Work Session WS

Milwaukie City Council

CITY OF MILWAUKIE

COUNCIL WORK SESSION

City Hall Council Chambers, 10722 SE Main Street
& Zoom Video Conference (www.milwaukieoregon.gov)

AGENDA

AUGUST 15, 2023

Council will hold this meeting in-person and through video conference. The public may attend the meeting by coming to City Hall or joining the Zoom webinar, or watch the meeting on the city's YouTube channel or Comcast Cable channel 30 in city limits. **For Zoom login** visit https://www.milwaukieoregon.gov/citycouncil/city-council-work-session-331.

To participate in this meeting by phone dial **1-253-215-8782** and enter Webinar ID **847 1299 8920** and Passcode: **331507**. To raise hand by phone dial *9.

Written comments may be delivered to City Hall or emailed to ocr@milwaukieoregon.gov. Council may take limited verbal comments.

Note: agenda item times are estimates and are subject to change. **Page #**

1. **Natural Hazard Mitigation Plan (NHMP) Update #2 – Discussion** (4:00 p.m.) **11**
   Staff: Dan Harris, Events & Emergency Management Coordinator

2. **Water System Development Charges (SDCs) – Discussion** (4:30 p.m.) **131**
   Staff: Peter Passarelli, Public Works Director

3. **Adjourn** (5:30 p.m.)

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Servicios de Accesibilidad para Reuniones y Aviso de la Ley de Estadounidenses con Discapacidades (ADA)
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Executive Sessions
The City Council may meet in executive session pursuant to Oregon Revised Statute (ORS) 192.660(2); all discussions are confidential; news media representatives may attend but may not disclose any information discussed. Final decisions and actions may not be taken in executive sessions.

CITY OF MILWAUKIE

Memorandum

To: City Council
From: Joseph Briglio, Community Development Director
CC: Ann Ober, City Manager
Date: August 15, 2023
Re: Community Development Department Update

Community Development, Economic Development, & Housing	Planning	Building	Engineering
▪ City Hall ▪ Economic Development ▪ Affordable Housing	▪ Comprehensive Plan Implementation ▪ Planning Commission ▪ Design and Landmarks Committee ▪ Land Use/ Development Review	▪ July Review	▪ CIP ▪ Traffic/Parking Projects ▪ Right-of-Way Permits ▪ PIP ▪ Document Administration

COMMUNITY DEVELOPMENT/ECONOMIC DEVELOPMENT/HOUSING

City Hall Projects

Historic City Hall

- City staff and representatives from Henry Point Development have officially executed the disposition and development agreement (DDA). The DDA serves as the roadmap for preparing city hall for its next intended use and ensuring that conditions such as maintaining the historic façade, among others, are compulsory with the property transfer.

- Henry Point Development has conducted several site and building inspections to further understand the costs associated with purchasing and rehabilitating city hall. These have so far included a phase I environmental assessment, topographical survey, mechanical, electrical, and structural inspections, exploratory demolition, and historic preservation consultations.

- During the initial site inspections, two underground storage tanks were located at the rear of city hall. Both tanks needed to be properly decommissioned per the DEQ standards and have since been physically decommissioned by an environmental contractor. The city is now waiting for official DEQ clearance, which can take a few months.

- Staff and Henry Point Development agreed on an MOU this month that will help ensure that the city and the new ownership continue to partner in events, improvements, and other complementary operations.

- Henry Point Development received land use approval from the Planning Commission on June 27 for modifications to the site. They intend to submit their building permit package near the end of August in order to be able to immediately initiate construction once the property officially transfers in Oct/November.

New City Hall

- City Council toured the building on August 8.

- The general contractor scope is wrapping up and starting the week of 8/7, the city contractors will take over for the month of August. This will include finishing the security/access programming, terminating, and testing audio-visual equipment, stairwell graphics, artist logos/signage, and wayfinding signage.

- The project schedule is on track for our target move-in timeline between September 11-15.

Economic Development

- Downtown: Staff worked closely with the owner of Spoke and Word, an independent bookstore, to find a location on Main Street. They will be taking over the old Elle Cree storefront at 10863 SE Main Street and plan to open in August. Their website is here: https://www.spokeandwordbooks.com/

- Milwaukie Marketplace: Planet Fitness is open, and Luna's Ice Cream will be opening in the coming months. Construction has stalled for the New Seasons space, which was originally planned to open in the Fall of 2023; however, New Seasons notified the city that they will be pushing out the opening date to early 2024 due to supply and material delays.

- Milwaukie Station: In order to address new state wastewater requirements for food cart pods, staff worked on improving the site with sewer and grease interceptor traps. Without these upgrades, the food carts would no longer be allowed to operate at Milwaukie Station. The project is now100% complete and operating well. The pod also recently participated in Milwaukie Porchfest and intends to continue providing more entertainment options.

- Enterprise Zone: Staff recently met with two businesses relocating to Milwaukie's north innovation area and taking advantage of the North Clackamas Enterprise Zone tax incentives. The two businesses are Swagelock and Overland Van Project. The Overland Van Project was recently approved for the incentive. Additionally, City and County staff recently met with Alpine Foods who are interested in applying in order to help offset their current expansion costs.

Affordable Housing

- Sparrow Site: The city purchased the parcel ("main property") at the northeast corner of SE Sparrow Street and the Trolley Trail from TriMet for the purpose of land banking to support affordable housing several years ago. More recently, staff received a Metro Brownfields grant to support due diligence for the acquisition of 12302 SE 26th Avenue ("auxiliary

property") from TriMet in order to help rectify access constraints to the main property. The city recently closed on the 12302 SE 26th Ave ("auxiliary") property and is considering next steps.

- Coho Point: The Developer presented an update to the city council during its February 21 work session and requested a 12-month extension of the Disposition and Development Agreement (DDA) due diligence period because of extenuating circumstances involving supply chain and subcontractor timing issues related to the COVID-19 pandemic. The due diligence period was officially extended to March 31, 2024. City Staff recently signed off on the Developer's conditional letter of map revision (CLOMR) submittal to FEMA so that they can begin the approval process for building within the flood plain. Staff were notified on May 10, 2023, that Black Rock had submitted the CLOMR to FEMA. The review process will take several months to complete.

- Construction Excise Tax (CET) Program: The CET Program was established by the city council in 2017 and codified within chapter 3.60 (Affordable Housing Construction Excise Tax) of the municipal code. The CET levy's a one percent tax on any development over $100,000 in construction value. In example, a property owner who is building an addition that has an assessed construction value of $100,000 would have to pay $1,000 in CET to the city. As development continues throughout the city, the CET fund increases in proportionality.

  The city released its inaugural competitive bid process for CET funds through a formal Request for Proposals (RFP). The RFP prioritized both workforce and affordable housing with a preference for the greatest number of income-restricted units for the longest duration. It further prioritized projects that offered deeply affordable (30% AMI) units designed to transition people out of homelessness, provide supportive services on-site, prevent displacement, involve community land trusts, provide first-time homebuyer education, serve historically underserved communities (i.e. BIPOC), and serve other high priority special needs populations as outlined in the Milwaukie Housing Affordability Strategy (MHAS). Lastly, since the city lacks the resources to manage income-restricted units and qualify tenants on an on-going basis, it was imperative that each proposal guaranteed continuing income-verification administration and unit restriction management for at least a 30-year term.

  The selection committee scored the Hillside Park Phase I project highest; however, it also felt that the Milwaukie Courtyard Housing Project warranted some award amount due to its unique land trust model and ownership niche. Therefore, Hillside Park Phase I was awarded $1.7M (requested $2M) and the Milwaukie Courtyard Housing Project with $300K (requested $600K).

  On March 7, 2023, the city council authorized the city manager to execute the necessary grant agreements in the amounts listed above. The grants agreements for both projects have been signed and executed, and initial funding disbursements have occurred. Staff will now work with the applicants to ensure that their projects meet the conditions for funding.

- Housing Capacity Analysis/Housing Production Strategy: The Housing Capacity Analysis was adopted as an ancillary document to the Comprehensive Plan **on June 6**. The Housing Production Strategy was adopted via resolution. According to Oregon Revised Statute 197.291, the Department of Land Conservation and Development (DLCD) is now inviting public comment on the city's adopted Housing Production Strategy Report. The report is available on DLCD's Housing Needs and Production webpage for a 45-day period, starting on August 2 and ending on September 16, 2023. You can find link to DLCD's website here.

Staff will be working through the implementation of the Housing Production Strategy over the next several years.

PLANNING

Comprehensive Plan Implementation

- Planning and community development staff continue to meet regularly with the consultant team to work on the Neighborhood Hubs implementation project. The code audit is underway which will transition into code concepts.

  A Hubs refinement and prioritization process is underway, which will result in:
  - New typologies/categories applied each of the identified hubs from the 2020 report
  - Development of prioritization criteria to evaluate each hub for short- and long-term efforts
    - Criteria will be both placemaking and community building
  - Identification of needs for each hub, such as:
    - Zoning
    - Economic development assistance
    - Infrastructure improvements

  The consultant team has submitted a draft Economic Development toolkit for staff review. Finally, staff is beginning to plan the fall public involvement event, which will include in-person and virtual participation opportunities. The public workshop(s) will likely take place in October.

- Planning and Engineering staff selected a consultant for the Transportation Systems Plan (TSP) in May of 2022. The Council appointed the TSP Advisory Committee (TSPAC) on February 6 comprised of members with geographic representation within the city and community members that historically have been excluded from transportation planning processes. Community engagement will officially kick-off with the first TSPAC in October.

Planning Commission

- ZA-2023-002: A Type V application for a package of more substantive code amendments. The original goal of this package was to review recent Type III variances in an effort to streamline the code and reduce barriers for residents. The package includes amendments to access spacing standards modification process in Title 12, allowing attached cottages in cottage clusters in the R-MD zone, allow encroachments for back decks into the rear yard setback, and revise the minimum lot size for townhouse corner lots, among other proposed amendments. The Planning Commission held a work session on February 28th to discuss the amendments. The public hearing was held on April 25, where the Commission voted 4-1 in favor of a motion to recommend approval to City Council. A Council work session to discuss the amendments was held on June 20. The public hearing with the Council has been scheduled for August 15.

- ZA-2023-003: A Type V application for code amendments related to psilocybin facilities. The public hearing with the Council was held on August 1. Council voted unanimously to adopt the proposed code amendments.

- ZA-2022-005: A Type V code amendment application related to Climate Friendly Equitable Communities rulemaking. The Planning Commission held a public hearing on February 14th and voted 6-0 to recommend approval of the code amendments. The City Council discussed the amendments during the regular session on March 7th. These code amendments are currently on hold while the rulemaking process continues through the fall of 2023. The city requested and received an alternative date to implement required CFEC code changes until rulemaking is complete.

- ZA-2023-004: A Type V code amendment application to update the bicycle parking quantity and development standards for new and redevelopment projects. The Planning Commission held a work session on the proposed amendments on July 25th. The amendments are now on pause while the rulemaking process continues through the fall of 2023 due to some indication that the bicycle parking requirements for residential development (which are now 1:1) may change.

- The Planning Commission acting as the Community Involvement Advisory Committee held a joint meeting with the NDA's last fall. A result of that meeting was the development of an NDA training titled "So You Received a Land Use Notification, Now What?" Staff has been presenting the training to NDA's.

- ZA-2023-005: A Type V code amendment application to retire the Design and Landmarks Committee, based on a June 6 discussion with City Council. The Planning Commission held a public hearing on July 25th and voted 4-1 to recommend denial of the proposed code amendments. City Council will hold a public hearing on August 15.

- WG-2023-001: A Type III application proposing a 13-unit multi-unit development at 1600 SE Lava Dr. The site is in the Willamette Greenway, so the proposal is subject to Willamette Greenway review, in addition to development review and a lot consolidation. The application has been deemed incomplete.

- CSU-2023-004: A Type III application to remove the ongoing condition that Milwaukie High School maintain shared parking agreements with two nearby churches as part of its off-street parking portfolio. The newly adopted statewide rules for Climate Friendly & Equitable Communities mean the City can no longer require minimum off-street parking facilities; but since the school is a community service use that was approved with a condition related to parking, Planning Commission review is required to determine whether any new impacts might result that need mitigation. The application is being reviewed for completeness, with a tentative hearing date on October 10.

Design and Landmarks Committee

- The DLC remains on hiatus unless needed for land use review (see note above on file #ZA-2023-005).

Land Use/Development Review

- A-2023-004: An application for expedited annexation of the property 9931 SE Hollywood Ave. The property is zoned Urban Low-Density Residential (R-10) in the county and will take the City's Moderate Density Residential (R-MD) zoning designation upon annexation. The property's owner wants to connect to the City sewer.

- CSU-2023-002 & -003: Type III applications for community service use approval to develop Balfour and Bowman-Brae Parks, respectively. Referrals were sent the week of July 10, and a public hearing with the Planning Commission is scheduled for August 22. (*The application to develop Scott Park has also been submitted but is being handled with the standard development review process because parks are permitted outright in the underlying Open Space and Downtown Mixed-Use zones.)*

- EXT-2023-002: A Type II application to extend the land use approval for the Coho Point project (primary file #DR-2021-001) by another two years (to October 2025). Public notice of the request was mailed on June 22, and no comments have been received. The Notice of Decision to approve the extension request will be issued within the coming week.

[1] Only land use applications requiring public notice are listed.

BUILDING

Permit data for	**July**	**FY to Date:**
New single-family houses:	0	0
New ADU's	0	0
New Solar	9	9
Res. additions/alterations	4	4
Commercial new	0	0
Commercial Alterations	3	3
Demo's	0	0

Total Number of Permits issued: 125
(includes fire, electrical, mechanical, plumbing, and other structural)

Total Number of Inspections: 187

Total Number of active permits: 1053

ENGINEERING

Capital Improvement Projects (CIP):

CIP 2018-A13 Washington Street Area Improvements
Summary: This project combines elements of the SAFE, SSMP, Water, Stormwater, and Wastewater programs. SAFE improvements include upgrading and adding ADA compliant facilities along 27th Ave, Washington St, and Edison St. Street Surface Maintenance Program improvements are planned for Washington Street, 27th Avenue, and Edison Street. The Spring Creek culvert under Washington Street at 27th Avenue will be removed, and a new structure added. The water system along Washington Street will be upsized from a 6" mainline to an 8" mainline. The stormwater system along Washington Street will be upsized from 18" to 24" storm lines. The project is being designed by AKS Engineering and Forestry.

Update: Project is out for bid. Proposal and bid packets were due August 3rd and the proposals will be reviewed by staff. The selected proposal award resolution will be presented to City Council at the September 5th meeting.

CIP 2016-Y11 Meek Street Storm Improvements
Summary: Project was identified in the 2014 Stormwater Master Plan to reduce flooding within this water basin. The project was split into a South Phase and a North Phase due to complications in working with UPRR.

Update: Staff received approval from Council on March 21st for property purchase and pipeline easements. Land use application is moving through the process. Staff put the project out to bid for construction in mid-May, with a bid opening in mid-June. A project authorization for the construction contract with Tapani Inc. was approved by council on July 18. Staff is coordinating with Tapani to execute the construction contract.

CIP 2020-A12 SAFE & SSMP FY 2021 Improvements (Home Ave & Wood Ave)
Summary: Project includes the Home Avenue SAFE and SSMP improvements and the Wood Avenue SSMP improvements.

Project is mostly completed; a few items remain that needed to be done during warm weather.

Update: Staff is working on closing out the Project. Final payment has been submitted to finance. Contractor has been largely un-responsive for the past 3+ months.

CIP 2022-W56 Harvey Street Improvements
Summary: The project includes water improvements and stormwater improvements on Harvey Street from 32nd Avenue to the east end, on 42nd Avenue from Harvey Street to Johnson Creek Boulevard, 33rd Avenue north of Harvey Street, 36th Avenue north of Harvey Street, Sherry Street west of 36th Avenue, 41st Street north of Wake Court, and Wake Court. Sanitary sewer work will be done on 40th Avenue from Harvey Street to Drake Street. The project also includes the installation of an ADA compliant sidewalk on Harvey Street from 32nd Avenue to 42nd Avenue and 42nd Avenue from Harvey Street to Howe Street. Roadway paving will be done throughout the project area.

Harvey Street: A design consultant was contracted in July. The Kickoff meeting and survey work is beginning.

CIP 2021-X39 FY 2021 Wastewater Improvements
Summary: Project includes replacement of old, high maintenance sanitary sewer mainlines at Kent Street, 37th Avenue, and Washington Street. Project also includes the installment of new sanitary connections for the trucks at the Milwaukie Station Food Carts and lining existing sanitary mains at Home Street and Harrison Street.

Update: Construction complete. This project is being closed out.

CIP 2021-W61 Ardenwald North Improvements
Summary: Project includes street repair on Van Water Street and Roswell Street with a shared street design for bicycles, pedestrians, and vehicles. Stormwater catch basins in the project boundary will be upgraded, the water system will be upsized on 29th Avenue, 30th Avenue, and

31st Avenue, and there will be wastewater improvements on 28th Avenue, 29th Avenue, and 31st Avenue to address multiple bellies and root intrusion to reduce debris buildup.

Update: Work is progressing on 90% design. Staff anticipates bidding the project this summer.

CIP 2022-A15 King Road Improvements
Summary: King Road (43rd Avenue to city limits near Linwood Avenue) SAFE/SSMP Improvements will replace existing sidewalk and bike lane with a multi-use path, improve stormwater system, replace water pipe, and reconstruct roadway surface.

Update: Kittelson & Associates has begun the 30% design.

Milwaukie Bay Park
Update: Project was put on hold indefinitely.

Waverly Heights Sewer Reconfiguration
Summary: Waverly Heights Wastewater project was identified in the 2010 Wastewater System Master Plan. The project may replace approximately 2,500 feet of existing clay and concrete pipe.

Update: Staff advertised a RFQ in mid May, and a consultat (Stantec Consulting Services) was selected early July. Authorization for the design contract with Stantec was approved by council on August 1. Staff is now coordinating with Stantec to execute the contract.

Monroe Street Greenway
Summary: The Monroe Street Greenway will create a nearly four-mile, continuous, low-stress bikeway from downtown Milwaukie to the I-205 multi-use path. Once complete, it will serve as the spine of Milwaukie's active transportation network connecting users to the Max Orange Line, Max Green Line, Trolley Trail, 17th Avenue Bike Path, I-205 path, neighborhoods, schools, and parks. Funding grants through ODOT and Metro will allow the city to complete our 2.2-mile section of the Monroe Greenway from the Trolley Trail to Linwood Ave in the next five years.

Update: East Monroe Greenway - 37th Avenue to Linwood Avenue: Presently, staff is working with ODOT and CONSOR to develop a scope of work and design cost. This will be installed using RFFA and City Funds over Fiscal years 2025 and 2026.

Monroe Street & 37th Avenue (34th to 37th): This segment is being constructed as part of the private development of the Seven Acres Apartments under the review and inspections of the Engineering Department. This segment is almost complete.

Central Monroe Greenway - Monroe/Campbell/Oak streets (29th to 34th): The city working with ODOT to prepare an IGA that will transfer $1.55 M in STIP funding to the city to manage this segment of the Monroe Street Greenway. City UR and Transportation Funds will also be used for the design and construction of this segment during Fiscal Years 2025 and 2026.

Monroe & Hwy 224 Intersection: This project has now been combined with a larger project which will mill and overlay Highway-224 from Rusk Road to 17th Avenue. Staff have begun regular meetings with the ODOT team managing the Highway-224 mill & overlay project. This project will also include permanently closing several crosswalks, however, none of the proposed closures are currently striped, or being used. Construction is anticipated in Fiscal Year 2025.

West Monroe Greenway - Milwaukie Bay Park to 29th Avenue: This segment is currently unfunded.

Kellogg Creek Restoration and Community Enhancement Project
Summary: Project to remove the Kellogg Creek dam, replace the McLoughlin Blvd. bridge, improve fish passage, and restore the wetland and riparian area. City of Milwaukie staff are part of the project Leadership Team, Core Technical Team, and the Technical Advisory Committee. The Leadership Team and Core Technical Team both meet monthly. In addition to city staff, these groups include staff from North Clackamas Watershed Council (NCWC), Oregon Department of Transportation (ODOT), and American Rivers. The Technical Advisory Committee (TAC) for the Kellogg Creek Restoration & Community Enhancement Project involves all collaborative partners that include the Confederated Tribes of the Warm Springs Indian Reservation of Oregon, the Confederated Tribes of Grand Ronde, Clackamas Water Environment Services, Metro, North Clackamas Parks and Recreation District, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, Oregon Division of State Lands, the Native Fish Society, and the Natural Resources Office of Governor Kate Brown.

Update: The Project Leadership Team will be meeting the week of August 7th to finalize the design scope so the Request for Proposal (RFP) can be issued by ODOT later this year or very early next year. The project RFP process is being led by ODOT because they have the required procedures and staff set-up, but the creation of the scope and the review of proposals will be completed by the project leadership team. ODOT also has several staff members that work directly with Union Pacific Railroad (UPRR), so these people will be working on an agreement regarding the UPRR right-of-way.

Traffic / Parking Projects, Issues

Right-Of-Way (ROW) Permits (includes tree, use, construction, encroachment)

Downtown Trees and Sidewalks
Update: Staff has a contract with AKS; working on what type of design works best now and in the future with both the trees and sidewalks & curbs.

Private Development – Public Improvement Projects (PIPS)

Seven Acres Apartments (formerly Monroe Apartments) – 234 units
Update: We anticipate completion of all ROW improvements in summer 2023; Contractor is working on installing the main driveway on 37th Ave. (opposite from Washington Street) and ADA ramps on both sides of 37th Ave. at Washington Street. The developer has received a TCO for two buildings.

Henley Place (Kellogg Bowl redevelopment)- 175 units
Update: A Right-of-Way permit has been issued; construction of improvements is underway.

Walnut Addition Subdivision – 9 lot subdivision at Roswell St. & 33rd Ave.
Update: Most of the street work has been completed; construction is in the project correction phase.

Elk Rock Estates – 5 lot subdivision at 19th Ave & Sparrow St.
Update: Most of the street work has been completed; construction is in the project correction phase.

Shah & Tripp Estates – 8-lot subdivision at Harrison Street and Home Ave.

Update: Design plans are under review.

Jackson / 52nd – 5-unit development.
Update: Design plans are under review. Staff and developer have agreed on a development agreement to have the developer pave Jackson Street from Home to 52nd Ave. and be reimbursed for areas outside of their responsibility. Pre-construction meeting has been scheduled. Construction is anticipated to start this summer.

Document Administration

Master Plans
Summary: WSC is preparing the Stormwater System Plan.

CITY OF MILWAUKIE

WS 1. 8/15/23

OCR USE ONLY

COUNCIL STAFF REPORT

To: Mayor and City Council
Ann Ober, City Manager

Date Written: August 3, 2023

From: Dan Harris, Events & Emergency Management Coordinator

Subject: **Natural Hazard Mitigation Plan Update**

ACTION REQUESTED

Council is asked to review the 2023/24 draft update to the Natural Hazard Mitigation Plan (NHMP) and provide feedback on the plan, including updates made since the last discussion with Council on August 1, 2023. In particular, feedback on the action items contained in the NHMP is requested.

HISTORY OF PRIOR ACTIONS AND DISCUSSIONS

January 21, 2020: Council adopted the previous update of the city's NHMP.

August 1, 2023: Council reviewed the draft NHMP.

ANALYSIS

The Engage Milwaukie page for the NHMP update was activated on the afternoon of Monday, July 31, 2023, to serve as the primary means of obtaining public feedback on the draft NHMP. At the time of writing (August 3), the page had been viewed 170 times, with 41 people having commented or responded to the poll embedded on the page.

On August 3 the city's events & emergency management coordinator, sent a draft copy of the NHMP including several updates based on feedback from Council and the public to the following entities:

- Milwaukie Public Safety Advisory Committee (PSAC)
- Milwaukie Equity Steering Committee (ESC)
- All Milwaukie Neighborhood District Association (NDA) Chairs and Vice Chairs
- North Clackamas Watershed Council (NCWC)
- Johnson Creek Watershed Council
- North Clackamas School District (NCSD)
- Clackamas County Water and Environment Services (WES)
- Northwest Housing Alternatives (NHA)
- Willamette Riverkeepers
- Clackamas Community College (CCC)
- Portland General Electric (PGE)
- Clackamas Fire District 1 (CFD1)
- Providence Milwaukie Hospital
- TriMet
- Union Pacific Railroad (UPRR)

A separate email was also sent to the city's Hazard Mitigation Advisory Committee (HMAC) to ensure that they were aware of the posting and had the opportunity to comment and offer any additional input.

The Engage Milwaukie page has been publicized in the Pilot newsletter, the city's website homepage banner, and city social media.

Changes made in response to public feedback are visible on the redline version of the NHMP draft attached to this report. As of the time of writing, the changes have been primarily clerical.

Next Steps

Members of city staff are conducting public engagement throughout August 2023.

Clackamas County has requested that cities submit their draft plans by the end of September 2023. Between September 2023 and January 2024, the Milwaukie NHMP will be reviewed by Clackamas County, Oregon Office of Emergency Management (OEM), and finally the Federal Emergency Management Administration (FEMA). If approved by FEMA, the plan will return to Council for adoption in early 2024.

BUDGET IMPACT

Staff does not anticipate an increase in cost due to the adoption of an updated NHMP. Although some of the action items included in the plan have costs that exceed the current budget, the events & emergency management coordinator will continue to seek out grant funding opportunities. Some action items, including the removal of Kellogg Dam listed as part of the Flood action item (FL1) will be contingent on funding from grants and other sources.

WORKLOAD IMPACT

The action items listed as being led by emergency management will be an important part of the work plan for the events & emergency management coordinator over the lifecycle of this NHMP. Other items are not expected to create a significant workload impact because they will be accomplished in the normal course of work for the departments leading them.

CLIMATE IMPACT

Climate and natural hazards are inextricably entwined. Anthropogenic climate change has observably exacerbated most of the hazards examined in this plan. City staff will continue to apply a climate lens when considering ways to implement action items. Multi-Hazard Action Item 5 involves continuing to support the implementation of the Community Climate Action Plan (CAP).

COORDINATION, CONCURRENCE, OR DISSENT

The HMAC, consisting of representatives from building, engineering, planning, police, public works, and the city manager's office have had the opportunity to review this plan. No dissent has been noted.

STAFF RECOMMENDATION

Not applicable as no action is being taken.

ATTACHMENTS

1. Draft 2024 Natural Hazard Mitigation Plan (Clean)
2. Draft 2023 Natural Hazard Mitigation Plan (Redline)

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

August 2023

Volume II: Milwaukie Addendum

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Purpose

This is an update of the Milwaukie addendum to the Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP). This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-Jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-Jurisdictional **Participation** §201.6(a)(3),
- Multi-Jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv) and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Milwaukie adopted their addendum to the Clackamas County Multi-jurisdictional NHMP on **[Month] [Day]. 2023.** FEMA Region X approved the Clackamas County NHMP on **[Month] [Day],** 2023 and the City's addendum on **[Month] [Day], 2023.**

Mitigation Plan Mission

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

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

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

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

Mitigation Plan Goals

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

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

Below is a list of the NHMP goals:

GOAL #1: PROTECT LIFE AND PROPERTY

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

GOAL #2: ENHANCE NATURAL SYSTEMS

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

GOAL #3: AUGMENT EMERGENCY SERVICES

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

GOAL #4: ENCOURAGE PARTNERSHIPS FOR IMPLEMENTATION

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

GOAL #5: PROMOTE PUBLIC AWARENESS

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

GOAL #6: ADVANCE EQUITY AND INCLUSION IN MITIGATION PLANNING

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

NHMP Process, Participation and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 44 CFR 201.6(a)(3), *Participation.*

Milwaukie first developed an addendum to Clackamas County's Natural Hazards Mitigation Plan in 2003. This plan was updated in 2009, 2012/2013, and in 2018/2019.

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

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

Convener

The City's Events & Emergency Management Coordinator served as the convener of the HMAC. They will continue to serve as the convener during the implementation and maintenance phase and during the next plan update. The convener of the NHMP will take the lead in implementing, maintaining and updating the addendum to the Clackamas County NHMP in collaboration with the designated convener of the Clackamas County NHMP (Clackamas County Resilience Coordinator).

Representatives from the City of Milwaukie HMAC met formally and informally to discuss updates to their addendum (Volume III, Appendix B). The HMAC reviewed and revised the City's addendum, with focus on the NHMP's risk assessment and mitigation strategy (action items).

This addendum reflects decisions made at the designated meetings and during subsequent work and communication with the Clackamas County Resilience Coordinator and the OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include a revision of the City's risk assessment and hazard identification sections, NHMP mission and goals, action items, and community profile.

The Milwaukie HMAC comprises the following representatives:

- Convener, Dan Harris, Events & Emergency Management Coordinator
- Luke Strait, Police Chief
- Robbie Graves, Police Captain
- Damien Farwell, Fleet and Facilities Supervisor
- Nick Lindekugel, GIS Coordinator
- Natalie Rogers, Climate and Natural Resources Manager
- Peter Passarelli, Public Works Director
- Steve Adams, City Engineer
- Jen Garbely, Assistant City Engineer
- Patrick McLeod, Building Official

- Joseph Briglio, Community Development Director
- Brett Kelver, Senior Planner

Public participation occurred with the assistance of the city's Public Safety Advisory Committee and a public comment period in summer 2023 during which time the NHMP shared through the City's website and social media. The HMAC served as the local review body for the NHMP's development.

NHMP Implementation and Maintenance

The City Council will be responsible for adopting the Milwaukie addendum to the Clackamas County NHMP. This addendum designates an HMAC and a convener to oversee the development and implementation of action items. Because the City addendum is part of the County's multi-jurisdictional NHMP, the City will look for opportunities to partner with the County. The City's HMAC will convene after re-adoption of the Milwaukie NHMP addendum on an annual schedule. The County is meeting on a semi-annual basis and will provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The City's Events and Emergency Management Coordinator will serve as the convener and will be responsible for assembling the HMAC. The HMAC will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating and training new HMAC members on the NHMP and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes and lessons learned during the year.

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

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

Implementation through Existing Programs

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other City plans and programs including the Comprehensive Plan, Capital Improvement Plan, and Building Codes, as well as the Clackamas County NHMP, and the State of Oregon NHMP.

The mitigation actions described herein (and in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans

and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Milwaukie's acknowledged comprehensive plan is the 2020 City of Milwaukie Comprehensive Plan.

Milwaukie currently has the following plans, regulations, and projects that relate to natural hazard mitigation. For a complete list visit the City's website and General City Maps:

- Comprehensive Plan
    - Land Use Map (Additional Planning Documents)
- Municipal Code (Ord. 1686, July 9, 2018)
    - Title 13: Public Services
    - Title 15: Buildings and Construction
    - Title 16: Environment
    - Title 17: Land Division
    - Title 18: Flood Hazard Areas (SFHA and 1996 flood inundation area)
    - Title 19: Zoning
    - Title 21: Utility Service
- Capital Improvement Plan (2023-2028)
- Disaster Debris Management Plan (Metro)
- Milwaukie Community Climate Action Plan
- Emergency Operations Plan
- Transportation System Plan
    - Portland Metro 2014 Regional Transportation Plan
- Stormwater Master Plan
- Urban Forest Plan
- Wastewater Master Plan
- Water System Master Plan

Other plans:

- Clackamas County Community Wildfire Protection Plan
    - Clackamas Fire District #1

Government Structure

The City of Milwaukie has a council-manager form of government. The city council consists of five members: a mayor and four councilors. The mayor presides over council meetings. The mayor and city council members are elected to four-year terms of office through a citywide general election. The city council is responsible for identifying problems and needs within the community and then addressing those problems through community goals and objectives.

The City of Milwaukie currently has the following departments which have a role in natural hazard mitigation:

Office of the City Manager is responsible for taking charge of the daily supervision of City affairs. The Events & Emergency Management Coordinator is assigned to this department.

Community Development oversees the following departments and services:

The **Planning Division** regulates growth and development in the city of Milwaukie by administering the City's Comprehensive Plan and Municipal Code related to zoning and land division. Tasks range from implementing existing zoning regulations to assisting City Council with land use and growth planning policy development. Planning is also responsible for regulating development impacts in natural resource areas.

The **Building Division** is responsible for plan review and inspections on commercial, industrial and residential developments, as well as fire life and safety plan review.

The **Engineering Department** provides quality engineering services to ensure that all city utilities, including wastewater collection, water, streets and storm water infrastructure, meet all municipal code requirements, are efficiently managed at the lowest cost to ratepayers, and serve the long-term needs of the community. In addition, the Engineering Department provides floodplain management and regulation for the City.

The **Public Works Department** provides many of the basic urban services to the citizens of Milwaukie including the following:

The **Stormwater Division** conducts regular sewer line cleaning and inspection. The Stormwater Division maintains all the components that comprise the City's Stormwater infrastructure, valued at over $6,094,886. The various components of the system include: 1190 catch basins, 548 manholes, 62 sedimentation-manholes, 197 drywells, 37 miles of pipe and open ditches, and 5 detention ponds. It uses information from inspections for ongoing analysis of the sewer system components and capital needs assessment, and on the spot pipe rehabilitation to minimize sewer back-ups. It also ensures that the city complies with the National Discharge Elimination System (NPDES) permit. The division monitors pollutants in surface water.

The **Wastewater Division** is responsible for the maintenance of the City's wastewater (sanitary sewer) system. The Wastewater Division maintains all the components that comprise the City's Wastewater infrastructure, valued at over $7,029,552. The various components of the system include: 75 miles of sanitary sewer, 5 lift stations, and 1,607 manholes.

The **Water Division** is responsible for the supply and distribution of drinking water. The Water division maintains all the components that comprise the city's infrastructure, valued at over $16,516,356. The various components of the system include: 100 miles of water main, 964 fire hydrants, 6,911 water services, 7 well houses, 3 storage reservoirs and 4 pump stations. The division ensures that the city's water storage and distribution systems comply with all state and federal regulations.

The **Streets Division** maintains all the components that comprise the City's infrastructure, valued at over $ 38,785,042. The various components of the system include: 75 miles of road surface, signage and street pavement markings.

The **Fleet Division** maintains all the City's vehicles and equipment including police cars, sweepers, excavators, dump trucks and 150 pieces of small equipment and generators. And, the **Facilities Division** is responsible for maintaining all city facilities.

Public Safety is committed to providing quality services to the Milwaukie community. Police services are provided by the **Police Department. Code Enforcement** is responsible for neighborhood preservation, code compliance, and nuisance abatement.

Fire services are provided by Clackamas Fire District #1.

Continued Public Participation

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

NHMP Maintenance

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

- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the NHMP was last updated?
- Have new issues or problems related to hazards been identified in the community?

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

- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the NHMP accurately address the impacts of this event?

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

Mitigation Strategy

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

The City's mitigation strategy (action items) were first developed during the 2003 NHMP planning process and revised during subsequent NHMP updates. During these processes, the HMAC assessed the City's risk, identified potential issues, and developed a mitigation strategy (action items). During the 2023 update process the City updated its action items.

Priority Action Items

Table MA-1 presents a list of action items. The HMAC decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. The City will focus their attention, and resource availability, upon these achievable, high-leverage, activities over the next five years. Although this methodology provides a guide for the HMAC, the HMAC has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each action.

In creating Table MA-1, the city was required to use county and state guidelines for timeline and estimated cost categories. The timeline categories were Short Term (0-2 years), Medium Term (2-5 years), Long Term (5+ years), and Ongoing. Cost categories were Low (less than $50,000), Medium ($50,000-100,000), and High ($100,000+).

Table MA-1 Milwaukie Action Items

Action Item			Community Impact										Implementation and Maintenance			
#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
Multi-Hazard Action Items																
1	Coordinate with Clackamas County, OEM, the American Red Cross, and other relevant agencies to identify shelter facilities within Milwaukie.	The city will work with partner agencies to ensure that there is an accurate and up-to-date list of facilities that could be used as mass-shelter sites in case of emergency.	X			X	X						Emergency Management	Ongoing	General Fund, BRIC	Low
2	Increase outreach and education for hazard awareness and natural disaster preparedness, especially for low-income, elderly, non-English-speaking, and other vulnerable populations.	The city will develop a public outreach campaign in multiple languages intended to educate and encourage residents about building emergency kits and preparing for disasters.	X	X	X	X	X						Emergency Management	Ongoing	General Fund, HMGP, BRIC	Medium

#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
3	Maintain and enhance strategies for debris management for all hazards.	The city participates in the Metro Disaster Debris Management Plan and will continue to look for other opportunities to prepare for debris management following a disaster.		X				X	X		X		Public Works	Ongoing	General Fund	Low
4	Improve and obtain resources and equipment essential for responding to and recovering from disasters.	The city will continue to maintain current emergency response infrastructure and equipment while looking for funding to improve resiliency.	X	X	X	X	X		X	X	X		Public Works	Ongoing	General Fund, HMGP, BRIC, Seismic Rehabilitation Grant Program	High
5	Coordinate natural hazard related climate change action items through the Milwaukie Community Climate Action Plan (CAP).	The city will continue to implement its CAP to mitigate and reverse the effects of climate change on the severity of natural hazards.	X	X	X		X	X	X				Public Works	Ongoing	General Fund	High

#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
Flood Action Item																
1	Evaluate alternatives for reducing the flooding hazard for properties along Kellogg Creek, Johnson Creek, Mount Scott Creek area, and the Willamette River.	The city will continue to implement policies to mitigate the threat of flooding. This includes several ongoing infrastructure projects such as the **Kellogg Creek Restoration and Community Enhancement Project**.	X	X	X		X	X	X		X	X	Engineering	Long Term	General Fund, HMGP, FMA, PDM	High
Severe Weather Action Item																
1	Bury and protect vulnerable critical infrastructure, such as power lines, to lessen potential	The city will work with utility providers to protect critical infrastructure.	X	X	X	X	X	X	X				Public Works	Long Term	General Fund, HMGP, BRIC	High

	failures during severe weather.															
#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
Wildfire Action Item																
1	Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.	The city will continue to partner with Clackamas Fire District #1 to prepare for wildfires.	X	X	X	X	X	X	X	X			Emergency Management	Ongoing	General Fund, HMGP, BRIC	Low

Source: City of Milwaukie HMAC, 2023.
Note: Full text of the plan goals referenced in this table is located in Attachment A.

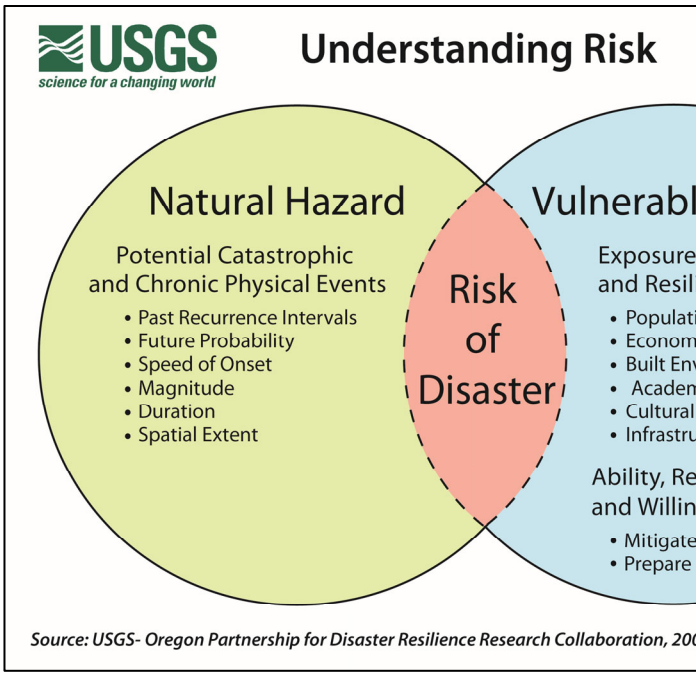
Risk Assessment

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

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

The local level rationale for the identified mitigation strategies (action items) is presented herein and within Volume I, Section 3 and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure MA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure MA-1 Understanding Risk



Hazard Analysis

The Milwaukie HMAC developed their hazard vulnerability assessment (HVA), using their previous HVA and the County's HVA as a reference. Changes from their previous HVA and the County's HVA were made where appropriate to reflect distinctions in vulnerability and risk from natural hazards unique to Milwaukie, which are discussed throughout this addendum. For detailed information on the methodology see Volume I, Section 2.

Table MA-2 shows the HVA matrix for Milwaukie listing each hazard in order of rank from high to low. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard.

Three chronic hazards (extreme heat, wildfire, and flood) rank as the top

hazard threats to the City (Top Tier). Earthquakes, winter storm, drought, and windstorm constitute the next highest ranked hazards (Middle Tier), while landslide and volcanic hazards are the lowest ranked (Bottom Tier).

Table MA-2 Hazard Analysis Matrix – Milwaukie

Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Rank	Hazard Tiers
Extreme Heat Event	16	50	90	70	226	1	Top
Wildfire (WUI)	16	45	90	70	221	2	
Flood - Riverine	10	30	80	70	190	3	
Earthquake - Cascadia (3-5min)	2	50	100	25	187	4	Middle
Earthquake - Crustal (1 min)	2	40	100	42	184	5	
Winter Storm	16	20	90	56	182	6	
Drought	16	20	70	70	176	7	
Windstorm	8	25	70	56	169	8	
Landslide/Debris Flow	12	15	60	56	143	9	Bottom
Volcano	2	15	50	7	74	10	

Source: Milwaukie HMAC, 2023.

Table MA-3 (next page) categorizes the probability and vulnerability scores from the hazard analysis for the City and compares the results to the assessment completed by the Clackamas County HMAC. Variations between the City and County are noted in **bold** text within the city ratings. Differences in city and county ratings can be attributed to a combination of differing circumstances between the city and county and different understandings of the maximum threat. For example, while the county as a whole has a medium vulnerability to volcanoes, because Milwaukie is relatively far from any volcanoes, its vulnerability is low. Similarly, Clackamas County rates its vulnerability to and probability of extreme heat events as low, but because Milwaukie is significantly more urbanized than the county as a whole, it is more vulnerable to the effects of extreme heat and more likely to experience heat island effects. As a final example, while the county's plan does not account for the effects of wildfire smoke, focusing instead on the direct threat of burning, the city's plan does account for smoke. This leaves Milwaukie with a higher vulnerability to wildfire than the county as a whole.

Future Climate Variability

Human-caused climate change is impacting the natural systems and environmental health of regional and local communities. The City of Milwaukie recognizes the effects that climate change will have on the city and its residents, including changes to the frequency, severity, and impacts of natural hazards from historical norms. According to the Intergovernmental Panel on Climate Change Fourth National Climate Assessment, the Pacific Northwest region will see impacts to drought risk, water quality, wildfires and air quality, human health and more due to climate change. Even with these challenges, the Pacific Northwest and the City of Milwaukie will shelter a growing population seeking livability and refuge from more extreme climates in the nation.

Table MA-3 Probability and Vulnerability Comparison

Threat Event / Hazard	Milwaukie

	Probability	Vulnerability	Probability	Vulnerability
Drought	High	Medium	High	Low
Earthquake - Cascadia (3-5min)	Medium	High	Medium	High
Earthquake - Crustal (1 min)	Medium	High	Low	High
Extreme Heat Event	High	High	Medium	Medium
Flood - Riverine	High	Medium	High	Medium
Landslide/Debris Flow	High	Low	High	Low
Volcano	Low	Low	Low	Medium
Wildfire (WUI)	High	High	High	Medium
Windstorm	High	Medium	Medium	Low
Winter Storm	High	Medium	Medium	Medium

Source: Milwaukie and Clackamas County HMAC, 2023.

Climate models for Oregon suggest, future regional climate changes include increases in temperature around 0.2-1°F per decade in the 21st Century, along with warmer and drier summers, and some evidence that extreme precipitation will increase in the future.[2] Increased droughts may occur in the Willamette Valley under various climate change scenarios because of various factors, including reduced snowpack, rising temperatures, and likely reductions in summer precipitation. Climate models suggest that as the region warms, winter snow precipitation will likely shift to higher elevations and snowpack will be diminished as more precipitation falls as rain altering surface flows.

Acknowledging the city's responsibility to be a leader in the climate crisis, Milwaukie adopted a Climate Action Plan detailing 53 city-led actions to mitigate and adapt to climate change. Along with reducing the city's greenhouse gas emissions and contribution to climate change, the Climate Action Plan calls for increasing the community's resiliency and preparedness for natural hazards through policy, advocacy, outreach and education.

Milwaukie is committed to planning and preparing for the immediate and future threats that climate change will have on the community. By addressing the climate crisis through the actionable goals of the Climate Action Plan, Milwaukie hopes to reduce the risk and impact of climate change related natural hazards on residents of Milwaukie and the region while encouraging others to take climate action.

Community Characteristics

Table MA-4 (next page) and the following section provides information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the City specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2016 and 2020 the City grew by 780 people. Median household income increased from $55,850 to $70,037 in the same period. Between 2018 and 2040 the population is forecast to grow to 23,149. Although this is the most current forecast available at the time of publication, given the large number of new multi-unit residential

[2] Oregon Climate Change Research Institute (OCCRI), Fourth Oregon Climate Assessment Report (2019) and Fourth National Climate Assessment, Chapter 23: Northwest (2019). http://www.occri.net/publications-and-reports/publications/

buildings currently being constructed or in advanced planning stages in Milwaukie which were not accounted for in this analysis, the actual number may be somewhat higher. New development has complied with the standards of the Oregon Building Code and the City's development code.

Transportation/Infrastructure

Milwaukie is accessible by two state highways, 99E (or McLoughlin Blvd.), running north to south in the western part of the city, and Highway 224, running west to east through the central part of the city. Milwaukie is also bisected by the Union Pacific Railroad main line, which travels northwest to southeast carrying both passengers and freight.

The responsibility and authority, as well as the financial capability, to maintain an adequate level or service for the highways rests with Metro and Oregon Department of Transportation (ODOT) authorities. Congestion can result in the diversion of traffic onto City streets.

The City's public transit is provided by the TriMet transit system. Nine bus routes go through the downtown Milwaukie transit center daily. The MAX Orange Line provides service to Milwaukie. The availability and quality of pedestrian and bicycling facilities (sidewalks, bike lanes, and pathways) is inconsistent but has improved substantially since the 2019 NHMP update due to an increased investment in the Safe Routes to School and Safe Access for Everyone Programs. Base Maps are found on the city's website.

Economy

Milwaukie is a major industrial center in the Portland metropolitan area containing one of the largest concentrations of warehousing and distribution facilities in the region. The Milwaukie Industrial Park, Omark Industrial Park, and the Johnson Creek industrial area comprise over 300 acres of industrial land within the city. These areas are nearing capacity and very little land within the city is currently available for new industrial development.

Milwaukie's commercial lands are largely built up. New commercial development along Highway 224, McLoughlin Boulevard, and 82nd Avenue has lured many people away from downtown Milwaukie for purchasing comparison goods such as clothes, furniture and appliances. Downtown Milwaukie, however, has continued to attract commercial investment in the form of commercial service uses including banks, insurance, professional offices, and several residential mixed-use developments. The city has identified areas for commercial, office, or mixed use development.

Table MA-4 Community Characteristics as of 2020

Population Characteristics		
2016 Population		20,525
2020 Population		21,305
Race and Ethnicity		
White	18,458	87.5%
Black/African American	176	0.8%
American Indian and Alaska Native	75	0.4%
Asian	519	2.5%
Native-Hawaiian and Other Pacific Islanders	15	0.1%
Some Other Race	475	2.3%
Two or More Races	1,368	6.5%
Hispanic or Latino	1,915	9.1%
Limited or No English Spoken		
Vulnerable Age Groups		
Less than 15 Years	3,011	14%
65 Years and Over	3,080	15%
Disability Status		
Total Population	2,431	12%
Children	96	3%
Seniors	913	30%

Income Characteristics		
Household Income by Category		
Less than $15,000	561	6.0%
$15,000-$29,999	1,008	10.8%
$30,000-$44,999	1,181	12.7%
$45,000-$59,999	1,021	11.0%
$60,000-$74,999	1,209	13.0%
$75,000-$99,999	1,384	14.9%
$100,000-$199,999	2,626	28.2%
$200,000 or more 3,735	310	3.3%
Median Household Income		$70,037
Poverty Rates		
Total Population	2,070	9.9%
Children	418	11.2%
Senior	253	8.4%
Housing Cost Burden		
Owners with Mortgage	4,193	73.8%
Renters	1,492	26.2%

Source: U.S. Census Bureau, 2012-2016 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2018 & 2020. Metro, 2040 Distributed Forecast. Note: * = Population forecast within Metro UGB

Housing Characteristics	
Housing Units	
Single-Family	6,771
Multi-Family	2,740
Mobile-Homes	134
Year Structure Built	
Pre-1970	5,371
1970-1989	3,079
1990 or later	1,195
Housing Tenure and Vacancy	
Owner-occupied	5,685
Renter-occupied	3,615
Seasonal	31
Vacant	345

Milwaukie has grown substantially since its incorporation in 1903 and has an area today of about 5 square miles. Between 1940 and 1980 the population grew from about 2,000 to just under 18,000 residents. Population growth slowed after 1980, but has accelerated in recent years. The current population is approximately 21,000 residents.

The city is located within the southern bounds of the Portland metropolitan area about six miles from downtown Portland. The city is within the Willamette River basin and has two major creeks flowing through it, Johnson Creek in the northern part of the city and Kellogg Creek in the south.

Milwaukie's climate is consistent with the marine west coast climate zone, with warm summers and cool, wet winters. Milwaukie receives most of its rainfall between October and May, and averages 43 inches of rain, and less than one (1) inch of snow, per year.

Elevations in the city range from 205 feet near 59th Avenue and Monroe Street to a low of 43 feet on the shores of the Willamette River. Milwaukie is characterized by flat or gently hilly topography.

Community Assets –

This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of Milwaukie. The community assets identified below were identified by the City of Milwaukie. The tables identify which hazards each asset may be exposed to, based upon both a GIS analysis as well as HMAC member knowledge. Additional information is needed to fully understand the extent of risk to each asset. It is important to note that the facilities identified as "critical" and "essential" are characterized differently than the structural code that identifies buildings as "essential" and "non-essential." The structural code uses different language and criteria and therefore have completely different meanings than the buildings identified in this addendum.

Critical Facilities

These facilities are critical to government response, and recovery activities (i.e., life, safety, property, and environmental protection). These facilities include: 911 Centers, Emergency Operations Centers, Police, and Fire Stations, Public Works facilities, sewer, and water facilities, hospitals, bridges, roads, shelters, and more.

City Facilities:

- Public Safety Building: Milwaukie Police Department/CFD #2 (3200 SE Harrison St)
- Public Works Campus (6101 SE Johnson Creek Blvd)

Public Safety Facilities Outside the City:

- Town Center Station (11300 SE Fuller Rd)
- Oak Grove Station (2930 SE Oak Grove Blvd)
- Lake Road Station (6600 SE Lake Rd)
- Clackamas County Sheriff's Office (9101 SE Sunnybrook Blvd)
- Oregon State Police (8805 SE Deer Creek Ln)

Hospitals:

- Providence Milwaukie Hospital (10150 SE 32nd Ave)
- Kaiser Permanente Sunnyside Hospital (10180 SE Sunnyside Rd; not in city)
- Providence Willamette Falls Medical Center (1500 Division St; not in city)

Essential Facilities

Facilities that are essential to the continued delivery of key government services, and/or that may significantly impact the public's ability to recover from the emergency. These facilities may include: City buildings such as the Public Safety Building, the City Hall, and other public facilities such as schools.

City Buildings:

- City Hall
- Ledding Library
- Milwaukie Community Center
- Johnson Creek Blvd Campus
- Public Safety Building

County Buildings:

- Kellogg Treatment Plant

Schools:

- Ardenwald Elementary
- Clackamas Community College (Harmony Road Campus)
- Linwood Elementary
- Milwaukie Elementary/El Puente
- Milwaukie High School
- Portland Waldorf School (private)
- Rowe Middle School
- Seth Lewelling Elementary
- St. John the Baptist School (private)
- School Transportation Center (not in city)
- Wichita Center (not in city)

Potential Red Cross Shelter Sites:

- Milwaukie Center (5440 SE Kellogg Creek Dr)
- Milwaukie Presbyterian Church (2416 SE Lake Rd)
- Clackamas Park Friends Church (8120 SE Thiessen Rd, Oak Grove)
- King of Kings Lutheran Church (5501 SE Thiessen Rd, Oak Grove)
- New Hope Church (5197 SE King Rd, Milwaukie, OR 97222)
- GracePointe Church (10750 SE 42nd Ave)
- Schools throughout Milwaukie

Essential Infrastructure

Infrastructure that provides necessary services that supplement response efforts:

Bridges:

County:

- 55th Ave across Johnson Creek
- 60th Ave across Johnson Creek
- Linwood Ave across Johnson Creek
- Milport Rd across Johnson Creek
- Stanley Ave across Johnson Creek
- Oatfield Rd across Kellogg Creek
- Rusk Rd across Mount Scott Creek

Portland:

- Johnson Creek Blvd. across Johnson Creek
- Ochoco St across Johnson Creek

TriMet (rail):

- Rail across Highway 99E
- Rail across Kellogg Creek
- Rail crossing north of Mailwell Dr

State of Oregon:

- 17th Ave across Johnson Creek
- McLoughlin Blvd. across Johnson Creek N. of city
- McLoughlin Blvd. across Kellogg Creek
- McLoughlin off-ramp to Hwy 224 across Johnson Creek
- Hwy 224 across Johnson Creek, McLoughlin Blvd. & Main
- Hwy 224 across railroad tracks and 26th Ave
- Hwy 224 across Mount Scott Creek
- Hwy 224 across MAX Light Rail Orange Line tracks

City of Milwaukie:

- Kellogg Creek near Milwaukie Bay Park
- Wichita Ave across Johnson Creek
- Stanley Ave across Johnson Creek
- 55th Ave across Johnson Creek

Transportation Corridors:

- 17th Ave
- 32nd Ave
- 55th Ave
- Harrison St/42nd Ave/King Rd.
- Highway 224
- Johnson Creek Blvd
- King Rd
- Lake Rd
- Linwood Ave
- Max Orange Line
- McLoughlin Blvd/Highway 99E
- Oatfield Rd
- River Rd

Water Treatment Facilities:

- 8 City Wells
- Aeration Packed Towers – 5 total at two locations
- Concrete Storage Tank – 40th Ave & Harvey St
- Elevated Water Storage Tank – 40th Ave & Harvey St
- Ground Level Metal Tank – Stanley Ave & Harlow St
- Sewerage Pump Stations – 5

Other Utilities:

- NW Natural pipelines
- PGE Substations (One is at edge of Lake Rd / Harmony Rd; a second is on the East end of Johnson Creek; a third is on the border between Milwaukie and Oak Grove)

Vulnerable Populations:

Vulnerable populations, including seniors, disabled citizens, women, and children, as well those people living in poverty, often experience the impacts of natural hazards and disasters more acutely. The city is aware that this is an incomplete list, and is actively seeking to expand it. Populations that have special needs or require special consideration include:

- Lockdown Facility (9200 SE McBrod Ave)
- Hillside Manor (2889 SE Hillside Ct)

- Johnson Creek Treatment Facility (2808 SE Balfour St)
- Prestige Post-Acute and Rehab Center (12045 SE Stanley Ave)
- Royal Marc Retirement Residence (5555 SE King Rd)
- Annie Ross House (transitional family housing; 2316 SE Willard St)
- Milwaukie Community Center (daytime programs; 5440 SE Kellogg Creek Dr)
- ElderPlace Providence (daytime programs, Providence Milwaukie; 10330 SE 32nd Ave)
- Retirement Community near North Clackamas Park (5801 SE Kellogg Creek Dr)
- Deerfield Village (5770 SE Kellogg Creek Dr, not in city)

Hazardous Materials:

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

- Johnson Creek Blvd
- North Milwaukie Industrial Area
- Milwaukie Business Industrial Area
- Kellogg Treatment Plant

Economic Assets/Population Centers:

Economic assets include businesses that employ large numbers of people and provide an economic resource to the City. If damaged, the loss of these economic assets could significantly affect economic stability, and prosperity. Population Centers usually are aligned with economic centers and are a concern during evacuation/notification during a hazard event. These assets include: Downtown, McLoughlin Commercial Areas, and North Milwaukie Industrial Area.

Environmental Assets:

Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic, and functional ecosystem services for the community. These environmental assets include, but are not limited to, the following: Ball-Michel Park, Dogwood Park, Elk Rock Island, Homewood Park, North Clackamas Park, Milwaukie Bay Park, Stanley Park, Water Tower Park, Three Creeks Natural Area, Spring Park, and Wichita Park.

Cultural or Historical Assets:

These assets include those facilities that augment or help define community character, and if lost, would represent a significant loss for the community.

Historic Inventory: (see State Historic Preservation Office for more information)

- Over 500 houses
- 5 commercial buildings
- 3 schools
- 1 cemetery
- 1 church
- 1 city hall
- 1 waterworks

Community Attractions:

- 17th Avenue Bike/Pedestrian Path
- Bob's Red Mill
- Carefree Sunday
- Dark Horse Comics Corporate Headquarters
- First Friday (June-October)
- Milwaukie Bay Park
- Milwaukie Farmers Market
- Milwaukie Museum
- Sara Hite Memorial Rose Garden
- Spring Park and Elk Rock Island
- Springwater Trail
- Trolley Trail
- Umbrella Parade
- Winter Solstice Event

Hazard Characteristics

Drought

The HMAC determined that the City's probability for drought is **High** and that their vulnerability to drought is **Medium**. *These ratings both increased from the previous NHMP addendum due to a combination of a different understanding of the most severe possible effects of drought and an increasingly unstable climate.*

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

The City of Milwaukie currently obtains its potable water from the Troutdale Aquifer through eight operating wells located throughout the city. Interties to the City of Portland and Clackamas River Water systems are maintained for emergency water supplies. The network of three water reservoirs provides a storage volume of six million gallons. The Water System Master Plan was last updated in 2021 to provide long-term guidance for the development of the City's water system. It is a supporting document for the Comprehensive Plan. The document also includes recommended capital improvement projects and a map documenting the water infrastructure placement within the city.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard.

Mitigation Activities

Milwaukie has a public awareness action item that can be used to address drought education. The existing drought hazard mitigation activities are conducted at the county, regional, state, and federal levels and are described in the Clackamas County NHMP.

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

Earthquake (Cascadia Subduction Zone)

The HMAC determined that the City's probability for a Cascadia Subduction Zone (CSZ) earthquake is **moderate** and that their vulnerability to a CSZ earthquake is **high**. *The*

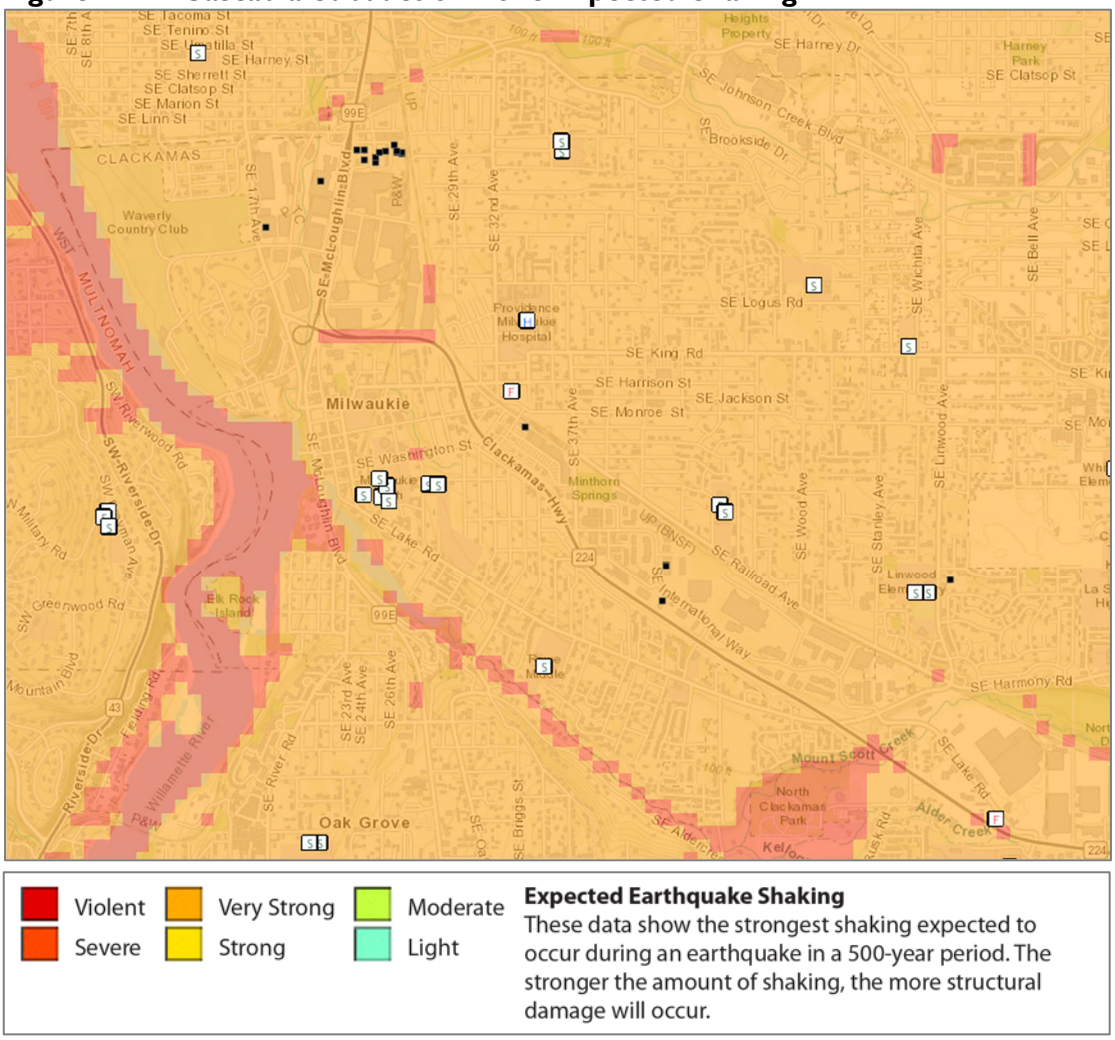
probability and vulnerability ratings did not change since the previous version of this NHMP addendum.

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

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

Figure MA-2 displays relative shaking hazards from a Cascadia Subduction Zone earthquake event. As shown in the figure, most of the city is expected to experience very strong shaking (orange), while areas near rivers and streams will experience severe (light red) to violent (dark red) shaking in a CSZ event.

Figure MA-2 Cascadia Subduction Zone Expected Shaking



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

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year. Scientists have found evidence that 11 large, tsunami-producing earthquakes have occurred off the Pacific Northwest coast in the past 6,000 years. These earthquakes took place roughly between 300 and 5,400 years ago with an average occurrence interval of about 510 years. The most recent of these large earthquakes took place in approximately 1700 A.D.[3]

The city's proximity to the Cascadia Subduction Zone, potential slope instability and the prevalence of certain soils subject to liquefaction and amplification combine to give the city a high-risk profile. Due to the expected pattern of damage resulting from a CSZ event, the Oregon Resilience Plan divides the State into four distinct zones and places the city

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

predominately within the "Valley Zone" (Valley Zone, from the summit of the Coast Range to the summit of the Cascades). Within the Northwest Oregon region, damage and shaking is expected to be strong and widespread - an event will be disruptive to daily life and commerce and the main priority is expected to be restoring services to business and residents.

Earthquake (Crustal)

The HMAC determined that the City's probability of crustal earthquake is **moderate** and that its vulnerability is **high**. *The probability rating increased while the vulnerability rating did not change since the previous version of this NHMP addendum due to an improved understanding of the likelihood of a crustal earthquake.*

Volume I, Section 2 describes the causes and characteristics of earthquake hazards, history, as well as the location, extent, and probability of a potential event. Generally, an event that affects the County is likely to affect Milwaukie as well. Figure MA-3 (next page) shows a generalized geologic map of the Milwaukie area that includes the areas for potential regional active faults, earthquake history (1971-2008), and soft soils (liquefaction) hazard. The figure shows the areas of greatest concern within the City limits as red and orange.

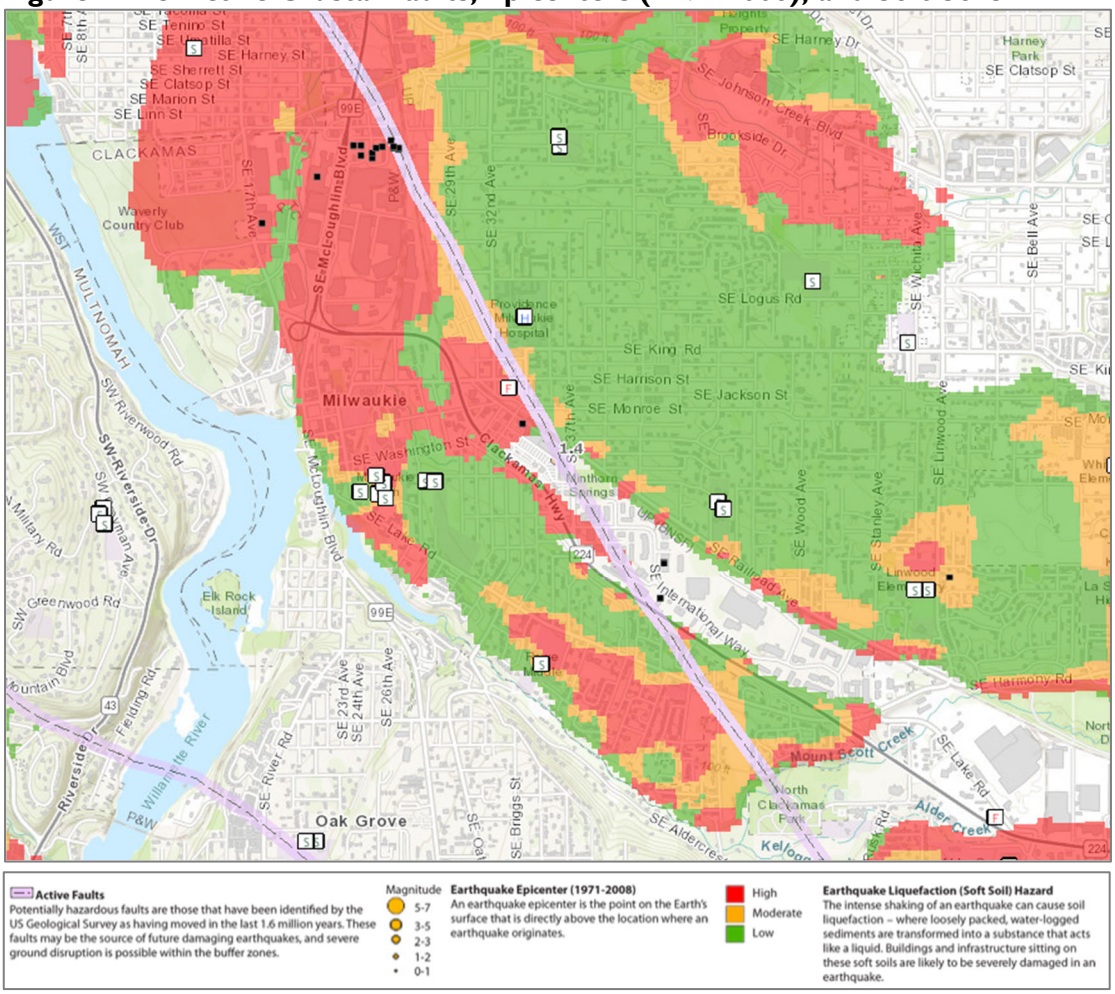
There are two potential crustal faults and/or zones near the City that can generate high-magnitude earthquakes. These are the Gales Creek-Mt. Angel Structural Zone and Portland Hills Fault Zone (discussed in greater detail below). Other faults include the Oatfield fault (just to the east of the city on the eastern side of the Willamette River), the Damascus-Tickle Creek fault, also to the east of the city, and the Mt. Hood Fault in eastern Clackamas County. Historical records count over 56 earthquakes in the Portland-metro area. The more severe ones occurred in 1877, 1880, 1953 and 1962. The most recent severe earthquake was the March 25, 1993 Scotts Mills quake. It was a 5.6 magnitude quake with aftershocks continuing at least through April 8.

Portland Hills Fault Zone

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

Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building, and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

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



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

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment for this hazard. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected. Additionally, in 2018 the Department of Geology and Mineral Industries (DOGAMI) completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults (O-18-02), findings from that report are provided at the end of the crustal earthquakes hazard section.

Community assets located in the highest hazard zone for earthquakes include the Public Safety Building (Milwaukie Police Department and Clackamas Fire District Station 2), Providence Milwaukie Hospital, and the Milwaukie Business Industrial Area. Milwaukie's infrastructure is particularly vulnerable to earthquake damage, especially Highway 224,

Highway 99E, and the crossings of Johnson Creek. Of the city's eight wells, two of them are along the fault line, with others in the moderate to high hazard zones for earthquakes. During a major earthquake, emergency responders may have difficulty performing their duties because their buildings could be impacted by the event. The Public Safety Building is in the moderate to high hazard zones. Areas near the Willamette River and various creeks around Milwaukie are likely composed of softer soils prone to liquefaction. This can be very destructive to underground utilities such as water and sewer lines. Buildings and water lines can sink into the liquefied ground while sewer pipes, manholes and pump stations (assets partially filled with air) may float to the surface. After the earthquake, the liquefied soil will re-solidify, locking tilted buildings and broken pipe connections into place.

Vulnerable populations, including children, could be significantly impacted, as many schools lie in the highest two hazard zones. The data gathered from the statewide DOGAMI inventory should be used to prioritize school buildings in Milwaukie for seismic hazard retrofitting.

Seismic building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community profile, approximately 86% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard. However, because Milwaukie's buildings are generally wood-framed structures of no more than two stories, the city is more resilient to earthquake damage than it might otherwise be. Information on specific public buildings' (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table MA-5 (next page); each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI using their Rapid Visual Survey (RVS), two (2) have very high (100% chance) collapse potential, while one (1) has a high (greater than 10% chance) collapse potential. *Note: two schools, Ardenwald Elementary and Milwaukie High School, have been rebuilt since the 2007 DOGAMI study.*

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

Utility systems will be significantly damaged, including damaged buildings and damage to utility infrastructure such as water treatment plants and equipment at high voltage substations (especially 230 kV or higher which are more vulnerable than lower voltage substations). Buried pipe systems will suffer extensive damage. Restoration of utility services will require substantial mutual aid from utilities outside of the affected area.

Mitigation Activities

Milwaukie has taken mitigation steps to reduce the city's vulnerably in earthquake events. Additional mitigation activities completed by the City of Milwaukie include:

- Compliance with SB 13, enacted in 2001, requiring local governments to develop seismic preparation procedures, inform their employees about the procedures, and conduct earthquake drills. (continued on Page MA-29)

Table MA-5 Rapid Visual Survey Scores

Facility	Site ID*	Level of Collapse Potential			
		Low (<1%)	Moderate (>1%)	High (>10%)	Very High (100%)
Schools					
Ardenwald Elementary (8950 SE 36th Ave)	**Clac_sch14**	**Rebuilt per a 2008 Bond.**			
Hector Campbell Elementary (11326 SE 47th Ave) - CLOSED	*Clac_sch87*			*X*	
Linwood Elementary (11909 SE Linwood Ave)	Clac_sch19				X
Milwaukie Elementary School (11250 SE 27th Ave)	Clac_sch20				X
Milwaukie High School (2301 SE Willard St)	**Clac_sch28**	**Rebuilt per a 2016 bond.**			
Portland Waldorf School (2300 SE Harrison St)		2007 RVS report did not include structural appendix for this facility.			
Rowe Middle School (3606 SE Lake Rd)		2007 RVS report did not include structural appendix for this facility.			
Seth Lewelling Elementary (5325 SE Logus Rd)	Clac_sch88	X			
St. John Catholic School (10956 SE 25th Ave)		2007 RVS report did not include structural appendix for this facility.			
Public Safety					
CFD Fire Station 1 (ca. 1983) (11300 SE Fuller Rd)	*Clac_fir09*	X			
CFD Fire Station 2 (ca. 1993) (Public Safety Building) (3200 SE Harrison)	Clac_fir26	X			
CFD Fire Station 3 (ca. 1997) (2930 SE Oak Grove Blvd)					
CFD Fire Station 4 (ca. 1999) (6600 SE Lake Rd)					
Hospital					
Providence Milwaukie (10150 SE 32nd Ave)	Clac_hos02	X			

Source: DOGAMI 2007. Open File Report O-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment. "*" – Site ID is referenced on the RVS Clackamas County Map
Note 1: Bold indicates facilities that have been seismically retrofitted or rebuilt.
Note 2: Private schools were not assessed by DOGAMI as part of O-07-02.

- Conformance with seismic-related construction requirements in the Oregon Structural Specialty Code and Oregon One- and Two-Family Dwelling Specialty Code.
- Adoption of a policy to require undergrounding of power lines in new subdivisions.
- Development Code restrictions regarding construction on steep slopes.
- The following buildings have been constructed to be earthquake safe:
  - Water tower at 40th Ave and Harvey St, Milwaukie High School Fine Arts Center, and Linwood Elementary Main Office and Gym.
  - Ardenwald Elementary rebuilt per 2008 bond passed by voters (former building demolished in 2009).
  - Milwaukie High School Main building rebuilt in 2021.

Earthquake Regional Impact Analysis

In 2018 DOGAMI completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults (O-18-02). Their study focused on damage to buildings, and the people that occupy them, and to two key infrastructure sectors: electric power transmission and emergency transportation routes. Each earthquake was studied with wet and dry soil conditions and for events that occur during the daytime (2 PM) and nighttime (2 AM). Expected impacts to buildings and people were tabulated at the county, jurisdictional (city), and neighborhood unit level. Estimated damage varied widely across the study area depending on local geology, soil moisture conditions, type of building, and distance from the studied faults. In general, damage from the Cascadia Subduction Zone scenario was greater in the western portion of the study area, however, damage could still be significant in some areas east of the Willamette River. The report found that damage to high-value commercial and industrial buildings was estimated to be high since many of these facilities are in areas of high to very high liquefaction hazard. Anticipated casualties were higher during the daytime scenario (generally double) since more people would be at work and occupying non-wood structures that fare worse in an earthquake. The Portland Hills fault scenario created greater forecasted damages than the Cascade Subduction Zone scenario due primarily to its placement relative to population centers and regional assets; however, at distances 15 or more miles from the Portland Hills fault the damages from the Cascadia Subduction Zone scenario were generally forecasted to be higher. In both the Cascadia Subduction Zone and Portland Hills Fault scenarios it is expected that emergency transportation routes will be fragmented, affecting the distribution of goods and services. Conditions are expected to be worse under the Portland Hills Fault scenario. Portions of the electric distribution system are also expected to be impacted under both scenarios, however, the impact is expected to be considerably less than it is to the transportation routes. Additional capacity or redundancy within the electric distribution network may be beneficial in select areas that are likely to experience greater affects of the earthquakes.

Table MA-6 (next page) shows the permanent resident population that are estimated to be vulnerable to injury or death (casualty) and the buildings in the city that are estimated susceptible to liquefaction and landslides. It does not predict that damage will occur in specific areas due to either liquefaction or landslide. More population and property are exposed to higher degrees of expected damage or casualty under the Portland Hills Fault "wet" scenario than in any other scenario.

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

	Cascadia Subduction Zone (M9.0)		Portland Hills Fault (M6.8)	
	"Dry" Soil	"Wet" Saturated Soil	"Dry" Soil	"Wet" Saturated Soil
Number of Buildings	7,891	7,891	7,891	7,891
Building Value ($ Million)	2,890	2,890	2,890	2,890
Building Repair Cost ($ Million)	295	394	1,341	1,598
Debris (Thousands of Tons)	162	193	542	615
Long-Term Displaced Population	93	83	2,459	5,456
Total Casualties (Daytime)	294	380	1,427	1,595
Level 4 (Killed)	14	19	82	89
Total Casualties (Nighttime)	34	92	326	546
Level 4 (Killed)	1	3	10	16

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

Cascadia Subduction Zone Scenario

The City of Milwaukie is expected to have a 10% building loss ratio with a repair cost of $295 million under the CSZ "dry" scenario, and a 14% building loss ratio with a repair cost of $394 million under the CSZ "wet" scenario.[4] The city is expected to have around 294 daytime or 34 nighttime casualties during the CSZ "dry" scenario and 380 daytime or 92 nighttime casualties during the CSZ "wet" scenario. It is expected that there will be a long-term displaced population of around 93 for the CSZ "dry" scenario and 83 for the CSZ "wet" scenario.[5]

Portland Hills Fault Scenario

The City of Milwaukie is expected to have a 46% building loss ratio with a repair cost of $1.341 billion under the CSZ "dry" scenario, and a 55% building loss ratio with a repair cost of $1.598 billion under the CSZ "wet" scenario.[6] The long-term displaced population and casualties are greatly increased for all the Portland Hills Fault scenarios. The city is expected to have around 1,427 daytime or 326 nighttime casualties during the Portland Hills Fault "dry" scenario and 1,595 daytime or 546 nighttime casualties during the Portland Hills Fault "wet" scenario. It is expected that there will be a long-term displaced population of around 2,459 for the Portland Hills Fault "dry" scenario and 5,456 for the Portland Hills Fault "wet" scenario.[7]

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

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

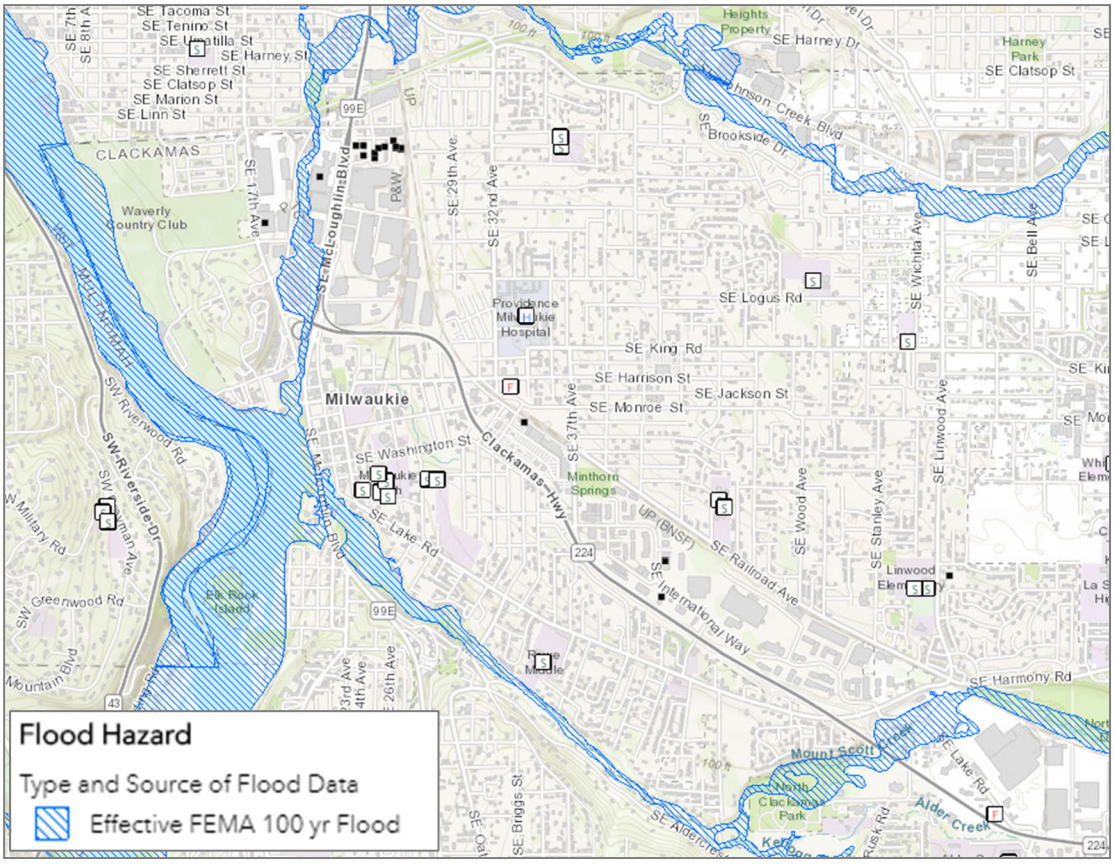
Please review Volume I, Section 2 for additional information on this hazard.

Flood

The HMAC determined that the City's probability for flood is **high** and that their vulnerability to flood is **medium**. *The probability rating did not change, while the vulnerability rating decreased since the previous version of this NHMP addendum due to progress made in infrastructure retrofitting and other mitigation actions.*

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

Figure MA-4 Special Flood Hazard Area



Source: Oregon HazVu: Statewide Geohazards Viewer (DOGAMI)
Note: To view detail click the link above to access Oregon HazVu
For additional maps including the 1996 flood inundation area see the City's Flood Hazard Map Viewer

Portions of Milwaukie have areas of floodplain (special flood hazard areas, SFHA). These include Johnson Creek, Kellogg Creek, Mount Scott Creek, Minthorn Creek, Spring Creek, and the Willamette River. The Federal Emergency Management Agency (FEMA) regulatory floodplains for each of these rivers are depicted as relatively narrow areas on each side of the channels. On the Willamette River, the floodway is generally confined within high stream banks. The FEMA 100-year map shows that approximately 1.3 miles of the transportation network could be affected in a flood.

Floods can have a devastating impact on almost every aspect of the community, including private property damage, public infrastructure damage, and economic loss from business interruption. It is important for the City to be aware of flooding impacts and assess its level of risk.

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

For mitigation planning purposes, it is important to recognize that flood risk for a community is not limited only to areas of mapped floodplains. As an urban city, Milwaukie is predominantly covered in impermeable surfaces like roads and buildings, impacting historical watershed hydrology and altering the amount and speed of stormwater runoff as sheet flow. With more frequent and intense storms caused by climate change, flash flooding events can produce volumes of surface water which can quickly exceed the capacity of the city's stormwater infrastructure. These events lead to an overflowing of piped stormwater facilities during high flow, as well as scouring, erosion, overflow flooding, and vegetation decline and/or death at facilities like detention ponds and rain gardens, along with the numerous small creeks, streams, ponds and other waterbodies crossing Milwaukie's landscape. Resulting damage from these events can be extremely costly in both labor and materials and can compromise both gray and green infrastructure. This in turn reduces the functionality of these systems for protecting water quality, jeopardizing the city's ability to meet state and federal water quality mitigation requirements.

More information on stormwater infrastructure and floodplain and runoff capacity planning can be found in the Milwaukie Stormwater System Plan.

The speed of onset, lack of warning, and depth of flooding make dam failures a potentially deadly, albeit unlikely, occurrence. There are four major dams upstream of Milwaukie on the Clackamas River: North Fork, Faraday, River Mill and Timothy. These are operated by Portland General Electric and are subject to the dam safety and warning requirements of the Federal Energy Regulatory Commission. According to the Clackamas County Emergency Operations Plan, areas of Milwaukie bordering on the Willamette in the vicinity of its confluence with the Clackamas would be inundated by a wall of water 60-80 feet high in approximately an hour and a half should the North Fork dam fail under a “probable maximum flood” (a worst-case scenario where all four dams fail). In December 2015 Milwaukie had to evacuate approximately 50 people from their homes as Mount Scott and Johnson Creek overflowed.

The largest flooding event to affect Milwaukie was the February 1996 flood. The high-water level meant tributaries could not drain into the Tualatin and Willamette River, which led to localized flooding on several backed-up creeks.

The extent of flooding hazards in Milwaukie primarily depends on climate and precipitation levels. Additionally, withdrawals for irrigation and drinking water, as well as stream and wetland modifications or vegetation removal can influence water flow.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment for this hazard. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

The areas around Johnson Creek (impacts industrial area), Kellogg Creek, Mount Scott Creek (impact North Clackamas Park, Milwaukie Community Center, and multiple residences north of Highway 224 and south of Lake Road), Minthorn Creek (impacts North Milwaukie Industrial Area), and the Willamette River are particularly vulnerable to flooding. Additionally, properties 19th Avenue may be vulnerable to Willamette River flooding. Johnson Creek runs through the Downtown Mixed Use and North Milwaukie Employment zones. Kellogg Creek mostly affects residential areas in the event of flooding. The downtown area is located near the Willamette River due to the historic economic importance of the river.

Additionally, a great deal of infrastructure (bridges, water lines, sewage pump stations, etc.) is in the floodplain. Infrastructure exposed to flooding includes, but is not limited to, Highway 224, SE Lake Rd, SE McLoughlin Blvd, and the north industrial park. Disruption to this infrastructure could result in transportation issues, power outages, sewage back-up, and affect overall community and environmental health.

Risk Analysis - Repetitive Loss Properties:

Milwaukie works to mitigate problems regarding flood issues when they arise. Some areas in the city are more susceptible to flooding issues and have incurred repetitive losses. The Community Repetitive Loss record for Milwaukie identifies eleven (11) Repetitive Loss (RL) properties[8], and one (1) Severe Repetitive Loss (SRL) property[9]. RL and SRL properties are troublesome because they continue to expose lives and valuable property to the flooding hazard. Local governments as well as federal agencies such as FEMA attempt to address losses through floodplain insurance and attempts to remove the risk from repetitive loss of properties through projects such as acquiring land and improvements, relocating homes or elevating structures. Continued repetitive loss claims from flood events lead to an increased

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

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

amount of damage caused by floods, higher insurance rates, and contribute to the rising cost of taxpayer funded disaster relief for flood victims.

Table MA-7 provides information on the identified RL and SRL properties. There have been 31 paid RL claims totaling $1,550,590. Seven (7) of the RL and SRL properties are not insured as of May 2023. For additional detail and a map of their general location see Volume I, Section 2 and Figure 2-13.

Table MA-7 Repetitive Loss and Severe Repetitive Loss Properties Detail

RL or SRL Property	Location	Currently Insured	Flood Zone	Occupancy	Historic Building	Total Paid Claims	Total Paid Amount
SRL	City of Milwaukie	NO	B	Single Family	No	6	$100,814
RL	City of Milwaukie	NO	C	2-4 Family	No	3	$28,463
RL	City of Milwaukie	NO	X	Single Family	No	2	$5,058
RL	City of Milwaukie	NO	C	2-4 Family	No	2	$17,351
RL	City of Milwaukie	NO	A19	Other Non-Residential	No	2	$396,804
RL	City of Milwaukie	YES	X	Single Family	No	2	$65,060
RL	City of Milwaukie	NO	AE	Single Family	No	2	$141,105
RL	City of Milwaukie	YES	AE	2-4 Family	No	3	$138,450
RL	City of Milwaukie	YES	AE	2-4 Family	No	3	$226,756
RL	City of Milwaukie	YES	AE	2-4 Family	No	3	$240,033
RL	City of Milwaukie	NO	AE	Single Family	No	3	$190,696
Total						33	$1,573,230

Source: Department of Land Conservation and Development, April 2023.
Notes: RL – Repetitive Loss Property, SRL – Severe Repetitive Loss Property
For location details see Table 2-15 in the Clackamas NHMP Volume I, Section 2.

Mitigation Activities

Milwaukie employs several mitigation strategies to reduce the city's risk to flood events, including mapping flood-prone areas by address. The city's priority is to mitigate residences located within the floodway (see FL #1). The city development code includes policies and regulations for flood prone areas including, Natural Resources Overlay Zone (Chapter 19.402, Natural Resources Administrative Map), Flood Hazard Regulations (Title 18 – Flood Hazard Areas (includes the SFHA and the 1996 flood inundation area; Flood Hazard Map Viewer), and Willamette Greenway Zone (Chapter 19.401). Milwaukie regularly inspects and maintains the stormwater facilities. Catch basins are routinely cleaned and inspected and a regular street sweeping program reduces the amount of debris and contaminants entering the stormwater system. The City maintains a Stormwater Master Plan and has been

planning various projects to restore Kellogg Creek. These projects would include building a bridge over the creek and downtown revitalization.

In 2022 and 2023, the city and project partners secured grant funding through the National Oceanic and Atmospheric Administration to pay for the planning, design, and permitting of the Kellogg Creek Restoration and Community Enhancement Project. Although Kellogg Creek has historically been less prone to flooding than Johnson Creek, the removal of the dam and restoration of the lower creek, as well as 14 acres of buried floodplain, is expected to further mitigate the existing flood hazard by draining Kellogg Lake and removing substantial amounts of contaminated sediment impounded by the dam. City engineers are working with project partners to undertake project planning, including risk assessment, design, and permitting for project implementation.

To improve stormwater management the city of Milwaukie continues to line the interiors of pipes in conjunction with Clackamas County Water and Environmental Services. This mitigation project minimizes the amount of groundwater that infiltrates into sewer lines and helps reduce the overall amount of water going into the wastewater treatment plant, thus reducing the chance of overflow of the sewer system. Additionally, a severe repetitive loss property on Rusk Road was purchased and demolished using FEMA Flood Mitigation Assistance funding in 2018 (grant covered approximately $315,000 for the purchase of the property, additional funds were allocated for staff hours, title report, due diligence reports, and demolition contract).

In 2006 Clackamas County Water Environment Services partnered with eight community groups to restore the Three Creeks area – including Mount Scott Creek, a tributary to Kellogg Creek and the Willamette River. The group reshaped the stream channel to make it more natural; removed invasive species; planted thousands of native plants to stabilize banks; and put in wood and boulders to stabilize the channel and provide habitat for fish. The groups also removed trash and transient camps that polluted the streams during floods.

Projects completed by the Johnson Creek Watershed Council:

- Tree Plantings along Johnson Creek in various places.
- Storm water detention near Milport.

The North Clackamas Watersheds Council has published a 10-year plan for further restoration and enhancement actions. Although many of these actions are currently unfunded, the city will continue to seek new opportunities to partner with the council.

In 2018 the City completed its Urban Forest Plan which includes information on tree planting strategies. Increasing the scope of the urban canopy can help to divert and retain water that would otherwise contribute directly to flooding.

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

Landslide

The HMAC determined that the City's probability for landslide is **high** and that its vulnerability to landslide is **low**. *The probability rating increased, and the vulnerability rating did not change since the previous version of this NHMP addendum due to the inclusion of smaller scale landslides and landslides occurring upstream of Milwaukie in the current update.*

Volume I, Section 2 describes the characteristics of landslide hazards, history, as well as the location, extent, and probability of a potential event within the region. Although catastrophic landslides have not occurred in Milwaukie, steep slopes do exist along the banks of the Willamette River and Kellogg Creek. Additionally, upstream landslides affecting waters that flow into or through Milwaukie pose secondary hazards to the city due to debris and flood risks.

Landslide susceptibility exposure for Milwaukie is shown in

Across the Willamette River in the Riverdale area, there is a large area of land that is at a very high risk of landslide. This could result in potential flooding along Milwaukie's banks in the event of a landslide that disrupts the flow of the Willamette River. Within the City, parts of Highway 224, SE Lake Rd, and SE Johnson Creek Blvd are located within the areas of high landslide susceptibility. These important arterials that help connect Milwaukie. The Milwaukie Heights area, which includes mostly low density residential and open space areas, is also vulnerable. This exposure means that large scale and simultaneous landslides triggered by an earthquake could substantially disrupt City operations buildings, fire stations and key pieces of infrastructure (bridges, sewage pump stations, water reservoirs) that would hinder the ability of the City to respond to emergency situations created by such an event.

As a result, it will be important for the City to pursue opportunities for retrofitting and mitigating important structures and infrastructure, such that said facilities can withstand and survive landslides, particularly simultaneous landslides generated by an earthquake. Business continuity planning shall also be an important factor, given the number of economic centers and employment facilities that are threatened by the landslide hazard.

Potential landslide-related impacts are described within Volume I, Section 2, and include infrastructure damages, economic impacts (due to isolation, and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides, and debris flows can potentially occur during any winter, and thoroughfares beyond city limits are susceptible to obstruction as well.

Figure MA-5 (Page MA-36).

Most of Milwaukie demonstrates a low to moderate landslide susceptibility exposure. Approximately 4% of Milwaukie has very high or high, and approximately 31% moderate, landslide susceptibility exposure.[10] However, most of the areas that are identified to exhibit dangerous potential rapidly moving landslides are vacant and often preserved in wooded and dedicated open space.

Note that even if a jurisdiction has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of the susceptibility, vulnerability, and presence of assets.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment for this hazard. However, DOGAMI completed a statewide

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

landslide susceptibility assessment in 2016 (O-16-02), general findings from that report are provided above and within

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Figure MA-5 (next page). Additionally, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

Across the Willamette River in the Riverdale area, there is a large area of land that is at a very high risk of landslide. This could result in potential flooding along Milwaukie's banks in the event of a landslide that disrupts the flow of the Willamette River. Within the City, parts of Highway 224, SE Lake Rd, and SE Johnson Creek Blvd are located within the areas of high landslide susceptibility. These important arterials that help connect Milwaukie. The Milwaukie Heights area, which includes mostly low density residential and open space areas, is also vulnerable. This exposure means that large scale and simultaneous landslides triggered by an earthquake could substantially disrupt City operations buildings, fire stations and key pieces of infrastructure (bridges, sewage pump stations, water reservoirs) that would hinder the ability of the City to respond to emergency situations created by such an event.

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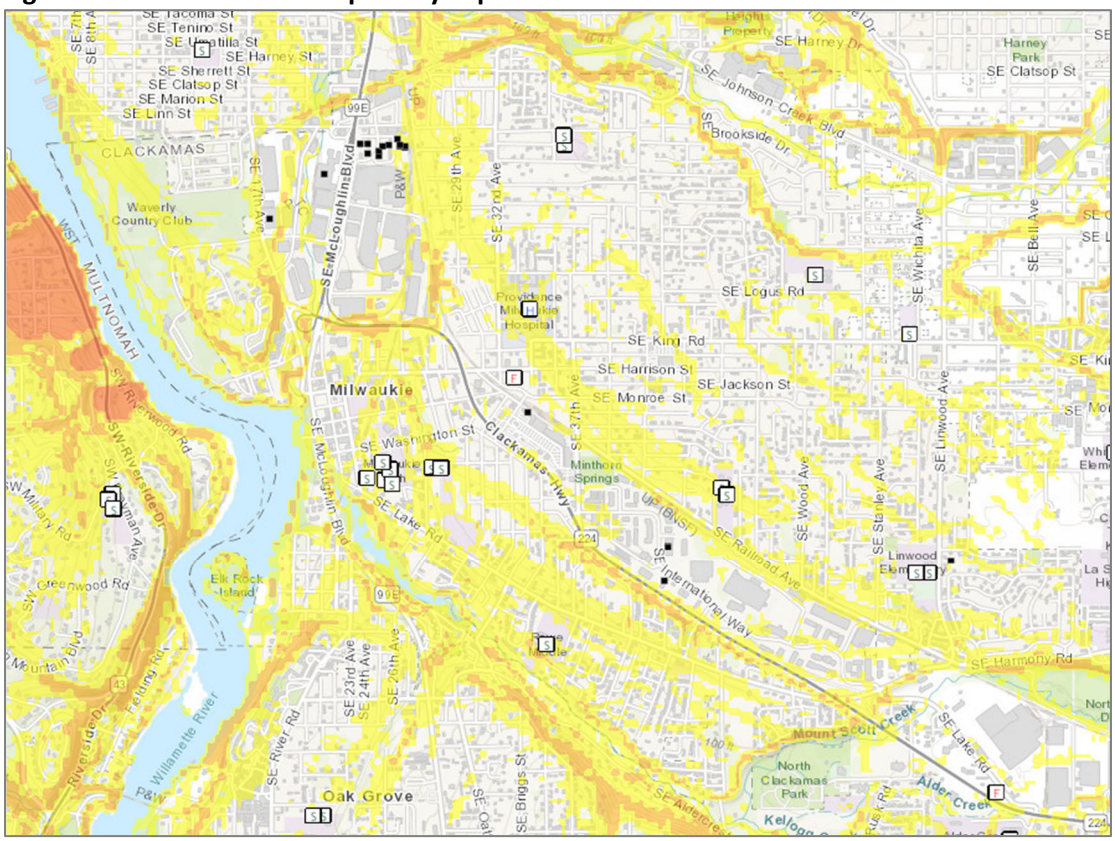
Figure MA-5 Landslide Susceptibility Exposure



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

The most common type of landslides are slides caused by erosion. Slides move in contact with the underlying surface, are generally slow moving, and can be deep. Rainfall-initiated

landslides tend to be smaller; while earthquake induced landslides may be quite large. All soil types can be affected by natural landslide triggering conditions.

Mitigation Activities

Milwaukie works to mitigate future landslide hazards. The city development code includes several policies and regulations to protect slopes including Erosion Control (Chapter 16.28), Willamette Greenway Zone Overlay (Chapter 19.401), and limitations of permitted development within slopes greater than 25%.

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

Severe Weather

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

Extreme Heat

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

Volume I, Section 2 describes the characteristics of extreme heat, history, as well as the location, extent, and probability of a potential event within the region. Generally, an event that affects the County is likely to affect the City as well, but Milwaukie is more vulnerable to the so "heat island effect" than more rural portions of the county. Heat islands occur where extremely localized ambient air temperatures in urban areas are an average of 1-7 degrees higher than those found in surrounding areas. They occur as structures and pavement absorb, radiate, and reflect heat energy rather than engaging in evapotranspiration as trees and other plants do. Milwaukie's efforts to preserve and expand its urban forest canopy will continue to play a role in mitigating the formation of heat islands, but the threat remains a significant one.

A severe heat episode or "heat wave" occurs about every two to three years, and typically lasting two to three days but can last as many as five days. A severe heat episode can be defined as consecutive days of upper 90s to around 100. Severe heat hazard in the Portland metro region can be described as the average number of days with temperatures greater than or equal to 90-degrees, or 100-degrees, Fahrenheit. On average the region experiences 14.6 days with temperatures above 90-degrees Fahrenheit, and 1.2 days above 100-degrees Fahrenheit, based on new 30-year climate averages (1991-2020) from the National Weather Service – Portland Weather Forecast Office. The 30-year average is used to account for short-term variation in temperatures. The frequency of high temperature days is expected to increase with the growing climactic instability of anthropogenic climate change. For example, the six hottest summers on record for Portland occurred between 2015 and the present.

Increasing frequency and duration of extreme heat events pose threats to human and animal life, as well as a danger to agricultural production in the Willamette Valley.

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

Windstorm

The HMAC determined that the City's probability for windstorm is **high** and that their vulnerability to windstorm is **moderate**. *These ratings increased since the previous version of this NHMP addendum due to the increased frequency and intensity of windstorms in recent years.*

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

Volume I, Section 2 describes the impacts caused by windstorms, including power outages, downed trees, heavy precipitation, building damages, and storm-related debris. Additionally, transportation, and economic disruptions result as well.

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

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

Winter Storm (Snow/Ice)

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

Volume I, Section 2 describes the characteristics of winter storm hazards, history, as well as the location, extent, and probability of a potential event within the region. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the City typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from November through March.

Most winter storms do not cause significant damage, but they are semi-frequent, and have the potential to impact economic activity. Road closures due to winter weather can interrupt commuter and commercial traffic, and roads that are not closed may present vehicle operators and pedestrians with dangerous conditions.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for the extreme heat, windstorm, and winter storm hazards. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard.

Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

The areas of the city that are often most at risk to severe storms are residential areas on steeper slopes, where roads may be icy and, thus, difficult to climb and descend. Road corridors leading to residential areas with fuller tree canopies are susceptible to downed tree limbs, and those areas that are above 500 feet in elevation are particularly vulnerable. However, some weather systems are characterized by a temperature inversion, where the valley floor is colder than the nearby hills. Consequently, severe storms affect the entire city. In 2016, 2017, 2019, and 2021 the State of Oregon declared a state of emergency for severe storms. The City's Plowing, Sanding, and De-Icing Removal Plan is maintained by the Public Works Department and includes provisions to place equipment on designated principal routes throughout the City (Plowing and Sanding Routes Map). Private property owners are also required to clear the sidewalks abutting their property of snow or ice within 24 hours after the snow has stopped falling. For more information see the City's Winter Weather Response Plan information webpage.

The major risk to property results from exposed utilities, especially power lines and water pipes that are damaged by wind, broken tree limbs and cold temperatures. Businesses also suffer economic losses when they must close as the result of the inclement weather and/or the loss of power, which, in turn, disrupts the local supply chain of goods and services. Periods of extended ice coverage hinder emergency response services and limit the mobility of residents, which could result in serious life safety issues.

Residents and businesses that are in areas that exhibit the severe storm hazard face some risk of damage from severe storms. Severe weather events are expected to impact nearly all City residents. In addition, critical infrastructure, economic centers, cultural or historic assets, environmental assets, and hazardous material sites are exposed to the severe weather hazards. For a list of facilities and infrastructure vulnerable to these hazards see the Community Assets section.

The exposure of these facilities and infrastructure means that severe weather events could substantially disrupt the operations of City government buildings and fire stations, impairing key City functions, while hindering the ability of emergency response personnel to respond to emergency situations that are created by a severe storm event.

All these facilities depend upon utility lines, roads and bridges to operate and perform their respective important functions within the City. Exposed utility and power lines are particularly vulnerable to damage from severe winter storms by wind, ice and snow. Hardened infrastructure, like bridges and roads, can sustain a severe winter storm, but during the event, they are often hazardous to traverse because of icy, windy and snowy conditions.

Consequently, severe weather (wind or winter storm) could substantially disrupt numerous key resources and facilities within the city through impediments to the transportation system and damage to the power grid. Among other things, these transportation problems and power failures disrupt business operations and educational facilities, resulting in economic losses and halting educational opportunities.

Power to hazardous material sites, including gas stations, rail yards, and some industrial facilities in the city, could also be disrupted. The sites themselves could be damaged or

rendered inaccessible in an especially severe storm. These conditions could pose threats to the natural environment of the city and the health of its population, while disrupting the availability of gasoline for vehicle transport.

As a result, it will be important for the City to pursue opportunities for undergrounding utilities and retrofitting utility lines so that they may withstand cold weather conditions without freezing and bursting. Adhering to current building codes for weatherization of structures, as well as current engineering and fire codes that pertain to the steepness of new roads, are also key factors for the City to consider. Business continuity planning shall also be an important factor, given the number of economic centers and employment facilities that are threatened by the severe storm hazard.

Mitigation Activities

Mitigating severe weather can be difficult because storms affect all areas of the city, but Milwaukie has made progress to reduce the effects of storms. Milwaukie has a tree board to maintain a plan for the care of the trees as well as codes about where trees can be planted (Chapter 16.32). Most utilities are underground, and all new utilities are required to be undergrounded. In case of power outages the city's critical facilities have back up power generation. Milwaukie also has a designated snow plow and sanding routes to help expedite snow removal (Plowing and Sanding Routes Map).

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

Volcanic Event

The HMAC determined that the city's probability for a volcanic event is **low** and that their vulnerability to a volcanic event is **low**. *The probability did not change and the vulnerability rating decreased since the previous version of this NHMP addendum. The previous HMAC considered volcanic activity to be a greater threat to Milwaukie than the current one.*

Volume I, Section 2 describes the characteristics of volcanic hazards, history, as well as the location, extent, and probability of a potential event within the region. Generally, an event that affects the western portion of the County is likely to affect Milwaukie as well. Several volcanoes are located near Milwaukie, the closest of which are Mount Hood, Mount Adams, Mount Saint Helens, Mount Rainier, and the Three Sisters.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard.

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

Mitigation Activities

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

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

Wildfire

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

The 2017 Clackamas County Community Wildfire Protection Plan (CWPP) was completed in May 2018. It remains the current plan as of 2023. The CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve as the wildfire section for this addendum. The following presents a summary of key information; refer to the full CWPP for a complete description, and evaluation of the wildfire hazard: https://www.clackamas.us/dm/CWPP.html. Information specific to Milwaukie is found in the following chapter: Chapter 10.3: Clackamas Fire District #1.

Volume I, Section 2 describes the characteristics of wildland fire hazards, history, as well as the location, extent, and probability of a potential event within the region. The location, and extent of a wildland fire vary depending on fuel, topography, and weather conditions. Weather, and urbanization conditions are primarily at cause for the hazard level. Milwaukie has not experienced a catastrophic wildfire within City limits. The Clackamas Fire District #1 also provides services to other cities besides Milwaukie, including: Oregon City, Happy Valley, Johnson City, and many unincorporated areas within Clackamas County.

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

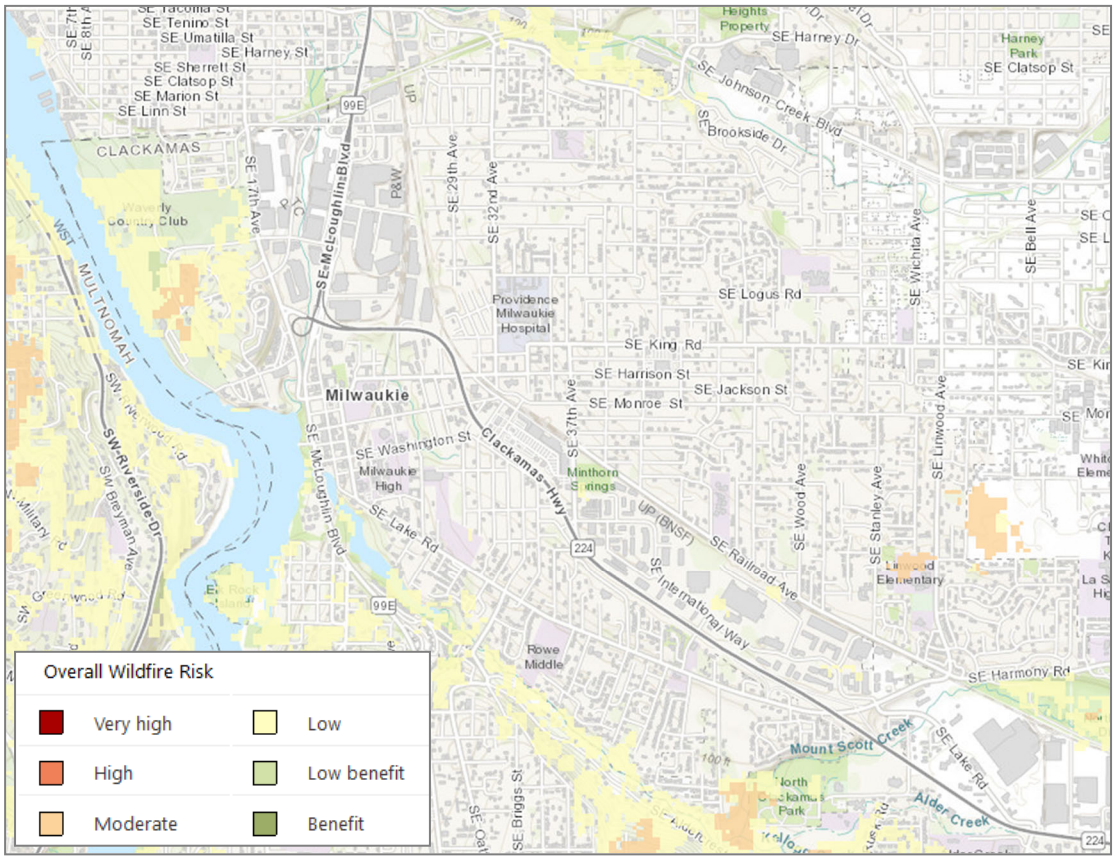
Milwaukie is highly urbanized and as such does not have as much danger of wildfire within its boundaries as more rural locations in Clackamas County. The City does have parks and neighborhoods surrounded by mature trees, as well as several natural areas. Located on the edge of its southeastern boundary is the Three Creeks Natural Area, which has heavy fuels adjacent to homes and infrastructure. Three Creeks Natural Area is a designated Medium Priority Community at Risk (CARs).[11] Elk Rock Island, though listed as low risk for wildfire by the Oregon Wildfire Risk Explorer, is a publicly owned greenspace near a built-up residential area. The island contains dense vegetation which dries out in the summer, and has no roads, which makes firefighting operations on the island more difficult, as demonstrated by the large fire there in 2020.

Figure MA-6 (next page) shows overall wildfire risk in Milwaukie.

[11] Clackamas County Community Wildfire Protection Plan, *Clackamas Fire District #1* (2018), Table 10.13-1.

Most of the city has less severe (moderate or less) wildfire burn probability. This indicates expected flame lengths less than four feet under normal weather conditions.[12] However, conditions vary widely and with local topography, fuels, and local weather conditions, especially wind. Under warm, dry, windy, and drought conditions, the City expects higher likelihood of fire starts, higher intensity, more ember activity, and a more difficult to control wildfire that will include more fire effects and impacts.

Figure MA-6 Overall Wildfire Risk



Source: Oregon Wildfire Risk Explorer, date accessed February 10, 2023.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

[12] Oregon Wildfire Risk Explorer, date accessed February 14, 2023.

Milwaukie does not have much vulnerability to wildfire flames, though there is always the risk of fire destroying residential and commercial areas. Vegetation along roadways can be highly dangerous, as negligent motorists provide ignition sources by tossing cigarette butts out car windows. Because schools are generally located near parks and scenic areas, they can be threatened by wildfires.

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

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Although the direct threat of wildfire burning Milwaukie is low, the city is vulnerable to smoke and aerial particulate matter generated by fires in the region. The 2020 wildfire season was especially bad, with the air quality index in the Portland metropolitan area being recorded as over 500, the upper limit of that scale. The regions air quality was rated as the worst in the world during that period. Air quality is not listed as standalone hazard by FEMA or the State of Oregon for the purposes of natural hazard mitigation planning. It was, nonetheless, discussed by the Milwaukie HMAC and factored into the vulnerability rating calculation for wildfires.

Mitigation Activities

Milwaukie and Clackamas Fire District #1 (CFD#1) use several mitigation tools to reduce the city's risk to wildfires. CFD #1 provides emergency fire suppression, medical response and rescue services to the City of Milwaukie. Mutual aid agreements with neighboring jurisdictions are also in place. Water supply and storage capacity in Milwaukie conforms with recommended fire flow requirements.

The City does not allow backyard burning due to requirements of DEQ. The CFD #1 provides outreach and education to the community on wildfire mitigation via news releases, posters, signage, website messages, safety exhibits at community events, and visits to schools, civic organizations and neighborhood associations.

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

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

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ATTACHMENT A

Action Items

Natural Hazard Action Item Multi-Hazard #1				☒ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Coordinate with Clackamas County, OEM, the American Red Cross, and other relevant agencies to identify shelter facilities within Milwaukie.
Description	By collaborating with partner agencies to identify and prepare mass shelter facilities, the City of Milwaukie will be better able to respond to large-scale disasters resulting in population displacement.
Potential Implementation	• Utilize existing list of potential shelter facilities included in this plan, as well as any maintained by partner agencies to identify shelter sites to be used in the event of a mass population displacement (earthquake, wildfire, etc.) • Coordinate with relief agencies and potential host sites to expedite post-disaster shelter setup
Lead	Emergency Management
Potential Hazard Mitigation Grant/Funding	General Fund, BRIC This goal and will require minimal or no additional funding.
Climate Change Related	An increasingly unstable climate leaves the city more vulnerable to flooding and fire displacement.
Community Lifelines	Shelter
Population Impact	Following a major earthquake or other displacing disaster, large numbers of Milwaukians may need to seek shelter in a communal setting.

Estimated Cost	Timing
☒ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #2				☒ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Increase outreach and education for hazard awareness and natural disaster preparedness, especially for low-income, elderly, non-English-speaking, and other vulnerable populations.
Description	In the event of a regional disaster such as a fire, earthquake, or prolonged winter storm, household disaster kits will provide vital life safety support while waiting for regional and federal responders. Working with the most vulnerable communities to inform them about steps to take to prepare will help to increase resilience in emergencies.
Potential Implementation	• Publicize existing disaster preparation materials with a no-less-than monthly publication target. Share information in multiple languages. • Stand up "Prepare Faire" booths at community and city events to help increase awareness around disaster preparedness and resilience. • Work with community organizations and communal living centers to identify their strengths and vulnerabilities in emergencies. • Work with CERT, as a neighborhood partner, to educate the community about disaster readiness
Lead	Emergency Management
Potential Hazard Mitigation Grant/Funding	General Fund, HMGP, BRIC The scope of this outreach will depend largely on available funding and staff time. Some of it can be completed with current resources.
Climate Change Related	The city expects climate change to continue to adversely affect the intensity, frequency, and duration of a wide variety of natural hazards.
Community Lifelines	Shelter, Food, Water, Healthcare
Population Impact	Household emergency kits continue to be one of the most effective ways to maintain life safety in the immediate aftermath of a disaster.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☒ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #3				☒ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Maintain and enhance strategies for debris management for all hazards.
Description	Following a windstorm, winter storm, flood, or earthquake there is likely to be widespread need for debris hauling. Removing bulky waste clears transportation corridors, reduces the number of shelters for rodents, and other pest species, and generally serves to help a community return to its pre-disaster condition.
Potential Implementation	• A partnership for a debris removal plan was developed with Metro. • Milwaukie participates in Metro's Disaster Debris Management Plan, last updated in December 2022. • Clackamas County is currently developing an on-call debris hauling contract to provide additional assistance following an emergency.
Lead	Public Works
Potential Hazard Mitigation Grant/Funding	General Fund This is part of the city's ongoing work, but following a disaster FEMA recovery funds will be sought to alleviate the cost burden of debris removal.
Climate Change Related	The city expects climate change to continue to adversely affect the intensity, frequency, and duration of a wide variety of natural hazards, including hazards that may be reasonably expected to generate significant quantities of debris.
Community Lifelines	Hazardous Materials, Energy, Transportation, Safety
Population Impact	Downed limbs/trees have been a routine part of windstorms and winter storms in Milwaukie annually. Flooding, earthquakes, and some other disasters would likely lead to a larger volume of debris to remove if they are severe enough.

Estimated Cost	Timing
☒ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #4				☐ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Improve and obtain resources and equipment essential for responding to and recovering from disasters.
Description	The protection of resources and infrastructure will be an essential part of disaster recovery beginning from the moment disaster strikes. Making efforts to harden existing infrastructure and ensure that the necessary equipment is in place before an emergency will help to mitigate multiple natural hazards.
Potential Implementation	• Obtain funding to purchase one fixed generator for the Lava Drive pump station • Obtain funding to purchase one storage trailer for emergency supplies • Refresh emergency ration stockpiles in critical facilities • Contact local facilities that have large trucks that could serve as water tenders in emergency situations, or purchase water tenders for the city • Conduct seismic evaluations and retrofitting where necessary of government facilities
Lead	Public Works
Potential Hazard Mitigation Grant	HMGP, BRIC, Seismic Rehabilitation Grant Program
Climate Change Related	Although this action item is primarily about earthquake recovery, which are not influenced by climate change, some other climate hazards.
Community Lifelines	Communications, transportation, shelter, water, energy
Population Impact	The ability of the city government to stand up and resume services quickly following a large natural disaster will expedite recovery for all residents and the surrounding community.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☐ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☒ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #5				☐ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Coordinate natural hazard related climate change action items through the Milwaukie Community Climate Action Plan.
Description	The Climate Change action items provide direction on specific activities that the City and residents in Milwaukie can take to reduce the impacts of climate change.
Potential Implementation	Implement relevant mitigation strategies identified in the Climate Action Plan related to the following topic areas: • Building Energy and Efficiency • Vehicles and Fuels • Land Use and Transportation Planning • Materials use, purchasing, and recovery • Natural resources • Public health and emergency preparedness
Lead	Public Works
Potential Hazard Mitigation Grant	General Fund
Climate Change Related	The Climate Action Plan is intended to describe the city's overall plan for climate action. Most of the natural hazards described in this plan will be exacerbated by climate change. Anything the city does to mitigate climate change by extension mitigates its vulnerability to natural hazards.
Community Lifelines	Health, Safety
Population Impact	Milwaukians have already experienced climate-conscious improvements to quality of life through the implementation of Climate Action Plan policies. A completely implemented Climate Action Plan would not prevent natural disasters from occurring, but would yield benefits to all residents in the form of reduced severity of those disasters.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Flood #1				☐ High Priority Action
☐ Multi-Hazard	☐ Drought	☐ Earthquake	☒ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Evaluate and implement alternatives for reducing the flooding hazard for properties along Kellogg Creek, Johnson Creek, Mount Scott Creek area, and the Willamette River.
Description	While most of Milwaukie is safe from all but the most extreme of riverine flooding, waterfront properties continue to be popular habitation and development sites.
Potential Implementation	• Prioritize mitigation for residences located within the floodway • Identify repetitive flood loss properties and discuss mitigation strategies with property owners • Limit cut and fill through development policy • Continue to support the Kellogg Creek Restoration and Community Enhancement Project • Complete Meek Stormwater Pipeline North Phase to connect to Roswell Detention Facility (currently receiving bids) • Washington area improvements (currently bidding) • Protect and expand storm gardens and swales • Update Stormwater System Plan 2023/24 (early implementation, consultant hired)
Lead	Engineering
Potential Hazard Mitigation Grant	General Fund, HMGP, FMA, PDM Some of these projects are already funded, while others are not.
Climate Change Related	Flooding is inextricably tied to climate change. Increased rainfall frequency and intensity makes flood mitigation an ongoing concern.
Community Lifelines	Transportation, sanitation, shelter, food, energy
Population Impact	Flooding will continue to affect Milwaukians for the foreseeable future. While most members of the community do not live in areas prone to flooding, creeks and the river overflowing their banks can have significant effects on transportation and other community lifelines listed above. Mitigating flood vulnerability is a benefit to the entire population.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☐ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☒ Long Term (More than 5 years)

Natural Hazard Action Item Severe Weather #1				☐ High Priority Action
☐ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☒ Winter Storm	☒ Windstorm

Statement	**Protect vulnerable critical infrastructure, such as power lines, to lessen potential failures during severe weather.**
Description	Severe weather poses a significant threat to powerlines and other critical infrastructure. Identifying opportunities to protect access to energy is a vital part of disaster recovery.
Potential Implementation	• Partner with PGE to obtain funding to bury powerlines for critical facilities within the city • Partner with PGE to continue hazardous tree inventory and mitigation programs • Partner with major businesses and employers to encourage undergrounding of powerlines • Continue to require undergrounding of powerlines in new developments
Lead	Public Works
Potential Hazard Mitigation Grant	General Fund, HMGP, BRIC Much of the work supporting this action item is being done by other agencies.
Climate Change Related	Climate change continues to exacerbate the severity of windstorms and winter storms.
Community Lifelines	Energy
Population Impact	Ensuring continued power to hospitals, Public Works, and public safety facilities during and after natural disasters allows the entire community to recover more quickly.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☐ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☒ Long Term (More than 5 years)

Natural Hazard Action Item Wildfire #1				☐ High Priority Action
☐ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☒ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.
Description	Fire services in Milwaukie are provides by Clackamas Fire District #1 (CFD1). Continuing to cooperate with the CFD1 promotes public safety for the entire community.
Potential Implementation	• Collaborate with CFD1 to identify areas where the city can cooperate more effectively with the Community Wildfire Protection Plan
Lead	Emergency Management
Potential Hazard Mitigation Grant/Funding	General Fund, HMGP, BRIC Participation in this action item will be funded as part of the city's ongoing hazard mitigation efforts. Additional actions arising from this collaboration will require additional funding, likely from grants.
Climate Change Related	Wildfires are fed by hot, dry conditions following periods of heavy rainfall. As climate change continues, conditions conducive to wildfires are expected to become more prevalent.
Community Lifelines	Energy, shelter, safety
Population Impact	Milwaukie's direct vulnerability to wildfires remains relatively low, but by continuing to integrate with the wider county action plan, the city remains ready to support neighboring jurisdictions and respond in the unlikely event of a local wildfire.

Estimated Cost	Timing
☒ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

ATTACHMENT B

Community Engagement Summary

This Section To Be Added

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

August 2023

Volume II: Milwaukie Addendum

Table of Contents

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Purpose

This is an update of the Milwaukie addendum to the Clackamas County Multi-Jurisdictional Natural Hazard Mitigation Plan (NHMP). This addendum supplements information contained in Volume I (Basic Plan) which serves as the NHMP foundation and Volume III (Appendices) which provide additional information. This addendum meets the following requirements:

- Multi-Jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-Jurisdictional **Participation** §201.6(a)(3),
- Multi-Jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv) and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Milwaukie adopted their addendum to the Clackamas County Multi-jurisdictional NHMP on **[Month] [Day]. 2023.** FEMA Region X approved the Clackamas County NHMP on **[Month] [Day],** 2023 and the City's addendum on **[Month] [Day], 2023.**

Mitigation Plan Mission

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

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

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

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

Mitigation Plan Goals

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

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

Below is a list of the NHMP goals:

GOAL #1: PROTECT LIFE AND PROPERTY

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

GOAL #2: ENHANCE NATURAL SYSTEMS

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

GOAL #3: AUGMENT EMERGENCY SERVICES

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

GOAL #4: ENCOURAGE PARTNERSHIPS FOR IMPLEMENTATION

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

GOAL #5: PROMOTE PUBLIC AWARENESS

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

GOAL #6: ADVANCE EQUITY AND INCLUSION IN MITIGATION PLANNING

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

NHMP Process, Participation and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 44 CFR 201.6(a)(3), *Participation.*

Milwaukie first developed an addendum to Clackamas County's Natural Hazards Mitigation Plan in 2003. This plan was updated in 2009, 2012/2013, and in 2018/2019.

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

~~The Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Institute for Policy Research, and Engagement (IPRE) collaborated with the Oregon Office of Emergency Management (OEM), Clackamas County, and Milwaukie to update their NHMP. This project is funded through the Federal Emergency Management Agency's (FEMA) Fiscal Year 2016 (FY16) Pre-Disaster Mitigation (PDM) Competitive Grant Program EMS-2017-PC-0005 (PDMC-PL-10-OR-2016-001). Members of the Milwaukie NHMP Hazard Mitigation Advisory Committee (HMAC) also participated in the County NHMP update process (Volume III, Appendix B).~~

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

Convener

The City's Events & Emergency Management Coordinator served as the convener of the HMAC. They will continue to serve as the convener during the implementation and maintenance phase and during the next plan update. The convener of the NHMP will take the lead in implementing, maintaining and updating the addendum to the Clackamas County NHMP in collaboration with the designated convener of the Clackamas County NHMP (Clackamas County Resilience Coordinator).

Representatives from the City of Milwaukie HMAC met formally and informally to discuss updates to their addendum (Volume III, Appendix B). The HMAC reviewed and revised the City's addendum, with focus on the NHMP's risk assessment and mitigation strategy (action items).

This addendum reflects decisions made at the designated meetings and during subsequent work and communication with the Clackamas County Resilience Coordinator and the OPDR. The changes are highlighted with more detail throughout this document and within Volume III, Appendix B. Other documented changes include a revision of the City's risk assessment and hazard identification sections, NHMP mission and goals, action items, and community profile.

The Milwaukie HMAC comprises the following representatives:

- Convener, Dan Harris, Events & Emergency Management Coordinator
- Luke Strait, Police Chief

- Robbie Graves, Police Captain
- Damien Farwell, Fleet and Facilities Supervisor
- Nick Lindekugel, GIS Coordinator
- Natalie Rogers, Climate and Natural Resources Manager
- Peter Passarelli, Public Works Director
- Steve Adams, City Engineer
- Jen Garbely, Assistant City Engineer
- Patrick McLeod, Building Official
- Joseph Briglio, Community Development Director
- Brett Kelver, Senior Planner

Public participation occurred with the assistance of the city's Public Safety Advisory Committee and a public comment period in summer 2023 during which time the NHMP shared through the City's website and social media. The HMAC served as the local review body for the NHMP's development.

NHMP Implementation and Maintenance

The City Council will be responsible for adopting the Milwaukie addendum to the Clackamas County NHMP. This addendum designates an HMAC and a convener to oversee the development and implementation of action items. Because the City addendum is part of the County's multi-jurisdictional NHMP, the City will look for opportunities to partner with the County. The City's HMAC will convene after re-adoption of the Milwaukie NHMP addendum on an annual schedule. The County is meeting on a semi-annual basis and will provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The City's Events and Emergency Management Coordinator will serve as the convener and will be responsible for assembling the HMAC. The HMAC will be responsible for:

- Reviewing existing action items to determine suitability of funding;
- Reviewing existing and new risk assessment data to identify issues that may not have been identified at NHMP creation;
- Educating and training new HMAC members on the NHMP and mitigation actions in general;
- Assisting in the development of funding proposals for priority action items;
- Discussing methods for continued public involvement; and
- Documenting successes and lessons learned during the year.

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

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

Implementation through Existing Programs

This NHMP is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and

qualifying for assistance programs. The mitigation plan works in conjunction with other City plans and programs including the Comprehensive Plan, Capital Improvement Plan, and Building Codes, as well as the Clackamas County NHMP, and the State of Oregon NHMP.

The mitigation actions described herein (and in Attachment A) are intended to be implemented through existing plans and programs within the city. Plans and policies already in existence have support from residents, businesses and policy makers. Many land-use, comprehensive and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented. Implementation opportunities are further defined in action items when applicable.

Milwaukie's acknowledged comprehensive plan is the 2020 City of Milwaukie Comprehensive Plan. ~~The City implements the plan through the development code.~~

Milwaukie currently has the following plans, regulations, and projects that relate to natural hazard mitigation. For a complete list visit the City's website and General City Maps:

- Comprehensive Plan
  - Land Use Map (Additional Planning Documents)
- Municipal Code (Ord. 1686, July 9, 2018)
  - Title 13: Public Services
  - Title 15: Buildings and Construction
  - Title 16: Environment
  - Title 17: Land Division
  - Title 18: Flood Hazard Areas (SFHA and 1996 flood inundation area)
  - Title 19: Zoning
  - Title 21: Utility Service
- Capital Improvement Plan (2023-2028)
- Disaster Debris Management Plan (Metro)
- Milwaukie Community Climate Action Plan
- Emergency Operations Plan
- Transportation System Plan
  - Portland Metro 2014 Regional Transportation Plan
- Stormwater Master Plan
- Urban Forest Plan
- Wastewater Master Plan
- Water System Master Plan

Other plans:

- Clackamas County Community Wildfire Protection Plan
  - Clackamas Fire District #1

Government Structure

The City of Milwaukie has a council-manager form of government. The city council consists of five members: a mayor and four councilors. The mayor presides over council meetings. The mayor and city council members are elected to four-year terms of office through a citywide general election. The city council is responsible for identifying problems and needs within the community and then addressing those problems through community goals and objectives.

The City of Milwaukie currently has the following departments which have a role in natural hazard mitigation:

Office of the City Manager is responsible for taking charge of the daily supervision of City affairs. The Events & Emergency Management Coordinator is assigned to this department.

Community Development oversees the following departments and services: ~~Planning and Building.~~

The **Planning Division** regulates growth and development in the city of Milwaukie by administering the City's Comprehensive Plan and Municipal Code related to zoning and land division. Tasks range from implementing existing zoning regulations to assisting City Council with land use and growth planning policy development. Planning is also responsible for regulating development impacts in natural resource areas.

The **Building Division** is responsible for plan review and inspections on commercial, industrial and residential developments, as well as fire life and safety plan review.

The **Engineering Department** provides quality engineering services to ensure that all city utilities, including wastewater collection, water, streets and storm water infrastructure, meet all municipal code requirements, are efficiently managed at the lowest cost to ratepayers, and serve the long-term needs of the community. In addition, the Engineering Department provides floodplain management and regulation for the City.

The **Public Works Department** provides many of the basic urban services to the citizens of Milwaukie including the following:

The **Stormwater Division** conducts~~tinues~~ regular sewer line cleaning and inspection. The Stormwater Division maintains all the components that comprise the City's Stormwater infrastructure, valued at over $6,094,886. The various components of the system include: 1190 catch basins, 548 manholes, 62 sedimentation-manholes, 197 drywells, 37 miles of pipe and open ditches, and 5 detention ponds. It uses information from inspections for ongoing analysis of the sewer system components and capital needs assessment, and on the spot pipe rehabilitation to minimize sewer back-ups. It also ensures that the city complies with the National Discharge Elimination System (NPDES) permit. The division monitors pollutants in surface water.

The **Wastewater Division** is responsible for the maintenance of the City's wastewater (sanitary sewer) system. The Wastewater Division maintains all the components that comprise the City's Wastewater infrastructure, valued at over $7,029,552. The various

components of the system include: 75 miles of sanitary sewer, 5 lift stations, and 1,607 manholes.

The **Water Division** is responsible for the supply and distribution of drinking water. The Water division maintains all the components that comprise the city's infrastructure, valued at over $16,516,356. The various components of the system include: 100 miles of water main, 964 fire hydrants, 6,911 water services, 7 well houses, 3 storage reservoirs and 4 pump stations. The division ensures that the city's water storage and distribution systems comply with all state and federal regulations.

The **Streets Division** maintains all the components that comprise the City's infrastructure, valued at over $ 38,785,042. The various components of the system include: 75 miles of road surface, signage and street pavement markings.

The **Fleet Division** maintains all the City's vehicles and equipment including police cars, sweepers, excavators, dump trucks and 150 pieces of small equipment and generators. And, the **Facilities Division** is responsible for maintaining all city facilities.

Public Safety is committed to providing quality services to the Milwaukie community. Police services are provided by the **Police Department. Code Enforcement** is responsible for neighborhood preservation, code compliance, and nuisance abatement.

Fire services are provided by Clackamas Fire District #1.

Continued Public Participation

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

NHMP Maintenance

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

- Are there new partners that should be brought to the table?
- Are there new local, regional, state or federal policies influencing natural hazards that should be addressed?

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

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

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

Mitigation Strategy

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

The City's mitigation strategy (action items) were first developed during the 2003 NHMP planning process and revised during subsequent NHMP updates. During these processes, the HMAC assessed the City's risk, identified potential issues, and developed a mitigation strategy (action items). During the 2023 update process the City updated its action items.

Priority Action Items

Table MA-1 presents a list of action items. The HMAC decided to modify the prioritization of action items in this update to reflect current conditions (risk assessment), needs, and capacity. The City will focus their attention, and resource availability, upon these achievable, high-leverage, activities over the next five years. Although this methodology provides a guide for the HMAC, the HMAC has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new opportunities arise, such as capitalizing on funding sources that could pertain to an action item that is not currently listed as the highest priority. Refer to Attachment A for detailed information for each action.

In creating Table MA-1, the city was required to use county and state guidelines for timeline and estimated cost categories. The timeline categories were Short Term (0-2 years), Medium Term (2-5 years), Long Term (5+ years), and Ongoing. Cost categories were Low (less than $50,000), Medium ($50,000-100,000), and High ($100,000+).

Table MA-1 Milwaukie Action Items

Action Item			Community Impact										Implementation and Maintenance			
#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
Multi-Hazard Action Items																
1	Coordinate with Clackamas County, OEM, the American Red Cross, and other relevant agencies to identify shelter facilities within Milwaukie.	The city will work with partner agencies to ensure that there is an accurate and up-to-date list of facilities that could be used as mass-shelter sites in case of emergency.	X			X	X						Emergency Management	Ongoing	General Fund, BRIC	Low
2	Increase outreach and education for hazard awareness and natural disaster preparedness, especially for low-income, elderly, non-English-speaking, and other vulnerable populations.	The city will develop a public outreach campaign in multiple languages intended to educate and encourage residents about building emergency kits and preparing for disasters.	X	X	X	X	X						Emergency Management	Ongoing	General Fund, HMGP, BRIC	Medium

#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
3	Maintain and enhance strategies for debris management for all hazards.	The city participates in the Metro Disaster Debris Management Plan and will continue to look for other opportunities to prepare for debris management following a disaster.		X				X	X		X		Public Works	Ongoing	General Fund	Low
4	Improve and obtain resources and equipment essential for responding to and recovering from disasters.	The city will continue to maintain current emergency response infrastructure and equipment while looking for funding to improve resiliency.	X	X	X	X	X		X	X	X		Public Works	Ongoing	General Fund, HMGP, BRIC, Seismic Rehabilitation Grant Program	High
5	Coordinate natural hazard related climate change action items through the Milwaukie Community Climate Action Plan (CAP).	The city will continue to implement its CAP to mitigate and reverse the effects of climate change on the severity of natural hazards.	X	X	X		X	X	X				Public Works	Ongoing	General Fund	High

#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
Flood Action Item																
1	Evaluate alternatives for reducing the flooding hazard for properties along Kellogg Creek, Johnson Creek, Mount Scott Creek area, and the Willamette River.	The city will continue to implement policies to mitigate the threat of flooding. This includes several ongoing infrastructure projects such as the ~~removal of the Kellogg Dam~~ Kellogg Creek Restoration and Community Enhancement Project.	X	X	X		X	X	X		X	X	Engineering	Long Term	General Fund, HMGP, FMA, PDM	High
Severe Weather Action Item																
1	Bury and protect vulnerable critical infrastructure, such as power lines, to	The city will work with utility providers to protect critical infrastructure.	X	X	X	X	X	X	X				Public Works	Long Term	General Fund, HMGP, BRIC	High

	lessen potential failures during severe weather.															
#	Statement	Description	Protect Life	Community Lifelines	Climate Adaptation	Enhance Communication	Vulnerable Populations	Encourage Resilient Dev	Environmental Impact	Historic and Cultural	Repetitive Losses	Dams Posing Risk	Lead	Timeline	Potential Funding Source	Estimated Cost
Wildfire Action Item																
1	Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.	The city will continue to partner with Clackamas Fire District #1 to prepare for wildfires.	X	X	X	X	X	X	X	X			Emergency Management	Ongoing	General Fund, HMGP, BRIC	Low

Source: City of Milwaukie HMAC, 2023.
Note: Full text of the plan goals referenced in this table is located in Attachment A.

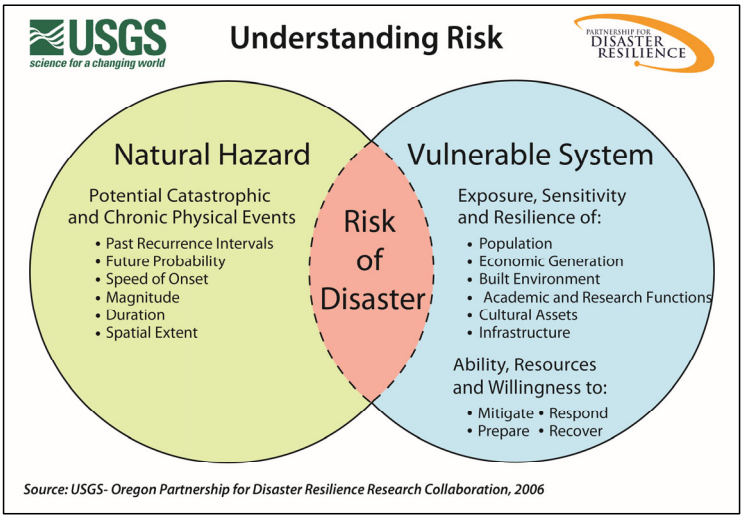
Risk Assessment

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

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

The local level rationale for the identified mitigation strategies (action items) is presented herein and within Volume I, Section 3 and Volume III, Appendix C. The risk assessment process is graphically depicted in Figure MA-1. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure MA-1 Understanding Risk



Hazard Analysis

The Milwaukie HMAC developed their hazard vulnerability assessment (HVA), using their previous HVA and the County's HVA as a reference. Changes from their previous HVA and the County's HVA were made where appropriate to reflect distinctions in vulnerability and risk from natural hazards unique to Milwaukie, which are discussed throughout this addendum. For detailed information on the methodology see Volume I, Section 2.

Table MA-2 shows the HVA matrix for Milwaukie listing each hazard in order of rank from high to low. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response and recovery. The method provides the jurisdiction with sense of hazard priorities but does not predict the occurrence of a hazard.

Three chronic hazards (extreme heat, wildfire, and flood) rank as the top hazard threats to the City (Top Tier). Earthquakes, winter storm, drought, and windstorm constitute the next highest ranked hazards (Middle Tier), while landslide and volcanic hazards are the lowest ranked (Bottom Tier).

Table MA-2 Hazard Analysis Matrix – Milwaukie

Hazard	History	Vulnerability	Maximum Threat	Probability	Total Threat Score	Hazard Rank	Hazard Tiers
Extreme Heat Event	16	50	90	70	226	1	Top
Wildfire (WUI)	16	45	90	70	221	2	
Flood - Riverine	10	30	80	70	190	3	
Earthquake - Cascadia (3-5min)	2	50	100	35	187	4	Middle
Earthquake - Crustal (1 min)	2	40	100	42	184	5	
Winter Storm	16	20	90	56	182	6	
Drought	16	20	70	70	176	7	
Windstorm	8	25	70	56	159	8	
Landslide/Debris Flow	12	15	60	56	143	9	Bottom
Volcano	2	15	50	7	74	10	

Source: Milwaukie HMAC, 2023.

Table MA-3~~Table MA-3~~ (next page) categorizes the probability and vulnerability scores from the hazard analysis for the City and compares the results to the assessment completed by the Clackamas County HMAC. Variations between the City and County are noted in **bold** text within the city ratings. Differences in city and county ratings can be attributed to a combination of differing circumstances between the city and county and different understandings of the maximum threat. For example, while the county as a whole has a medium vulnerability to volcanoes, because Milwaukie is relatively far from any volcanoes, its vulnerability is low. Similarly, Clackamas County rates its vulnerability to and probability of extreme heat events as low, but because Milwaukie is significantly more urbanized than the county as a whole, it is more vulnerable to the effects of extreme heat and more likely to experience heat island effects. As a final example, while the county's plan does not account for the effects of wildfire smoke, focusing instead on the direct threat of burning, the city's plan does account for smoke. This leaves Milwaukie with a higher vulnerability to wildfire than the county as a whole.

Future Climate Variability

Human-caused climate change is impacting the natural systems and environmental health of regional and local communities. The City of Milwaukie recognizes the effects that climate change will have on the city and its residents, including changes to the frequency, severity, and impacts of natural hazards from historical norms. According to the Intergovernmental Panel on Climate Change Fourth National Climate Assessment, the Pacific Northwest region will see impacts to drought risk, water quality, wildfires and air quality, human health and more due to climate change. Even with these challenges, the Pacific Northwest and the City of Milwaukie will shelter a growing population seeking livability and refuge from more extreme climates in the nation.

Table MA-3 Probability and Vulnerability Comparison

Threat Event / Hazard	Milwaukie		Clackamas County	
	Probability	Vulnerability	Probability	Vulnerability
Drought	High	**Medium**	High	Low
Earthquake - Cascadia (3-5min)	Medium	High	Medium	High
Earthquake - Crustal (1 min)	**Medium**	High	Low	High
Extreme Heat Event	**High**	**High**	Medium	Medium
Flood - Riverine	High	Medium	High	Medium
Landslide/Debris Flow	High	Low	High	Low
Volcano	Low	**Low**	Low	Medium
Wildfire (WUI)	High	**High**	High	Medium
Windstorm	High	Medium	Medium	Low
Winter Storm	High	Medium	Medium	Medium

Source: Milwaukie and Clackamas County HMAC, 2023.

Climate models for Oregon suggest, future regional climate changes include increases in temperature around 0.2-1°F per decade in the 21st Century, along with warmer and drier summers, and some evidence that extreme precipitation will increase in the future.[2] Increased droughts may occur in the Willamette Valley under various climate change scenarios because of various factors, including reduced snowpack, rising temperatures, and likely reductions in summer precipitation. Climate models suggest that as the region warms, winter snow precipitation will likely shift to higher elevations and snowpack will be diminished as more precipitation falls as rain altering surface flows.

Acknowledging the city's responsibility to be a leader in the climate crisis, Milwaukie adopted a Climate Action Plan detailing 53 city-led actions to mitigate and adapt to climate

[2] Oregon Climate Change Research Institute (OCCRI), Fourth Oregon Climate Assessment Report (2019) and Fourth National Climate Assessment, Chapter 23: Northwest (2019). http://www.occri.net/publications-and-reports/publications/

change. Along with reducing the city's greenhouse gas emissions and contribution to climate change, the Climate Action Plan calls for increasing the community's resiliency and preparedness for natural hazards through policy, advocacy, outreach and education.

Milwaukie is committed to planning and preparing for the immediate and future threats that climate change will have on the community. By addressing the climate crisis through the actionable goals of the Climate Action Plan, Milwaukie hopes to reduce the risk and impact of climate change related natural hazards on residents of Milwaukie and the region while encouraging others to take climate action.

Community Characteristics

Table MA-4~~Table MA-4~~ (next page) and the following section provides information on City specific demographics and assets. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the City specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation. Between 2016 and 2020 the City grew by 780 people. Median household income increased from $55,850 to $70,037 in the same period. Between 2018 and 2040 the population is forecast to grow to 23,149. Although this is the most current forecast available at the time of publication, given the large number of new multi-unit residential buildings currently being constructed or in advanced planning stages in Milwaukie which were not accounted for in this analysis, the actual number may be somewhat higher. New development has complied with the standards of the Oregon Building Code and the City's development code.

Transportation/Infrastructure

Milwaukie is accessible by two state highways, 99E (or McLoughlin Blvd.), running north to south in the western part of the city, and Highway 224, running west to east through the central part of the city. Milwaukie is also bisected by the Union Pacific Railroad main line, which travels northwest to southeast carrying both passengers and freight.

The responsibility and authority, as well as the financial capability, to maintain an adequate level or service for the highways rests with Metro and Oregon Department of Transportation (ODOT) authorities. Congestion can result in the diversion of traffic onto City streets.

The City's public transit is provided by the TriMet transit system. Nine bus routes go through the downtown Milwaukie transit center daily. The MAX Orange Line provides service to Milwaukie. The availability and quality of pedestrian and bicycling facilities (sidewalks, bike lanes, and pathways) is inconsistent but has improved substantially since the 2019 NHMP update due to an increased investment in the Safe Routes to School and Safe Access for Everyone Programs. Base Maps are found on the city's website.

Economy

Milwaukie is a major industrial center in the Portland metropolitan area containing one of the largest concentrations of warehousing and distribution facilities in the region. The Milwaukie Industrial Park, Omark Industrial Park, and the Johnson Creek industrial area comprise over 300 acres of industrial land within the city. These areas are nearing capacity and very little land within the city is currently available for new industrial development.

Milwaukie's commercial lands are largely built up. New commercial development along Highway 224, McLoughlin Boulevard, and 82nd Avenue has lured many people away from

downtown Milwaukie for purchasing comparison goods such as clothes, furniture and appliances. Downtown Milwaukie, however, has continued to attract commercial investment in the form of commercial service uses including banks, insurance, professional offices, and several residential mixed-use developments. The city has identified areas for commercial, office, or mixed use development.

~~The City, school district, and smaller employers (retail, offices and other professional services) provide for most of Milwaukie's employment.~~

Table MA-4 Community Characteristics
as of 2020

Population Characteristics		
2016 Population		20,525
2020 Population		21,305
Race and Ethnicity		
White	18,458	87.5%
Black/African American	176	0.8%
American Indian and Alaska Native	75	0.4%
Asian	519	2.5%
Native-Hawaiian and Other Pacific Islanders	15	0.1%
Some Other Race	475	2.3%
Two or More Races	1,368	6.5%
Hispanic or Latino	1,915	9.1%
Limited or No English Spoken		
Vulnerable Age Groups		
Less than 15 Years	3,011	14%
65 Years and Over	3,080	15%
Disability Status		
Total Population	2,431	12%
Children	96	3%
Seniors	913	30%

Income Characteristics		
Household Income by Category		
Less than $15,000	561	6.0%
$15,000-$29,999	1,008	10.8%
$30,000-$44,999	1,181	12.7%
$45,000-$59,999	1,021	11.0%
$60,000-$74,999	1,209	13.0%
$75,000-$99,999	1,384	14.9%
$100,000-$199,999	2,626	28.2%
$200,000 or more 3,735	310	3.3%
Median Household Income		$70,037
Poverty Rates		
Total Population	2,070	9.9%
Children	418	11.2%
Senior	253	8.4%
Housing Cost Burden		
Owners with Mortgage	4,193	73.8%
Renters	1,492	26.2%

Source: U.S. Census Bureau, 2012-2016 American Community Survey; Portland State University, Population Research Center, "Annual Population Estimates", 2018 & 2020. Metro, 2040 Distributed Forecast. Note: * = Population forecast within Metro UGB

Housing Characteristics	
Housing Units	
Single-Family	6,771
Multi-Family	2,740
Mobile-Homes	134
Year Structure Built	
Pre-1970	5,371
1970-1989	3,079
1990 or later	1,195
Housing Tenure and Vacancy	
Owner-occupied	5,685
Renter-occupied	3,615
Seasonal	31
Vacant	345

Milwaukie has grown substantially since its incorporation in 1903 and has an area today of about 5 square miles. Between 1940 and 1980 the population grew from about 2,000 to just under 18,000 residents. ~~Since then the growth in population has slowed, with the city currently containing more than~~Population growth slowed after 1980, but has accelerated in recent years. The current population is approximately 21,000 residents.

The city is located within the southern bounds of the Portland metropolitan area about six miles from downtown Portland. The city is within the Willamette River basin and has two major creeks flowing through it, Johnson Creek in the northern part of the city and Kellogg Creek in the south.

Milwaukie's climate is consistent with the marine west coast climate zone, with warm summers and cool, wet winters. Milwaukie receives most of its rainfall between October and May, and averages 43 inches of rain, and less than one (1) inch of snow, per year.

Elevations in the city range from 205 feet near 59th Avenue and Monroe Street to a low of 43 feet on the shores of the Willamette River. Milwaukie is characterized by flat or gently hilly topography.

Community Assets –

This section outlines the resources, facilities, and infrastructure that, if damaged, could significantly impact the public safety, economic conditions, and environmental integrity of Milwaukie. The community assets identified below were identified by the City of Milwaukie. The tables identify which hazards each asset may be exposed to, based upon both a GIS analysis as well as HMAC member knowledge. Additional information is needed to fully understand the extent of risk to each asset. It is important to note that the facilities identified as "critical" and "essential" are characterized differently than the structural code that identifies buildings as "essential" and "non-essential." The structural code uses different language and criteria and therefore have completely different meanings than the buildings identified in this addendum.

Critical Facilities

These facilities are critical to government response, and recovery activities (i.e., life, safety, property, and environmental protection). These facilities include: 911 Centers, Emergency Operations Centers, Police, and Fire Stations, Public Works facilities, sewer, and water facilities, hospitals, bridges, roads, shelters, and more.

City Facilities:

- Public Safety Building: Milwaukie Police Department/CFD #2 (3200 SE Harrison St)
- Public Works Campus (6101 SE Johnson Creek Blvd)

Public Safety Facilities ~~not in the~~Outside the City:

- Town Center Station (11300 SE Fuller Rd)
- Oak Grove Station (2930 SE Oak Grove Blvd)
- Lake Road Station (6600 SE Lake Rd)
- Clackamas County Sheriff's Office (9101 SE Sunnybrook Blvd)
- Oregon State Police (8805 SE Deer Creek Ln)

Hospitals:

- Providence Milwaukie Hospital (10150 SE 32nd Ave)
- Kaiser Permanente Sunnyside Hospital (10180 SE Sunnyside Rd; not in city)
- Providence Willamette Falls Medical Center (1500 Division St; not in city)

Essential Facilities

Facilities that are essential to the continued delivery of key government services, and/or that may significantly impact the public's ability to recover from the emergency. These facilities may include: City buildings such as the Public Safety Building, the City Hall, and other public facilities such as schools.

City Buildings:

- City Hall
- Ledding Library
- Milwaukie Community Center
- Johnson Creek Blvd Campus
- Public Safety Building

County Buildings:

- Kellogg Treatment Plant

Schools:

- Ardenwald Elementary
- Clackamas Community College (Harmony Road Campus)
- Linwood Elementary
- Milwaukie Elementary/El Puente
- Milwaukie High School
- Portland Waldorf School (private)
- Rowe Middle School
- Seth Lewelling Elementary
- St. John the Baptist School (private)
- School Transportation Center (not in city)
- Wichita Center (not in city)

Potential Red Cross Shelter Sites:

- Milwaukie Center (5440 SE Kellogg Creek Dr)
- Milwaukie Presbyterian Church (2416 SE Lake Rd)
- Clackamas Park Friends Church (8120 SE Thiessen Rd, Oak Grove)
- King of Kings Lutheran Church (5501 SE Thiessen Rd, Oak Grove)
- New Hope Church (5197 SE King Rd, Milwaukie, OR 97222)
- GracePointe Church (10750 SE 42nd Ave)
- Schools throughout Milwaukie

Essential Infrastructure

Infrastructure that provides necessary services that supplement response efforts:

Bridges:

County:

- 55th Ave across Johnson Creek
- 60th Ave across Johnson Creek
- Linwood Ave across Johnson Creek
- Milport Rd across Johnson Creek
- Stanley Ave across Johnson Creek
- Oatfield Rd across Kellogg Creek
- Rusk Rd across Mount Scott Creek

Portland:

- Johnson Creek Blvd. across Johnson Creek
- Ochoco St across Johnson Creek

TriMet (rail):

- Rail across Highway 99E
- Rail across Kellogg Creek
- Rail crossing north of Mailwell Dr

State of Oregon:

- 17th Ave across Johnson Creek
- McLoughlin Blvd. across Johnson Creek N. of city
- McLoughlin Blvd. across Kellogg Creek
- McLoughlin off-ramp to Hwy 224 across Johnson Creek
- Hwy 224 across Johnson Creek, McLoughlin Blvd. & Main
- Hwy 224 across railroad tracks and 26th Ave
- Hwy 224 across Mount Scott Creek
- Hwy 224 across MAX Light Rail Orange Line tracks

City of Milwaukie:

- Kellogg Creek near Milwaukie Bay Park
- Wichita Ave across Johnson Creek
- Stanley Ave across Johnson Creek
- 55th Ave across Johnson Creek

Transportation Corridors:

- 17th Ave
- 32nd Ave
- 55th Ave
- Harrison St/42nd Ave/King Rd.
- Highway 224
- Johnson Creek Blvd
- King Rd
- Lake Rd
- Linwood Ave
- Max Orange Line
- McLoughlin Blvd/Highway 99E
- Oatfield Rd
- River Rd

Water Treatment Facilities:

- 8 City Wells
- Aeration Packed Towers – 5 total at two locations
- Concrete Storage Tank – 40th Ave & Harvey St
- Elevated Water Storage Tank – 40th Ave & Harvey St
- Ground Level Metal Tank – Stanley Ave & Harlow St
- Sewerage Pump Stations – 5

Other Utilities:

- NW Natural pipelines
- PGE Substations (One is at edge of Lake Rd / Harmony Rd; a second is on the East end of Johnson Creek; a third is on the border between Milwaukie and Oak Grove)

Vulnerable Populations:

Vulnerable populations, including seniors, disabled citizens, women, and children, as well those people living in poverty, often experience the impacts of natural hazards and disasters more acutely. The city is aware that this is an incomplete list, and is actively seeking to expand it. Populations that have special needs or require special consideration include:

- Lockdown Facility (9200 SE McBrod Ave)
- Hillside Manor (2889 SE Hillside Ct)

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- Johnson Creek Treatment Facility (2808 SE Balfour St)
- Prestige Post-Acute and Rehab Center (12045 SE Stanley Ave)
- Royal Marc Retirement Residence (5555 SE King Rd)
- Annie Ross House (transitional family housing; 2316 SE Willard St)
- Milwaukie Community Center (daytime programs; 5440 SE Kellogg Creek Dr)
- ElderPlace Providence (daytime programs, Providence Milwaukie; 10330 SE 32nd Ave)
- Retirement Community~~Senior Center~~ near North Clackamas Park (~~in development,~~ 5801 SE Kellogg Creek Dr)
- Deerfield Village (5770 SE Kellogg Creek Dr, not in city)

Hazardous Materials:

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

- Johnson Creek Blvd
- North Milwaukie Industrial Area
- ~~McLoughlin Industrial Area/Rail Yard~~Milwaukie Business Industrial Area
- Kellogg Treatment Plant

Economic Assets/Population Centers:

Economic assets include businesses that employ large numbers of people and provide an economic resource to the City. If damaged, the loss of these economic assets could significantly affect economic stability, and prosperity. Population Centers usually are aligned with economic centers and are a concern during evacuation/notification during a hazard event. These assets include: Downtown, McLoughlin Commercial Areas, and North Milwaukie Industrial Area.

Environmental Assets:

Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic, and functional ecosystem services for the community. These environmental assets include, but are not limited to, the following: Ball-Michel Park, Dogwood Park, Elk Rock Island, Homewood Park, North Clackamas Park, Milwaukie Bay Park, Stanley Park, Water Tower Park, Three Creeks Natural Area, Spring Park, and Wichita Park.

Cultural or Historical Assets:

These assets include those facilities that augment or help define community character, and if lost, would represent a significant loss for the community.

Historic Inventory: (see State Historic Preservation Office for more information)

- Over 500 houses
- 5 commercial buildings
- 3 schools
- 1 cemetery
- 1 church
- 1 city hall

- 1 waterworks

Community Attractions:

- 17th Avenue Bike/Pedestrian Path
- Bob's Red Mill
- Carefree Sunday
- Dark Horse Comics Corporate Headquarters
- First Friday (June-October)
- ~~Milwaukie Art and Artisan Market~~
- Milwaukie Bay Park
- Milwaukie Farmers Market
- Milwaukie Museum
- Sara Hite Memorial Rose Garden
- Spring Park and Elk Rock Island
- Springwater Trail
- Trolley Trail
- Umbrella Parade
- Winter Solstice Event

Hazard Characteristics

Drought

The HMAC determined that the City's probability for drought is **High** and that their vulnerability to drought is **Medium**. *These ratings both increased from the previous NHMP addendum due to a combination of a different understanding of the most severe possible effects of drought and an increasingly unstable climate.*

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

The City of Milwaukie currently obtains its potable water from the Troutdale Aquifer through eight operating wells located throughout the city. Interties to the City of Portland and Clackamas River Water systems are maintained for emergency water supplies. The network of three water reservoirs provides a storage volume of six million gallons. The Water System Master Plan was last updated in 2021 to provide long-term guidance for the development of the City's water system. It is a supporting document for the Comprehensive Plan. The document also includes recommended capital improvement projects and a map documenting the water infrastructure placement within the city.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard.

Mitigation Activities

Milwaukie has a public awareness action item that can be used to address drought education. The existing drought hazard mitigation activities are conducted at the county, regional, state, and federal levels and are described in the Clackamas County NHMP.

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

Earthquake (Cascadia Subduction Zone)

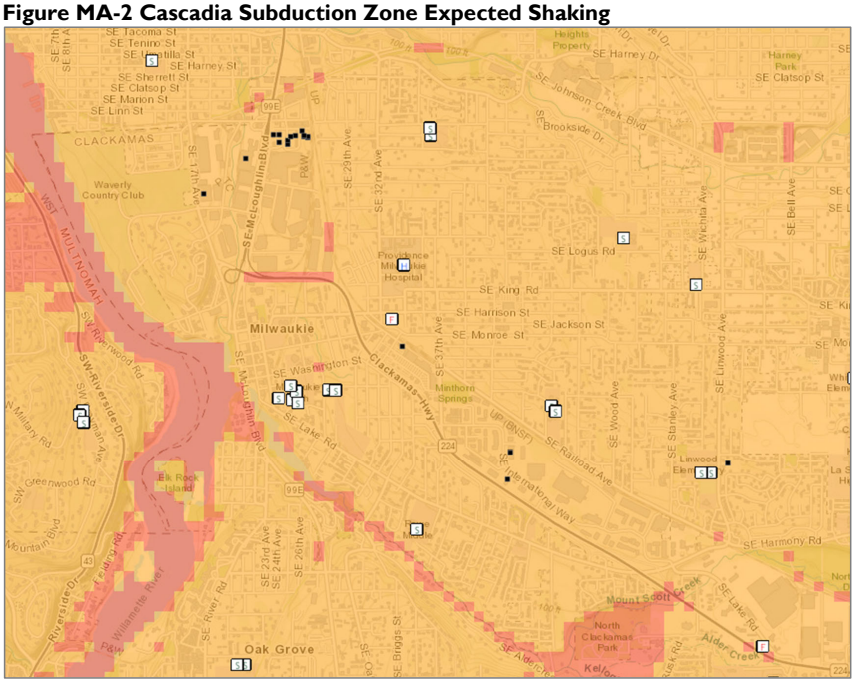
The HMAC determined that the City's probability for a Cascadia Subduction Zone (CSZ) earthquake is **moderate** and that their vulnerability to a CSZ earthquake is **high**. *The probability and vulnerability ratings did not change since the previous version of this NHMP addendum.*

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

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

Figure MA-2 displays relative shaking hazards from a Cascadia Subduction Zone earthquake event. As shown in the figure, most of the city is expected to experience very strong shaking (orange), while areas near rivers and streams will experience severe (light red) to violent (dark red) shaking in a CSZ event.

Figure MA-2 Cascadia Subduction Zone Expected Shaking



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

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year. Scientists have found evidence that 11 large, tsunami-producing earthquakes have occurred off the Pacific Northwest coast in the past 6,000 years. These earthquakes took place roughly between 300 and 5,400 years ago with an average occurrence interval of about 510 years. The most recent of these large earthquakes took place in approximately 1700 A.D.[3]

The city's proximity to the Cascadia Subduction Zone, potential slope instability and the prevalence of certain soils subject to liquefaction and amplification combine to give the city a high-risk profile. Due to the expected pattern of damage resulting from a CSZ event, the Oregon Resilience Plan divides the State into four distinct zones and places the city

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

predominately within the "Valley Zone" (Valley Zone, from the summit of the Coast Range to the summit of the Cascades). Within the Northwest Oregon region, damage and shaking is expected to be strong and widespread - an event will be disruptive to daily life and commerce and the main priority is expected to be restoring services to business and residents.

Earthquake (Crustal)

The HMAC determined that the City's probability of crustal earthquake is **moderate** and that its vulnerability is **high**. *The probability rating increased while the vulnerability rating did not change since the previous version of this NHMP addendum due to an improved understanding of the likelihood of a crustal earthquake.*

Volume I, Section 2 describes the causes and characteristics of earthquake hazards, history, as well as the location, extent, and probability of a potential event. Generally, an event that affects the County is likely to affect Milwaukie as well. Figure MA-3 (next page) shows a generalized geologic map of the Milwaukie area that includes the areas for potential regional active faults, earthquake history (1971-2008), and soft soils (liquefaction) hazard. The figure shows the areas of greatest concern within the City limits as red and orange.

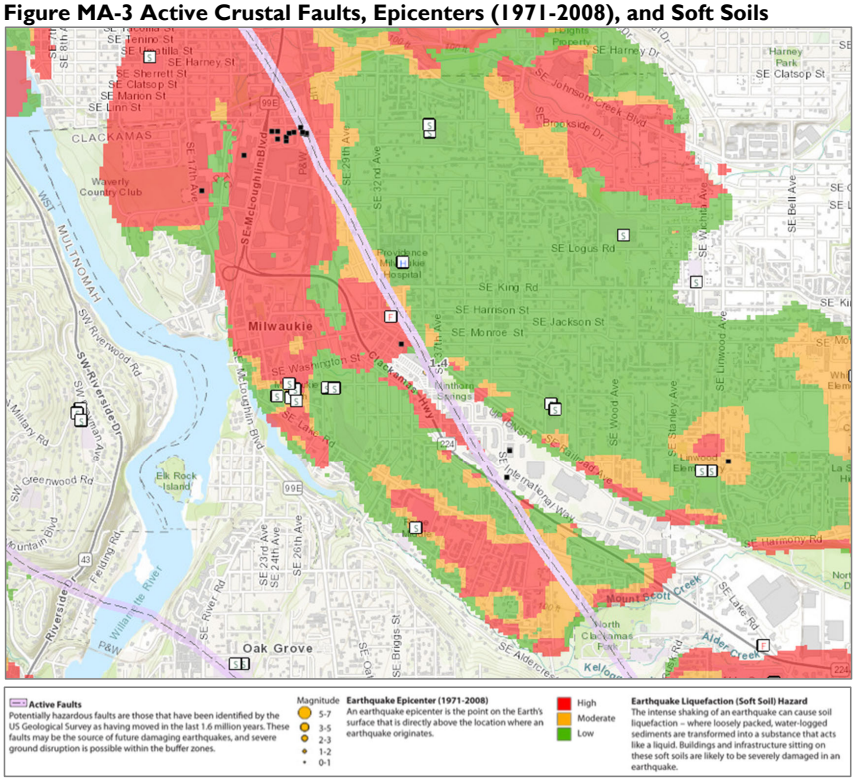
There are two potential crustal faults and/or zones near the City that can generate high-magnitude earthquakes. These are the Gales Creek-Mt. Angel Structural Zone and Portland Hills Fault Zone (discussed in greater detail below). Other faults include the Oatfield fault (just to the east of the city on the eastern side of the Willamette River), the Damascus-Tickle Creek fault, also to the east of the city, and the Mt. Hood Fault in eastern Clackamas County. Historical records count over 56 earthquakes in the Portland-metro area. The more severe ones occurred in 1877, 1880, 1953 and 1962. The most recent severe earthquake was the March 25, 1993 Scotts Mills quake. It was a 5.6 magnitude quake with aftershocks continuing at least through April 8.

Portland Hills Fault Zone

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

Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building, and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any site. In many major earthquakes, damages have primarily been caused by the behavior of the soil.

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



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

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment for this hazard. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected. Additionally, in 2018 the Department of Geology and Mineral Industries (DOGAMI) completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults (O-18-02), findings from that report are provided at the end of the crustal earthquakes hazard section.

Community assets located in the highest hazard zone for earthquakes include the Public Safety Building (Milwaukie Police Department and Clackamas Fire District Station 2), Providence Milwaukie Hospital, and the Milwaukie Business Industrial Area. Milwaukie's infrastructure is particularly vulnerable to earthquake damage, especially Highway 224,

Highway 99E, and the crossings of Johnson Creek. Of the city's eight wells, two of them are along the fault line, with others in the moderate to high hazard zones for earthquakes. During a major earthquake, emergency responders may have difficulty performing their duties because their buildings could be impacted by the event. The Public Safety Building is in the moderate to high hazard zones. Areas near the Willamette River and various creeks around Milwaukie are likely composed of softer soils prone to liquefaction. This can be very destructive to underground utilities such as water and sewer lines. Buildings and water lines can sink into the liquefied ground while sewer pipes, manholes and pump stations (assets partially filled with air) may float to the surface. After the earthquake, the liquefied soil will re-solidify, locking tilted buildings and broken pipe connections into place.

Vulnerable populations, including children, could be significantly impacted, as many schools lie in the highest two hazard zones. The data gathered from the statewide DOGAMI inventory should be used to prioritize school buildings in Milwaukie for seismic hazard retrofitting.

Seismic building codes were implemented in Oregon in the 1970s, however, stricter standards did not take effect until 1991 and early 2000s. As noted in the community profile, approximately 86% of residential buildings were built prior to 1990, which increases the City's vulnerability to the earthquake hazard. However, because Milwaukie's buildings are generally wood-framed structures of no more than two stories, the city is more resilient to earthquake damage than it might otherwise be. Information on specific public buildings' (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table MA-5 (next page); each "X" represents one building within that ranking category. Of the facilities evaluated by DOGAMI using their Rapid Visual Survey (RVS), two~~hree~~ (2~~3~~) have very high (100% chance) collapse potential, while one~~two~~ (1~~2~~) has~~ve~~ a high (greater than 10% chance) collapse potential. *Note: two schools, Ardenwald Elementary and Milwaukie High School, have been ~~retrofitted~~rebuilt since the 2007 DOGAMI study.*

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

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

Mitigation Activities

Milwaukie has taken mitigation steps to reduce the city's vulnerably in earthquake events. Additional mitigation activities completed by the City of Milwaukie include:

- Compliance with SB 13, enacted in 2001, requiring local governments to develop seismic preparation procedures, inform their employees about the procedures, and conduct earthquake drills. (continued on Page MA-29)

Table MA-5 Rapid Visual Survey Scores

Facility	Site ID*	Level of Collapse Potential			
		Low (<1%)	Moderate (>1%)	High (>10%)	Very High (100%)
Schools					
Ardenwald Elementary (8950 SE 36th Ave)	**Clac_sch14**	~~Retrofitted per a 2008 bond~~Rebuilt per a 2008 Bond.			
Hector Campbell Elementary (11326 SE 47th Ave) - CLOSED	*Clac_sch87*			*X*	
Linwood Elementary (11909 SE Linwood Ave)	Clac_sch19				X
Milwaukie Elementary School (11250 SE 27th Ave)	Clac_sch20				X
Milwaukie High School (2301 SE Willard St)	**Clac_sch28**	Rebuilt~~trofitted~~ per a 2016 bond.			
Portland Waldorf School (2300 SE Harrison St)		2007 RVS report did not include structural appendix for this facility.			
Rowe Middle School (3606 SE Lake Rd)		2007 RVS report did not include structural appendix for this facility.			
Seth Lewelling Elementary (5325 SE Logus Rd)	Clac_sch88	X			
St. John Catholic School (10956 SE 25th Ave)		2007 RVS report did not include structural appendix for this facility.			
Public Safety					
CFD Fire Station 1 (ca. 1983) (11300 SE Fuller Rd)	*Clac_fir09*	X			
CFD Fire Station 2 (ca. 1993) (Public Safety Building) (3200 SE Harrison)	Clac_fir26	X			
CFD Fire Station 3 (ca. 1997) (2930 SE Oak Grove Blvd)					
CFD Fire Station 4 (ca. 1999) (6600 SE Lake Rd)					
Hospital					
Providence Milwaukie (10150 SE 32nd Ave)	Clac_hos02	X			

Source: DOGAMI 2007. Open File Report O-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment. "*" – Site ID is referenced on the RVS Clackamas County Map
Note 1: Bold indicates facilities that have been seismically retrofitted or rebuilt.
Note 2: Private schools were not assessed by DOGAMI as part of O-07-02.

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- Conformance with seismic-related construction requirements in the Oregon Structural Specialty Code and Oregon One- and Two-Family Dwelling Specialty Code.
- Adoption of a policy to require undergrounding of power lines in new subdivisions.
- Development Code restrictions regarding construction on steep slopes.
- The following buildings have been constructed to be earthquake safe:
    - Water tower at 40th Ave and Harvey St, Milwaukie High School Fine Arts Center, and Linwood Elementary Main Office and Gym.
    - Ardenwald Elementary rebuilt~~trofitted~~ per 2008 bond passed by voters (former building demolished in 2009).
    - Milwaukie High School Main building rebuilt in 2021.

Earthquake Regional Impact Analysis

In 2018 DOGAMI completed a regional impact analysis for earthquakes originating from the Cascadia Subduction Zone and Portland Hills faults (O-18-02). Their study focused on damage to buildings, and the people that occupy them, and to two key infrastructure sectors: electric power transmission and emergency transportation routes. Each earthquake was studied with wet and dry soil conditions and for events that occur during the daytime (2 PM) and nighttime (2 AM). Expected ~~i~~Impacts to buildings and people were tabulated at the county, jurisdictional (city), and neighborhood unit level. Estimated damage~~d~~ varied widely across the study area depending on local geology, soil moisture conditions, type of building, and distance from the studied faults. In general, damage from the Cascadia Subduction Zone scenario was greater in the western portion of the study area, however, damage could still be significant in some areas east of the Willamette River. The report found that damage to high-value commercial and industrial buildings was estimated to be high since many of these facilities are in areas of high to very high liquefaction hazard. Anticipated c~~C~~asualties were higher during the daytime scenario (generally double) since more people would be at work and occupying non-wood structures that fare worse in an earthquake. The Portland Hills fault scenario created greater forecasted damages than the Cascade Subduction Zone scenario due primarily to its placement relative to population centers and regional assets; however, at distances 15 or more miles from the Portland Hills fault the damages from the Cascadia Subduction Zone scenario were generally forecasted to be~~were~~ higher. In both the Cascadia Subduction Zone and Portland Hills Fault scenarios it is expected~~forecasted~~ that emergency transportation routes will be fragmented, affecting the distribution of goods and services. ~~,~~ C~~c~~onditions are expected to be worse under the Portland Hills Fault scenario. Portions of the electric distribution system are also expected to be impacted under both scenarios, however, the impact is expected to be considerably less than it is to the transportation routes. Additional~~,~~ capacity or redundancy within the electric distribution network may be beneficial in select areas that are likely to experience~~have~~ greater affects~~impacts~~ of the earthquakes.

Table MA-6 (next page) shows the permanent resident population that are estimated to be vulnerable to injury or death (casualty) and the buildings in the city that are estimated susceptible to liquefaction and landslides. ~~,~~ I~~i~~t does not predict that damage will occur in specific areas due to either liquefaction or landslide. More population and property are exposed to higher degrees of expected damage or casualty under the Portland Hills Fault "wet" scenario than in any other scenario.

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

	Cascadia Subduction Zone (M9.0)		Portland Hills Fault (M6.8)	
	"Dry" Soil	"Wet" Saturated Soil	"Dry" Soil	"Wet" Saturated Soil
Number of Buildings	7,891	7,891	7,891	7,891
Building Value ($ Million)	2,890	2,890	2,890	2,890
Building Repair Cost ($ Million)	295	394	1,341	1,598
~~Building Loss Ratio~~	~~0~~	~~0~~	~~0~~	~~1~~
Debris (Thousands of Tons)	162	193	542	615
Long-Term Displaced Population	93	83	2,459	5,456
Total Ca~~u~~sual~~+~~ties (Daytime)	294	380	1,427	1,595
Level 4 (Killed)	14	19	82	89
Total Casual~~+~~ties (Nighttime)	34	92	326	546
Level 4 (Killed)	1	3	10	16

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

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Cascadia Subduction Zone Scenario

The City of Milwaukie is expected to have a 10% building loss ratio with a repair cost of $295 million under the CSZ "dry" scenario, and a 14% building loss ratio with a repair cost of $394 million under the CSZ "wet" scenario.[4] The city is expected to have around 294 daytime or 34 nighttime casualties during the CSZ "dry" scenario and 380 daytime or 92 nighttime casualties during the CSZ "wet" scenario. It is expected that there will be a long-term displaced population of around 93 for the CSZ "dry" scenario and 83 for the CSZ "wet" scenario.[5]

Portland Hills Fault Scenario

The City of Milwaukie is expected to have a 46% building loss ratio with a repair cost of $1.341 billion under the CSZ "dry" scenario, and a 55% building loss ratio with a repair cost of $1.598 billion under the CSZ "wet" scenario.[6] The long-term displaced population and casualties are greatly increased for all the Portland Hills Fault scenarios. The city is expected to have around 1,427 daytime or 326 nighttime casualties during the Portland Hills Fault "dry" scenario and 1,595 daytime or 546 nighttime casualties during the Portland Hills Fault "wet" scenario. It is expected that there will be a long-term displaced population of around 2,459 for the Portland Hills Fault "dry" scenario and 5,456 for the Portland Hills Fault "wet" scenario.[7]

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

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

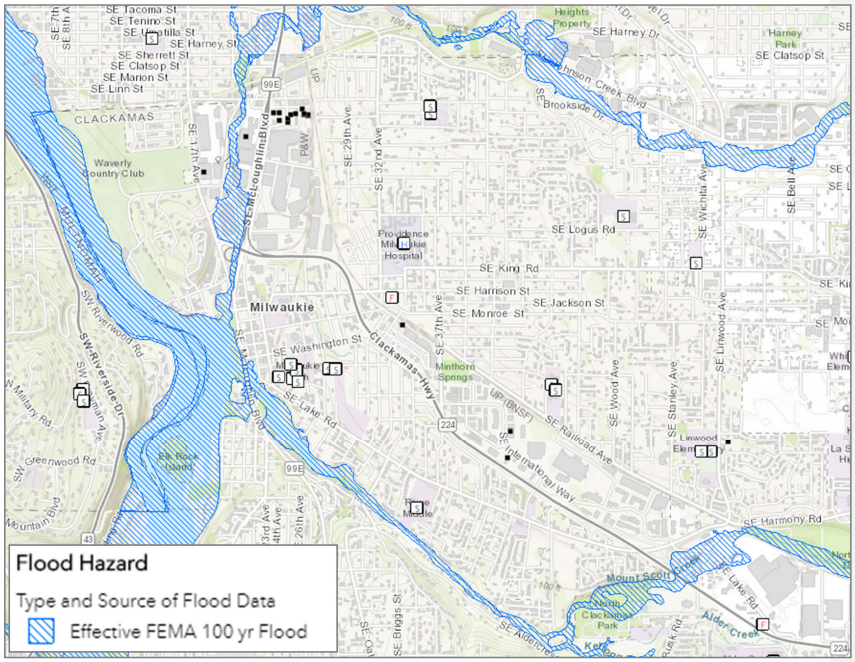
Please review Volume I, Section 2 for additional information on this hazard.

Flood

The HMAC determined that the City's probability for flood is **high** and that their vulnerability to flood is **medium**. *The probability rating did not change, while the vulnerability rating decreased since the previous version of this NHMP addendum due to progress made in infrastructure retrofitting and other mitigation actions.*

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

Figure MA-4 Special Flood Hazard Area



Source: Oregon HazVu: Statewide Geohazards Viewer (DOGAMI)
Note: To view detail click the link above to access Oregon HazVu
For additional maps including the 1996 flood inundation area see the City's Flood Hazard Map Viewer

Portions of Milwaukie have areas of floodplain (special flood hazard areas, SFHA). These include Johnson Creek, Kellogg Creek, Mount Scott Creek, Minthorn Creek, Spring Creek, and the Willamette River. The Federal Emergency Management Agency (FEMA) regulatory floodplains for each of these rivers are depicted as relatively narrow areas on each side of the channels. On the Willamette River, the floodway is generally confined within high stream banks. The FEMA 100-year map shows that approximately 1.3 miles of the transportation network could be affected in a flood.

Floods can have a devastating impact on almost every aspect of the community, including private property damage, public infrastructure damage, and economic loss from business interruption. It is important for the City to be aware of flooding impacts and assess its level of risk.

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

For mitigation planning purposes, it is important to recognize that flood risk for a community is not limited only to areas of mapped floodplains. As an urban city, Milwaukie is predominantly covered in impermeable surfaces like roads and buildings, impacting historical watershed hydrology and altering the amount and speed of stormwater runoff as sheet flow. With more frequent and intense storms caused by climate change, flash flooding events can produce volumes of surface water which can quickly exceed the capacity of the city's stormwater infrastructure. These events lead to an overflowing of piped stormwater facilities during high flow, as well as scouring, erosion, overflow flooding, and vegetation decline and/or death at facilities like detention ponds and rain gardens, along with the numerous small creeks, streams, ponds and other waterbodies crossing Milwaukie's landscape. Resulting damage from these events can be extremely costly in both labor and materials and can compromise both gray and green infrastructure. This in turn reduces the functionality of these systems for protecting water quality, jeopardizing the city's ability to meet state and federal water quality mitigation requirements.

More information on stormwater infrastructure and floodplain and runoff capacity planning can be found in the Milwaukie Stormwater System Plan.

The speed of onset, lack of warning, and depth of flooding make dam failures a potentially deadly, albeit unlikely, occurrence. There are four major dams upstream of Milwaukie on the Clackamas River: North Fork, Faraday, River Mill and Timothy. These are operated by Portland General Electric and are subject to the dam safety and warning requirements of the Federal Energy Regulatory Commission. According to the Clackamas County Emergency Operations Plan, areas of Milwaukie bordering on the Willamette in the vicinity of its confluence with the Clackamas would be inundated by a wall of water 60--80 feet high in approximately an hour and a half should the North Fork dam fail under a “probable maximum flood” (a worst-case scenario where all four dams fail). In December 2015 Milwaukie had to evacuate approximately 50 people from their homes as Mount Scott and Johnson Creek overflowed.

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The largest flooding event to affect Milwaukie was the February 1996 flood. The high-water level meant tributaries could not drain into the Tualatin and Willamette River, which led to localized flooding on several backed-up creeks.

The extent of flooding hazards in Milwaukie primarily depends on climate and precipitation levels. Additionally, withdrawals for irrigation and drinking water, as well as stream and wetland modifications or vegetation removal can influence water flow.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment for this hazard. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

The areas around Johnson Creek (impacts industrial area), Kellogg Creek, Mount Scott Creek (impact North Clackamas Park, ~~Senior Center~~Milwaukie Community Center, and multiple residences north of Highway 224 and south of Lake Road), Minthorn Creek (impacts North Milwaukie Industrial Area), and the Willamette River are particularly vulnerable to flooding. Additionally, ~~proposed lots on~~properties 19th Avenue may be vulnerable to Willamette River flooding. Johnson Creek runs through the Downtown Mixed Use and North Milwaukie Employment zones. Kellogg Creek mostly affects residential areas in the event~~chance~~ of flooding. The downtown area is located near the Willamette River due to the historic ~~use of the river for economic reasons~~economic importance of the river.

Additionally, a great deal of infrastructure (bridges, water lines, sewage pump stations, etc.) is in the floodplain. Infrastructure exposed to flooding includes, but is not limited to, Highway 224, SE Lake Rd, SE McLoughlin Blvd, and the north industrial park. Disruption to this infrastructure could result in transportation issues, power outages, sewage back-up, and affect overall community and environmental health.

Risk Analysis - Repetitive Loss Properties:

Milwaukie works to mitigate problems regarding flood issues when they arise. Some areas in the city are more susceptible to flooding issues and have incurred repetitive losses. The Community Repetitive Loss record for Milwaukie identifies eleven (11) Repetitive Loss (RL) properties[8], and one (1) Severe Repetitive Loss (SRL) property[9]. RL and SRL properties are troublesome because they continue to expose lives and valuable property to the flooding hazard. Local governments as well as federal agencies such as FEMA attempt to address losses through floodplain insurance and attempts to remove the risk from repetitive loss of properties through projects such as acquiring land and improvements, relocating homes or elevating structures. Continued repetitive loss claims from flood events lead to an increased

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

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

amount of damage caused by floods, higher insurance rates, and contribute to the rising cost of taxpayer funded disaster relief for flood victims.

Table MA-7~~Table MA~~ provides information on the identified RL and SRL properties. There have been 31 paid RL claims totaling $1,550,590. Seven (7) of the RL and SRL properties are not insured as of May 2023. For additional detail and a map of their general location see Volume I, Section 2 and Figure 2-13.

Table MA-7 Repetitive Loss and Severe Repetitive Loss Properties Detail

RL or SRL Property	Location	Currently Insured	Flood Zone	Occupancy	Historic Building	Total Paid Claims	Total Paid Amount
SRL	City of Milwaukie	NO	B	Single Family	No	6	$100,814
RL	City of Milwaukie	NO	C	2-4 Family	No	3	$28,463
RL	City of Milwaukie	NO	X	Single Family	No	2	$5,058
RL	City of Milwaukie	NO	C	2-4 Family	No	2	$17,351
RL	City of Milwaukie	NO	A19	Other Non-Residential	No	2	$396,804
RL	City of Milwaukie	YES	X	Single Family	No	2	$65,060
RL	City of Milwaukie	NO	AE	Single Family	No	2	$141,105
RL	City of Milwaukie	YES	AE	2-4 Family	No	3	$138,450
RL	City of Milwaukie	YES	AE	2-4 Family	No	3	$226,756
RL	City of Milwaukie	YES	AE	2-4 Family	No	3	$240,033
RL	City of Milwaukie	NO	AE	Single Family	No	3	$190,696
Total						33	$1,573,230

Source: Department of Land Conservation and Development, April 2023.
Notes: RL – Repetitive Loss Property, SRL – Severe Repetitive Loss Property
For location details see Table 2-15 in the Clackamas NHMP Volume I, Section 2.

Mitigation Activities

Milwaukie employs several mitigation strategies to reduce the city's risk to flood events, including mapping flood-prone areas by address. The city's priority is to mitigate residences located within the floodway (see FL #1). The city development code includes policies and regulations for flood prone areas including, Natural Resources Overlay Zone (Chapter 19.402, Natural Resources Administrative Map), Flood Hazard Regulations (Title 18 – Flood Hazard Areas (includes the SFHA and the 1996 flood inundation area; Flood Hazard Map Viewer), and Willamette Greenway Zone (Chapter 19.401). Milwaukie regularly inspects and maintains the stormwater facilities. Catch basins are routinely cleaned and inspected and a regular street sweeping program reduces the amount of debris and contaminants entering the stormwater system. The City maintains a Stormwater Master Plan and has been

planning various projects to restore Kellogg Creek. These projects would include building a bridge over the creek and downtown revitalization.

~~In late 2022, the City secured grant funding through the National Oceanic and Atmospheric Administration to pay for the planning, design, and permitting of the removal of Kellogg Dam. Although Kellogg Creek has historically been less prone to flooding than Johnson Creek, the removal of the dam is expected to further mitigate the existing flood hazard by draining Kellogg Lake.~~ In 2022 and 2023, the city and project partners secured grant funding through the National Oceanic and Atmospheric Administration to pay for the planning, design, and permitting of the Kellogg Creek Restoration and Community Enhancement Project. Although Kellogg Creek has historically been less prone to flooding than Johnson Creek, the removal of the dam and restoration of the lower creek, as well as 14 acres of buried floodplain, is expected to further mitigate the existing flood hazard by draining Kellogg Lake and removing substantial amounts of contaminated sediment impounded by the dam. ~~The draining lake is expected to create some hazards of its own, including the uncovering of a currently submerged sewer line that crosses the lake in the vicinity of SE 29th Ave. This pipe will need additional support. The foundations of the railroad trestle bridge crossing the lake will also be exposed. City engineers are working to identify mitigation strategies for the risks created by this exposure~~ City engineers are working with project partners to undertake project planning, including risk assessment, design, and permitting for project implementation.

To improve stormwater management the city of Milwaukie ~~lined the interiors of all pipes along the 18th Avenue infiltration line~~continues to line the interiors of pipes in conjunction with Clackamas County Water and Environmental Services. This mitigation project minimizes the amount of groundwater that infiltrates into sewer lines and helps reduce the overall amount of water going into the wastewater treatment plant, thus reducing the chance of overflow of the sewer system. Additionally, a severe repetitive loss property on Rusk Road was purchased and demolished using FEMA Flood Mitigation Assistance funding in 2018 (grant covered approximately $315,000 for the purchase of the property, additional funds were allocated for staff hours, title report, due diligence reports, and demolition contract).

In 2006 Clackamas County Water Environment Services partnered with eight community groups to restore the Three Creeks area – including Mount Scott Creek, a tributary to Kellogg Creek and the Willamette River. The group reshaped the stream channel to make it more natural; removed invasive species; planted thousands of native plants to stabilize banks; and put in wood and boulders to stabilize the channel and provide habitat for fish. The groups also removed trash and transient camps that polluted the streams during floods.

Projects completed by the Johnson Creek Watershed Council:

- Tree Plantings along Johnson Creek in various places.
- Storm water detention near Milport.

The North Clackamas Watersheds Council has published a 10-year plan for further restoration and enhancement actions. Although many of these actions are currently unfunded, the city will continue to seek new opportunities to partner with the council.

In 2018 the City completed its Urban Forest Plan which includes information on tree planting strategies. Increasing the scope of the urban canopy can help to divert and retain water that would otherwise contribute directly to flooding.

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

Landslide

The HMAC determined that the City's probability for landslide is **high** and that its vulnerability to landslide is **low**. *The probability rating increased, and the vulnerability rating did not change since the previous version of this NHMP addendum due to the inclusion of smaller scale landslides and landslides occurring upstream of Milwaukie in the current update.*

Volume I, Section 2 describes the characteristics of landslide hazards, history, as well as the location, extent, and probability of a potential event within the region. Although catastrophic landslides have not occurred in Milwaukie, steep slopes do exist along the banks of the Willamette River and Kellogg Creek. Additionally, upstream landslides affecting waters that flow into or through Milwaukie pose secondary hazards to the city due to debris and flood risks.

Landslide susceptibility exposure for Milwaukie is shown in

Across the Willamette River in the Riverdale area, there is a large area of land that is at a very high risk of landslide. This could result in potential flooding along Milwaukie's banks in the event of a landslide that disrupts the flow of the Willamette River. Within the City, parts of Highway 224, SE Lake Rd, and SE Johnson Creek Blvd are located within the areas of high landslide susceptibility. These important arterials that help connect Milwaukie. The Milwaukie Heights area, which includes mostly low density residential and open space areas, is also vulnerable. This exposure means that large scale and simultaneous landslides triggered by an earthquake could substantially disrupt City operations buildings, fire stations and key pieces of infrastructure (bridges, sewage pump stations, water reservoirs) that would hinder the ability of the City to respond to emergency situations created by such an event.

As a result, it will be important for the City to pursue opportunities for retrofitting and mitigating important structures and infrastructure, such that said facilities can withstand and survive landslides, particularly simultaneous landslides generated by an earthquake. Business continuity planning shall also be an important factor, given the number of economic centers and employment facilities that are threatened by the landslide hazard.

Potential landslide-related impacts are described within Volume I, Section 2, and include infrastructure damages, economic impacts (due to isolation, and/or arterial road closures), property damages, and obstruction to evacuation routes. Rain-induced landslides, and debris flows can potentially occur during any winter, and thoroughfares beyond city limits are susceptible to obstruction as well.

Figure MA-5~~**Figure MA-5**~~ (Page MA-36).

Most of Milwaukie demonstrates a low to moderate landslide susceptibility exposure. Approximately 4% of Milwaukie has very high or high, and approximately 31% moderate,

landslide susceptibility exposure.[10] However, most of the areas that are identified to exhibit dangerous potential rapidly moving landslides are vacant and often preserved in wooded and dedicated open space.

Note that even if a jurisdiction has a high percentage of area in a high or very high landslide exposure susceptibility zone, this does not mean there is a high risk, because risk is the intersection of the susceptibility, vulnerability, and presence of assets.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment for this hazard. However, DOGAMI completed a statewide landslide susceptibility assessment in 2016 (O-16-02), general findings from that report are provided above and within

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Figure MA-5~~**Figure MA-5**~~ (next page). Additionally, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

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

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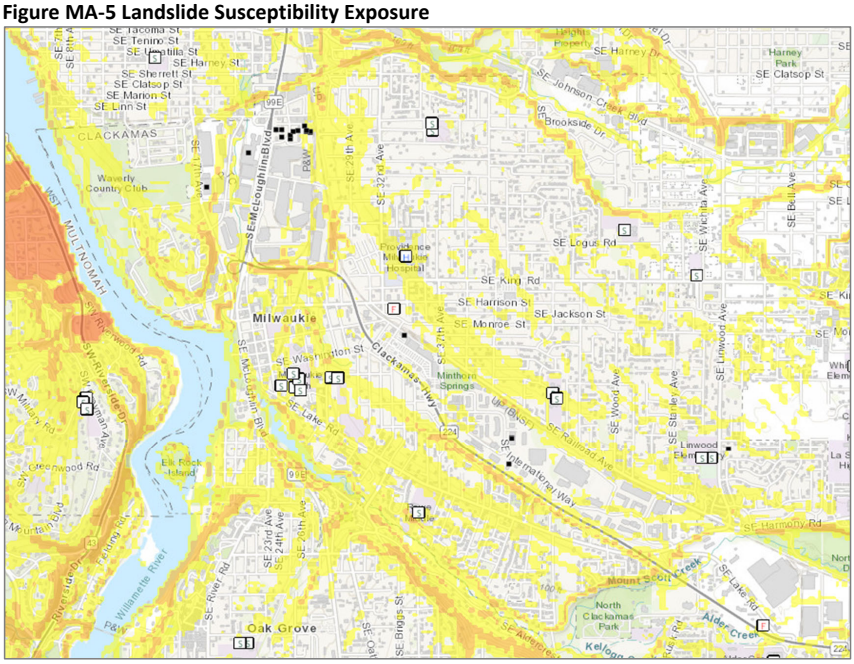
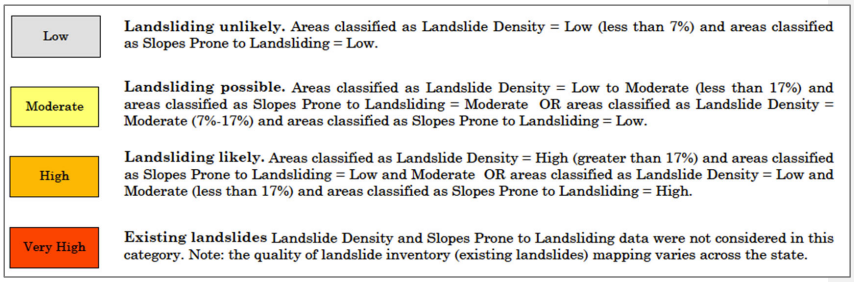
Figure MA-5 Landslide Susceptibility Exposure





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

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

Mitigation Activities

Milwaukie works to mitigate future landslide hazards. The city development code includes several policies and regulations to protect slopes including Erosion Control (Chapter 16.28), Willamette Greenway Zone Overlay (Chapter 19.401), and limitations of permitted development within slopes greater than 25%.

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

Severe Weather

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

Extreme Heat

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

Volume I, Section 2 describes the characteristics of extreme heat, history, as well as the location, extent, and probability of a potential event within the region. Generally, an event that affects the County is likely to affect the City as well, but Milwaukie is more vulnerable to the so "heat island effect" than more rural portions of the county. Heat islands occur where extremely localized ambient air temperatures in urban areas are an average of 1-7 degrees higher than those found in surrounding areas. They occur as structures and pavement absorb, radiate, and reflect heat energy rather than engaging in evapotranspiration as trees and other plants do. Milwaukie's efforts to preserve and expand its urban forest canopy will continue to play a role in mitigating the formation of heat islands, but the threat remains a significant one.

A severe heat episode or "heat wave" occurs about every two to three years, and typically lasting two to three days but can last as many as five days. A severe heat episode can be defined as consecutive days of upper 90s to around 100. Severe heat hazard in the Portland metro region can be described as the average number of days with temperatures greater than or equal to 90-degrees, or 100-degrees, Fahrenheit. On average the region experiences 14.6 days with temperatures above 90-degrees Fahrenheit, and 1.2 days above 100-degrees Fahrenheit, based on new 30-year climate averages (1991-2020) from the National Weather Service – Portland Weather Forecast Office. The 30-year average is used to account for short-term variation in temperatures. The frequency of high temperature days is expected to increase with the growing climactic instability of anthropogenic climate change. For example, the six hottest summers on record for Portland occurred between 2015 and the present.

Increasing frequency and duration of extreme heat events pose threats to human and animal life, as well as a danger to agricultural production in the Willamette Valley.

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

Windstorm

The HMAC determined that the City's probability for windstorm is **high** and that their vulnerability to windstorm is **moderate**. *These ratings increased since the previous version of this NHMP addendum due to the increased frequency and intensity of windstorms in recent years.*

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

Volume I, Section 2 describes the impacts caused by windstorms, including power outages, downed trees, heavy precipitation, building damages, and storm-related debris. Additionally, transportation, and economic disruptions result as well.

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

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

Winter Storm (Snow/Ice)

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

Volume I, Section 2 describes the characteristics of winter storm hazards, history, as well as the location, extent, and probability of a potential event within the region. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They

originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the City typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from November through March.

Most winter storms ~~typically~~ do not cause significant damage, but they are semi-frequent, and have the potential to impact economic activity. Road closures due to winter weather can interrupt commuter and commercial traffic, and roads that are not closed may present vehicle operators and pedestrians with dangerous conditions.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for the extreme heat, windstorm, and winter storm hazards. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

The areas of the city that are often most at risk to severe storms are residential areas on steeper slopes, where roads may be icy and, thus, difficult to climb and descend. Road corridors leading to residential areas with fuller tree canopies are susceptible to downed tree limbs, and those areas that are above 500 feet in elevation are particularly vulnerable. However, some weather systems are characterized by a temperature inversion, where the valley floor is colder than the nearby hills. Consequently, severe storms affect the entire city. In 2016, 2017, 2019, and 2021 the State of Oregon declared a state of emergency for severe storms. The City's Plowing, Sanding, and De-Icing Removal Plan is maintained by the Public Works Department and includes provisions to place equipment on designated principal routes throughout the City (Plowing and Sanding Routes Map). Private property owners are also required to clear the sidewalks abutting their property of snow or ice within 24 hours after the snow has stopped falling. For more information see the City's Winter Weather Response Plan information webpage.

The major risk to property results from exposed utilities, especially power lines and water pipes that are damaged by wind, broken tree limbs and cold temperatures. Businesses also suffer economic losses when they must close as the result of the inclement weather and/or the loss of power, which, in turn, disrupts the local supply chain of goods and services. Periods of extended ice coverage hinder emergency response services and limit the mobility of residents, which could result in serious life safety issues.

Residents and businesses that are in areas that exhibit the severe storm hazard face some risk of damage from severe storms. Severe weather events are expected to impact nearly all City residents. In addition, critical infrastructure, economic centers, cultural or historic assets, environmental assets, and hazardous material sites are exposed to the severe weather hazards. For a list of facilities and infrastructure vulnerable to these hazards see the Community Assets section.

The exposure of these facilities and infrastructure means that severe weather events could substantially disrupt the operations of City government buildings and fire stations, impairing

key City functions, while hindering the ability of emergency response personnel to respond to emergency situations that are created by a severe storm event.

All these facilities depend upon utility lines, roads and bridges to operate and perform their respective important functions within the City. Exposed utility and power lines are particularly vulnerable to damage from severe winter storms by wind, ice and snow. Hardened infrastructure, like bridges and roads, can sustain a severe winter storm, but during the event, they are often hazardous to traverse because of icy, windy and snowy conditions.

Consequently, severe weather (wind or winter storm) could substantially disrupt numerous key resources and facilities within the city through impediments to the transportation system and damage to the power grid. Among other things, these transportation problems and power failures disrupt business operations and educational facilities, resulting in economic losses and halting educational opportunities.

Power to hazardous material sites, including gas stations, rail yards, and some industrial facilities in the city, could also be disrupted. The sites themselves could be damaged or rendered inaccessible in an especially severe storm. These conditions could pose threats to the natural environment of the city and the health of its population, while disrupting the availability of gasoline for vehicle transport.

As a result, it will be important for the City to pursue opportunities for undergrounding utilities and retrofitting utility lines so that they may withstand cold weather conditions without freezing and bursting. Adhering to current building codes for weatherization of structures, as well as current engineering and fire codes that pertain to the steepness of new roads, are also key factors for the City to consider. Business continuity planning shall also be an important factor, given the number of economic centers and employment facilities that are threatened by the severe storm hazard.

Mitigation Activities

Mitigating severe weather can be difficult because storms affect all areas of the city, but Milwaukie has made progress to reduce the effects of storms. Milwaukie has a tree board to maintain a plan for the care of the trees as well as codes about where trees can be planted (Chapter 16.32). Most utilities are underground, and all new utilities are required to be undergrounded. In case of power outages the city's critical facilities have back up power generation. Milwaukie also has a designated snow plow and sanding routes to help expedite snow removal (Plowing and Sanding Routes Map).

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

Volcanic Event

The HMAC determined that the city's probability for a volcanic event is **low** and that their vulnerability to a volcanic event is **low**. *The probability did not change and the vulnerability rating decreased since the previous version of this NHMP addendum. The previous HMAC considered volcanic activity to be a greater threat to Milwaukie than the current one.*

Volume I, Section 2 describes the characteristics of volcanic hazards, history, as well as the location, extent, and probability of a potential event within the region. Generally, an event that affects the western portion of the County is likely to affect Milwaukie as well. Several

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

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard.

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

Mitigation Activities

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

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

Wildfire

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

The 2017 Clackamas County Community Wildfire Protection Plan (CWPP) was completed in May 2018. It remains the current plan as of 2023. The CWPP is hereby incorporated into this NHMP addendum by reference, and it will serve as the wildfire section for this addendum. The following presents a summary of key information; refer to the full CWPP for a complete description, and evaluation of the wildfire hazard: https://www.clackamas.us/dm/CWPP.html. Information specific to Milwaukie is found in the following chapter: Chapter 10.3: Clackamas Fire District #1.

Volume I, Section 2 describes the characteristics of wildland fire hazards, history, as well as the location, extent, and probability of a potential event within the region. The location, and extent of a wildland fire vary depending on fuel, topography, and weather conditions. Weather, and urbanization conditions are primarily at cause for the hazard level. Milwaukie has not experienced a catastrophic wildfire within City limits. The Clackamas Fire District #1 also provides services to other cities besides Milwaukie, including: Oregon City, Happy Valley, Johnson City, and many unincorporated areas within Clackamas County.

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

Milwaukie is highly urbanized and as such does not have as much danger of wildfire within its boundaries as more rural locations in Clackamas County. The City does have parks and neighborhoods surrounded by mature trees, as well as several natural areas. Located on the edge of its southeastern boundary is the Three Creeks Natural Area, which has heavy fuels adjacent to homes and infrastructure. Three Creeks Natural Area is a designated Medium Priority Community at Risk (CARs).[11] Elk Rock Island, though listed as low risk for wildfire by the Oregon Wildfire Risk Explorer, is a publicly owned greenspace near a built-up residential area. The island contains dense vegetation which dries out in the summer, and has no roads, which makes firefighting operations on the island more difficult, as demonstrated by the large fire there in 2020.

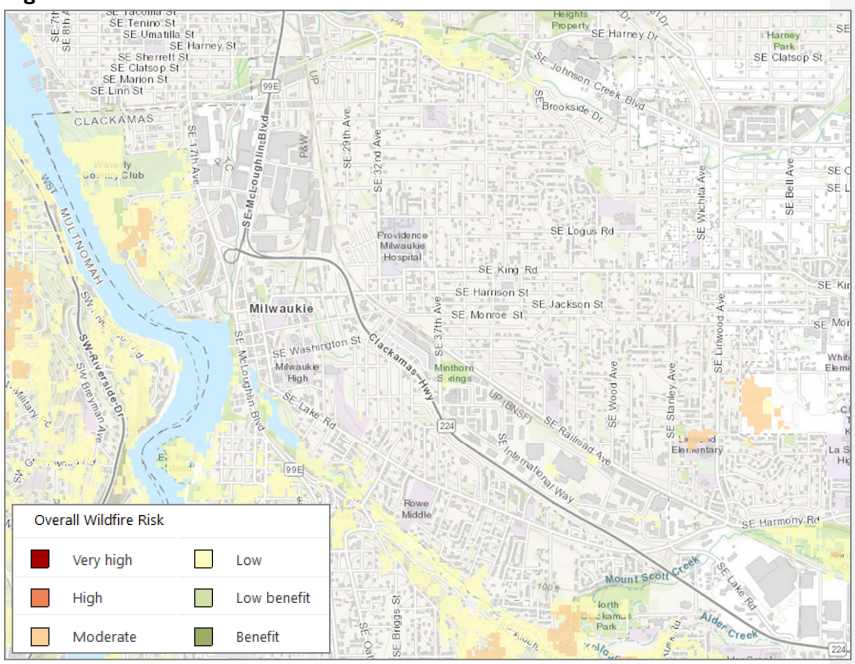
Figure MA-6 (next page) shows overall wildfire risk in Milwaukie.

Most of the city has less severe (moderate or less) wildfire burn probability. This indicates expected flame lengths less than four feet under normal weather conditions.[12] However, conditions vary widely and with local topography, fuels, and local weather conditions, especially wind. Under warm, dry, windy, and drought conditions, the City expects higher likelihood of fire starts, higher intensity, more ember activity, and a more difficult to control wildfire that will include more fire effects and impacts.

[11] Clackamas County Community Wildfire Protection Plan, *Clackamas Fire District #1* (2018), Table 10.13-1.

[12] Oregon Wildfire Risk Explorer, date accessed February 14, 2023.

Figure MA-6 Overall Wildfire Risk



Source: Oregon Wildfire Risk Explorer, date accessed February 10, 2023.

Vulnerability Assessment

Due to insufficient data and resources, Milwaukie is currently unable to perform a quantitative risk assessment, or exposure analysis, for this hazard. However, the City completed an analysis, using the best available data, as a component of the vulnerability assessment in 2009, updated in 2012, and reviewed and updated, as appropriate, in 2018 and 2023. This analysis looked at identified hazard areas in conjunction with available data on property exposed to the hazard. Exposure of community assets to natural hazards was determined by manually comparing community assets with each hazard and identifying where assets and hazards intersected.

Milwaukie does not have much vulnerability to wildfire flames, though there is always the risk of fire destroying residential and commercial areas. Vegetation along roadways can be highly dangerous, as negligent motorists provide ignition sources by tossing cigarette butts out car windows. Because schools are generally located near parks and scenic areas, they can be threatened by wildfires.

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

Property can be damaged or destroyed with one fire as structures, vegetation, and other flammables easily merge to become unpredictable, and hard to manage. Other factors that affect ability to effectively respond to a wildfire include access to the location, and to water, response time from the fire station, availability of personnel, and equipment, and weather (e.g., heat, low humidity, high winds, and drought).

Although the direct threat of wildfire burning Milwaukie is low, the city is vulnerable to smoke and aerial particulate matter generated by fires in the region. The 2020 wildfire season was especially bad, with the air quality index in the Portland metropolitan area being recorded as over 500, the upper limit of that scale. The regions air quality was rated as the worst in the world during that period. Air quality is not listed as standalone hazard by FEMA or the State of Oregon for the purposes of natural hazard mitigation planning. It was, nonetheless, discussed by the Milwaukie HMAC and factored into the vulnerability rating calculation for wildfires.

Mitigation Activities

Milwaukie and Clackamas Fire District #1 (CFD#1) use several mitigation tools to reduce the city's risk to wildfires. CFD #1 provides emergency fire suppression, medical response and rescue services to the City of Milwaukie. Mutual aid agreements with neighboring jurisdictions are also in place. Water supply and storage capacity in Milwaukie conforms with recommended fire flow requirements.

The City does not allow backyard burning due to requirements of DEQ. The CFD #1 provides outreach and education to the community on wildfire mitigation via news releases, posters, signage, website messages, safety exhibits at community events, and visits to schools, civic organizations and neighborhood associations.

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

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

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ATTACHMENT A

Action Items

Natural Hazard Action Item Multi-Hazard #1				☒ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Coordinate with Clackamas County, OEM, the American Red Cross, and other relevant agencies to identify shelter facilities within Milwaukie.
Description	By collaborating with partner agencies to identify and prepare mass shelter facilities, the City of Milwaukie will be better able to respond to large-scale disasters resulting in population displacement.
Potential Implementation	• Utilize existing list of potential shelter facilities included in this plan, as well as any maintained by partner agencies to identify shelter sites to be used in the event of a mass population displacement (earthquake, wildfire, etc.) • Coordinate with relief agencies and potential host sites to expedite post-disaster shelter setup
Lead	Emergency Management
Potential Hazard Mitigation Grant/Funding	General Fund, BRIC This goal and will require minimal or no additional funding.
Climate Change Related	An increasingly unstable climate leaves the city more vulnerable to flooding and fire displacement.
Community Lifelines	Shelter
Population Impact	Following a major earthquake or other displacing disaster, large numbers of Milwaukians may need to seek shelter in a communal setting.

Estimated Cost	Timing
☒ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #2				☒ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Increase outreach and education for hazard awareness and natural disaster preparedness, especially for low-income, elderly, non-English-speaking, and other vulnerable populations.
Description	In the event of a regional disaster such as a fire, earthquake, or prolonged winter storm, household disaster kits will provide vital life safety support while waiting for regional and federal responders. Working with the most vulnerable communities to inform them about steps to take to prepare will help to increase resilience in emergencies.
Potential Implementation	• Publicize existing disaster preparation materials with a no-less-than monthly publication target. Share information in multiple languages. • Stand up "Prepare Faire" booths at community and city events to help increase awareness around disaster preparedness and resilience. • Work with community organizations and communal living centers to identify their strengths and vulnerabilities in emergencies. • Work with CERT, as a neighborhood partner, to educate the community about disaster readiness
Lead	Emergency Management
Potential Hazard Mitigation Grant/Funding	General Fund, HMGP, BRIC The scope of this outreach will depend largely on available funding and staff time. Some of it can be completed with current resources.
Climate Change Related	The city expects climate change to continue to adversely affect the intensity, frequency, and duration of a wide variety of natural hazards.
Community Lifelines	Shelter, Food, Water, Healthcare
Population Impact	Household emergency kits continue to be one of the most effective ways to maintain life safety in the immediate aftermath of a disaster.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☒ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #3				☒ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Maintain and enhance strategies for debris management for all hazards.
Description	Following a windstorm, winter storm, flood, or earthquake there is likely to be widespread need for debris hauling. Removing bulky waste clears transportation corridors, reduces the number of shelters for rodents, and other pest species, and generally serves to help a community return to its pre-disaster condition.
Potential Implementation	• A partnership for a debris removal plan was developed with Metro. • Milwaukie participates in Metro's Disaster Debris Management Plan, last updated in December 2022. • Clackamas County is currently developing an on-call debris hauling contract to provide additional assistance following an emergency.
Lead	Public Works
Potential Hazard Mitigation Grant/Funding	General Fund This is part of the city's ongoing work, but following a disaster FEMA recovery funds will be sought to alleviate the cost burden of debris removal.
Climate Change Related	The city expects climate change to continue to adversely affect the intensity, frequency, and duration of a wide variety of natural hazards, including hazards that may be reasonably expected to generate significant quantities of debris.
Community Lifelines	Hazardous Materials, Energy, Transportation, Safety
Population Impact	Downed limbs/trees have been a routine part of windstorms and winter storms in Milwaukie annually. Flooding, earthquakes, and some other disasters would likely lead to a larger volume of debris to remove if they are severe enough.

Estimated Cost	Timing
☒ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #4				☐ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Improve and obtain resources and equipment essential for responding to and recovering from disasters.
Description	The protection of resources and infrastructure will be an essential part of disaster recovery beginning from the moment disaster strikes. Making efforts to harden existing infrastructure and ensure that the necessary equipment is in place before an emergency will help to mitigate multiple natural hazards.
Potential Implementation	• Obtain funding to purchase one fixed generator for the Lava Drive pump station • Obtain funding to purchase one storage trailer for emergency supplies • Refresh emergency ration stockpiles in critical facilities • Contact local facilities that have large trucks that could serve as water tenders in emergency situations, or purchase water tenders for the city • Conduct seismic evaluations and retrofitting where necessary of government facilities
Lead	Public Works
Potential Hazard Mitigation Grant	HMGP, BRIC, Seismic Rehabilitation Grant Program
Climate Change Related	Although this action item is primarily about earthquake recovery, which are not influenced by climate change, some other climate hazards.
Community Lifelines	Communications, transportation, shelter, water, energy
Population Impact	The ability of the city government to stand up and resume services quickly following a large natural disaster will expedite recovery for all residents and the surrounding community.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☐ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☒ Long Term (More than 5 years)

Natural Hazard Action Item Multi-Hazard #5					☐ High Priority Action
☒ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide	
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm	

Statement	Coordinate natural hazard related climate change action items through the Milwaukie Community Climate Action Plan.
Description	The Climate Change action items provide direction on specific activities that the City and residents in Milwaukie can take to reduce the impacts of climate change.
Potential Implementation	Implement relevant mitigation strategies identified in the Climate Action Plan related to the following topic areas: • Building Energy and Efficiency • Vehicles and Fuels • Land Use and Transportation Planning • Materials use, purchasing, and recovery • Natural resources • Public health and emergency preparedness
Lead	Public Works
Potential Hazard Mitigation Grant	General Fund
Climate Change Related	The Climate Action Plan is intended to describe the city's overall plan for climate action. Most of the natural hazards described in this plan will be exacerbated by climate change. Anything the city does to mitigate climate change by extension mitigates its vulnerability to natural hazards.
Community Lifelines	Health, Safety
Population Impact	Milwaukians have already experienced climate-conscious improvements to quality of life through the implementation of Climate Action Plan policies. A completely implemented Climate Action Plan would not prevent natural disasters from occurring, but would yield benefits to all residents in the form of reduced severity of those disasters.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

Natural Hazard Action Item Flood #1				☐ High Priority Action
☐ Multi-Hazard	☐ Drought	☐ Earthquake	☒ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

Statement	Evaluate and implement alternatives for reducing the flooding hazard for properties along Kellogg Creek, Johnson Creek, Mount Scott Creek area, and the Willamette River.
Description	While most of Milwaukie is safe from all but the most extreme of riverine flooding, waterfront properties continue to be popular habitation and development sites.
Potential Implementation	• Prioritize mitigation for residences located within the floodway • Identify repetitive flood loss properties and discuss mitigation strategies with property owners • Limit cut and fill through development policy • ~~Remove Kellogg Dam~~Continue to support the Kellogg Creek Restoration and Community Enhancement Project • Complete Meek Stormwater Pipeline North Phase to connect to Roswell Detention Facility (currently receiving bids) • Washington area improvements (currently bidding) • Protect and expand storm gardens and swales • Update Stormwater System Plan 2023/24 (early implementation, consultant hired)
Lead	Engineering
Potential Hazard Mitigation Grant	General Fund, HMGP, FMA, PDM Some of these projects are already funded, while others are not.
Climate Change Related	Flooding is inextricably tied to climate change. Increased rainfall frequency and intensity makes flood mitigation an ongoing concern.
Community Lifelines	Transportation, sanitation, shelter, food, energy
Population Impact	Flooding will continue to affect Milwaukians for the foreseeable future. While most members of the community do not live in areas prone to flooding, creeks and the river overflowing their banks can have significant effects on transportation and other community lifelines listed above. Mitigating flood vulnerability is a benefit to the entire population.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☐ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☒ Long Term (More than 5 years)

Natural Hazard Action Item Severe Weather #1				☐ High Priority Action
☐ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☐ Wildfire	☐ Extreme Heat	☒ Winter Storm	☒ Windstorm

Statement	P~~Bury and p~~rotect vulnerable critical infrastructure, such as power lines, to lessen potential failures during severe weather.
Description	~~Wind and ice pose significant threats to overhead powerlines. Undergrounding the lines, especially those running to critical facilities, provides for a more resilient energy grid.~~Severe weather poses a significant threat to powerlines and other critical infrastructure. Identifying opportunities to protect access to energy is a vital part of disaster recovery.
Potential Implementation	• Partner with PGE to obtain funding to bury powerlines for critical facilities within the city • Partner with PGE to continue hazardous tree inventory and mitigation programs • Partner with major businesses and employers to encourage undergrounding of powerlines • Continue to require undergrounding of powerlines in new developments
Lead	Public Works
Potential Hazard Mitigation Grant	General Fund, HMGP, BRIC Much of the work supporting this action item is being done by other agencies.
Climate Change Related	Climate change continues to exacerbate the severity of windstorms and winter storms.
Community Lifelines	Energy
Population Impact	Ensuring continued power to hospitals, Public Works, and public safety facilities during and after natural disasters allows the entire community to recover more quickly.

Estimated Cost	Timing
☐ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☒ High ($100,000 or more)	☐ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☒ Long Term (More than 5 years)

Natural Hazard Action Item Wildfire #1				☐ High Priority Action
☐ Multi-Hazard	☐ Drought	☐ Earthquake	☐ Flood	☐ Landslide
☐ Volcanic Event	☒ Wildfire	☐ Extreme Heat	☐ Winter Storm	☐ Windstorm

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Statement	Coordinate wildfire mitigation action items through the Clackamas County Community Wildfire Protection Plan.
Description	Fire services in Milwaukie are provides by Clackamas Fire District #1 (CFD1). Continuing to cooperate with the CFD1 promotes public safety for the entire community.
Potential Implementation	• Collaborate with CFD1 to identify areas where the city can cooperate more effectively with the Community Wildfire Protection Plan
Lead	Emergency Management
Potential Hazard Mitigation Grant/Funding	General Fund, HMGP, BRIC Participation in this action item will be funded as part of the city's ongoing hazard mitigation efforts. Additional actions arising from this collaboration will require additional funding, likely from grants.
Climate Change Related	Wildfires are fed by hot, dry conditions following periods of heavy rainfall. As climate change continues, conditions conducive to wildfires are expected to become more prevalent.
Community Lifelines	Energy, shelter, safety
Population Impact	Milwaukie's direct vulnerability to wildfires remains relatively low, but by continuing to integrate with the wider county action plan, the city remains ready to support neighboring jurisdictions and respond in the unlikely event of a local wildfire.

Estimated Cost	Timing
☒ Low (Less than $50,000) ☐ Medium ($50,000 to $100,000) ☐ High ($100,000 or more)	☒ Ongoing ☐ Short Term (0 to 2 years) ☐ Medium Term (3 to 5 years) ☐ Long Term (More than 5 years)

ATTACHMENT B

Community Engagement Summary

This Section To Be Added

WS 1. 8/15/23
Presentation

Natural Hazard Mitigation Plan Update 2

Dan Harris (he/they)
Events & Emergency Management Coordinator
harrisd@milwaukieoregon.gov

NHMP Engagement Summary

Engagement Summary

- July 31: Engage Page
  - 227 Page Visits
  - 60 Poll Responses
  - 6 Original Comments/Questions

- August 1: Pilot Article

- August 3: Community Partners Email
  - Full List Included in Staff Report; More Than 20 Organizations
  - Four Replies from Groups Contacted

- August 9: Facebook Post

Outstanding Issues

- Specific Effects of Simultaneous Clackamas Dam Failures (PGE)
- Seismic Stability of Linwood Elementary Buildings (NCSD)
- General Clerical Cleanup

Next Steps

- Updated Plan Posted to Engage Page by August 17
- Comments Remain Open Until August 31
- Hazard Mitigation Advisory Committee Roundup September 8
- Draft NHMP submitted to Clackamas County by September 30
- Plan Returns to Council February 2024




Questions & Comments

Dan Harris (he/they)
Events & Emergency Management Coordinator
harrisd@milwaukieoregon.gov

CITY OF MILWAUKIE

WS 2.
8/15/23

OCR USE ONLY

COUNCIL STAFF REPORT

To: Mayor and City Council
Ann Ober, City Manager

Date Written: August 1, 2023

Reviewed: Sasha Freeman (as to form), Administrative Specialist II

From: Peter Passarelli, Public Works Director

Subject: **Water System Development Charges (SDCs)**

ACTION REQUESTED

Council is asked to review and provide guidance on the proposed SDC methodology and SDC rate structure recommendations for the city's water utility.

HISTORY OF PRIOR ACTIONS AND DISCUSSIONS

June 16, 2020: Council adopted a resolution waiving city controlled SDCs and frontage improvement requirements for additional dwelling units (ADU) for a limited duration.

March 2, 2021: Council received a presentation on SDCs and provided guidance to staff and the city's consultant team concerning the desire to develop a tiered wastewater SDC for residential properties based on dwelling unit size.

January 4, 2022: Council received a presentation on the proposed wastewater SDC methodology and SDC rate structure recommendations for the city's wastewater utility.

May 17, 2022: Council adopted the proposed SDC methodology and SDC rate structure recommendations for the city's wastewater utility.

ANALYSIS

SDCs are one-time charges assessed on new development, additions, and changes of use to pay for the costs of expanding public facilities. As growth creates new infrastructure demand, SDCs provide a mechanism for new growth to pay for new demand on the water, sewer, storm, transportation, and parks systems. Milwaukie currently charges SDCs for development and redevelopment for water, sewer, parks, and street systems. SDCs are the city's principal source of revenue for planning and infrastructure costs related to growth.

Generally, the charges are broken down into two components: 1) a reimbursement charge to recover existing capacity available for growth and 2) an improvement charge to cover planned capacity for growth. In some circumstances, the fee may include an administrative fee/compliance fee to cover the costs of complying with Oregon's SDC laws.

Not all SDCs collected by Milwaukie are set by the city. The city collects charges set and managed by the North Clackamas Parks and Recreation District (NCPRD) as well as sewer connection fees set by Clackamas County Water Environment Services (WES) and the City of Portland.

SDC Philosophy

Council has generally reflected the view that growth should pay for growth, but the current SDC structure is regressive as a percentage of house value, it overestimates the impact of smaller dwelling units, and is a potential barrier to affordable housing. Although Milwaukie SDCs are lower compared to other communities regionally, this is likely a combination of the current build of the community and infrastructure needs based on system plans from ten years ago that no longer capture future growth requirements as opposed to reflecting the Council's current philosophy.

Proposed SDC

Staff and the consultant team have developed preliminary rate structures from the water SDC study and are presenting the findings and recommendations for review and feedback. The tables below show the current water SDC, proposed SDC, a proposed tiered schedule for single family residential that aligns with the city's wastewater SDC structure and a water SDC comparison within the region.

Current and Proposed SDC Rate by Meter Size

Water SDC		
Meter Size	Current SDC	Calculated Full SDC
3/4"	**$2,297**	**5,708**
1"	$3,836	$ 9,513
1.5"	$7,666	19,025
2"	$12,268	30,441
3"	$24,528	60,881
4"	$38,326	95,127
6"	$76,658	190,254
8"	$122,654	304,406
10"	$176,313	437,583
12"	$344,964	963,159

Tiered Structure

	EDUs	Max. Water SDC
Single-Family Residential		
< 500 sqft (use ADU rate)	0.60	$ 3,425
500-800 sqft	0.70	3,995
800-1,799 sqft	0.90	5,137
1,800-2,999 sqft	1.00	5,708
3,000-3,799 sqft	1.10	6,278
≥ 3,800 sqft	1.20	6,849
Accessory dwelling unit (ADU)	0.60	3,425

Water SDC Comparison

	Water SDC per 5/8" meter
West Linn	15,385
Oregon City	13,967
Wilsonville	12,089
Tigard	10,853
Beaverton	10,329
Gladstone	9,986
Lake Oswego	9,571
Sherwood	9,544
Tualatin	8,290
Milwaukie (proposed)	5,708
Gresham	5,603
Portland	4,563
Milwaukie (current)	2,197

Source: *FCS Group Survey (7/12/23)*
Assumes 5/8" meter

Based on feedback, staff will make necessary revisions and then schedule the required public hearing necessary for adoption. A 90 day public notice is required for the hearing.

BUDGET, CLIMATE, & WORKLOAD IMPACTS
Not applicable.

COORDINATION, CONCURRENCE, OR DISSENT
Not applicable.

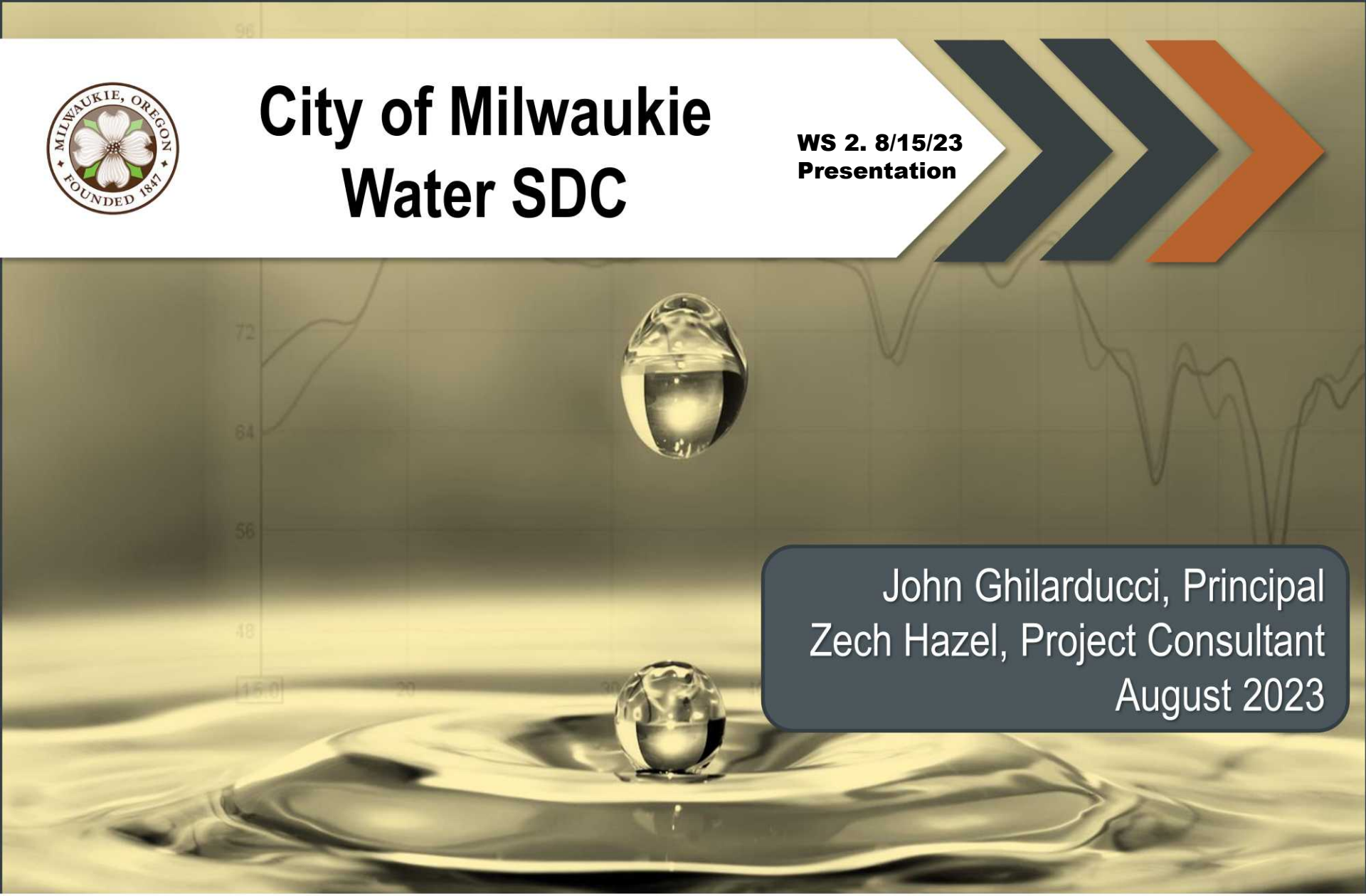
STAFF RECOMMENDATION
Not applicable.

ALTERNATIVES
Not applicable.

ATTACHMENTS
None.

City of Milwaukie Water SDC

WS 2. 8/15/23
Presentation



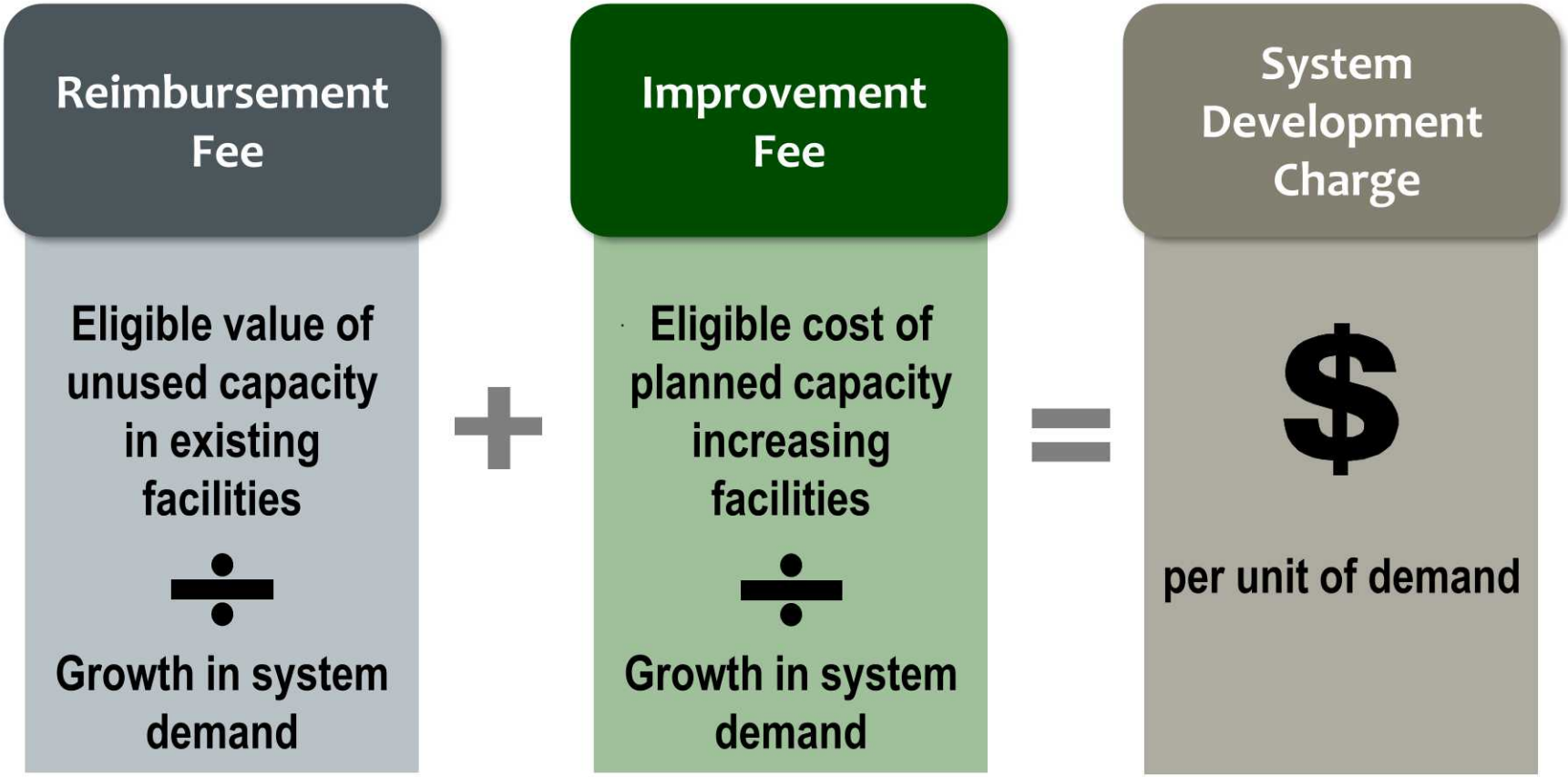
John Ghilarducci, Principal
Zech Hazel, Project Consultant
August 2023

FCS GROUP
Solutions-Oriented Consulting

Key Characteristics of SDCs

- SDCs are one-time charges, not ongoing rates. Paid at the time of development.
- SDCs are available for water, wastewater, stormwater, transportation, and parks.
- SDCs are for capital only, in both their calculation and in their use.
- SDCs include both existing and future (planned) infrastructure cost components.
- SDCs are for "system" facilities, not "local" facilities.

The SDC Calculation



Current SDCs – FY 2024

Meter Size	MCE Ratio	Current SDC
3/4"	1.00	$ 2,297
1"	1.67	3,836
1.5"	3.33	7,666
2"	5.33	12,268
3"	10.67	24,528
4"	16.67	38,326
6"	33.33	76,658
8"	53.33	122,654
10"	76.67	176,313
12"	168.75	344,964

System Development Charge

- **The maximum allowable SDC per Meter Customer Equivalent (MCE) is $5,708**

Calculated SDC	
Improvement Fee Cost Basis	$ 11,555,291
Reimbursement Fee Cost Basis	1,544,372
Compliance Costs	1,003,566
Total:	$ 14,103,228
Growth in MCEs	2,485
Improvement Fee per MCE	$ 4,682
Reimbursement Fee per MCE	621
Compliance Fee per MCE	404
Total SDC per MCE:	**$ 5,708**

Growth

- **Expected growth of 2,485 MCEs**

	2019	2023	2040	Growth (2023-2040)	Growth Share
Peak Season Maximum Day Demand (MGD)	4.13	4.38	5.64	1.26	22.29%
Total MCEs		8,664	11,149	2,485	22.29%

Source: *2021 Water System Master Plan, Table 3-7 (maximum day demand projections); previous tables (total MCEs)*

Project List (abbreviated)

- **$11.6M SDC-eligible project costs**
- **Large projects include:**
  - **$22.7M** – *Sum of the costs from the installation and replacement of various pipeline projects*
  - **$7.0M** – *Additional 3 MG storage reservoir to address storage deficiency in Zone 2*
  - **$2.9M** – *3 MG tank recoating and modernization of mixing system in Stanley Reservoir*
  - **$1.6M** – *Replacement of W2 PS with two 3,000 gpm pumps*

#	Description	Timeline	2023 Project Cost	SDC Eligibility	Outside Funding	SDC-Eligible Cost
1	Unspecified miscellaneous equipment replacement and upgrades as needed.	2023-2032	$ 325,368	0.00%	$ -	$ -
2	Intertie Development	2025-2032	325,368	22.29%	-	72,522
3	Re-establish the production of Well 8 to maximize supply	2024	271,140	22.29%	-	60,435
	. . .	. . .	. . .	. . .	. . .	. . .
93	Perform system wide seismic evaluation.	2029	325,368	22.29%	-	72,522
94	Planning and securing of additional water rights	2025-2028	108,456	22.29%	-	24,174
95	Revised Lead and Copper Rule Compliance Study	2023	135,570	0.00%	-	-
		Total:	**$49,962,874**		**$ 2,895,774**	**$11,635,069**

Source: *2021 Water System Master Plan, City staff*

Reimbursement Fee Summary

	Estimated Capacity for Growth	Original Cost	Reimbursable Cost
Supply	21.65%	$ 4,307,901	$ 932,700
Storage	35.51%	1,447,865	514,174
Pumping	14.18%	687,747	97,498
Transmission & Distribution	0.00%	15,009,614	-
Total:		**$ 21,453,127**	**$ 1,544,372**

Calculated SDCs

Meter Size	MCE Ratio	Improvement Fee	Reimbursement Fee	Compliance Fee	Calculated Full SDC
3/4"	1.00	$ 4,682	$ 621	$ 404	**$ 5,708**
1"	1.67	7,804	1,036	673	**9,513**
1.5"	3.33	15,608	2,072	1,346	**19,025**
2"	5.33	24,972	3,315	2,154	**30,441**
3"	10.67	49,944	6,629	4,308	**60,881**
4"	16.67	78,038	10,358	6,731	**95,127**
6"	33.33	156,075	20,717	13,462	**190,254**
8"	53.33	249,721	33,146	21,539	**304,406**
10"	76.67	358,973	47,648	30,962	**437,583**
12"	168.75	790,132	104,877	68,149	**963,159**

Scalable SDCs by House Size

	EDUs	Max. Water SDC
Single-Family Residential		
< 500 sqft (use ADU rate)	0.60	$ 3,425
500-800 sqft	0.70	3,995
800-1,799 sqft	0.90	5,137
1,800-2,999 sqft	1.00	5,708
3,000-3,799 sqft	1.10	6,278
≥ 3,800 sqft	1.20	6,849
Accessory dwelling unit (ADU)	0.60	3,425

Source: *2021 Water Environment Services Rules and Regulations*

SDC Comparison

	Water SDC per 5/8" meter
West Linn	15,385
Oregon City	13,967
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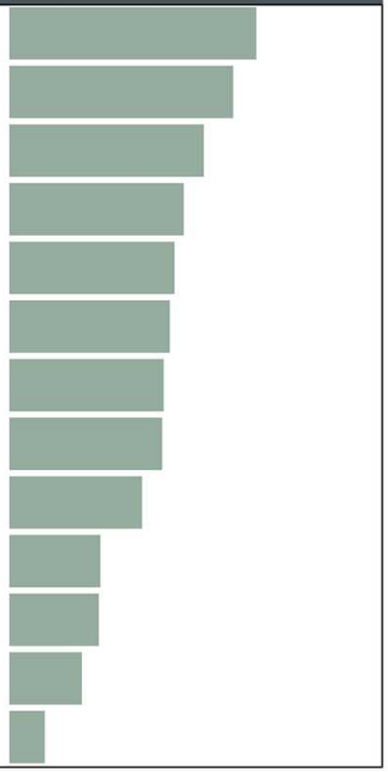

Source: *FCS Group Survey (7/12/23)*

Assumes 5/8" meter

Next Steps

- Incorporate Council input to SDC analysis
- 90-day public hearing notice
- Public hearing for adoption
- Implementation