RESOLUTION NO. 38-2003

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MILWAUKIE, OREGON ADOPTING THE MULTI-JURISDICTIONAL CLACKAMAS COUNTY NATURAL HAZARDS MITIGATION PLAN INCLUDING THE MILWAUKIE ADDENDUM, AS REQUIRED BY TITLE 44 CODE OF FEDERAL REGULATIONS PART 201 AS AUTHORIZED BY THE DISASTER MITIGATION ACT OF 2000, IN ORDER TO REMAIN ELIGIBLE FOR STATE AND FEDERAL DISASTER RELIEF FUNDING.

WHEREAS, the City of Milwaukie recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required as a condition of future grant funding for mitigation projects;

WHEREAS, the City of Milwaukie participated jointly in the planning process with the other local units of government within the County to prepare a Natural Hazards Mitigation Plan;

- **NOW, THEREFORE, BE IT RESOLVED** that that the City of Milwaukie Council, hereby adopts the Multi-jurisdictional Clackamas County Natural Hazards Mitigation Plan including Attachment A, the City of Milwaukie Addendum as an official plan; and

- **BE IT FURTHER RESOLVED** that this Addendum will be submitted on behalf of the City of Milwaukie to Federal Emergency Management Agency officials for final review and approval.

Introduced and adopted by the City Council on September 16, 2003

This resolution is effective on September 16, 2003

James Bernard, Mayor

ATTEST:

Pat DuVal

Pat DuVal, City Recorder

APPROVED AS TO FORM:
Ramis, Crew, Corrigan & Bachrach, LLP

City Attorney

ATTACHMENT A

CITY OF MILWAUKIE

Natural Hazards Mitigation Plan Addendum

Prepared for

City of Milwaukie
10722 SE Main Street
Milwaukie, OR 97222

In cooperation with

Clackamas County Emergency Management
2200 Kaen Road
Oregon City, OR 97045

City of Milwaukie
Natural Hazards Mitigation Plan Addendum

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Section 1:
Planning Process

The City of Milwaukie Natural Hazards Mitigation Plan includes resources and information to assist city residents, public and private sector organizations, and others interested in participating in planning for natural hazards. The mitigation plan provides a list of activities that may assist City of Milwaukie in reducing risk and preventing loss from future natural hazard events. Milwaukie has developed this Plan as an addendum to the Multi-Jurisdictional Clackamas County Natural Hazards Mitigation Plan in an effort to take a more regional approach to planning for natural hazard scenarios.

Who Participated in Developing the Plan?

The City of Milwaukie Natural Hazards Mitigation Plan is the result of a collaborative effort between City of Milwaukie public agencies, non-profit organizations, the private sector, and regional and state organizations. The Milwaukie Hazard Mitigation Advisory Committee (HMAC) guided the process of developing the plan. The HMAC was comprised of representatives from:

- Dave Church, North Clackamas School District
- Kevin Donegan, Clackamas County Fire District #1
- Craig Holman, City GIS Coordinator
- Cindy Kolomechuk, Clackamas County Office of Emergency Management
- Barb Kwapich, City Risk Manager
- Tom Larson, City Building Official
- Lindsey Nesbitt, City Community Development Department
- Jack Perry, City Sewer Department
- Paul Roeger, City Engineering Department
- Jason Wachs, City Neighborhood Services Department

Planning Process

The Milwaukie HMAC had a regular meeting schedule to complete the planning process, and the residents of the City of Milwaukie had an opportunity to participate in the county-wide public workshops designed to gain citizen input. The planning process is described in Appendix B of the Clackamas County Natural Hazards Mitigation Plan.

Special Service Districts

The following Special Service Districts are located in Milwaukie have been given the opportunity to participate in plan development and implementation.

- Clackamas Community College
- Clackamas Education Service District
- North Clackamas School District
- City of Milwaukie
- Clackamas County
- North Clackamas Parks and Recreation District
- Port of Portland
- Milwaukie Road District #4
- Metro Service District 2
- Clackamas County Vector Control
- Tri-met
- Oak Lodge Water District #4
- Clackamas County Sewer District #1

Multi-Jurisdictional Planning Effort

City of Milwaukie is dedicated to taking a regional approach to planning for natural hazards since hazards do abide by jurisdictional boundaries. The City of Milwaukie has representation on the Clackamas County Hazard Mitigation Advisory Committee through the Clackamas Local Emergency Managers (CLEM) to ensure that the City's interests are represented in the larger scale planning effort. The City will partner with the county in implementation of appropriate action items, and will work with other jurisdictions to reduce losses from future natural hazards.

What is the Plan Mission?

City of Milwaukie concurs with the mission statement developed during the Clackamas County planning process.

What are the Plan Goals?

City of Milwaukie concurs with the goals developed during the Clackamas County planning process.

How Will the Plan be Implemented, Monitored, and Evaluated?

The plan maintenance process includes a schedule for implementing, monitoring, evaluating, and reviewing this plan addendum. It is essential to have this process to ensure plan sustainability.

Plan Adoption

The City of Milwaukie City Council will be responsible for adopting the Multi-Jurisdictional Clackamas County Natural Hazards Mitigation Plan including the City of Milwaukie Addendum. This governing body has the authority to promote sound public policy regarding natural hazards.

Coordinating Body

The Milwaukie Hazard Mitigation Advisory Committee (HMAC) will be responsible for coordinating implementation of plan action items and undertaking the formal review process. In order to develop momentum for plan implementation, the HMAC will convene monthly for the first three months of

plan implementation, and will establish an appropriate timeframe for the meeting schedule as plan implementation begins. The HMAC will meet no less than quarterly to identify funding for the implementation of mitigation strategies, evaluate the effectiveness of the plan, and develop new mitigation strategies to reduce losses from natural hazards.

Due to the nature of this project-based committee, technical advisory committees as well as other ad hoc committees may be established to implement appropriate mitigation projects and tasks, and will be held as needed. The attendees of these technical advisory committees will report on their actions to the HMAC at the regularly scheduled meetings.

The City Manager will assign representatives from appropriate city agencies, including, but not limited to, the current Hazard Mitigation Advisory Committee members. In order to make this committee as broad and useful as possible, the HMAC will engage other relevant organizations and agencies in hazard mitigation. The recommendations for adding to the Hazard Mitigation Advisory Committee include:

- A representative from the Neighborhood Associations
- A representative from the Police Department
- A representative from the business community or from the Chamber of Commerce

Convener

The Milwaukie City Council will adopt the Milwaukie Natural Hazard Mitigation Plan, and the Hazard Mitigation Advisory Committee will take responsibility for plan implementation. The Planning Director for Milwaukie will serve as a ***convener*** to facilitate the Hazard Mitigation Advisory Committee meetings, and will assign tasks such as updating and presenting the Plan to the members of the committee. Plan implementation and evaluation will be a shared responsibility among all of the Natural Hazard Advisory Committee Members.

Implementation through Existing Programs

City of Milwaukie addresses statewide planning goals and legislative requirements through its Comprehensive Land Use Plan, Capital Improvement Plans, and Building Codes. The Natural Hazard Mitigation Plan provides a series of recommendations that are closely related to the goals and objectives of these existing planning programs. City of Milwaukie will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Economic Analysis of Mitigation Projects

The Federal Emergency Management Agency's approaches to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages and costs later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards

can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Emergency Management Committee will use a FEMA-approved benefit/cost analysis approach to analyze and prioritize mitigation action items. For other projects and funding sources, the Emergency Management Committee may use other approaches to understand the costs and benefits of each action item and develop a prioritized list. For more information regarding economic analysis of mitigation action items, please see Appendix C of the Clackamas County Natural Hazards Mitigation Plan.

Formal Review Process

The City of Milwaukie Addendum to the Clackamas County Natural Hazards Mitigation Plan will be evaluated on an annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The convener will be responsible for contacting the Hazard Mitigation Advisory Committee members and organizing the annual meeting. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

The committee will review the goals and action items to determine their relevance to changing situations in the county, as well as changes in state or federal policy, and to ensure they are addressing current and expected conditions. The committee will also review the hazard assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised.

The convener will assign the duty of updating the plan to one or more of the committee members. The designated committee members will have ninety days to make appropriate changes to the Plan before submitting it to the Hazard Committee members, and presenting it to the City Council. The HMAC will also notify all holders of the plan when changes have been made. Every five years, the convener or designee will submit the updated plan to the State Hazard Mitigation Officer and the Federal Emergency Management Agency for review and approval.

Continued Public Involvement

The City of Milwaukie is dedicated to involving the public directly in review and updates of the Hazard Mitigation Plan. The public will have the opportunity to provide feedback about the Plan though a variety of forums. Copies of the Plan (on compact disk) will be catalogued and kept at all of the appropriate agencies in the city. In addition, a copy of the plan and any proposed changes will be posted on the city website. This site will also contain an email address and phone number to which people can direct their comments and concerns.

A public meeting will also be held after each annual evaluation or when deemed necessary by the Hazard Mitigation Advisory Committee. The meetings will provide the public a forum for which they can express its concerns, opinions, or ideas about the Plan. The HMAC will be responsible for using city resources to publicize the annual public meetings and maintain public involvement through the

public access channel, webpage, and newspapers. HMAC can provide updates to all Neighborhood Association (NDA) leaders annually or when deemed necessary and each NDA will distribute accordingly.

What are the Mitigation Strategies Identified by the City of Milwaukie?

The *action items* are a listing of activities in which county agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the timeline for implementation. *Short-term action items (ST)* are activities that county agencies may implement with existing resources and authorities within one to two years. *Long-term action items (LT)* may require new or additional resources or authorities, and may take between one and five years to implement. The action items are organized within the following matrix, which lists all of the multi-hazard and hazard-specific action items included in the mitigation plan.

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Emergency Services	Natural Systems	Partnerships and Implementation
Short-Term Multi-Hazard #1	Improve and attain resources and equipment essential for responding to and recovering from disasters.	Public Works	1-2 Years	30	✓		✓	✓	✓
Short-Term Multi-Hazard #2	Ensure that there are adequate shelter facilities in hazard-free zones to serve Milwaukie residents.	Hazard Mitigation Advisory Committee	Ongoing	30	✓	✓	✓		✓
Short-Term Multi-Hazard #3	Improve the hazard assessment in the Milwaukie Natural Hazards mitigation Plan.	City Geographic Information Systems	Ongoing	30	✓	✓	✓	✓	✓
Short-Term Multi-Hazard #4	Improve network of communications during a disaster.	Hazard Mitigation Advisory Committee	Ongoing	31	✓	✓	✓		✓
Short-Term Multi-Hazard #5	Develop, enhance, and implement education programs designed to reduce the losses from natural hazards.	Hazard Mitigation Advisory Committee	Ongoing	31	✓	✓	✓	✓	✓
Short-Term Multi-Hazard #6	Promote CERT program activity in the area and recruit new members for training.	Clackamas Fire District One	Ongoing	32	✓	✓	✓		✓
Short-Term Multi-Hazard #7	Develop and enhance strategies for debris management for all hazards.	Public Works	Ongoing	32	✓		✓	✓	✓
Short-Term Multi-Hazard #8	Integrate the goals and action items from the Milwaukie Natural Hazard Mitigation Plan into existing regulatory documents and programs where appropriate.	Hazard Mitigation Advisory Committee	Ongoing	32	✓	✓	✓	✓	✓
Long-Term Multi-Hazard #1	Improve vegetation management throughout the city.	Hazard Mitigation Advisory Committee	Ongoing	33	✓	✓	✓	✓	✓

City of Milwaukie Mitigation Strategies

Natural Hazard	Action Item	Coordinating Organization	Timeline	Ideas for Implementation	Plan Goals Addressed				
					Protect Life and Property	Public Awareness	Emergency Services	Natural Systems	Partnerships and Implementation
Long-Term Flood #1	Update Storm Water Management Plan, and identify appropriate mitigation strategies.	Public Works	3-5 years	18	✓		✓	✓	✓
Long-Term Flood #2	Evaluate alternatives for reducing the flooding hazard for properties along Kellogg Creek, Johnson Creek, the Mount Scott Creek area, and the Willamette River.	Public Works	3-5 years	18	✓	✓	✓	✓	✓
Long-Term Landslide#1	Reduce the vulnerability of property owners in landslide-prone areas.	Department of Community Development	Ongoing	20	✓	✓		✓	✓
Short-Term Wildfire #1	Inventory and map alternative firefighting water sources and encourage the development of additional sources.	Clackamas Fire District One	1-2 Years	24	✓		✓	✓	✓
Long-Term Severe Storm #1	Bury power lines subject to frequent failures to reduce power outages from the windstorm and severe winter storm hazard where possible.	Public Works	3-5 years	23	✓		✓		✓
Long-Term Earthquake #1	Conduct seismic evaluations on identified critical/essential facilities & infrastructure for implementing appropriate structural and non-structural mitigation strategies.	Public Works	5 Years	28	✓		✓		✓

City of Milwaukie Mitigation Strategies

Section 2:
Community Profile

Geography and the Environment

Milwaukie has an area of 4.8 square miles and is located along the Willamette River in northwestern Clackamas County in Northwestern Oregon (Map 1). Milwaukie is an incorporated city on the southern border of Portland, Oregon's largest city. It 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 southern part. Other tributaries include Mount Scott Creek in the southeastern part of the City, Minthorn Creek in the eastern industrial area, which flows into Mount Scott Creek; and Spring Creek in the western part of the City, which flows into Johnson Creek.

Elevations in the City range from 205 feet near 59th Avenue and Monroe Street to a low of 4 feet on the shores of the Willamette River. Milwaukie could be characterized by flat or gently hilly topography.

Transportation

Milwaukie has 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.

Population and Demographics

City of Milwaukie has a population of 20,490 per the 2000 Census. A break down of City demographics is provided in Table 2-1.

Table 2-1. Community Age Groups

Year	1970	1980	1990	2000
Under 5 years	1389	1263	1237	1306
5-19 years	4809	3840	3439	3874
20-44 years	5307	7104	7701	7548
45-64 years	3519	3548	3515	4946
65+ years	1275	2140	2800	2816
Median Age	28	30	35	37.7

Source: US Census, 0 or N/A indicates data is not available. Median value is the middle value, not an average.

Land and Development

Although Milwaukie's history dates back to 1840, until the 1940's it was a small town of less than 2,000 people just south of Portland. Map 1 shows the City's location in the region. With the war years came the development of the Milwaukie Industrial Park, and Milwaukie rapidly became a city with local jobs and an industrial tax base. During the 1950's, suburban growth spread to Milwaukie and to the south and east of the City boundaries. New suburbanites and large annexations added to the City's growth into the 1960's. Although the City itself was growing

rapidly, new residential development extended past Milwaukie, and was encouraged by the growth of sewer, water, and fire service districts.

Developing or fully developed residential areas now border the City. A basic map of the City is included in the addendum as Map #1. Although new development is occurring in newer, still vacant portions of the City, many of the older parts of Milwaukie are completely developed.

As new development has occurred further from the Portland core area, Milwaukie has become a close, older suburb. This type of growth pattern is associated with may complex development situations. For example, single-family building lots are becoming more scarce and expensive, while the existing housing stock grows older. The remaining truck farms and agricultural lands are being converted to housing and industry. In addition, citizens are concerned about the lack of parks and open space as the remaining vacant land disappears. Existing industrial parks are approaching full development, and limited land is available for future industrial growth. Traffic congestion on old streets and highways is increasing, and new freeways are opening up lands for residential and commercial development. In summary, Milwaukie is an older city with older building stock and infrastructure, but continues to have high demands for continued development.

The future character of Milwaukie is largely dependent on how land within the community is used, the relationships among the different land uses, and the intensity of development allowed within individual areas. Nearly 90 percent of the City's land area is already developed. The future of the remaining 10 percent is one of the most difficult questions facing the citizens and officials of Milwaukie. Should these presently vacant lands be used for industry to strengthen the City's tax base? Should more housing be encouraged? What about the City's lack of open space, or the need for neighborhood parks? All of these issues are addressed in the Land Use Chapter, which contains the following elements:

- Residential Land Use and Housing Element
- Economic Base and Industrial/Commercial Land Use Element
- Recreational Needs Element
- Willamette Greenway Element
- Neighborhood Element

A developed city like Milwaukie also faces questions about how existing residential neighborhoods, commercial areas, and industrial parks will be maintained and enhanced to support the desirable characteristics they already possess. Issues focusing on maintaining neighborhood character, supporting the strong industrial areas, and managing the City's riverfront are addressed in this division. The foremost challenge in arriving at conservation and development policies for Milwaukie is to recognize and support the strong desirable characteristics of the community, while allowing flexibility to accommodate changes in housing demand, consumer habits, and the recreational needs of existing and future residents.

Housing in Milwaukie provides shelter for a population which has income, education, age distribution and employment characteristics similar to Portland metropolitan area averages. Currently, the City's housing stock is composed of 66 percent single family and 33 percent multifamily. During the 1980's, however, 56 percent of the City's newly constructed housing units were multi-family.

Within the metropolitan area 36 percent of new housing starts are multi-family, while in Clackamas County only 28 percent are new multi-family housing starts. Milwaukie has clearly assumed a major role in providing opportunities for constructing a variety of housing types in north Clackamas County.

Milwaukie was comprised of 7,900 households in 1990, which increased to 8,561 in 2000. This represents an 8.4% increase in total households over the past ten years. Ownership information for 1990 and 2000 is contained in the following chart. Owner occupied households have increased 9.6% more than renter occupied households over the years 1990 to 2000.

Only 34.3 vacant gross buildable acres of residential lands outside the Town Center are available in Milwaukie for future housing or related recreation development. Much of these lands are small single parcels, substandard lots or large developed lots capable of partitioning to provide additional buildable area. Larger parcels are typically found in the Waverly area, along S.E. Lake Road and Kellogg Lake and Creek. The majority of these vacant lands are expected to be fully developed by the year 2017 if current housing construction rates continue. As residential land use and ownership patterns are well established, alternatives for housing become more limited. The City has considered the needs of existing and future residents for suitable affordable housing, and the desires of existing citizens to maintain the neighborhood character with which they are familiar. Striving to achieve a balance between meeting future needs and conserving existing character has been the aim of residential planning in Milwaukie.

Employment and Industry

Milwaukie is a major industrial center in the Portland metropolitan area, containing one of the largest concentrations of warehousing and distribution industries 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, however, are nearing capacity, and very little land within the City is currently available for new industrial development. For this reason, redevelopment and business retention are as important to the City as attracting new businesses to maintain employment and industrial tax base. The undeveloped industrially zoned area to the west of the Omark Industrial Park contains about 55 acres, but is hampered by poor soil conditions which pose problems for industrial development and contains some wetland areas.

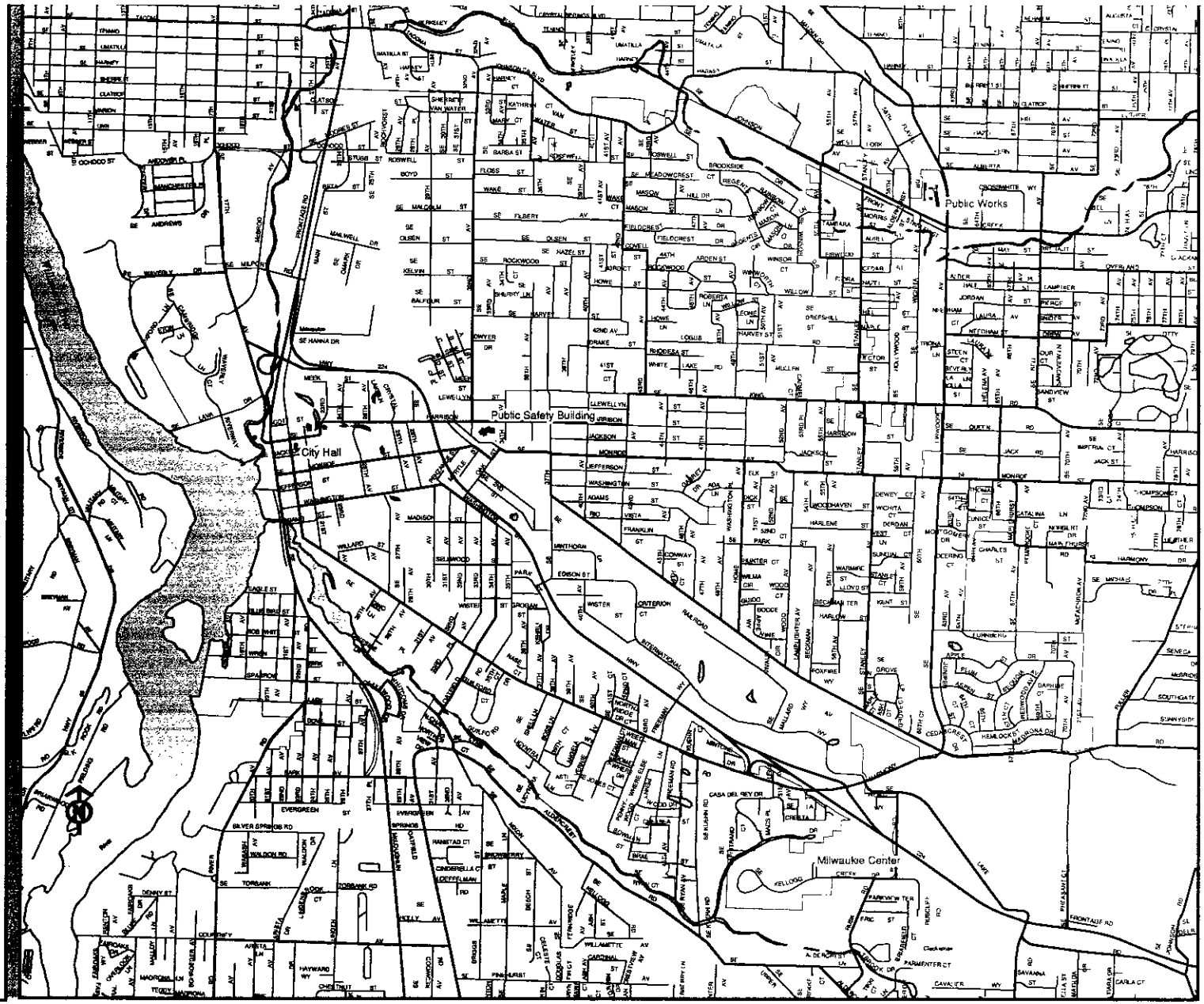
Less than 20% of Milwaukie residents in the labor force are employed in Clackamas County. Milwaukie is part of a much larger metropolitan labor market. Local jobs are important, however, for energy cost savings by reducing commuting and stimulation of the local economy by employees in the area. Industry is very important to the City, not only in providing local jobs, but also in paying a large portion of local property taxes relative to the services required. The high level of local industrial activity is one of the reasons the City has such a low tax rate. Tax Income from industrial lands is almost three times greater than City costs for providing police, fire, sewer and water services, which offsets costs for service of residential uses. In 1987, over 125 residents also conducted businesses from their homes. Home occupations provide local employment opportunities but must be subject to neighborhood quality standards. The City's three largest employers are shown in Table 2-2.

Milwaukie's commercial lands are also largely built up. As of 1987, there are 25 acres of vacant or re-developable commercial lands. Twenty-one acres were re-designated from industrial to commercial in 1986 and designated as a community shopping center. This should provide the potential for increased local comparison-shopping. New commercial development along McLoughlin, 82nd Avenue and the Clackamas Town Center area has lured many people away from downtown Milwaukie for purchasing comparison goods such as clothes, furniture and appliances. This is true for most small community commercial centers since comparison-shopping has increasingly occurred at large shopping centers. Downtown Milwaukie, however, has continued to attract commercial investment in the form of commercial service uses including banks, insurance and professional offices.

Table 2-2. Three Largest Employers as of March 2003

Employer	Product/Service	Number of Employees
Precision Castparts	Titanium & Steel Castings	500
Blount Inc/Oregon Cutting Systems Div.	Chain Saw Blades	500
North Clackamas School District	Education	500

City of Milwaukie, Oregon
Map #1



Legend

- Milwaukie City Limits
- Waterways
- City-Owned Buildings

The information on this map was derived from digital databases on Milwaukie's GIS. Care was exercised in the creation of this Map. The City of Milwaukie cannot accept any responsibility for errors, omissions or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product. However, notification of errors will be appreciated.

Craig Holman, GIS Coordinator
3200 SE Harrison Street
Milwaukie, OR 97222
503 786.7498 (holmanc@ci.milwaukie.or.us)

0 650 1,300 2,600 3,900 5,200 Feet

Section 3:
Hazard Assessment

Definition of a Hazard Assessment

Conducting a hazard assessment can provide information on the location of hazards, the value of existing land and property in hazard locations, and an analysis of risk to life, property, and the environment that may result from natural hazard events. Hazard assessments are subject to the availability of hazard-specific data. Milwaukie conducted a hazard assessment for all of the hazards for which data was available. The three levels of a hazard assessment are as follows:

1) ***Hazard Identification*** identifies the geographic extent and intensity of the hazard, the intensity of the hazard, and the probability of its occurrence. Maps are frequently used to display hazard identification data. Milwaukie identified six major hazards that consistently affect this geographic area. These hazards – floods, landslides, wildfires, earthquakes, severe storms: wind and winter, and volcanoes – were identified through an extensive process that utilized input from the Hazard Mitigation Advisory Committee The geographic extent of each of the identified hazards has been identified by the Milwaukie GIS department using the best available data, and is illustrated by the maps listed in Table 3.1.

2) ***Vulnerability Assessment/Inventorying Assets*** combines hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard. A complete listing of the community assets is located in Table 3.2. Additionally, a more detailed description of the vulnerability of these assets is located in the specific hazard sections.

3) ***Risk Analysis/Estimating Potential Losses*** involves estimating the damage, injuries, and financial losses likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two measurable components of risk analysis are magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets. Unfortunately, there is insufficient data for conducting a risk analysis for the natural hazards affecting Milwaukie. However, this need is identified in our action plan, and a complete risk assessment will be conducted when the resources are available.

Table 3-1. List of Hazard Mitigation Plan Maps

Map #	Type of Map	Section of the Plan
1	Base Map of Milwaukie	Section 2
2	Critical Facilities	Section 3
3	Essential Facilities	Section 3
4	Infrastructure	Section 3
5	FEMA NFIP 100-Year Floodplain	Section 4
6	FEMA NFIP 100-Year Floodplain & Flood Inundation, 1996	Section 4
7	Flood Inundation, 1996	Section 4
8	Landslide Hazards	Section 4
9	Storm (City Streets we sand)	Section 4
10	Wildfire Hazards	Section 4
11	Earthquake Hazards	Section 4

Federal Requirements for Hazard Assessment

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 201.6 (c) (2) includes a requirement for hazard assessment. This risk assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. The federal criterion for hazard assessments and information on how the Milwaukie Natural Hazard Mitigation Plan meets those criteria is outlined in Table 3-2 below.

Table 3-2. Federal Criteria for Hazard Assessment

Section 322 Requirement	How is this addressed?
Identifying Hazards	Each hazard section includes a map illustrating the geographic extent of the hazards affecting Milwaukie using the best available data.
Profiling Hazard Events	The hazard sections of the Clackamas County Natural Hazard Mitigation Plan provide documentation for all of the large-scale hazard events affecting the region. Where data is available, City of Milwaukie has provided local impacts from historical hazard events.
Assessing Vulnerability: Identifying Assets	Table 3-3 documents the community assets that are vulnerable to natural hazards. A more detailed description of the vulnerability of these assets is located in the specific hazard sections.
Assessing Vulnerability: Estimating Potential Losses	Using the best available data, an estimate of potential losses from natural hazards is located in the hazard specific sections.
Assessing Vulnerability: Analyzing Development Trends	The Community Profile Section of this plan provides a description of the development trends in City of Milwaukie.

Hazard Assessment Mapping Methodology

The information used to identify the hazards was derived from digital databases on Milwaukie's Geographic Information System, (GIS). Milwaukie obtains its data from Clackamas County, Metro and produces some data in-house. Maps and data were produced on ArcGIS, ArcMap version 8.3 and plotted on an HP-755CM plotter.

To identify the exposure to each hazard, the hazard areas were intersected with the facilities layers. The facilities and infrastructure located within each specific hazard zone were then reported. For the evaluations of protected monetary

damage assessment the City did the same type of overlay with the city's tax lot data.

Community Assets: Vulnerability Assessment

This section outlines the resources, facilities and infrastructure that, if damaged, could significantly impact public safety, economic conditions, and environmental integrity of Milwaukie. The exposure of community assets to natural hazards is provided in Table 3-3 Milwaukie Vulnerability Assessment. The community assets were defined as follows:

Critical Facilities: Those facilities and infrastructure necessary for emergency response efforts (Map 2).

- **Fire Stations:**
  City
  - ✓ Public Safety Building (Clackamas County Fire District)

  County:
  - ✓ Lake Road Station
  - ✓ Oak Lodge Station

- **Law Enforcement**:
  - ✓ Public Safety Building
  - ✓ County Sheriff
  - ✓ Oregon State Police

- **Hospitals:**
  - ✓ Milwaukie Providence Hospital – 32nd Avenue
  - ✓ Kaiser Permanente Hospital – Sunnyside Road
  - ✓ Willamette Falls Hospital – Oregon City

- **Schools**:
  - ✓ Milwaukie High School
  - ✓ Rowe Junior High
  - ✓ Ardenwald Elementary
  - ✓ Hector Campbell Elementary
  - ✓ Linwood Elementary
  - ✓ Milwaukie Elementary
  - ✓ Seth Llewelling Elementary
  - ✓ Portland Waldorf School
  - ✓ St. Johns School
  - ✓ School Transportation Center

Essential Facilities: Those facilities and infrastructure that supplement response efforts (Map 3).

- **City Buildings** :
  - ✓ Milwaukie City Hall
  - ✓ Public Safety Building – 32nd & Harrison
    - ✓ Public Facilities Building – 6101 SE JCB
    - ✓ Milwaukie Center
    - ✓ Ledding Library
    - ✓ Old Fire Station – 40th & Harvey
    - ✓ Old Shop – 40th & Harvey

- **County Buildings :**
  - ✓ Kellogg Treatment Plant

- **Potential Shelter Sites** :
  - ✓ Milwaukie Lutheran Church
  - ✓ St. Johns Catholic Church
  - ✓ St. Johns Episcopal Church
  - ✓ Milwaukie First Baptist Church
  - ✓ Romanian Baptist Church
  - ✓ Clackamas Christian Center
  - ✓ Milwaukie Center
  - ✓ School Gyms
  - ✓ Milwaukie Center
  - ✓ Ledding Library

Infrastructure: Infrastructure that provides services for Milwaukie (Map 4).

- **Bridges**:

  City
  - ✓ Milport Road across Johnson Creek
  - ✓ 17th Avenue across Johnson Creek

  County
  - ✓ Oatfield Road across Kellogg Creek
  - ✓ Rusk Road across Mount Scott Creek
  - ✓ 55th Avenue across Johnson Creek
  - ✓ Stanley Avenue across Johnson Creek
  - ✓ 60th Avenue across Johnson Creek
  - ✓ Linwood Avenue across Johnson Creek

  Portland
  - ✓ Ochoco Street across Johnson Creek
  - ✓ Johnson Creek Blvd. across Johnson Creek

  Oregon
  - ✓ 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 Avenue
  - ✓ Hwy. 224 across Mount Scott Creek

- **Transportation Networks**:
  - ✓ McLoughlin Blvd.
  - ✓ Highway 224
  - ✓ Harrison St/42nd Ave./King Rd.
  - ✓ Lake Road
  - ✓ Oatfield Road
  - ✓ Linwood Avenue
  - ✓ 17th Avenue

- **Water Treatment Facilities**

- ✓ 7 City Wells
- ✓ Aeration Packed Towers – 5 @ two locations
- ✓ Elevated Water Storage Tank – 40th & Harvey
- ✓ Concrete Storage Tank – 40th & Harvey
- ✓ Ground Level Metal Tank – Stanley & Harlow
- ✓ Sewerage Pump Stations – 5

- **Other Utilities**
  - ✓ NW Natural pipelines
  - ✓ PGE Substations (One is at edge of Lake / Harmony; a second is on the East end of Johnson Creek)
  - ✓ Quest facility in Oatfield
  - ✓ Satellite & Communication Towers

Table 3-3 identifies the number of facilities and infrastructure exposed to each of the natural hazards affecting the City of Milwaukie. The implications of exposure to the various hazards are outlined in each of the hazards sections. Additional tax lot information is also included in the hazard specific sections.

Table 3-3. Milwaukie Vulnerability Assessment

Hazard	Critical Facilities Exposed	Essential Facilities Exposed	Infrastructure Exposed
Flood	13	1	13
Landslide	1	0	0
Earthquake	21	1	19
Severe Storm: Wind and Winter	-	-	-
Wildfire	8	5	4
Volcano	NA	NA	NA

City of Milwaukie Critical Facilities Map #2

Legend

- Bridges
- Fire Stations
- Police Station
- Hospital
- Schools
- Well Systems
- Aeration Tower
- Concrete Water Tank
- Elevated Water Tank
- Kellogg Treatment Plant
- Ground Metal Tank
- Sewer Pumps
- Old Shop\Fire Station
- Waterways
- Milwaukie City Limits

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Craig Holman, GIS Coordinator
3200 SE Harrison Street
Milwaukie, OR 97222
503 786.7498 (holmanc@ci.milwaukie.or.us).

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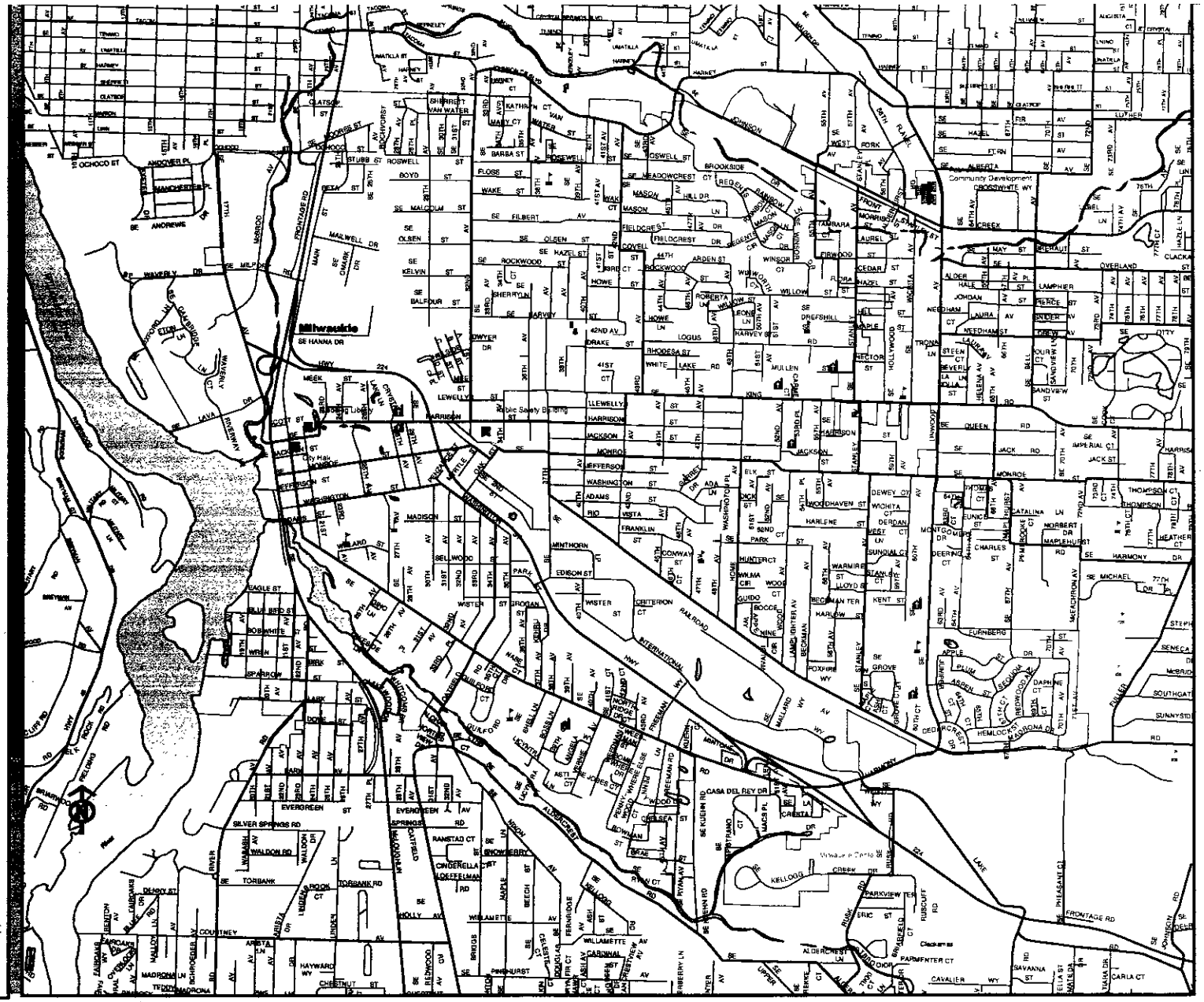
City of Milwaukie, Oregon
Essential Facilities
Map #3



Legend

- Water Wells & Pumps
- Potential Shelters, Schools/Gyms
- Potential Church Shelters
- Potential Shelters, City Buildings
- Waterways
- Milwaukie City Limits
- Old Fire Station/Old Shop

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Milwaukie, OR 97222
503.786.7498 (holmanc@ci.milwaukie.or.us)

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City of Milwaukie Critical Infrastructure Map #4

Legend

- Sewer Pumps
- Metal Water Tank
- Kellogg Sewer Treatment
- Elevated Water Tank
- Concrete Water Tank
- Aeration Towers
- City Wells
- PGE Substations
- Cell Towers & Antenna
- Bridges
- Critical Transportation Networks
- Milwaukie City Limits
- Waterways

0 650 1,300 2,600 3,900 5,200 Feet

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3200 SE Harrison Street
Milwaukie, OR 97222
503.786.7498 (holmanc@ci.milwaukie.or.us).

Section 4:
Natural Hazards

Flooding

City of Milwaukie has several large rivers and smaller tributaries that are susceptible to annual flooding events. Flooding poses a threat to life and safety, and can cause severe damage to public and private property. The major rivers, creeks and tributaries include:

- Willamette River
- Johnson Creek
- Kellogg Creek
- Mount Scott Creek
- Minthorn Creek
- Spring Creek

Flooding Profile

The historical large-scale flooding events have been described in Section 6 of the county plan, and are applicable to City of Milwaukie. As such, the events will not be repeated here.

The probability of flooding events in Milwaukie was determined using scientific data, historical occurrences, and local knowledge. The probability of flooding in Milwaukie is described in Chapter Five.

Flooding Hazard Assessment

Hazard Identification

Hazard identification is the first step of flood hazard assessment. The geographic extent of the flooding hazard was determined using the designated FEMA NFIP 100-year floodplain data, as well as the inundation line for the 1996 flood. Maps 5-7 illustrate the flood hazard area for Milwaukie. Map 5 shows that there are 304 acres identified in the FEMA 100 year floodplain, which is .09% of the total 3087 acres in the City.

Vulnerability Assessment

Vulnerability assessment is the second step of flood hazard assessment. Table 4-1 below shows the number, acres, and value of tax lots in the floodplain, as well as the property affected during the 1996 flood. This information was calculated to provide an estimate for potential flood losses.

Critical features impacted in the floodplain are bridges. There is no fiscal impact data available for the bridges. Transportation network affect is 1.1 miles under the FEMA 100-year floodplain. Having all bridges affected during major flooding is significant to the traffic flow in and out of the City but does not completely cut off all avenues. McLaughlin Boulevard is a major transportation route between Portland and cities such as Milwaukie, Oak Grove and Oregon City. Flooding on McLaughlin Blvd would have a significant impact on residents and commuters in these cities going to and from Portland. The amount of property in the flood plain

is not a large area but damage to the property could be significant as it could affect residential, commercial property and public property. Flooding can affect building foundations, seep into basements, damage interiors and exteriors of buildings, as well as, contents inside the buildings dependent upon the velocity and depth of the water and items that might be floating in it. The overflowing of the City sewer system during flooding can cause further property damage.

Table 4-1. Property Assessment:

Flood Plain	Tax Lots	Acres	Value
FEMA100-year & 1996 Combined	165	200	$ 2,088,874
FEMA 100 year	232	304	$132,343,958
1996 Only	155	200	$100,543,370

*Value of property in the 100-year floodplain may include property in tax lots that intersect the floodplain, including property that does not physically reside in the floodplain itself.

Risk Analysis

Due to insufficient data, Milwaukie is unable to perform a quantitative risk assessment at this time. The City has addressed this issue in the action items, and will be completing a risk assessment as data and resources become available.

Repetitive Flood Loss

City of 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, meaning that they have had greater than two NFIP claims in the past ten years. According the most current data from Oregon Emergency Management, there are two repetitive loss properties in Milwaukie. The total NFIP payments are listed in Table 4-2.

Table 4-2. Milwaukie Repetitive Loss Claims

Number of Loss	Total Building Payments	Total Content Payments
1st NFIP Claim	$18,804	$313,032
2nd NFIP Claim	$18,391	$84,915
3rd NFIP Claim	$1,288	-

Source: Oregon Emergency Management

Existing Flood Mitigation Activities

Flood mitigation activities listed here include current mitigation programs and activities that are being implemented by City of Milwaukie agencies or organizations.

City of Milwaukie Codes Pertaining to Flooding

Milwaukie Municipal Code Title 18 Flood Hazard Regulation (Ord 1899, 2002)

It is the purpose of this chapter to promote the public health, safety and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed:

A. To protect human life and health;
B. To minimize expenditure of public money and costly flood control projects;
C. To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
D. To minimize prolonged business interruptions;
E. To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;
F. To help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;
G. To ensure that potential buyers are notified that property is in an area of special flood hazard;
H. To ensure that those who occupy the areas of special flood hazard assume responsibility for their actions; and
I. To maintain the functions and values of floodplains such as allowing for storage and conveyance of stream flows through existing and natural flood conveyance systems.

Milwaukie Comprehensive Plan, Chapter 3 Environmental and Natural Resources (Ord 1666)

GOAL STATEMENT: To prohibit development that would be subject to damage or loss of life from occurring in known areas of natural disasters and hazards without appropriate safeguards.

Milwaukie's future role will primarily be as a residential community with considerable employment opportunities. This future, however, is not incompatible with the conservation of the City's remaining natural resources of land, air, water, and the natural environment. The wise use and management of these resources is particularly important in Milwaukie because the City is almost completely developed and few areas remain in a natural state. The protection of these natural resources is essential if residents are to experience the pleasures and amenities, which can only be enjoyed when nature is close at hand. The Plan elements which address these issues include:

- Natural Hazards Element
- Historic Resources Element
- Open Spaces, Scenic Areas, and Natural Resources Element
- Agricultural and Forest Lands Element
- Air, Water and Land Resources Quality Element

Policies in each of these elements, as well as the technical studies and inventories documented in the Resources and Environment, Parks and Open Space, Land Use and Transportation working papers, and the Neighborhood Blockwalk, comply with Statewide Planning Goals 3, 4, 5, 6, and 7 (reference Oregon Administrative Rules 660, Division 15).

Flood Mitigation Projects

Projects completed by the Johnson Creek Watershed Council:

- Tree Plantings along the creek in various places including the most recent planting at ODS.
- Storm water detention near Milport.

Flood Mitigation Action Items

The flood mitigation action items provide direction on specific activities that organizations and residents in City of Milwaukie can undertake to reduce risk and prevent loss from flood events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

LT-FL#1: Update Storm Water Management Plan, and identify appropriate mitigation strategies.

Ideas for Implementation:

- Identify and reduce development encroachment into storm water detention basins;
- Remove dry wells, prioritize replacements, and attain funding for upgrades.
- Identify areas that are frequently inundated due to low elevation and storm water run-off and develop mitigation strategies including public education materials.
- Refer to FEMA and the USACE for info to assist in mitigation efforts.

Coordinating Organization:	Public Works
Timeline:	3-5 Years
Plan Goals Addressed:	Protect Life and Property, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed	LT-FL #3

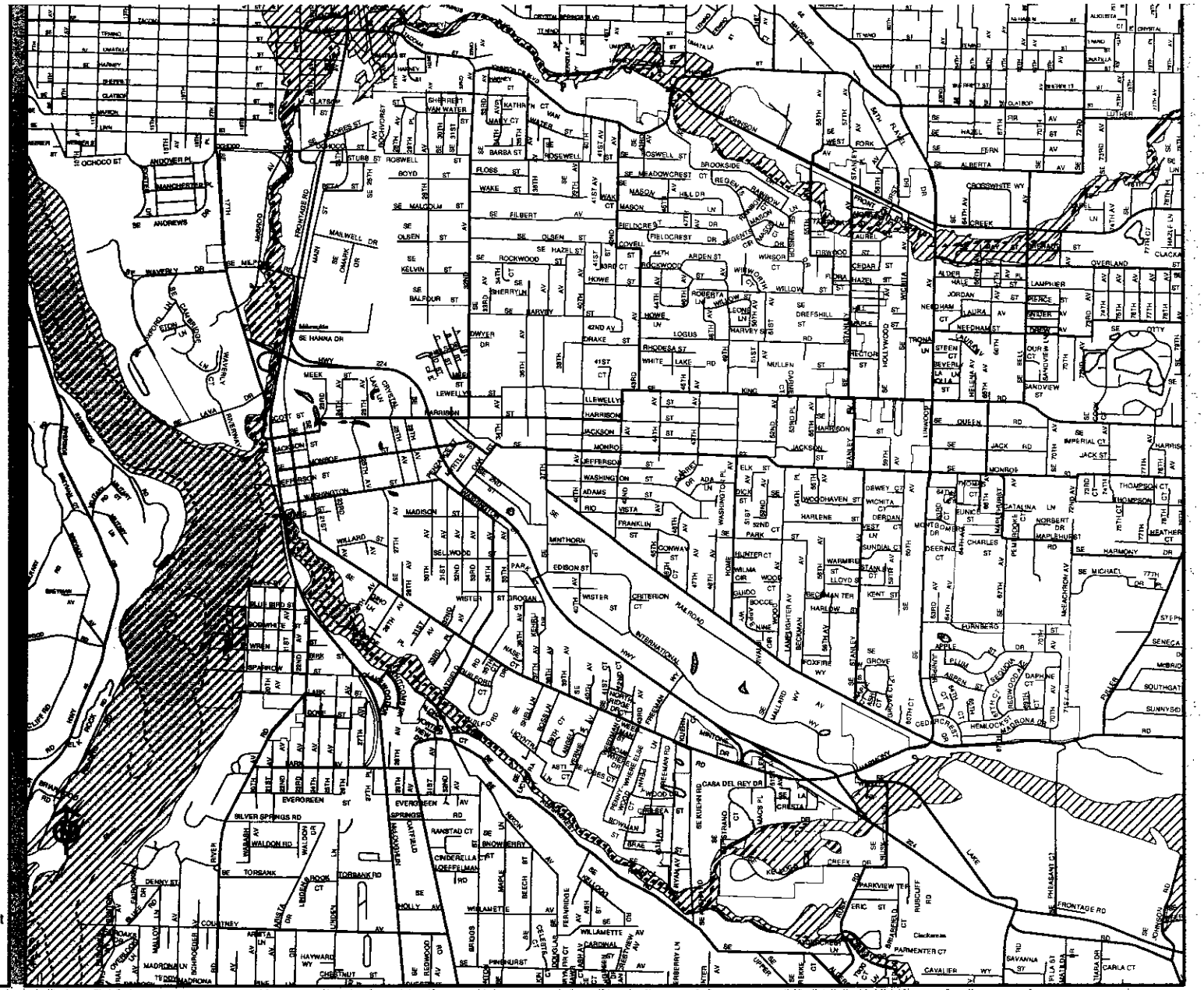
LT-FL#2: Evaluate alternatives for reducing the flooding hazard for properties along Kellogg Creek, Johnson Creek, the Mount Scott Creek area, and the Willamette River.

Ideas for Implementation:

- Identify mitigation strategies for repetitively flooded properties, and discuss mitigation strategies with property owners for potential partnerships.
- Continue to develop and implement a plan for dealing with traffic on McLoughlin when it becomes inundated by the Willamette (detour routes)

Coordinating Organization:	Public Works
Timeline:	3-5 years
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	LT-FL#2, LT-FL #3

City of Milwaukie, Oregon
Flood Hazard Zones
FEMA 100-Year Flood Zone
Map #5



Legend

- Milwaukie City Limits
- Waterways
- FEMA 100 Year Flood Zone

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Craig Holman, GIS Coordinator
3200 SE Harrison Street
Milwaukie, OR 97222
503.786.7498 (holmanc@ci.milwaukie.or.us).

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City of Milwaukie, Oregon
Flood Hazard Zones
FEMA & 1996 Overlay
Map #6

Legend

- Milwaukie City Limits
- Waterways
- 1996 Flood Zone
- FEMA 100-Year Flood

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Milwaukie, OR 97222
503.786.7498 (holmanc@ci.milwaukie.or.us)

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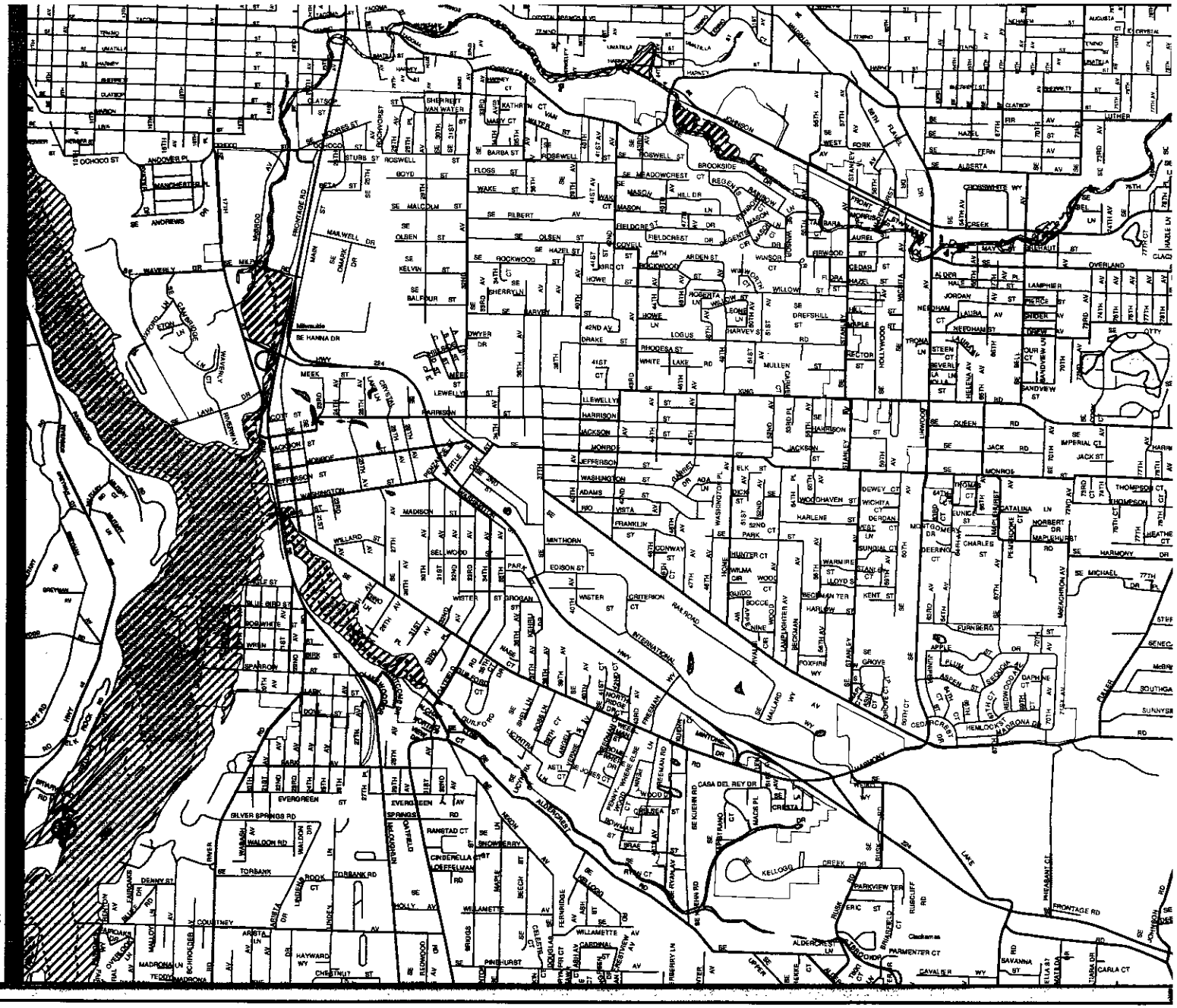
City of Milwaukie, Oregon
Flood Hazard Zones
1996 Flood Boundary
Map #7



Legend

- Milwaukie City Limits
- Waterways
- 1996 Flood Boundary

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503.786.7498 (holmanc@ci.milwaukie.or.us)

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Landslide

Landslide Profile

The historical landslide events have been described in Section 7 of the County Plan, and are applicable to City of Milwaukie. As such, the events will not be repeated here.

The probability of landslide events in Milwaukie was determined using scientific data, historical occurrences, and local knowledge. The probability of flooding in Milwaukie is described in Chapter Five.

Landslide Hazard Assessment

Hazard Identification

An essential step towards mitigation of landslide hazards is to identify the hazardous locations. Landslide events within the City have not significantly impacted residents or caused major property damage. Mapping landslide and debris flow allows the City to estimate damage do to a given event location and to help prevent future losses in landslide prone areas. The geographic extent of the landslide hazard was illustrated using percent slope, soil type, and bedrock type. The landslide hazard is depicted on Map 7, and shows that landslides would affect less than 1% of the City's land area.

Vulnerability Assessment

Landslide loss estimates are shown in Table 4-2 using a 20% or greater threshold to identify potential unstable slopes. The landslide hazard affects .06 miles of critical streets. Landslide events within the City have not significantly impacted residents or caused major property damage in the past but potentially landslides could inhibit traffic flow, cause damage to roads, as well as damage buildings. Erosion to hillside areas can take place during heavy rain.

Table 4-2. Landslide Loss Estimates in Milwaukie

	Lots	Acres	Value
Critical features effected by landslides	1	6.6	$2,088,874
Property by tax lot:	22	25.5	$13,826,352

Source: City of Milwaukie Geographic Information System

Risk Analysis

Due to insufficient data, Milwaukie is unable to perform a quantitative risk assessment at this time. The City has addressed this issue in the action items, and will be completing a risk assessment as data and resources become available.

Existing Landslide Mitigation Activities

Landslide mitigation activities listed here include current mitigation programs and activities that are being implemented by the City of Milwaukie agencies or organizations.

City of Milwaukie Codes Pertaining to Landslides

Milwaukie Comprehensive Plan, Chapter 3 Environmental and Natural Resources (Ord 1666)

GOAL STATEMENT: To prohibit development that would be subject to damage or loss of life from occurring in known areas of natural disasters and hazards without appropriate safeguards.

Milwaukie's future role will primarily be as a residential community with considerable employment opportunities. This future, however, is not incompatible with the conservation of the City's remaining natural resources of land, air, water, and the natural environment. The wise use and management of these resources is particularly important in Milwaukie because the City is almost completely developed and few areas remain in a natural state. The protection of these natural resources is essential if residents are to experience the pleasures and amenities which can only be enjoyed when nature is close at hand. The Plan elements which address these issues include:

- Natural Hazards Element
- Historic Resources Element
- Open Spaces, Scenic Areas, and Natural Resources Element
- Agricultural and Forest Lands Element
- Air, Water and Land Resources Quality Element

Policies in each of these elements, as well as the technical studies and inventories documented in the Resources and Environment, Parks and Open Space, Land Use and Transportation working papers, and the Neighborhood Blockwalk, comply with Statewide Planning Goals 3, 4, 5, 6, and 7 (reference Oregon Administrative Rules 660, Division 15).

Municipal Code Chapter 17.40 Section 17.40.010 Environmental Standards (Ord 1440)

Developments approved through this title must conform to the requirements of the environmental protection subpart of the community development ordinance (Title 16 of this code). Particular note should be made regarding requirements relating to excavation in landslide-prone areas.

Municipal Code Chapter 16.28 Erosion Control (Ord 1899)

Temporary and permanent measures for all construction projects shall be required to lessen the adverse effects of erosion and sedimentation. The owner or his/her agent, contractor, or employee, shall properly install, operate and maintain both temporary and permanent works as provided in this section or in an approved plan, to protect the environment during the useful life of the project. These erosion control rules apply to all lands within the City of Milwaukie.

Landslide Mitigation Action Items

The landslide mitigation action items provide direction on specific activities that organizations and residents in City of Milwaukie can undertake to reduce risk and prevent loss from landslide events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

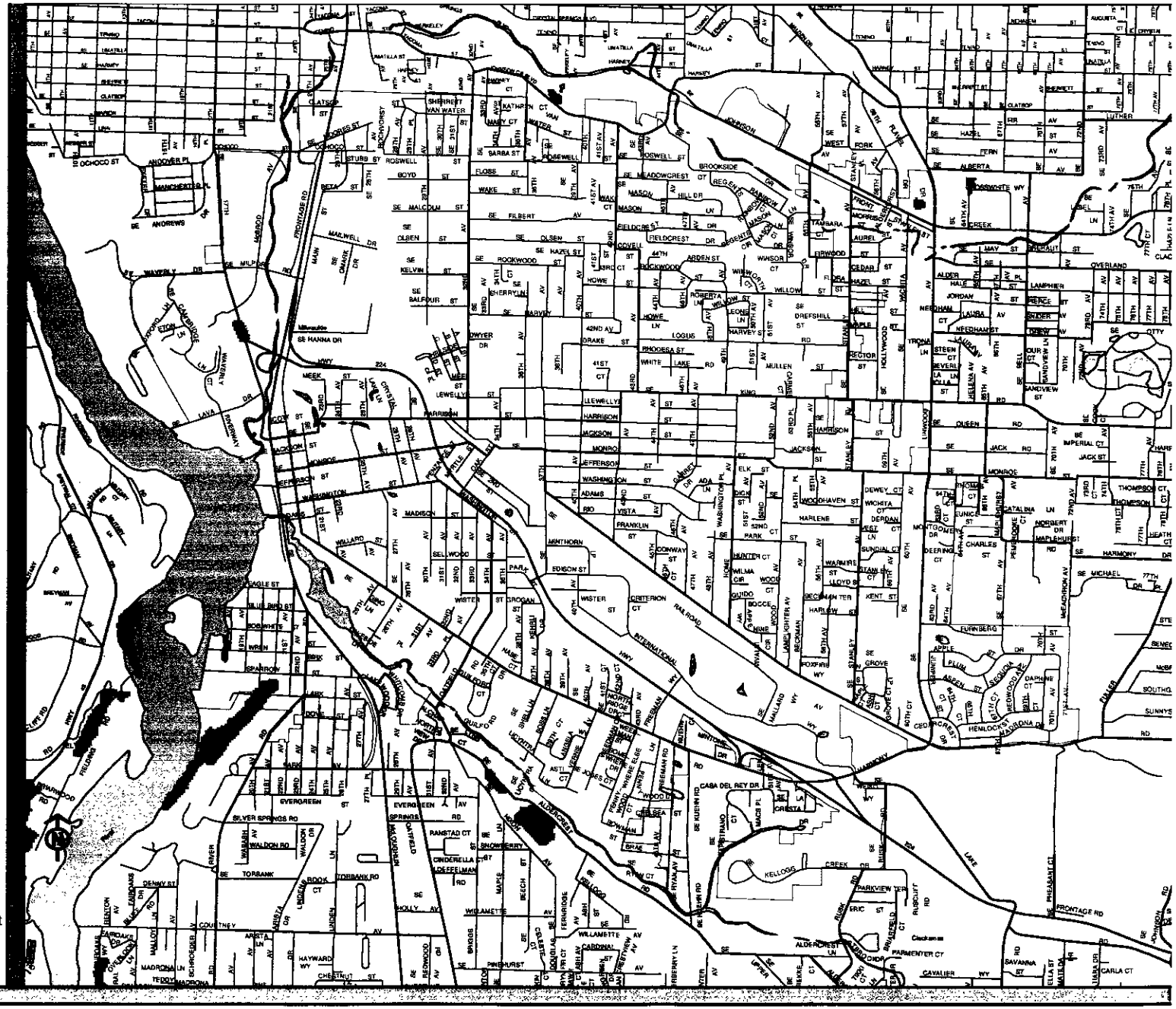
ST-LS #1: Reduce the vulnerability of property owners in landslide-prone areas.

Ideas for Implementation:

- Conduct a study to identify appropriate mitigation strategies in the area above Tideman Johnson Park, Waverly Heights, Island Station, and Tarrybrooks Hill.
- Develop public information to emphasize economic risk when building on potential or historical landslide areas.

Coordinating Organization:	Department of Community Development
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-LS#1

City of Milwaukie, Oregon
Potential Landslide Hazard Zones
Map #8



Legend

- Milwaukie City Limits
- Waterways
- Landslide Hazard Zones

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3200 SE Harrison Street
Milwaukie, OR 97222
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Wildfire

Wildfire Profile

Statistics provided by Clackamas County Fire District #1 show the City of Milwaukie had 28 brush and grass fires from 2001 until present. Earlier wildfire history specific to Milwaukie was not available. The large-scale wildfires affecting the region are described in the Clackamas County Natural Hazards Mitigation Plan.

The probability of wildfire events in Milwaukie was determined using scientific data, historical occurrences, and local knowledge. The probability of flooding in Milwaukie is described in Chapter Five.

Wildfire Hazard Assessment

Hazard Identification

Wildfire hazard identification data is based upon fuels, weather, and topography, and was generated from Clackamas County GIS. The wildfire hazard in Milwaukie is shown on Map 10, and identified less than 1% of all land being vulnerable to this hazard.

Vulnerability Assessment

About 2 miles of critical streets are exposed to the wildfire interface zone. Past history on wildfires that interface with urban areas throughout the county and community indicate 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 items that might affect the outcome of a wildfire are access to the location and to water, response time from the fire station, as well as the availability of personnel and equipment. Weather, such as hot dry winds and draught, can also play a part in a wildfire

Table 4-3. Wildfire Loss Estimates in Milwaukie

	Lot	Acres	Value
Critical Features –	1	2.5	$5,903,706
	Bridge at 224 & 26th		No data available
Property By Tax Lot	839	619	$323,028,550

Source: City of Milwaukie Geographic Information System

Risk Analysis

Due to insufficient data, Milwaukie is unable to perform a quantitative risk assessment at this time. The City has addressed this issue in the action items, and will be completing a risk assessment as data and resources become available.

Existing Wildfire Mitigation Activities

The City of Milwaukie works with Clackamas County Fire District 1 to mitigate problems regarding wildfire issues when they arise. Currently the City does not allow back yard burning due to requirements of DEQ (back yard burning is a key contributor to fires in the interface. Also, that the County Fire Defense Board provides daily burn messages and restrictions for the community to prevent

interface fires. This information is provided from both, the State Department of Forestry and the US Forest Service for all regions of the state.

City of Milwaukie Codes Pertaining to Wildfires

Municipal Code Chapter 8.04 Nuisances Section 8.04.110 Weeds and Noxious Growth.

This code mentions controlling vegetation before becoming a fire hazard.

Local Fire Prevention/Education Programs

The City of Milwaukie contracts with the Clackamas County Fire District for all fire prevention and education. They provide the community with the following.

- Counseling juvenile fire-setters
- Teaching fire prevention in schools
- Conducting CPR classes
- Teaching proper use of fire extinguishers
- Coordinating educational programs with other agencies, hospitals, and schools
- Answering citizens' questions

Wildfire Mitigation Action Items

The wildfire mitigation action items provide direction on specific activities that organizations and residents in City of Milwaukie can undertake to reduce risk and prevent loss from wildfire events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

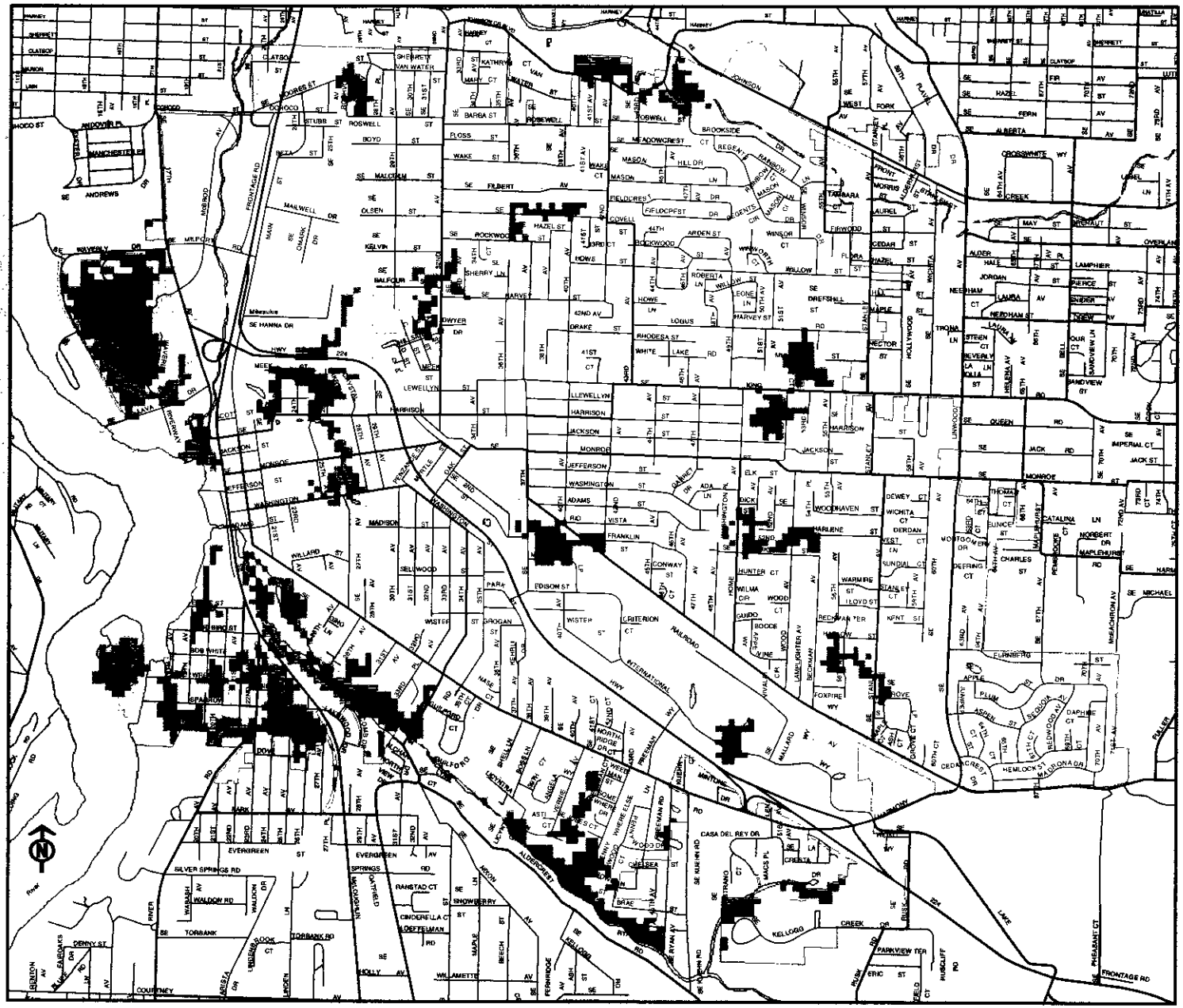
ST-WF#1: Inventory and map alternative firefighting water sources and encourage the development of additional sources.

Ideas for Implementation:

- Identify alternative water sources such as ponds and reservoirs, and partner with owners to access this resource during emergencies.

Coordinating Organization:	Clackamas Fire District One
Timeline:	1-2 Years
Plan Goals Addressed:	Protect Life and Property, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-WF#3

City of Milwaukie, Oregon
Wildfire Hazards
Map #10



Legend

- Milwaukie City Limits
- Waterways
- Moderate Fire Risk
- High Fire Risk

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Milwaukie, OR 97222
503 786.7498 (holmanc@ci.milwaukie.or.us).

0 550 1,100 2,200 3,300 4,400 Feet

Severe Storms: Wind and Winter

Severe Storm Profile

The historical severe wind and winter storm events have been described in the county plan, and are applicable to City of Milwaukie. As such, the events will not be repeated here.

The probability of wildfire events in Milwaukie was determined using scientific data, historical occurrences, and local knowledge. The probability of wildfire in Milwaukie is described in Chapter Five.

Severe Storm Hazard Assessment:

Hazard Identification

The severe weather hazard is difficult to illustrate cartographically. However, the City of Milwaukie has developed a map denoting regular sanding routes, which represents those areas that require resources to reduce the effect of the sever storm hazard. However, the sanding routes map (Map 8) do not accurately portray the geographic extent of the severer storm in Milwaukie, as the entire City would be affected by large-scale storms event.

Vulnerability Assessment

The City of Milwaukie has identified 10.2 miles of streets and roadways that would be sanded during severe weather. The City has not done a study on actual number of individuals or property that can be affected during a severe winter storm. Severe storms can bring power outages and cause transportation and economic disruptions. Specific problems for residences in the City are the number of electrical wires; trees and tree limbs that come down during severe storms that cause both major and minor property damage as well as are a threat to life. Downed wires and trees can make accessibility to residences by Police and Fire difficult.

Risk Analysis

Due to insufficient data, Milwaukie is unable to perform a quantitative risk assessment at this time. The City has addressed this issue in the action items, and will be completing a risk assessment as data and resources become available.

Existing Severe Storm Mitigation Activities

The City has designated sanding routes. All new subdivision development is required to place telephone, cable and power lines underground. New single lot development is required to have service lines from the street to the home underground.

Severe Storm Mitigation Action Items

The severe winter storm mitigation action items provide direction on specific activities that organizations and residents in Milwaukieundertake to reduce risk and prevent loss from severe storm events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

LT-SS #1: Attain funding to bury power lines subject to frequent failures to reduce power outages from the windstorm and severe winter storm hazard where possible.

Ideas for Implementation:

- Partner with PGE to continue hazardous tree inventory and mitigation programs; and
- Ensure that there are back up underground lines to major businesses & employers.

Coordinating Organization:	Public Works
Timeline:	3-5 Years
Plan Goals Addressed:	Protect Life and Property, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-MH#5; ST-WS#1, LT-WS#2

City of Milwaukie, Oregon
Severe Storm Sanding Routes
Map #9

Legend

- Milwaukie City Limits
- Waterways
- Sanding Routes

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Craig Holmes, GIS Coordinator
3200 SE Harrison Street
Milwaukie, OR 97222
503.786.7498 (holmesc@ci.milwaukie.or.us)

0 550 1,100 2,200 3,300 4,400 Feet

Earthquake

Earthquake Profile

The historical earthquake events have been described in the county plan, and are applicable to City of Milwaukie. As such, the events will not be repeated here.

The probability of earthquake events in Milwaukie was determined using scientific data, historical occurrences, and local knowledge. The probability of earthquake in Milwaukie is described in Chapter Five.

Earthquake Hazard Assessment

Hazard Identification

The geographic extent of the earthquake hazard in Milwaukie was illustrated using data derived from DOGAMI, and shows the relative earthquake hazard. The relative hazards were determined by slope, soils, and bedrock characteristics. The original dataset shows the hazards in four relative hazard zones, and the City broke earthquake hazard information into two categories, moderate and severe. The data is reflected on Map 11.

Vulnerability Assessment

The City identifies critical features affected in Table 4-4. There is 1% of the critical features effected under the severe category that includes 5 bridges, 1 city building and one fire station. The moderate category includes 1 bridge, 1 city building, 1 school and totals less than 1% of the City's area. Total area affected by tax lot is 29% under the moderate risk category and 12% under the high-risk category as indicated in Table 4-5. Critical streets affected totals 12.4 miles.

The area vulnerable from earthquake is larger than from any other hazard identified and potentially would produce more damage to property and life although degree of damage is clearly related to degree an earthquake is felt. Older buildings and the sewer system in the City are most vulnerable. Earthquakes shift soil that could cause landslides. Transportation routes and economics within the City can also be affected. Demand on resources such as Police, Fire and Public Works would also be impacted.

Table 4-4. Critical Features Affected

Category	Lot	Acres	Value
Moderate	2	18.78	$7,622,970
Severe	2	31.78	$3,356,168

Table 4-5. Tax Lots Affected

Category	Lot	Acres	Value
Moderate	1959	904	$551,246,971
Severe	338	371	$207,371,391

Risk Analysis

The County Plan provides a quantitative analysis of nine potential earthquake scenarios for the county. This analysis includes an estimation of fatalities, direct damage losses number of buildings in complete damage state, and number of people requiring shelter. Milwaukie does not have the resources to conduct a local risk assessment for the earthquake analysis, so the data reported in the county plan is the best quantitative assessment for the earthquake hazard in Milwaukie.

Existing Earthquake Mitigation Activities

City of Milwaukie Codes

Milwaukie Comprehensive Plan, Chapter 3 Environmental and Natural Resources (Ord 1666)

GOAL STATEMENT: To prohibit development that would be subject to damage or loss of life from occurring in known areas of natural disasters and hazards without appropriate safeguards.

Milwaukie's future role will primarily be as a residential community with considerable employment opportunities. This future, however, is not incompatible with the conservation of the City's remaining natural resources of land, air, water, and the natural environment. The wise use and management of these resources is particularly important in Milwaukie because the City is almost completely developed and few areas remain in a natural state. The protection of these natural resources is essential if residents are to experience the pleasures and amenities, which can only be enjoyed when nature is close at hand. The Plan elements which address these issues include:

- Natural Hazards Element
- Historic Resources Element
- Open Spaces, Scenic Areas, and Natural Resources Element
- Agricultural and Forest Lands Element
- Air, Water and Land Resources Quality Element

Policies in each of these elements, as well as the technical studies and inventories documented in the Resources and Environment, Parks and Open Space, Land Use and Transportation working papers, and the Neighborhood Blockwalk, comply with Statewide Planning Goals 3, 4, 5, 6, and 7 (reference Oregon Administrative Rules 660, Division 15).

Municipal Code Chapter 16.12 Seismic Conditions (Ord 1439)

Section 16.12.020 Building requirements.
Construction of new commercial, industrial and multifamily structures shall conform to the requirements of the Oregon Structural Specialty Code requirements for Seismic Zone 3.

Construction of single-family residences and duplexes shall conform to the requirements of the Oregon One And Two Family Dwelling Specialty Code for Seismic Category D1

The public works director through the building inspector shall ensure compliance with the requirements of this chapter. Plans submitted with applications for building permits shall be reviewed for compliance with the requirements of this chapter.

Earthquake Mitigation Action Items

The earthquake mitigation action items provide direction on specific activities that organizations and residents in the City of Milwaukie can undertake to reduce risk and prevent loss from earthquake events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

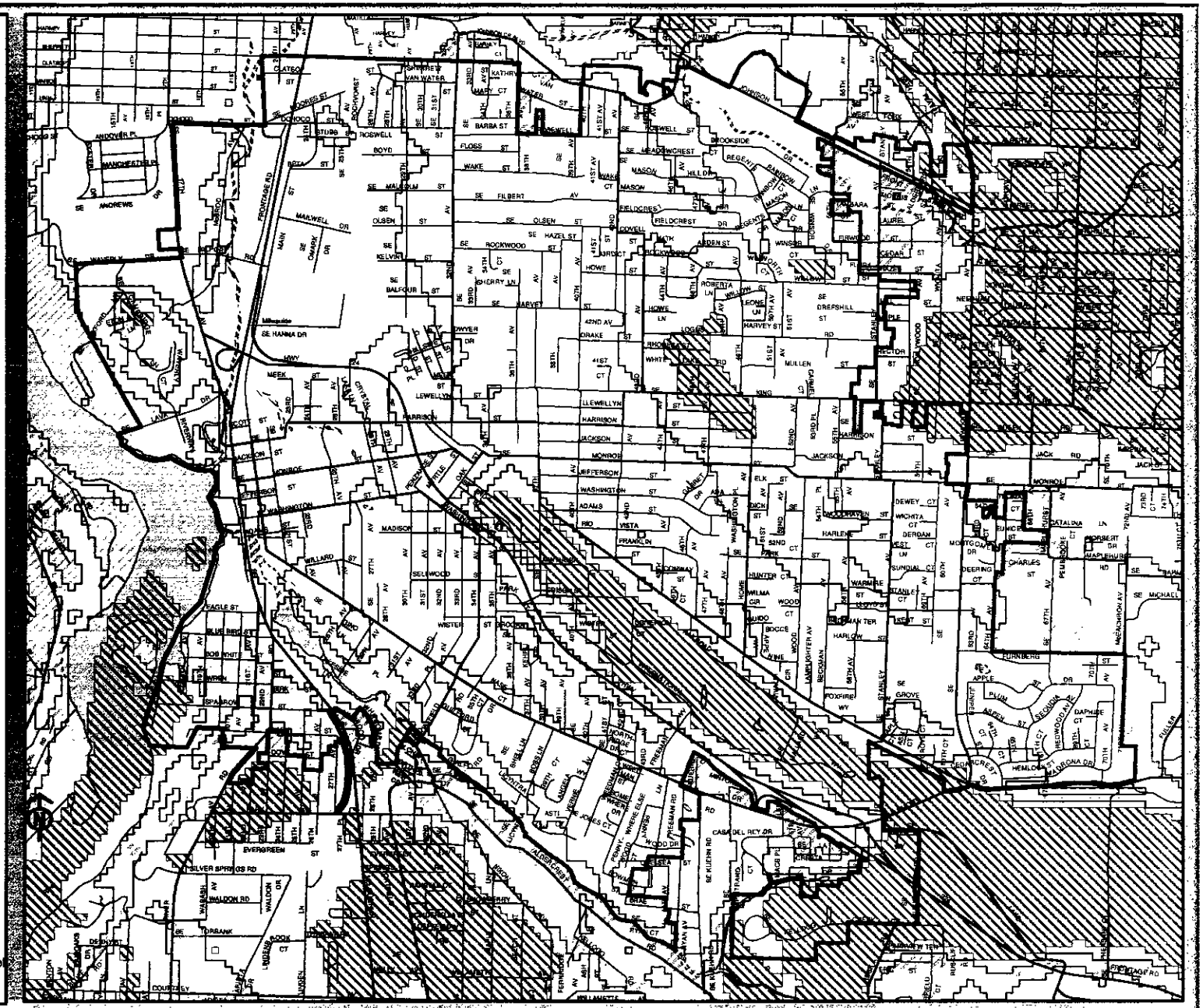
LT-EQ#1: Conduct seismic evaluations on identified critical/essential facilities & infrastructure for implementing appropriate structural and non-structural mitigation strategies.

Ideas for Implementation:

- Attain funding to perform evaluations;
- Prioritize seismic upgrades based on criticality of need and population served.

Coordinating Organization:	Facilities
Timeline:	3-5 Years
Plan Goals Addressed:	Protect Life and Property, Emergency Services, Partnerships and Implementation
County Action Items Addressed:	LT-EQ#3 & LT-EQ#4

City of Milwaukie, Oregon
Earthquake Hazards
Map #11



Legend

- High Quake Hazard
- Moderate Quake Hazard
- Medium Quake Hazard
- Low Earthquake Hazard
- Waterways
- Milwaukie City Limits

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Craig Holman, GIS Coordinator
3200 SE Harrison Street
Milwaukie, OR 97222
503.786.7498 (holmanc@ci.milwaukie.or.us).

0 600 1,200 2,400 3,600 4,800 Feet

Volcanic Eruption

Volcanic Eruption Profile

The historical volcanic eruption events have been described in the county plan, and are applicable to Milwaukie. As such, the events will not be repeated here.

The probability of volcanic eruptions in Milwaukie was determined using scientific data, historical occurrences, and local knowledge. The probability of volcanic eruptions in Milwaukie is described in Chapter Five.

Volcanic Eruption Hazard Assessment

The hazard assessment in the Clackamas County Natural Hazards Mitigation Plan best describes the volcano hazards for the Milwaukie area. As such, the information will not be repeated here.

Existing Volcanic Eruption Mitigation Activities

The existing volcanic hazard mitigation activities are conducted at the County, regional, state, and federal levels and are described in the Clackamas County Natural Hazards Mitigation Plan. As such, the information will not be repeated here.

Volcanic Eruption Mitigation Action Items

Milwaukie will not be undertaking any local volcanic eruption mitigation activities, but will partner with the county in the implementation of identified mitigation strategies.

Multi-Hazard

Multi-Hazard Action Items (MH)

Multi-hazard action items are those activities that pertain to more than one of the six hazards in the mitigation plan: flood, landslide, wildfire, severe storm: wind and winter, earthquake, and volcanic eruption.

ST-MH#1: Improve and attain resources and equipment essential for responding to and recovering from disasters.

Ideas for Implementation:

- Contact local facilities that have large trucks that could serve as water tenders in emergency situations, or purchase water tenders for the city;
- Partner with national guard, local businesses, contractors and developers;
- Attain funding to purchase one fixed generator for the Lava Drive pump station;
- Attain funding to purchase one 250 Kw portable generator and transfer system for city hall and shelter sites; and
- Attain funding to purchase one storage trailer for emergency supplies.

Coordinating Organization:	Public Works
Timeline:	1-2 Years
Plan Goals Addressed:	Protect Life and Property, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-MH #2; ST-MH #5

ST-MH#2: Ensure that there are adequate shelter facilities in hazard-free zones to serve Milwaukie residents.

Ideas for Implementation:

- Identify and contact potential shelter sites to see if there is an interest in becoming a designated Red Cross shelter site.
- Contact Red Cross Shelter Sites to renew and maintain agreements.

Coordinating Organization:	Hazard Mitigation Advisory Committee
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Partnerships and Implementation
County Action Items Addressed:	ST-MH #5

ST- MH#3: Improve the hazard assessment in the Milwaukie Natural Hazards Mitigation Plan.

Ideas for Implementation:

- Attain funding to gather more localized hazard data to illustrate the geographic extent of natural hazards in Milwaukie;
- Update vulnerability assessment as new development occurs; and

- Contract with the County or other service provider to conduct a risk analysis for Milwaukie.

Coordinating Organization:	City Geographic Information Systems
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-MH #2; LT-WF #1

ST-MH#4: Improve network of communications during a disaster.

Ideas for Implementation:

- Recruit and provide training for Amateur Radio Operators;
- Address 800 MHz communication deficiencies;
- Improve communication between school officials and parents by updating school emergency contact information for parents/children every 3 months;
- Supply schools with communication equipment necessary for emergency situations;
- Post bulletins on the internet for school emergency info, community bulletin board on cable, etc.; and
- Utilize county network for the Education Service District

Coordinating Organization:	Hazard Mitigation Advisory Committee
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Partnerships and Implementation
County Action Items Addressed:	LT-MH#1

ST-MH#5: Develop, enhance, and implement education programs designed to reduce the losses from natural hazards.

Ideas for Implementation:

- Gather hazard related information and public information materials, and disseminate to public through local publications;
- Identify property owners in the hazard zones, and conduct a target mailing to disseminate hazard information;
- Conduct public education as hazard seasons approach;
- Target neighborhood associations for public education and outreach;
- Add emergency preparedness and response curriculum to school programs; and
- Develop public education flyers as billing inserts.

Coordinating Organization:	Hazard Mitigation Advisory Committee
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items	

Addressed: LT-MH#2

ST-MH#6: Promote CERT program activity in the area and recruit new members for training.

Ideas for Implementation

- Provide information about the CERT program to Milwaukie residents through local publications, neighborhood organizations, churches, etc.;
- Identify needs of local CERT programs and attain funding to purchase CERT supplies.

Coordinating Organization:	Clackamas Fire District One
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Partnerships and Implementation
County Action Items Addressed:	LT-MH#1; LT-MH#2

ST-MH#7: Develop and enhance strategies for debris management for all hazards.

Ideas for Implementation:

- Develop a Debris Management Plan that looks at each need for each hazard inventory of equipment needed;
- Develop an Inter Governmental Agreement with other jurisdictions, businesses, tree service outfits to share equipment and manage debris during disasters.

Coordinating Organization:	Public Works
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-SWS #1; ST-WS #2; ST-MH #2

ST-MH#8: Integrate the goals and action items from the Milwaukie Natural Hazard Mitigation Plan into existing regulatory documents and programs, where appropriate.

Ideas for Implementation:

- Use the mitigation plan to help the City's Comprehensive Land Use Plan meet State Land Use Planning Goal 7, designed to protect life and property from natural disasters and hazards through planning strategies that restrict development in areas of known hazards;
- Integrate the city's mitigation plan into current capital improvement plans to ensure that development does not encroach on known hazard areas; and
- Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant at the state level.

Coordinating Organization:	Hazard Mitigation Advisory Committee
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-MH #1

LT-MH#1: Improve vegetation management throughout the city.

Ideas for Implementation:

- Partner with Union Pacific to maintain vegetation along the railroad;
- Encourage planting of native species along the waterways;
- Identify interface zones and target them for public education for defensible space, landscaping techniques, etc.

Coordinating Organization:	Hazard Mitigation Advisory Committee
Timeline:	Ongoing
Plan Goals Addressed:	Protect Life and Property, Public Awareness, Emergency Services, Natural Systems, Partnerships and Implementation
County Action Items Addressed:	ST-WS#2 & ST-WS#1

Section 5: Mitigation Planning Priority System

Action Item Prioritization Methodology

The Hazard Mitigation Advisory Committee (HMAC) has prioritized the identified mitigation strategies in order to better allocate resources for plan implementation. The criteria used for prioritizing the action items are the plan goals, hazards addressed, criticality of need, population served, and likelihood of success.

Although this methodology provides a guide for the HMAC in terms of implementation, the HMAC has the option to implement any of the action items at any time. This option to consider all action items for implementation allows the committee to consider mitigation strategies as new situations arise, such as capitalizing on funding sources that could pertain to an action item that is not the highest priority.

Step 1: Prioritize Plan Goals

The Milwaukie mitigation goals including Protect Life and Property, Public Awareness, Emergency Services, Natural Systems, and Partnerships and Implementation were considered during each phase of the mitigation planning process. As the mitigation action items were developed, the HMAC identified which plan goals were addressed by each action item. The HMAC ranked the plan goals to determine the priorities for Milwaukie, and each goal was given a score of one point to five points, in ascending order. The points for the plan goals were then totaled for each action item. The prioritized plan goals are as follows:

5 Points: Protect Life and Property
4 Points: Emergency Services
3 Points: Public Awareness
2 Points: Partnerships and Implementation
1 Point: Natural Systems

Step 2: Prioritize Hazards

The natural hazards addressed by the Milwaukie Natural Hazard Mitigation Plan were prioritized using a FEMA-accepted hazard analysis methodology for Emergency Operations Plans. This methodology considers the history of the hazard, the vulnerability to the hazard, the maximum threat of the hazard (worst case scenario), and the probability of the hazard. Each of these criteria is weighted, and the final score is used for prioritizing the hazards. The following is a full description of the methodology used:

Categories Considered:

HISTORY:	The record of occurrences of previous major emergencies or disasters (weight factor = 2).
LOW	0 - 1 event per 100 years
MEDIUM	2 - 3 events per 100 years

HIGH	4 + events per 100 years

VULNERABILITY: The percentage of population and property likely to be affected (weight factor = 5).

LOW	< 1% affected
MEDIUM	1 - 10% affected
HIGH	> 10% affected

MAXIMUM THREAT: The maximum percentage of population and property that could be impacted under a worst-case scenario (weight factor = 10).

LOW	< 5% affected
MEDIUM	5 - 25% affected
HIGH	> 25% affected

PROBABILITY: The likelihood of occurrence within a specified period of time (weight factor = 7).

LOW	> 1 chance per 100 years
MEDIUM	> 1 chance per 50 years
HIGH	> 1 chance per 10 years

Severity Ratings:

LOW	= 1 - 3 points
MEDIUM	= 4 - 6 points
HIGH	= 7 - 10 points

Although the methodology used allows the Milwaukie to quantify and compare natural hazards, it is flawed in that it compares hazards with high probabilities and relatively low consequences with hazards that have low probabilities and high consequences. The HMAC took this into consideration during the prioritization process, and the results are shown in table 5-1. The hazards were given a score of one point to eight points, in ascending order of importance. The Multi-Hazard action items were given the highest score (8), as they address more than one hazard. The points for the hazard scores were then totaled for each action item.

Table 5-1 Natural Hazard Prioritization Score

Hazard	History	Vulnerability	Max. Threat	Probability	Total	Hazard Score
Multi-Hazard	-	-	-	-	-	8
Severe Winter Storm	18	45	90	63	216	7
Earthquake	14	35	100	49	198	6
Windstorm	14	35	70	49	168	5
Flood	20	15	60	35	130	4
Wildfire	14	10	30	70	124	3
Landslide	2	5	10	7	24	2
Volcano	2	35	40	35	112	1

Step 3: Incorporate Criticality of Need, Large Number of Population Served, Likelihood of Success

The final score for each action item was computed by summing the plan goal score and the hazard score. The committee then considered the criticality of need, the number of population served, and the likelihood of success. The HMAC was given an opportunity to add five points to the action item that has a high criticality of need, four points were given to the action item that has a high probability of success, and three points were given to an action item that serves a large number of the population. The prioritized action items are as follows:

Table 5-2. Action Item Prioritization Score

Existing Resources		*Funding Required*	
Short-Term Multi-Hazard #3	29	Short-Term Multi-Hazard #7	34
Short-Term Multi-Hazard #6	27	Long-Term Earthquake #1	32
Short-Term Multi-Hazard #2	22	Short-Term Multi-Hazard #5	31
Short-Term Multi-Hazard #4	22	Short-Term Wildfire #2	22
Short-Term Multi-Hazard #1	17	Long-Term Wildfire #1	21
Short-Term Landslide #2	15	Short-Term Flood #1	21
		Long Term Multi-Hazard #1	19
		Short-Term Wildfire #1	17
		Long-Term Flood #1	16
		Short-Term Flood #2	15
		Short-Term Landslide #1	15

Section 6:
Resource Directory

Clackamas County Resource Directory from the County's Natural Hazard Plan is considered to be a very comprehensive resource listing. The City of Milwaukie has chosen to use their directory but has modified it to provide contact information for local agencies, organizations, and departments that may address natural hazard mitigation activities. This resource directory provides a listing of potential partners for action item Implementation. The City's Hazard Mitigation Advisory Committee will continue to add contact information for organizations as new partners are identified.

City of Milwaukie Resource Directory

Agency	Contact Information	Type of Assistance
Planning	Planning Director Phone: (503) 786-7652 Fax: (503) 774-8236	Plan Implementation
Structural Safety	Building Official Phone: (503) 786-6711 Fax: (503) 774-8236	Plan Implementation
Engineering	Engineering Director Phone: (503) 786-7601 Fax: (503) 774-8236	Plan Implementation
Sewer	Operations Supervisor Phone: (503) 786-7615 Fax: (503) 774-8236	Plan Implementation
Storm Water	Operations Supervisor Phone: (503) 786-7615 Fax: (503) 774-8236	Plan Implementation
Streets	Operations Supervisor Phone: (503) 786-7617 Fax: (503) 774-8236	Transportation
Water	Operations Supervisor Phone: (503) 786-7616 Fax: (503) 774-8236	Plan Implementation
Risk/EOC	Risk Manager Phone: (503) 786-7504 Fax: (503) 653-2444	Plan Implementation
City of Milwaukie Pilot Monthly Newsletter	10722 SE Main St Milwaukie, OR 972223 Phone: (503) 786-7503 Fax: (503) 653-2444 Email: wheeler@ci.milwaukie.or.us	Public Outreach

Agency	*Contact Information*	*Type of Assistance*
Neighborhood Services	Program Specialist Phone: (503) 786-7568 Fax: (503) 653-2444	Public Outreach
Facilities	Facilities Manager Phone: (503) 786-7614 Fax: 786-7634	Plan Implementation
Police	Chief Phone: (503) 786-7405 Fax: (503) 786-7426 And Neighborhood Land Use	
Historic Milwaukie Committees	Island Station Lake Road Lewelling Linwood **See Neighbor hood Services or City COMContacts for contact information*	Plan Implementation
American Red Cross	Regional Representative (503) 280-0205	The Red cross provides shelters & supplies during a disaster. They will be able to provide criteria for any additional shelter sites.
Chamber of Commerce	North Clackamas Chamber of Commerce 7740 SE Harmony Rd Milwaukie, OR 97222 Phone: (503) 654-7777 Fax: (503) 653-9575 Email: yourchamber.com	This organization could be important in bringing in local businesses as partners.
Local Businesses	Oregon Cutting System Blount 4909 SE International Way Milwaukie, OR 972222 Phone: (503) 653-8881 Precision Cast Parts 13309 SE 84th Milwaukie, OR 97015 (503) 531-5899	These companies are among Milwaukie's larger employers.