and could be affected if the dam failed, especially in fall, winter, and early spring.
- Residences in the inundation zones could be vulnerable to flooding.
- Local bridges crossing Highway 210 and Borrows Road may be flooded.
- Summer Lake Park and Cook Park could be flooded.

3.3.2. Drought

Drought typically occurs as a regional event and often affects more than one city and county simultaneously. The City's main source of drinking water comes from the Clackamas River. The cities of Lake Oswego and Tigard formally became partners in 2008 and have also designed an underground aquifer for water storage. During dangerously low water conditions, the City considers limiting access to creeks, rivers, and lakes to protect already stressed aquatic life. They may also temporarily reduce water rights and initiate mandatory water use curtailment restrictions. Potential impacts of and vulnerabilities to drought are identified below.

3.3.2.1. Potential Impacts

The potential impacts from a drought event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Reduction or loss of water supply.
- Water use restrictions and lack of drinkable water supply.
- Health effects, including increased heat-related, waterborne, and cardiorespiratory illnesses, as well as mental health conditions.
- Reduced economic productivity or business closures, including agriculture, livestock, recreation, energy, tourism, timber, and fisheries.
- Supply chain restrictions, including food shortages.
- Loss of power or reduced availability of electricity due to infrastructure damage and high demand.
- Property and infrastructure damage due to expansive soils.
- Damage to natural environments, including low water levels in lakes, rivers, and other water bodies, reduced plant growth, local species reduction or extinction, increased water temperature, and deteriorated water quality, which may result in fish kills and increased waterborne pollutants.
- Concurrent hazards, including extreme heat, wildfire, flooding, and landslides.

3.3.2.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to drought. These include:

- People in the City with preexisting health conditions, those without access to clean water, children, pregnant women, and older adults. This may include those living in or spending time in the City's 20 schools and education administration buildings, 7 medical facilities, the Just Compassion Shelter, and the City of Tigard Senior Center.
- Those who are employed in water-dependent sectors, such as agriculture and recreation, may experience a reduction in income.
- The Clackamas River, the City's water supply source.
- The City operates three aquifer and recovery systems and three wells that provide six million gallons of water a day. The operations and outputs of these facilities may be vulnerable to drought.
- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2

hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.

- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad.
- Other critical infrastructure, including communication structures and emergency generators.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Safeway, Walmart, Home Depot, and Lowes.
- Natural environments located throughout the City of Tigard, such as protected wetlands and small tributaries.

3.3.3. Earthquake

The City could experience earthquakes that originate from the Cascadia Subduction Zone, Portland Hills Fault Zone, and Gales Creek Fault Zone. It could also experience liquefaction and coseismic landslides as the result of an earthquake. Potential impacts of and vulnerabilities to earthquake are identified below.

3.3.3.1. Potential Impacts

The potential impacts from an earthquake event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Mental health impacts, including post-traumatic stress disorder.
- Public health hazards resulting from disruption of drinking water and wastewater systems.
- Need for widespread search and rescue operations.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage to ground utilities; residential, public, and private buildings; and transportation systems above and below.
- Disruption of essential infrastructure systems, such as power systems, public utilities, and telecommunications.
- Blocked roads and rail transportation routes due to debris from trees and damaged property, ground deformation, and liquefaction.
- Downed or damaged power lines that can lead to wildfires.
- Power outages and natural gas leaks.
- Hazardous material releases due to infrastructure and facility damage.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Change in water flows, including paths of rivers and streams.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards initiated by an earthquake, including flood, wildland fire, and landslide.

3.3.3.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to earthquakes. These include:

- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2 hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.
- Other critical infrastructure, including aboveground power lines, communication structures, and emergency generators.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Safeway, Walmart, Home Depot, and Lowes.
- Underground infrastructure, such as pipelines and utility lines, buildings, and roads are vulnerable to damage from liquefaction due to the type of soil in the City. The concentration of soft soils is the highest along the Tualatin River and its tributaries.
- Older buildings and infrastructure. This includes historical structures and properties, Tigard City Hall, the Public Works Operations Building, and the Highway 99W viaduct over downtown and a heavily trafficked rail line.
- Buildings with very high or high collapse potential include residential and commercial buildings constructed prior to 1990 and unreinforced masonry buildings.
 - Approximately 65% of residential buildings were built prior to 1990.
 - A 2007 Oregon Department of Geology and Mineral Industries (DOGAMI) study identified that these buildings had “high” collapse potential:
 - ◆ Tigard Police Department
 - ◆ Durham Elementary School
 - ◆ James Templeton Elementary School
 - ◆ Mary Woodward Elementary School
 - ◆ Thomas R Fowler Middle School
- Areas near the epicenter of an earthquake event are likely to incur a significant amount of damage to all buildings, infrastructure, facilities, and property.
- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad.
- An estimated 51% of the City’s economy could be vulnerable to impacts from an event.
- Natural environments located throughout the City.
- Using 2022 Hazus®-MH information, it is estimated a 6.7 magnitude Gales Creek Fault earthquake event would result in 31 yellow-tagged buildings, 2 red-tagged buildings, and \$44,742,000 in total economic losses.⁴⁹⁵

⁴⁹⁵ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

- A 2018 DOGAMI report shows that a:
 - Cascadia Subduction Zone magnitude 9.0 earthquake in “dry” soil conditions could result in \$756,000,000 in building repair costs, 405,000 tons of debris, 329 long-term displaced residents, and up to 533 deaths;
 - Cascadia Subduction Zone magnitude 9.0 earthquake in “wet” soil conditions could result in \$1,087,000,000 in building repair costs, 516,000 tons of debris, 2,306 long-term displaced residents, and up to 920 deaths;
 - Portland Hills Fault magnitude 6.8 earthquake in “dry” soil conditions could result in \$1,873,000,000 in building repair costs, 870,000 tons of debris, 1,404 long-term displaced residents, and up to 1,452 deaths; and
 - Portland Hills Fault magnitude 6.8 earthquake in “wet” soil conditions could result in \$2,783,000,000 in building repair costs, 1,164,000 tons of debris, 7,409 long-term displaced residents, and up to 2,569 deaths.⁴⁹⁶

⁴⁹⁶ Oregon Department of Geology and Mineral Industries. (2018). Earthquake Regional Impact Analysis for Clackamas, Multnomah, and Washington Counties, Oregon. https://www.oregongeology.org/pubs/ofr/O-18-02/O-18-02_report.pdf

3.3.4. *Extreme Heat*

Due to a rise in the frequency and severity of extreme heat events and the impacts from those events, the NHMP Steering Committee chose to include this hazard for the first time in the Washington County NHMP. Previous significant events and the potential impacts of and vulnerabilities to extreme heat are identified below.

3.3.4.1. Significant Events

Extreme heat was not included in previous NHMPs. The City identified two significant extreme heat events it has experienced.

- **June 16–20, 2021:** The maximum temperature reached 108 °F, with a heat index of 115 °F. Throughout the County there were fatalities, closures and postponements of businesses and events, and buckled roads, and cooling shelters were opened.
- **August 11–15, 2021:** Peak afternoon temperatures ranged from 100 °F to 105 °F. Throughout the County there were fatalities and closures and postponements of businesses and events, and cooling shelters were opened.

3.3.4.2. Potential Impacts

The potential impacts from an extreme heat event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Heat illnesses, including heat rashes, heat cramps, heat exhaustion, heat stroke, and death.
- Extended operational hours of County staff and additional resources needed for response to the event, including the operation of daytime cooling centers and overnight cooling shelters.
- Strain on or loss of water supply due to increased demand.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Economic losses from decreased worker efficiency and effectiveness and time lost on the job when workers take more frequent or longer breaks to avoid overheating.
- Economic impacts from closure of outdoor activities and events, such as farmers markets and concerts.
- Property damage, such as roof expansions, leading to warped, cracked, and leaking shingles; dry, cracked, and leaking caulking around flashing and joints; cracked foundations; excessive drying of wood structures; and melted siding.
- Disruption of essential infrastructure systems from overheated and damaged utilities, including power, water, transportation, and communication systems.
- Impacts to roadways as heat expands concrete or causes cracking and buckling. Public transit can also be impacted due to melted cables, sagging wires, and warping tracks.
- Damage to crops, livestock, vegetation, parks, and natural systems.

- Impacts to greenspaces, such as scorch and sunscald of new foliage, branches or tops of trees dying, and significant stress and die-off of native trees, particularly Douglas fir and cedar. These impacts are intensified if drought is also occurring.
- Concurrent hazards include drought and wildland fire.

3.3.4.3. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to extreme heat.

Populations substantially vulnerable to extreme heat include:

- People who work or spend a significant amount of time outdoors. An estimated 27% of Tigard's workforce works outdoors. There have been cases of extreme heat exposure resulting from the Balloon Festival, Street Fair, and Latino Festival outdoor events.
- People who live and/or work in buildings without air conditioning or cooling equipment. It is estimated that 10–15% of manufactured home parks and multi-dwelling structures in the City do not have cooling equipment.
- People living outdoors or in the upper floors of multi-family housing units.
- Populations with higher heat sensitivity, including older adults, infants and children, pregnant women, people with preexisting or chronic diseases, and those who take certain medications that affect thermoregulation or block nerve impulses. This may include those living in or spending time in the City's 20 schools and education administration buildings, 7 medical facilities, the Just Compassion Shelter, and the City of Tigard Senior Center.
- People with limited mobility and no access to cooling systems who may not be able to travel to cooling centers or shelters.
- People who live in social isolation, including linguistic isolation or those living alone with few social relationships.
- People with mental health conditions. Extreme heat can be associated with higher levels of aggression, violence, and suicidal behavior.
- Factors including race and ethnicity, income, and educational attainment are correlated with heat-related illness.

Additional vulnerabilities to extreme heat include:

- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2 hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.
- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad.
- Railroad tracks can be vulnerable to damage from high heat.
- Bridge infrastructure is vulnerable to thermal expansion of bridge joints and paved surfaces and deterioration of steel, asphalt, protective cladding, coats, and sealants.
- Asphalt pavement is vulnerable to accelerated deterioration through softening, rutting, and migration of liquid asphalt.

- Vehicles, including first responder vehicles, are vulnerable to engine overheating and tire deterioration.
- Aboveground utility and power lines can droop or sag and create a heightened fire risk.
- Other critical infrastructure, including aboveground power lines, communication structures, and emergency generators.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Safeway, Walmart, Home Depot, and Lowes.
- Natural environments located throughout the City.
- Plants, animals, ecosystems, and natural environments are vulnerable to high rates of mortality due to excessive heat, especially during repetitive high-heat days.

3.3.5. Flooding, Including Channel Migration and Streambed Erosion

Some degree of flooding is not uncommon in the County, and events typically occur from October through April. The City experiences localized flooding that has caused disruptions. Tigard is located in the Tualatin Basin, with the Tualatin River defining the city's southern border. Streams within the city's border include Fanno Creek, which has two primary tributaries, Ash Creek and Summer Creek, and eight smaller tributaries, including Red Rock, Pinebrook, Ball, Derry Dell, Krueger, Hiteon and two unnamed streams. Two small perennial streams, Copper Creek and an unnamed stream, flow directly into the Tualatin River. Tigard also has two lakes and ponds in residential areas. All of these water sources are susceptible to annual flooding events. Potential impacts of and vulnerabilities to flooding and a previous significant event are identified below.

3.3.5.1. Significant Event Since Adoption of the 2017 NHMP

The City identified one previous significant event that impacted the area.

- **April 8–11, 2019:** Local flooding impacted and disrupted emergency transportation routes, and multiple outfall and stream bank damage impacts occurred.

3.3.5.2. Potential Impacts

The potential impacts from a flooding event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Public health concerns, such as the spread of infectious diseases, exposure to hazardous materials and debris, and water quality issues.
- Need for widespread search and rescue operations, including water rescues.
- Displaced residents in need of sheltering.
- Delayed emergency response times and disruption of traffic due to high water, debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal economic impacts from loss of income and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, and parks.

3.3.5.3. Vulnerabilities

Population, economic, built environment, critical facility, infrastructure, and natural environment vulnerabilities to a flooding event include:

- Populations without access to private transportation.
- There are 14 bridges and 1 Portland General Electric power station located inside the floodplain. The North Dakota Street and Tigard Street/Outfall on 113th Avenue have been damaged during previous flooding events.
- There have been past flooding challenges at the Clean Water Services Treatment Plan during fast, heavy rain events.
- Other critical infrastructure, including communication structures and emergency generators.
- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad.
 - Highway 99W and Highway 217 are major transportation routes between Portland and cities such as Tigard, Sherwood, Lake Oswego, and Tualatin. The floodplain does not contain a large amount of property, but damage could be significant as it would affect residential, commercial, and public property.
 - The following streets in the City have been identified as prone to flash flooding. When flooded, neighborhoods and main routes to commercial areas and highways may be blocked.
 - ◆ SW Dartmouth Street
 - ◆ SW Tigard Street
 - ◆ SW North Dakota Street
 - ◆ SW Tiedeman Avenue
- There are two repetitive loss (RL) properties within the City.
- Properties without flood insurance.
- Special flood hazard areas within the City. These include areas along the Tualatin River and areas along smaller tributary creeks, such as Fanno Creek, Red Rock Creek, Summer Creek, Ash Creek, and Hiteon Creek.
- Portions of the City outside of the mapped floodplains are also subject to flooding from local storm water drainage.
- There is a potential for property damage from the Tualatin River, Tigard creeks, and Scoggins Dam. The inadequate size and moderate grade of the channel for the Tualatin River and Fanno Creek causes over-bank flooding, even in mild storms. The flow of Fanno Creek is constricted by many culverts and bridges, resulting in increased upstream heights. The potential for damage is significant due to extensive development in the Fanno Creek flood basin.
- Commercial areas in Tigard along Fanno Creek are at risk of flooding.⁴⁹⁷
- Flood loss estimates determined by Hazus-MH include⁴⁹⁸:
 - 10-year flood scenario
 - ◆ Number of buildings lost: 15

⁴⁹⁷ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

⁴⁹⁸ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

- ◆ Loss estimate: \$213,000
- 50-year flood scenario
 - ◆ Number of buildings lost: 37
 - ◆ Loss estimate: \$889,000
- 100-year flood scenario
 - ◆ Number of buildings lost: 45
 - ◆ Loss estimate: \$1,392,000
- 500-year flood scenario
 - ◆ Number of buildings lost: 78
 - ◆ Loss estimate: \$2,959,000
- There is one building with a value of \$130,000 exposed to channel migration.⁴⁹⁹
- Natural environments located throughout the City.

Table 237: Land Use Type in the 100-Year Floodplain in the City of Tigard

Land Use Type	Total Parcels in 100-Year Floodplain	Total Value of Exposed Parcels	Total Area in Jurisdiction (Acres)	Total Area in the 100-Year Floodplain (Acres)	Percentage of Area in the 100-Year Floodplain
Agriculture	0	\$0	51.76	0	0%
Commercial	73	\$216,101,070	1400.05	157.64	11.26%
Forest	0	\$0	77.61	0	0%
Industrial	1	\$472,160	28.57	0.96	3.36%
Multi-Family Residential	17	\$196,114,700	341.52	63.7	18.65%
Public	99	\$307,265,400	921.94	459.96	49.89%
Single-Family Residential	189	\$92,299,910	3,063.82	74.62	2.4%
Vacant	30	\$3,007,160	297.98	38.19	12.82%
Other	39	\$43,476,260	596.91	97.16	16.28%
Total	448	\$858,736,660	6780.16	892.23	13.16%

⁴⁹⁹ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

Table 8: Buildings in Tigard within FEMA-Mapped Floodplains

Building Classification	Buildings within Tigard	Buildings within 100-Year Floodplain	Buildings within 500-Year Floodplain	Buildings within Combined 500-Year & 100-Year Floodplain
Total Buildings	19,308	145	24	169
Percentage of Buildings within Tigard	100%	0.75%	0.12%	0.88%

3.3.6. *Landslide*

The City can be directly impacted by landslides, and northwest Tigard on Bull Mountain and Roy Rogers Road are particularly susceptible. The two lanes eastbound on State Highway 99W are also susceptible. Potential impacts of and vulnerabilities to landslides are identified below.

3.3.6.1. **Potential Impacts**

The potential impacts from a landslide event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Mobility or access issues for residents due to blocked or damaged transportation routes.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income and property damage that may not be covered by insurance.
- Debris flows.
- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Power outages and natural gas leaks.
- Disruption of traffic due to damaged or destroyed transportation systems.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, and parks.

3.3.6.2. **Potential Vulnerabilities**

Population, economic, built environment, critical facility, infrastructure, and natural environment vulnerabilities to a landslide event include:

- Populations without access to private transportation.
- Populations that live in, work in, or use highly susceptible areas for recreation.
- Areas of northwest Tigard on Bull Mountain and Roy Rogers Road are particularly susceptible to landslide.

- Many areas in the southwestern portion of the City are also highly susceptible to damage from landslides.
- The two eastbound lanes of State Highway 99W may be at risk for closure or damage due to a landslide.
- Subdivisions from State Highway 99W from the City of Sherwood and King City to the City of Tigard can be blocked due to landslides.
- The intersection of State Highway 99W and SW Gaarde Street can be impacted by landslides.
- Per DOGAMI, there are 635 buildings with a total value of \$228,061,000 at high susceptibility and 8,352 buildings with a total value of \$2,608,886,000 at moderate susceptibility to landslide exposure.⁵⁰⁰ Additionally, a community risk profile completed by DOGAMI shows 2,005 residents could be displaced due to a very high or high susceptibility landslide event.⁵⁰¹
- Harm to ecosystems from loss of habitat, and death and destruction of vegetation and animals.
- Landslide hazard is ubiquitous in a large percentage of undeveloped land and may present challenges for future planning and mitigation efforts. Awareness of nearby areas of landslide hazard is beneficial for reducing risk for every community in Washington County.

⁵⁰⁰ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

⁵⁰¹ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

3.3.7. Volcanic Ash

Volcanic activity is possible from mountains near the County. It is anticipated that ashfall from a volcanic eruption has the potential to impact the City, although the scale and types of impacts and vulnerabilities may differ depending on which volcano erupts, the level of eruption, and the wind direction during and after eruption. Potential impacts of and vulnerabilities to volcanic ash are identified below.

3.3.7.1. Potential Impacts

Though unlikely, the impacts of a significant ashfall can be substantial. Impacts may include:

- Indirect injuries and deaths, such as those sustained during ash cleanup operations or in traffic accidents.
- Short-term health effects, including respiratory effects.
- Widespread public health issues stemming from failing or damaged infrastructure, such as lack of clean water and sanitation. This includes public water systems that rely on outdoor reservoirs.
- The need to shelter individuals to protect them from poor air quality, including houseless persons and persons displaced from their residences due to poor residential air filtration systems.
- Delayed emergency response times due to decreased visibility and increased traffic hazards.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and cleanup activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, drainage systems, telecommunications, and transportation routes.
- Downed or damaged power lines can lead to wildfires.
- Damage to crops, livestock, vegetation, parks, and natural systems.

3.3.7.2. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to volcanic ash. This includes:

- People in the City with chronic lung problems and other preexisting health conditions, children, pregnant women, and older adults. This may include those living in or spending time in the City's 20 schools and education administration buildings, 7 medical facilities, the Just Compassion Shelter, and the City of Tigard Senior Center.
- People without access to effective dust masks, eye protection, and drinking water and food uncontaminated by volcanic ash.

- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2 hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.
- Other critical infrastructure, including aboveground power lines, communication structures, and emergency generators.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Safeway, Walmart, Home Depot, and Lowes.
- Older buildings and infrastructure not built to withstand the weight and impacts from large amounts of volcanic ash. This includes historical structures and properties, manufactured homes and buildings, Tigard City Hall, the Public Works Operations Building, and the Highway 99W viaduct over downtown and a heavily trafficked rail line.
- Drinking water sources and water treatment infrastructure, food supplies and availability, and access to medical resources or care may also be impacted by volcanic ash and can cause health impacts on a large scale.
- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad.
- Natural environments located throughout the City.

3.3.8. Wildland Fire

Although the City could experience a wildland–urban interface event, historically it is more likely to be affected by smoke and poor air quality due to wildland fires outside its boundaries. Tigard typically issues burn bans every July through September to reduce the likelihood of an event occurring. Potential impacts of and vulnerabilities to wildland fire and previous significant events are identified below.

3.3.8.1. Significant Events Since Adoption of the 2017 NHMP

The City has not been directly impacted by a wildland fire event since adoption of the 2017 NHMP. However, in September 2020, multiple wildfires occurred concurrently in the county, outside the county, and outside the state, and the City experienced significant smoke from the fires. In addition, on August 13, 2021, wildfire smoke occurred in Tigard due to wildfires outside the City, county, and state. The Occupational Safety and Health Administration (OSHA) distributed hundreds of thousands of respirator masks to construction and contractor crews, and clean air and cooling centers were staffed and stood up for multiple consecutive days within the City.

3.3.8.2. Potential Impacts

The potential impacts from a wildfire event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Exposure to wildfire smoke, which can lead to eye, nose, and throat irritation and the worsening of chronic heart and lung diseases.
- Widespread public health issues stemming from failing or damaged infrastructure, such as lack of clean water and sanitation.
- Need for widespread search and rescue operations.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to blocked transportation routes and debris, congested transportation routes due to evacuations, and damaged infrastructure and vehicles.
- Extended operational hours of County staff and resources needed for response to the event.
- Strain on or loss of water supply due to increased demand.
- Economic impacts to governments, including costs for fire suppression, staff, equipment, supplies, transportation and mobilization of first responders, evacuations, sheltering operations, post-fire recovery, and rebuilding costs associated with government-owned buildings, property, and infrastructure.
- Economic impacts, including loss of local revenue due to business and property tax losses, agriculture production losses, and reduced recreation and tourism activity. Scoggins Valley Park receives one million visitors a year, most during summer, which is when wildland fires tend to occur.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.

- Damage and destruction to the built environment, including above- and belowground utility lines; residential, public, and private buildings; and transportation systems.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property, causing blocked road and rail transportation routes.
- Downed or damaged power lines. This impact may be compounded since powerline failures can lead to additional wildfires.
- Power outages and natural gas leaks.
- Hazardous material releases due to infrastructure and facility damage.
- Harm to ecosystems from loss of habitat, death and destruction of vegetation and animals, and erosion.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards, including air and water quality issues. Landslide and erosion issues are common following a wildland fire.

3.3.8.3. Vulnerabilities

Given the dynamic nature of wildland fires, all populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to this hazard. These include:

- People in the City with chronic lung problems and other preexisting health conditions, children, pregnant women, and older adults. This may include those living in or spending time in the City's 16 schools and 11 commercial pre-school and/or day care and education administration buildings, 7 medical facilities, the Just Compassion Shelter, and the City of Tigard Senior Center.
- Populations without access to private transportation.
- First responders and other personnel working directly on fire protection, suppression, and patrols or near a wildfire can experience burns, smoke exposure, heat-related impacts such as heat stroke, heat exhaustion, dehydration, physical fatigue, mental health challenges, injuries, and death.
- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2 hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.
- Other critical infrastructure, including aboveground power lines, communication structures, and emergency generators.
- Drinking water sources and water treatment infrastructure, food supplies and availability, and access to medical resources or care may also be impacted by wildfire and can cause health impacts on a large scale.
- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad.
- Per analysis of the Oregon State University–Extension Service Fire Program and Wildland Fire Associates dataset, there are 33 buildings with a total value of \$9,706,000 at high risk of wildland fire, 16 buildings with a total value of \$3,304,000 at moderate wildland fire risk, and 1,768

buildings with a total value of \$569,993,000 at low wildland fire risk.⁵⁰² Additionally, a community risk profile completed by DOGAMI shows 94 residents may be potentially displaced due to a high or moderate risk wildland fire event.⁵⁰³

- Homes, businesses, and infrastructure adjacent to the wooded areas near the outskirts of Tigard.
- Areas in the City that are more vulnerable to wildland fire include northwest Tigard on Bull Mountain and Roy Rogers Road, the full length of the Tualatin River east to west, the Cook Park vicinity, the Summer Lake Park vicinity, the southwest Tigard in the vicinity of Royal Villa Senior Living, Bonita Park, and the Wall Street and Fanno Creek Trail area.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Albertsons, Safeway, Walmart, Home Depot, and Lowes.
- Natural environments located throughout the City.

⁵⁰² Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

⁵⁰³ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

3.3.9. Windstorm, Including Tornado

The City experiences high winds at all elevations. Potential impacts of and vulnerabilities to windstorms are identified below. Potential impacts of and vulnerabilities to windstorm, including tornado, and previous significant events are identified below.

3.3.9.1. Significant Events Since Adoption of the 2017 NHMP

The City identified two previous significant events that impacted the area.

- **April 7, 2017:** Many weather stations across the planning area recorded wind gusts up to 60 to 75 mph. Several trees came down across the area, and personal property throughout the City sustained damage.
- **April 30, 2022:** Significant infrastructure, trees, and personal property damage was sustained throughout the City of Tigard. A short-lived gustnado (a brief, shallow surface-based vortex that forms the downburst emanating from a thunderstorm) at the lowest elevation in the city tore off roofs of dugouts at a youth baseball field during the game.

3.3.9.2. Potential Impacts

The potential impacts from a windstorm event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths.
- Displaced residents in need of sheltering.
- Delayed emergency response times due to debris, blocked transportation routes, and damaged infrastructure and vehicles.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems. Significant damage could lead to the complete loss of structures or totaled vehicles.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property, causing blocked road and rail transportation routes.
- Downed or damaged power lines can lead to wildfires.
- Power outages.
- Harm to ecosystems from loss of habitat, and death and destruction of vegetation and animals.
- Damage to crops, livestock, vegetation, parks, and natural systems.

3.3.9.3. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to windstorms, including tornadoes. These include:

- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2 hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.
- Older buildings and infrastructure not built to withstand high winds. This includes historical structures and properties, manufactured homes and buildings, Tigard City Hall, the Public Works Operations Building, and the Highway 99W viaduct over downtown and a heavily trafficked rail line.
- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad. Street signs and traffic lights may also be damaged.
- Other critical infrastructure, including aboveground power lines, communication structures, and emergency generators.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Albertson, Safeway, Walmart, Home Depot, and Lowes.
- Natural environments located throughout the City.

3.3.10. Winter Storm

The City has experienced winter storms every year since the 2017 NHMP was adopted. Although the severity of most of the storm events has been low and did not cause significant damage, winter storms occur frequently and have the potential to impact economic activity. Potential impacts of and vulnerabilities to winter storms and previous significant events are identified below.

3.3.10.1. Significant Events Since Adoption of the 2017 NHMP

The City identified three previous significant events that impacted the area.

- **February 18, 2018:** Light snow fell in the City, impacting roads, infrastructure, trees, and power lines.
- **February 8, 2019:** Light snow occurred in the City, impacting roads, infrastructure, trees, and power lines.
- **January 5, 2020:** Many areas in the County received an inch of snow, and areas of the region lost power for up to five days. Within the City, road and water infrastructure was significantly impacted, and trees and power lines were damaged.

3.3.10.2. Potential Impacts

The potential impacts from a winter storm event are identified below. The type, magnitude, and extent of impacts can vary based on the scale of the event. Impacts may include:

- Injuries or deaths, including from carbon monoxide poisoning, falls from slick or icy conditions, frostbite, and hypothermia.
- Delayed emergency response times due to debris, blocked transportation routes, damaged infrastructure and vehicles, and difficulty using fire hydrants because of frozen or damaged water system components.
- Stranded travelers due to ice, snow, and transportation impacts.
- Extended operational hours of County staff and resources needed for response to the event.
- Economic impacts to governments, including reduced future revenues, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Industries can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Personal and household economic impacts from loss of income, increased medical costs, and property damage that may not be covered by insurance.
- Damage and destruction to the built environment, including aboveground utility lines; residential, public, and private buildings; and transportation systems.
- Increased number of house fires due to unsafe alternate heating methods.
- Significant property damage and loss of water due to frozen or damaged pipes or the thawing of frozen pipes.
- Disruption of essential infrastructure systems, such as power systems, public utilities, telecommunications, and transportation routes.
- Debris from trees and damaged property, causing blocked road and rail transportation routes.

- Downed or damaged power lines can lead to wildfires, and tree debris can create fuel load for wildfire.
- Power outages.
- Harm to ecosystems from loss of habitat, and death and destruction of vegetation and animals.
- Damage to crops, livestock, vegetation, parks, and natural systems.
- Concurrent hazards, including flooding.

3.3.10.3. Vulnerabilities

All populations, economies, structures, improved property, critical facilities and infrastructure, historical properties and cultural resources, and natural environments in the City are vulnerable to winter storms. These include:

- People who do not have access to sufficient heating, insulated clothing, or dry living conditions, including unhoused populations.
- Older adults and infants, people who take certain medications, people who have certain medical conditions, and people who have been drinking alcohol are at increased risk for hypothermia. This may include those living in or spending time in the City's 20 schools and education administration buildings, 7 medical facilities, the Just Compassion Shelter, and the City of Tigard Senior Center.
- People improperly using generators and heating devices.
- Populations with disabilities may be more affected due to mobility issues.
- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2 hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.
- Roads within the City that may be especially susceptible to impacts include Bull Mountain Road, SW Gaarde Street, Roy Rogers Road, State Highways 99W and 217. Abandoned vehicles along these roads may restrict the ability to maintain them. Small snow walls that have built up on non-collector streets and downed trees can block streets and cause traffic issues. The City has a combination of county and state roads, which creates a dependency on the county and state for street clearing and maintenance. Additionally, Tigard is surrounded by bridges and overpasses into and out of the City.
- Older buildings and infrastructure not built to withstand the weight and impacts from large amounts of snow and ice. This includes historical structures and properties, manufactured homes and businesses, Tigard City Hall, the Public Works Operations Building, and the Highway 99W viaduct over downtown and a heavily trafficked rail line.
- Other critical infrastructure, including aboveground power lines, communication structures, and emergency generators.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Albertsons, Safeway, Walmart, Home Depot, and Lowes.
- Natural environments located throughout the City.

3.4. Historical Events

Hazard events that have affected the entire planning area since adoption of the 2017 NHMP are detailed in Volume I, Section 2. The City has experienced impacts from extreme heat, flooding, windstorm, winter storm, and wildfire smoke events since the 2017 NHMP update.

A City disaster declaration for the COVID-19 pandemic began on March 17, 2020. Although pandemic is not a hazard included in this NHMP, this declaration is noted because FEMA provided support and Hazard Mitigation Grant Program funding during the event.

3.5. Overall Vulnerability

Based on the analysis completed by the Technical Committee, windstorm, including tornado, winter storm, earthquake, wildland fire, and drought present the highest relative risk to the City of Tigard. These hazards can create widespread events, and all populations, economies, structures, improved property, critical facilities and infrastructure, and natural environments in the City can be vulnerable to these hazards.

Areas of greatest vulnerability to these hazards within the City include:

- Populations with higher vulnerability, such as those with preexisting health conditions, older adults, children, and pregnant women. This may include those living in or spending time in the City's 20 schools and education administration buildings, 7 medical facilities, the Just Compassion Shelter, and the City of Tigard Senior Center.
- Populations that are unhoused, do not have access to private transportation, and/or are without access to sufficient heating and clean water.
- Populations with limited income and financial resources.
- Populations whose primary language is not English.
- Industries that can experience commerce losses from power interruptions, damaged buildings and assets, and road closures. Industries can also sustain direct losses to buildings, personnel, and other vital equipment.
- Economic impacts to the City, including loss of local revenue due to business and property tax losses, reduced future revenues, reduced recreation and tourism activity, increased costs resulting from response activities, and increased future costs resulting from recovery and reconstruction activities.
- Critical infrastructure and facilities, including 8 city buildings, 14 roads throughout the City, 1 freight rail line, 1 commuter rail line, water infrastructure throughout the City, 1 Clean Water Services Treatment Plant, 3 fire stations, 19 school and education administration buildings, 2 hazardous material sites, 7 medical facilities, 18 religious facilities, 13 private utilities throughout the City, 3 historical properties, 4 cultural sites, 3 natural resources, 1 overnight shelter, 1 shopping center, and 1 office building.
- Older buildings and infrastructure not built to current building codes or seismic standards, including historical structures and properties, manufactured homes and businesses, Tigard City Hall, the Public Works Operations Building, and the Highway 99W viaduct over downtown and a heavily trafficked rail line.
- Critical transportation infrastructure, including Oregon Highways 99W and 217, Interstate 5, arterial roads, TriMet services, and the Portland & Western Railroad.
 - Roads within the City that may be especially vulnerable to winter storm impacts include Bull Mountain Road, SW Gaarde Street, Roy Rogers Road, State Highways 99W and 217. Additionally, Tigard is surrounded by bridges and overpasses in to and out of the City.

- Other critical infrastructure, including communication structures, emergency generators, and aboveground utility and power lines. Underground infrastructure, such as pipelines and utility lines, buildings, and roads are also vulnerable to damage from liquefaction due to the type of soil in the City.
- Areas in the City that are more vulnerable to wildland, including northwest Tigard on Bull Mountain and Roy Rogers Road, the full length of the Tualatin River east to west, the Cook Park vicinity, the Summer Lake Park vicinity, southwest Tigard in the vicinity of Royal Villa Senior Living, Bonita Park, and the Wall Street and Fanno Creek Trail areas.
- The City's water sources and its three aquifers and three wells.
- Essential businesses, including Costco, WinCo Foods, Fred Meyer, Albertsons, Safeway, Walmart, Home Depot, and Lowes.
- Natural environments located throughout the City.

4. Capability Assessment

(In compliance with 44 CFR §201.6(c)(3))

The following capability assessment and safe growth analysis examine the ability of the City to implement and manage a comprehensive mitigation strategy. Strengths, opportunities, and resources of the jurisdiction are identified to develop an effective hazard mitigation action plan. The capabilities identified in this assessment were evaluated collectively to develop feasible recommendations, which support the implementation of effective mitigation activities.

A capability questionnaire was distributed to the City of Tigard Technical Committee to initiate this assessment. The survey included questions regarding existing plans, policies, and regulations that contribute to or hinder the ability to implement hazard mitigation activities, including legal and regulatory capabilities, administrative and technical capabilities, education and outreach capabilities, and fiscal capabilities. The Technical Committee also completed a safe growth analysis to identify potential gaps in growth guidance instruments and improvements that could be made to reduce vulnerability to future development.

4.1. Planning and Regulatory Assessment

Planning and regulatory capabilities include plans, policies, codes, and ordinances within the City that can prevent and reduce the impacts of hazards.

The City's yearly Capital Improvement Plan and Stormwater System Plan address natural hazards and identify and implement specific mitigation strategies and actions. The City's Capital Improvement Program provides funding for hazard mitigation projects identified in this NHMP and limits expenditures on projects that would encourage development in areas vulnerable to natural hazards. Additionally, the City's infrastructure policies also limit extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards.

The City's Comprehensive Plan addresses natural hazards and grants the authority to prepare mitigation strategies, but it does not identify and cannot be used to implement mitigation projects. It also provides adequate space for expected future growth in areas located outside natural hazard areas. Many of the goals and policies in the City's Comprehensive Plan are related to those in this NHMP and safe growth objectives. The monitoring and implementation section of the NHMP covers these and all other hazard mitigation strategies discussed in the plan. Safety is explicitly included in the Comprehensive Plan's growth and development policies.

The local Emergency Operations Plan contains hazard-specific annexes that include the natural hazards of earthquake, flood, major fire, severe weather, landslides, and volcano. Tigard also has a Continuity of Government (COG) Plan as well as seven department continuity of operations plans that can be used to plan for and mitigate against natural hazard events.

There is not a standalone city economic development plan; however, this topic is addressed in the City's Comprehensive Plan. Additionally, Tigard has multiple transportation plans, but these plans do not address natural hazards. The Regional Disaster Preparedness Organization and Metro is working to revise Emergency Transportation Route maps, and the City is a part of this effort.

The City defers to Tualatin Valley Fire & Rescue for wildfire planning. A Community Resiliency Plan is currently being written and will be a comprehensive community and science-based strategy to bring Tigard to carbon neutrality by 2035, reduce the City's effect on natural resources and the environment, and help the City adapt. It centers people around people, especially historically excluded communities most vulnerable to climate change.

Land use planning and ordinances are adequately administered and enforced and are an effective measure for reducing hazard impacts. These include zoning, subdivision, floodplain, and natural hazard-specific ordinances and the utilization of flood insurance rate maps (FIRMs). The zoning ordinance is effective for reducing some hazard impacts from flooding, landslide, and earthquake, but less effective for other hazards and does not address volcanic ash or windstorms. The subdivision ordinance is older and needs to be updated to better address natural hazards and will be addressed in 2023 and 2024. The floodplain ordinance is currently being updated and should be completed by the end of 2022. The update will include FEMA's Model Code-Coordinated ordinance. FIRMs were updated in 2017. System Development Charge funds may be used to purchase properties for open space and public recreation uses.

The City has zoning ordinances that conform to the Comprehensive Plan in terms of discouraging development or redevelopment within natural hazard areas, including prohibiting development within, or filling of, wetlands, floodways, and floodplains. The ordinance also contains natural hazard overlay zones that set conditions for land use within such hazard zones. Rezoning procedures recognize natural hazard areas as off limits to any zoning changes that would allow for increased activity or development in the area. The City does not have subdivision regulations that restrict the subdivision of land within or adjacent to natural hazard areas, provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources, or allow density transfer where hazard areas exist.

The City has environmental systems that prevent development in natural hazard areas or zones that have been identified and mapped and has policies that maintain and restore protective ecosystems, including land use policies. Additionally, the city council's Community Promise includes embracing sustainability to improve natural resources. The City has a comprehensive Community Resiliency Plan, utilizes carbon responsible community development, and supports the planting of trees on public and private property to maximize the environmental benefit they can provide, even administering a program to provide free trees to the community. The City also has policies that provide incentives to development that is located outside protective ecosystems.

The Building, Planning, and Engineering Departments review all site plans for compliance with state building codes, land use requirements, and accepted engineering practices. The City implements and adequately enforces state building codes, including the 2019 Oregon Structural Specialty Code, 2019 Oregon Mechanical Specialty Code, 2021 Oregon Residential Specialty Code, 2021 Oregon Electrical Specialty Code, and 2021 Oregon Plumbing Specialty Code. Both Tualatin Fire & Rescue stations that service the city have an Insurance Services Office (ISO) Public Protection Classification of 2. The City's building codes also contain provisions to strengthen or elevate construction to withstand hazard forces, and the City has an adopted evacuation and shelter plan to deal with emergencies from natural hazards.

4.1.1. National Flood Insurance Program Compliance

Participation in the National Flood Insurance Program (NFIP) is based on a voluntary agreement between a community and FEMA. For communities that adopt a floodplain management ordinance to reduce flood risks to new construction, federally backed flood insurance is made available to property owners in the community. Compliance with the NFIP, however, extends beyond participation in the program. The three basic components of the NFIP include floodplain identification and mapping risk, responsible floodplain management, and flood insurance.

An RL property is a property insured under the NFIP for which the program has paid at least two claims of more than \$1,000 in any 10-year period since 1978, regardless of any change(s) of ownership during that period. As of September 30, 2021, there are two FEMA-identified RL properties in the City.

4.1.1.1. National Flood Insurance Program Details

Insurance Summary

There are currently 127 NFIP policies in the City and \$37,270,800 coverage in force. The dollar amount of premiums paid annually was not available at the time this NHMP was published. Identifying this information is an improvement for the next planning cycle.

There have been 12 claims paid for a total amount of \$170,962 paid. One substantial damage claim has been paid.

There are 59 structures exposed to 1% (100-year) flood risk within the City.⁵⁰⁴

Staff Resources

There are no barriers to running an effective NFIP program in the City. The City's NFIP Coordinator is not currently certified, and floodplain management is not an auxiliary function. NFIP administration services in the City include building and development permit review to ensure the floodplain is not impacted, education of homeowners and property owners, and staff coordination to certify that capital projects, infrastructure projects, and other City-led projects follow the City's Community Development Code and its floodplain regulations.

Compliance History

The City is in good standing with the NFIP and there are no outstanding compliance issues. The most recent Community Assistance Visit (CAV) or Community Assistance Contact (CAC) was in June 2022 and the City passed the program audit.

The City will continue NFIP compliance during the next five years of NHMP implementation by enforcing floodplain management requirements, including active program administration, undertaking any code amendments needed to maintain compliance, and adopting FEMA's Model Code-Coordinated Ordinances within the next two months.

Regulation

The City entered into the NFIP on February 14, 1978, and has both digital and paper FIRMs. The current effective map date is October 19, 2018. Floodplain development regulations either meet or exceed the minimum FEMA and state requirements. No new residential development is allowed in the flood hazard area, and other development within the floodplain is controlled through zoning processes and land use permitting policies.

⁵⁰⁴ Oregon Department of Geology and Mineral Industries. (2022). Open-File Report O-22-04: Natural Hazard Risk Report for Washington County. <https://www.oregongeology.org/pubs/ofr/O-22-04/p-O-22-04.htm>

Community Rating System

The City does not participate in the NFIP's Community Rating System.

4.2. Administrative and Technical Assessment

This portion of the assessment includes staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

The City's Planning Commission is not generally directly involved in mitigation planning; however, Planning Commissioners review land use and transportation policy proposals and advise City Council on updates to the Tigard Comprehensive Plan, Tigard Community Development Code, and Tigard Zoning Map. They also review and decide whether to approve development proposals that are subject to discretionary approval criteria. These plans and codes contain policies and regulations, such as limited development in and access to identified hazard areas, that promote mitigation efforts. The Mitigation Technical Committee works together effectively to update and maintain the NHMP.

The City administers maintenance programs to reduce risk, including tree trimming, clearing drainage systems, and landscape maintenance of open spaces and rights of way. The City also has multiple effective mutual aid agreements and planning partnerships, including intergovernmental agreements and the Managing Oregon Resources Efficiently Mutual Aid Agreement, and partnerships with the Regional Water Providers Consortium, the Oregon Water/Wastewater Agency Response Network, Washington County Emergency Management Cooperative, the Regional Disaster Preparedness Organization, and the Cooperative Public Agencies of Washington County.

Tigard has adequate staffing levels to enforce regulations, staff are trained on hazards and mitigation efforts, and coordination on mitigation initiatives with staff is effective. The chief building official is part of the Community Development Department and is a full-time position. This department also has several other full-time positions, including planners and engineers, and houses subject matter experts on the floodplains and natural resources. The Emergency Management Program is located within the Public Works Department.

City departments like Community Development and Public Works have staff who can support the mitigation strategy, including planners and engineers with an understanding of natural hazards and land development and management practices, engineers and professionals trained in construction practices related to buildings and infrastructure, staff with education or expertise to assess vulnerability to hazards, and GIS staff and coordinators. The City also has an assigned damage assessment team that is trained by the Applied Technology Council in the post-earthquake safety evaluation of buildings and safety evaluation procedures of buildings after windstorms and floods.

Additionally, the City has many technical capabilities that have been used to assess or mitigate risk and could be used in future efforts. Warning systems include CodeRED/Everbridge in partnership with Washington County. Grant writing is completed by individual departments as needed. The City has a robust GIS program that has the ability to create mapping products for all hazards, infrastructure, critical and essential facilities, HAZMAT resources, and Adult Foster Care, and Urgent Care and American Red Cross facilities. Hazard data and information can be pulled from a variety of sources, including historical records and DOGAMI.

4.3. Education and Outreach Assessment

Education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information were assessed to determine the City's capabilities.

Tigard's Community Emergency Response Team (CERT) Program promotes disaster preparedness for hazards and trains members in basic disaster response skills, such as fire safety, light search and rescue, and disaster medical operations. Annually for the past 13 years, the City has partnered with the Church of Jesus Christ of Latter-day Saints to conduct a whole community emergency preparedness fair with an average attendance of 1,000 participants.

The City's Emergency Management Program provides public education in the form of the Take 5 to Survive and the Be Two Weeks Ready programs and school programs. It also provides resources such as emergency preparedness for older adults, people with disabilities, pets; emergency driving tips; extreme heat information and preparedness; and how to pack and storm items to prevent damage from disasters. The City's Public Works Department trains residents on proper tree trimming and vegetation waste disposal. Additionally, Tigard is a Tree City USA and works to maintain landscaping and properties to reduce natural hazards vulnerabilities and impacts.

There are nonprofit organizations and community groups that can assist with implementing future mitigation actions, including The Church of Jesus Christ of Latter-day Saints, the American Red Cross, and other faith-based organizations. The City also participates in the Regional Disaster Preparedness Organization, Washington County Emergency Management Cooperative, Local Emergency Managers group, and the Local Emergency Planning Committee.

4.4. Financial Assessment

The City has access to or is eligible to potentially use the following funding resources for hazard mitigation initiatives:

- Capital improvements project funding
- Taxes levied for specific purposes
- Fees for water, sewer, gas, and/or electric services
- Impact fees for new development
- Stormwater utility fees
- Federal funding sources, including the Community Development Block Grant, Urban Areas Security Initiative, Building Resilient Infrastructure and Communities, and Hazard Mitigation Assistance Grants
- State funding programs, including the State Homeland Security Program and the State Preparedness and Incident Response Equipment grant program
- Public or private partnership funding sources, including Oregon's Seismic Rehabilitation Grant Program

4.5. Capability Expansion and Improvement

Actions that can expand and improve existing authorities, plans, policies, and resources for mitigation include continuing to update City plans as necessary to ensure they are current and reflect the needs of the community; creating and implementing additional public education and outreach offering; and ensuring grant opportunities are capitalized upon to meet goals, as appropriate.

5. Mitigation Strategy

(In compliance with 44 CFR §201.6(c)(3)(i), §201.6(c)(3)(ii), §201.6(c)(3)(iii), §201.6(c)(3)(iv), and §201.6(c)(4)(ii))

The mitigation strategy serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) directs local mitigation plans describe hazard mitigation actions a community will undertake to lessen the danger from hazards of concern and establish a strategy for implementing those actions. As such, all other requirements for a local hazard mitigation plan lead to and support the mitigation strategy.

5.1. Mitigation Goals

The Steering Committee reviewed and evaluated goals from the 2017 Washington County NHMP, 2020 City of Beaverton NHMP, 2011 Cities of Cornelius and Forest Grove NHMPs, and 2020 State of Oregon NHMP. The goals from each plan were grouped by topic and then synthesized to create the seven goals detailed in Volume I, Section 3. These goals are the basis of this plan and summarize what the Steering Committee will accomplish by implementing this plan.

5.2. Plan Incorporation and Integration into Existing Planning Mechanisms

Based on mitigation plan requirement 44 CFR §201.6(c)(4)(ii), the vulnerability and capabilities assessment for the City was carefully reviewed and considered when developing the mitigation actions for this plan. The City's Technical Committee has established a process by which the mitigation strategy, goals, objectives, and actions outlined in this plan will be incorporated into existing local planning strategies.

The committee will coordinate implementation with the responsible parties in the City and with external stakeholders as needed. The primary means for integrating mitigation strategies is through the revision, update, and implementation of current plans and regulations, such as comprehensive plans, capital improvement plans, and land development regulations, as feasible.

The members of the City's Technical Committee are charged with ensuring the goals and strategies of new and updated local planning documents for their jurisdictions and special districts are consistent with the goals and actions in the NHMP and will not contribute to increased hazard vulnerability.

5.2.1. Comprehensive Plan

The City of Tigard's Comprehensive Plan addresses the hazards identified in this plan and mitigation action items. Once the 2023 NHMP is adopted, these hazard-related portions of the Comprehensive Plan will be updated to reflect any changes, as applicable.

5.2.2. Building and Zoning Codes

The City is enforcing all current building codes and will continue to do so. The current zoning ordinance is effective for reducing hazard impacts from flooding, landslides, and earthquakes, but is less effective in reducing hazard impacts from volcanic ash or winter storm. Updates to these codes will be considered and integrated, as necessary, and appropriate.

5.2.3. Public Engagement, Education, and Outreach

City departments will continue to hold events to educate the public about mitigation planning efforts throughout the year, especially during the five-year NHMP update process, including continuing to host an annual community preparedness fair. City teammates will continue to reach out to established public and private partners, local nongovernmental organizations, and other stakeholders to increase community outreach opportunities.

5.2.4. Day-to-Day Government Functions

The City of Tigard has strong maintenance programs, including park, storm drain, and traffic and transportation maintenance programs. To adapt to current situations, maintenance frequency is being increased for chronic problem catch basins, water retention sites, hillside and stream bank vegetation habitat restoration projects, and hazardous tree inspection locations. These programs will remain flexible and be modified as needed.

5.2.5. Land Development Regulations

Current land development regulation policies ensure there is adequate space for development outside natural hazard areas and restricts development or re-development within these areas. These regulations will continue to be in place and enforced.

5.2.6. Floodplain Management Program and/or National Flood Insurance Program

The City's floodplain management program and NFIP administration meet FEMA and state standards. FEMA's Model Code-Coordinated Ordinances will be adopted by the City in the next two months. Flood hazard area restrictions will continue to be in place and enforced, including not allowing any new residential development in flood hazard areas.

5.2.7. Stormwater Management Plans and Procedures

The City's current Stormwater System Plan has natural hazards identified as well as mitigation action items and strategies that address erosion, water quality, and flooding. When the plan goes through a regular update, additional details about hazard mitigation will be added, as applicable.

5.2.8. Emergency Plans That Address Evacuation and Sheltering

Evacuation and sheltering are addressed in the City's Emergency Operations Plan, and the City works with Washington County on sheltering efforts as needed.

5.2.9. Enforcement of Existing Policies

The City will continue to enforce current policies, which includes not allowing residential or commercial development in identified natural hazard areas.

5.2.10. Funding Opportunities

The City of Tigard will continue to review annual, post-disaster, and stand-alone grant opportunities for potential mitigation project funding opportunities, including, but not limited to, the State Homeland Security Program funding, Building Resilient Infrastructure and Communities funding, and pre-disaster grants.

6. Action Items

The City of Tigard’s action items in the 2017 Washington County NHMP were determined by the 2017 planning team. The action items from the previous plan and the status of each action are below in Section 6.1.

Action items for the 2023 NHMP were determined by the City’s Technical Committee based on the review of its risk assessment, its existing capabilities, and the status of its previous action items. This comprehensive range of actions includes local plans and regulations, structure and infrastructure projects, natural systems protections, and education and awareness programs. A summary of these actions and full action item planning worksheets are provided in Sections 6.2 and 6.3. Additional information about how these actions were developed, evaluated, and prioritized is in Volume I, Section 3.

6.1. Status of City of Tigard Action Items from the 2017 Washington County NHMP

Table 238: Status of Action Items from 2017 NHMP

Action Item Number*	Action Item Description	Hazard(s) Addressed	Current Status
Priority #1	Protect existing development in landslide prone areas.	Landslide	Ongoing with significant progress
Priority #2	Improve local capabilities to perform earthquake building safety evaluations and to record and manage building inventory data.	Earthquake	Ongoing with significant progress
Priority #3	Integrate the goals and action items from the Tigard Natural Hazard Mitigation Plan Addendum into existing regulatory documents and programs, where appropriate.	Multi-Hazard	Ongoing with significant progress
Priority #4	Maintain public and private drainage systems.	Landslide	Ongoing with significant progress
Priority #5	Inventory and map alternative firefighting water sources and encourage the development of additional sources.	Wildfire	Ongoing with some progress

Action Item Number*	Action Item Description	Hazard(s) Addressed	Current Status
Priority #6	Adopt the Tualatin Valley Fire & Rescue Wildfire Hazard Map and implement the Wildfire Mitigation section of the Oregon Residential Specialty Code.	Wildfire	Ongoing with some progress
Priority #7	Increase technical knowledge of natural hazards and mitigation strategies in Tigard and implement policies and programs on the basis of that knowledge.	Multi-Hazard	Ongoing with significant progress
Priority #8	Identify critical public infrastructure and facilities located in flood hazard areas and highlight those facilities as a focus for mitigation and preparedness measures.	Flood	Complete
1	Improve network of communications during a disaster.	Multi-Hazard	Ongoing with significant progress
2	Develop inventories of at-risk buildings and infrastructure and prioritize mitigation projects based on those providing the most benefit (at the least cost) to city residents.	Multi-Hazard	Ongoing
3	Develop, enhance, and implement information and education programs aimed at mitigating natural hazards and reducing the risk to citizens, public agencies, private property owners, businesses, and schools.	Multi-Hazard	Ongoing with some progress
4	Identify and pursue funding opportunities to develop and implement mitigation activities.	Multi-Hazard	Ongoing with some progress
5	Identify funding sources to retrofit existing public facilities and services to contemporary standards that are identified as seismically vulnerable.	Earthquake	Ongoing with some progress
6	Expand earthquake hazard mapping in Tigard and improve technical analysis of earthquake hazards.	Earthquake	Ongoing with some progress
7	Enforce the current building code standards to ensure only the appropriate land uses are allowed in high seismic hazard areas.	Earthquake	Ongoing with significant progress
8	Continue to maintain eligibility for the National Flood Insurance Program.	Flood	Ongoing with significant progress
9	Update Storm Water Management Master Plan and identify appropriate mitigation strategies.	Flood	Complete

Action Item Number*	Action Item Description	Hazard(s) Addressed	Current Status
10	Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in those areas.	Landslide	Ongoing with some progress
11	Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during windstorm and severe winter storm events.	Severe Weather**	Ongoing with some progress
12	Coordinate and encourage electrical utilities to use underground construction practices wherever possible to reduce power outages from severe weather storms.	Severe Weather**	Ongoing with significant progress
13	Develop and implement or enhance strategies for debris management for windstorm and severe winter storm events.	Severe Weather**	Ongoing with significant progress
14	Identify critical facilities and industries that may be affected by ashfall and assist them in emergency response plan development.	Volcanic Ash	Ongoing with significant progress
15	Work with the Tualatin Valley Fire & Rescue Community Safety Program to provide information and education about wildland-urban interface to Tigard citizens.	Wildfire	Ongoing with some progress

* Number given to action item in the 2017 Washington County NHMP

** Not a hazard in the 2023 Washington County NHMP

6.2. City of Tigard Action Items: 2023 Washington County NHMP

Table 239: City of Tigard Action Items

Action Item Number	Action Item Description	Hazard(s) Addressed	Priority
1	Offer GIS hazard mapping online for residents and design professionals. More accurately map problem areas to educate residents about unanticipated risks. Upgrading maps provides a truer measure of risks to a community. Educate property owners in high-risk areas about mitigation options. Educate the public about risks, preparedness measures, and evacuation procedures.	Dam Failure	Low
2	Educate K–12 students about water conservation. Install low-flow water fixtures in schools and public facilities. Plant drought-resistant xeriscape gardens and landscapes. Capture rainwater in cisterns and rain barrels for future use on gardens, trees, and other planted areas.	Drought	Low
3	Conduct seismic evaluations on identified community assets (including shelters and critical and essential facilities) and “high risk” school and emergency service buildings, and implement appropriate structural and non-structural upgrades as mitigation strategies.	Earthquake	Low
4	Adopt future required seismic building code revisions as they become introduced. Enforce the current building code standards to ensure only the appropriate land uses are allowed, especially in high hazard areas.	Earthquake	Medium
5	Develop a technical assistance information program for homeowners. Teaching homeowners how to seismically strengthen their houses can be an effective mitigation activity. The program can include providing local government building departments with copies of existing strengthening and repair information for distribution.	Earthquake	High
6	Require minimum temperatures in housing/landlord codes. Encourage utility companies to offer special arrangements for paying cooling bills, if not already required by state law. Create a database to track those individuals at high risk of death, such as the older adults, physically fragile, and unhoused.	Extreme Heat	Medium

Action Item Number	Action Item Description	Hazard(s) Addressed	Priority
7	Adopt codes and regulations that incentivize the installation of green roofs, solar panels, and solar parking area covers, which provide shade and remove heat from roof and paving surfaces and surrounding air. Incentivize and encourage cool roofing products such as white roofs that reflect sunlight and heat away from a building. Increase tree plantings around buildings to shade parking lots and along public rights-of-way.	Extreme Heat	High
8	Educate citizens regarding the dangers of extreme heat and the steps they can take to protect themselves when extreme temperatures occur. Conduct an outreach campaign, partnering with Tigard CERT, FBOs, and other CBOs.	Extreme Heat	High
9	Heighten awareness of flood risk. Incorporate the procedures for tracking high-water marks following a flood into emergency response plans	Flood	Low
10	Create partnerships and facilitate riparian habitat restoration projects in flood or erosion-prone areas, especially along the Tualatin River, Summer Lake, and Fanno Creek.	Flood	Medium
11	Study areas where riparian landslides may occur. Complete an inventory of locations where critical facilities, other buildings, and infrastructure are vulnerable to landslides. Continue monitoring of all forested slopes cleared for housing developments. Assess vegetation in landslide-prone areas to prevent landslides and encourage plants with strong root systems.	Landslide	Medium
12	Regulate development in landslide hazard areas.	Landslide	Medium
13	Identify critical facilities and industries that may be affected by ashfall and assist them in emergency response plan development.	Volcanic Ash	Low
14	Collaborate with the Washington County Environmental Health Program for immediate warnings to communities about degraded air quality following volcanic eruptions, particularly in areas with a high concentration of vulnerable groups (e.g., schools and retirement and assisted living facilities). Work with state agencies, such as National Oceanic and Atmospheric Administration and DOGAMI, who can assist in developing ashfall models for Washington County and Tigard.	Volcanic Ash	Low

Action Item Number	Action Item Description	Hazard(s) Addressed	Priority
15	Public education/awareness of wildfire smoke can be improved. Inform the public about wildfire smoke impacts. Produce and distribute family emergency preparedness information about wildfire smoke hazards, including tips to mitigate impacts, such as stay indoors, limit indoor pollution, stay cool, limit driving, wear a mask outdoors, and use an air purifier when possible. Encourage homeowners to install carbon monoxide monitors and alarms.	Wildland Fire (Wildfire Smoke)	Medium
16	Develop and implement defensible space programs to reduce risk to structures and infrastructure.	Wildland Fire	Medium
17	Inform residents of shelter options and evacuation protocols. Educate homeowners on the benefits of wind retrofits. Provide outreach material to property owners on how to properly install temporary window coverings before a storm. Educate design professionals to include wind mitigation during building design. Educate homeowners on larger tree maintenance and management.	Windstorm, Including Tornado	Low
18	Establish and enforce standards for all utilities regarding tree pruning around lines. Bury overhead power lines. Use designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration. Install redundancies and loop feeds.	Winter Storm	Low
19	Produce and distribute family and traveler emergency preparedness information about severe winter weather hazards, including safety strategies for severe weather in driver education classes and materials. Encourage homeowners to install carbon monoxide monitors and alarms. Educate citizens that all fuel-burning equipment should be vented to the outside.	Winter Storm	Low

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Table 241: EQ – Conduct Seismic Evaluations on Identified Community Infrastructure

Mitigation Action Information	
Title of action	EQ – Conduct Seismic Evaluations on Identified Community Infrastructure
Type of action	Plans/regulations <input type="checkbox"/> Natural systems protection <input type="checkbox"/> Structure and infrastructure project <input checked="" type="checkbox"/> Public education/awareness <input type="checkbox"/>
Action description	Conduct seismic evaluations on identified community assets (shelters, critical and essential facilities) and “high-risk” school and emergency service buildings, and implement appropriate structural and non-structural upgrades mitigation strategies.
Hazard(s) addressed	Dam failure <input type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input checked="" type="checkbox"/> Volcanic ash <input type="checkbox"/> Extreme heat <input type="checkbox"/> Wildland fire <input type="checkbox"/>
How does the action address identify current or future risks and vulnerabilities?	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. 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.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input checked="" type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input type="checkbox"/> Goal 2 <input checked="" type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	Tigard’s Community Resiliency Plan, Council Goal 3, Council Promises 1–4
Alignment with existing plans and policies	Water Master Plan, Wastewater/Storm Master Plan, Comprehensive Plan (Goal 7), The Disaster Mitigation Act of 2000
Mitigation Action Implementation Plan	
Priority	Low <input checked="" type="checkbox"/> Medium <input type="checkbox"/> High <input type="checkbox"/>
Lead position, office, department, or division responsible for implementation	Community Development, PW Engineering, and Emergency Management
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	Seismic Rehabilitation Grant Program, Hazard Mitigation Assistance Grants
Estimated Cost	High – More than \$100,000

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input checked="" type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		

Table 245: EH – Increase Awareness of Extreme Temperature Risk and Safety

Mitigation Action Information	
Title of action	EH – Increase Awareness of Extreme Temperature Risk and Safety
Type of action	Plans/regulations <input type="checkbox"/> Natural systems protection <input type="checkbox"/> Structure and infrastructure project <input type="checkbox"/> Public education/awareness <input checked="" type="checkbox"/>
Action description	Educating citizens regarding the dangers of extreme heat and the steps they can take to protect themselves when extreme temperatures occur. Conduct outreach campaign partnering with Tigard CERT, FBOs, and other CBOs.
Hazard(s) addressed	Dam failure <input type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input type="checkbox"/> Volcanic ash <input type="checkbox"/> Extreme heat <input checked="" type="checkbox"/> Wildland fire <input type="checkbox"/>
How does the action address identify current or future risks and vulnerabilities?	The impacts of extreme temperatures on public health can be lessened if citizens know how to prepare and protect themselves.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input type="checkbox"/> Goal 2 <input type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input checked="" type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	Council Goal 3, Council Promises 1, 2, and 4
Alignment with existing plans and policies	Know Your Neighborhood and Annual Community Preparedness Fair, OSHA Heat Rule, The Disaster Mitigation Act of 2000
Mitigation Action Implementation Plan	
Priority	Low <input type="checkbox"/> Medium <input type="checkbox"/> High <input checked="" type="checkbox"/>
Lead position, office, department, or division responsible for implementation	Community Engagement, Emergency Management, Risk Management, Meals on Wheels
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund and Non-Profit In-Kind match	Not Applicable
Estimated Cost	Low – Less than \$50,000
Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s)
Protect Life and Property	\$300,000

Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property Environment		\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input checked="" type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Table 253: WF Smoke – Public Education/Awareness of Wildfire Smoke

Mitigation Action Information	
Title of action	WF Smoke – Public Education/Awareness of Wildfire Smoke
Type of action	Plans/regulations <input checked="" type="checkbox"/> Natural systems protection <input type="checkbox"/> Structure and infrastructure project <input type="checkbox"/> Public education/awareness <input checked="" type="checkbox"/>
Action description	Public education/awareness of wildfire smoke can be improved. Inform the public about wildfire smoke impacts. Produce and distribute family emergency preparedness information about wildfire smoke hazards, including tips to mitigate impacts such as: Stay indoors, limit indoor pollution, stay cool, limit driving, wear a mask outdoors, and use an air purifier when possible. Encourage homeowners to install carbon monoxide monitors and alarms.
Hazard(s) addressed	Dam failure <input type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input type="checkbox"/> Volcanic ash <input type="checkbox"/> Extreme heat <input type="checkbox"/> Wildfire smoke <input checked="" type="checkbox"/>
How does the action address identify current or future risks and vulnerabilities?	Larger and more frequent and intense wildfires are a growing public health problem, contributing to reduced air quality for people living near or downwind of fire. Health problems related to wildfire smoke exposure can be as mild as eye and respiratory tract irritation and as serious as worsening of heart and lung disease, including asthma, and even premature death.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input type="checkbox"/> Goal 2 <input type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input checked="" type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	Council Goal 1 and 3, Council Promises 1, 2, and 4
Alignment with existing plans and policies	U.S. EPA: Wildfire Smoke Guide for Public Officials U.S. EPA: Smoke Ready Toolbox City Smoke/AQI Policy, The Disaster Mitigation Act of 2000
Mitigation Action Implementation Plan	
Priority	Low <input type="checkbox"/> Medium <input checked="" type="checkbox"/> High <input type="checkbox"/>
Lead position, office, department, or division responsible for implementation	OHA, NOAA, WC Public Health, Risk and Emergency Management, OSFM, Fire Defense Board, ODF, and Tigard CERT
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	Not Applicable
Estimated Cost	Low–Medium (Low – Less than \$50,000; Medium – \$50,000 – \$100,000)

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input checked="" type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Table 255: Volcanic Ash – 1

Mitigation Action Information	
Title of action	Volcanic Ash – 1
Type of action	Plans/regulations <input type="checkbox"/> Natural systems protection <input type="checkbox"/> Structure and infrastructure project <input checked="" type="checkbox"/> Public education/awareness <input type="checkbox"/>
Action description	Identify critical facilities and industries that may be affected by ash fall and assist them in emergency response plan development
Hazard(s) addressed	Dam failure <input type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input type="checkbox"/> Volcanic ash <input checked="" type="checkbox"/> Extreme heat <input type="checkbox"/> Wildland fire <input type="checkbox"/>
How does the action address identify current or future risks and vulnerabilities?	Volcanic ash can lead to respiratory problems for vulnerable sectors of residents such as the elderly and youth. Increasing awareness through public outreach reduces the impact of a volcano on vulnerable groups residing in Tigard.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input checked="" type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input type="checkbox"/> Goal 2 <input checked="" type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	Council Goal 3, Council Promise 1
Alignment with existing plans and policies	Tigard Emergency Operations Plan, City Facility Emergency Action Plan, The Disaster Mitigation Act of 2000
Mitigation Action Implementation Plan	
Priority	Low <input checked="" type="checkbox"/> Medium <input type="checkbox"/> High <input type="checkbox"/>
Lead position, office, department, or division responsible for implementation	USGS-CVO, DOGAMI, Major Industries, City Facility Management
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	Not Applicable
Estimated Cost	Low–Medium (Low – Less than \$50,000; Medium – \$50,000–\$100,000)
Estimated Benefit	
Primary Benefit(s)	Financial Benefit(s)
Protect Life and Property	\$300,000-\$600,000

Project Timeline		
Expected Timeline for Completion		
Short-term <input checked="" type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000-\$600,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input checked="" type="checkbox"/> Mid-term <input type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		

Table 258: Dam Failure – Provide Information on High-Risk Areas

Mitigation Action Information	
Title of action	Dam Failure – Provide Information on High-Risk Areas
Type of action	Plans/regulations <input type="checkbox"/> Natural systems protection <input checked="" type="checkbox"/> Structure and infrastructure project <input checked="" type="checkbox"/> Public education/awareness <input checked="" type="checkbox"/>
Action description	Offering GIS hazard mapping online for residents and design professionals. More accurately mapping problem areas to educate residents about unanticipated risks. Upgrading maps provides a truer measure of risks to a community. Educating property owners in high-risk areas about mitigation options. Educating the public about risks, preparedness measures, and evacuation procedures.
Hazard(s) addressed	Dam failure <input checked="" type="checkbox"/> Flood <input type="checkbox"/> Windstorm, incl. tornado <input type="checkbox"/> Drought <input type="checkbox"/> Landslide <input type="checkbox"/> Winter storm <input type="checkbox"/> Earthquake <input type="checkbox"/> Volcanic ash <input type="checkbox"/> Extreme heat <input type="checkbox"/> Wildland fire <input type="checkbox"/>
How does the action address identify current or future risks and vulnerabilities?	A high-volume water surge upstream from a catastrophic Scoggins Dam failure can cause the rise of downstream tributaries anywhere from 4 feet to 5 feet. High water surges can be devastating, causing flooding, severe bank erosion, and property damage along the immediate tributary. Furthermore, water can rise very rapidly due to the surge, posing a serious threat to people remaining in lower-lying inundation areas.
Mitigation Action Integration	
Alignment with NHMP goals	Goal 1 <input checked="" type="checkbox"/> Goal 4 <input type="checkbox"/> Goal 7 <input type="checkbox"/> Goal 2 <input type="checkbox"/> Goal 5 <input type="checkbox"/> Goal 3 <input checked="" type="checkbox"/> Goal 6 <input type="checkbox"/>
Integration into other initiatives	Council Goal 3 and Council Promises 2 and 4
Alignment with existing plans and policies	Statewide Planning Goal 7, Comprehensive Plan Goal 7, Emergency Operations Plan, The Disaster Mitigation Act of 2000
Mitigation Action Implementation Plan	
Priority	Low <input checked="" type="checkbox"/> Medium <input type="checkbox"/> High <input type="checkbox"/>
Lead position, office, department, or division responsible for implementation	Community Development, PW Engineering, Army Corp of Engineers, Bureau of Reclamation
Potential Funding Sources	
Non-Federal Funding Sources	Federal Funding Sources
General Fund	Not Applicable
Estimated Cost	Low – Less than \$50,000

Estimated Benefit		
Primary Benefit(s)		Financial Benefit(s)
Protect Life and Property		\$300,000
Project Timeline		
Expected Timeline for Completion		
Short-term <input type="checkbox"/> Mid-term <input checked="" type="checkbox"/> Long-term <input type="checkbox"/> Ongoing <input type="checkbox"/>		
Implementation Progress Report for Plan Maintenance		
Date		
What progress in implementation has been made to date?		
What challenges in implementation have been experienced?		
What are the next steps in implementation?		