City of Molalla

Addendum to the Clackamas County Natural Hazards Mitigation Plan

Prepared for
City of Molalla
117 N. Molalla Ave
Molalla, OR 97038

In cooperation with

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

Adopted by City Council on Date, 2010

2.4 Housing

Housing type and age are important factors in mitigation planning. Certain housing types tend to be less disaster resistant and warrant special attention: mobile homes, for example, are generally more prone to wind and water damage than standard stick-built homes. Generally the older the home is, the greater the risk of damage from natural disasters. This is because stricter building codes have been developed following improved scientific understanding of plate tectonics and earthquake risk. For example, structures built after the late 1960s in the Northwest and California use earthquake resistant designs and construction techniques. In addition, FEMA began assisting communities with floodplain mapping during the 1970s, and communities developed ordinances that required homes in the floodplain to be elevated to one foot above Base Flood Elevation.

In 2000, Molalla had 2,027 housing units, 1,948 of which were occupied. Of the occupied housing hunts, 67% (1,306 units) were owner-occupied and 33% (642 units) were renter-occupied.[xi] Molalla also has a large number of older housing structures that may be vulnerable to earthquakes. Roughly half of all housing units were built before 1980 when more stringent seismic codes were put into place (see Table 2.3 below). Additionally, mobile homes represent 11.8% of Molalla's housing units (see Table 2.4 below)**.**

Table 2.3 Age of Housing Structures

Year Built	Number Structures	Percent of Structures
1990 to March 2000	852	41.5%
1980 to 1989	183	8.9%
1970 to 1979	408	19.9%
1960 to 1969	200	9.7%
1940 to 1959	218	10.6%
1939 and earlier	191	9.3%

Source: US Census, 2000

Table 2.4 Housing by Type, 2000

Housing Type	Total Structures	Percent of Structures
1-unit, detached	1,242	60.5%
1-unit, attached	62	3%
2 units	72	3.5%
3 or 4 units	178	8.7%
5 to 9 units	26	1.3%
10 to 19 units	34	1.7%
20 or more units	179	8.7%
Mobile home	242	11.8%
Boat, RV, van, etc.	17	0.8%
Total	**2,052**	**100%**

Source: US Census 2000

2.5 Employment and Economics

Historically, Molalla's economy focused on forestry and farming. More recently, new businesses are discovering the advantages of the city's close proximity to Oregon's two largest metropolitan areas, Portland and Salem. Table 2.5 shows employment by major industry for the City of Molalla. Manufacturing is Molalla's largest employment sector. Currently, a significant portion of the land available for industrial development in Clackamas County is located in the Molalla area.[xii]

Table 2.5 City of Molalla Employment by Major Industry, 2000

Industry	Total Persons Employed	Percent
Manufacturing	468	19.2%
Educational, health and social services	455	18.7%
Retail trade	240	9.9%
Construction	237	9.7%
Arts, entertainment, recreation, accommodation and food services	178	7.3%
Transportation and warehousing, and utilities	154	6.3%
Other services (except public administration)	138	5.7%
Public administration	118	4.9%
Finance, insurance, real estate, and rental and leasing	117	4.8%
Wholesale trade	116	4.8%
Professional, scientific, management, administrative, and waste management services	111	4.6%
Agriculture, forestry, fishing and hunting, and mining	72	3%
Information	28	1.2%
Civilian employed population 16 years and over	**2,432**	**100%**

Source: US Census, 2000

The five largest employers in Molalla include: Molalla School District, Floragon Forest Products, Safeway Stores, Scotts Hyponex Corporation, and Northwest Polymers.[xiii]

2.6 Transportation and Commuting Patterns

Molalla is roughly 29 miles from Portland, and is connected to surrounding communities by two state highways that run through the downtown area. Highway 211 runs east-west and connects Molalla to the communities of Cedardale, Colton, Elwood, and Woodburn. Additionally, Highway 211 connects Molalla to Interstate 5 and 99E, the major north-south routes along the west coast. Interstate 5 connects Molalla to both Portland and Salem.

Highway 213 runs north-south through Molalla and connects the city to both Silverton and Oregon City. Additionally, Highway 213 connects Molalla to the smaller adjacent unincorporated communities of Liberal and Mulino (north) as well as Marquan and Scotts Mills (south.)

Transportation is an important consideration when planning for emergency service provisions. Growth within the city will put pressure on the major and minor roads, especially if the main mode of travel is by single occupancy vehicles. How people travel to work can help predict the amount of traffic congestion and the potential for accidents. Table 2.6 below shows the different methods Molalla residents use to travel to work. The transportation map shown below on page 20 highlights the major transportation networks that run through Molalla.

The majority of Molalla's working population, 83.3%, travels in single occupancy vehicles to work. Molalla's proximity to Portland and Salem has enabled residents to live in town and work elsewhere. The average commute time for Molalla residents is 31.9 minutes.

Table 2.6 Transportation Mode Used to Commute to Work, 2000

Mode of Commute	Number of Residents	% of Residents
Car, truck, or van -- drove alone	1998	83.3%
Car, truck, or van -- carpooled	190	7.9%
Walked	89	3.7%
Worked at home	71	3.0%
Other means	44	1.8%
Public transportation (including taxicab)	8	0.3%
Total	**2400**	**100.0%**

Source: US Census Bureau, "Journey to Work: 2000"

R. 2 E.

T. 4 S.

T. 5 S.

Molalla

Prairie

Blackmans Corner

NO. 160

NO. 161

213

211

OREGON

PACIFIC R.R.

BARNARDS RD.

MOLALLA AVE.

SPRAGUE RD.

MOLALLA FOREST RD.

CAYUSE CT.

APPALOOSA DR.

VICK RD.

MCCOWN RD.

VAUGHN RD.

SANDERS CEMETERY

Creamery Creek

Molalla Prairie Irrigation Co. Canal

M.P. 15.34

M.P. 15.88

M.P. 12.06

M.P. 12.10

M.P. 12.25

M.P. 13.61

M.P. 13.43

SOUTH HWY.

WOODBURN - ESTACADA HWY.

CASCADE HWY.

MOUNTAIN VIEW LN.

HOMESTEAD PL.

MEADOW LN.

MEADOWLARK DR.

MEADOWLAWN PL.

JUNE DR.

KELSEY LP.

BURGHARDT (LOCATED LINE)

BOARDWALK AVE. (PVT.)

TOLIVER RD.

LYNN LN.

HEINTZ AVE.

MAIN ST.

LOWE AVE.

5TH (LOCATED LINE) ST.

SECTION

FOREST RD.

GOODTIME RD.

KYLLO WY.

COMMERCIAL PK.

JACKSON CEMETERY

MOLALLA RIVER MIDDLE SCHOOL

MOLALLA ELEM. SCHOOL

CITY SHOPS

MOLALLA HIGH SCHOOL

CITY PARK

FIRE HALL

KENNEL

EAST CLARK PARK

BUCKEROO RODEO GROUNDS

U.S. FOREST SERVICE

SHIRLEY ST.

FEYRER PARK RD.

CLAIM RD.

ADAMS RD.

WARRICK RD.

SAWTELL RD.

WILHOIT RD.

EVES RD.

KRUPICA WY.

RACHEL LARKIN RD.

BARBARA WAY

Bear Creek

Kaiser Creek

Log Pond

Pond

LEGEND

FUNCTIONAL CLASSIFICATION

STATE HWY / OTHER JURISDICTION

FOR FURTHER FUNCTIONAL CLASSIFICATION INFORMATION, CONTACT ODOT REGION OFFICE.

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- URBAN COLLECTOR/ RURAL MAJOR COLLECTOR
- MINOR COLLECTOR
- LOCAL ROAD
- ORE. ROUTE - US. ROUTE - INTERSTATE ROUTE
- NATIONAL HIGHWAY SYSTEM ROUTE
- CITY LIMIT
- URBAN GROWTH BOUNDARY
- AMTRAK RAIL PASSENGER STATION
- GRAVEL PIT - QUARRY - ODOT STOCKPILE

- PUBLIC BUILDING
- COURTHOUSE
- HOSPITAL
- CITY HALL
- ARMORY
- POST OFFICE
- SCHOOL
- LIBRARY
- SAFETY REST AREA
- WEIGH STATION
- PARK & RIDE LOCATION
- INTERCITY - CITY TRANSIT
- COMMERCIAL - GENERAL AVIATION
- AMTRAK STOP - PORT FACILITY

Published by

ODOT GIS

NORTH

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SCALE

0 300 600 1,200 1,800 Feet

0 200 400 800 1,200 Meters

MOLALLA
Population 6,830

T. 4-5 S. R. 2 E. W.M.

OREGON TRANSPORTATION MAP

Showing Functional Classification of Roads
City of

MOLALLA

PARK & RIDE | INTERBUS | AMTRAK

AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

CLACKAMAS COUNTY
2008

PORT | AIRPORT | COMM. AIR

AVAILABLE TRANSPORTATION SERVICES SHOWN WITH YELLOW BACKGROUND

Copies Available from the Oregon Department of Transportation, Geographic Information Services Unit, Mill Creek Office Building, 555 13th St. NE, Salem, Oregon 97301, (503) 986-3154, http://www.oregon.gov/ODOT/TD/TDATA/gis/odotmaps.shtml
Population numbers are based on current Oregon Population Report, College of Urban and Public Affairs, Portland State University, http://pdx.edu/prc

2.7 Historic and Cultural Resources

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important. The following historic buildings can be found within the City of Molalla.

- Dibble House, built 1859, a three quarter New-England saltbox, is listed in the National Historic Register
- The Vonder Ahe House, built 1865, was moved to its present site in 1973

Both structures are located on the same property on Molalla Avenue between Metzler Avenue and 7th Street. The half-acre site and structures are owned and maintained by the Molalla Historical Society.[xiv]

Throughout the year, Molalla celebrates its pioneering heritage with many community events that are typical of small towns such as the Fourth of July and Christmas parades. Additionally, the Molalla Historical Society hosts two events in late winter and early spring and the Molalla Buckeroo Grounds host events all summer long, including the Buckeroo PRCA Rodeo. The final big annual community event, the Apple Festival, takes place during early October.[xv]

2.8 Existing Plans and Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from local residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs. [xvi]

The City of Molalla's Natural Hazards Mitigation Plan Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the Natural Hazards Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the plan. Implementing the plan's action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the city's resources. The following list documents the plans and policies already in place in the City of Molalla

Plan: Comprehensive Plan
Date of Last Revision: February 2009 DRAFT
Author/Owner: Winter Brook Community Resource Planning, City of Molalla
Description: Establishes the city's authority to plan for and deal with issues related to the future development of Molalla.
Relation to Natural Hazard Mitigation: Inventories hazards and degree of potential disasters; defines goal as "to protect life and property within the planning area from

natural disasters and hazards;" defines land with slopes of 25% or greater and land in the 100 year floodplain as unbuildable, and describes a completed emergency network plan with Clackamas County.

Plan: Natural Features Report
Date of Last Revision: March 2008
Author/Owner: Winter Brook Community Resource Planning, City of Molalla
Description: The report is an inventory of natural resources within the city limits. The report includes wetlands, riparian corridors, wildlife habitats, groundwater resources, and Oregon scenic waterways.
Relation to Natural Hazard Mitigation: The natural features report can inform the content of the natural hazards mitigation plan.

Plan: Parks and Recreation Master Plan
Date of Last Revision: November 2008
Author/Owner: City of Molalla
Description: The Parks & Recreation Master Plan identifies a vision for Molalla's park system, and presents recommendations for achieving that vision.
Relation to Natural Hazard Mitigation: Mitigation actions relating to parks should be consistent with goals and policies stated in the Parks and Recreation Master Plan. Likewise, any mitigation actions that pertain to parks should be integrated into the Parks and Recreation Master Plan.

Plan: Transportation Master Plan
Date of Last Revision: June 2001
Author/Owner: Kittelson & Associates, Inc., City of Molalla
Description: Intended to guide the management and development of appropriate transportation facilities within Molalla while incorporating the community's vision of future land use by addressing the potential for infill and redevelopment strategies.
Relation to Natural Hazard Mitigation: Mitigation actions relating to improving transportation facilities should be linked with goals and policies found in the Transportation System Plan. Likewise, any mitigation activities that relate to transportation facilities should be tied to and/or integrated within the Transportation System Plan.

Plan: Molalla Development Code
Date of Last Revision: 2006-2008
Author/Owner: City of Molalla
Description: Map of zoning districts, details standards of each zoning district and related review and amendment procedures. It is the primary implementation tool of the Comprehensive Plan. Development of natural areas is subject to the code interpretation process where authority is given to the Planning Commission to interpret the impact of the development (17.1.300, 19.8.200).
Relation to Natural Hazard Mitigation: The development code should reflect needs and issues related to development in hazardous areas.

Plan: Molalla Capital Improvement Program

Date of Last Revision:
Author/Owner: City of Molalla
Description: Identifies capital projects, provides a planning schedule, and outlines financing for the plan. It connects local government agencies to the comprehensive plan as well as adhering to annual budgets.
Relation to Natural Hazard Mitigation: Facility upgrades should incorporate retrofits that prevent damages from flooding, wind & winter storms, earthquakes, and other natural hazards.

Section 3:
Risk Assessment

The following hazards have been addressed in the Clackamas County Natural Hazards Mitigation Plan. The City of Molalla reviewed the county's plan on August 13th, 2009 and assessed how Molalla's risks vary from the risks facing the entire planning area.

3.1 Flood

The Clackamas County Natural Hazards Mitigation Plan adequately describes the causes and characteristics of flooding for the region, as well as the history of major flooding events through September 2007. Potential flood-related impacts are adequately described within the county's plan, and apply to the City of Molalla as well.

The City of Molalla regularly experiences urban flooding. This is primarily due to inadequate storm drain pipes, and culverts that are too small. Molalla also has clay soils, which means that the percolation rate is very slow, and the water table is very high. Additionally, the extent of flooding will vary depending on climatic conditions and precipitation levels.

Areas within Molalla that are frequently impacted by urban flooding events include: the intersection of South Cole and Main Street; East 3rd Street; Mathias Road south of 8th Street; areas south of 7th Street; and Highway 213 south of Toliver Road. Typically, roads are covered with water in urban flooding events, and water will occasionally overflow manholes in some parts of the city. Newer homes are built on higher ground to avoid flooding issues, and many older homes have pumps within their crawlspaces to avoid flood events.

Currently, the City of Molalla is a participant in the National Flood Insurance Program (NFIP).[xvii] The city's initial Flood Hazard Base Map was created on November 21, 1975. Additionally, the city's initial Flood Insurance Rate Map (FIRM) was created on June 17, 2008. Molalla is a "Non-Special Flood Hazard Area" (NSFHA), which means that the entire city is in a low-to-moderate risk flood zone. An NSFHA is not in any immediate danger from flooding caused by overflowing rivers or hard rains. As such, the purchase of flood insurance is not required. Structures within a NSFHA, however, are still at risk, and one out of four floods occurs in an NSFHA.[xviii]

Although Molalla's residents are not required to purchase flood insurance, the city has 8 policy-holders, with a total insurance value of $2,298,600.[xix] There have been 5 flood-insurance losses in Molalla, 4 of which have 'closed.' Total claim payments, as of April 30, 2009, are $110,943.17.[xx] Additionally, the city has had 2 repetitive flood losses, with total payments amounting to $16,732.28.[xxi]

The Molalla Planning Commission estimates a 'high' probability that flooding will occur in the city, meaning that at least one event is likely to occur within a 10-35 year period. The Planning Commission additionally estimates that the city has a 'moderate'

vulnerability to flooding, meaning 1-10% of the city's population and/or assets could be affected in a major flood event. Both ratings are in agreement with the county's probability and vulnerability estimates.

Existing Flood Mitigation Activities

The flood mitigation activities listed here include current mitigation programs and activities that are being implemented by Molalla agencies or organizations.

1) The Molalla Comprehensive Plan includes the following:
    a. In 2004, the city adopted a "local wetland inventory" (LWI) that describes and maps significant wetlands and streams within the 2006 Molalla urban growth boundary (UGB). Wetlands constitute significant natural resource areas in Molalla that warrant special use management consideration in order to preserve water quality, visual quality, and sensitive wildlife habitats. As such, Molalla developed water resource goals and policies. Careful management within and adjacent to these areas significantly increases public safety by controlling development in hazardous areas.
    b. Goal 7: Natural Hazards. The Comprehensive Plan addresses flooding (associated with the Molalla River). Natural Hazard Policy #4 states that land within the 100-year floodplain will be considered unbuildable for purposes of calculating residential density, and unsuitable for purposes of meeting employment needs. Limited development may be permitted consistent with the city's floodplain regulations.
2) Mapping and protection is required for 'significant vegetation' within the city's community design standards. The use of mature, native vegetation within developments is a preferred alternative to removal of vegetation and re-planting. Mature landscaping provides summer shade and wind breaks, controls erosion, and allows for water conservation due to larger plants having established root systems.
3) Molalla's community design standards require adequate storm drainage for all lots that are connected to the city's storm drainage system, and where storm drainage facilities exist at the lot or parcel line. Storm drainage facilities shall include suitable on-site detention facilities as required by the Director of Public Works. These facilities must be large enough to safely transport the anticipated volume of water generated both onsite and upstream.
4) Molalla has a Water Resources (WR) Overlay District that is intended to protect and enhance significant wetlands, stream corridors and floodplains identified in the Molalla Natural Features Inventory. Among several benefits of the overlay district, it limits development activity in designated riparian corridors, and prevents property damage during floods and storms.
5) Molalla has street sweeping once a week (which clears potential culvert-blocking debris), and leaf/debris pick up through garbage service.
6) The public works department cleans out drainage ditches and culverts once a month.
7) The city offers hazard mitigation training once a year for flood, fire, and earthquake. This training is open to the public and advertised through the Molalla Pioneer (newspaper) and email lists.
8) Molalla has a Water System Master Plan and Storm Water Master Plan. Neither is available electronically.

9) Building standards do not require developments to account for impervious surfaces, and address 25 year flood events, meaning detention requirements are much greater for new developments.

Flood Mitigation Action Items

The flood mitigation action items provide direction on specific activities that organizations and residents in Molalla 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.

Evaluate flooding risk in areas being considered for future growth.

Ideas for Implementation:

- Evaluate and map flood hazards in newly annexed areas.
- Conduct an assessment of the floodplain ordinances to ensure they reflect new flood hazards;
- Coordinate with the county to ensure that floodplain ordinances and NFIP regulations are maintained and enforced;
- As the community grows, continue to explore participation in the NFIP and/or CRS as needed.
- Request a Community Assistance Visit (CAV) for the purpose of assisting the community in implementing effective flood loss reduction measures if program deficiencies are discovered upon expansion.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department
External Partners: FEMA, DLCD, Clackamas County Planning Department
Timeline: Short term ongoing
Status: *Added during the 2009 plan development process.*

Obtain funding for implementing recommendations outlined in the Stormwater Master Plan.

Ideas for Implementation:

- Review all recommendations and determine priority for implementation;
- Identify funding sources to implement recommendations;
- Increase capacity of storm drain pipes and culverts throughout the city. Identify undersized culverts and pipes; prioritize construction projects; include culvert and pipe enhancement in the Capital Improvements Plan; and coordinate with the Oregon Department of Transportation for access to culverts along roadways (if applicable).

Coordinating Organization: Planning Commission
Internal Partners: Planning Department, Public Works
External Partners: ODOT, Clackamas County Water Environment Services
Timeline: Short term ongoing
Status: *Added during the 2009 plan development process.*

Minimize overall impervious cover, and disconnect impervious areas.

Minimizing overall impervious cover is a management recommendation within the city's Natural Features Report. Paved roadways, sidewalks, driveways and parking areas are the primary sources of impervious surface area. Impervious areas alter runoff and recharge values and site hydrology. On the other hand, maintaining pervious surfaces encourages surface water infiltration and groundwater recharge. There are several methods that can be used to reduce the total runoff volume from impervious surfaces. These include:

- Substitute pervious surfaces for impervious wherever possible.
- Utilize the minimum required width for streets and roads.
- Where appropriate, avoid the use of curb and gutter. Utilize vegetated open swales, preferably "engineered swales" with a permeable soil base.
- Minimize excess parking space construction; utilize pervious pavers in low-use areas.
- Minimize cul-de-sac diameters, use doughnut cul-de-sacs, or use alternative turnarounds.
- Minimize compaction of the landscape. In areas where soils will become compacted due to construction equipment, specify that the soils will be "disked" prior to seeding, and amended with loam or sand to increase absorption capacity.
- Require developers to design and construct drainage systems that cannot release more water from the new development than was released before the construction.
- Preserve natural vegetative cover.
- Disconnect streets and parking areas from closed culverts.
- Increase the time travel of water off of the site.
- Revegetate all cleared and graded areas.
- Provide sheet flow into natural open space.
- Protect wetlands and stream corridors.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department, Public Works
External Partners: Clackamas County Water Environment Services
Timeline: Long term ongoing
Status: *Added during the 2009 plan development process.*

LT-FL#2: Continue compliance with the National Flood Insurance Program through the enforcement of local floodplain management ordinances.

Ideas for Implementation:

- Conduct an assessment of the floodplain ordinances to ensure they reflect current flood hazards and situations, and meet NFIP requirements.
- Continue to enforce local floodplain management ordinances, as well as programs/policies that help to mitigate flooding issues within the city.
- Coordinate with the county to ensure that floodplain ordinances and NFIP regulations are maintained and enforced.

Coordinating Organization: Planning Department
Timeline: Ongoing
Status: *Added during the 2009 plan update.* This will be an ongoing action.

3.2 Landslide

The Clackamas County Natural Hazards Mitigation Plan adequately describes the causes and characteristics of landslides in the region. Additionally, the county's plan describes locations that are typically at risk of landslide or debris flow, as well as the extent of landslides in varying conditions.

The City of Molalla has a relatively flat topography and for the most part, and slope hazards are shown within the Molalla Buildable Lands Inventory. Slopes of 25% or greater are subject to slide and erosion hazards, and are considered "unbuildable" for the purposes of meeting the city's future housing needs.[xxii] The city requires geological analysis on slopes of 25% or greater before extensive tree removal, excavation, or construction occurs. Currently, areas within Molalla's 2006 Urban Growth Boundary (UGB) do not have steep slopes, except for areas along stream embankments. The city is currently looking at a boundary extension, however, which may include areas with steeper slopes. An escarpment south of the 2006 UGB, for example, includes slopes of 25% or greater.[xxiii]

Although landslides are a relatively frequent occurrence in Clackamas County, the City of Molalla has no history of landslides occurring within city limits. In 1996, however, a landslide upstream of Molalla dammed the Molalla River for about 6 or 7 hours and destroyed the city's intake valves. Currently, this is the city's biggest vulnerability to landslide hazards. A dammed river could also damage the 211 and 213 bridges. Potential landslide-related impacts are adequately documented in the county's mitigation plan and apply to the City of Molalla.

The city's Planning Commission estimates a 'low' probability that landslides will happen in the future, meaning one incident is likely to occur within a 75-100 year period. This estimate is lower than the county's 'high' ranking due to Molalla's flat terrain and limited history of landslides. Additionally, the Planning Commission estimates that the city has a 'low' vulnerability to landslides, meaning less than 1% of the population or community assets would be affected by a major landslide event. This is in agreement with the county's vulnerability estimate.

Existing Landslide Mitigation Activities

The landslide mitigation activities listed here include current mitigation programs and activities that are being implemented by Molalla agencies or organizations.

1) The Molalla Comprehensive Plan addresses slope hazards within Goal 7, Natural Hazards. According to the Comprehensive Plan, "slope hazard areas are shown on the Molalla Buildable Lands Inventory (BLI). Slopes of 25% or greater are subject to slide and erosion hazards and are considered "unbuildable for purposes of meeting the city's future housing needs. Such areas require geotechnical analysis prior to extensive tree removal, excavation, or construction. Steeply sloped areas within the 2006 Molalla UBG are limited to stream embankments. However, as shown on the BLI, an escarpment south of the 2006 UGB includes slopes of 25% or greater."

The Comprehensive Plan's Natural Hazards Policy #3 states that "Land shown on the Buildable Lands Inventory with slopes of 25% or greater shall be considered unbuildable for purposes of calculating residential density. Limited development may be permitted consistent with the recommendations of a professional geologist.

2) Molalla's community design standards address cut and fill slopes as follows: "the fill slope shall begin no closer than 2 feet to the edge of the curb. Cut and fill slopes shall not exceed a ratio of 2 horizontal to one vertical. The Public Works Director may approve slopes not to exceed a one to one ratio upon certification by a qualified engineer or geologist stating that the slope will remain stable under all foreseeable conditions.

Landslide Mitigation Action Items

The City of Molalla does not believe that implementing landslide-related mitigation activities will be cost-effective at this time. As such, the city has not identified landslide mitigation action items. Molalla will partner with Clackamas County, however, on the implementation of mitigation strategies outside city boundaries that benefit both jurisdictions.

3.3 Wildfire

The Clackamas County Natural Hazards Mitigation Plan adequately describes the causes and characteristics of wildfires in Molalla. General impacts and vulnerabilities are also described in Section 8 of the 2002 Clackamas County Natural Hazards Mitigation Plan and pages 42 to 45 of the 2007 update. The Clackamas County Community Wildfire Protection Plan details a limited history of wildfire in the county. In 1951 approximately 2,000 acres burned in Clackamas and Multnomah Counties. In 2001 lightning strikes started eight fires in eastern Clackamas County on US Forestry Service lands, burning about 80 acres. In 2002, the Bowl Fire burned over 300 acres just east of Estacada (about 21 miles east of Molalla). No history of wildfires is reported for Molalla.

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 is the most heavily populated portion of the county and is characterized by flat or gently hilly topography. The Cascade Range, which includes Molalla, 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 because of its dense forested land. Human caused fires are responsible for the majority of fires in Clackamas County, and recreation (i.e., campers and visitors to the forest) is the second leading cause of fires in the last ten years.

The majority of Molalla is surrounded by farmland and not forest, but there are areas of heavy tree coverage in the northeast and southern portions of town. As shown in the Wildfire Map below on page 32, the majority of Molalla has a 'moderate' wildfire risk. Three elements (fuels, slope, and weather) produced the ratings shown in the wildfire map, and vulnerability factors such as wildland-urban interface, property accessibility, water sources, and defensible space, are not accounted for in the map.

The Molalla Planning Commission estimates a 'moderate' probability that wildfires will occur in the future, meaning one incident is likely to occur within a 35-75 year period. This rating is in agreement with the county's probability estimate. The Planning Commission additionally estimates a 'high' vulnerability to wildfire events, meaning more than 10% of the population or community assets would be affected by a major wildfire event. Wildfires are not a frequent occurrence within the city, but regional wildfires occasionally introduce pollutants within the city. Molalla sits in the bottom of a valley, and pollution from regional fires settles in the area, causing health concerns for local residents. As such, Molalla's vulnerability estimate is higher than the county's 'moderate' vulnerability ranking.

Existing Wildfire Mitigation Activities

1) The Molalla Rural Fire Protection District offers information on fire prevention and defensible space. Additionally, the District offers fire extinguisher training classes, and fire prevention information for kids.

Wildfire Mitigation Action Items

The wildfire mitigation action items provide direction on specific activities that organizations and residents in Molalla 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.

LT-WF#1: Promote fire-resistant strategies for new and existing developments.

Ideas for Implementation:

- Describe the procedures for ongoing maintenance of fuel breaks, and place information on the city website for public view.
- Require street design that facilitates the movement of firefighting equipment.
- Review roofing standards and develop recommendations for promoting non-combustible roofing.
- Maintain awareness of potential city growth into the wild land urban interface.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department
External Partners: Clackamas County Fire Prevention Co-op
Timeline: Short term ongoing
Status: *Added during the 2009 plan development process.*

City of Molalla Relative Wild Fire Hazards

Relative Hazard

- HIGH
- MODERATE

- State Highway
- Major Arterial
- Local
- RailRoad
- Molalla City Limits

S HWY 211 HWY

S HWY 211 HWY

HWY 213 HWY

W MAIN ST

N MOLALLA AVE

S MOLALLA AVE

E MAIN ST

S HWY 211 HWY

S FEYRER PARK RD

Relative Wildfire Hazard Risk Areas determined from state-wide model resulting from Oregon Senate Bill 360 (1997). State-wide hazard areas rated low, moderate, high, and extreme. Only moderate and high values present in Clackamas County. Three elements (fuels, slope & weather) comprised the model. Fuels data derived from 2001 Landsat Enhanced Thematic Mapper (ETM) satellite imagery (30-meter pixels). Image classification for fuels completed by Spatial Solutions, Inc. in 2002. Slope data from 10-meter digital elevation model (DEM). Weather hazard factor determined by state as a constant for Clackamas County. Determination of these Relative Wildfire Hazard Risk Areas did not account for wildland-urban interface areas or other risk factors like property accessibility, water sources or defensible space.

N

1 inch equals 1,100 feet

Clackamas County

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3.4 Severe Storms: Wind and Winter

The Clackamas County Multi-Jurisdictional Natural Hazards Mitigation Plan adequately describes the causes and characteristics, location, extent and impacts of the severe storm hazard in the City of Molalla. Severe storm information can be found on pages 9-1 to 10-7 of the 2002 Clackamas County Natural Hazards Mitigation Plan, and pages 46 to 50 in the 2007 plan update.

The historical severe windstorm and winter storm events have been described in the county plan, and are applicable to Molalla. One event requires further explanation.

- January 2007: the city experienced freezing temperatures, and high winds caused a tree to fall on the main fire station. During cleanup efforts, the city removed a few trees in Leonard Long Park (just south of the fire station).

Severe storms present a significant threat to Molalla residents, property, and infrastructure. Although there is very little data to spatially represent this hazard, the location and extent of severe storms includes all of Molalla. The probability of severe storm events in Molalla was determined using scientific data, historical occurrences, and local knowledge. The Planning Commission estimates that the probability of severe storm events is 'high', meaning one incident is likely to occur in a 10 to 35 year period. This rating is in agreement with the county's winter storm probability rating, but higher than the county's windstorm probability rating. The history of wind storms in Molalla shows that they occur frequently enough to warrant the 'high' probability rating.

Severe storms can be life threatening, cause major infrastructure damage, and can be difficult to manage in terms of response and recovery. Winter storms can cover the road networks with snow and ice, impeding transportation to schools and medical facilities. Winter storms and windstorms can topple trees, down power lines, and cause widespread power outages. Pipes can burst in cold weather and sewer interceptors can overflow in heavy rains when the earth becomes saturated with snowmelt, or if the soil freezes and reduces permeability.

The Planning Commission estimates a 'moderate' vulnerability to severe storms, meaning between 1% and 10% of the city's population and assets would be affected. This rating is in agreement with the county's winter storm vulnerability rating, but is higher than the county's vulnerability rating for wind storms. Molalla's wind storm vulnerability is higher than the county's rating because Molalla loses power so frequently. Molalla only has 5 power grids, meaning 20% of the population is without power when just one grid fails.

Existing Severe Storm Mitigation Activities

Mitigating severe storms can be difficult because storms affect all areas of the city, but the following programs and/or activities are being implemented by Molalla agencies or organizations:

1) The city has snowplows and clears arterials first. There are no designated snow plow/sanding routes at this time.
2) All water, phone and sewer lines have been placed underground.

3) Most of the electrical lines within the city are currently above ground. New developments, however, are required to place all utilities underground. In areas where it is not feasible to have utilities underground, the underground infrastructure must still be in place to facilitate future transitions.

Severe Storm Mitigation Action Items

The severe storm mitigation action items provide direction on specific activities that organizations and residents in Molalla can undertake 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: Reduce negative effects from severe windstorm and severe winter storm events.

Ideas for Implementation:

- Reduce power outages by partnering with PGE to obtain funding to bury power lines subject to frequent failures.
- Encourage auxiliary power sources for hospitals, grocery stores, etc.
- Develop partnerships to implement programs to keep trees from threatening lives, property, and public infrastructure.
- Continue to require new developments to underground power lines.
- Partner with PGE to continue hazardous tree inventory and mitigation programs.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department
External Partners: PGE, ODOT
Timeline: Long term ongoing
Status: *Added during the 2009 plan development process.*

3.5 Earthquake

Clackamas County's Natural Hazards Mitigation Plan adequately describes the causes and characteristics of earthquake hazards for the region. Likewise, the county's plan adequately documents past earthquake occurrences. Historical records count over 56 earthquakes in the Portland area. The more severe earthquakes occurred in 1877, 1880, 1953 and 1962. The most recent severe earthquake was the March 25, 1993 Scotts Mills quake. It was a 5.6 magnitude quake with aftershocks continuing at least through April 8. In Molalla, the Scotts Mills quake damaged Molalla High School so severely that the building was rendered unsafe, and needed to be rebuilt.

Three potential source zones capable of generating damaging earthquakes are thought to exist in the region. These include the Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

- 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.[xxiv] The fault zone extends along the eastern margin of the Portland Hills for a distance of 25 miles.
- Gales Creek-Newberg-Mount Angel Structural Zone
  The Gales Creek-Newberg-Mount Angel Structural Zone is a 50-mile-long zone of discontinuous, NW trending faults. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment.[xxv]
- 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.[xxvi] Paleoseismic studies along the Oregon coast indicate that the state has experienced seven Cascadia Subduction Zone (CSZ) events possibly as large as M9 in the last 3,500 years. These events are estimated to have an average recurrence interval between 500 and 600 years, although the time interval between individual events ranges from 150 to 1000 years. Scientists estimate that the chance in the next 50 years of a great subduction zone earthquake is between 10 and 20 percent assuming that the recurrence is on the order of 400±200 years.[xxvii]

The geographic extent of the earthquake hazard in Molalla has been mapped by the Clackamas County GIS department, as shown in the maps below on pages 38-40. Earthquake data was developed by the state Department of Geology and Mineral Industries (DOGAMI), and shows that Molalla's relative earthquake risk is 'low.' The city has a 'very low' risk of liquefaction, and 'moderate' risk of soil amplification. Because Molalla is currently looking to grow and/or expand its Urban Growth Boundary, the city should pay particular attention to the relative earthquake risks outside of current city boundaries.

The Planning Commission estimates a 'high' probability that an earthquake will occur, meaning one event is likely to happen within a 10-35 year period. This is in agreement with the county's 'high' rating as well. Paleoseismic studies along the Oregon coast indicate that the state has experienced seven Cascadia Subduction Zone (CSZ) events possibly as large as M9 in the last 3,500 years. These events are estimated to have an average recurrence interval between 500 and 600 years, although the time interval between individual events ranges from 150 to 1000 years. Since Clackamas County's Natural Hazards Mitigation Plan was updated in 2007, better earthquake probability estimates have surfaced. Scientists now estimate that the chance in the next 50 years of a great subduction zone earthquake is between 10 and 20 percent assuming that the recurrence is on the order of 400±200 years.[xxviii] Crustal and deep intraplate earthquakes remain difficult to predict.

The Planning Commission estimates that the city's vulnerability to an earthquake is 'high,' meaning more than 10% of the population and assets would be affected in a large-scale event. This is in agreement with the county's rating.

Oregon is rated third highest in the nation for potential losses due to earthquakes. This is due in part to the fact that until recently Oregon was not considered to be an area of high seismicity, and consequently the majority of buildings and infrastructure were not designed to withstand the magnitude of ground shaking that would occur in conjunction with a major seismic occurrence. Experts predict that in the event of a magnitude 8.5 Cascadia Subduction Zone earthquake, losses in the Cascadia Region (Northern California, Oregon, Washington and British Columbia) could exceed $12 billion, with 30,000 buildings destroyed, and 8,000 lives lost.

The degree of damage to structures and injury and death to people will depend upon the type of earthquake, proximity to the epicenter and the magnitude and duration of the event. Buildings, dams, and lifelines including water, sewer, storm water and gas lines, transportation systems, and utility and communication networks are particularly at risk. Also, damage to roads and water systems will make it difficult to respond to post-earthquake fires.

Earthquake damage to roads and bridges can be particularly serious by hampering or cutting off the movement of people and goods and disrupting the provision of emergency response services. Such effects in turn can produce serious impacts on the local and regional economy by disconnecting people from work, home, food, school and needed commercial, medical and social services. A major earthquake can separate businesses and other employers from their employees, customers, and suppliers thereby further hurting the economy. Finally, following an earthquake event, the cleanup of debris can be a huge challenge for the community.

For more information on the earthquake hazard, and potential impacts to regional assets, please see pages 11-1 to 11-20 in the 2002 Clackamas County Natural Hazards Mitigation Plan, and pages 53 to 58 in the 2007 plan update.

Existing Earthquake Mitigation Activities

1) The main fire station has been seismically retrofitted.

Earthquake Mitigation Action Items

The earthquake mitigation action items provide direction on specific activities that organizations and residents in Molalla 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.

ST-EQ#1: Conduct seismic evaluations on City Hall/Police Building for implementation of appropriate structural and non-structural mitigation strategies.

Ideas for Implementation:

- Research non-structural seismic mitigation strategies.
- Obtain funding to perform evaluations.
- Prioritize seismic upgrades based on criticality of need and population served.
- Partner with appropriate organizations to implement seismic upgrades.
- Seismically retrofit facilities to guarantee continuous operation during and after a natural disaster.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department
External Partners: CCEM, DOGAMI
Timeline: 2-3 years
Status: *Added during the 2009 plan development process.*

City of Molalla Relative Earthquake Hazards

Relative Hazard

- Slight
- Lower
- Moderate
- Higher
- Molalla City Limits

- State Highway
- Major Arterial
- Local
- Private Roads
- RailRoad

1 inch equals 1,100 feet

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City of Molalla
Soil Liquefaction

Soil Liquefaction

- NONE/ VERY_LOW
- LOW
- MODERATE
- HIGH

- Molalla City Limits
- State Highway
- Major Arterial
- Local
- Private Roads
- RailRoad

1 inch equals 1,100 feet

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S HWY 211 HWY

S HWY 211 HWY

S HWY 213 HWY

W MAIN ST

N MOLALLA AVE

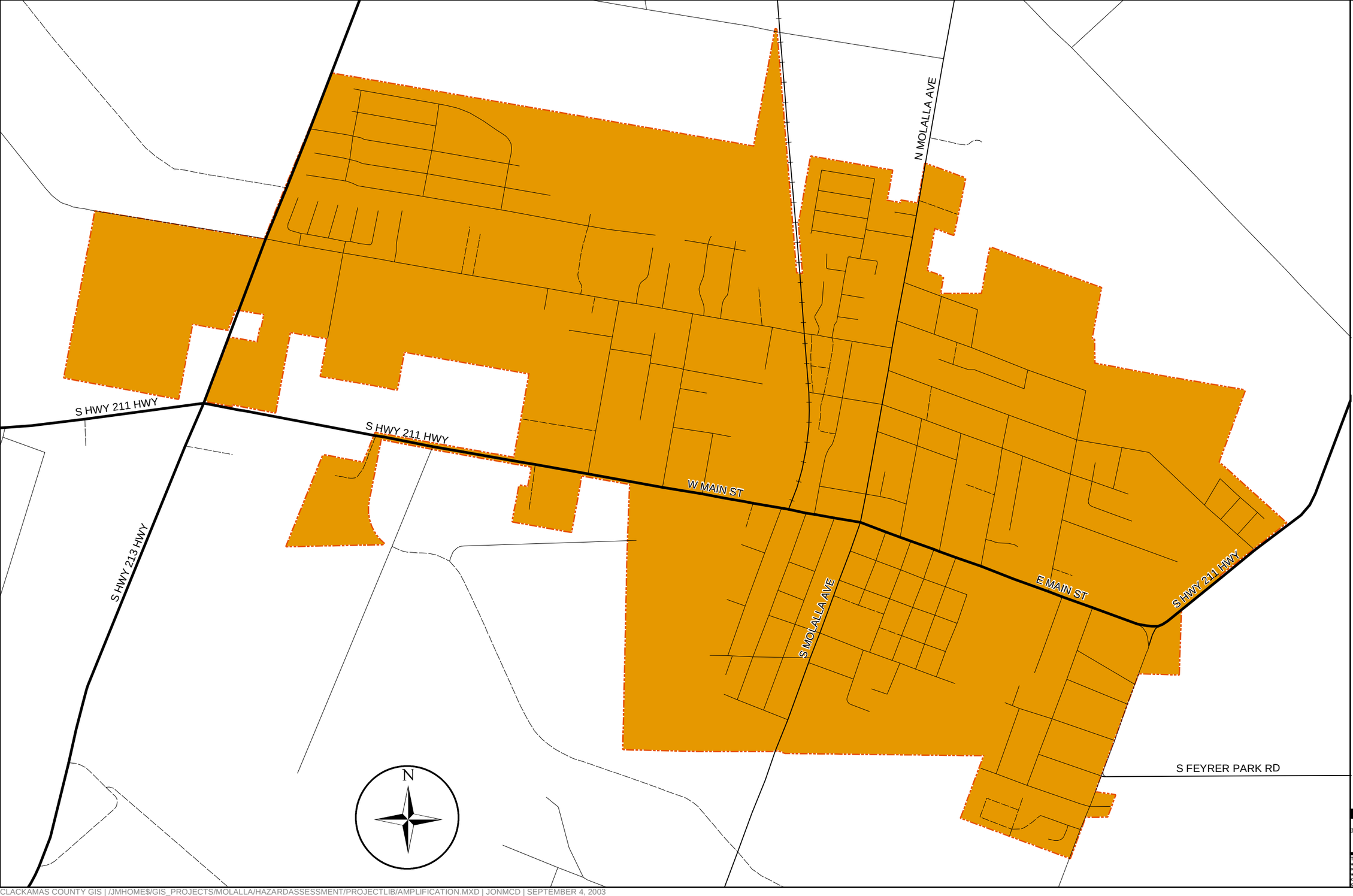
S MOLALLA AVE

E MAIN ST

S HWY 211 HWY

S FEYRER PARK RD

N



City of Molalla Soil Amplification

Soil Amplification

- LOW
- MODERATE
- HIGH

Molalla City Limits

- State Highway
- Major Arterial
- Local
- Private Roads
- RailRoad

1 inch equals 1,100 feet

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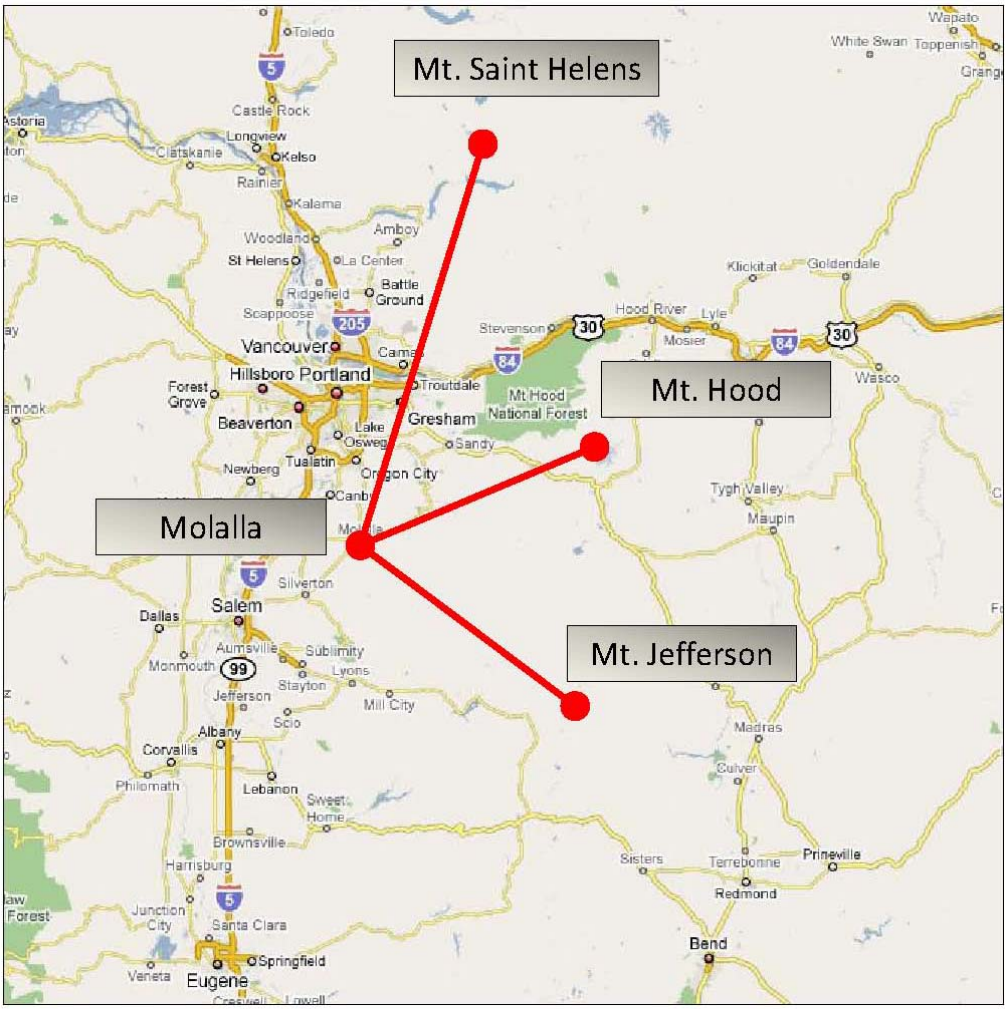
3.6 Volcano

The Clackamas County Natural Hazards Mitigation Plan adequately describes the causes and characteristics, history, location, extent, and impacts of volcanic eruptions affecting the City of Molalla. Descriptions of the volcano hazard can be found on pages 12-1 to 12-13 of the 2002 Clackamas County Natural Hazards Mitigation Plan and pages 61 to 64 of the 2007 plan update.

Immediate danger areas for volcanic eruptions lie within a 20-mile radius of the blast site, and ashfall is likely to affect communities downwind of the eruption. Several volcanoes are located near Molalla, the closest of which are shown in Figure 2 below. Additionally, Mount Adams is located north of Mount Hood; Mount Rainier is located north of Mount Saint Helens; and the Three Sisters lie to the south of Mount Jefferson.

Figure 2: Volcano Locations in Relation to the City of Molalla



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

Willamette Valley with a fine layer of ash. If Mount Hood erupts the city is likely to be fully coated in ash.

Clackamas County estimates a low probability that volcanic eruptions will occur in the future, meaning one event is likely within a 75 to 100 year period, and a high vulnerability to volcanic events, meaning more than 10% of the population or assets would be affected. Both ratings are true for the city of Molalla as well. Hazards related to volcanic eruptions (i.e., potential community impacts) are adequately described in the Clackamas County Natural Hazards Mitigation Plan. Although the City of Molalla is unlikely to experience lahars or lava flows, tephra (sand-sized or finer particles of volcanic rock that is ejected rapidly into the air from volcanic vents) drifts downwind from the explosions and can form a blanket-like deposit of ash. Tephra is a public health threat, and can damage agriculture and transportation systems (i.e., aircraft and on-the-ground vehicles). Tephra can also clog drainage systems and create major debris management problems. Within Molalla, public health would be a primary concern, and keeping transportation routes open/accessible would be important as well.

Existing Volcano Mitigation Activities

None at this time.

Volcano Mitigation Action Items

The City of Molalla does not believe that implementing volcano-related mitigation activities will be cost-effective at this time. As such, the city has not identified volcano mitigation action items. Molalla will partner with Clackamas County, however, on the implementation of mitigation strategies that benefit both jurisdictions.

4.7 Multi-Hazard

Multi-Hazard Action Items (MH)

Multi-hazard action items are those activities that could pertain to any of the six hazards in the mitigation plan: flood, landslide, wildfire, severe wind and winter storm, earthquake, and volcanic eruption. The multi-hazard mitigation action items provide direction on specific activities that organizations and residents in Molalla can undertake to reduce risk and prevent loss from multi-hazard 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. Plan goals and county action items addressed are also noted for each action item.

LT-MH#1: Develop public education programs to inform the public about methods of mitigating the impact of natural hazards.

Ideas for Implementation:

- Conduct public education as hazard seasons approach. These include: earthquake awareness month in April, wildfire prevention in summer, flood, severe storm and landslide outreach in fall/winter.
- Identify property owners in flood and wildfire hazard zones and conduct a target mailing to disseminate hazard information.
- Partner with Clackamas County and other jurisdictions to develop public education flyers for all hazards.
- Include hazard information on the city website.
- Encourage individual homeowners to implement mitigation practices.
- Educate the public about the resources available for hazard mitigation, response, and preparedness.
- Include insurance information in public outreach and education materials.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department, City Recorder
External Partners: Clackamas County Emergency Management, Oregon Partnership for Disaster Resilience
Timeline: Ongoing
Status: *Added during the 2009 plan development process.*

LT-MH#2: Continue to integrate mitigation strategies into existing regulatory documents and programs, where appropriate.

Ideas for Implementation:

- Use the mitigation plan to update Goal 7 of the city's Comprehensive Land Use Plan. Goal 7 is designed to protect life and property from natural disasters and hazards through planning strategies that restrict development in areas of known hazards.
- Integrate mitigation strategies within current capital improvement plans. When applicable, utilize mitigation funding to assist with capital improvement projects.
- Incorporate the Natural Hazards Mitigation Plan into deed restrictions and conditions of approval where appropriate.

Coordinating Organization: Planning Commission

Internal Partners: Planning Department
External Partners: Oregon Partnership for Disaster Resilience
Timeline: Ongoing
Status: *Added during the 2009 plan development process.*

LT-MH#3: Identify and pursue funding opportunities to develop and implement hazard mitigation activities.

Ideas for Implementation:

- Meetings will be held semi-annually to discuss, update, and implement actions in the NHMP. Funding opportunities should also be discussed at the semi-annual meetings.
- Allocate city resources and assistance to mitigation projects when possible.
- Develop incentives for special service districts, citizens, and businesses to pursue hazard mitigation projects.
- Review mitigation projects during each city budget review cycle.
- Partner with other organizations and agencies to identify grant programs and foundations that may support mitigation activities.
- Pursue funding opportunities for the five-year update (2012).

Coordinating Organization: Planning Commission
Internal Partners: Police, Fire, Planning, Public Works, City Recorder
External Partners: Clackamas County Emergency Management, OEM, FEMA Region X, ODF Molalla Unit, Molalla River School District, TEAM
Timeline: Ongoing
Status: *Added during the 2009 plan development process.*

LT-MH#4: Continue to update and improve hazard assessments in the Natural Hazards Mitigation Plan as new information becomes available.

Ideas for Implementation:

- Continue to update vulnerability assessment as new development occurs.
- Cooperate with participating agencies to obtain data for improved risk analyses.
- Actively seek and incorporate data into the vulnerability assessment.
- Obtain funding to update GIS hazards maps as information becomes available.
- Use new data to guide public outreach programs and update educational outreach pieces.
- Update codes and city policies as required by state planning goal 7 when new data and information becomes available.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department
External Partners: CCEM, Clackamas County GIS, DOGAMI, FEMA
Timeline: Ongoing
Status: *Added during the 2009 plan development process.*

LT-MH#5: Improve vegetation management throughout the city.
Ideas for Implementation:

- Partner with Clackamas County, ODOT, Oregon Department of Forestry, US Forestry Service, and citizens to control vegetation along transportation corridors.

- Identify appropriate practices for eliminating invasive species such as blackberry and English Ivy.
- Maintain a healthy tree population to develop a canopy within the urban area.
- Maintain vegetation coverage for slope stability.
- Provide education to the public about justifications for, and benefits of vegetation mitigation practices.

Coordinating Organization: Planning Commission
Internal Partners: Planning Department, Code Enforcement
External Partners: Clackamas Soil and Water Conservation District, Fire Co-op, Oregon Department of Forestry, US Forestry Service, Clackamas County
Timeline:
Status: *Added during the 2009 plan development process.*

Section 4:
Mitigation Planning Priority System

The Disaster Mitigation Act of 2000 (via the Pre-Disaster Mitigation Program) requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities often come from a variety of sources; therefore the project prioritization process needs to be flexible. Projects may be identified by steering committee members, local government staff, other planning documents, or the risk assessment.

4.1 Action Items

Short and long-term action items identified through the planning process are an important part of the mitigation plan. Action items are detailed recommendations for activities that local departments, citizens and others could engage in to reduce risk. Full action item descriptions are located in Section 3 of this addendum. Descriptions include ideas for implementation, and coordinating / partner organizations.

Multi-Hazard

- MH #1: Develop public education programs to inform the public about methods of mitigating the impacts of natural hazards.
- MH #2: Continue to integrate the goals and action items from the Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.
- MH #3: Identify and pursue funding opportunities to develop and implement hazard mitigation activities.
- MH #4: Continue to update and improve hazard assessments in the Natural Hazards Mitigation Plan as new information becomes available.
- MH #5: Improve vegetation management throughout the city.

Flood

- Evaluate flooding risk in areas being considered for future growth.
- Obtain funding for implementing recommendations outlined in the Stormwater Master Plan.
- Minimize overall impervious cover, and disconnect impervious areas.
- Continue compliance with the National Flood Insurance Program through the enforcement of local floodplain management ordinances.

Wildfire

- WF #1: Promote fire-resistant strategies for new and existing developments.

Severe Storm

- SS #1: Reduce negative effects from severe windstorm and severe winter storm events.

Earthquake

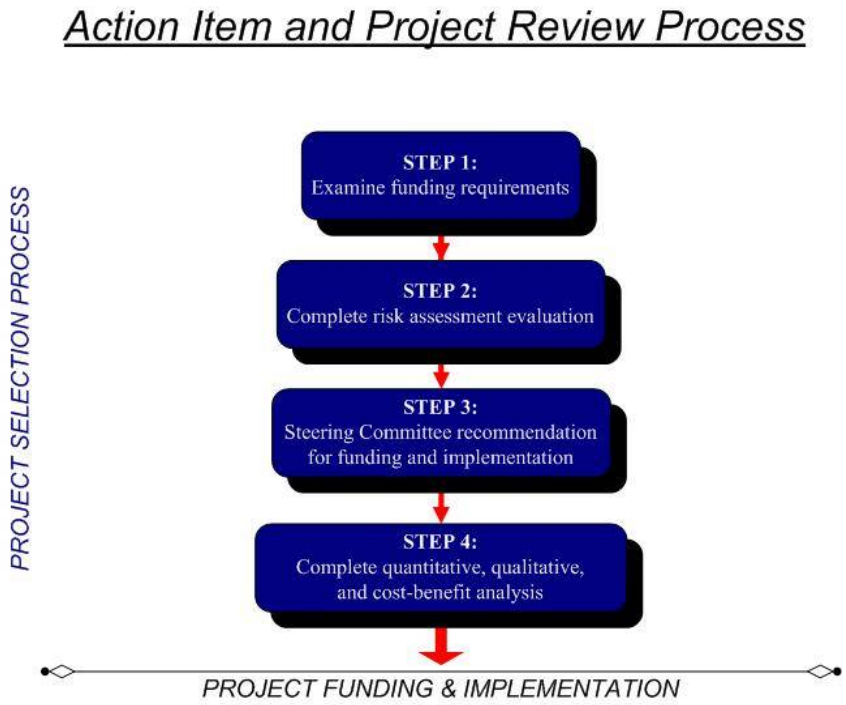
- EQ #1: Conduct seismic evaluations on City Hall/Police Building for implementation of appropriate structural and non-structural mitigation strategies.

Note: the City of Molalla does not believe that implementing landslide or volcano-related mitigation activities will be cost-effective at this time. As such, the city has not identified landslide or volcanic-eruption mitigation action items. Molalla will partner with Clackamas County, however, on the implementation of mitigation strategies that benefit both jurisdictions.

4.2 Project Prioritization Process

The Disaster Mitigation Act of 2000 (via the Pre-Disaster Mitigation Program) requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities often come from a variety of sources; therefore the project prioritization process needs to be flexible. Projects may be identified by committee members, local government staff, other planning documents, or the risk assessment. Figure 3 illustrates the project prioritization process.

Figure 3: Project Prioritization Process



Source: Community Service Center's Partnership for Disaster Resilience at the University of Oregon, 2008.

Step 1: Examine funding requirements

The first step in prioritizing the plan's action items is to determine which funding sources are open for application. Several funding sources may be appropriate for the city's proposed mitigation projects. Examples of mitigation funding sources include but are not limited to: FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance (FMA) program, Hazard Mitigation Grant Program (HMGP),

National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations, among others.

Because grant programs open and close on differing schedules, the Hazard Mitigation Team (HMT) will examine upcoming funding streams' requirements to determine which mitigation activities would be eligible. The HMT may consult with the funding entity, Oregon Emergency Management, or other appropriate state or regional organizations about project eligibility requirements. This examination of funding sources and requirements will happen during the HMT's semi-annual plan maintenance meetings.

Step 2: Complete risk assessment evaluation

The second step in prioritizing the plan's action items is to examine which hazards the selected actions are associated with and where these hazards rank in terms of community risk. The HMT will determine whether or not the plan's risk assessment supports the implementation of eligible mitigation activities. This determination will be based on the location of the potential activities, their proximity to known hazard areas, and whether community assets are at risk. The HMT will additionally consider whether the selected actions mitigate hazards that are likely to occur in the future, or are likely to result in severe / catastrophic damages.

Step 3: Committee recommendation

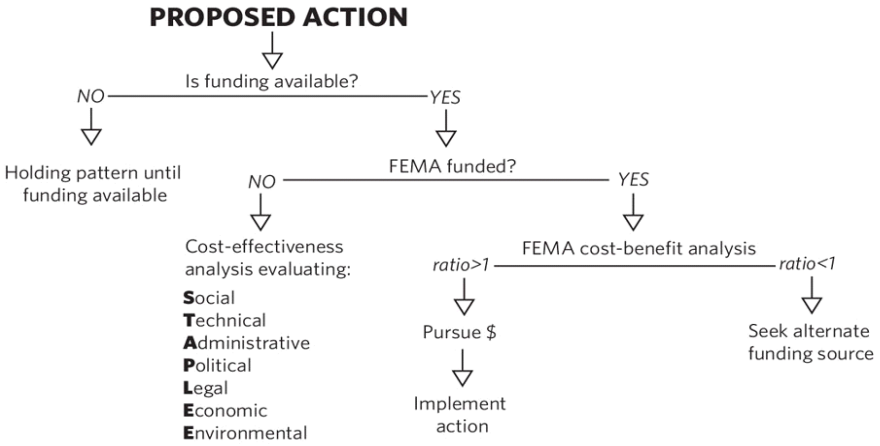
Based on the steps above, the HMT will recommend which mitigation activities should be moved forward. If the HMT decides to move forward with an action, the coordinating organization designated on the action item form will be responsible for taking further action and, if applicable, documenting success upon project completion. The HMT will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

The HMT and the community's leadership have the option to implement any of the action items at any time, (regardless of the prioritized order). This allows the HMT to consider mitigation strategies as new opportunities arise, such as funding for action items that may not be of the highest priority. This methodology is used by the HMT to prioritize the addendum's action items during the annual review and update process.

Step 4: Complete quantitative and qualitative assessment, and economic analysis

The fourth step is to identify the costs and benefits associated with the selected natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity assists in determining whether a project is worth undertaking now, in order to avoid disaster-related damages 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 provides 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. Figure 4 shows decision criteria for selecting the appropriate method of analysis.

Figure 4: Benefit Cost Decision Criteria



Source: Community Service Center's Partnership for Disaster Resilience at the University of Oregon, 2006.

If the activity requires federal funding for a structural project, the committee will use a Federal Emergency Management Agency-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one in order to be eligible for FEMA grant funding.

For non-federally funded or nonstructural projects, a qualitative assessment will be completed to determine the project's cost effectiveness. The committee will use a multivariable assessment technique called STAPLE/E to prioritize these actions. STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these seven variables can help define a project's qualitative cost effectiveness. Please see Appendix B for a description of STAPLE/E.

[i] USGS - Partnership for Disaster Resilience Research Collaborative, 2006.

[ii] National Institute of Building Science's Multi-hazard Mitigation Council. "Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities" 2005.

[iii] Western Regional Climate Center, www.wrcc.dri.edu, Molalla 1 NW, Oregon (355677), accessed July 6, 2009.

[iv] Ibid.

[v] Ibid.

[vi] Version 3 Molalla Comprehensive Plan Revision Project, WinterBrook Planning, February 2009.

[vii] Ibid.

[viii] Ibid.

[ix] PSU Population Research Center, "Population Estimate for Oregon and Its Counties and Incorporated Cities: April 1, 1990- July 1, 2008"

[x] Source: US Census Bureau, 2000 Census

[xi] US Census Bureau, 2000 Census "Tenure, Household Size, and Age of Householder: 2000"

[xii] Ibid.

[xiii] Oregon Economic & Community Development Department, Molalla Community Profile, accessed July 8, 2009. http://info.econ.state.or.us:591/FMPro?-db=Community.fp4&-Format=forms.htm&-lay=webpage&-op=eq&sort%20name=Molalla&-script=hit%20count&-Find#employers

[xiv] Version 3 Molalla Comprehensive Plan Revision Project, WinterBrook Planning, February 2009.

[xv] Molalla Chamber of Commerce, accessed July 8, 2009. http://www.molallachamber.com/

[xvi] Burby, Raymond J., ed. 1998. *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities.*

[xvii] Federal Emergency Management Agency Community Status Book Report: Communities Participating in the National Flood Insurance Program, September 2009. <http://www.fema.gov/cis/OR.html.>

[xviii] National Flood Insurance Program, Resources. <http://www.floodsmart.gov/floodsmart/pages/faqs/faqs_flood_q5.jsp>

[xix] Federal Emergency Management Agency Policy Statistics as of 04/30/2009. <http://bsa.nfipstat.com/reports/1011.htm#ORT>

[xx] Federal Emergency Management Agency Claim Statistics as of 04/30/2009. <http://bsa.nfipstat.com/reports/1040.htm#41>

[xxi] Oregon Department of Land Conservation and Development. June 2008 Repetitive Loss Summary.

[xxii] City of Molalla Comprehensive Plan, p.18

[xxiii] Ibid.

[xxiv] Madin, Ian, 1990. *Earthquake-hazard geology maps of the Portland metropolitan area, Oregon; text and map explanation: Portland, OR.* Oregon Department of Geology and Mineral

Industries.

[xxv] Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996. *Tectonics of the Willamette Valley, Oregon.* U.S. Geological Survey Professional Paper 1560

[xxvi] Goldfinger, C., L. D. Kulm, R. S. Yeats, C. Hummon, G. J. Huftile, A. R. Niem, C. G. Fox, and L. C. McNeill, 1996. *Oblique strike-slip faulting of the Cascadia submarine forearc: the Daisy Bank fault zone off central Oregon*, in Subduction Top to Bottom, G. E. Bebout, D. Scholl, S. Kirby and J. P. Platt (Editors), American Geophysical Monograph 96, 65–74.

[xxvii] NOAA, 1993. Tsunamis affecting the West Coast of the United States: 1806-1992.

[xxviii] NOAA, 1993. Tsunamis affecting the West Coast of the United States: 1806-1992.

Appendix A: Planning and Public Process

The following appendix documents Lake Oswego's natural hazards mitigation planning and public involvement processes.

Work Sessions

Hazard Mitigation Meeting 1 Minutes (March 17, 2009) A2
Hazard Mitigation Meeting 1 Sign-In A10
Hazard Mitigation Meeting 2 Minutes (May 11, 2009) A11
Hazard Mitigation Meeting 2 Sign-In A14
Public Outreach Press Release (June 8, 2010).....A15

Meeting: Molalla Natural Hazard Mitigation Plan Meeting 1
Date: August 13, 2009
Time: 6:00pm
Location: Molalla City Hall

MINUTES

1. Meeting Attendees
    a. Robert Trexler, Molalla Planning Commission
    b. Shane Potter, Molalla Planning Director
    c. Dick Miller, Molalla Planning Commission
    d. Michelle Mills, Molalla Planning Commission
    e. Bill Hood, Molalla Planning Commission
    f. Jerome Beattie, Molalla Planning Commission
    g. Harry N. Ruth, Molalla Planning Commission
    h. Roger Gates, Citizen of Molalla

2. Natural Hazards Mitigation Plan Overview
    a. Laurel explained the "disaster cycle" to the group, stating that after an event the cycle goes from response to recovery to mitigation and finally to preparedness. Laurel emphasized that the natural hazards mitigation plan (NHMP) focuses on the mitigation portion of the disaster cycle. Mitigation is making adjustments now that increase the resiliency of the city in the long-term.
    b. Laurel then showed the group the "understanding risk" diagram, saying natural hazards are chronic and potential events. We cannot always predict or control them, and they will happen. 'The vulnerable system' is all of the built environment and population in the City of Molalla. These are things that can be controlled. The 'natural hazard' bubble represents the physical events affecting the city, and these are events that cannot be controlled. The 'risk of disaster' is the overlap between natural hazards and vulnerable systems. The goal of a NHMP is to decrease the amount of overlap between the vulnerable system and natural hazards so humans can limit or mitigate any issues that can arise from the area of overlap.

3. Community Assets
    a. Shane will email the city resource list to Laurel
    b. ***Critical Facilities & Infrastructure:*** Those critical facilities and infrastructure necessary for emergency response efforts.
        i. City Hall and Police Department
        ii. Molalla Main Fire Station (station 82)
        iii. Transportation Networks: Highways 213 and 211
        iv. Public Works
        v. Water Distribution/Drainage Infrastructure

vi. Sewage Treatment Plant
vii. Sewage infrastructure
viii. Bridges – Wagon Wheel Park Bridge, Milk Creek Bridge, Pudding River bridge, bridge over the Molalla river, Molino bridge, Fryer Park Bridge
ix. Communications Towers
x. NW Natural Pipelines
xi. Power substations
xii. Molalla Adult Community Center (EOC)
xiii. Molalla Medical (Urgent Care)
xiv. Smucker Medical Facilities

c. ***Essential Facilities:*** Those facilities and infrastructure that supplement response efforts.
    i. Granges (potential shelters)
        1. Mooselodge
        2. Foothills
        3. Molalla Grange
        4. South Molalla
    ii. Safeway
    iii. Harvest Market
    iv. High School Football Field
    v. Molalla Aquatic Center
    vi. Molalla Public Library
    vii. Churches
        1. Molalla Assembly of God
        2. Saint James Catholic Church
        3. Molalla Christian Church
        4. Church of Christ of Latter Day Saints
        5. South Clackamas Community Church
        6. Evangelical Church of North America
        7. Molalla Four Square Church
        8. Grace Lutheran Church
        9. United Methodist Church
        10. Church of the Nazarene
        11. Country Church
        12. Seventh-Day Adventist
    viii. Schools
        1. Molalla Elementary School
        2. Rural Dell Elementary School
        3. Molino Elementary
        4. Molalla River Middle School
        5. Molalla High School

d. ***Vulnerable Populations:*** Locations serving populations that have special needs or require special consideration.
    i. Molalla Adult Community Center
    ii. Senior Living Facilities

1. Evergreen Court
2. Pheasant Pointe
3. Molalla Manor
4. Twin Firs Mobile Home Park

iii. Molalla Mobile Manor
iv. Child care centers
    1. 24 Hours Child Care/Preschool
    2. Early Horizons Preschool Childcare, Inc.
v. Schools
vi. Plaza Los Robles (Spanish speaking)
vii. Cole Apartments (Spanish speaking)

e. ***Economic Assets/ Population Centers: Economic Centers*** are those businesses that employ large numbers of people, and provide an economic resource to Gladstone. If damaged, the loss of these economic centers could significantly affect economic stability and prosperity. ***Population Centers*** usually are aligned with economic centers, and will be if particular concern for evacuation/notification during a hazard event.
    i. Molalla Buckaroo
    ii. Avison's Rock Products
    iii. Brentwood Corp.
    iv. International Forest Products Limited (Interfor)
    v. Molalla Redi-Mix
    vi. Northwest Polymers
    vii. Pacer Propane
    viii. Superior Glass Works
    ix. RGS Forest Products, Inc.
    x. Cencast Corporation
    xi. Titanic Ice Co
    xii. Clarke Manufacturing Co.
    xiii. Molalla Market Center
    xiv. First Student
    xv. Molalla School District
    xvi. Stone Place
    xvii. Fir Crest
    xviii. Big Meadows
    xix. Rondel Court
    xx. Toliver Terrace
f. ***Environmental Assets:*** Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic and functional service for the community.
    i. Clark Park
    ii. Ivor Davies Trail Park
    iii. Molalla Skate Park
    iv. Leonard Long Park
    v. Old Fellows Park

vi. Sally Fox Park
vii. Billy Sheets Field
viii. The Molalla BMX Track
ix. Bohlander Field
x. Rosse Posse Acres (Elk Farm)
xi. High School Sports Complex
xii. Friar Park

g. ***Hazardous Materials***: Those sites that store, manufacture, or use potentially hazardous materials.
   i. Gas Stations
   ii. Pacer Propane
   iii. Simcast

4. Hazard Identification
   a. Flood
      i. The county plan accurately describes the causes and characteristics, history and impacts.
      ii. Water sources in Molalla include Creamery Creek, Bear Creek, and the irrigation ditch near Vaughan Road
      iii. All of Molalla is in flood zones C and X, meaning they are outside the 1% annual chance floodplain and no base flood elevations are shown. Flood insurance is available but not required.
      iv. Potential Impacts
         1. During heavy flooding rocks and debris can flow downstream and damage effluence release points and intake structures
         2. Molalla has clay soils so the percolation rate is very slow/minimal and the water table is very high. Some Molalla homes have pumps running in the crawlspace of their homes year round to keep water out. Newer homes in Molalla are built higher off the ground because of this.
         3. The water system in the older parts of town is inadequate. Stormdrain pipes and culverts are too small = regular urban flooding
         4. The areas that experience the worst urban flooding include South Cole and Main Street, East 3rd, Mathias Road south of 8th Street, South Molalla south of 7th Street, Highway 213 south of Toliver Road. In these areas urban flooding is very common and water rushes over the roads. Water has even come up out of the manholes in some areas because the storm sewers are so inadequate.
         5. Molalla has an underground creek system. New developments since 2003 have been built under

better code standards and don't have these problems because the developments address drainage issues.

v. Probability: High (One incident is likely to occur within a 10-35 year period)
vi. Vulnerability: Moderate (1% to 10% of the population or regional assets are likely to be affected by a major event)
vii. Mitigation steps taken
    1. Molalla is a regular participant in the National Flood Insurance Program with 8 policies in force at a value of $1,971,200. Four losses have been paid, but there are no repetitive loss properties. The city's most current effective Flood Insurance Rate Map (FIRM) date is June 17th, 2008 (initial FHBM 11/21/1975)
    2. Comprehensive Plan includes water resource policies and Goal 7: Natural Hazards – land within the 100-year floodplain shall be considered unbuildable for purposes of calculating residential density, and unsuitable for purposes of meeting employment needs. Limited development may be permitted consistent with the City's floodplain regulations
    3. Molalla has street sweeping once a week and leaf/debris pick up through garbage service
    4. Public works cleans out drainage ditches and culverts once a month.
    5. The city offers hazard mitigation training once a year for flood, fire and earthquake. This training is open to the public and advertised through the Molalla Pioneer (newspaper) and email lists
    6. Molalla has a Water System Master Plan and Storm Water Master Plan (neither in electronic form)
    7. Molalla works to identify problem areas and solve through code. Building standards now require developments to account for impervious surfaces and address 25 year flood events, meaning detention requirements are much greater for newer developments.

b. Landslide
    i. Molalla's landslide hazard is much less of a threat than other hazards. The county plan's description of history, causes and characteristics, and impacts will suffice.
    ii. Molalla does not have any 25% slopes right now but the city is in the midst of boundary expansion which will include some areas with 25% slope.
    iii. Most of the steep slope areas are along stream banks
    iv. Potential Impacts
        1. The main threat landslides pose is a slide upstream that affects the river. A very large slide could dam

the river and clog the intake and waste water effluent lines. In 1996 the Molalla River dammed up for about 6 or 7 hours and destroyed the city's intake valves.

2. A dammed up river could also damage the 211 and 213 bridges. If there were an earth dam and the dam broke there is a good change that the 211/213 bridge downstream could be damaged by the heavy wave of water flow.
3. While the above scenarios would occur outside city limits, they would have an impact on Molalla.

v. Probability: Low (one incident likely to occur within a 75 to 100 year period). This is lower than the county's 'high' ranking because Molalla has flat terrain and no landslides within the city limits on record.
vi. Vulnerability: Low (<1% of the population or assets would be affected by a major event)
vii. Mitigation steps taken
    1. The Comprehensive Plan states slopes of 25% or are subject to slide and erosion hazards are required to have geological analysis prior to extensive tree removal, excavation or construction, and
    2. Slopes 25% or greater are considered unbuildable for purposes of calculating residential density

c. Wildfire
    i. The county plan will suffice
    ii. Molalla is mostly surrounded by farmland, not forest
    iii. Area of heavy tree coverage in the NE portion of town just north west of the Molalla High School (large oak grove)
    iv. The southern limits of the city also have some tree coverage
    v. The main concern in Molalla is they are located at the bottom of the valley (sit in a bowl) and pollution from fires would drift and settle there and create a health hazard.
    vi. Probability: Moderate (one incident is likely to occur within a 35-75 year period)
    vii. Vulnerability: High (>10% of population or regional assets would be affected). This is higher than the county's 'moderate' ranking because air pollution would be a problem for the whole city
    viii. Mitigation steps taken:
        1. Molalla Rural Fire Protection District #73 offers information on fire prevention, defensible space, fire extinguisher training classes, and outreach to kids
        2. City has a noxious vegetation code

d. Severe Storm: Wind and Winter
    i. County plan will suffice
    ii. January 2007 freezing temperatures – a tree fell on the main fire station. During clean up efforts the city removed a few trees in Leonard Long Park (just south of the fire station)
    iii. The impacts described in the county plan apply to Molalla. The only addition is that Molalla always loses power because most power lines are above ground. The city can lose power for up to one week.
    iv. Probability: High for wind and winter (one incident is likely to occur within a 10-35 year period). This is higher than the county's 'moderate' wind ranking. History has shown that wind storms occur more frequently than 'moderate'.
    v. Vulnerability winter: Moderate (1% to 10% of population or regional assets would be affected)
    vi. Vulnerability wind: High (>10% of population or regional assets would be affected). This is higher than the county's low ranking because Molalla loses power so frequently. Molalla only has 5 power grids so when it goes out it affects 20% of residents at a time.
    vii. Mitigation steps taken
        1. The city has snowplows and clears arterials first but no designated snow plow/sanding route
        2. All water, phone and sewer lines are underground
        3. Most electricity is above ground but new developments are required to underground utilities. In areas where it is not feasible to have utilities underground (i.e. neighbor's utilities still above ground) they still must put the infrastructure in so when neighbors have underground capabilities they can make the transition.

e. Earthquake
    i. County plan will suffice
    ii. The 1993 Scotts Mills Quake damaged Molalla High School so severely the building was rendered unsafe and needed to be rebuilt
    iii. City Hall/Police building is not seismically resilient
    iv. Many of the downtown building are older and not up to recent codes – the whole downtown areas is potentially vulnerable.
    v. Probability: High
    vi. Vulnerability: High
    vii. Mitigation steps taken: the main fire station was retrofitted a couple years ago

f. Volcano
    i. County plan will suffice
    ii. Health hazards will be the biggest issue
    iii. Probability: Low
    iv. Vulnerability: High

5. Next Meeting: Tentatively Thursday, August 27th at 6pm (later re-scheduled for September 22, 2009)

Natural Hazard Mitigation Plan Meeting 1

City of Molalla
August 13, 2009
6:00pm to 8:00pm

First	Last	Agency	Job Title	Email	Roundtrip Mileage
Robert	Troedler	Molalla Planning Comm			
Shane	Potter	Staff			
Dick	Miller	Planning Comm.			
Michelle	Mills	Planning Comm		Michelle.mills@cityofmolalla.com	
Bill	Hood	Planning Comm			
Jerome	Beattie	Planning Comm			
Harry N	Ruth	" "		Hruth@Molalla.net	
Roger	Gates	Citizen			

Meeting: Molalla Natural Hazard Mitigation Plan Meeting 2
Date: September 22, 2009
Time: 6:00pm
Location: Molalla City Hall

MINUTES

1. Meeting Attendees
    a. Robert Trexler, Molalla Planning Commission
    b. Shane Potter, Molalla Planning Director
    c. Dick Miller, Molalla Planning Commission
    d. Megan Findley, Oregon Partnership for Disaster Resilience

2. Welcome and Introductions
    a. Megan introduced herself to the group, and discussed the transition between Laurel (RARE Participant), and OPDR. Megan will serve as Molalla's plan facilitator, and will complete a draft of the city's mitigation plan for FEMA review. The city should continue to communicate with Megan, as they would have done with Laurel. Additionally, Megan will guide the city through FEMA's plan review process, as well as the city's local adoption process.

3. Reminders for the Committee
    a. Laurel left a note for Megan to check on two pieces of information that the planning commission held. Shane will email Megan the city resource list (to place in the Community Profile), and public works cleans the drainage ditches once a month (for flood section).

4. Planning Process, Formal Review Process, and Plan Maintenance
    a. Mission and goals
        i. The group reviewed, and agreed to adopt the county's natural hazards mitigation plan mission and goals.
    b. Adoption, coordinating body and convener
        i. Megan provided an overview of the convener and coordinating body's [typical] roles and responsibilities. The group decided to keep the Planning Commission as the coordinating body, and Shane Potter agreed to continue serving as the convener for the city's mitigation plan.
    c. Meeting schedule
        i. The group decided upon a semi-annual future meeting schedule. The first meeting will be near the first of the year, and the second meeting of the year will be in June or July.
    d. Meeting tasks
        i. The group reviewed a list of typical meeting tasks, and added new ones, where needed.

e. Timeline for plan updates
    i. Megan provided an overview of federal regulations related to plan maintenance and update. The city's plan must be updated in conjunction with the county's plan update cycle. The group understands the timeline, and Megan will write the plan update timeline into the city's mitigation plan.
f. Plan evaluation questions
    i. The group reviewed a list of questions that will guide five-year plan update activities. Megan will incorporate those questions into the city's mitigation plan.
g. Public involvement
    i. The group discussed future public involvement activities. Since Planning Commission meetings are always open to the public, the Commission agreed to have a standing agenda item (at every meeting) that allowed for public comment on the mitigation plan, among others. Additionally, the city's website will host a copy of the mitigation plan, and the Commission will hold public meetings when necessary, such as after a natural disaster event.

5. Mitigation Planning Priority System
    a. Megan presented a potential mitigation planning priority system. There was not a handout for this agenda item. As such, the group agreed to pay particular attention to Section 4 of the plan (Mitigation Planning Priority System) when Megan completes a final draft.

6. Update and Brainstorm Action Items
    a. Action item overview
        i. Megan provided an overview of the federal regulations and requirements concerning action items.
    b. Review and revise developed action items
        i. The group reviewed each proposed action, and modified some.
    c. Identify new mitigation strategies
        i. The group did not identify any additional mitigation strategies.

7. Next Steps
    a. Megan talked about grant funding programs that the city will be eligible for upon completion of the natural hazards mitigation plan.
    b. Megan will take about two weeks to complete a draft mitigation plan for the City of Molalla. She will then send the draft to steering committee members for review. After the group is

satisfied with a final draft, they can begin public outreach. Following public outreach, Megan will send the plan to FEMA for review. FEMA typically takes about 45 days to review a plan. When FEMA pre-approves the plan, the city may then adopt the plan via resolution. Megan can provide sample resolution language at that time, if needed. Additionally, Megan will provide the city with electronic copies of all planning resources, and a hard copy of the plan.

Natural Hazard Mitigation Plan Meeting 2

City of Molalla
September 22, 2009
6:00pm to 8:00pm

First	Last	Agency	Job Title	Email	Roundtrip Mileage
Shane	Potter	Molalla	Planning Director	planner@molalla.net	
ROBERT	TREXLER	MOLALLA	PLANNING COMM		
Dick	Miller	Molalla	Planning Comm	m, richardsgarden@wbcable.net	

NEWS

City of Molalla ● 117 N. Molalla Ave. ● Molalla, OR 97038

IMMEDIATE RELEASE June 8, 2010
Contact: Shane Potter, 503-829-6855

CITY INVITES COMMENTS ON NATURAL HAZARDS PLAN

With assistance from the Clackamas County Emergency Management office, the City of Molalla has completed work on a plan designed to reduce risk from future natural disaster events. The natural hazards mitigation plan provides the community with a set of goals, action items, and resources to reduce risks arising from earthquakes, floods, winter storms and wildfires.

The draft plan is posted on the city's website at www.molallaplanning.com. Public comments on the draft plan are invited, and should be directed to the City of Molalla Planning Dept., PO Box 248, Molalla, OR 97068. Comments may also be emailed to planner@molalla.net.

Benefits of having a mitigation plan include reduced injuries and fatalities when disaster strikes, reduced property losses and economic hardship, continuation of essential services and critical facilities, reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

In 2000, Congress approved the Disaster Mitigation Act of 2000 that listed requirements for communities to develop and adopt local natural hazard mitigation plans to become eligible for mitigation grant funding from the Federal Emergency Management Agency.

Clackamas County adopted its Natural Hazard Mitigation Plan in 2002 and updated it in 2007. Each city within the county was encouraged to prepare an addendum to the County's Plan. Clackamas County contracted with the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon to hire staff to work with each participating city in developing an addendum to Clackamas County's Natural Hazards Mitigation Plan.

Molalla planning staff, the planning commission, and other volunteers worked with county staff to develop the draft plan.

# # #

Appendix B
Economic Analysis of Natural Hazard Mitigation Projects

This appendix was developed by the Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon. It has been reviewed and accepted by the Federal Emergency Management Agency as a means of documenting how the prioritization of actions shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

The appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: The Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan,* (Oregon State Police – Office of Emergency Management, 2000), and Federal Emergency Management Agency Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigatio*n. This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to provide the details of economic analysis methods that can be used to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred. Evaluating possible natural hazard mitigation activities provides 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.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables. First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" throughout the

community, greatly increasing the disaster's social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison. Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are Some Economic Analysis Approaches for Evaluating Mitigation Strategies?

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach. The distinction between the there methods is outlined below:

Benefit/cost Analysis

Benefit/cost analysis is a key mechanism used by the state Office of Emergency Management (OEM), the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. 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 later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (i.e., the net benefits will exceed the net costs) to be eligible for FEMA funding.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in public sector mitigation activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still

affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

Investing in private sector mitigation activities

Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies;
2. Dispose of the building or land either by sale or demolition;
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

STAPLE/E Approach

Conducting detailed benefit/cost or cost-effectiveness analysis for every possible mitigation activity could be very time consuming and may not be practicable. There are some alternate approaches for conducting a quick evaluation of the proposed mitigation activities which could be used to identify those mitigation activities that merit more detailed assessment. One of these methods is the STAPLE/E Approach.

Using STAPLE/E criteria, mitigation activities can be evaluated quickly by steering committees in a systematic fashion. This set of criteria requires the committee to assess the mitigation activities based on the Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation item in your community. The second chapter in FEMA's How-To Guide "Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies" as well as the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process" outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E Approach from the "State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process".

Social: Community development staff, local non-profit organizations, or a local planning board can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical: The city or county public works staff, and building department staff can help answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative: Elected officials or the city or county administrator, can help answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult the mayor, city council or county planning commission, city or county administrator, and local planning commissions to help answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic: Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?

- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)?
- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other community goals, such as capital improvements or economic development?
- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Watershed councils, environmental groups, land use planners and natural resource managers can help answer these questions.

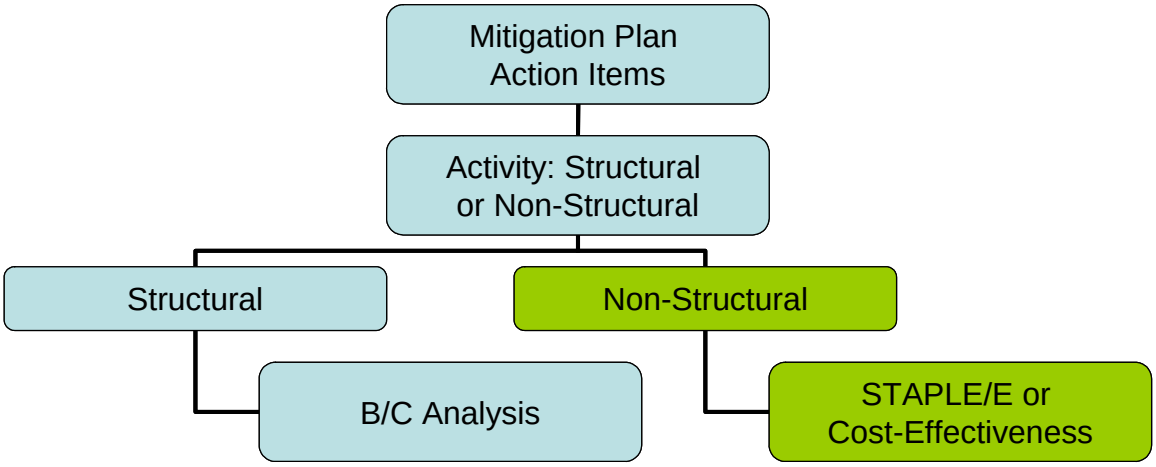
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed Benefit/Cost Analyses.

When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. The following figure is to serve as a guideline for when to use the various approaches.

Figure A.1: Economic Analysis Flowchart



Source: Community Service Center's Oregon Natural Hazards Workgroup at the University of Oregon, 2005

Implementing the Approaches

Benefit/cost analysis, cost-effectiveness analysis, and the STAPLE/E are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating mitigation activities is outlined below. This framework should be used in further analyzing the feasibility of prioritized mitigation activities.

1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation project can assist in minimizing risk to natural hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- ***Determine the project cost.*** This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- ***Estimate the benefits.*** Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult

to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- ***Consider costs and benefits to society and the environment.*** These are not easily measured, but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- ***Determine the correct discount rate.*** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- ***Net present value***. Net present value is the value of the expected future returns of an investment minus the value of expected future cost expressed in today's dollars. If the net present value is greater than the project costs, the project may be determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- ***Internal Rate of Return***. Using the *internal rate of return* method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided
- Content damages avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietor's income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to

understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

Resources

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