

# Columbia County

## Multi-Jurisdictional Hazard Mitigation Plan Update

April 2009



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## List of Acronyms and Abbreviations

ALF	Animal Liberation Front
BPA Bonneville	Power Administration
CCEM	Columbia County Emergency Management
CCEPA	Columbia County Emergency Planning Association
CDBG	Community Development Block Grant
CDC	United States Center for Disease Control
CEPA	Citizen’s Emergency Preparedness Association
CFR	Code of Federal Regulations
CR2K	State Fire Marshall’s Community Right to Know
CRS	Community Rating System
DHS	United States Department of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000
DOGAMI	Oregon Department of Geology and Mineral Industries
DOT	U.S. Department of Transportation
EHS	Extremely Hazardous Substance
EIR Environm	ental Impact Report
ELF	Earth Liberation Front
ENSO	El Niño/Southern Oscillation
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act of 1986
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
FY Fiscal	Year
GIS Geographic	Information System
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HS Hazardous	Substance
HSIS	Hazardous Substance Information System
MHMP	Multi-Jurisdictional Hazard Mitigation Plan
MM Modif	ied Mercalli
mph	Miles per Hour
NID	National Inventory of Dams
NFIA	National Flood Insurance Act
NFIP	National Flood Insurance Program

## List of Acronyms and Abbreviations (continued)

NFPA	National Fire Protection Association
NGO	Nongovernmental Organizations
NGVD	National Geodetic Vertical Datum
ODF	Oregon Department of Forestry
ODOT	Oregon Department of Transportation
OSFM	Oregon State Fire Marshall
PDM	Pre-Disaster Mitigation
PGA	Peak Ground Acceleration
RFC	Repetitive Flood Claims
RL	Repetitive Loss
SFHA	Special Flood Hazard Area
SRL	Severe Repetitive Loss
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
USC	United States Code
US Census	United States Census Bureau
USGS	United States Geological Survey
WUI	Wildland-Urban Interface

## 1. INTRODUCTION

This section provides a brief introduction to hazard mitigation planning, local mitigation plan requirements, the grants associated with these requirements, and a description of this Multi-Jurisdictional Hazard Mitigation Plan (MHMP).

### 1.1 HAZARD MITIGATION PLANNING

Hazard mitigation, as defined in Title 44 of the Code of Federal Regulations (CFR), Part 201.2, is “any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards.” Many areas have expanded this definition to also include human-caused hazards. As such, hazard mitigation is any work done to minimize the impacts of any type of hazard event before it occurs. It aims to reduce losses from future disasters. Hazard mitigation is a process in which hazards are identified and profiled, people and facilities at risk are analyzed, and mitigation actions are developed. The implementation of the mitigation actions, which include long-term strategies that may include planning, policy changes, programs, projects, and other activities, is the end result of this process.

### 1.2 PLANNING REQUIREMENTS

#### 1.2.1 Local Mitigation Plans

In recent years, local hazard mitigation planning has been driven by a new Federal law. On October 30, 2000, Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390) which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) (Title 42 of the United States Code [USC] 5121 et seq.) by repealing the act’s previous mitigation planning section (409) and replacing it with a new mitigation planning section (322). This new section emphasized the need for State, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. In addition, it provided the legal basis for the Federal Emergency Management Agency’s (FEMA) mitigation plan requirements for mitigation grant assistance.

To implement these planning requirements, FEMA published an Interim Final Rule in the *Federal Register* on February 26, 2002 (FEMA 2002a), 44 CFR Part 201 with subsequent updates. The planning requirements for local entities are described in detail in Section 2 and are identified in their appropriate sections throughout this MHMP.

FEMA’s October 31, 2007 changes to 44 CFR Part 201 combined and expanded flood mitigation planning requirements with local mitigation plans (44 CFR §201.6). All hazard mitigation assistance program planning requirements for HMGP, PDM, FMA, SRL and potentially RFC programs were combined eliminating duplicated mitigation plan requirements. It also required participating NFIP communities’ risk assessments and mitigation strategies to identify and address repetitively flood damaged properties.

The July 01, 2008 FEMA crosswalk, which documents compliance with 44 CFR, is provided in Appendix J.

Under the new 2008 44 CFR update, requirements have changed governing mitigation planning requirements for local mitigation plans published under 44 CFR §201.6. Local mitigation plans now qualify communities for the following federal mitigation grant programs:

*Disaster Funded Grants:*

- *Hazard Mitigation Grant Program (HMGP)*

*Hazard Mitigation Assistance Grants:*

- *Pre-Disaster Mitigation (PDM)*
- *Flood Mitigation Assistance (FMA)*
- *Severe Repetitive Loss (SRL)*
- *Repetitive Flood Claim (RFC)*

FEMA policy may require a local mitigation plan under the RFC Program, at which time this policy will apply to those governments that apply for and/or receive assistance under the RFC program as well.

## 1.3 GRANT PROGRAMS REQUIRING HAZARD MITIGATION PLANS

All five FEMA grant programs provide funding to States, Tribes, and local entities that have a FEMA-approved State or Local Mitigation Plan. Two of the grants are authorized under the Stafford Act and DMA 2000, while the remaining three are authorized under the National Flood Insurance Act and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act. As of June 19, 2008, the grant programs were segregated. The HMGP is a state competitive grant program which is directly disaster funded. Whereas the other programs: PDM, FMA, RFC, SRL programs although competitive, rely on specific pre-disaster grant funding sources, sharing several common elements.

*The Department of Homeland Security (DHS) FEMA Hazard Mitigation Assistance (HMA) grant programs present a critical opportunity to protect individuals and property from natural hazards while simultaneously **reducing reliance on Federal disaster funds**. The HMA programs provide pre-disaster mitigation grants annually to States, Territories, Tribes, and local communities. The statutory origins of the programs differ, but all share the common goal of reducing the loss of life and property due to natural hazards.*

*The PDM program is authorized by the Stafford Act and focuses on mitigation project and planning activities that address multiple natural hazards, although these activities may also address hazards caused by manmade events. The FMA program, RFC program, and SRL program are authorized by the National Flood Insurance Act (NFIA), and focus on reducing claims against the National Flood Insurance Program (NFIP). (FEMA 2008e)*

### 1.3.1 Disaster Funded Mitigation Assistance

**Hazard Mitigation Grant Program:** Provides grants to States, Tribes, and local entities to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a



project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The amount of funding available for the HMGP under a particular disaster declaration is limited. The program may provide a State or Tribe with up to 20 percent of the total disaster grants awarded by FEMA. The cost-share for this grant is 75 percent Federal/25 percent non-Federal.

## 1.3.2 Hazard Mitigation Assistance Programs

**Pre-Disaster Mitigation Program:** Provides funds to State, Tribes, and local entities, including public universities, for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. PDM grants are awarded on a nationally competitive basis. Like HMGP funding, a PDM project's potential savings must be more than the cost of implementing the project. In addition, funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The total amount of PDM funding available is appropriated by Congress on an annual basis. In Fiscal Year (FY) 2007, PDM program funding totaled \$100 million. The 2008 PDM program funding totaled \$54 million. The cost-share for this grant is 75 percent Federal/25 percent non-Federal.

**Flood Mitigation Assistance Grant Program:** As noted above, the goal of the FMA grant program is to reduce or eliminate flood insurance claims under the NFIP. Particular emphasis for this program is placed on mitigating repetitive loss (RL) properties (*Repetitive loss properties: A property for which two or more NFIP losses of at least \$1,000 each have been paid within any 10 year period since 1978*). The primary source of funding for this program is the National Flood Insurance Fund. Grant funding is available for three types of grants, including Planning, Project, and Technical Assistance. Project grants, which use the majority of the program's total funding, are awarded to States, Tribes, and local entities to apply mitigation measures to reduce flood losses to properties insured under the NFIP. In FY 2007, FMA funding totaled \$31 million. The 2008 FMA program funding totaled \$35.7 million. The cost-share for this grant is 75 percent Federal/25 percent non-Federal. However, 90 percent Federal/10 percent non-Federal to mitigate SRL properties (defined below) is available in certain situations.

**Severe Repetitive Loss Program:** Provides funding to reduce or eliminate the long-term risk of flood damage to residential structures insured under the NFIP. Structures considered for mitigation must have at least four NFIP claim payments over \$5,000 each, when at least two such claims have occurred within any 10-year period, and the cumulative amount of such claims payments exceeds \$20,000; or for which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any 10-year period. Congress has authorized up to \$40 million per year from FY 2005 – FY 2009. However 2008 funding provided up to 80 million. The cost-share for this grant is 75 percent Federal/25 percent non-Federal. However, 90 percent Federal/10 percent non-Federal to mitigate SRL properties is available when the State or Tribal plan addresses ways to mitigate SRL properties.

**Repetitive Flood Claims Program:** Provides funding to reduce or eliminate the long-term risk of flood damage to residential and nonresidential structures insured under the NFIP. Structures considered for mitigation must have had one or more claim payments for flood damages. In FY

2007 and 2008, Congress appropriated \$10 million for the implementation of this program. All RFC grants are eligible for up to 100 percent Federal assistance.

## 1.4 MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN DESCRIPTION

The remainder of this MHMP consists of the following sections and appendices:

**Prerequisites** - This section addresses the prerequisites of plan adoption, which include adoption by the governing body of each participating jurisdiction, including Columbia County and the cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, Scappoose, and Vernonia.

**Adoption resolutions for each jurisdiction are included in Appendix K.**

**Community Description** - This section provides a general history and background of the communities and unincorporated areas of Columbia County, including historical trends for population and the demographic and economic conditions that have shaped the area. Trends in land use and development are also discussed (Figure I-1).

**Planning Process** - This section describes the planning process and identifies the Steering Committee members (community specific appendices B – H), the meetings held as part of the planning process (Appendix L), and the key stakeholders within the county and surrounding region. In addition, this section documents public outreach activities (attached as Appendix M) and the review and incorporation of relevant plans, reports, and other appropriate information (community specific appendices B – H).

**Hazard Analysis** - This section describes the process through which the Steering Committees identified, screened, and selected the 16 hazards to be profiled in this version of the MHMP. The hazard analysis includes the nature, history, location, extent, and probability of future events for each hazard. In addition, historical and location hazard figures are included in Appendix I.

**Vulnerability Analysis** - This section identifies potentially vulnerable assets—people, residential and nonresidential buildings dwelling units, RL properties, critical facilities, and critical infrastructure—in the incorporated cities and unincorporated areas of the county. These data were compiled by assessing the potential impacts from each hazard using Geographic Information System (GIS) and community provided information. The resulting information identifies the full range of hazards that the incorporated cities and unincorporated areas of the county could face and potential impacts, damages, and (where data was available) economic losses.

**Mitigation Strategy** - The mitigation strategy provides a plan for reducing the potential losses identified in the vulnerability analysis. The Steering Committees developed a list of mitigation goals and potential actions to address the risks facing Columbia County and the seven incorporated communities. All hazard mitigation actions and strategies include NFIP compliance, preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities. The Steering Committees selected relevant mitigation actions and strategies to implement countywide.

County and city-specific mitigation strategies, including capability assessments, are provided in Appendices A through H.

# INTRODUCTION

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Plan Maintenance - This section describes the Steering Committees' formal plan maintenance process to ensure that the MHMP remains an active and applicable document. The process includes monitoring, evaluating, and updating the MHMP; implementation through existing planning mechanisms; and continued public involvement (community specific appendices). Suggested Plan Maintenance documents are located in Appendix O.

References - This section lists the reference materials used to prepare this MHMP.

Appendices - Appendices A through H provide the vulnerability analyses and mitigation strategies, including the capability assessments, for Columbia County and the cities of St. Helens, Columbia City, Scappoose, Clatskanie, Rainier, Prescott, and Vernonia.

Appendix I includes the figures that identify known hazard areas, previous hazard occurrences, and critical assets.

Appendix J provides the FEMA crosswalk, which documents compliance with 44 CFR Local Mitigation Plan requirements.

Appendix K provides the adoption resolutions for Columbia County and the cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, Scappoose, and Vernonia.

Appendix L contains the Steering Committees meeting agendas and handouts.

Appendix M provides public outreach information, including press releases, information posted on Columbia County's and participating jurisdiction's websites, and public workshop material.

Appendix N contains the Benefit-Cost Analysis Fact Sheet used to select and prioritize mitigation actions.

Appendix O provides the plan maintenance documents, such as an annual review sheet and the progress report form.

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## 2. PREREQUISITES

### 2.1 ADOPTION BY LOCAL GOVERNING BODIES AND SUPPORTING DOCUMENTATION

The requirements for the adoption of this MHMP by the participating local governing bodies, as stipulated in the DMA 2000 and its implementing regulations, are described below.

#### DMA 2000 REQUIREMENTS: PREREQUISITES

##### Multi-Jurisdictional Plan Adoption

**Requirement §201.6(c)(5):** For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

##### Element

- Does the new or updated plan indicate the specific jurisdictions represented in the plan?
- For each jurisdiction, has the local governing body adopted the new or updated plan?
- Is supporting documentation, such as a resolution, included for each participating jurisdiction?

Source: FEMA, July 2008.

Columbia County and the cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, Scappoose, and Vernonia are the jurisdictions represented in this MHMP and meet the requirements of Section 322 of the Stafford Act.

The local governing body of Columbia County and the cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, Scappoose, and Vernonia have adopted the MHMP by resolution. A scanned copy of each resolution is included in Appendix K.

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### 3. COMMUNITY DESCRIPTION

This section describes the location, geography, and history; demographics; and land use development trends of Columbia County and the cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, Scappoose, and Vernonia.

#### 3.1 LOCATION, GEOGRAPHY, AND HISTORY

Columbia County, named for the Columbia River, was created in 1854 from the northern half of Washington County. As shown in Figure I-1, it encompasses 646 square miles and is bounded on the north and east by 62 miles of the Columbia River. It is bordered on the west by Clatsop County and on the south by Washington and Multnomah Counties. Columbia County is Oregon's third smallest county and the sixteenth county to be formed.

Columbia County lies within the marine west coast climate zone. Summers are warm and dry with clear skies, with July averaging 68.4° Fahrenheit (F). Winters can be mild to chilly, and very moist, with January averaging 39°F. The rainfall averages 44.6 inches per year. Columbia County averages 155 days of measurable precipitation a year. Snow occurs infrequently delivering trace amounts however the County can experience major snow and ice storms as cold air patterns flow from the Columbia River Gorge. The county's winter snowfall totals range from negligible to 60.9 inches in the early 1890s. The County's lowest temperature was -3°F on February 2, 1950; the highest temperature reached 107°F on July 29, 1965, August 8, 1981, and August 10, 1981.

The Lewis and Clark expedition traveled through Columbia County on its way to the Pacific Ocean. The County was settled in 1810 by early fur traders. Many settlers came to the heavily forested region as immigrants seeking adventure and lush farm land. Other inhabitants left Washington State because of ongoing Indian wars. These emigrants sought safer locations on the other side of the Columbia River arriving in what is now St. Helens and Columbia City.

The primary industries of Columbia County are timber, fishing, water transportation, dairying, horticulture, and recreation. The county was covered by old growth timber, which was completely logged over by the 1950s. Second growth timber provides the raw material for local lumber and paper mills. Land cover for Columbia County is shown on Figure I-2.

#### 3.2 DEMOGRAPHICS

##### 3.2.1 Columbia County

According to the 1990 Census report, conducted by the United States Census Bureau, (U.S. Census) Columbia County's population was 37,557; the 2000 population was 43,560, with an estimated 2006 population of 49,163 indicating a 12.9 percent increase between April 1, 2000 and July 1, 2006 (2007 - 2009 U.S. Census estimated data is not available). The 2000 U.S. Census distributed the population as 6.4 percent under the age of five, 72.7 percent between 18 and 64 years old, and 11.6 percent were over the age of 65. The U. S. Census estimates the 2006 population as 49,163, with 5.3 percent under the age of five, 60.1 percent between 18 and 64, with 11.4 percent over the age of 65.

## COMMUNITY DESCRIPTION

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The entire County's labor force (defined as members over 16 years) for 2000 was recorded as 21,419 (64.8 percent). The median household income was \$45,797 (for the U.S. as a whole that figure is \$41,994), while the median family income for the same year was recorded as \$51,381 (\$50,046 nationwide). In 2000, 3,910 individuals (9.1 percent) were living below the poverty level, compared to 12.4 percent nationwide. The County's per capita income was \$20,078 while the U.S. per capita income was \$21,587.

Columbia County's 2004 median household income was \$49,227. The 2006 U.S. Census data search was interspersed with 2004 data. This prevented clear data delineation and comparison. 2006 Census data was for the most part unavailable preventing estimation for individual income, families or individuals living below the poverty level, or other income indicators. In 2004, 9.5 percent of the persons were below the poverty level.

The 2000 U.S. Census delineated the workforce showing unemployment at 1,345 or 4.1 percent for the incorporated and unincorporated County. The leading industries in the County were manufacturing (22.1 percent), education, health and social services (15.8 percent), and retail trade (10.7 percent). Construction; transportation, warehousing, and utilities; professional, scientific, management, administrative, and waste management services were nearly equally distributed with an approximate average of 8 percent per category.

### 3.2.2 City of Clatskanie

The City of Clatskanie is located along U.S. Highway 30 in Columbia County between Rainier and Astoria, approximately 62 miles northwest of Portland, Oregon, and 53 miles northwest of Vancouver, Washington within the northern portion of Columbia County. Their population in 2000 was 1,528. According to the 2000 U.S. Census, 7.2 percent of the population is under 5 years of age, 70.4 percent are between the ages of 17 and 64 years, and 16 percent of the population is 65 years or older. Of the City of Clatskanie's 744 residents eligible for the labor force, 44 are employed with an unemployment rate of 3.7 percent. The 2000 median household income was \$35,833 and the median family income was \$48,056, their per capita income in 2000 was \$16,712. Eleven percent of Clatskanie's families were living below the poverty level in 2000. In that same year, 11.5 percent of individuals were also living below the poverty level.

### 3.2.3 Columbia City

Columbia City is located in northwestern Oregon on the banks of the Columbia River approximately 32 miles north of the City of Portland on Highway 30 and 2 miles north of the City of St. Helens and 61 miles east of the Pacific Ocean. Their population in 2000 was 1,571. According to the 2000 U.S. Census, 5.9 percent of the population is under 5 years of age, 74.2 percent are between the ages of 17 and 64 years, and 12.2 percent of the population is 65 years or older. Of Columbia City's 1,206 residents eligible for the labor force, 801 are employed with an unemployment rate of 2.8 percent. The 2000 median household income was \$59,945 and the median family income was \$62,596. Columbia City's per capita income in 2000 was \$ 25,266. Nearly three percent of Columbia City's families were living below the poverty level in 2000. In that same year, 4.5 percent of individuals were also living below the poverty level.



### 3.2.4 City of Prescott

The City of Prescott is located 4 miles from the City of Rainier and 41 miles from Portland. Their population in 2000 was 72. According to the 2000 U.S. Census, three percent of the population is under 5 years of age, 53 percent are between the ages of 17 and 64 years, and 19 percent of the population is 65 years or older. Of the City of Prescott's 66 residents eligible for the labor force, 33 are employed with an unemployment rate of 4.5 percent. The 2000 median household income was \$40,000 and the median family income was \$41,563. The City of Prescott's per capita income in 2000 was \$13,773. Thirteen percent of the City of Prescott's families were living below the poverty level in 2000. In that same year, 7.4 percent of individuals were also living below the poverty level.

### 3.2.5 City of Rainier

The City of Rainier is located in northwest Oregon on the Columbia River across the Lewis & Clark Bridge from Longview, Washington. Their population in 2000 was 1,687. According to the 2000 U.S. Census, seven percent of the population is under 5 years of age, 73 percent are between the ages of 17 and 64 years, and 13 percent of the population is 65 years or older. Of the City of Rainier's 1,297 residents eligible for the labor force, 745 are employed with an unemployment rate of 4.5 percent. The 2000 median household income was \$41,949 and the median family income was \$46,759. The City of Rainier's per capita income in 2000 was \$18,511. Nearly 24 percent of the families were living below the poverty level in 2000. In that same year, 10.4 percent of individuals were also living below the poverty level.

### 3.2.6 City of St. Helens

The City of St Helens is located in southeastern Columbia County, on the Columbia River, approximately 30 miles northwest of Portland, Oregon. Their population in 2000 was 10,019. According to the 2000 U.S. Census, 8.6 percent of the population is under 5 years of age, 69.8 percent are between the ages of 17 and 64 years, and 9.6 percent of the population is 65 years or older. Of St Helens' 7,331 residents eligible for the labor force, 4,964 are employed. St Helens' unemployment rate is 4.8 percent. The 2000 median household income was \$40,648 and the median family income was \$45,548. St Helens' per capita income in 2000 was \$17,237. Almost 9 percent of families were living below the poverty level in 2000. In that same year, 11.9 percent of individuals were also living below the poverty level.

### 3.2.7 City of Scappoose

The City of Scappoose lies between the Columbia River and mountainous hillsides, approximately 20 miles North of Portland on State Highway 30. Highway 30, a fully developed 5-lane thoroughfare carries 35,000 cars a day through the City. Their population in 2000 was 4,979. According to the 2000 U.S. Census, 5.9 percent of the population is under 5 years of age, 74.2 percent are between the ages of 17 and 64 years, and 12.2 percent of the population is 65 years or older. Of the City of Scappoose's 3,733 residents eligible for the labor force, 2,521 are employed with an unemployment rate of 4.5 percent. The 2000 median household income was \$47,796 and the median family income was \$55,616. The City of Scappoose's per capita income

in 2000 was \$20,837. Nearly five percent of families were living below the poverty level in 2000. In that same year, 6.1 percent of individuals were also living below the poverty level.

### 3.2.8 City of Vernonia

The City of Vernonia is located in northwest Oregon, located 45 miles from the City of Portland. Their population in 2000 was 2,228. According to the 2000 U.S. Census, 8.3 percent of the population is under 5 years of age, 66 percent are between the ages of 17 and 64 years, and 9.8 percent of the population is 65 years or older. Of the City of Vernonia's 1,582 residents eligible for the labor force, 893 are employed with an unemployment rate of 4.4 percent. The 2000 median household income was \$41,181 and the median family income was \$48,563. The City of Vernonia's per capita income in 2000 was \$ 16,647. Nearly 9 percent of families were living below the poverty level in 2000. In that same year, 9.7 percent of individuals were also living below the poverty level.

### 3.3 LAND USE AND DEVELOPMENT TRENDS

The Columbia County Assessor's Office indicates that land use in Columbia County is a mix of timber (339,875 acres), agricultural (37,367 acres), residential (30,212 acres), industrial (4,300 acres), commercial (566 acres) and public (187 acres) lands. Government lands consist of federal (11,708 acres), state (18,910 acres), county (6,165 acres) and city (7,309 acres) owned and managed lands.

The Columbia County Comprehensive Plan states that the vast majority of the County is devoted to wood fiber production and various agricultural uses with minimal federal, state, and county managed timber lands. A very limited percentage of land is designated as High Density Use, approximately four percent. The county feels that limited high density increases will occur around the seven incorporated cities of Clatskanie, Columbia City, Prescott, Rainier, Scappoose, St. Helens, and Vernonia. The County currently designates two percent of its land area to low density residential uses. However, there is significant pressure to increase residential development opportunities.

The County's Comprehensive Plan stated,

*...“the County recognizes that it must ... [provide] adequate review procedures that will assure existing commercial activities [while ensuring] future innovative forest practices will be protected... Currently less than half (44%) of the County's Class I-IV soils are being used for agriculture. The remainder of these non-farmed, agriculture soils either support acknowledged Type I "Built and Committed" exceptions or have been designated as Forest-Agriculture.”*

The County's residential land development philosophy has remained constant while the demand and need for affordable housing for middle and lower income families has increased.

## 4. PLANNING PROCESS

This section provides an overview of the planning process; identifies the Steering Committee members and key stakeholders; documents public outreach efforts; and summarizes the review and incorporation of existing plans, studies, and reports used to develop this MHMP. Additional information regarding the Steering Committees and public outreach efforts are provided in community-specific appendices B – H and Appendix M.

The requirements for the planning process, as stipulated in DMA 2000 and its implementing regulations, are described below.

### DMA 2000 Requirements: Planning Process

#### Multi-Jurisdictional Planning Participation

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

#### Element

- Does the new or updated plan describe how each jurisdiction participated in the plan's development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

#### Planning Process

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

#### Documentation of the Planning Process

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

#### Element

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

#### Element

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

The 2005 Multi-Hazard Mitigation Plan for Columbia County described the hazards, critical facilities and resulting mitigation goals and actions for county-owned facilities. Additionally, the 2005 Multi-Hazard Mitigation Plan for Vernonia described the hazards, critical facilities and resulting mitigation goals and actions for city-owned facilities. This document reviews and updates both the County and the City of Vernonia's original plans and addresses the new participating jurisdictions of the Cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, and Scappoose in a single document.

## 4.1 OVERVIEW OF PLANNING PROCESS

### 4.1.1 Initial Planning Processes, 1998-2005

The Columbia County Director of Emergency Management, under direction from the County Commissioners, expanded the original Steering Committee to include, not only County agencies, but city agencies, public safety agencies, private organizations, and businesses broadening countywide citizen involvement. The newly expanded Steering Committee collaboratively worked to evaluate and update the 1998 Natural Hazards Mitigation Plan (1998 HMP) to fulfill newly developed DMA 2000 requirements ultimately adopting it as the 2005 Natural Hazards Mitigation Plan (2005 HMP).

The 2005 HMP Steering Committee consisted of a county level commissioner, emergency management, road department, land development staff, city public works, police, fire and rescue, 911 communications staff, State forestry, fire district personnel and a consultant.

The Committee formed and met five times from September 2004 through February 2005 as a way to establish an outline and schedule, develop plan goals and objectives, adhere to DMA 2000 requirements, and provided information for the contractor to ultimately write the plan. The team gathered and shared information, assessed vulnerabilities, identified critical facilities, assisted in developing mitigation strategies, and provided continuity throughout the planning process.

During the seven-month planning period, the Steering Committee compiled information and collected data for six natural hazards: flood, landslide, fire, winter storm, earthquake, and volcano; and four technological hazards: hazardous materials, dam failure, utility transmission and transportation, and terrorism. Information was obtained from local historical records, and a wide variety of local, state, and federal agencies. Additionally, the Steering Committee obtained public input from seven monthly Citizens Emergency Preparedness Association (CEPA) meetings spanning from July 2004 through January 2005; and from Steering Committee reports filed and reviewed at County Board of Commissioners work sessions between November 2004 and January 2005. One public hearing was conducted on February 17, 2005 in Vernonia, Oregon as described in the 2005 HMP, Section 3.

The 2005 HMP formed the basis for the County's All Hazard Mitigation Planning focus -- identifying five far reaching planning goals with supporting objectives, and corresponding action items. This process refined goal achievement with a matrix to delineate coordinating and partner organizations, timelines, and lists the specific planning goals addressed by each action item.

The plan proceeded to explain Oregon and Columbia County planning initiatives and legislatively mandated land-use policy and supporting initiatives, the development methodology

and research process along with a detailed explanation of each chosen hazard potentially threatening the county. Various natural processes were defined for each community and participating jurisdiction along with demographic information to form the basis for a risk assessment. However, only the flood hazard had a well defined critical facility risk assessment and vulnerability analysis. The remaining hazards did not possess a thorough assessment due to limited available information, resources, and funding.

The plan listed several mitigation actions to reduce or prevent damage and losses from natural hazards. However, limited resources prevented developing specific actions or assigning responsible entities to undertake project development and completion.

### 4.1.2 2009 Plan Update

The 2009 Columbia County Multi-Jurisdictional Hazard Mitigation Plan update is intended to: include newly identified hazards affecting individual jurisdictions; provide a comprehensive risk assessment and vulnerability analysis; provide community based mitigation actions; identify funding sources; and include all incorporated jurisdictions within the county as part of the update.

FEMA provided technical assistance to facilitate developing this MHMP. This includes updating the portions of the existing plan for the unincorporated areas within the County as well as including the incorporated cities (the Cities of Clatskanie, Columbia City, Prescott, Rainier, Scappoose, and Vernonia). The City of Vernonia's portion of this plan also addresses update requirements as part of bringing all of the cities under one multi-jurisdictional plan.

The first step in the planning process was to establish Steering Committees within each participating jurisdiction. These Steering Committees consisted of the County and city representatives as well as representatives from the rural fire districts within the County. Frank Hupp of Columbia County served as the primary point of contact for the overall plan's update and development. Table 4-1 identifies the Steering Committee leaders and participants from each jurisdiction.

Once the Steering Committees were formed, the following six-step planning process took place from April 2008 to February 2009.

- **Organize Resources:** Each Steering Committee identified resources, including county staff, city departments and agencies, and local nongovernmental organization (NGOs), which could provide the technical expertise and historical information needed to update the MHMP.
- **Profile Hazards:** Each Steering Committee identified the hazards specific to Columbia County and the cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, Scappoose, and Vernonia. A hazard analysis was developed for these 16 hazards.
- **Assess Risks:** A vulnerability analysis was developed for the county and each of the incorporated communities. The county and incorporated communities used the vulnerability analysis results during the mitigation strategy development.
- **Assess Capabilities:** Each Steering Committee reviewed the current administrative and technical, legal and regulatory, and fiscal capabilities to determine whether existing

provisions and requirements adequately addressed relevant hazards in each respective jurisdiction.

- **Develop Mitigation Strategy:** Each Steering Committee developed a comprehensive range of potential mitigation goals and actions. Subsequently, Columbia County and the incorporated communities identified, evaluated, and prioritized the actions to be implemented in the county- and city-specific Mitigation Action Plans (Appendices A-H).
- **Monitor Progress:** Each Steering Committee developed an implementation process to ensure the success of an ongoing program to minimize hazard impacts to Columbia County and the incorporated communities.

## 4.2 HAZARD MITIGATION STEERING COMMITTEES

### 4.2.1 Formation of the Steering Committees

As previously noted, this planning update process began in April 2008. Each Steering Committee leader formed the advisory body, known as the Steering Committee, using staff from relevant local departments, agencies, and NGOs. The Steering Committee members represent community members within Columbia County and each of the county’s seven incorporated cities. They are listed in Table 4-1 and the meetings held throughout the planning process are described below. In addition, the meeting agendas and handouts are provided in Appendix L.

**Table 4-1. Steering Committees**

Name	Agency/Department
Columbia County	
Frank Hupp (Steering Committee Leader)	Columbia County Emergency Management
Tony Hyde	Columbia County Commissioner
Janet Wright	Columbia County Economic Development
Vicki Harguth	Columbia County Emergency Management
Todd Dugdale	Columbia County Land Development Services
Lonny Welter	Columbia County Road Department
Gail Rakitnitch	Clatskanie Public Utilities District
Brian Fawcett	Columbia River Public Utility District
Dick Long	Clatskanie Rural Fire District
Terry Grice	Columbia River Fire and Rescue District
Dave Crawford	Mist-Birkenfeld Fire and Rescue District
Mike Greisen	Scappoose Rural Fire District
Diane Dillard	Boise, Inc and CEPA
Lee Knowlton	Columbia 911 Communications District
City of Clatskanie	
Diane Pohl (Steering Committee Leader)	Mayor
Ray Pohl	Emergency Committee/Planning Commissioner
David True	Public Works Director
Marvin Hoover	Police Chief
Frank Hupp	Columbia County Emergency Management

**Table 4-1. Steering Committees**

Name	Agency/Department
Columbia City	
Leahnette Rivers (Steering Committee Leader)	City Administrator/Recorder
Lisa Smith	City Planner
Mike Reedy	Chief of Police
Jeff Anderson	Public Works Superintendent
Frank Hupp	Columbia County Emergency Management
City of Prescott	
Kevin Miller (Steering Committee Leader)	Mayor
Jeff Sanders	Prescott City Council
Bob Ashline	Prescott City Council
Joe Balcuns	Prescott City Council
Starr Sanders	City/Finance/Director/Treasurer
James Larson	Prescott City Council/Public Works/
Frank Hupp	Columbia County Emergency Management
City of Rainier	
Lars Gare (Steering Committee Leader)	City Administrator
Ralph Painter	Police Chief
Darrel Lockard	Public Works Director
Frank Hupp	Columbia County Emergency Management
City of St. Helens	
Skip Baker (Steering Committee Leader)	Community Development Director
Dale Goodman	Public Works Director
Neil Shepard	Public Works Supervisor
Dave Elder	Public Works Assistant
Sue Nelson	City Engineer
Frank Hupp	Columbia County Emergency Management
City of Scappoose	
Jon Hanken (Steering Committee Leader)	City Manager
Doug Greisen	Police Chief
Mike Greisen	Fire Chief
Frank Hupp	Columbia County Emergency Management
City of Vernonia	
Dan Brown (Steering Committee Leader)	Planning Commission, City of Vernonia
Maggie Peyton	Upper Nehalem Watershed Council Coordinator
Paul Epler	Fire Chief, City of Vernonia
Sandy Welch	Director, Vernonia Cares Food Bank
Marc Farmer	General Manager, West Oregon Electric Coop
Jim Tierney	Committee Chair, Unmet Needs
Bill Haack	Columbia County Flood Relief
Jim Johnson	Interim City Administrator
Sally Harrison	Mayor
Frank Hupp	Columbia County Emergency Management

## 4.2.2 Planning Team Meetings and Tasks

FEMA's contractor, URS, provided technical guidance throughout the planning process.

### ***April 9, 2008***

During the kickoff meeting, Kristen Meyers of FEMA Region X and Dennis Sigrist of the State of Oregon, Office of Emergency Management discussed the objective of the project to update the County's existing hazard mitigation plan to include the incorporated cities within the county with the end result of a multi-jurisdictional all-hazards mitigation plan. The DMA 2000 requirements, the hazard mitigation planning process, public outreach opportunities, and mitigation projects and grant funding opportunities were also discussed. In addition, the presentation included a review of GIS technology as a tool for identifying and mapping known hazards throughout the county. Also discussed was the need for each jurisdiction to identify a Steering Committee to network with Columbia County, their community, other agencies, and other professionals who might have specialized knowledge about the hazards and mitigation activities that could affect the jurisdictions.

Each jurisdiction filled out data collection forms to assist in identifying necessary information to be included in the plan with a proposed schedule for each of the six sections. The sections included:

- Community Description Data
- Hazard Identification & History Data
- Repetitive Loss Data
- Vulnerability Data (Critical Facilities)
- Planning Data (Steering Committee, Methods of Public Engagement)
- Capability Assessment Data

The hazard identification data collection form was based on the State of Oregon Natural Hazard Mitigation Plan and the Existing Columbia County and City of Vernonia's Hazard Mitigation Plans and is meant to familiarize the County and city representatives with the approach and concepts that would be used in the risk identification phase of the MHMP development. Among the 18 potential hazards initially discussed (Section 5.2), 16 hazards were determined to pose the greatest potential risk to the county and participating jurisdictions: flood, winter storm, landslide, wildland/urban fire, earthquake, volcano, wind, erosion, El Niño – Southern Oscillation (ENSO), expansive soils, drought, dam failure, disruption of utility and transportation systems, hazardous materials, terrorism, and infectious disease epidemics.

Over the next three months URS facilitated teleconferences (considered meeting #2) with each participating jurisdiction's Steering Committee to complete the data collection effort.

### ***August 13, 2008***

During the third meeting, the Steering Committees reviewed draft hazard figures and the data used to develop each figure. They reviewed the draft asset information (critical facilities and infrastructure, population, and residential and nonresidential structures) for all participating jurisdictions. They then reviewed preliminary jurisdiction-specific vulnerability analyses



information. Next, the Steering Committees examined and revised the initial list of mitigation goals and potential action items.

After the Steering Committee members reviewed the simplified Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) evaluation criteria, they identified and prioritized the mitigation action items to be included in the MHMP.

## 4.3 PUBLIC INVOLVEMENT

### 4.3.1 Project Introduction

In early May 2008, shortly after the first Steering Committee meeting, a newsletter was distributed throughout the county regarding the preparation of the MHMP. The newsletter was sent out through utility bills and posted on websites inviting the public, local, State, and Federal districts and agencies to participate in the planning process. Other media outlets used included newspapers and local radio stations.

Prior to the August 13, 2008 meeting, another public meeting announcement was published throughout the county inviting the public to participate in the risk assessment presentation.

Table 4-2 contains a summary of the Public Meeting Mechanisms.

**Table 4-2. Public Involvement Mechanisms**

Mechanism	Description
Columbia County Website	The MHMP Update newsletter was posted on the Columbia County website in June 2008 to introduce the project to the community and to request public participation in hazard identification for each jurisdiction. Public meeting announced to present results of draft risk assessment.
Columbia County Emergency Planning Association (CCEPA)	CCEPA is an association of local businesses, individuals, local and state government agencies and stakeholders. The association includes over 300 members. The following list is a sampling of the attendees from the June and July, 2008 meetings: American Red Cross, ARES/RACES, Armstrong World Industries, Boise Inc., CERT, Cities Readiness Initiative/Medical Reserve Corps, City of St. Helens, Clatskanie Rural Fire District, Columbia 911 Communications District, Columbia County Board of County Commissioners, Columbia County Emergency Management, Columbia County Rider, Columbia County Sherriff's Department, Columbia Health District, Columbia River Fire & Rescue District, DHS – Chemical Security/Homeland Security, Dyno Nobel, Georgia Pacific, Graymont Western, Guardsmart, Mist-Birkenfeld Fire & Rescue District, Northwest Natural Gas, Oregon Office of Emergency Management, Office of State Fire Marshal, Oregon DEQ, Oregon Department of Transportation, Oregon –E-Prep Outreach, Oregon Public Health Division, Portland General Electric, Portland Police Bureau, Port of St. Helens, Scappoose Rural Fire District, Scappoose Planning Commission, Scappoose Police Department, St. Helens Police Department and Vernonia Police Department. At the June and July monthly meetings, County Commissioner Hyde made public announcements about the hazard mitigation plan update, and asked for public input.
Public Service Announcements on KOHI	KOHI radio station in St. Helens has made public service announcements about the Columbia County Hazard Mitigation plan update and asked for

**Table 4-2. Public Involvement Mechanisms**

Mechanism	Description
	public input.
The Chronicle, St. Helens, OR	The MHMP Update newsletter was placed in this newspaper in August 2008.
The Spotlight, Scappoose, OR	The MHMP Update newsletter was placed in this newspaper in August 2008.
The Chief, Clatskanie, OR	The MHMP Update newsletter was placed in this newspaper in August 2008.
The Independent, Vernonia, OR	The MHMP Update newsletter was placed in this newspaper in August 2008.
Public Input Meetings	Three public input meetings were held on August 13, 2008. They were held at the Columbia 911 Communications District at 10:00 a.m., 2:00 p.m. and 6:00 p.m.
Email to Steering Committee Members	The MHMP Update newsletter was emailed to each of the steering committee members to be given the widest possible distribution within their organizations and contact circles.

\* Copies of the newsletters and public meeting announcements are included in Appendix M.

## 4.4 INCORPORATION OF EXISTING PLANS AND OTHER RELEVANT INFORMATION

During the planning process, the Steering Committee reviewed and incorporated information from existing plans, studies, reports, and technical reports into the MHMP. Section 9 contains a detailed list of references used throughout the document. A synopsis of some of the sources follows.

- *Columbia County General Plan:* The Land Use Element provided information on existing land use and future development trends. The Safety Element provided information for the hazard profiles and development of the mitigation strategy for landslides, fire, and flood hazards. The Seismic Safety Element provided information for the hazard profile section and the mitigation strategy for earthquakes and tsunamis.
- *Columbia County Zoning Ordinance:* These codes regulate development and land use; they were used to develop the capability assessment and the mitigation strategy.
- *The Columbia County Comprehensive Plan:* The plan provided the public's conclusion about development and conservation of the County's resources, public facilities and services.
- *Columbia County Community Wildfire Protection Plan:* The plan provided historical wildland fire information as well as mitigation projects and programs to include in the MHMP mitigation strategy.
- *State of Oregon Multi-Hazard Mitigation Plan:* This plan, prepared by the Oregon Division of Emergency Management was consulted to ensure that the MHMP is consistent with the State hazard mitigation plan.

## PLANNING PROCESS

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- *Multi-Hazard Mitigation Plan for Columbia County, Oregon:* The 2005 plan was used as a baseline for this planning update. Hazards, critical facilities, and mitigation goals and actions were reviewed as part of the update process.
- *Multi-Hazard Mitigation Plan for Vernonia, Oregon:* The 2005 plan was also used as a baseline for this planning update. Hazards, critical facilities, and mitigation goals and actions were reviewed as part of the update process.

Appendices B through H include the incorporated city-specific existing plans, studies, and reports used during the update.

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## 5. HAZARD PROFILES

This section identifies and profiles the hazards that could affect Columbia County.

### 5.1 OVERVIEW OF A HAZARD ANALYSIS

A hazard analysis includes the identification, screening, and subsequent profiling of each hazard. Hazard identification is the process of recognizing the natural and human-caused events that threaten an area. Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude. Human-caused hazards result from human activity and include technological hazards and terrorism. Technological hazards are generally accidental or result from events with unintended consequences (for example, an accidental hazardous materials release). Terrorism is defined as the calculated use of violence (or threat of violence) to attain goals that are political, religious, or ideological in nature. Even though a particular hazard may not have occurred in recent history in the study area, all hazards that may potentially affect the study area are considered; the hazards that are unlikely to occur, or for which the risk of damage is accepted as being very low, are eliminated from consideration.

Hazard profiling is accomplished by describing hazards in terms of their nature, history, magnitude, frequency, location, and probability. Hazards are identified through the collection of historical and anecdotal information, review of existing plans and studies, and preparation of hazard maps of the study area. Hazard maps are used to determine the geographic extent of the hazard and define the approximate boundaries of the areas at risk.

### 5.2 HAZARD IDENTIFICATION AND SCREENING

The requirements for hazard identification, as stipulated in DMA 2000 and its implementing regulations, are described below.

#### DMA 2000 Requirements: Risk Assessment: Identifying Hazards

##### Identifying Hazards

**Requirement §201.6(c)(2)(i):** [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.

##### Element

- Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?

Source: FEMA, July 2008.

The Steering Committees identified 19 possible hazards that could affect Columbia County and the participating jurisdictions. They evaluated and screened the comprehensive list of potential hazards based on a range of factors, including prior knowledge or perception of the relative risk presented by each hazard, the ability to mitigate the hazard, and the known or expected availability of information on the hazard (Table 5-1). The Steering Committees determined that 16 hazards pose the greatest threat: flood, winter storm, landslide, wildland/urban fire, earthquake, volcano, wind, erosion, ENSO, expansive soils, drought, dam failure, disruption of utility and transportation systems, hazardous materials, terrorism, and epidemic. The remaining hazards excluded through the screening process were considered to pose a lower threat to life

# HAZARD PROFILES

and property in the county due to the low likelihood of occurrence or the low probability that life and property would be significantly affected.

**Table 5-1. Identification and Screening of Hazards**

Hazard Type	Should It Be Profiled?	Explanation
<b>Natural Hazards</b>		
Avalanche No		Columbia County is not located in an area prone to frequent or significant snowfall.
Erosion (Riverine & Tributary)	Yes	Columbia County is located inland and is not subject to coastal erosion. Riverine and tributary erosion occurs throughout the county in localized areas.
Drought Yes		Similar to the entire State of Oregon, Columbia County is subject to impacts associated with drought.
Dust Storm	No	No historic events have occurred in Columbia County or other jurisdictions.
Earthquake Yes		Columbia County is located within the geographical area bordering the Cascadia Subduction Zone and is subject to impacts associated with earthquakes.
El Niño / La Niña	Yes	Historic El Niño / La Niña patterns have been observed affecting weather patterns throughout the state.
Expansive Soils	Yes	Expansive soils occur in Columbia County.
Flood Yes		Historic flooding has been identified as occurring throughout Columbia County.
Landslide/Debris Flow	Yes	Columbia County is vulnerable to slope instability, especially after prolonged rainfalls.
Tsunami No		Columbia County is located inland and is not subject to tsunami impacts, although the Columbia River is subject to tidal influences.
Volcano	Yes	Columbia County is located in the vicinity of active volcanoes.
Wind	Yes	Columbia County is vulnerable to high winds.
Winter Storm	Yes	Winter storms in Columbia County result in several natural hazards – including floods, ice formations, snow, and wind.
Wildland/Urban Fire	Yes	The terrain, vegetation, and weather conditions in the region are favorable for the ignition and rapid spread of wildland fires in Columbia County. Historic downtowns of the cities of Scappoose and Rainier include wood-frame structures that are clustered close together.
<b>Man-Made/Technological Hazards</b>		
Dam Failure	Yes	Several dams are located within Columbia County.
Disruption of Utility and Transportation Systems	Yes	Columbia County is subject to the impacts of disruption of utility and transportation systems.
Hazardous Materials	Yes	Hazardous materials facilities and major transportation routes are located throughout Columbia County and all jurisdictions.
Terrorism Yes		Terrorism impacts have been identified in several jurisdictions within Columbia County.
Infectious Disease Epidemic	Yes	Epidemic impacts have been identified in several jurisdictions within Columbia County.

## HAZARD PROFILES

Table 5-2 shows the natural and technological hazards for the County and participating jurisdictions and the newly identified hazards (noted with an \*) for the County's and the City of Vernonia's update process. Wind, erosion, ENSO, expansive soils, drought, and infectious disease epidemic are the newly identified hazards. Again, where hazards were excluded through the screening process by each jurisdiction, they were considered to pose a lower threat to life and property due to the low likelihood of occurrence or the low probability that life and property would be significantly affected. Should the risk from these hazards increase in the future, the MHMP can be updated to incorporate vulnerability analyses for these and other identified hazards.

**Table 5-2. Hazards by Jurisdiction**

Hazard	Columbia County	City of Clatskanie	Columbia City	City of Prescott	City of Rainier	City of St. Helens	City of Scappoose	City of Vernonia
<b><i>Natural Hazards</i></b>								
Flood	X X		X	X X		X X		X
Winter Storm	X X		X	X X		X X		X
Landslide	X X		X	X X		X X		X
Fire (Wildland/Urban)	X X		X	X X		X X		X
Earthquake	X X		X	X X		X X		X
Volcano	X X		X	X X		X X		X
Wind*	X X		X	X X		X X		X
Erosion*	X	X X			X X		X X	
ENSO ( <i>El Niño / La Niña</i> )*							X	
Expansive Soils*	X	X			X		X	X
Drought*	X						X	
<b><i>Manmade and Technological Hazards</i></b>								
Dam Failure	X X			X X			X	X
Disruption of Utility and Transportation Systems	X X		X	X X		X X		X
Hazardous Materials	X X		X	X X		X X		X
Terrorism	X X		X			X X		
Infectious Disease Epidemic*	X	X	X				X	
<i>*Newly identified hazards (2009 update)</i>								

## 5.3 HAZARD PROFILE

The requirements for hazard profiles, as stipulated in DMA 2000 and its implementing regulations, are described below.

### DMA 2000 Requirements: Risk Assessment – Profiling Hazards

#### Profiling Hazards

**Requirement §201.6(c)(2)(i):** [The risk assessment shall include a] description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

#### Element

- Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the new or updated plan?
- Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the new or updated plan?
- Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?
- Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the new or updated plan?

Source: FEMA, July 2008.

The specific hazards selected by the Steering Committees for profiling have been examined in a methodical manner based on the following factors:

- Nature
- History
- Location
- Extent
- Probability of future events

The order of presentation does not signify the level of importance or risk.

### 5.3.1 Flood

#### 5.3.1.1 Nature

A flood is the temporary inundation of water or mud on normally dry land. Heavy or prolonged rain, snowmelt, or dam collapse can cause inundation, as can riverine and flash floods. (NOAA 2008) Urban and riverine flooding primarily affect Columbia County.

Urban flooding occurs in developed areas where the amount of water generated from rainfall and runoff exceeds the stormwater systems' capacity. As land is converted from agricultural and forest to urban uses, it often loses its ability to adsorb rainfall. Rain flows over impervious surfaces such as concrete and asphalt and into nearby storm sewers and streams. This runoff can result in the rapid rise of floodwaters. During urban floods, streets can become inundated, and basements can fill with water. Storm drains often back up because of the volume of water and become blocked by vegetative debris like yard waste, which can cause additional flooding.



Development in the floodplain can raise the base flood elevation and cause floodwaters to expand past their historic floodplains. (FEMA 2008c)

Riverine or overbank flooding of rivers and streams is the most common type of flood hazard. Riverine flooding most frequently occurs in winter and late spring. Air rises and cools over the Coast Range and its foothills and heavy rainfall develops over high-elevation streams, as storms move from the Pacific across the Oregon Coast. In this region, as much as four to six inches of rain can fall over a 24-hour period. Severe and prolonged storms can raise rivers and streams to their flood stages for three to four days or longer. (State of Oregon 2008)

Flash floods were identified as occurring in Columbia County by members of the public as part of this planning process. However, the incident events do not fulfill the following scientifically defined flashflood parameters.

*Flash floods typically originate from slow-moving storms that can generate immense volumes of rainfall and a rapid rise in water levels. The flash floods themselves quickly reach high velocities, and often carry debris. Flash floods can strike a community with little to no warning within 6 hours of heavy rain or rain and snowmelt, dam or levee failure and may bring 10 to 20 feet of water. These events can move boulders the size of small cars, uproot trees, destroy structures and facilities, erode roadways, sweep away vehicles and create new water channels. The County's erodibility index (a soils sensitivity to the effects of wind and water on the soil structure) will greatly determine its water and wind erosion potential and its impact from heavy rains and flash floods. Flash flood intensity is proportionate to rainfall intensity and duration, and is affected by watershed steepness and vegetation, stream gradient, natural and artificial flood storage areas, and streambed and floodplain configurations. Urban areas are more vulnerable to flash flooding because of development, land clearing, drainage system construction, and unobstructed channels such as roads, parking lots and ditches. Wildfires may also contribute to flash floods and landslides by removing vegetation and altering soil conditions. (NOAA 2002, State of Oregon 2008)*

Floods usually are the result of prolonged rainfall over a large area from major weather systems that cause flooding of smaller streams that flow into major rivers. This type of flood and inundation of the natural floodplains of the river system is a part of the natural process. Development in or near the floodplain puts lives and property at risk.

Flood damage can include:

- Structure inundation
- Erosion of stream banks, road embankments, foundations, footings for bridge piers and other features
- Impact damage from high-velocity flow and from debris
- Additional debris damage from accumulation on or blockage of infrastructure
- Cropland destruction
- Sewage and hazardous or toxic materials releases from damaged pipelines, tanks, and facilities
- Economic loss (local facilities, utilities, communications, agriculture)

### 5.3.1.2 History

Several very destructive floods have been recorded in Columbia County, as well as much of western Oregon, throughout the years. Between 1955 and 1999, Oregon ranked eleventh nationally for flood losses, with more than \$197 million in annual damages. The county lies between the Coastal Range and the Cascade Range, in topography rich with rivers and tributaries. Because of this topography, melting snow and heavy winter rains can combine to produce devastating flood events. Floods along the Columbia River itself are in many places limited by the high, steep banks of the river, which contain most floodwaters to a narrow band. However, other waterways exceed their banks more easily. (FEMA 2008b, Goettel 2005)

- 1948. A flood in 1948 covered eight drainage districts, inundated the industrial port of St. Helens, and much of Clatskanie's central business district.
- In 1964, 1972, and 1974, the Nehalem River, Scappoose Creek, North Scappoose Creek, Clatskanie River, Conyers Creek, and McNulty Creek were all subject to winter flooding. (Goettel 2005)
- December 1964. Nearly every river in the state of Oregon exceeded its flood stages as weather stations set new records for precipitation. Known as the *Christmas Flood*, the event triggered debris flows, bridge failures and flooding that caused thousands to evacuate and closed airports, railways and hundreds of miles of roads across the state. Ultimately, the event caused more than \$157 million in damages and 20 people were killed. (FEMA 2008b)
- In 1987, a major flood of Scappoose Creek inundated many homes in Scappoose. (Goettel 2005)
- February 1996. Virtually every county in the state received a disaster declaration due to a combination of warm temperatures, heavy snow pack and four days of record-breaking rain. Many areas had already received above-average rainfall, meaning rivers were at or reaching their capacities and flood stages. Recent logging activities contributed to increased runoff, resulting in atypical sediment and debris, which made conditions ripe for flooding and landslides. Hundreds of homes were destroyed, power outages were widespread, thousands were evacuated to public shelters and five people died. Some estimates of flood-related damages exceeded \$1 billion. Later that year, in November, a tropical air mass swept across the state, once again bringing record-breaking precipitation. The stormy weather continued into December and early January as 26 major rivers reached flood stage. Snow melt and intense rain caused extensive flooding that led to widespread landslides, erosion, power outages, damaged homes and businesses, closed roads and eventually resulted in a Presidential Disaster Declaration. (FEMA 2008b, Goettel 2005)

In Columbia County, there were widespread road closures due to high water and landslides, including the Scappoose-Vernonia Road and highways 30 and 47 in several places. At the peak of the flood, all major highways were closed and those secondary roads that were open were restricted to emergency vehicles. Road closures isolated Vernonia and Clatskanie. Much of these two communities as well as parts of Scappoose, St. Helens and Rainier had to be evacuated. A boil-water alert was in effect for most of the county, and telecommunications, including some emergency communications, were

disrupted. FEMA disbursed repair and response totaling more than \$5,000,000 to public entities, and the Oregon Economic Development Department funded nearly \$1,000,000 in Disaster Recovery Grants. Damages to private property were estimated at more than \$5,000,000. Extensive as the 1996 flood was, much larger floods are possible in Columbia County. (FEMA 2008b, Goettel 2005)

- Other notable flooding events occurred in January 1972, November 1973, January 1974, January 1987, December 1995, November 1996, December 1996 - January 1997, December 2003 - January 2004, March 2006, and December 2006. (FEMA 2008b)
- December 2007. Severe storms, winds, mudslides, landslides, and flooding occurred between December 1 and 17, 2007 shutting down roads and highways including Interstate 5. Public infrastructure, homes, and personal property were damaged. In Oregon, 73,000 residents were without power, and wastewater treatment plants were overwhelmed. A major disaster was declared for the State of Oregon on December 8, 2007 with Columbia County included in the declaration. (FEMA 2008) Coastal river flooding was estimated at or above the 25-year stage and compared to that of the 1964 and 1996 flood events.

The December storm flooded over 750 residences with 340 of those located in the City of Vernonia alone. 220 Vernonia homes were more than 50% damaged, and 34 greater than 70% damaged with an estimated \$16.5 million in losses. March 2008 FEMA disaster aid was estimated at approximately \$20 million including:

- ❖ \$6,051,729 in individual assistance approved
- ❖ \$10,957,500 in low-interest disaster loan assistance approved to homeowners, renters and businesses of all sizes
- ❖ \$3,157,918 in public assistance obligated
- ❖ 3,569 individuals registered for assistance
- ❖ 3,864 individuals visited Disaster Recovery Centers
- ❖ 2,014 home inspections completed

### **5.3.1.3 Location**

Columbia County is subject to flooding from river overflow (the Columbia River, Multnomah Channel, and smaller rivers such as the Nehalem and Clatskanie rivers) and lesser waterways (including Conyers, McNulty, Milton, Rock, and Scappoose creeks); as well as flooding from local storm water drainage. Between October and April the county is susceptible to winter rain flooding, while between May and July, snowmelt and runoff can create floods. Typically, the most severe floods are winter rainfall floods in December, January and February.

Flood control storage reservoirs have substantially reduced flood potential along the Columbia River and other major waterways. Upstream of Columbia County, the Columbia River has 22 major reservoirs (representing 40 million acre-feet of flood storage), the Willamette River has 11 major reservoirs (1.7 million acre-feet), and the Cowlitz River, one (360,000 acre-feet). The Lewis River has three reservoirs (12,420 acre-feet). These reservoirs have reduced, but not eliminated flood potential.

Figures I-3 through I-3H identify the location of the 100-year and 500-year floodplains for the county and participating jurisdictions.

### 5.3.1.4 Extent

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies often use historical records, such as streamflow gauges, to determine the probability of occurrence for floods of different magnitudes.

FEMA has mapped most of the flood-prone streams in Oregon for 100- and 500-year flood events. A 100-year flood (one percent probability of occurring within any given year) is used as the standard for floodplain management in the United States and is referred to as a base flood. Flood Insurance Rate Maps (FIRMs) prepared by FEMA provide the most readily available source of information for 100-year floods. These maps are used to support the NFIP. FIRMs delineate 100- and 500-year (two percent probability of occurring in a given year) floodplain boundaries for identified flood hazards; these areas are Special Flood Hazard Areas (SFHAs) and provide the basis for flood insurance and floodplain management requirements.

Columbia County contains a total of 82.2 square miles within the 100-year floodplain, and 103.8 square miles within the 500-year floodplain. The 500-year event floodplain generally encompasses slightly more area than a 100-year event. Each watershed has its own water absorption characteristics. Buildings, roads, and parks replace grass and soil with asphalt or other non-absorbing materials, which limit or prevent water absorption. Therefore, 500-year events contain more water, which spreads further throughout the floodplain until the water can be managed by manmade and natural drainage systems.

The FEMA-mapped floodplains in Columbia County include, for the most part, only areas along the larger rivers and streams which also have significant population and/or development. Other areas in the county have flood risk, but are not included in the FIRM because of small stream size or low population. Flood hazard evaluation for Columbia County must also take into account these localized areas of high flood risk or repetitive flooding which lie outside mapped floodplains. (Goettel 2005)

For Columbia County, there are several dozen FIRMs for cities as well as for communities in the unincorporated portions of the county. Major SFHAs identified within Columbia County are located in Table 5-3:

**Table 5-3. Flood Insurance Rate Maps (FIRMs) for Columbia County Flood Sources**

Flood Source	Mapped Reach	FIRM <sup>1</sup>
Columbia River	Reach extends from Multnomah County line to Clatsop County line	41009C0015 C, 41009C0020 C, 41009C0040 C, 41009C0045 C, 41009C0065 C, 41009C0070 C, 41009C0180 C, 41009C0185 C, 41009C0195 C, 41009C0330 C, 41009C0340 C, 41009C0345 C, 41009C0456 C, 41009C0458 C, 41009C0470 C, 41009C0510 C

**Table 5-3. Flood Insurance Rate Maps (FIRMs) for Columbia County Flood Sources**

Flood Source	Mapped Reach	FIRM <sup>1</sup>
Clatskanie River	3.2 river miles upstream from the mouth of the river, at Hazel Grove Road	41009C0150 C, 41009C0131 C
Conyers Creek	1.5 river miles upstream from the mouth of the creek	41009C0130 C, 41009C0127 C
McNulty Creek	2.3 river miles upstream from the mouth of the creek, at Ross Road	41009C0454 C, 41009C0453 C, 41009C0452 C
Milton Creek	8.1 river miles upstream from the mouth of the creek, at Brinn Road	41009C0456 C, 41009C0452 C, 41009C0451 C, 41009C0435 C
Multnomah Channel	From the channel's confluence with the Columbia River to the Multnomah County line	41009C0456 C, 41009C0458 C, 41009C0454 C, 41009C0465 C, 41009C0470 C, 41009C0505 C
Nehalem River	From river mile 88.2 to river mile 91.2	41009C0375 C, 41009C0400 C, 41009C0377 C, 41009C0381 C, 41009C0275 C, 41009C0250 C
Rock Creek	1.1 river miles upstream from the mouth of the creek	41009C0377 C, 41009C0275 C, 41009C0250 C
Scappoose Creek	From West Lane Road (river mile 4.2) to Raymond Creek Road (river mile 9.9)	41009C0481 C, 41009C0482 C, 41009C0444 C, 41009C0463 C
North Scappoose Creek	1.2 river miles upstream from the mouth of the creek	41009C0444 C, 41009C0450 C
North Scappoose Creek Overflow	Overflow area between Scappoose Creek and North Scappoose Creek	41009C0444 C

<sup>1</sup>FIRM = Flood Insurance Rate Map. The last effective date for these maps was 8/16/1988.

Goettel, 2005

### 5.3.1.5 Probability of Future Events

Columbia County and the incorporated Cities of St. Helens, Columbia City, Scappoose, Clatskanie, Rainier, Prescott, and Vernonia, participate in the NFIP and are required to regulate floodplain development. Any structure built in the floodplain after 1974 must meet NFIP requirements for elevation and flood proofing. Columbia County and the incorporated jurisdictions use FEMA developed floodplain maps as the basis for implementing floodplain regulations. FIRMs delineate flood hazard areas where NFIP regulations apply. FIRMS and flood insurance studies assess the probability of flooding at given locations. These maps represent a snapshot in time, and do not account for changes in the floodplains. Development and other natural and artificial changes in floodplains have caused changes to the rivers and streams in Columbia County. For areas not mapped by FIRMS, flood-susceptible areas can be delineated and flood levels estimated by using historic stream flow records to determine flood frequency and recurrence.

Flood studies use this information to determine the probability of occurrence for floods of different magnitudes. The probability of occurrence is expressed as a percentage indicating the probability of a specific flood event occurring in any given year.

Factors contributing to the frequency and severity of riverine flooding include:

- Rainfall intensity and duration
- Moisture conditions
- Watershed conditions, including steepness of terrain, soil types, amount and type of vegetation, and density of development
- The existence of attenuating features in the watershed, including natural features such as swamps and lakes, and human-built features such as dams
- The existence of flood control features, such as levees and flood control channels
- Velocity of flow
- Tide heights and storm surge
- Availability of sediment for transport, and the erodibility of the bed and banks of the watercourse

These factors are evaluated using a hydrologic analysis to determine the probability that discharge of a certain size will occur, and to determine the characteristics and depth of the flood resulting from that discharge.

Flooding in western Oregon generally occurs when storms from the Pacific Ocean bring intense or prolonged rainfall to the west coast. Columbia County typically experiences the most severe floods from winter rainfall in December, January, and February. These floods are occasionally exacerbated by frozen snow packs where rain and snow melt combine while the ground is frozen, preventing ground seepage capability. The County is subject to flooding from river overflows; as well as flooding from local storm water drainage. The county is susceptible to winter rain flooding from October through April; while the months between May and July bring snowmelt and runoff floods. Based on previous occurrences, the county is not susceptible to flash floods according to NOAA's National Weather Service – Portland Office, Warning Coordination Meteorologist. However, the county is likely to experience major flood events occurring in and around the county every 2 to 6 years based on recent historic occurrences.

### **5.3.2 Winter Storm**

Winter storms occurring in Columbia County result in several natural hazards – including floods, landslides/debris flows, and wind. Each on its own, or in combination, can completely immobilize emergency response activities, close down transportation corridors, and disrupt transportation and utilities. Each of these natural hazards is individually discussed in detail in their respective sections.

Winter storms in Columbia County can bring snow as well as rain, or can be followed by rising temperatures that melt newly fallen snow in higher elevations. Either scenario often causes flooding; most floods in western Oregon occur as a result of winter storms. The flood hazard is described in detail in the flood section of this document.

As is the case with flood, wind as a hazard in Columbia County most frequently occurs as part of a winter storm. The *nature, history, location, extent, and probability of future events* for wind, including winter storm wind, are explored in detail in the wind section of this document.

### 5.3.2.1 Nature

Ice and snow storms, which include freezing rain, sleet, and hail, can be the most devastating of winter weather phenomena and are often the cause of automobile accidents, power outages and personal injury. Ice storms result in the accumulation of ice from freezing rain which coats every surface it falls on with a glaze of ice. Freezing rain is most commonly found in a narrow band on the cold side of a warm front, where surface temperatures are at or just below freezing. Typically, ice crystals high in the atmosphere grow by collecting water vapor molecules, which are sometimes supplied by evaporating cloud droplets. As the ice crystals fall, the air warms and the particles melt and collapse into raindrops. As the raindrops approach the ground, they encounter a layer of cold air and cool to temperatures below freezing. However, since the cold layer is shallow, the drops themselves do not freeze, but rather are supercooled, that is cooled in a liquid state to below-freezing temperatures. These supercooled raindrops freeze on contact when they strike the ground or other cold surfaces.

Snowstorms happen when a mass of very cold air collides with a mass of warm air. The warm air rises quickly and the cold air cuts underneath it, cooling and condensing as it rises, forming a cloud bank in the process. As the moisture droplets in the cloud cool to a point below freezing, they become ice crystals, which then collide within the cloud and snow is formed. The resulting precipitation falls as snow only when the temperature of the air between the bottom of the cloud and the ground is below 40 degrees Fahrenheit. (ONHW 2006) A higher temperature will cause the snowflakes to melt as they fall through the air, turning them into rain or sleet. Similar to those of ice storms, the effects of a snowstorm can disturb a community for weeks or even months. The combination of heavy snowfall, high winds and cold temperatures poses danger from prolonged power outages, automobile accidents and transportation delays, dangerous walkways, and through direct damage to buildings, pipes, crops, other vegetation, and livestock. Buildings and trees can also collapse under the weight of heavy snow.

### 5.3.2.2 History

Table 5-4 summarizes the NOAA NWS Forecast Office’s past storm events website, (<http://www.wrh.noaa.gov/pqr/paststorms/index.php>) which lists nine significant ice and snow storms having occurred in Columbia County since 2000<sup>1</sup>.

**Table 5-4. Winter Storms Events, 2000 – 2007**

Date	Snow Type (Ice, Snow, Sleet)	Details
12/3/2001 H	eavy Snow	A powerful Pacific storm dumped very heavy snow in the Cascades again. In the Columbia River Gorge 3 to 4 inches of new snow was reported at Hood River, and both Bonneville Dam and Cascade.

**Table 5-4. Winter Storms Events, 2000 – 2007**

<b>Date</b>	<b>Snow Type (Ice, Snow, Sleet)</b>	<b>Details</b>
12/17/2001	Heavy Snow	In the Columbia River Gorge, Hood River had 4 inches of snow.
12/27/2001 W	inter Storm	In the Columbia River Gorge, Hood River reported 2 inches of snow.
12/30/2001 W	inter Storm	In the Columbia River Gorge, Hood River reportedly received sleet, freezing rain, and one inch of snow.
11/17/2003 W	inter Storm	Over a three-day period of strong Pacific storms, high winds were brought to the North and Central Oregon coast along with heavy rain and/or snow to the area. Locations in the Central and Southern Willamette Valley reported up to an inch.
1/7/2005 Heavy	Snow	Snow fell in the NW Oregon Coast Range, with 8 inches in Buxton, 5 inches west of McMinnville, and 4 inches at Sunset Summit and Wilson River Summit. A cold Pacific storm brought heavy snow to the NW Oregon Coast Range, Northern Oregon Cascades, and Columbia River Gorge.
12/3/2005 W	inter Storm	A strong moisture-laden Pacific system brought winter conditions to various regions of northwest Oregon.
3/8/2006 W	inter Storm	A strong Pacific storm and associated cold front brought relatively late winter conditions to northwest Oregon. This snow event was one of the latest of the year seen in the Portland area, and forced many school closures around the area.
12/14/2006	Winter Storm and Flooding	A strong low pressure system combined with existing very cold, shallow air over portions of northwest Oregon brought a wintry mix of precipitation resulting in flooding in eight counties including Columbia County.
12/08/07 W	inter Storm	Severe storms resulted in flooding, landslides, and mudslides beginning on December 1, 2007 resulted in a major disaster declaration requiring over 20 million in aid. Five counties in Oregon were included in this disaster. Columbia county and participating jurisdictions were severely impacted by this storm.
12/20-26/2008	Snow, Mudslide, Landslide	A severe storm, record and near-record snow, mudslides, and landslides occurred between December 20 and 26, 2008. Said to be the worst snow and ice event to occur in the Willamette Valley in 40 years -- significantly damaged agricultural buildings and equipment. Heavy snow and freezing rain caused ice buildup that resulted in downed trees, limbs and broken branches throughout northwestern Oregon. Roads, infrastructure, and private property were damaged as a result of the storm. The full economic impacts of this storm event will not be known until spring, when the agricultural products potentially damaged by the event can be fully evaluated.

(Data from NOAA 2008a)

For additional historical data regarding snow and ice storms in Columbia County, see the 2005 *Multi-Hazard Mitigation Plan*.

In addition to snow events, Columbia County is also subject to ice storm and freezing rain events. For example, the winter storm in January 2004 had 8 inches to 12 inches of snow, followed by about 0.5 inches to 0.75 inches of ice. This storm resulted in considerable disruption of traffic in many portions of Columbia County. Ice storms and freezing rain are



fairly common, especially along the Columbia River when cold air near the ground coincides with warm moist air at higher altitudes.

### **5.3.2.3 Location**

All areas of Columbia County and the participating jurisdictions are susceptible to winter storms as cold arctic air breaches the Cascade Range and moves westward. Cold air rarely travels west of the Cascade Range, as the mountains provide a natural barrier separating the Willamette Valley from the cold air to the east. However, the Columbia River Gorge can provide a low-level passage funneling cold air westward. Rain, sleet, and/or snow will fall if moisture-saturated warm air from the Pacific moves into the area colliding with the colder air mass.

### **5.3.2.4 Extent**

Columbia County is located in Climate Zone 2, generally consisting of wet winters and dry summers. Winter storm characteristics are determined by the amount and extent of ice and snow, air temperature, wind speed and wind direction. Winter storms can cause power outages, transportation and economic disruptions, injuries and loss of life. Winter storms can also cause traffic-related accidents and death, hypothermia, and heart attacks from snow shoveling. Emergency response times can be slowed because of icy road conditions. The weight of the snow or ice can cause utility disruption and falling trees and limbs. Snowmelt can cause flooding and landslides. (State of Oregon 2006)

### **5.3.2.5 Probability of Future Events**

Historical data shows that the probability for annual winter storm recurrence is high with a one year recurrence interval. Winter storms combined with other weather events, like El Niño and La Niña cycle, often result in compounded hazards countywide. Winter storms have caused flooding, landslides, debris flows, utility and transportation systems disruptions.

## **5.3.3 Landslide**

### **5.3.3.1 Nature**

Landslide is a general term for the dislodgment and fall of a mass of soil or rocks along a sloped surface, or for the dislodged mass itself. The term is used for varying phenomena, including mudflows, mudslides, debris flows, rockfalls, rockslides, debris avalanches, debris slides and slump-earth flows. The susceptibility of hillside and mountainous areas to landslides depends on variations in geology, topography, vegetation and weather.

Landslides can be triggered by natural events such as seismic tremors and earthquakes, volcanic eruptions, stream erosion, snowmelt, and prolonged or heavy rainfall. Development and other human activities can also provoke landslides. Increased runoff, excavation in hillsides, shocks and vibrations from construction, placement of non-engineered fill, and changes in vegetation from fire, timber harvesting and land clearing have all led to landslide events. Weathering and decomposition of geologic material, and alterations in flow of surface or ground water can further increase the potential for landslides.

The United States Geological Survey (USGS) identifies six types of landslides, distinguished by the type of material and movement mechanism involved:

- **Slides:** The more accurate and restrictive use of the term landslide refers to a mass movement of material, originating from a discrete area of weakness that slides from stable underlying material. A *rotational slide* occurs when there is movement along a concave surface; and a *translational slide* originates from movement along a flat surface.
- **Debris flows:** Flows arise from saturated material that generally moves rapidly down a slope. A debris flow usually mobilizes from other types of landslides on steep slopes, then flows through confined channels, liquefying and gaining speed. Debris flows can travel at speeds of more than 35 miles per hour for several miles. Other types of flows include debris avalanches, mudflows, creeps, earthflows, debris flows, and lahars.
- **Lateral Spreads:** This type of landslide generally occurs on gentle slopes or flat terrain. Lateral spreads are characterized by liquefaction of fine-grained soils. The event is typically triggered by an earthquake or human-caused rapid ground motion.
- **Falls:** Falls are the free-fall movement of rocks and boulders detached from steep slopes or cliffs.
- **Topples:** Topples are rocks and boulders that rotate forward and may become falls.
- **Complex:** Any combination of landslide types.

The likelihood of a landslide in any given slide-prone location is largely dependent on the water content of the soil or rock fill. Landslides may happen at any time of the year, especially during rainy months when soils become saturated with water. Earthquakes can add to slope stress and disrupt ground stability, thereby triggering landslides, usually in already slide-prone locations. In addition, unconsolidated deposits of alluvial and glacial outwash materials are subject to accelerated stream bank erosion and landslides.

Indicators of a possible landslide include:

- springs, seeps, or wet ground that is not typically wet;
- new cracks or bulges in the ground or pavement;
- soil subsiding from a foundation;
- secondary structures (decks, patios) tilting or moving away from main structures;
- broken water line or other underground utility;
- leaning structures that were previously straight;
- offset fence lines;
- sunken or dropped-down road beds;
- rapid increase in stream levels, sometimes with increased turbidity;
- rapid decrease in stream levels even though it is raining or has recently stopped; and
- sticking doors and windows, visible spaces indicating frames out of plumb.

Landslides often occur in conjunction with other natural hazards, thereby exacerbating conditions, as described below:

- Shaking due to earthquakes can trigger events ranging from rockfalls and topples to massive slides.
- Intense or prolonged precipitation that causes flooding can also saturate slopes and cause failures leading to landslides.
- Landslides into a reservoir can indirectly compromise dam safety, and a landslide can even affect the dam itself.
- Wildfires can remove vegetation from hillsides, significantly increasing runoff and landslide potential.

### **5.3.3.2 History**

Landslides and debris flows are common in Columbia County. Much of the terrain is hilly and susceptible to slides; however, many slides take place in undeveloped areas and are unreported or even unnoticed. A statewide survey of winter storm landslides during 1996 and 1997, conducted by the Oregon Department of Geology and Mineral Industries (DOGAMI), reported 9,582 documented slides. The actual number was estimated to be many times the documented number. (Goettel 2005)

Historically, long periods of winter rain and heavy snowfall in the mountains trigger landslides (see Table 5-4 for winter storm history). These landslides affect county roads and key emergency transportation routes.

A February 1996 winter storm triggered numerous slides in Columbia County. Slides interrupted transportation routes in dozens of locations, including two emergency transportation routes, the Scappoose-Vernonia Road (19 locations) and Apiary Road (4 locations). (Goettel 2005)

The December 2007 winter storm caused 77 landslides and 41 debris flows in Columbia, Clatsop, and Tillamook counties. In northwestern Columbia County, one or more small landslides occurred triggering a debris flow that traveled approximately 1 mile and blocked a drainage near Woodson on Highway 30. This blockage, combined with additional rainfall resulted in a temporary lake (30-40 feet deep and 200 feet long). Woodson residents were evacuated and Highway 30 was closed on December 11<sup>th</sup> 2007. A catastrophic debris flow occurred when the embankment failed and engulfed Highway 30 and Woodson. No fatalities occurred.

A severe storm, record and near-record snow, mudslides, and landslides occurred between December 20 and 26, 2008. Roads, infrastructure, and private property were damaged as a result of the storm.

### **5.3.3.3 Location**

In general, the probability of slope failure increases with an increase in slope inclination. However, this is not always the case. Depending on various factors such as soil type and water content, a slope having a relatively low inclination could be at greater risk of failure than another slope having a relatively high inclination. Other factors that influence susceptibility include:

rock type; vegetative cover and type; slope aspect; permeability and rate of infiltration; proximity to seismic sources; and magnitude of seismic events. In addition, unconsolidated deposits of alluvial and glacial outwash materials are subject to accelerated stream bank erosion and landslides. The possibility of failure also increases in sloped areas in which human influences, such as cutbacks, have occurred. Figures I-4 through I-4H show landslide hazard areas.

### **5.3.3.4 Extent**

The Oregon Department of Forestry (ODF) conducted a 3-year study of the impacts of landslides for two 1996 winter storms, entitled, *Storm Impacts and Landslides of 1996: Final Report*. The ODF study included eight study areas, one of which was in Columbia County, but did not provide a detailed inventory of landslide prone areas in Columbia County, outside of the very small study area. This study concluded that the highest hazard for shallow rapid landslides in western Oregon occurs on slopes of over 70% to 80% steepness (depending on landform and geology).

The geographic extent of landslide events is essentially the same as slide location, while the effects depend on what infrastructure is in the way of a slide, as well as the magnitude and force of the slide itself. The extent of effects could be as limited as one building or property, to region-wide effects, as in the case of a major transportation disruption, slide-induced dam failure, or utility outage.

Rapidly moving landslides have the greatest potential to endanger human life or inflict serious injury, especially to those living in or traveling through rapidly moving slide prone areas. Slow moving slides are less likely to inflict serious human injuries, but can cause property damage. (ONHW 2006)

### **5.3.3.5 Probability of Future Events**

Landslides are an annual occurrence in Oregon during the rainy months, October through April. They generally result from intense or prolonged rainfall, particularly during a rain on snow event. Slope alteration and shape can also be a recurrence interval factor. Oregon's Enhanced Natural Hazard Mitigation Plan states that, "Landslide recurrence interval is highly variable" and is terrain dependent. Recurrence intervals for steep terrain can range from 50-5,000 years, with some debris flow recurrence intervals of less than 10 years.

## **5.3.4 Wildfires**

### **5.3.4.1 Nature**

Wildfires can be classified as wildland fires, wildland/urban interface (or intermix) fires, urban fires, and prescribed fires. Due to the large amount of forested land in Columbia County, both wildland fires and wildland/urban interface fires are significant hazards.

Wildland fires spread through the consumption of vegetation. They often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may be visible for miles around. Wildland fires can be caused by human activities such as arson or campfires, or by natural events

like lightning. Wildland fires often occur in forests or other areas with ample vegetation. When a wildland fire spreads to developed areas such as suburbs, small communities, or isolated homes, it becomes a wildland/urban interface fire.

The following three factors contribute appreciably to wildland fire behavior and can be used to identify hazards.

- **Topography:** As slope increases, the rate of wildfire spread increases. South-facing slopes are also subject to more solar radiation, making them drier and thereby intensifying wildfire behavior. However, ridgetops can mark the end of a wildfire's spread, since fire spreads more slowly or may even be unable to spread downhill.
- **Fuel:** The type and condition of vegetation plays a significant role in the occurrence and spread of wildfires. Certain types of plants are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the "fuel load"). The ratio of living to dead plant matter is also important. The moisture content of both living and dead plant matter decreases during periods of prolonged drought and greatly increases the risk of fire. The fuel's continuity, both horizontally and vertically, is also an important factor. Forests with strong ladder fuels (understory growth between ground fuels and tree crowns) are more likely to have major fires involving tree crowns. Forests with limited ground fuels and little or no ladder fuels are much more likely to experience minor ground fires than a fire involving tree crowns. (ONHW 2006)
- **Weather:** The most variable factor affecting wildfire behavior is weather. Temperature, humidity, wind and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures coupled with low humidity, can lead to devastating wildfires. Conversely, cool temperatures and higher humidity often signal reduced wildfire occurrence and easier containment of existing fires.

In Columbia County, wildland fires burn primarily vegetative fuels, outside highly urbanized areas. Wildland fires can be categorized as occurring in the following locations:

- **Agricultural:** Agricultural fires burn in areas where the primary fuels are flammable cultivated crops, such as wheat. This type of fire tends to spread very rapidly, but is relatively easy to suppress if adequate resources are available. Structures threatened, if any, are generally those belonging to ranch and farm owners. There can also be significant losses in agricultural products.
- **Forest:** Forest fires are the classic wildland fire. These fires burn fuels composed primarily of timber and associated fuels, such as brush, grass, logging residue and thick stands of replanted trees. Due to variations in fuel and topography, this type of fire may be extremely difficult and costly to suppress.
- **Wildland-Urban Interface:** Fires involving the wildland-urban interface occur in areas where urbanization and the presence of natural vegetation fuels allow a fire to spread rapidly from natural fuels to structures and vice versa. Especially in the early stage of such fires, structural fire suppression resources can be quickly overwhelmed, increasing the number of structures destroyed. Such fires are known for the large number of structures simultaneously exposed to fire. Nationally, wildland interface fires commonly produce widespread losses.

- Urban:** While fires in urban areas rarely spread out of control, thanks to proximity to fire-fighting resources and less fuel between buildings, urban conflagration is a hazard in densely populated areas. Many of the same factors that influence hazard in wildland and interface areas come into play in urban centers. Drought, high temperatures, and fuel load are joined by factors such as flammable building materials, aging electrical wiring, and closely packed structures to increase fire hazard. When combined with inadequate or faulty firefighting equipment, staff shortages, or poor location data, urban fire risk factors can set the stage for disaster.

Although thought of as a summer occurrence, wildland fires can, and do, occur during any month of the year. The vast majority of wildland fires occur between July and October. Dry spells during the winter months, especially when combined with the factors of winds or dead fuels, result in fires that burn with alarming intensity and rate of spread. Common causes of wildland fire include: lightning; equipment use; railroad activity; debris burning; arson; and improperly extinguished cigarettes.

Wildland fires are part of the natural ecology and natural life cycles of wildlands. Fires create open spaces with different habitats for both plants and animals than existed previously. Fires also reduce fuel loads in areas, which in turn decreases the potential for large catastrophic fires. (ONHW 2006) However, a wildland fire may grow into an emergency or disaster if not promptly controlled. Even a small fire can threaten lives and resources and destroy property, especially in heavily developed interface areas. Wildland fires may also harm livestock and pets. In addition to threatening humans, animals, and infrastructure, wildfires in forested areas have a severe impact on natural resources. Wildland fires strip the land of vegetation and destroy forest resources. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thus increasing flood potential, harming aquatic life and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards, as discussed in the landslides hazard profile.

### 5.3.4.2 History

Wildland fires have burned the Oregon landscape for thousands of years. Many wildfires have resulted from natural lightning strikes and intentional human activities. Historically, indigenous people purposely ignited large portions of the basin valley annually for agriculture, hunting, communication, warfare, visibility, safety, and sanitation. Such systemic burning may have been used for as long as ten thousand years prior to Euro-American settlement. Euro-American settlement in the mid-19<sup>th</sup> century continued to shape the landscape with fire. Euro-Americans burned land to protect timber and property in the region. They directed more attention to forested areas and coastland. As a result, valley prairies and savannas burned less and areas not used for fields or pastures began growing into forests. (ONHW 2006)

According to ODF, the following major wildfires have occurred in Oregon in the past 150 years. However, as outlined in Table 5-5 below, none of these major fires occurred in Columbia County.

**Table 5-5. Historic Fires in Oregon (1848-2008)**

Year	Name of Fire	Counties	Acres burned
1848	Nestucca	Tillamook/Yamhill	290,000

**Table 5-5. Historic Fires in Oregon (1848-2008)**

Year	Name of Fire	Counties	Acres burned
1849 Si	letz	Lincoln/Polk	800,000
1853 Yaq	uina	Lincoln	482,000
1865 Si	lverton	Marion	988,000
1868 C	oos Bay	Coos	296,000
1933 Tillam	ook	Tillamook/Yamhill	240,000
1936 B	andon	Coos	143,000
1939 Saddle	Mountain	Tillamook/Yamhill 190,000	
1945 W	ilson River/Salmonberry	Tillamook	33,000
1951	North Fork & Elkhorn	Tillamook, Yamhill	33,000
1966 O	xbow	Lane	44,000
1987 Si	lver	Josephine	97,000
1992 Lo	ne Pine	Klamath	31,000
1996 Skel	ton	Deschutes	17,700
2002 B	iscuit	Josephine/Curry	500,000
2003 B	&B Complex	Jefferson/Linn/Deschutes/Marion	80,000
2005 Blo	ssom Complex	Curry	14,772
2006	Shake Table Complex	Grant	14,453
2007 Lov	elett Creek	Grant	53,556
2007	Battle Creek Complex	Wallowa	79,299
2007	Irish Springs (Vale BLM)	Baker	45,743
2007 Egl	ey Complex	Harney	140,360
2008	Royce Butte	Deschutes/Klamath/Lane	390-1,100 acres

**Source:** Department of Forestry and Oregon Emergency Management – State Hazard Risk Assessment

Jim Wolf of ODF provided records for all wildland fires in ODF-responsibility lands in Columbia County from 1970 to 2003 for the 2005 Columbia County HMP. For this 34-year period, a total of 689 wildland fires occurred on ODF-responsibility lands in Columbia County, or an average of 20 fires per year. Most of these fires were less than one acre, 134 fires were between 1 and 9 acres, and 15 fires were 10 acres or more. The largest fire reported consumed 93 acres. It is important to keep in mind that these data are for ODF-responsibility areas, along with ODF joint responses to fires in areas where the primary responsibility is provided by local fire agencies. However, because ODF-responsibility lands include nearly 80% of the entire county, these data probably represent most of the wildland fires in Columbia County in the last 34 years. (Goettel 2005) 2004 through 2008 data was obtained from the ODF fire statistics database. Table 5-6 shows recent fires in the vicinity of Columbia County. Columbia County historic fires are shown on Figure I-5.

**Table 5-6. Recent Large Fires in Columbia County and Vicinity**

Fire Name	Location	Size (Acres)	Fuel Type	w/i WUI	Year	Cause Category	Vicinity of Homes
Pebble Creek	South of Vernonia	165	Logging Slash/Timber	Yes	1987	Hunter/Smoking	Yes
Keasey Dam	West of Vernonia	117	Logging Slash Reproduction	No	1989	Recreationist/Campfire	No
Emerald Forest	37		Logging Slash	No	1994	Equipment/Logging	Yes
Kerry Road	West of Clatskanie	31	Fell/Buck, Slash, Reproduction			Equipment/Logging	No
Wolden Road	31		Reproduction	Yes	1999	Debris Burning	Yes
Lost Creek Road	20		Reproduction	Yes	1999	Debris Burning	Yes
Lost Creek Road	West of St. Helens	5 Lo	Logging Slash	Yes	1999	Burning	Yes
Scappoose Airport	Scappoose Airport	200	Logging Slash/Timber	Yes	2000	Burning	Yes
Pittsburg Road	South of Liberty Hill	5 Scrub	Oak/Grass	Yes	2006	Recreationist/unknown	Yes

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Mike Greisen, Fire Chief, Scappoose Rural Fire District stated, “The Scappoose Rural Fire District experienced a 200 acre fire in 2000 that threatened 8 homes and a trailer park. We had resources from Multnomah and Washington County assist. Columbia River Fire & Rescue had one this summer near Rainier and brought in resources from Washington County and the State of Washington.”

In 2008 a total of 16 fires consumed 22.06 acres in Columbia County. Causes included debris burning, equipment use, recreationist, and lightning.

### 5.3.4.3 Location

Columbia County is approximately 90% forested; therefore, there is high risk for wildland fires in the county. (Loy 2001) According to a United States Forest Service report identifying wildland/urban interface communities within the vicinity of Federal lands in Oregon that are at high risk from wildfire, every community in Columbia County is at risk for wildland/urban interface fires. (66 Fed. Reg. 43383-43435)

However, the actual fire hazard in these areas may be lower than expected because a high percentage of forest lands in Columbia County are actively managed for timber. Harvested areas typically have lower fire risk because they are relatively free of dead and downed material that would contribute to the fuel load. In addition, forests within Columbia County are relatively free of major insect and disease problems that often plague other forests in Oregon. Finally, typical rainfall amounts for Columbia County are “moderately high” to “high”, averaging 40 to 60 inches per year. (Goettel 2005)



The fire protection service providers in the county identified areas of special concern for wildland/urban interface fires. These areas are identified in Table 5-7. Fire hazard areas are shown on Figures I-6 through I-6H.

**Table 5-7. Areas of Special Concern for Wildland/Urban Interface Fires**

Community	Areas of Special Concern <sup>1</sup>
Clatskanie	Conyers Creek drainage area, area NE of Clatskanie and populated areas in the interface adjoining natural cover and wildland fuels.
Mist-Birkenfeld	Fishhawk Lake area and other rural areas in the interface adjoining natural cover and wildland fuels.
Rainier	Populated areas of the interface adjoining natural cover and wildland areas.
Scappoose	Chapman, Alder Creek, JP West, Mt. View, Callahan, Bonneville, and Wilkinson Roads. Dutch Canyon, Pamarama Terrace and Raymond Creek subdivisions. <sup>2</sup> Populated areas of the interface adjoining natural cover and wildland areas.
St. Helens	Gray Cliffs and surrounding greater St. Helens area. Areas involving oak, brush, and grass fuel types. Populated areas of the interface adjoining natural cover and wildland areas.
Vernonia	Populated areas of the interface adjoining natural cover and wildland areas.

<sup>1</sup> Michael Simek, ODF, Sept. 21, 2004.

<sup>2</sup> Scappoose RFD, November, 2004

Source: Goettel 2005

### 5.3.4.4 Extent

ODF records of historical fires show that minor wildland fires occur regularly in Columbia County. Fire protection services have generally been able to contain these fires before they exceeded 10 acres. The county’s success in controlling wildland fires is likely due to a combination of well-run fire protection services, “moderately high” to “high” levels of rainfall, and the fact that most of the county’s forests are disease-free and actively managed for timber.

Due to successful fire control, the minor wildland fires that have occurred in Columbia County have damaged relatively few residential areas, scattered buildings, and natural resources in the affected forests. However, if a major wildland fire were to occur, it would have the potential to severely impact residential structures, roads, power lines, and other critical infrastructure in all jurisdictions in the county.

### 5.3.4.5 Probability of Future Events

In Oregon, wildland fire season normally begins in late June, peaks in August, and ends in October. However, a combination of above normal-temperatures and drought can increase the length of the traditional fire season. Wildland fire hazards throughout the county would be highest during prolonged periods of drought, especially after periods of below normal rainfall, which would result in a combination of high fuel loads and unusually dry conditions.

Due to historical fire patterns, the probability of a minor wildland fire occurring in any of the jurisdictions is very high. Although Columbia County has never experienced the major fires that have affected other counties in Oregon, there is a possibility that a major wildland or wildland/urban interface fire could occur in Columbia County in the future.

Urban fires are the most preventable type of fire, and future events depend largely on prevention measures. Although no historical urban conflagrations in have occurred, educating residents,

building and maintenance code enforcement, and firefighting equipment, staff, and response systems upkeep are all steps that can ensure that highly likely localized urban fires do not become large-scale conflagrations.

### **5.3.5 Earthquake**

#### **5.3.5.1 Nature**

An earthquake is a sudden motion or trembling of the earth produced by the rupture of rocks due to stresses beyond the rocks' elastic limits. The point inside the Earth where the rupture takes place is termed the hypocenter. The point on the planet's surface directly above the hypocenter is the epicenter. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. The most common effect of earthquakes is ground motion, usually felt as shaking and vibrations.

The severity of ground motion generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. Ground motion causes waves in the earth's interior, also known as seismic waves, and along the earth's surface, known as surface waves. There are two kinds of seismic waves. P (primary) waves are longitudinal or compression waves similar in character to sound waves, that cause back-and-forth oscillation along the direction of travel (vertical motion). S (secondary) waves, also known as shear waves, are slower than P waves and cause structures to vibrate from side to side (horizontal motion). When P and S waves hit the surface of the Earth, they generate surface waves, which are further categorized into Raleigh waves and Love waves. Slower than seismic waves, and therefore later to hit, surface waves are responsible for most of the damage during an earthquake.

Earthquakes are usually measured in terms of magnitude and intensity. Magnitude is related to the amount of energy released during an event, while intensity refers to the effects on people and structures at a particular place. Small to moderate earthquake magnitude is usually reported according to the standard Richter scale. Larger earthquakes are reported according to the moment-magnitude scale because the standard Richter scale does not adequately represent the energy released by these large events.

Intensity is usually reported using the Modified Mercalli Intensity Scale. This scale has 12 categories ranging from "not felt" to "total destruction." Different values can be recorded at different locations for the same event depending on local circumstances such as distance from the epicenter or building construction practices. Peak ground acceleration (PGA) is also used to measure earthquake intensity. It measures the earthquake's intensity by quantifying how hard the earth shakes in a given location. PGA can be measured in g, which is acceleration due to gravity. Table 5-8 identifies corresponding intensity and magnitude ratings as well as effects associated with each rating.

**Table 5-8. Effects of Intensity and Magnitude Ratings**

Magnitude	MM Intensity	PGA (% g)	Perceived Shaking
0 – 4.3	I <0	.17	Not Felt
	II-III	0.17 – 1.4	Weak
4.3 – 4.8	IV	1.4 – 3.9	Light
	V	3.9 – 9.2	Moderate
4.8 – 6.2	VI	9.2 – 18	Strong
	VII	18 – 34	Very Strong
6.2 – 7.3	VIII	34 – 65	Severe
	IX	65 – 124	Violent
	X 12	4 +	Extreme

In addition to ground motion, several secondary hazards can occur from earthquakes, such as surface faulting. Surface faulting is the differential movement of two sides of a fault at the earth’s surface. Displacement along faults, both in terms of length and width, varies but can be significant (up to 20 feet), as can the length of the surface rupture (up to 200 miles). Surface faulting can cause severe damage to linear structures, such as railways, highways, pipelines, and tunnels.

Earthquake-related ground failure due to liquefaction is another secondary hazard. Liquefaction occurs when seismic waves pass through saturated granular soil, distorting its structure, and causing some of the empty spaces between granules to collapse. Pore-water pressure may also increase sufficiently to cause the soil to briefly become fluid. Liquefaction causes lateral spreads (horizontal movements commonly of 10 to 15 feet, but up to 100 feet), flow failures (massive flows of soil, typically hundreds of feet, but up to 12 miles) and loss of bearing strength (soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property.

The most common earthquakes that occur in Oregon are crustal, intraplate or great subduction earthquakes. These are described as follows:

**Crustal earthquakes:** These generally occur along shallow faults near the earth’s surface. Crustal earthquakes make up the majority of earthquakes in the Cascadia area (western Washington, Oregon and northwestern California) and are a result of fault movement in the Earth’s surface. These shallow earthquakes are usually less than 7.5 magnitude and strong shaking generally lasts 20 to 60 seconds. Aftershocks, as well as tsunamis and landslides, are anticipated after a crustal event.

**Intraplate earthquakes:** These occur deeper, at 20 to 40 miles beneath the ground surface. These deep earthquakes are usually less than 7.5 magnitude, and damaging events occur every 10 to 30 years in this region. There are few aftershocks, and tsunamis are generally not anticipated, although landslides can trigger localized tsunamis. Due to the deep earth movement, an intraplate earthquake is felt over a larger area with less intensity. Damage from this type of event is generally less than with an equally sized crustal earthquake.

**Great subduction earthquakes:** occur offshore of the Oregon and Washington Coasts along the Cascadia Subduction Zone. This zone is the result of the Juan de Fuca plate being pushed under the North American plate. Earthquakes centered along this zone can be as great as 9.0 magnitude. Geologic evidence demonstrates approximately 500 years between events with the last significant event on January 26, 1700. Aftershocks up to 7.0 magnitude are anticipated to cause additional damage. Liquefaction, tsunamis and landslides are expected as a result of a great subduction earthquake.

### 5.3.5.2 History

Approximately 7,000 earthquakes in the Pacific Northwest have been documented over the past 200 years. This documentation has occurred sporadically, with only the most significant events being recorded until recent history. Currently, the University of Washington seismology laboratory records approximately 1,000 earthquakes of magnitude 1.0 or greater annually in Washington and Oregon. While most of these events are barely felt, anywhere from 12 to 24 earthquakes cause enough ground shaking to be recognized as an actual earthquake by area residents. Historic earthquakes are shown on Figure I-7. Table 5-9 shows magnitude 4.0 or greater earthquakes potentially felt in Columbia County since 1949.

**Table 5-9. Magnitude 4.0 or Greater Earthquakes, 1949 - 2006**

Date	Magnitude	Location
April 13, 1949	7.1	Olympia, WA
April 18, 1961	4.5	Albany, OR
November 5, 1962	5.5	Vancouver, WA
March 7, 1963	4.6	Salem, OR
March 25, 1993	5.6	Scotts Mills, OR
February 28, 2001	6.8	Anderson Island, WA
June 29, 2002	4.5	Mt. Hood, OR
June 30, 2004	4.4	Lakeview, OR
July 12, 2004	4.9	Newport, OR
July 22, 2004	4.3	Lakeview, OR
August 18, 2004	4.7	Newport, OR
July 14, 2008	4.2	Maupin, OR

### **5.3.5.3 Location**

Columbia County is located within the geographical area bordering the Cascadia Subduction Zone. This zone is comprised of an 800-mile sloping fault and several smaller offshore faults located west of the Pacific Coast, from British Columbia to the north and Northern California to the south. The fault system separates the Juan de Fuca and North American plates. Inland, there are nine faults located within the USGS Quaternary Fault and Fold Database for the Salem 1° x 2° Sheet (44°- 45° by 124° -122°), including the Portland Hills Fault, East Bank Fault, and Mount Angel Fault. (Evarts 2005) Statewide, regional, and local earthquake fault and hazard areas are shown on Figures I-8 through I-10.

### **5.3.5.4 Extent**

The extent of earthquake effects depends on the nature, magnitude, and location of the quake. An earthquake can range from a tiny tremor affecting only a small, localized area, to a major shake affecting an entire region. For hazard mitigation purposes, it should be considered that the extent of a major event would be greater than countywide.

During the rainy winter season, an earthquake may trigger a landslide. Areas with steep slopes and loose rock are most susceptible. The Cities of St. Helens, Columbia City, and Scappoose, may be subject to earthquake-induced landslides. To date, these “high” landslide potential areas of have received little development; although some residential areas are present.

Overall, an earthquake may affect water and sewer systems, natural gas lines, and power/electrical systems.

### **5.3.5.5 Probability of Future Events**

Geological evidence indicates that damaging earthquakes (M 8.0 to M 9.0) may have occurred at least seven times in the last 3,500 years, suggesting a return interval of 300 to 600 years. While it is impossible to predict when an earthquake may occur, it is highly probable (1 event in 35 years) that a moderate earthquake (M 4.0 and greater) will occur along the Cascadia Subduction Zone, thereby affecting the jurisdictions in Columbia County.

Shaking hazard maps produced by the USGS consider two alternative scenarios for damaging earthquakes (M 8.3 or M 9.0) along the subduction zone. The shaking hazard maps show the level of ground motion that has 1 chance in 475 of being exceeded each year, which is equal to a 10 percent probability of being exceeded in 50 years. Any place within the planning area may be subject to earthquake. However, the jurisdictions in the western portion of Columbia County are more likely to be impacted by a major quake, because of their closer proximity to the Cascadia Subduction Zone. (Weldon 2003)

## **5.3.6 Volcano**

### **5.3.6.1 Nature**

A volcano is a vent or opening in the earth’s crust from which molten lava (magma), pyroclastic materials, and volcanic gases are expelled onto the surface. Volcanoes and other volcanic phenomena can unleash cataclysmic destructive power greater than nuclear bombs, and can pose

serious hazards if they occur in populated and/or cultivated regions. Ashfall and tephra, an eruptive hazard, are of the greatest concern in Columbia County.

There are four general types of volcanoes found within a short distance of Columbia County:

- **Lava domes** are domes that are formed when lava erupts and accumulates near the vent.
- **Cinder cones** are cone-shaped and formed by accumulation of cinders, ash, and other fragmented materials originating from an eruption.
- **Shield volcanoes** are broad, gently sloping volcanic cones of flat domical shape, usually several tens or hundreds of square miles in extent, built chiefly of overlapping and interfingering basaltic lava flows.
- **Composite or stratovolcanoes** are typically steep-sided, symmetrical cones of large dimensions built of alternating layers of lava flows, volcanic ash, cinders, and blocks. Most composite volcanoes have a crater at the summit containing a central vent or clustered group of vents.

Along with the different kinds of volcanoes there are different types of eruptions. The type of eruption is a major determinant of what physical results an event will create, and what hazards it poses. Six main types of volcano hazards exist:

- **Volcanic gases** are made up of water vapor (steam), carbon dioxide, ammonia, as well as sulfur, chlorine, fluorine, boron, and several other compounds. Wind is the primary source of dispersion for volcanic gases. Life, health, and property can be endangered from volcanic gases within about six miles of a volcano. Acids, ammonia, and other compounds present in volcanic gases can damage eyes and respiratory systems, and heavier-than-air gases, such as carbon dioxide, can accumulate in closed depressions and suffocate humans or animals.
- **Lahars** are formed when loose masses of unconsolidated, wet debris become mobilized, and are usually created by shield volcanoes and stratovolcanoes. Eruptions may trigger one or more lahar directly by quickly melting snow and ice on a volcano or ejecting water from a crater lake. More often, lahars are formed by intense rainfall during or after an eruption. Rainwater can easily erode loose volcanic rock and soil on hillsides and in river valleys. As a lahar moves farther away from a volcano, it will eventually begin to lose its heavy load of sediment and decrease in size.
- **Landslides** are common on stratovolcanoes because their massive cones typically rise thousands of feet above the surrounding terrain, and are often weakened by the very process that created the mountain – the rise and eruption of molten rock (magma). If the moving rock debris is large enough and contains a large content of water and soil material, the landslide may transform into a lahar and flow more than 50 miles from the volcano.
- **Lava flows** are streams of molten rock that erupt from a vent and move down slope. Lava flows destroy everything in their path. However, deaths caused directly by lava flows are uncommon because most move slowly, and flows usually do not travel far from the source vent. Lava flows can bury homes and agricultural land under hardened rock, obscuring landmarks and property lines.

- **Pyroclastic flows** are dense mixtures of hot, dry rock fragments and gases that can reach 50 mph. Most pyroclastic flows include a ground flow composed of coarse fragments and an ash cloud that can travel by wind. Escape from a pyroclastic flow is unlikely because of the speed at which they move.
- **Tephra** is a term describing any size of volcanic rock or lava that is expelled from a volcano during an eruption. Large fragments generally fall back close to the erupting vent, while particles of ash can be carried hundreds to thousands of miles away from the source by wind. Ash clouds are common adaptations of tephra.

### **5.3.6.2 History**

Mount St. Helens has been the most active volcano in the Cascade Range during the past 10,000 years. In Oregon, awareness of the potential for volcanic eruptions was greatly increased by the May 18, 1980 eruption which killed 57 people. The upper portion of the summit collapsed in a massive landslide triggered by volcanic tremors. That portion of the mountain is now a horseshoe-shaped crater partially filled by a lava dome. Early 19<sup>th</sup> Century settlers in the region witnessed eruptions occurring along the north flank area of the mountain.

As a result of the 1980 eruption and the far-reaching extent of the lateral blast, damage and reconstruction exceeded \$1 billion. The coverage area was 230 square miles and reached 17 miles northwest of the crater. Impacts from pyroclastic flows covered six square miles and reached 5 miles north of the crater, and landslides covered 23 square miles. Lahars (mudflows) affected the North and South Forks of the Toutle River, the Green River, and ultimately the Columbia River as far as 70 miles from the volcano.

Mount St Helens' most recent eruption began in October of 2004, with initial steam and ash eruptions giving away to slow-moving lava flows which ceased in January of 2008.

Mount Hood erupted in approximately 1805. Two other minor eruption periods occurred during the last 500 years with some lava flow near the summit. The eruptions created pyroclastic flows and lahars with little ash fall. (State Interagency Hazard Mitigation Team 2006) The other volcanoes in the Pacific Northwest have undergone similar formation and eruption cycles.

### **5.3.6.3 Location**

The extensive north-south oriented chain of volcanoes known as the Cascadia volcanic arc, or Cascade Range were formed by the Cascadia subduction zone. As the seafloor plate sinks beneath the North American Plate, it heats up and begins to melt, providing a vast reservoir of the heat and molten rock that create the magma chambers that become volcanoes.

Volcanoes near Columbia County include Mount St. Helens, Mt. Hood, Mt. Rainier, and Mt. Adams. The first three are active, and Mt. Adams is potentially active. Columbia County is approximately 40 miles from Mount St. Helens, and further away from the other volcanoes.

Historic volcanic eruptions are shown on Figure I-11.

### **5.3.6.4 Extent**

The volcanoes nearest to Columbia County are far enough away that none of the more devastating near source hazards are likely to be experienced. Heavier tephra particles will generally not reach Columbia County.

The major hazard for Columbia County is ashfall – either minor ash falls from an eruption of Mount St. Helens or lesser ash falls from more distant volcanoes. Ashfall deposition is controlled by prevailing wind direction, which in the Cascades is predominately from the west. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006) Volcanic eruptions may impact water bodies, such as the Columbia River at Longview and further downstream. River valleys are susceptible to debris flows, landslides, and lahars; rivers may require dredging to maintain channel depths for navigation.

Mount St. Helens, a stratovolcano, is located in southwestern Washington and is believed to be the volcano with the greatest potential to have a near-term impact on the region because of its ongoing activity since the cataclysmic event in 1980. A large eruption of Mount St. Helens is expected to eject tephra to altitudes of 12 to 20 miles, with a deposition area of 40,000 square miles or more. Wind direction and velocity, along with the vigor and duration of the eruption, will control the location, size, and shape of the area affected by tephra fall.

Mount St. Helens most recently erupted in October of 2004, pushing ash more than 10,000 ft into the air, and lava flows continued until January 2008, after which activity ceased. The volcano has been recently downgraded from “Advisory” to “Normal”, although another eruption in the near future is highly likely.

### **5.3.6.5 Probability of Future Events**

By careful analysis of past activity, geologists can make general forecasts of long-term activity associated with individual volcanoes, but these are on the order of trends and likelihood, rather than specific events or timeline. Short-range forecasts are often possible with greater accuracy. Several signs of increasing activity can indicate that an eruption will follow within weeks or months. Magma moving upward into a volcano often causes a significant increase in small, localized earthquakes, and increased emissions of carbon dioxide and compounds of sulfur and chlorine that can be measured. Shifts in magma depth and location can cause changes in ground level elevation that can be detected through ground instrumentation or remote sensing.

The USGS has identified several other potentially active volcanoes in Washington, Oregon, and California. The effects of volcanic activity from these volcanoes could include landslide avalanches, lahars, tephra, lava, and pyroclastic flows or surges. Activity from one of these volcanoes is highly likely in the near future.

## **5.3.7 Wind**

### **5.3.7.1 Nature**

Wind is air flow that travels horizontally with respect to the Earth’s surface. High winds are defined as those that last longer than one hour at greater than 39 miles per hour (mph) or for any length of time at greater than 57 mph. Wind speeds vary with individual storms.



In general, the damaging effects of windstorms may extend for distances of 100 to 300 miles from the center of storm activity. Many buildings, utility and transportation systems in open areas, natural grasslands, agricultural, or timberlands are especially vulnerable to wind damage.

Columbia County’s most devastating windstorms typically occur from the south.

### 5.3.7.2 History

Columbia County has a two-year recurrence interval of sustained winds speed that ranges from 37 to 43 mph. Winds of this velocity may cause significant damage at sites where local wind speeds are higher than this average. Damage is more prevalent in clear-cut areas. The 50-year recurrence interval winds speed range from 56 to 62 mph, which can cause widespread wind damage.

Numerous damaging windstorms have occurred within Columbia County. Table 5-10 includes some of the most noteworthy windstorms that brought extensive damage to the region. (NOAA 2008b)

**Table 5-10. Windstorm Events, 1950 – 2008**

Date	Sustained Wind Speeds	Details
November 10–11, 1951	40 mph	Extensive timber, building, and utility losses and disruption. Damage experienced statewide. Statewide winds 40-80 mph
December 1951	42 mph	Serious damage to buildings and utility system disruption. Statewide winds 40-100 mph
December 21, 1955	60 mph	Extensive damage to buildings, power and telephone lines throughout the state. Statewide winds 55-70 mph
November 1958	51 mph	Extensive timber, building, and utility losses and disruption. At one point, all highways closed at one or more points from fallen trees. Statewide winds 50-75 mph
October 1962	62 mph (90 mph wind gusts)	Downed trees and power lines, utility disruption. The Columbus Day storm was the equivalent of a Category IV hurricane in terms of central pressures and wind speeds. The storm, which started east of the Philippines as Typhoon Freda, measured 1,000 miles long as it hit the West Coast. 38 fatalities, \$200M damages statewide. Statewide winds 29-138 mph. Portland wind-116 mph
March 1963	39-68 mph	Widespread destruction. Statewide wind 39-100 mph
October 1967	70 mph	Extensive agricultural, timber, power and telephone utilities, and home losses Statewide 70 - 115 mph, one fatality and 15 injuries
March 1971	58 mph	Extensive roof damage, trees toppled, power line breakage, extensive utility disruption. Statewide wind 40-71 mph
November 1981	57 mph	Strongest windstorm since the 1962 Columbus Day storm. 57 mph winds. 75-92 mph wind along coast, gusts, 11 fatalities, \$50M damages statewide
November 1997	52 mph	Trees uprooted

**Table 5-10. Windstorm Events, 1950 – 2008**

Date	Sustained Wind Speeds	Details
December 2007	52 mph	Heavy snowfall, rains, rapid temperature warming created widespread flooding, tree blockages, landslides, transportation and utility disruptions, and 5 deaths in Oregon. Statewide wind 50-100 mph \$180M damages

*Sources: NOAA 2008b*

(Data from Western Region Headquarters NWS Historical Archives)

Tornadoes have occasionally occurred in Oregon and two tornadoes have been documented in Columbia County (NOAA 2008); one in August of 1978 near Scappoose, and the other in November of 1965 at Rainier. The nearby counties of Clatsop and Multnomah have experienced several tornado events. (Goettel 2005)

### **5.3.7.3 Location**

Several Pacific low-pressure centers make landfall on the Northwest each winter. Winds blowing along a north to south axis (parallel to the major mountain ranges) can prove extremely destructive. The windstorm pattern in this area is typically southwesterly, flowing directly into the Pacific Northwest. Severe windstorms have historically impacted all jurisdictions in Columbia County.

The National Weather Service’s extensive ENSO website delineates information explaining these weather patterns as they affect various US locations. They describe the Pacific Northwest’s late fall and early winter El Niño effects as warmer than normal temperatures with decreased precipitation, while La Niña patterns exhibit increased storminess, precipitation, and cold. These patterns and trends appear in Oregon’s historical weather events listing.

### **5.3.7.4 Extent**

The low-pressure centers bring sustained winds (40-60 mph) strong enough to topple power lines and trees. These prolonged windstorms are likely to last an average of three to six hours before moving on.

### **5.3.7.5 Probability of Future Events**

Windstorms producing winds gusting up to 70 mph or greater occur 1- 2 times every 10 years. High winds usually occur during October through April. Destructive windstorms are less frequent.

The preliminary research shows that El Niño events tend to shear weather systems apart as they approach the Northwest and La Niña events tend to have periods with enhanced high pressure, thereby producing enhanced cool, northerly flows. The wind-producing intervening neutral years tend to occur every 3-7 years.

Tornadoes have been documented in Columbia County and nearby counties; however, climate and weather conditions in Columbia County make the occurrence of major tornadoes unlikely. (Goettel 2005)

## 5.3.8 Erosion

### 5.3.8.1 Nature

Erosion is a process that involves the gradual wearing away, transport, and movement of land. However, not all erosion is gradual. It can occur quite quickly as the result of a flash flood, coastal storm, or other event. Most of the geomorphic change that occurs in a river system is in response to a peak flow event. It is a natural process but its effects can be exacerbated by human activity.

Erosion is a problem in developed areas where the disappearing land threatens development and infrastructure. There are three main types of erosion that affect human activity in Oregon.

- ❑ **Coastal erosion** is the wearing away of land and loss of beach, shoreline, or dune material because of natural activity or man-made influences. It can occur gradually or suddenly. Usually erosion is a long-term process, but it can also happen quickly during storm events.
- ❑ **Wind erosion** occurs when wind removes, moves, and redeposits soil. It can cause a loss of topsoil, hindering agricultural production. Blowing dust can also reduce visibility and have a negative effect on air quality.
- ❑ **Riverine erosion** results from the force of flowing water in, and adjacent to, river, creek, and tributary channels. This erosion affects the bed and banks of the channel and can alter or preclude any channel navigation or embankment development. In less stable braided channel reaches, erosion and material deposition are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally.

Riverine and wind erosion threaten various communities along the rivers, creeks, and tributaries in Columbia County. Erosion of any type rarely causes death or injury. However, erosion can cause significant destruction to property and infrastructure. The Columbia River is subject to tidal influences in the far distant lower river. Additionally, a major river reclamation project has taken away part of the natural floodplain north of Clatskanie. This combination of a high tide and reduced floodplain exacerbates flooding damages as these two conditions limit where excess Clatskanie River water can flow during a high-flow flood event. Flooding and erosion scour result from these two conditions.

Generally, erosion within the Columbia River occurs when the flow of the river changes and is directed towards the banks or mid-channel islands. These changes can be caused by surface wind stress and gravity waves during storm events (primarily severe winter storms), transporting sediment by bottom currents. (Sternberg 1986)

The reduction in peak river-flows due to the construction of dams and reservoirs have reduced the amount of sand reaching the lower river as well as reducing nearshore sediment movement in many areas of the Columbia River. (Mitchell 2008, O’Conner, 2003)

Rivers constantly alter their courses, changing shape and depth, trying to find a balance between the sediment transport capacity of the water and the sediment supply. This process is usually seen as the wearing away of the water course’s banks and beds over a long time period.

Riverine erosion is often initiated by failure of an embankment causing high sediment loads, or by heavy rainfall. This generates high volume and velocity run-off, which will concentrate in the lower drainages within a river's catchment area. When the stress applied by these flows exceeds the resistance of the embankment material, erosion will occur. As the sediment load increases, fast-flowing waters will erode their banks downstream. Eventually, the river, creek, or tributary becomes overloaded or velocity is reduced, leading to the deposition of sediment further downstream or in dams and reservoirs. The deposition may eventually lead to the watercourse developing a new channel.

While all rivers change in the long-term, short-term rates of change vary significantly. All rivers can be categorized based on their ability to adjust their shape and gradient as either bedrock or alluvial channels. Within Columbia County, the Columbia River is an alluvial channel. (Tetra Tech 1992)

### **5.3.8.2 History**

Erosion loss has historically occurred in Columbia County from landslides, stream bank failures, and agricultural activities. All rivers and creeks are subject to erosion. Columbia County has over 200 rivers and creeks.

A series of dams were constructed along the Columbia River and its major tributaries from 1912 through the 1970s; the US Army Corps of Engineers dredged the Clatskanie River to accommodate navigational concerns in 1924 and lowered the channel depth to -7.5 feet National Geodetic Vertical Datum (NGVD) (referring to the elevation above or below mean sea level). Periodic dredging occurred until 1968 to maintain the channel depth, and again in 1998 by the City of Clatskanie.

The combination of dam construction, dredging, flow training device construction, and bank stabilization projects has affected river velocities and sediment transport. Only limited major alterations have occurred since 1970 to the lower river system. (Tetra Tech 1992)

The following descriptions provide a brief overview of historic erosion events in Columbia County.

- Sand Island, located east of the City of St. Helens in the Columbia River has experienced annual erosion loss.
- The shoreline at the Nehalem Street Bridge on the Clatskanie River lost 1.25 feet of depth between 1981 and 1996.
- A small side drainage coming into Conyer's Creek from the west caused road culvert damage. (City of Clatskanie, 1999)

### **5.3.8.3 Location**

Columbia County has experienced erosion loss in several localized areas. Rivers, creeks, and tributaries within the county are subject to the effects of erosion include the Columbia, Clatskanie, and Nehalem Rivers, Beaver Creek, Conyer's Creek, Fox Creek, Nice Creek, Owl Creek, Rock Creek, and Bear Creek and several unidentified tributaries. The County experiences annual rain and wind events which assail river shorelines combined with landslides and debris

flows within the watersheds, loss of plant cover in riparian areas, and river traffic induced erosion, particularly during severe storm events.

Historic erosion hazard areas and community identified areas of potential erosion hazards are identified in Figures I-12 through I-12G and in Table 5-11.

**Table 5-11. Historic Erosion Hazard Areas within Columbia County**

Community	Description of Location
City of Clatskanie <sup>2</sup>	A number of locations within the Clatskanie River Basin (City of Clatskanie and upstream) occur where portions of the stream bank are unstable  Nehalem Street Bridge  Dirt road along Conyer’s Creek  25-75% of the Beaver Creek shoreline, which enters northeast of the City is subject to stream bank erosion.
Columbia City <sup>1</sup>	North of Columbia City at McBride Creek and Columbia River.
City of Rainier <sup>3</sup>	Nice Creek and Fox Creek as well as 25-75% of the Beaver Creek shoreline.
City of St. Helens <sup>1</sup>	Sand Island and Columbia River shoreline along city boundary
City of Scappoose <sup>1</sup>	Scappoose Creek (main and North and South areas as well as forks of Alder Creek and Coal Creek)
City of Vernonia <sup>4</sup>	Nehalem River, Rock Creek, Knickerson Creek, Sheely Creek, and Bear Creek

<sup>1</sup> Steering Committee Meetings, 2008.

<sup>2</sup> & <sup>3</sup> - Entranco, 1999

<sup>4</sup> - City of Vernonia, 1996

### 5.3.8.4 Extent

A variety of natural and human-induced factors influence the erosion process. For example, embankment orientation and exposure to prevailing winds (which can be altered by human development) all influence erosion rates. Other factors that may influence riverine erosion include:

- Geomorphology (composition)
- Structure types along the river embankments
- Development density
- Amount of encroachment in the high hazard zone
- Proximity of erosion-inducing structures
- Nature of the shoreline topography
- Embankment elevation

- Embankment wind exposure

The erosion rate depends on the sediment supply and amount of run-off reaching the watercourse. These variables are affected by many factors including earthquakes, floods, climatic changes, loss of bank vegetation, urbanization, and the construction of civil works in the waterway.

Erosion along the banks of the rivers and streams in Columbia County is generally caused by a combination of factors:

- The natural process of a watercourse to find the path of least resistance.
- Debris flows within the watershed.
- Loss of plant cover in of riparian areas.
- Logging.
- Increased boat traffic close to river embankments.
- Runoff from rainfall.

While erosion has been identified as occurring within the county, only one event was reported to result in damage (City of Clatskanie culvert at Conyer's Creek). Additionally, the Clatskanie River is reported to have lost 1.25 feet of depth over a 15-year period. Based on past events and the lack of development in proximity to erosion hazard areas, the magnitude and severity of erosion impacts in Columbia County are considered negligible.

### **5.3.8.5 Probability of Future Events**

Based on historic events it is possible that structures located near the shoreline of the Columbia, Clatskanie, and Nehalem Rivers, and numerous creeks and tributaries are vulnerable to erosion. Erosion data is limited to localized geographic areas within the County.

### **5.3.9 El Niño/Southern Oscillation**

ENSO comprise two weather phenomenon known as El Niño and La Niña. While ENSO activities are not a hazard itself, it can lead to severe weather events and large-scale damage throughout the jurisdictions in Columbia County. Direct correlations have been found linking ENSO events to severe weather across the Pacific Northwest, particularly drought, flooding, and severe winter storms. (State of Oregon 2004) Therefore, increased awareness and understanding of the impacts of ENSO events on regional weather are important.

For more detailed discussions on drought, flood, and winter storms, please refer to their respective sections in this chapter.

#### **5.3.9.1 Nature**

ENSO weather patterns portray periodic warming and cooling of the central Pacific Ocean. This warming and cooling cycle has global implications as normal weather patterns are altered over vast areas of the world, causing changes in temperature and precipitation from Chile to Indonesia to the Pacific Northwest.

During El Niño periods, alterations in atmospheric pressure in equatorial regions yield an increase in the surface temperature off the west coast of South America. This gradual warming sets off a chain reaction affecting major air and water currents throughout the Pacific Ocean. In the North Pacific, the Jet Stream is pushed north, carrying moisture laden air up and away from its normal landfall along the Pacific Northwest coast. In Oregon, this shift results in reduced precipitation and warmer temperatures, normally experienced several months after the initial onset of the El Niño. (Taylor 2008a) These periods tend to last nine to twelve months, after which surface temperatures begin to trend back towards the long-term average.

La Niña periods ensue when surface temperatures increase past the long-term average. Typical weather patterns throughout the Pacific Ocean are strengthened, yielding stormier than normal weather throughout the Pacific Northwest. Above average precipitation and colder temperatures are experienced across Oregon during these periods, with the potential for severe snow storms increasing. (Taylor 2008a) These periods generally last longer than El Niño events, taking anywhere from one to three years to dissipate.

Both El Niño and La Niña periods tend to develop between March and June, and peak from December to April. (NOAA 2005)

### **5.3.9.2 History**

An examination of past ENSO patterns show El Niño and La Niña events are regularly observed in Oregon. Direct correlations have been found linking precipitation, temperature, and snowfall with ENSO across Oregon, including Columbia County (Taylor 2008a). In general, El Niño periods result in warmer temperatures and lower precipitation, while La Niña periods are colder and wetter. (Lubomudrov 2008)

Strong El Niños of 1982 and 1997 were observed throughout the state, and the El Niño in 1994 resulted in widespread drought conditions. Alternatively, severe flooding caused by the heavy snow and intense rain in the winters of 1995-1996 and 1998-1999 were due to La Niñas. (State of Oregon 2004)

### **5.3.9.3 Location**

ENSO weather pattern effects are experienced on a global scale. Any local climate changes experienced in Columbia County will be reflective of a much broader trend impacting the entire Pacific Northwest. Hazards resulting from one of these periods will most likely be spread across large regions of the state, with adjoining counties experiencing similar conditions.

### **5.3.9.4 Extent**

Columbia County has a climate generally consisting of wet winters and dry summers. (Taylor 2008b) During El Niño years, decreased precipitation and increased temperatures throughout the winter can lead to drought. Alternatively, increased precipitation and decreased temperatures associated with La Niña periods can result in widespread flooding and severe winter storms.

## 5.3.9.5 Probability of Future Events

As climate scientists continue to unravel the oceanic and atmospheric relationships governing ENSO, predictive powers are growing. 1997 marked the first time an El Niño was accurately forecasted, and as more studies detail how ENSO impacts the Pacific Northwest, and Oregon in particular, hazard mitigation agencies will benefit from increased warning time. ENSO generally follows a two to seven year cycle, with El Niño or La Niña periods occurring every three to five years. However, the cycle is highly irregular, and no set pattern exists. (Taylor 2008a) Furthermore, variations are likely to continue, and not all droughts and floods are related to El Niño or La Niña events. (State of Oregon 2004)

## 5.3.10 Expansive Soils

### 5.3.10.1 Nature

The addition of moisture to any soil will cause a change in volume, which is referred to as a shrink-swell characteristic. (USDA NRCS 2008) Expansive soils are typically comprised of clay minerals that, under some conditions, are capable of increasing in volume when moisture is added. Clay soils consist of mineral particles that are less than 0.002 millimeters in diameter.

Linear extensibility is used to determine the shrink-swell potential of soils. Linear extensibility refers to the change in soil volume as the moisture content is decreased from a moist to a dry state. The amount and type of clay minerals in the soil influence volume change. The volume change is described as a percentage value change for the soil being tested. A low shrink-swell potential is considered less than a 3% change in soil volume (Table 5-12); whereas a high shrink-swell potential is greater than 6% change in soil volume. (USDA NRCS 2008)

**Table 5-12. Expansive Soil Criteria Based on Shrink-Swell Potential**

Shrink-Swell Potential	Linear Extensibility (%)
Low <	3
Moderate	3 - 6
High	6 - 9
Very High	> 9

Source: NRCS National Cooperative Soil Survey

Soil expansion may be caused by changes in soil moisture, variations in thickness and composition of the expansive foundation soil, non-uniform structural loads, and the geometry of the structure. (US Army 1983) Potential sources of moisture changes are variation in precipitation, poor gutter or water drainage, vegetation changes over time (such as root growth of nearby trees), and plumbing leaks. By affecting the relative moisture of soils underlying foundations, uneven movement such as localized heave can occur, causing shifting and non-uniform foundation movements, thus impacting the structures above.

However, many sources of soil moisture change can be avoided, minimized, or mitigated through planning and structure maintenance. Some signs of possible soil expansion include: separation of joints and trim; cracks in walls, floors, or concrete; and bowed or non-vertical walls. Some



possible mitigation measures are maintaining separation between structures and runoff, using compact fill to shed water, not absorb it, and planting trees a distance equal to their mature height away from buildings to reduce root interference.

Several different types of soil expansion related to structures and infrastructure exist, which can include but are not limited to:

- Doming heave - upward, long-term, dome-shaped foundation movement that develops over many years,
- Cyclic heave - shrink and swell associated with seasonal or water leak events,
- Edge heave - damaging edge or dish-shaped heaving, and
- Lateral movement – lateral thrust of expansive soils.

### **5.3.10.2 History**

In 1982, expansive soils were documented as the most costly natural hazard in the US, causing more damage than all other natural hazards combined, including earthquakes, floods, tornadoes and hurricanes. (FEMA 1982) Annual losses nationwide have been estimated between \$2 billion and \$9 billion. (Jones and Jones 1987) While expansive soils occur in Columbia County, there have been no historic damages reported.

### **5.3.10.3 Location**

In Columbia County, approximately 18,925 acres contain soils with “moderate” to “high” rated shrink-swell potential, concentrated mainly in the northern portion of the county and along the Columbia River.

Potential damages to structures from expansive soils in Columbia County include: cracks in grade beams, walls, and drilled shafts; distortion and cracking of pavements and on-grade floor slabs; failure of steel or concrete blocks supporting grade beams; jammed or misaligned doors and windows; and buckling of basement and retaining walls due to lateral forces. Extensive damage can potentially result in the condemnation of structures. (US Army 1983)

Expansive soil locations are shown on Figures I-13 through I-13D.

### **5.3.10.4 Extent**

The geographic extent of expansive soil events are directly dependant on the extent of clay-based expansive soil types and the size and type of moisture event that triggers the soil expansion. Another dependant factor for the extent is the amount and type of infrastructure that exists at the expansive soil location and near proximity, as well as the percentage volume change of the swelling or shrinking soil. The extent of expansive soil effects could be very local and limited to a single structure (i.e. resulting from a plumbing leak), or more landscape in nature due to a large area of soil moisture change (i.e. resulting from a large flood or storm event).

### **5.3.10.5 Probability of Future Events**

Expansive soil events are difficult to predict because the location and time when water is available to the soil could happen at various periods in the life of a structure. Most soil expansion and associated structural damage has been shown to occur within five to eight years following construction. However, the effects of heave may also not be observed for many years until some change occurs in the foundation conditions to disrupt the moisture regime. (PCCDD 2006) The probability of damages increases for structures on expansive soils if the climate, effects of construction, and effects of occupancy promote moisture changes in the soil. (US Army 1983)

### **5.3.11 Drought**

#### **5.3.11.1 Nature**

Drought is variously defined as a period of abnormally dry weather creating hydrologic imbalance, shortage of precipitation adversely affecting crops, or a period of below-average water in streams and lakes, reservoirs, aquifers, and soils. (USGS 2008) There is no universal measure of precipitation or dryness that signifies drought. Historically, droughts have been seen as unpredictable and unavoidable events. Climate fluctuations occur everywhere, and periods of low precipitation are a normal, recurrent feature of climate.

Drought is commonly referenced in terms of its effects on agriculture, with crop damage or failure used to measure its effects. Other direct environmental effects of drought include livestock death or decreased production, wildland fire, impaired productivity of forest land, damage to fish habitat, loss of wetlands, and air quality effects. Indirect effects to society are measured by the economic and physical hardships brought on by drought and by the increased stress on residents of a drought-stricken area. (ONHW 2004) The economic impact of drought is estimated between \$6 and \$8 billion annually in the United States. These costs primarily affect agricultural, forestry, fisheries, recreation and tourism, transportation and energy sectors. Drought is also associated with insect infestation, disease, and wind erosion. (ONHW 2006)

Drought is usually thought of as a meteorological phenomenon, resulting from abnormally low precipitation. It can also be an institutional phenomenon, resulting from poor management of water supply and reserves – an imbalance in supply and demand – and is often due to a combination of these factors. Understanding drought as a recurring climate cycle is a first step toward creating management practices that effectively mitigate its effects.

Drought is difficult to measure, due to its diverse geographical and temporal nature, and its operation on many scales. Despite that difficulty, various indices for measuring and characterizing drought can be useful. The Palmer Drought Indices and the Standardized Precipitation Index are most commonly used. Palmer's indices describe water balance—looking at water supply (precipitation), demand (evapotranspiration), and loss (runoff)—on three scales; weekly during growing season, long-term cumulative measured by month, and another long-term scale that takes into account hydrological factors such as reservoir and groundwater levels. These are the Crop Moisture Index, the Palmer Drought Severity Index, and the Palmer Hydrological Drought Index, respectively. The Standardized Precipitation Index considers precipitation alone, comparing the probability of a region's receiving a given amount of

precipitation (based on historical levels) in a given time period with precipitation actually recorded. (NOAA 2008d)

There are four types of drought: meteorological, agricultural, hydrological and socioeconomic. Meteorological drought is based on the degree of dryness. Agricultural drought focuses the amount of soil moisture versus the needs of the crops. Hydrological drought is associated with shortfalls of surface and subsurface water supply. Socioeconomic drought refers to physical water shortages and its human effect, and occurs when the need for water exceeds the supply resulting in a shortfall. (ONHW 2006)

### **5.3.11.2 History**

Drought occurs in all parts of Oregon, and has had profound effects in the past on the state's economy, particularly the agricultural and hydro-power sectors. Environmental consequences have included insect infestations in forests, insufficient stream flows to support endangered fish species, and increased susceptibility to fire.

The following past drought events were recorded for Columbia County:

- 1928-1941 – Statewide prolonged drought caused major agricultural problems
- 1976-1981 – Stream flows were low for western Oregon; 1976 and 1977 were the driest years of the century.
- 1985- 1994 – Ten consecutive years of drought cause problems statewide; fires were common and insects attacked trees; a drought emergency was declared in 1992.
- 1999 – Drought reduced spring and summer agriculture yields and delayed planting of winter wheat. (NOAA 2008d)
- 2000-2001 – Severe drought conditions; October 2000 to February 2001 was the second driest period of record in Washington and Oregon.
- 2005 – February 2005 was the driest since 1977. (ONHW 2006)

### **5.3.11.3 Location**

Droughts occur in every climate zone, and can vary from region to region. Drought occurs in all parts of Oregon, and has had profound effects on the state's economy, particularly the agricultural and hydro-power sectors. All jurisdictions in Columbia County are susceptible to drought.

### **5.3.11.4 Extent**

Drought is often associated with El Niño events affecting the polar and subtropical jet streams. The polar jet stream dips southward causing the northwest to be drier than average. The severity of drought depends on the degree of moisture deficiency, duration, and size of the affected area. The agricultural sector is usually the first to feel the impacts of drought because of its dependence on soil moisture. Those reliant on surface and groundwater sources are usually the last to feel the effects of drought. (ONHW 2006)

## 5.3.11.5 *Probability of Future Events*

As part of a statewide HMP process, county emergency management program managers conducted risk analyses to determine probability of, and vulnerability to, severe drought occurrence in each county. Oregon's Partnership for Disaster Resilience assesses Columbia County as having an "average risk" for drought; a future drought affecting the planning area is likely. (*Partnership 2008*)

Drought appears to be a cyclic part of the climate of Oregon, occurring in both summer and winter, with an average recurrence interval between 8 and 12 years. Short-term, seasonal events are more frequent, while the less frequent, long-term events have ranged from 3 to 12 years in length.

Estimating drought probability and frequency is difficult, but understanding cyclic climate variations and other variables that contribute to weather behavior is advancing. (State Interagency Hazard Mitigation Team 2006) Understanding ENSO weather systems are helping scientists to better predict weather changes in the Pacific Northwest.

## 5.3.12 Dam Failure

### 5.3.12.1 *Nature*

Dams are impervious artificial barriers typically constructed of earth, rock, concrete, or mine tailings. The purpose of a dam is to divert water or impound (store) water, wastewater, or liquid-borne materials for any one or a combination of several reasons including: flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, and pollution control.

Dams can be embankment dams constructed with excavated natural materials or masonry dams constructed with stone, brick or concrete blocks painted with mortar. Most dams are built at the narrowest part of a river on a stable foundation made of concrete, rock, or compacted soil. The abutments of a dam can be the natural valley walls or constructed of artificial materials when a natural abutment is not suitable. There are several types of dams named for the primary material used in construction, the primary purpose of the dam, and/or the way they are engineered to function. Common types of dams include:

- **Diversion Dam:** diverts water from one waterway to another waterway
- **Arch Dam:** a concrete dam that is convex on the upstream side and concave on the downstream side, taking advantage of the water load itself to compress the concrete, and allowing the majority of water load to shift to the abutments
- **Overflow Dam:** designed to be overtopped
- **Regulating Dam:** designed to regulate water flow downstream
- **Gravity Dam:** constructed of masonry materials wherein the weight and internal strength provides stability

Dam inundation is the flooding that occurs resulting from the structural failure of a dam (breach) or mis-operation (unscheduled release). Outlet works and spillways allow dam managers to

make scheduled releases when necessary, e.g., to prevent damaging flooding. Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding
- Seismic activity/Earthquake
- Landslides into reservoir or onto dam itself
- Inadequate spillway capacity, resulting in excess overtopping flows
- Internal erosion caused by embankment or foundation leakage or piping
- Improper design or construction
- Improper maintenance or operation
- Failure of upstream dams on the same waterway
- Vegetation growth
- Structural integrity loss from burrowing small animals

Dam failures can create flash floods that are catastrophic to life and property. Seismic activity can directly cause dam failure, and can also generate a wave capable of overtopping a dam, which may inundate the surrounding area but not cause dam failure. Two factors that influence the potential severity of a full or partial dam failure include: (1) the amount of water impounded, and (2) the density, type, and value of development and infrastructure located downstream.

The hazard potential for dams is determined by the downstream damage that could result from improper operation or dam failure. It is important to note that neither the integrity of a dam nor the probability of failure are considerations when determining the hazard potential. The hazard potential rating for dams describes only the extent of expected losses if the dam were to fail. Hazard potential categories are organized into three tiers:

**High hazard:** dam failure or improper operation would probably cause loss of life. Economic, environmental, and lifeline losses are also likely but not necessary for this rating, which is based solely on probable loss of life.

**Significant hazard:** dam failure or improper operation would cause property damage or temporary loss of roads or utilities, with a remote chance of loss of life.

**Low hazard:** dams would have little or no effect to life and property downstream in the event of failure or improper operation.

### **5.3.12.2**      *History*

The National Performance of Dams Program records no dam failures for dams located in Columbia County.

### **5.3.12.3**      *Location*

Dams and reservoirs have been built throughout Columbia County primarily for the purposes of irrigation and water diversion. The National Inventory of Dams (NID), maintained by the US Army Corps of Engineers, is a database of all dams in the United States that either pose a

## HAZARD PROFILES

significant or high hazard, or that meet inclusion criteria for dam height and storage (exceed 25 feet in height and 15 acre-feet of storage, or exceed 6 feet in height and 50 acre-feet of storage). There are many dams too small to be listed in the NID, but these small dams are not expected to have significant impacts if they fail. The storage capacities of reservoirs and impoundments in the planning area range from a few acre-feet to several thousand acre-feet. The water from most of these reservoirs eventually makes its way to the Pacific Ocean by way of several river systems. NID listed dams in Columbia County are summarized in Table 5-13.

**Table 5-13. National Inventory of Dams Listed Dams in Columbia County**

Dam Name	Waterway	Downstream City	Owner	Year	Storage (acre-feet)	Hazard	EAP
Vernonia Log Pond	Nehalem R	Vernonia	ODFW	1924	170	Significant	No
Fisher, James O Reservoir	Sly Creek (tributary)	None	Betsy Johnson	1971	36	Low	No
Petes Slough Reservoir	Petes Slough	None	State Hwy Division	1980	2,000	Low	No
Rainier City Reservoir	Fox Creek	Rainier	City of Rainier	1952	14.5	Significant	No
Floeter Pond Reservoir	E Fork Nehalem River	OD	FW	1962	9	Low	No
Salmonberry Reservoir	Salmon Creek	Trenholm	City of St. Helens	1960	61	Significant	No
Sherman Stock Reservoir#1	Sly Creek (tributary)	Warren	Jeff & Beverly Heller	1962	36	Significant	No
Sherman Stock Reservoir#2	Trib of N Scappoose Creek	Warren	Clark W Sherman	1950	13.7	Low	No
Bauder Reservoir	West Fork Clatskanie River		Rudolph Bauder	1996	15.0	Low	No
Deep Lake Reservoir	Cunningham Slough	OD	FW	2002	102	Low	No
Ruby Reservoir	Cunningham Slough	OD	FW	2002	240	Low	No
Millionaire Lake Reservoir2002	Cunningham Slough	OD	FW	2002	120	Low	No
Fishhawk Lake*	Fishhawk Creek	Birkenfeld	Fishhawk Lake Rec. Club	1969	1,650	Significant	No

Source: NID, available at: <http://crunch.tec.army.mil/nidpublic/webpages/nid.cfm>

\* Fishhawk Lake Dam is in Clatsop County, but is upstream of Birkenfeld in Columbia County, and therefore is included.

Oregon Water Resources Dept Dam Inventory available at: [http://apps2.wrd.state.or.us/apps/misc/dam\\_inventory/Default.aspx](http://apps2.wrd.state.or.us/apps/misc/dam_inventory/Default.aspx)

**EAP** refers to whether or not the dam has an emergency action plan, which is not required for dams in the size range of those listed here. All dams in this table are RE (rockfill/earthfill) dams (primarily rockfill), with the exception of Vernonia Log Pond, which is a combination RE and earthfill/rockfill (ER) dam.

In addition to dams within or proximate to Columbia County, there is dam failure risk from numerous large dams upstream on the Columbia River and its tributaries, most notably the Willamette, Snake, and Lewis rivers. For instance, 22 major dams on the Columbia River

represent over 40 million acre-feet of flood control storage, 11 dams on the Willamette River provide about 1.7 million acre-feet of flood control storage, (Goettel 2005) and three dams on the Lewis River provide approximately 12,420 acre-feet of flood control storage. (CCEM 2008) Inundation hazard areas are shown on Figures I-14 through I-14E.

### **5.3.12.4      *Extent***

The extent of dam failure effects in the planning area can be assessed region-wide or by each body of impounded water. Effects depend a great deal on the nature of the failure—for instance, whether a dam fails when retaining a normal level of water, or whether water influx is involved in the dam failure, which then involves a greater-than-usual volume of impounded water. Likewise, whether a dam is overtopped, damaged, or fails completely will make a great difference in volume of water released, and therefore in effects. An isolated dam failure, even a significant release, may have less significant impact than a series of dam failures caused by region-wide flooding.

Of the twelve dams within Columbia County, five of them would have a significant impact if breached. The volume of water held by each of these strategically located dams is large enough to create a chain reaction of flooding, property damage, and/or impairment of the local water supplies. Oregon's Water Resources Department advocates for a continued dialogue among dam owners and municipalities to practice emergency planning procedures to ensure public safety should such an event occur.

### **5.3.12.5      *Probability of Future Events***

Given that there are no recorded dam failure events in the county, it is impossible to predict the probability of future events of dam failure with significant effects on the jurisdictions along the waterways. The risk to the jurisdictions in Columbia County from upstream dams, and the history of dam failures in those areas, has yet to be evaluated. Also, it is important to note that global and regional climate change could alter the likelihood of dam failure in the planning area, if increasing storms and rainfall were to significantly change water inflow.

## **5.3.13 Disruption of Utility and Transportation Systems**

The 2005 *Multi-Hazard Mitigation Plan for Columbia County* treated disruption of utility and transportation systems as a separate hazard because, while such disruption is a potential impact of each of the natural and human-caused hazards reviewed, its ramifications are far-reaching and much broader than direct damage and direct loss of service. For continuity and ease of comparison, this revised plan will do the same.

It is important to remember, in considering any of the other hazards profiled in this plan, that disruption of utility and transportation systems should be viewed in addition to other impacts. The probability, duration, extent, and risk associated with disruption of systems is described below, and in some cases quantified. Electric power outages are dealt with in more detail than other disruptions because loss of electric power has the most widespread effects on other utilities.

### 5.3.13.1 Nature

The major transportation modes of significance to Columbia County are roads and railways. Both are subject to disruption from the hazards already profiled in this plan: flood, dam failure, landslide, earthquake, volcano, wind, fire, winter storm, infectious disease epidemic (quarantine, public transit restrictions), hazardous materials incidents, and terrorism.

The ramifications of transportation system disruption range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital supplies if transport is seriously disrupted for an extended period of time) to the economic effects of delays, lost commerce, and lost time.

Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. Analysis of potential utilities disruptions is complicated because utilities like electric power, potable water, wastewater, natural gas, and telecommunications are all networks, consisting of nodes (centers where something happens) and links (connections between nodes). Networks typically have some level of redundancy built in, and the amount and nature of alternate pathways determines the robustness of the system to any particular disturbance. (Goettel 2005)

Many water treatment plants in Columbia County are located in flood-prone areas. Floodwater inundation can cause raw water to circumvent and contaminate source wells and filtration and treatment systems. Earthquakes can damage water storage, treatment, and transport systems. Water systems are also extremely vulnerable to power outages. Storage tanks are usually located 60 to 200 feet above the water customer network, and water is pumped into these tanks using electricity. Storage tanks typically contain one to two days' supply of water. Power outages of longer duration can result in a shortage of clean water for drinking and cooking—a basic requirement for public health. (Goettel 2005)

Wastewater management is also crucial for public health, and wastewater systems are similarly vulnerable to floods, earthquake damages, and power outages. Floods may cause collection pipes to overflow, and can cause inflow that exceeds treatment plant capacity, resulting in release of untreated or partially treated wastewater. Treatment plants are often located in low-lying areas, which facilitates gravity flow of collected wastewater to the plant. However, this means that treatment plants are often found in flood zones. Wastewater pipes and plants are subject to earthquake damage, and loss of power can result in plant shutdown and releases of untreated or partially treated water. (Goettel 2005) Public health hazards can be posed by backed up wastewater and sewage, as well as by releases of untreated or incompletely treated wastewater.

Natural gas systems (compression stations and distribution pipes) are vulnerable to seismic events, and compression stations are vulnerable to flood damage and power loss. Landslides, too, can affect natural gas systems. (Goettel 2005) Where it is used for cooking or heating, disruption of natural gas distribution will create difficulties. Leaks in enclosed areas present a health hazard, and it is both flammable and explosive, attributes which are addressed in the Hazardous Materials section.

Telecommunications systems (including telephone, broadcast radio and television, as well as cable networks) are generally somewhat less vulnerable to hazards than other services, given that few nodes (stations) are located in flood zones or landslide areas. Buried lines have more ability to stretch than do gas and water lines, and can usually accommodate several feet of ground



movement before failing. Above-ground lines are vulnerable to falling trees or the failure of poles, but disruptions are about 10 times less common than electrical line failures—partly because electrical lines are the highest on utility poles and therefore the first to be hit by falling trees and branches, and partly because the much lower voltage of communications lines makes them much less vulnerable to arcing or shorting out if lines come very close to one another. (Goettel 2005) Telecommunications failures can have devastating impacts on a community. Emergency response systems at the individual level (fire, police, ambulance) as well as at the disaster-response level rely on immediate, accurate communications.

Electrical power plants and transmission lines are vulnerable to most of the hazards covered in this Plan. Flood, fire, earthquake, volcano, intentional sabotage and/or terrorism are all threats to power sources and transmission and distribution lines. Columbia County has only one small (530 megawatt) generating plant (near Clatskanie). The bulk of the County’s electrical power is produced outside the county and transmitted via high-voltage transmission lines—most of which are operated by the Bonneville Power Administration (BPA). BPA electricity comes from Corps of Engineers and Bureau of Reclamation operated hydroelectric power plants, and from the Pacific Interties, a high-voltage transmission system that moves electric power between California, the Pacific Northwest, and western Canada. Electric power is pivotal to modern life. Residential, commercial, and public facilities all rely heavily on electricity. Emergency facilities such as hospitals and emergency response centers typically are equipped with backup generators for critical life-support and communications functions. Nonetheless, the consequences of long-term and widespread electrical power outages are significant. Other utility systems, discussed above, are also dependent on electricity for normal operations, so loss of electric power can have serious secondary effects. In addition, power outages longer than a few hours can greatly increase the impact of riverine floods, as all of the drainage districts and drainage improvement companies within Columbia County rely on pumping to keep diked areas dry, even during non-flood conditions. (Goettel 2005)

### **5.3.13.2 History**

System disruptions are deemed a secondary hazard or a result from a primary hazard event and receive discussion in the natural hazards sections throughout this document.

### **5.3.13.3 Location**

Columbia County has and relies upon modern infrastructure. Transportation and utility systems are the basis of everyday life in both urban and rural areas of the county.

The County has worked with each community to identify critical system networks and links which may experience critical failure from these technological hazards. To that end, all jurisdictions communities have expressed that they have or are working to acquire emergency generators, bury utility lines, and ensure fuel availability for their critical infrastructure’s sustainability. Many of the communities have also identified the need to work with their utility suppliers to encourage them to consider mitigating power line failure projects, developing plans for fuel distribution, and water-waste treatment alternatives.

The most common countywide relied upon critical components are summarized below in Table 5-14.

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**Table 5-14. Countywide Infrastructure Affected by Utility and Transportation System Disruptions**

(Key: C – County, CC – Columbia City, CL – Clatskanie, P – Prescott, R – Rainier, S – Scappoose, ST – St Helens, V – Vernonia)

	Central Governance And EOC	Electrical Power Distribution	Emergency Medical Response And Care	Emergency Response Access/ Transportation Route	Emergency Response And Equipment Maintenance	Coordinate Emergency Infrastructure Repairs	Emergency Transportation	Fire Equipment Management, Emergency Response	Fuel Distribution/Public Health & Safety	Law Enforcement/ Emergency Response	Law Enforcement/ Confinement	Material Transportation	Possible Shelter/ Community Aid Centers	Public Health And Safety	Volunteer Organization/ Dispatch Center
Airport/Heliport							CL,S,V					CL,S,V			
City Hall	CC,CL, P,R,S, ST,V														
Courthouse/ Jail											CL,R,S				
Police/Sheriff Station										C,CC,C L,P,R, S,ST,V,					
Fire /Rescue Dept								CC,CL, P,R,S, ST,V							
Medical			CC,CL, S,ST,V												
Elec Pwr Distr / Comm		CC,CL, P,S,ST, V													
Potable Water Distr.														CC,CL, P,R,S, ST,V	
Waste Water Treatment														CC,CL, R,S,ST, V	
Public Work														CC,CL, R,S,ST, V	
Maintenance						CC,CL, R,S,ST, V									

**HAZARD PROFILES**

**Table 5-14. Countywide Infrastructure Affected by Utility and Transportation System Disruptions**

(Key: C – County, CC – Columbia City, CL – Clatskanie, P – Prescott, R – Rainier, S – Scappoose, ST – St Helens, V – Vernonia)

	Central Governance And EOC	Electrical Power Distribution	Emergency Medical Response And Care	Emergency Response Access/ Transportation Route	Emergency Response And Equipment Maintenance	Coordinate Emergency Repairs	Emergency Transportation	Fire Equipment/ Management, Emergency Response	Fuel Distribution/Public Health & Safety	Law Enforcement/ Emergency Response	Law Enforcement/ Confinement	Material Transportation	Possible Shelter/ Community Aid Centers	Public Health And Safety	Volunteer Organization/Dispatch Center	
Railroad							CC, CL,P, R,S,ST					CL,P, R,S,ST				
Bridges				CC,CL, R,ST,V			CC,CL, R,ST,V					CC,CL, R,ST,V				
Highway				CC,CL, P,R,S, ST,V												
Marina/Port				CC,R, S,ST			CC,R, ST					CC,R				
Private Fuel Distr.							CC,CL, R,S,V									
Private Nat. Gas Distr.							CC,CL, R,S,V									
Private Trans. Co.							CL,S, ST									
Churches													CL,R, S,V			
Schools & Distr Offices													CC,CL, P,R,S, ST,V			
Community/ Civic Ctr													CC,CL,			
Dam																CC,CL, R,S,ST, V

## 5.3.13.4 **Extent**

The extent of transportation or utility service disruptions is directly dependent on the nature and magnitude of the hazard. Minor hazard events may cause minor disruptions, while significant hazard events may cause long-term transportation and utility failures.

## 5.3.13.5 **Probability of Future Events**

Inclement weather, topography, and human influence are the usual cause for transportation and utility system failure events. Increased usage (portrayed by heavy traffic periods or increased utility needs such as summer air conditioning or winter heating) can exacerbate or accelerate these systems' failure rate. Consequently, Columbia County will continue to experience episodic utility failure.

## 5.3.14 **Hazardous Materials**

### 5.3.14.1 **Nature**

Hazardous materials can be simply defined as any materials having a negative impact on health; human, animal, aquatic, or environmental. Hazardous materials exposure may cause injury, illness, or death. Exposure impacts may be evident within seconds, minutes, or hours. Or impacts may not surface until days, weeks, or even years after exposure. Also, it is important to note that harmful effects can be short- or long-term.

Some hazardous materials are highly toxic so that even brief exposures to minute amounts may be dangerous or even fatal. Other hazardous materials are much less toxic. Negative effects may occur only after a significant exposure to large quantities of a substance, or exposure to smaller quantities for a prolonged period of time. The technical term "toxic," or "toxicity," which is widely used to describe hazardous materials, is simply a synonym for the more common terms "poison" or "poisonous." A toxin is thus defined as any substance that causes injury, illness, or death to living tissue by chemical activity.

The Institute of Hazardous Materials defines hazardous materials according to several regulatory agencies:

*...any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. **Hazardous materials professionals** are responsible for and properly qualified to manage such materials. This includes managing and/or advising other managers on such items at any point in their life-cycle, from process planning and development of new products; through manufacture, distribution, and use; to disposal, cleanup, and remediation.*

*Hazardous materials are defined and regulated in the United States primarily by laws and regulations administered by the U.S. Environmental Protection Agency (EPA), the U.S. Occupational Safety and Health Administration (OSHA), the U.S. Department of Transportation (DOT), and the U.S. Nuclear Regulatory Commission (NRC). Each has its own definition of a "hazardous material."*

*OSHA's definition includes any substance or chemical which is a "health hazard" or "physical hazard," including: chemicals which are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents which act on the hematopoietic system; agents which damage*

*the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapors, mists or smoke which may have any of the previously mentioned characteristics. (Full definitions can be found at 29 Code of Federal Regulations (CFR) 1910.1200.)*

*EPA incorporates the OSHA definition, and adds any item or chemical which can cause harm to people, plants, or animals when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment. (40 CFR 355 contains a list of over 350 hazardous and extremely hazardous substances.)*

*DOT defines a hazardous material as any item or chemical which, when being transported or moved, is a risk to public safety or the environment, and is regulated as such under the: Hazardous Materials Regulations (49 CFR 100-180); International Maritime Dangerous Goods Code; Dangerous Goods Regulations of the International Air Transport Association; Technical Instructions of the International Civil Aviation Organization; U.S. Air Force Joint Manual, Preparing Hazardous Materials for Military Air Shipments.*

*The NRC regulates items or chemicals which are "special nuclear source" or by-product materials or radioactive substances. (See 10 CFR 20).*

<http://www.ihmm.org/dspWhatIsHazMat.cfm>

Both Federal and State of Oregon statutes govern hazardous materials. Federal regulations include the Clean Air Act, Emergency Planning and Community Right to Know Act, and Superfund Amendments and Reauthorization Act. Oregon statutes are listed below:

- ORS Chapter 453, 453.001 to 453.185 and 453.605 to 453.807
- ORS Chapter 465, Hazardous Waste, Haz. Mat. I
- ORS Chapter 466, Hazardous Waste, Haz. Mat. II
- ORS Chapter 475, 475.405 to 475.495, Illegal Drug Clean-up
- ORS Chapter 480, Explosives, flammable materials, pressure vessels.

Hazards are found nearly everywhere; petroleum products, natural and synthetic gas, acids, and other acutely toxic chemicals found in everyday products such as paints, solvents, adhesives, household cleaners, pesticides and herbicides, batteries, and even medicines.

This plan does not focus on the hazards in everyday products, but rather on the larger quantities of hazardous materials classified as Hazardous Substances (HS) or Extremely Hazardous Substances (EHS) that are transported through the planning area by rail, highway, and air. Hazardous substances can present problems when spilled, however EHS potentially pose the most catastrophic threat as the category includes substances, such as chlorine and ammonia, which pose an acute inhalable toxic threat to humans and animals. (Alaska State HMP, 2007)

The toxicity of a specific substance is one important factor in determining the risk it poses, but there are other factors that can be just as, if not more, significant. Factors affecting the severity of an accidental release include toxicity, quantity, dispersal characteristics, release location, population density, environmental sensitivity, and efficacy of response and recovery actions.

Hazardous materials are generally classified by their primary health effects on humans. Some common types include the following:

- Anesthetics and narcotics depress the central nervous system.

- Asphyxiants interfere with normal breathing and can cause suffocation.
- Explosives: pose explosion, fire, and chemical danger.
- Flammable materials catch fire easily, although they may pose other dangers such as explosion or chemical effects. Gasoline, propane, and diesel fuel are common examples in this category.
- Irritants cause burns or irritation to body tissues such as eyes, nose, throat, lungs, or skin.

Hazardous substance exposure generally takes place by one, or a combination of, the following mechanisms:

- Direct contact with skin or eyes
- Ingestion via contaminated food or water
- Particulate or gas inhalation via contaminated air

Unless exempted, facilities that use, manufacture, or store hazardous materials in the US fall under the regulatory requirements of the Emergency Planning and Community Right to Know Act, and must report to the United States Environmental Protection Agency (EPA). Releases of HS and EHS can occur at facilities or during transport. Transportation-related releases are generally more troublesome because they may occur anywhere, including close to human populations, critical facilities, or environmentally sensitive areas. Transportation-related EHS releases can also be more difficult to mitigate due to the great area over which any given incident might occur, and the potential distance from response resources.

Natural phenomena may also cause a hazardous materials release and complicate response activities from not only the primary but also subsequent or combined secondary events. For instance, earthquakes pose a particular risk, because they can damage or destroy facilities, fires can develop, explosions can occur, and high winds can disperse the released chemical. The threat of any hazardous material event may be further amplified by restricted access, reduced fire suppression, and spill containment capability. Response personnel and equipment may have their access cutoff as roads, highways, or railroad traffic are impeded. EHS releases can trigger evacuation and short- or long-term displacement creating social and business disruptions.

Affected areas may include the eyes, nose, throat, lungs, or skin. Exposure to hazardous substances generally takes place by one, or a combination of the following mechanisms:

- Direct contact with skin or eyes
- Ingestion via contaminated food or water
- Particulate or gas inhalation via contaminated air

### **5.3.14.2 History**

On behalf of several federal agencies including the EPA and Department of Transportation, the National Response Center serves as the point of contact for reporting oil, chemical, radiological, biological, and etiological discharges within the U.S. The National Response Center's Internet-based query system of non-Privacy-Act data shows that since 1997, 87 oil and chemical spills

have occurred in Columbia County. Of these spills, 54 were transport related, three were pipeline related, none were railroad related, and 21 were fixed (or non-mobile) (Table 5-15).

**Table 5-15. National Response Center “Incidents” 1997 – 2007,  
Columbia County Oregon**

Entity	Toxic Releases Reported	Air Releases Reported	Transport Accident	Rail	Pipeline	Other
<b>Columbia County Total</b>	<b>17</b>	<b>21</b>	<b>54</b>	<b>-</b>	<b>3</b>	<b>13</b>
Clatskanie 3		1	4	-	1	4
Columbia City		1	2	-	-	1
Deer Island	1	-	2	-	-	-
Goble -		-	-	-	-	-
City of Prescott	-	-	-	-	-	-
City of Rainier	-	-	7	-	-	1
City of Scappoose	3	-	6	-	-	-
City of St Helens	6	17	22	-	2	4
City of Vernonia	3	2	7	-	-	3
City of Warren			2			
Other 1			2			

From the State Fire Marshal’s Hazardous Substance Information Data Base at  
[http://www.sfm.state.or.us/CR2K\\_IncDB/Incident\\_Search.html](http://www.sfm.state.or.us/CR2K_IncDB/Incident_Search.html)

### 5.3.14.3 Location

Hazardous substances are found throughout Columbia County jurisdictions. The Oregon Fire Marshal’s Office has documented 271 EHS sites with 1,677 identified substances as shown in Table 5-16. The County’s six major cities account for only 42 percent of the facilities within the county overall. Gas stations, garages, automotive repair facilities, millwork, manufacturing, food processing plants, agricultural supply, petroleum, natural gas, and school laboratories, public swimming pools, are EHS users. The vast majority of these sites would be places where an unintentional release would create an extremely localized event. Manufacturing and woodworking sites where EHS are used regularly could also create site-specific contamination from repeated spills or improper storage. The greatest exceptions to this would be an accident involving large EHS quantities used at large industrial complexes or being transported by either road, water, or rail.

**Table 5-16. Extremely Hazardous Substances Listed Sites, Columbia County**

Entity	# Facilities Surveyed	# Facilities Reporting Substances	% Facilities Reporting Substances	Total Substances Reported
<b>Columbia County</b>	<b>644</b>	<b>271</b>	<b>42</b>	<b>1,677</b>
City of Clatskanie	94 50		53	607
Columbia City	19 9		47	33
City of Rainier	90 43		48	193
City of Scappoose	138 50		36	188
City of St Helens	185 73		39	436
City of Vernonia	67 29		43	90

*As listed in the Oregon Hazardous Substance Information Survey Annual Report 2005*

Hazardous materials at fixed sites are generally identified by an NFPA (National Fire Protection Association) placard, commonly referred to as the NFPA hazard diamond.

The Oregon State Fire Marshall (OSFM) maintains a comprehensive listing of hazardous materials locations in Oregon. As shown in Table 5-17, Columbia County also has 124 sites with Section 112(r) chemicals, 32 sites with Section 313 Toxics Release Inventory chemicals, and 27 sites with Extremely Hazardous Substances (Table 5-18).

**Table 5-17. Columbia County Hazardous Materials Locations**

County	Total Reports	Reportable Quantities	112(r) <sup>1</sup> Chemicals	313 (TRI) <sup>2</sup> Chemicals	EHS <sup>3</sup> Chemicals
Columbia 61	0	256	124	32	27

<sup>1</sup> Chemicals reportable under Section 112(r)

<sup>2</sup> Chemicals reportable under Section 313, Toxics Release Inventory

<sup>3</sup> Extremely hazardous substances

For Columbia County, the Hazardous Substance Information System (HSIS) database has hazardous materials reports for 610 companies and other entities such as cities that are required to report quantities of hazardous materials on hand. Of these reporting locations, 256 or about 42%, have reportable quantities of hazardous materials.

More detailed information about hazardous materials can be found online in the State Fire Marshal's CR2K Hazardous Substance Information Program.



**Table 5-18. Geographic Distribution of EHS Sites in Columbia County**

Community	Number of EHS Sites
City of Clatskanie	7
Goble	1
City of Rainier	4
City of St. Helens	10
City of Scappoose	3
City of Vernonia	2

Of these 27 sites with EHS chemicals in Columbia County, 13 are telephone company sites which presumably contain small quantities of cleaning solvents. There are two forest product company sites and a utility site which contains sulfuric acid and other chemicals, along with several commercial/industrial sites that appear to contain only small quantities of EHS.

The (confidential) facility in St. Helens appears to be the only facility in Columbia County that contains substantial quantities of EHS. The Company Report for this facility in the HSIS database lists a total of 58 chemicals, of which only six, anhydrous ammonia and ammonium hydroxide, ammonium nitrate, nitric acid, urea fertilizer, and urea ammonium nitrate solution appear to be present in large quantities. Of these six chemicals, only anhydrous ammonia and nitric acid are classified as EHS.

In addition to fixed facilities, hazardous material events have the potential to occur along Highway 30. The trucks and trains that use these transportation arteries commonly carry a variety of hazardous materials including gasoline, other crude oil derivatives, and other chemicals, such as chlorine, known to cause human health problems.

The Oregon Department of Transportation (ODOT) monitored the movement of hazardous materials on Oregon roads in 1987 (most current data available). The study was conducted in three phases over three different three-day periods. Phase I was conducted in March, Phase II in August, and Phase III surveyed ports of entry at or near the borders of Washington, California, and Idaho in November.

During Phases I and II, checkpoints were set up at 11 weigh-scale locations on various interstate highways (I) 5 and 84, U.S. highways 30, 26, and 97, and State Road (SR) 99W, 99E, and 6. One checkpoint was set up in Scappoose in Columbia County on west U.S. 30.

A total of 2,511 hazardous materials placarded vehicles, representing 3,637 shipments, and 208 different hazardous commodities were surveyed. The study determined 5.5 percent (%) of total truck traffic at the survey sites carried hazardous materials. Vehicles marked with FLAMMABLE or COMBUSTIBLE placards ranked first with 54%, followed by CORROSIVE placards marking 16% of the 2,511 vehicles. Most DANGEROUS placarded vehicles carried both flammable and corrosive liquids together.

A total of 2,189 deliveries were bound for Oregon destinations, serving 186 cities in 36 counties. At the ports of entry, 35% of all vehicles were bound for out of state destinations. Most

hazardous materials moved over the roads between 6 a.m. and 6 p.m. (70%) and 38% of those occurred between 8 a.m. and noon. DANGEROUS –placarded vehicles moved mostly at night between 6 p.m. and 6 a.m. Hazardous materials carrying vehicles moved at a rate of 46.5 per day or nearly 2 vehicles per hour.

Average hazardous material movement in Scappoose was recorded at 39 vehicles per day or 1.6 vehicles per hour. The checkpoint at Scappoose recorded 7.2% of the hazardous material truck traffic. Shipments bound for Columbia County included gasoline, sodium hydroxide, fuel oil, diesel fuel, oxygen, aluminum sulfate solution, and oxygen refrigerated liquid. Trucks made 127 stops in Columbia County, and 141 vehicles carrying hazardous materials passed through. Today, more than 10 million tons of freight are transported through the county annually.

Large and small facilities can experience hazardous materials events from product delivery systems via road or rail transportation events. Transportation events occur along US Highway 30 and along the railroad corridor. The trucks and trains that use these transportation arteries commonly carry a variety of hazardous materials including fuel, crude oil derivatives, and chemicals. Chlorine, ammonia, acids and other chemicals can be very devastating to human and animal life and the environment. Hazardous materials may be transported once or many times during their “life cycle” as raw materials, manufacturing, incorporation in other products, wholesale and retail trade, use, waste disposal, and recycling. The transport of hazardous materials may be local (within a single city), across a state, across the country or internationally.

For Columbia County, a general perspective on hazardous materials incidents is provided by annual statistics of hazardous materials incidents, prepared by the OSFM. These incident reports include all reported hazardous material incidents, at fixed sites and during transportation, except generally excluding:

- a. motor fuels which are spilled in quantities less than 42 gallons,
- b. sewage overflows,
- c. structure fires or other emergencies where hazardous substances are involved as exposures, if the quantities exposed are less than 42 gallons.

For Columbia County, the general pattern of hazardous materials is likely to be similar to the statewide pattern and to be the most commonly involved materials (i.e., drug lab chemicals, fuels, and motor vehicle fluids) (Table 5-19).

**Table 5-19. Hazardous Materials Incidents 2000-2007,  
Reported Categories of Hazardous Materials**

Chemical	2000	2001	2002	2003	2004	2005	2006	2007
Diesel, Gasoline, Fuel Oil	1	-	5	-	4	5	2	2
Antifreeze, motor oil, hydraulic fluid, transmission fluid	5	2	2	- 1 -			- 5	
Unknown chemical	-	1	1	5 12 5			3	-
No chemical involved	1	1	1	-	-	1	-	-
Other chemicals	-	4 13		14 2		8	4	3
Total	7	8	22	19 19 19			9	10

*Source: National Response Center Database*

Areas located within 0.25 miles of EHS sites and major transportation routes are identified on Figures I-15 through I-15H as areas that may be at risk of a hazardous materials event.

### **5.3.14.4      *Extent***

The extent of hazardous materials risk from any given incident depends heavily on materials dispersed, weather conditions, and water presence. Some materials, such as acids, tend to have localized fumes and destruction, while others can displace oxygen and cause suffocation. Many hazardous liquids and gases depend on wind for dispersal. Water can compound the hazard by dispersing materials or through reactions that convert chemicals into a gaseous state.

The low number of hazmat incidents for Columbia County reflects the relatively low population of the county (with correspondingly, few shipments of fuels and other hazardous commodities relative to a more populated county). Another contributing factor may be the fact that there are no major interstate highways or major through roads between major population centers passing through Columbia County.

For Columbia County, the most likely road/highway hazmat incidents involve the common chemicals shown in Table 5-19. In addition, chemicals necessary for the forest products and fertilizer industry facilities in the county may also be involved in hazmat incidents, along with outgoing shipments of fertilizer products. Road/highway hazmat incidents are most likely along Highway 30 which connects most of the population centers in the county and most of the major industrial facilities using or shipping potentially hazardous materials.

The Mist-Birkenfeld gas pipeline extends towards the southeast to connect to transmission lines in the greater Portland area and runs north to connect to a pipeline running along the Highway 30 corridor. Each of the larger cities in Columbia County (including Scappoose, St. Helens, Columbia City, Rainier, Clatskanie, and Vernonia) and many smaller communities have local natural gas distribution systems connecting to transmission lines.

Columbia County also has a natural gas distribution system operated by Northwest Natural Gas. The natural gas pipeline systems of local gas utilities, including the systems in Columbia County, almost always follow road and street patterns because of established utility rights of way and because of the need to connect with each building served. Thus, for areas served by natural gas, the local street network is essentially identical to the natural gas distribution pipe network.

The only freight railroad serving Columbia County is the Portland & Western Line that runs from Astoria through Columbia County along the Highway 30 corridor to Portland. Specific data on hazmat shipments for this rail line were not available for this mitigation plan. However, the most likely chemicals for potential spills are generally similar to those noted above for road shipments within Columbia County.

The toxicity of particular hazardous materials is an important measure of the potential impact of hazardous materials on affected communities, but not the only important measure. Other characteristics of hazardous materials, especially the quantity of material and the ease of dispersal of the material may be as important, or more important, in governing the level of potential threat to a community.

## 5.3.14.5 **Probability of Future Events**

There are many fixed locations in Columbia County with inventories, and a considerable volume, of hazardous materials being transported to, from, within, or through the county.

Historically, the safety record for hazardous materials has been good, with relatively few, mostly minor hazmat incidents. Nevertheless, there is a potential for larger hazmat incidents in Columbia County. Previous occurrences indicate the likelihood of a small oil or chemical spill occurring within the County approximately 10 times per year. However, more comprehensive information on the probability and magnitude of hazardous material events from all types of sources is not available. Wide variations among the characteristics of hazardous material sources and among the materials themselves make such an evaluation difficult. While it is beyond the scope of this HMP to make detailed hazardous materials probability and magnitude evaluations for Columbia County, it is possible to determine building and critical facility exposure to this hazard. Two hundred-seventy one sites were identified as being EHS sites from annual EPA Tier II Material Inventory Reports.

Figures I-15 through I-15H show areas vulnerable to a hazardous material event, including an area within a 1-mile radius of major highways, EHS facilities, and railroad routes.

## 5.3.15 **Terrorism**

### 5.3.15.1 **Nature**

The Homeland Security Act of 2002, Public Law 107-296, 107th Congress, Nov 25, 2002, 6 USC 101, §2(15) defines terrorism as:

*“...any activity that involves an act that is dangerous to human life or potential destructive of critical infrastructure or key resources; and is a violation of the criminal laws of the United States or of any State or other subdivisions of the United States; and appears to be intended to intimidate or coerce a civilian population; to influence the policy of government by intimidation or coercion; or to affect the conduct of a government by mass destruction, assassination or kidnapping.”*

Terrorists may use a range of possible malevolent actions, including vandalism, arson, explosions and armed attacks, as well as use of chemical, biological, radioactive or nuclear materials.

- Chemical attacks: deliberate release of a toxic agent (gaseous, liquid, or solid) that can poison people or the environment
- Biological attacks: releases of large quantities of living, disease-causing microorganisms that have extraordinary lethal potential
- Radiological attacks: deliberate dispersal of radioactive materials, via dirty bombs (conventional explosives laced with radioactive materials) or other methods.
- Nuclear attacks: explosion of nuclear devices and the radioactive fallout from such explosions.
- Cyber-terrorism: deliberate disruption/damage of computer systems and data.

### **5.3.15.2 History**

Two major underground movements active in Columbia County, Oregon - the Earth Liberation Front (ELF) and the Animal Liberation Front (ALF) - are among the most destructive domestic terrorist groups in the United States. ALF, ELF, and related movements have claimed responsibility for more than 1,200 criminal acts since 1990 and caused more than \$110 million in property damage in the United States since 1976. (J. Lewis 2005, J. Lewis 2004) Since 1996, ALF and ELF have claimed responsibility for acts which have destroyed property in excess of \$13 million in Oregon alone.

In January 2006, 11 suspected members of an animal rights and environmental extremist cell in Oregon were indicted on 65 counts of conspiracy and related offenses including arson and attempted arson. The cell was allegedly responsible for a domestic terrorism campaign that spanned five Western states from 1996 to 2001. Specifically in Oregon, ELF is responsible for firebombing a Southern Oregon lumber mill office, toppling a high-tension electric line, and torching a Clatskanie tree farm. (Mail Tribune 2005) ELF burned part of the headquarters of the cottonwood plantation with damages estimated at \$1 million dollars. Columbia County lost several jobs, causing families to move out and the schools to lose 40 children (due to relocation); the latter resulted in the school shutting down. (D. Pohl 2008)

### **5.3.15.3 Location**

Oregon is home to a wide variety of criminal extremist groups including hate groups, anti-government groups, anarchists, and special issue movements like environmental and animal rights extremists, as well as activity by foreign terrorists. Individuals connected to these groups have used criminal activities to achieve their objectives, including arson, harassment, threats, extortion, home invasions, animal releases, sabotage, and destruction of private and government property. All jurisdictions throughout Columbia County are subject to impacts associated with domestic terrorism.

### **5.3.15.4 Extent**

Because of its location among logging industries and endangered species, Columbia County is susceptible to the following types of terrorism: vandalism, cyber/computer hacking, and eco-terrorism actions.

### **5.3.15.5 Probability of Future Events**

Within Columbia County, there is risk of terrorism incidents based on infrastructure and the environmental resources. Federal agencies work with state agencies to watch these organized groups; agencies may infiltrate their core structure and/or terminate any actions that cause harm to citizens, property, and the environment.

## 5.3.16 Infectious Disease Epidemic

### 5.3.16.1 Nature

Infectious diseases impair or damage bodily functions. They are caused by foreign organisms entering the human body and multiplying; including bacteria, viruses, fungi, and protozoa. Infections range from mild to deadly. Organisms enter the body via means such as: skin contact; inhalation; ingestion; blood (intravenous contact, bites, or punctures); sexual contact; and transmission from mothers to unborn children.

While infectious diseases pose a threat to people of any age and health condition, they are often a greater hazard to very young children, older adults, or people with compromised health. Vaccines and other advances in medical technology have reduced risks of some infectious diseases; however, new diseases emerge, new strains of existing diseases appear, and diseases that have been previously eliminated may reemerge.

When a disease spreads rapidly, affecting a greater portion of the population than would normally be expected, we call it an epidemic. An epidemic that reaches worldwide proportions is called a pandemic. When an infectious disease reaches epidemic level, it is considered to be a public health emergency. Such emergencies are commonly addressed through quarantine and immunization.

Viruses and bacteria are of particular concern in epidemics. Both types of organisms are capable of rapid mutation, and some mutations can make an organism more easily communicable, or more virulent, or resistant to the preventions or remedies that humans use against the disease. For instance, a new strain of a disease previously passed only from animal to human may be communicable between humans, and such a mutation will multiply rapidly because it affords the disease a way to colonize new hosts much more quickly. Because of the rapidly changing nature of infectious disease, even though recent historical data for Columbia County would lead one to believe that infectious disease is not a problem today, public health officials carefully monitor communicable diseases as well as those with current limitations that preclude epidemic outbreaks. (L. Rivers, personal communication)

Non-communicable, vector-borne diseases (such as those carried by mosquitoes or ticks) are important in community education, but generally would not lead to an epidemic in their current forms. It is worth noting that there is an association between climate and many infectious diseases, and global climate change will affect the range and prevalence of certain epidemics. In 2005, the World Health Organization published a report on using climate, and climate change models, to predict infectious disease epidemics. A climate-based early warning system may become an important tool for public health officials. (Khun *et al.* 2005)

In Oregon, some of the most common pathogens that cause disease outbreaks are *E. coli*, *Salmonella*, *Shigella*, and norovirus. Outbreaks of pertussis and measles still occur. Oregon is now tracking mumps as a reportable disease.

(<http://www.oregon.gov/DHS/ph/acd/outbreak/outbreak.shtml> )

Three diseases that occur or have potential to be introduced to the residents of Columbia County are norovirus, influenza, and West Nile virus. These diseases have been documented within the State of Oregon; information is available through the Oregon Department of Human Services,

Public Health Emergency Preparedness. The state also tracks other infectious diseases that could become a hazard to the community in the future, such as the emerging avian influenza (bird flu).

### *Influenza*

Influenza viruses have been present in the human population for many years. Major changes in the virus (antigenic shifts) in the 20<sup>th</sup> century have led to three pandemics or global outbreaks of the disease, identified by the country or region that first reported the outbreak: the 1918 Spanish Influenza; 1957 Asian Influenza; and the 1968 Hong Kong Influenza. The 1918 pandemic, which was the only major influenza outbreak during which the most affected population group was young, healthy individuals (18 to 34 years old), coincided with World War I, and the movement of many young men around the globe as soldiers. (L. Rivers, personal communication; Diamond, 1997)

Influenza viruses are passed between people through respiratory droplets that are spread by coughing or sneezing. Transmission is typically via air, but may also occur by contact with infected surfaces and then touching mucous membranes, such as those in the eyes, mouth, or nose. Incubation of the virus typically ranges from 1 to 5 days and symptoms generally last for 2 to 7 days. Symptoms may include fever, muscle aches, headache, cough, sore throat, runny or stuffy nose, and fatigue.

There are three types of influenza virus (A, B, and C) and many different strains of each type. Types A and B are known to cause annual epidemics, while Type C produces mild respiratory illnesses and is not known to cause epidemics. Influenza is a virus that mutates continually and rapidly in ways that essentially disguise the virus from human immune systems, so that previous exposure to, or illness from, the virus does not confer immunity. Vaccines are updated annually for Types A and B, based on the previous year's virus. (CDC 2008a)

In the northern hemisphere, influenza generally occurs from November through May. Peak months vary, but February is often the peak of flu season. The U.S. Center for Disease Control (CDC) reports that an average of 36,000 people died annually due to influenza between 1990 and 1999. In the same time-period, an average of 226,000 people were hospitalized annually. (CDC 2008b)

### *Norovirus*

The original strain of noroviruses appeared in Norwalk, Ohio in 1968. The virus produces a condition known as gastroenteritis, an inflammation of the stomach and intestines resulting in vomiting or diarrhea. The condition is often referred to as the "stomach flu," although it is not related to influenza. There are five groups of noroviruses and over 30 genetic clusters.

Noroviruses are transmitted between humans by eating or drinking food or water contaminated with feces from an infected person. Some reports indicate that the virus can be transmitted through droplets produced when a person is vomiting; the droplets may be swallowed by others. The virus is known to be highly contagious; transmission of the disease is often swift in high density situations such as nursing homes, cruise ships, schools, restaurants, and catered events. Incubation of the virus typically ranges from 12 to 48 hours and symptoms generally last from 24 to 60 hours.

The CDC believe that at least 50% of all foodborne outbreaks of gastroenteritis are caused by noroviruses. From July 1997 to June 2000, 232 outbreaks of norovirus illness were reported to the CDC. Of these, 57% were foodborne, 16% were spread person-to-person, and 3% were

waterborne; the cause of transmission was undetermined in 23% of outbreaks. Common settings included: restaurants and catered meals; nursing homes; schools; and vacation spots or cruise ships.

Foodborne outbreaks are most common, the most frequent cause of which is thought to be direct contamination by a food handler immediately before consumption. Cold foods, such as salads, bakery products, and sandwiches, are often implicated, as are fluid foods such as salad dressing or cake icing. Food can be contaminated at its source, as in the case of oysters from contaminated waters. Some foods have been contaminated before distribution, leading to widespread outbreaks; examples include raspberries and salads. Waterborne outbreaks are often associated with sewage contamination of drinking wells or recreational water. (CDC 2008c)

### *West Nile Virus*

West Nile virus is a mosquito-borne illness present in Oregon. It affects humans, horses, and birds. The disease does not, at present, spread from person to person, nor from animals to humans; it can only be contracted from the bite of an infected mosquito. Most infections are mild, with no symptoms or mild fever and flu-like symptoms, but in rare cases, a severe infection can cause encephalitis or death.

There exists the possibility that the virus could mutate in a manner that would make it more severe to humans, communicable between individuals, or both. For this reason, as well as for the small number of very serious cases, the disease is being carefully tracked. There are no vaccines nor cures at this point; avoiding mosquito bites is the best prevention. More information about the virus, and guidelines for prevention can be found at [www.oregon.gov/DHS/ph/acd/diseases/wmile](http://www.oregon.gov/DHS/ph/acd/diseases/wmile).

### **5.3.16.2 History**

The Oregon Department of Human Services, Health Services, tracks disease outbreaks annually. There have been no epidemics in recent history. A statewide summary of reportable disease outbreaks with more than one outbreak in any given year, for the years 2002 – 2006, is provided in Table 5-20. To give an idea of the current level of hazard within Columbia County, the total number of communicable disease cases in the county during 2006 (the year for which this statistic was readily available) was 169.

**Table 5-20. 2002-2006 Oregon Disease Outbreaks**

Causal agent	Number of cases in 2002	2003	2004	2005	2006
<b>Norovirus</b>	43*	78 97 68			130
<b>Pertussis</b>	8	6 - 5			2
<i>Salmonella</i>	7	13 22 12 11			
<i>Varicella</i>	6 - 2			3	5
<i>Campylobacter</i>	2 1 3			-	1
<i>Clostridium perfringens</i>	2 3 2			-	-



**Table 5-20. 2002-2006 Oregon Disease Outbreaks**

Causal agent	Number of cases in 2002	2003	2004	2005	2006
Hepatitis A	2	1 -		- 3	
Influenza	2	3 - 5			2
Scombroid	2	1	- - -		
<i>E. coli</i>	1 4 1 7 5				
<i>Shigella</i>	-	4 1 2 4			
Echovirus	- 2 -			-	-
<i>Streptococcus</i>	- 2		1 -		-
Rotavirus	- 2 -			-	-
Listeria	- - - -				2

\* includes 5 suspected - no cases reported  
 Source: Oregon Department of Human Services, Health Services

### 5.3.16.3 Location

The entire population of Columbia County is potentially susceptible to infectious diseases. Infectious diseases may occur throughout a school, spread to the community, and then county-wide. Transmission of disease is often greatest in high-density situations such as nursing homes, schools, dormitories, and restaurants.

### 5.3.16.4 Extent

This section takes the example of an influenza epidemic or pandemic to illustrate the extent of a highly contagious disease. Planning for an influenza pandemic, whether “avian flu” or another especially virulent influenza variant, would be the same for any community in the nation. Everyone would be susceptible; it cannot be known in advance which, if any, particular population segment would be most affected. Although pharmaceutical companies have prepared a vaccine directed at the present version of the avian flu, it would have to mutate further to become a communicable pandemic, and it is unknown to what extent, if any, the vaccine would apply to a new strain. Even if applicable, the avian vaccine cannot be grown in eggs (the standard method of mass-producing vaccines) and supply would be unlikely to meet demand. (L. Rivers, personal communication)

Immunity or resistance might then largely depend on inherent genetic diversity within the population, which is the case in any human population facing a newly emerged virulent disease. (Diamond, 1997)

### 5.3.16.5 Probability of Future Events

Based on historical events, Columbia County can expect that there will continue to be limited outbreaks of infectious diseases each year, including food-borne viral and bacterial pathogens,

measles, pertussis, hepatitis, and influenza, among others. The likelihood of any of these diseases reaching epidemic proportions in any given year is very low.

If another influenza pandemic occurs, Columbia County is very likely to be affected. In the past century, there have been three influenza pandemics, with 40 and 10-year return intervals. The last one was in 1968, 40 years ago, which is one reason that health officials are becoming concerned about when the next one will occur. However, the emergence of pandemic illnesses depends on a number of extremely complex factors, which makes the timing of such an outbreak extremely difficult to predict.

As mentioned above, climate has an affect on communicable disease, and climate change could alter the repertoire of diseases that exist in Oregon, as well as outbreak frequency.

## **6. VULNERABILITY ANALYSIS**

This section provides an overview of the vulnerability analysis and describes the five specific steps: asset inventory, methodology, data limitations and exposure analysis for current assets, and areas of future development. County- and city-specific asset inventory and exposure analysis tables are listed in Appendices A through H.

### **6.1 OVERVIEW OF VULNERABILITY ANALYSIS**

A vulnerability analysis predicts the extent of exposure, and the impacts that may result from a hazard event of a given intensity in a given area. The analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing communities to focus attention on areas with the greatest risk of damage. A vulnerability analysis is divided into five steps including asset inventory, methodology, data limitations, exposure analysis for current assets, and areas of future development.

The requirements for a vulnerability analysis as stipulated in DMA 2000 and its implementing regulations are described below.

- A summary of the community’s vulnerability to each hazard that addresses the impact of each hazard on the community.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction’s vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment ]must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

Source: FEMA, July 2008.

## DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties

### DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures

#### Assessing Vulnerability: Identifying Structures

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

#### Element

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.

### DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses

#### Assessing Vulnerability: Estimating Potential Losses

**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

#### Element

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

### DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment

#### Assessing Vulnerability: Multi-Jurisdictional Risk Assessment

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area

#### Element

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## 6.2 VULNERABILITY ANALYSIS: SPECIFIC STEPS

### 6.2.1 Asset Inventory

An asset inventory is the first step of a vulnerability analysis. Assets throughout the County that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

The asset inventory delineates Columbia County's existing building and infrastructure assets and insured values and are identified in detail in Appendix A, Table A – 7. Jurisdiction-specific asset inventories are located in Appendices B – H.

Appendix A, Tables A – 8, 9, and 10 (and respective jurisdiction-specific appendices B – H) portray the critical infrastructure numbers and values, and their potential vulnerability by hazard type.

Columbia County seeks to protect its population by supporting Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk is mitigated.

### **6.2.1.1 Population and Building Stock**

Population data for all of Columbia County were obtained from the 2000 U.S. Census, which was collected at the census block level. Columbia County's total population for 2000 was 43,560 with a certified estimated of 47,565 for 2007, and the Portland State University estimated an increase to 49,163 for 2008. (Appendix A) Jurisdiction specific population data are found in their respective Appendices B – H.

Estimated numbers of residential buildings and replacement values for those structures, as shown in Appendix A, were obtained from the 2000 U.S. Census. A total of 17,572 residential buildings were considered in this analysis, including single-family dwellings, mobile homes, multi-family dwellings, temporary lodgings, and institutional dormitory facilities.

### **6.2.1.2 Repetitive Loss Properties**

Repetitive loss properties are properties that suffer from repeated flooding. FEMA defines a RL property as a NFIP insured property with at least two \$1,000 claims within any 10-year period since 1978. SRL properties have been identified by FEMA as most at risk for repeat flooding. These properties include every property that since 1978 has experienced: four or more separate building and content claims (that are NFIP insured) each exceeding \$5,000 with cumulative claims exceeding \$20,000, or at least two separate building claims with cumulative losses exceeding the value of the property (that is, the value of the structure).

Table 6-1 shows general RL property data located within the county. Locations for both RL and SRL properties are not available for publication, however individual property files are kept with the floodplain manager in Columbia County.

**Table 6-1. Countywide Repetitive Loss Properties  
NFIP Insurance Report**

Jurisdiction	Total Premiums (\$)	Policies A-Zone	Total Policies	Total Coverage (\$)	Average Premium (\$)	Total Claims Since 1978	Total Paid Since 1978 (\$)	Rep Loss Properties <sup>2</sup>	
Columbia County	218,292	15	3	333	65,255,300	108	1,159.19	4,454,338	1
Clatskanie 23	,183	15	20	3,581,600	1,159.15	6	41	6,095	1
Columbia City	7,706	10	18	4,777,300	428.11	-	-	-	-
Prescott 30	4	-	1	350,000	304.00	-	-	-	-
Rainier 1,	015	-	4	770,000	253.75	3	2,129	0	0
St. Helens	34,826	27	68	13,357,800	512.15	17	195,846	1	1
Scappoose 62	,697	75	133	25,198,500	471.41	21	123,448	2	2
Vernonia	153,434	13	4	249	45,450,800	616.21	222	12,161,122	5

Source: FEMA SQANet.

<sup>2</sup>Content and building claims.

**6.2.1.3 Critical Facilities and Infrastructure**

A critical facility is defined as a local (non-State or Federal) facility in either the public or private sector that provides essential products and services to the general public, such as preserving the quality of life in Columbia County and fulfilling important public safety, emergency response, and disaster recovery functions. The critical facilities profiled in this plan include the following:

- Local government facilities, such as departments, agencies, and administrative offices
- Emergency response facilities, including police, fire, and Emergency Operations Centers
- Educational facilities, including K-12
- Care facilities, such as congregate living health, residential care, and continuing care retirement facilities
- Community gathering places, such as parks, museums, libraries, and senior centers

The total number of county-identified critical facilities is listed in Appendix A and shown in Figure I-17. The incorporated city-specific critical facilities are listed in Appendices B through H and shown on Figures I-18 through I-24.

Similar to critical facilities, critical infrastructure includes infrastructure that is essential to preserving the quality of life and safety in the county. Critical infrastructure profiled in this plan includes the following:

- State and Federal Highways

- Railroad Tracks
- Local, State, and Federal bridges
- Utilities, including communication (cell, radio, and television), water and wastewater, and electrical facilities

### 6.2.2 Methodology

A conservative exposure-level analysis was conducted to assess the risks of the identified hazards. This analysis is a simplified assessment of the potential effects of the hazards on values at risk without consideration of probability or level of damage.

Using census block level information, a spatial proportion was used to determine the percentage of the population and residential and nonresidential structures located where hazards are likely to occur. Census blocks that are completely within the boundary of a hazard area were determined to be vulnerable and were totaled. A spatial proportion was also used to determine the amount of linear assets, such as highways, within a hazard area. The exposure analysis for linear assets was measured in miles.

Replacement values or insurance coverage were developed for physical assets. These values were provided by the county and each jurisdiction. For facilities that didn't have specific values per building in a multi-building scenario (e.g., schools), the buildings were grouped together and assigned one value where available. Value information is not available for all critical facilities at this time and will be collected as it becomes available. For each physical asset located within a hazard area, exposure was calculated by assuming the worst-case scenario (that is, the asset would be completely destroyed and would have to be replaced). Finally, the aggregate exposure, in terms of replacement value or insurance coverage, for each category of structure or facility was calculated.

A similar analysis was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no estimate of the number of potential injuries or deaths was prepared.

### 6.2.3 Data Limitations

The vulnerability estimates provided herein use the best data currently available, and the methodologies applied result in an approximation of risk. These estimates may be used to understand relative risk from hazards and potential losses. However, uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning hazards and their effects on the built environment as well as the use of approximations and simplifications that are necessary for a comprehensive analysis.

It is also important to note that the quantitative vulnerability assessment results are limited to the exposure of people, buildings, and critical facilities and infrastructure to the identified hazards. It was beyond the scope of this MHMP to develop a more detailed or comprehensive assessment of risk (including annualized losses, people injured or killed, shelter requirements, loss of facility/system function, and economic losses). Such impacts may be addressed with future updates of the MHMP.

### **6.2.4 Exposure Analysis**

The results of the exposure analysis for loss estimations in Columbia County and each participating jurisdiction are located in Appendices A – H. Each appendix represents a jurisdiction and lists the critical facilities and the specific hazard areas in which each facility is located.

### **6.2.5 Areas of Future Development**

Columbia County and the participating jurisdictions represented in this MHMP seek to protect its population by supporting Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any proposed essential infrastructure component will undergo stringent review and design to ensure potential hazard risk is mitigated.



## **7. MITIGATION STRATEGY**

This section outlines the four-step process for preparing a mitigation strategy including:

- Developing mitigation goals,
- Identifying mitigation actions,
- Evaluating mitigation actions, and
- Implementing mitigation action plans.

The steering committee developed the mitigation goals, reviewed potential mitigation actions, and developed the Mitigation Action Plan for the unincorporated portion of the County. The incorporated jurisdictions pursued the same process. As such, County and city-specific Appendices (Appendices A – H) are provided with their respective information.

### **7.1 DEVELOPING MITIGATION GOALS**

The requirements for the local hazard mitigation goals, as stipulated in DMA 2000 and its implementing regulations, are described below.

#### **DMA 2000 Requirements: Mitigation Strategy – Local Hazard Mitigation Goals**

##### **Local Hazard Mitigation Goals**

**Requirement §201.6(c)(3)(i):** [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

##### **Element**

- Does the new or updated plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards? (GOALS are long-term; represent what the community wants to achieve, such as “eliminate flood damage,” and are based on the risk assessment findings.)

Source: FEMA, July 2008.

During the August 13, 2008 Risk Assessment Public meeting, the County and participating jurisdictions reviewed County and city-specific analysis results as a basis for developing the mitigation goals and potential mitigation actions (Appendices A – H).

Mitigation goals are defined as general guidelines that explain what a community wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing community-wide visions. As such, the Steering Committee decided to keep their original goals (Table 7-1) reflected in their 2005 HMP which are focused to reduce or avoid long-term vulnerabilities to the identified hazards.

**Table 7-1. Mitigation Goals**

Goal Number	Goal Description
1	<p><b>Reduce the Threat to Life Safety</b>                      Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.</p>
2	<p><b>Protect Critical Facilities and Enhance Emergency and Essential Services</b></p> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, businesses, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, businesses, and industry.</li> </ul>

## 7.2 IDENTIFYING MITIGATION ACTIONS

The requirements for the mitigation actions identification and analysis, as stipulated in DMA 2000 and its implementing regulations, are described below.

<p><b>DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions</b></p> <p><b>Identification and Analysis of Mitigation Actions</b></p> <p><b>Requirement §201.6(c)(3)(ii):</b> [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.</p> <p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?</li> <li>■ Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?</li> <li>■ Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?</li> </ul> <p>Source: FEMA, July 2008.</p>
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The County then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals. Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Appendix A depicts the County’s existing and newly considered mitigation actions developed during this mitigation plan update. The appendix further defines whether the existing actions were completed, deleted, deferred, or ongoing. Appendices B through H contain jurisdiction specific mitigation actions considered as part of this MHMP update.

Appendices A through H contain County and jurisdiction-specific mitigation actions to reduce hazard impacts to new and existing buildings and infrastructure.

### **DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance**

#### **National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

#### **Element**

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

Columbia County, and the Cities of Clatskanie, Columbia City, Prescott, Rainier, St. Helens, Scappoose, and Vernonia all actively participate in FEMA’s National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance. The City of Scappoose has exceeded NFIP minimum requirements to receive a Community Rating System (CRS) rating of “7.”

Each jurisdiction’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives. They subsequently selected and prioritized County or community appropriate actions to ensure an effective flood mitigation program. The County and jurisdictional appendices (A – H) describe their respective processes. Each jurisdiction also specifically addressed RL properties.

### 7.3 EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The requirements for the evaluation and implementation of mitigation actions, as stipulated in DMA 2000 and its implementing regulations, are described below.

**DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions**

**Implementation of Mitigation Actions**

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

**Element**

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The steering committees met to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the jurisdiction-specific Mitigation Action Plans update as outlined in Appendices A-H.

The committees then met to determine the responsible agency and potential funding sources. The jurisdiction-specific Mitigation Action Plans represents mitigation projects and programs to be implemented through the cooperation of multiple entities.

The steering committees evaluated the simplified STAPLEE evaluation criteria (shown in Table 7-2) and the Benefit-Cost Analysis Fact Sheet (Appendix N) to consider the opportunities and constraints of implementing each particular mitigation action.

**Table 7-2. Evaluation Criteria for Mitigation Actions**

Evaluation Category	Discussion “It is important to consider...”	Considerations
<b>Social</b>	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
<b>Technical</b>	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
<b>Administrative</b>	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance/operations
<b>Political</b>	What the community and its members feel about issues related to the environment,	Political support Local champion

**Table 7-2. Evaluation Criteria for Mitigation Actions**

Evaluation Category	Discussion “It is important to consider...”	Considerations
	economic development, safety, and emergency management.	Public support
<b>Legal</b>	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Local, State, and Federal authority Potential legal challenge
<b>Economic</b>	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
<b>Environmental</b>	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, State, and Federal laws

The committee members reviewed and discussed each action, and then determined the priority order by committee member consensus. Subsequently, those actions listed in the Mitigation Action Plans (Appendices A-H) are the highest priority for each jurisdiction. They are listed by hazard, in priority order only within each hazard.

Upon review and consensus, the Steering Committees assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for each jurisdiction and responsible entities to implement during the 5-year lifespan of this version of the MHMP.

## **7.4 IMPLEMENTING A MITIGATION ACTION PLAN**

The requirements for the identification of a mitigation action for each participating jurisdiction, as stipulated in DMA 2000 and its implementing regulations, are described below.

<p><b>DMA 2000 Requirements: Mitigation Strategy – Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Requirement §201.6(c)(3)(iv):</b> For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.</p> <p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?</li> <li>■ Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?</li> </ul> <p>Source: FEMA, July 2008.</p>
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Columbia County (Appendix A) and the City of Vernonia (Appendix H) identifies “existing” mitigation action’s status (i.e. completed, deleted or deferred mitigation actions) and provided

comments regarding those actions that were deferred. The tables indicate “Ongoing” for those actions that were implemented and are now continuous initiatives.

Columbia County’s Mitigation Action Plan matrix (Appendix A) states that the benefit-costs consideration will be determined once an action undergoes development, and how each mitigation action will be implemented and administered by the responsible entity where appropriate. Columbia County’s ongoing actions are listed in blue text.

The remaining six incorporated cities followed this same process and developed city-specific Mitigation Action Plans. The city-specific Mitigation Action Plans are provided in Appendices B-H.

### **Roadblocks to Implementing Mitigation Actions:**

- All jurisdictions rely heavily on available and consistent programmatic funding to ensure existing programs remain viable. Fluctuations within these funding streams will dramatically affect each jurisdiction’s mitigation strategies. Reductions will severely limit successful mitigation action plan implementation.
- Permitting processes vary by jurisdiction and regulatory agency. There is no established clearinghouse or one-stop-shopping process. Coordinating between regulatory agencies like Fish and Game, the Department of Natural Resources, the Army Corps of Engineers, and other agencies can be cumbersome and time consuming. One jurisdiction stated it takes up to five years to successfully complete the permitting process.
- Limited available funding prevents preparing potential mitigation project Benefit/Cost Analysis prior to project development and submittal for grant application development.

## **8. PLAN MAINTENANCE**

This section describes a formal plan maintenance process to ensure that the MHMP remains an active and applicable document. It includes an explanation of how Columbia County Emergency Management and the Steering Committees intend to organize their efforts to ensure that improvements and revisions to the MHMP occur in a well-managed, efficient, and coordinated manner.

The following three process steps are addressed in detail below:

- Monitoring, evaluating, and updating the MHMP
- Implementation through existing planning mechanisms
- Continued public involvement

### **8.1 MONITORING, EVALUATING, AND UPDATING THE MHMP**

The requirements for monitoring, evaluating, and updating the MHMP, as stipulated in the DMA 2000 and its implementing regulations, are described below.

**DMA 2000 Requirements: Plan Maintenance Process - Monitoring, Evaluating, and Updating the Plan**

**Monitoring, Evaluating and Updating the Plan**

**Requirement §201.6(c)(4)(i):** [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

**Element**

- Does the new or updated plan describe the method and schedule for monitoring the plan, including the responsible department?
- Does the new or updated plan describe the method and schedule for evaluating the plan, including how, when and by whom (i.e. the responsible department)?
- Does the new or updated plan describe the method and schedule for updating the plan within the five-year cycle?

Source: FEMA, July 2008.

The MHMP was prepared as a collaborative effort among Columbia County Emergency Management (CCEM) and the Steering Committees of the participating jurisdictions. To maintain momentum and build upon previous hazard mitigation planning efforts and successes, CCEM will use the Steering Committees to monitor, evaluate, and update the MHMP. Columbia County Emergency Management, Emergency Manager, will serve as the primary point-of-contact and will coordinate all local efforts to monitor, evaluate, and revise the MHMP.

Each participating jurisdiction will be responsible for implementing the county- or city-specific Mitigation Action Plan. CCEM will serve as the primary point of contact and will coordinate all local efforts to monitor, evaluate, and revise the MHMP.

Each member of the Steering Committee, or representative from each participating jurisdiction, will conduct an annual review to monitor the progress in implementing the MHMP, particularly the County- or city-specific Mitigation Action Plan. As shown in Appendix O, the Annual Review Worksheet will provide the basis for possible changes to the overall MHMP Mitigation Action Plan and each County- or city-specific Mitigation Action Plan by refocusing on new or

more threatening hazards, adjusting to changes to, or increases in, resource allocations, and engaging additional support for the MHMP implementation.

CCEM will initiate an annual review one month prior to the adoption date anniversary. The findings from these reviews will be presented at the annual Steering Committee meeting.

The review will contain an evaluation of the MHMP implementation progress, particularly the Mitigation Action Plan Appendices (A-H). The CCEM will use the Annual Review Worksheet (Appendix O) to document possible changes to the Mitigation Action Plan.

Each review, as shown on the Annual Review Worksheet, will include an evaluation of the following:

- Participation of each jurisdiction and others in the MHMP implementation
- Notable changes in the countywide risk of natural or human-caused hazards
- Impacts of land development activities and related programs on hazard mitigation
- Progress made with the countywide Mitigation Action Plan as well as each county- or city-Mitigation Action Plan (identify problems and suggest improvements as necessary)
- The adequacy of local and county resources for implementation of the MHMP

Each participating jurisdiction will submit a Progress Report (Appendix O) to the planning team. The report will include the current status of the Mitigation Action Plan's mitigation projects, including any changes made to the projects, the identification of implementation problems and appropriate strategies to overcome them, and whether or not the project has achieved the appropriate goals identified in the plan.

In addition to the annual review, the Steering Committee will update the MHMP every five (5) years. To ensure that this update occurs, in the third year following adoption of the MHMP, CCEM and the Steering Committees will undertake the following activities:

- Submit a request for eligible grant-funding for the MHMP update (2014) from the State of Oregon Division of Emergency Management.
- Review FEMA MHMP update requirements for the new planning cycle.
- Thoroughly analyze and update the risk of natural and human-caused hazards countywide.
- Provide a copy of the County and its participating jurisdictions' prior and current years annual reviews.
- Complete a detailed mitigation strategy review and revision.
- Update the Mitigation Action Plan for all participating jurisdictions identifying the status of the currently identified actions and adding newly considered, prioritized, and assigned actions.
- Prepare a new draft MHMP and submit it to the each appropriate governing body for review.
- Submit an updated MHMP to the Oregon Division of Emergency Management and FEMA for review.



- Present MHMP with FEMA’s “Conditional Approval” to the County and City Councils for adoption
- Return a copy of the finalized MHMP with adoption resolutions from all participating jurisdictions to FEMA to finalize FEMA’s approval.

## **8.2 IMPLEMENTATION THROUGH EXISTING PLANNING MECHANISMS**

The requirements for implementation through existing planning mechanisms, as stipulated in the DMA 2000 and its implementing regulations, are described below.

### **DMA 2000 Requirements: Plan Maintenance Process - Incorporation into Existing Planning Mechanisms**

#### **Incorporation into Existing Planning Mechanisms**

Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

#### **Element**

- Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?
- Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?
- Does the updated plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?

*Source:* FEMA, July 2008.

The original 2005 Hazard Mitigation Plan called for a steering committee to be convened on a periodic basis to focus efforts on maintaining the plan and implementing the mitigation strategy and applicable initiatives. This had not occurred until the update process began in early 2008. However, existing programs continue to address statewide planning goals and legislative requirements. The County's comprehensive land use plan, capital improvement plan, mandated standards and building codes currently address identified mitigation initiatives and code compliance requirements. The county strives to incorporate mitigation actions into existing programs and procedures as the opportunity arises.

Table 3 in each of appendices A-H identifies the local planning mechanisms and regulatory tools available for incorporating the mitigation requirements of the mitigation plan.

The Steering Committee, after MHMP adoption, will ensure that the MHMP, in particular each Mitigation Action Plan is incorporated into existing planning mechanisms. Each Steering Committee will achieve this incorporation by undertaking the following activities.

- Conduct a review of the community-specific regulatory tools to assess the schedule for integration of the mitigation strategy. These regulatory tools are identified in each community-specific capability assessment presented in Appendices A-H.
- Work with pertinent community departments and agencies to increase MHMP awareness and provide assistance in integrating the mitigation strategy into relevant planning

mechanisms. Implementation of these requirements may require updating or amending specific planning mechanisms.

There were no specific documents identified that had incorporated the results of the original 2005 HMP. However, the steering committee members are now aware of the resources available in this updated document and how they can be utilized to enhance other planning activities.

### **8.3 CONTINUED PUBLIC INVOLVEMENT**

The requirements for continued public involvement, as stipulated in the DMA 2000 and its implementing regulations, are described below.

**DMA 2000 Requirements: Plan Maintenance Process - Continued Public Involvement**

**Continued Public Involvement**

**Requirement §201.6(c)(4)(iii):** [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

**Element**

- Does the new or updated plan explain how continued public participation will be obtained? (For example, will there be public notices, an ongoing mitigation plan committee, or annual review meetings with stakeholders?)

*Source:* FEMA, July 2008.

CCEM and each of the seven incorporated cities within the County are dedicated to involving the public directly in the continual reshaping and updating of the MHMP. Electronic and hard copies of the MHMP will be provided to Columbia County and each city. In addition, a downloadable copy of the MHMP and any proposed changes will be posted on CCEM’s Web site. This site will also contain an e-mail address and phone number to which people can direct their comments or concerns.

CCEM and the steering committees will also identify opportunities to raise community awareness about the MHMP and the hazards that affect the County and participating jurisdictions. This effort could include attendance and provision of materials at County-, city-, and school-sponsored events; through the American Red Cross, the Columbia County Fire Districts, AARP, and other outreach programs and public mailings. Any public comments received regarding the MHMP will be collected by CCEM, included in the annual report, and considered during future MHMP updates.

Any public comments received regarding the MHMP will be collected by the Steering Committee leader, included in the annual Steering Committee Meeting’s report, and considered during future MHMP updates.

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**Appendix A**  
**Columbia County**

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This appendix contains specific Columbia County information to support the County's 2009 Multi-Jurisdictional Hazard Mitigation Plan update.

This further supports the County's planning process by summarizing the review and incorporation of existing plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan's development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

Columbia County is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the County organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats. Table 4-1 identifies the steering committee members and Table 4-2 identifies the public involvement mechanisms used through the planning update process.

## CAPABILITY ASSESSMENT

Table A-1, A-2, and A-3 contain the County’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table A-1. Columbia County Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	2005 Columbia County Multi-Hazard Mitigation Plan	The primary objectives of the Mitigation plan are to reduce the negative impacts of future disasters on the community: to save lives and reduce injuries, minimize damage to buildings and infrastructure (especially critical facilities), and minimize economic losses. The Mitigation Plan is a planning document, not a regulatory document.
	Comprehensive Land Use Plan	<p>The Comprehensive Plan contains public policy concerning the development and conservation of the County's resources, and provision of public facilities and services. The policies and objectives of the plan must be consistent with the Statewide Planning Goals and Guidelines and Administrative Rules.</p> <ol style="list-style-type: none"> <li>1) The plan emphasizes natural resources including land, air, and water and how they are to be preserved, conserved, managed, or utilized.</li> <li>2) Constraints on development, such as resource limitations as well as the physical limitations of the public and private sectors in providing necessary services.</li> <li>3) The locations for various types of land and water uses and activities in an area, such as agricultural, forestry, residential, commercial, public, and industrial.</li> <li>4) The utilities, services, and facilities needed to support current and contemplated uses and activities.</li> <li>5) Considerations deriving from special values and needs of the area, such as housing, energy supplies, recreational facilities, and scenic areas.</li> </ol> <p>The plan is a document upon which public agencies, private firms, and individuals must be able to rely so that their decisions are consistent with land use policies as well as Statewide Goals and Guidelines. The plan is implemented by zoning and subdivision regulations, which must be consistent with the overall Policies and Objectives reflected in the plan.</p>
	Transportation Plan	The Transportation System Plan (TSP) for Columbia County provides the framework to guide development of the transportation system into the twenty-first century. It addresses the needs, funding resources, and implementation requirements to respond to future growth in population and employment. All modes of transportation are considered, including vehicular and freight movement, public transit, walking and bicycling, service for the transportation disadvantaged, railroad, air, water, and pipeline transportation. This plan provides for transportation development in the rural areas of Columbia County. In a separate process, TSP documents have been previously completed for most incorporated cities within the County.

**Table A-1. Columbia County Legal and Regulatory Resources Available for Hazard Mitigation**

Regulatory Tool	Name	Effect on Hazard Mitigation
	Comprehensive Emergency Management Plan (CEMP)	This plan describes the roles and responsibilities of the departments and certain other agencies (including Special Districts) during major emergencies or disasters. The plan sets forth a strategy and operating guidelines using the National Incident Management System’s (NIMS) Incident Command System (ICS) adopted by the County for managing its response and recovery activities during emergencies and disasters. It is the intent of the County to integrate all emergency response systems into a program for comprehensive emergency management.
	Columbia County Debris Management Plan	To facilitate and coordinate the removal, collection, and disposal of debris following a disaster, to mitigate against any potential threat to the health, safety, and welfare of the impacted citizens, and expedite recovery efforts in the impacted area, and address any threat of significant damage to improved public or private property.
	Columbia County Community Wildfire Protection Plan (CWPP)	Document serves as a resource for the wildland urban interface fire threat mitigation through community education and awareness, prioritized hazard and risk reduction, and community action partnerships. The Columbia County Community Wildfire Protection Plan (CWPP) is a strategic planning document that forms a foundation for a realistic assessment of wildfire risks in our county and develops plans or action statements of what we can do as a community to mitigate wildfire threats to life, property, and natural resources.
Programs	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods. These regulations are combined in the County Zoning Ordinance and Building Codes.
	Community Rating System (CRS) Rating	This rating demonstrates the County’s commitment to floodplain mitigation. The County has incorporated programs which surpasses the basic NFIP requirements and have subsequently earned a rating which reduces their NFIP policy holders insurance premiums.
Policies	Zoning and Land Use Ordinances	Flood Overlay Zone Regulations – Flood Plain Ordinance regulates development within the floodplain.
	Columbia County Storm Water and Erosion Control Ordinance	The purpose of this ordinance is to: <ul style="list-style-type: none"> <li>• Prevent water quality degradation of the county’s water resources;</li> <li>• Prevent damage to property from increased runoff rates and volumes;</li> <li>• Protect the quality of waters for drinking water supply, contact recreation, fisheries, irrigation, and other beneficial uses;</li> <li>• Establish sound development policies which protect and preserve the county's water and land resources;</li> <li>• Protect County roads and right-of-ways from damage due to inadequately controlled runoff and erosion;</li> <li>• Protect the health, safety, and welfare of the inhabitants of the County;</li> <li>• Maintain existing instream flows; and</li> <li>• Preserve and enhance the aesthetic quality of the County's water resources.</li> </ul>

<b>Table A-1. Columbia County Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
	State of Oregon Uniform Building Codes	The Building Codes Division (BCD) provides code development, administration, inspection, plan review, licensing, and permit services to the construction industry. These are integral to the safe and effective construction of structures in Oregon and are administered by the County. The division was added to the newly formed Department of Consumer & Business Services in 1993.
	Emergency Services and Communications Statute (ORS 401)	(1) The general purpose of ORS 401.015 to 401.107, 401.257 to 401.325 and 401.355 to 401.584 is to reduce the vulnerability of the State of Oregon to loss of life, injury to persons or property, and human suffering and financial loss resulting from emergencies, and to provide for recovery and relief assistance for the victims of such occurrences. (2) It is declared to be the policy and intent of the Legislative Assembly that preparations for emergencies and governmental responsibility for responding to emergencies be placed at the local government level. The state shall prepare for emergencies, but shall not assume authority or responsibility for responding to such an event unless the appropriate response is beyond the capability of the city and county in which it occurs, the city or county fails to act, or the emergency involves two or more counties.
	Subdivision and Partitioning Ordinance	The purpose of this ordinance is to establish standards and procedures for the partitioning of land in the County outside the incorporated cities' boundaries. These regulations are necessary in order to provide uniform procedures and standards for the subdivision of land, to assure adequate width of streets, to coordinate proposed development with plans for utilities and other public facilities, to avoid undue congestion of population, to assure adequate sanitation and water supply, to provide for the protection, conservation, and proper use of land and to protect in other ways the public's health, safety, and welfare. This ordinance is supplemental to the provisions of the Columbia County Zoning Ordinance of 1985. Where conflicts exist with the provisions of the Zoning Ordinance, this ordinance will take precedence.

<b>Table A-2. Columbia County Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	Land Development Services / Planning Division
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Land Development Services / Building Division and County Road Department
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	Emergency Management
Floodplain manager	Land Development Services / Planning Division
Personnel skilled in GIS and/or HAZUS-MH	Assessment and Taxation / County Cartographer (GIS Only)
Director of Emergency Services	Emergency Management, Director
Finance	County Finance Department
Public Information Officers	Board of County Commissioners / Public Information Officer

<b>Table A-3. Columbia County Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	None
Authority to levy taxes for specific purposes	Yes, with voter approval
Incur debt through general obligation bonds	Yes, with voter approval
Incur debt through special tax	Yes, with voter approval
Incur debt through revenue bonds	With Board of County Commissioners Approval
Incur debt through private activity bonds	With Board of County Commissioners Approval
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local eligible communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate and protect repetitively flooded structures and infrastructure.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment: Identifying Hazards**

**Identifying Hazards**  
**Requirement §201.6(c)(2)(i):** [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.  
**Element**  
 ■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?  
 Source: FEMA, July 2008.

The Columbia County Steering Committee determined that the following hazards could potentially threaten the County.

<b>Table A-4. Columbia County Hazard Identification</b>	
<i><b>Natural Hazards</b></i>	
Flood X	
Winter Storm	X
Landslide X	
Fire (Wildland/Urban)	X
Earthquake X	
Volcano X	
Wind* X	
Erosion* X	
ENSO (El Niño / La Niña)*	X
Expansive Soils*	X
Drought* X	
<i><b>Technological Hazards</b></i>	
Dam Failure	X
Disruption of Utility and Transportation Systems	X
Hazardous Materials	X
Terrorism X	
Infectious Disease Epidemic	X



## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes County specific vulnerability information. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following section defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment ]must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

Columbia County, and the Cities of Clatskanie, Columbia City, Prescott, Rainier, Scappoose, St Helens, and Vernonia all actively participate in FEMA's National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

Each jurisdiction's Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**

**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area

**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS**

### **Asset Inventory**

The asset inventory is the first step of a vulnerability analysis. Assets within each community that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure. The Steering Committee made appropriate changes throughout the 2009 plan update process.

The Asset Inventory delineates Columbia County's existing building and infrastructure assets and insured values which are identified in detail in Tables A-5, A-6 and A-7.

Tables A-8, 9, and 10 portray the critical infrastructure numbers and values, and their potential vulnerability by hazard type.

Columbia County seeks to protect its population by supporting Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure, and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### **Population and Building Stock**

Population data listed in Table A-5 was obtained from the 2000 U.S. Census and Portland State University preliminary 2008 population estimate. It comprises census block level data, and estimates from university conducted community research.

The County's existing building, infrastructure, and insured values are identified in Tables A-5, A-6, and A-7.

<b>Table A-5. Columbia County Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Estimated 2008 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
43,560	7,565	49,163	17,572	2,648,100,400

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$150,700 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table A-6. Columbia County NFIP Insurance Report</b>								
<b>Jurisdiction</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Total Claims Since 1978</b>	<b>Average Premium (\$)</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>
Columbia County	218,292	153	333	65,255,300	108	1,159.19	4,454,338	1

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

(NOTE – many critical facilities and locations have been identified and included in this inventory and risk assessment – due to their confidential nature, their locations and identity have been “shaded” for publication. The data will remain in the report for the County’s future mitigation planning efforts)

<b>Table A-7. Columbia County Critical Facilities and Infrastructure</b>			
<b>Facility Type</b>	<b>Name / Number</b>	<b>Address</b>	<b>Value<sup>1</sup> (\$)</b>
Government	Scappoose City Hall	33568 E Columbia Avenue, Scappoose, OR	1,082,112
	County Courthouse and Administrative Offices	230 Strand Street., St. Helens, OR 97051	8,547,014
	Old County Courthouse	280 Strand Street, St. Helens, OR 97051	4,609,375

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Jail – Men’s Transitional House	901 Port Avenue., St. Helens OR 97051	243,000
	Jail - Women’s Transitional House	901 Port Avenue, St. Helens, OR 97051	195,000
	County Road Department	1004 Oregon Street, St. Helens, OR 97051	1,290,120
	Road Department Building	1054 Oregon Street, St. Helens, OR 97051	722,816
	Animal Control	2084 Oregon Street, St. Helens, OR 97051	672,209
	Columbia County Fair Grounds	58892 Saulser Road, St. Helens, OR 97051	3,579,826
	Clatskanie Shop Bldg (Road Dept)	5th Street, Clatskanie, OR 97016	310,359
	Rainier Shop Equipment Shed (Road Dept)	30526 Brownlee Road, Rainier, OR 97048	424,982
	Scappoose Shop Bldg (Road Dept)	32281 Scappoose-Vernonia Hwy, Scappoose, OR 97056	106,496
	Vernonia Shop Bldg (Road Dept)	392 G Street, Vernonia, OR 97064	327,906
	Equipment Shed (Road Dept)	Scappoose Vernonia Hwy, Scappoose, OR 97056	39,426
	Vernonia Justice of the Peace	622 Bridge Street, Vernonia, OR 97064	17,218
	Clatskanie Justice of the Peace	28 S Nehalem Street, Clatskanie, OR 97016	8,788
	Beaver Boat Ramp & Restroom	Hwy 30, Clatskanie, OR 97016	150,159
	Gilbert Boat Ramp	Reeder Road, Sauvie Island, Scappoose, OR 97056	60,489
	Law Library/Civil Service	270 1 <sup>st</sup> Street, St. Helens, OR 97051	448,374
	Clatskanie Library District	1 Library Access Road, Clatskanie, OR	Unknown
	Columbia City Library	205 I Street, Columbia City, OR	Unknown
	Rainier City Library	106 B Street West, Rainier, OR	Unknown
	Scappoose Public Library	52469 SE 2 <sup>nd</sup> Street, Scappoose, OR	1,543,000
	St. Helens Library	375 18 <sup>th</sup> Street, St. Helens, OR	Unknown
	Vernonia City Library	1001 Bridge Street, Vernonia, OR	Unknown

**Appendix A  
Columbia County**

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
Emergency Response	Sheriff's Office / Jail Community Corrections	901 Port Avenue, St. Helens, OR 97051	14,793,372
	Emergency Operations Center	230 Strand Street, St. Helens, OR 97051	125,000
			759,000 Office Building 2,150,000 Contents & Tower
			306,464
			425,333
			230,000
			50,000
			492,933
			383,336
	Clatskanie Rural Fire (CRF)– Main	230 SE 3 <sup>rd</sup> Road, Clatskanie, OR	1,169,000
	CRF – Substation 1	76015 Atkins Road, Rainier, OR	238,000
CRF – Substation 2	80694 Mayger Fill Road, Clatskanie, OR	64,000	

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Columbia River Fire and Rescue (CRF&R) Administrative Office	270 Columbia Blvd, St. Helens, OR	563,680
	CRF&R Columbia City Station	400 G Street, Columbia City, OR	26,000
	CRF&R Fairgrounds Station	58798 Sausler Road, St. Helens, OR	347,880
	CRF&R Rainier Station	211 W 2 <sup>nd</sup> Street, Rainier, OR	1,711,312
	CRF&R St. Helens Station	105 S 12 <sup>th</sup> Street, St. Helens, OR	2,779,840
	CRF&R Maintenance Shop	58555 McNulty Way, St. Helens, OR	436,000
	CRF&R Garage – Goble	69321 Nicolai Road, Goble, OR	75,400
	CRF&R Garage – Rainier	73667 Neer City Road, Rainier, OR	15,000
	CRF&R Fire Station – Deer Island	33701 Canaan Road, Deer Island, OR	347,880
	CRF&R Fire Station – Fernhill	73153 Doan Road, Rainier, OR	343,200
	CRF&R Fire Station – Goble	69321 Nicolai Road, Goble, OR	343,200
	Mist-Birkenfeld Rural Fire Protection District – Main Station	12525 Highway 202, Mist, OR	1,234,000 – building 156,000 - contents
	Mist-Birkenfeld Rural Fire Protection District – Sager Sub Station # 2	75125 Highway 202, Clatskanie, OR	74,000
	Mist-Birkenfeld Rural Fire Protection District – Station # 3	71921 N Shore Drive, Clatskanie, OR	91,000
	Mist-Birkenfeld Rural Fire Protection District – Sub Station # 4	65551 Nehalem Highway, Vernonia, OR	77,000
	Mist-Birkenfeld Rural Fire Protection District – Storage	67131 Burris Road, Vernonia, OR	45,000
	Mist-Birkenfeld Rural Fire Protection District – Storage	11131 Highway 202, Birkenfeld, OR	67,000
	Scappoose Rural Fire Protection District (RFPD) Main	52751 Columbia River Highway, Scappoose, OR	2,309,000
	Scappoose RFPD – Boathouse Lighthouse Moorage	34323 Johnson Landing Road, Scappoose, OR	27,000
	Scappoose RFPD – Chapman	27713 Chapman Road, Scappoose, OR	248,000
	Scappoose RFPD – Holbrook	19260 NW Cleetwood Dr, Portland, OR	74,000
	County Sheriff’s Sub Station Delena Fire Station	Delena, OR	4,966
	Mist-Birkenfeld County Sheriff’s Substation	12525 Hwy 202, Mist, OR	2,409

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
Educational	Rainier School District 13 Admin Office	P.O. Box 160, Rainier, OR 97048	89,988
	Hudson Park Elementary School	28176 Old Rainier Road, Rainier, OR 97048	3,286,730
	Rainier High School	28170 Old Rainier Road, Rainier, OR 97048	6,525,050
	Rainier School Commons	28170 Old Rainier Road, Rainier, OR 97048	11,391,800
	Rainier Gymnasium	28170 Old Rainier Road, Rainier, OR 97048	1,349,300
	Rainier School Complex Portables	28170 Old Rainier Road, Rainier, OR 97048	420,987
	Rainier Industrial Tech Shops	28170 Old Rainier Road, Rainier, OR 97048	1,616,070
	Midco (Bus Garage)	28170 Old Rainier Road, Rainier, OR 97048	355,612
	Rainier Maintenance Building	28170 Old Rainier Road, Rainier, OR 97048	82,400
	Scappoose School District 1J Admin Office	33589 High School Way ,Scappoose, OR 97056	219,834
	Grant Watts Grade School	52000 SE Third Place, Scappoose, OR 97056	955,504
	Otto H H Peterson Grade School	521 SW EM Watts Road, Scappoose, OR 97056	3,608,198
	Sauvie Island Elementary School	14445 NW Charlton Road, Portland, OR 97231	1,212,872
	Scappoose Middle School	52265 Columbia River Hwy, Scappoose, OR 97056	603,435
	Scappoose High School	33700 SE High School Way, Scappoose, OR 97056	9,745,976
	Grace Christian Preschool	51737 Columbia River Hwy, Scappoose, OR	Unknown
	Mary Jude Montessori Children's House	Scappoose, OR	Unknown
Grace Christian Preschool	51737 Columbia River Hwy, Scappoose, OR	Unknown	

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Scappoose Adventist School	54285 Columbia River Hwy, Scappoose, OR	Unknown
	Berry Bright Preschool and Kindergarten	560 Columbia Blvd, St. Helens, OR	Associated with Warren Community Fellowship Church
	Creekside Junior Academy	696 Columbia Blvd, St. Helens, OR	Unknown
	Snoopeland Child Development Center	174 Sunset Blvd, St. Helens, OR	Associated with Church of God, St. Helens, OR
	Sonshine Preschool	58251 S Division Road, St. Helens, OR	Part of Calvary Lutheran Church, St. Helens, OR
	Warren Elementary School Building #1	34555 Berg Road, Warren, OR	3,958,084
	Warren Elementary School Building #2	34555 Berg Road, Warren, OR	153,556
	Warren Maintenance Shop Building		230,000
	Vernonia School District 47 Admin Office	475 Bridge Street, Vernonia, OR 97064	285,432
	Vernonia Middle School	249 Bridge Street, Vernonia, OR	3,330,000
	Vernonia High School	299 Bridge Street, Vernonia, OR	6,112,808
	Washington Elementary School	199 Bridge Street, Vernonia, OR	7,104,040
	Mist Elementary School	69163 Hwy 47, Mist, OR	1,046,088
	Clatskanie School District 6-J Admin Office	555 SW Bryant Street, Clatskanie, OR 97016	3,923,661
	Clatskanie Elementary School	815 S Nehalem Street, Clatskanie, OR 97016	6,568,705
	Clatskanie Middle School	471 NW Bel Air Drive, Clatskanie, OR 97016	577,470
	Clatskanie School District 6-J Admin Office	555 SW Bryant Street, Clatskanie, OR 97016	1,285,192
	Clatskanie Elementary Storage Shed	815 S Nehalem Street, Clatskanie, OR 97016	845
	Clatskanie Elementary Bus Shop	815 S Nehalem Street, Clatskanie, OR 97016	243,687
	Clatskanie Elementary Bus Garage	815 S Nehalem Street, Clatskanie, OR 97016	117,515
	Clatskanie Elementary Yard including Playground	815 S Nehalem Street, Clatskanie, OR 97016	36,463



**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Clatskanie Elementary Underground Storage Tank and Fuel Pump	815 S Nehalem Street, Clatskanie, OR 97016	4,263
	Clatskanie High School	571 NW Bel Air Drive, Clatskanie, OR 97016	17,605,309
	Clatskanie Head Start Program	365 SW High School Drive, Clatskanie, OR 97016	726,000
	Bryant House Preschool	265 S Nehalem Street, Clatskanie, OR 97016	100,000
	Piercing Arrow Private School	187 N Nehalem Street, Clatskanie, OR	Leased
	Columbia River Youth Corp Main Building	58751 Bachelor Flat Road, St. Helens, OR	856,095
	Columbia River Youth Corps – Storage Building	58751 Bachelor Flat Road, St. Helens, OR	192,404
	South Columbia Learning Center – Alternative School	64500 Columbia River Hwy, Deer Island, OR	663,244
	Deer Island Gymnasium	64500 Columbia River Hwy, Deer Island, OR	187,501
	St. Helens School District # 502 Admin Office	474 16 <sup>th</sup> Street, St. Helens, OR 97051	1,834,880
	Columbia City Elementary School	2000 2 <sup>nd</sup> Street, Columbia City, OR	9,099,638
	Columbia City Elementary School Portable Classroom	2000 2 <sup>nd</sup> Street, Columbia City, OR	84,340
	Lewis and Clark Elementary School	111 9 <sup>th</sup> Street, St. Helens, OR	17,862,467
	Lewis and Clark Elementary School Portable Classroom	111 9 <sup>th</sup> Street, St. Helens, OR	84,340
	McBride School	2774 Columbia Blvd, St. Helens, OR	16,180,517
	St. Helens Middle School	354 N 15 <sup>th</sup> Street, St. Helens, OR	16,053,928
	St. Helens High School	2375 Gable Road, St. Helens, OR	42,193,238
	St. Helens School District Maintenance Building	301 St. Helens Street, St. Helens, OR	1,081,500
Care Facilities	Legacy Clinic	500 Columbia River Hwy, St. Helens, OR 97051	Unknown
	Providence Medical Center	510 Bridge Street, Vernonia, OR 97064	269,640

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	OHSU Clinic	53177 Old Portland Road, Scappoose, OR	Unknown
	Clatskanie Family Health Center	401 SW Bel Air Drive, Clatskanie, OR	175,000
	Clatskanie Senior Citizens	620 SW Tichenor, Clatskanie, OR	275,000
	Rainier Senior Center	48 West 7 <sup>th</sup> Street, Rainier, OR	Unknown
	Scappoose Senior Citizens Center	33342 Meadow Drive, Scappoose, OR	Unknown
	St. Helens Senior Center	375 S 15 <sup>th</sup> Street, St. Helens, OR 97051	Unknown
	Vernonia Senior Citizens	446 Bridge Street, Vernonia, OR	72,030
Care Facilities	Avamere at St. Helens	2400 Gable Road, St. Helens	Unknown
	Clatskanie Care Center	203 SW Bel Air Drive, Clatskanie, OR	Unknown
	Columbia Care	33910 Columbia Avenue, Scappoose, OR	Unknown
	Meadow Park Health and Special (Unicare Homes, Inc.)	75 Shore Drive, St. Helens, OR	Unknown
	Rose Valley Senior Living Community	33800 SE Frederick Street, Scappoose, OR	Unknown
	Spring Meadow Assisted Living Facility Inc.	36070 Pittsburg Road, St. Helens, OR	Unknown
	Amber Assisted Living	364 SW Bel Air Dr, Clatskanie, OR	Unknown
Community	Vernonia Museum	511 E Bridge Street, Vernonia, OR 97064	432,819
	St. Helens Golf Course	St. Helens, OR 97051	Unknown
	Vernonia Golf Course	Vernonia, OR 97064	Unknown
	Big Eddy Park	64556 Nehalem Hwy, Vernonia, OR 97064	265,479
	Camp Wilkerson	65866 Apiary Road, Rainier, OR 97048	1,110,260
	Clatskanie Recreational Center	660 SW Bryant, Clatskanie, OR	Unknown
Community	Hudson-Parcher Park	75503 Larson Road, Rainier, OR 97048	839,586
	Prescott Beach Park	73125 Prescott Beach Drive, Rainier, OR 97048	201,910

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Scapponia Park	22870 Scappoose Vernonia Hwy 45° 50' 47.74" N 123° 06' 00.85" W	19,338
	Scappoose RV Park	34038 Honeyman Road, Scappoose, OR 97056	236,420
	J J Collins Marine Park Coon Island, Sauvie Island	(boat access only. Multnomah Channel river mile 8)	110,704
	Scappoose Bay Marine Park	57420 Old Portland Road, Warren, OR 97053	Unknown
	Beaver Boat Ramp & Restroom	Highway 30, Clatskanie, OR	150,159
	Law Library/Civil Service	270 1 <sup>st</sup> Street, St. Helens, OR 97051	448,374
	Birkenfeld Community Church	11249 Highway 202, Birkenfeld, OR	Unknown
	Faith Lutheran Church	1010 NE 5 <sup>th</sup> Street, Clatskanie, OR	148,210
	Apostolic Lutheran Church	18558 Beaver Falls Road, Clatskanie, OR	600,000
	Clatskanie Baptist Church	415 S Nehalem Street, Clatskanie, OR	224,000
	Clatskanie Presbyterian Church	215 S Nehalem Street, Clatskanie, OR	296,160
	Gateway Worship Center	610 NW 5 <sup>th</sup> Street, Clatskanie, OR	250,000
	Mayger Downing Community Church	80071 Life Lane, Clatskanie, OR	323,220
	St. John the Baptist Catholic Church	SW High Street, Clatskanie, OR	300,000
	The Church at Beaver Creek Beaver	Falls Road, Clatskanie, OR	275,000
	United Methodist Church	290 S Nehalem Street, Clatskanie, OR	71,300
	Westport Assembly of God	Grade School Road, Clatskanie, OR	Unknown
	Westport Christian Center	91104 Hungry Hollow Loop, Clatskanie, OR	Unknown
	Westport Community Church	49246 Highway 30, Clatskanie, OR	Unknown
	Columbia River Foursquare	1955 2nd Street, Columbia City, OR	Unknown
	Deer Island Community Church	34971 Canaan Road, Deer Island, OR	Unknown
	Canaan Community Church	64610 McDermott Road, Deer Island, OR 97018	Unknown
	Great Vow Zen Monastery	79640 Quincy-Mayger Road, Clatskanie, OR	275,000

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Nativity Of The BVM Parish	204 East C Street, Rainier, OR 97048	Unknown
	Calvary Chapel	24056 Beaver Falls Road, Rainier, OR	128,260
	Rainier Assembly of God	75950 Rockcrest Road, Rainier, OR	946,250
	Alston's Corner Assembly of God	25272 Alston Road, Rainier, OR 97048	10,9140
	Rainier United Methodist Church	1st & C Street, Rainier, OR 97048	133,470
	Rainier Community Church of God	321 West C Street, Rainier, OR	672,310
	Rainier Congregation of Jehovahs Witnesses	25381 Wonderly Rd, Rainier, OR 97048	183,130
	Shiloh Basin Community Church	67043 Nicolai Road, Rainier, OR	Unknown
	Columbia Bible Church	407 East 2nd Street, Rainier, OR	Unknown
	Riverside Community Church	305 W 3rd Street, Rainier OR	Unknown
	The Church of Jesus Christ of Latter-Day Saints	27410 Parkdale Road, Rainier, OR	Unknown
	Hudson Park Baptist Church	75212 Larson Road, Rainier, OR	Unknown
	Chapman Community Church	28693 Melling Drive, Scappoose, OR	77,600
	Church of Jesus Christ	53987 Columbia River Hwy, Scappoose, OR	135,820
	Columbia Bible Presbyterian	Church 33342 Meadow Drive, Scappoose, OR	Unknown
	Creekside Baptist	51681 SW Old Portland Road, Scappoose, OR	693,290
	Morning Star Worship Center (Assembly of God)	33404 SW JP West Road, Scappoose, OR	Unknown
	Grace and Peace	52339 Columbia River Hwy, Scappoose, OR	Unknown
	Grace Lutheran Church	51737 S Columbia River Hwy, Scappoose, OR	48,000
	Jehovah's Witness	54116 Paradise Lane, Scappoose, OR	11,330
	Scappoose Foursquare	33741 S.E. Oak Street, Scappoose, OR	Unknown
	Seventh-Day Adventist Church	54287 N Columbia River Hwy, Scappoose, OR	Unknown
	ST. Wenceslaus Catholic Church	51555 Old Portland Road, Scappoose, OR	Unknown

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Ascension Lutheran Church	1911 Columbia Blvd, St. Helens, OR 97051	Unknown
	Bethel Fellowship	104 North Vernonia Road, St. Helens, OR 97051	127,600
	Calvary Chapel Fellowship	213 South First Street, St. Helens, OR	Unknown
	Calvary Lutheran	58251 South Division Road, St. Helens, Oregon 97051	191,340
	Christ Episcopal Church	35350 E Division Road, St. Helens, OR	292,700
	Church of Christ	295 South 18th Street, St. Helens, OR	Unknown
	Sunset Park Community Church	174 Sunset Blvd, St. Helens, OR	86,200
	Church of Jesus Christ of Latter Day Saints	2755 Sykes Road, St. Helens, OR	Unknown
	Church of the Nazarene	2360 Gable Road, St. Helens, OR	Unknown
	First Christian Church	185 South 12th Street, St. Helens, OR	Unknown
	First Evangelical Church of St. Helens	225 3 <sup>rd</sup> St. N, St. Helens, OR	135,840
	First Lutheran Church	214 North 4th Street, St. Helens, OR	Unknown
	First Missionary Baptist Church	2625 Gable Road, St. Helens, OR	Unknown
	First United Methodist	560 Columbia Blvd, St. Helens, OR	192,080
	Plymouth Presbyterian	2615 Sykes Road, St. Helens, OR	Unknown
	Riverside Baptist Church	235 S. 15th Street, St. Helens, OR	Unknown
	St. Frederic Catholic Church	175 South 13th Street, St. Helens, OR	390,800
	St. Helens Community Bible Church	35031 Millard Road, St. Helens, Oregon 97051	79,700
	Yankton Baptist Church	33579 Pittsburg Road, St. Helens, OR	45,400
	7th Day Adventist Church Vernonia	1294 Nehalem Street, Vernonia, OR	28,670
	Assembly Of God Church Vernonia	662 Jefferson Avenue, Vernonia, OR	65,970
	Christian Church	410 North Steet, Vernonia, OR	Unknown
	First Baptist Church	652 A Street, Vernonia, OR	286,180
	Grace Reformed Baptist Church	1080 E Bridge Street, Vernonia, OR	Unknown
	Jehovah's Witness Kingdom Hall	880 Texas Avenue, Vernonia, OR	Unknown
	Vernonia Foursquare Church	850 Madison Avenue, Vernonia, OR	40,110
	St Mary's Catholic Church	960 Missouri Avenue, Vernonia, OR	839,060
	Vernonia Community Church	957 State Avenue, Vernonia, OR	894,350
	Warren Baptist Church	56799 Columbia River Hwy, Warren,	Unknown

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
		OR	
	Warren Community	56523 Columbia River Hwy, Warren, OR	1,647,310
	Bethany Lutheran Church	34721 Church Road, Warren, OR	Unknown
	Grace Baptist Church	58690 Ross Road, Warren, OR	Unknown
	Apiary Cemetery	Lat 46.0101 and Lon -123.0209	Unknown
	Bryant Cemetery	Lat 46.1062 and Lon -123.1915	Unknown
	Columbia Memorial Gardens Cemetery	Lat 45.7873 and Lon -122.8707	Unknown
	Fairview Cemetery	Lat 45.7348 and Lon -122.877	Unknown
	Fishhawk Cemetery	Lat 46.0123 and Lon -123.3243	Unknown
	Goble Cemetery	Lat 45.9832 and Lon -122.9582	Unknown
	Hudson Cemetery	Lat 46.0987 and Lon -122.9943	Unknown
Community	Independent Order of Odd Fellows Cemetery	Lat 45.8276 and Lon -122.8429	Unknown
	Jones Family Cemetery	Rainier, OR	Unknown
	Kinder Cemetery	Lat 45.9137 and Lon -122.8248	Unknown
	Knights of Pythias Cemetery	Lat 46.0784 and Lon -122.9301	Unknown
	Lutheran Cemetery	Lat 45.8221 and Lon -122.8498	Unknown
	Maplewood Cemetery	Lat 46.099 and Lon -123.2037 585 SE Cowyer Street, Clatskanie, OR	30,070
	Masonic Cemetery	Lat 45.8776 and Lon -122.8193	Unknown
	Mayger Downing Cemetery	Lat 46.1579 and Lon -123.0937	Unknown
	Mist Cemetery	Lat 46.0004 and Lon -123.2476	Unknown
	Murray Hill Cemetery	Lat 46.0976 and Lon -123.214	Unknown
	Neer City Cemetery	Lat 46.0248 and Lon -122.8898	Unknown
	No Name Cemetery	Lat 45.8873 and Lon -123.0332	Unknown
	North Cemetery	Lat 45.8026 and Lon -123.2943	Unknown
	Pioneer Cemetery	Lat 45.869 and Lon -123.1909	Unknown
	Pisgah Home Cemetery	Lat 45.7859 and Lon -122.9957	Unknown
	Prescott Cemetery	Lat 46.0332 and Lon -122.8943	Unknown
	Saint Wenceslaus Cemetery	Lat 45.7437 and Lon -122.8815	Unknown
	Shiloh Basin Cemetery	Lat 45.9679 and Lon -122.9498	Unknown
	Stewart Hill Cemetery	Lat 46.1276 and Lon -123.1582	Unknown

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Vernonia Cemetery	Lat 45.8637 and Lon -123.2054	Unknown
	Yankton-Hillcrest Cemetery	Lat 45.8673 and Lon -122.8768	Unknown
	Yankton Grange# 301	33065 Pittsburg Road, St. Helens, OR 97051	No Tax Assessment Value
	Natal Grange # 302	67542 Nehalem Hwy, Mist, OR 97016 97016	No Tax Assessment Value
	Vernonia Grange # 305	375 N Street, Vernonia, OR 97064	No Tax Assessment Value
Community	Beaver Valley Grange # 306	75942 Larson Road, Rainier, OR 97048	No Tax Assessment Value
	Quincy Grange # 321	3-1/2 miles NE of Clatskanie, near Quincy School on Rutter Road	No Tax Assessment Value
	Beaver Homes Grange # 518	31105 Beaver Homes Road, Goble, OR 97048	No Tax Assessment Value
	Warren Grange # 536	38285 Millard Road, Warren, OR 97053	No Tax Assessment Value
	Fern Hill Grange # 592	4-1/2 miles SW of Rainier on Fern Hill Road at Lentz Road, Rainier, OR 97048	No Tax Assessment Value
	Deer Island Grange # 947, CRPUD	64001 Columbia River Hwy, Deer Island, OR 97054	Does not own the facility
State and Federal Highways	U.S. 30 – 51 miles Highway 47 – 30 miles Highway 202 – 10 miles		51 X 385,000 (est.) = \$19,935,000 30 X 385,000 (est.) = \$11,550,000 10 X 385,000 (est.) = \$3,850,000
County Highways	There are 553 miles of county maintained roads in Columbia County	County wide	The 553 X \$308,000 = \$170,324,000
Railroads	Pacific Western Railroad Burlington Northern Railroad	51 miles	Unknown Unknown
Bridges	There are 97 county maintained non state or federally owned bridges in Columbia County		The 97 county maintained bridges have a total value of \$73,445,843, for an average of \$757,714 per bridge
Transportation Facilities	Scappoose Industrial Airpark	Scappoose, OR (Owned by Port of St. Helens) 45° 46'N; 122° 52'W	Unknown
	Vernonia Municipal Airport	Airport Way, Vernonia, OR 45° 51' 05.401" N -123° 14' 29.419" W	Unknown

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Scappoose Bay Marina	57420 Old Portland Road, St. Helens, OR	Unknown
	St. Helens Marina	134 N River Street, St. Helens, OR	718,700
	Dixieline Lumber Co (deep water dock)	62420 Columbia River Hwy, Columbia City, OR 45° 54' 13.25 N -122° 48' 49.54 W (from Google Earth)	Unknown
	Knife River Dock	63180 Columbia River Hwy, Deer Island, OR 45° 54' 33.11" N -122° 48' 57.99 W (from Google Earth)	Unknown
	Port of St Helens Facility, Port Westward	(deep water port, 1,250 ft dock) Clatskanie, OR 97016	Unknown
	Port of St Helens Facility, Rainier	(deep water access) Rainier, OR 97048	Unknown
	Columbia County Rider	230 Strand Street, St. Helens, OR	Located in Columbia County Courthouse Building
Utilities	Meissner Radio Repeater	Meissner Road, Rainier, OR 97048	18,866
	Fishhawk Lake Recreation Club Inc, Water Treatment Plant		36,310
	KOHI Radio Station 503-397-1600		1,200,000
	Rainier Waste Water Treatment Plant		Unknown
	Transfer Station		692,250
	Clatskanie PUD, Main Office		Unknown
	Clatskanie PUD, Conservation Bldg		185,152 Building 42,432 Contents
	Clatskanie PUD, Radio Tower		2,128 Building 10,608 Contents



**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Clatskanie PUD, Warehouse		1,950,091 Building 1,591,200 Contents
	Clatskanie PUD, Pole Yard		53,196
	Clatskanie PUD, Bradbury Substation		5,225,000
	Clatskanie PUD, Clatskanie Substation		1,636,440
	Clatskanie PUD, Delena Substation		1,630,200
	Clatskanie PUD, Rainier Substation		1,636,440
	Clatskanie PUD, Rainier Switching Station		163,020
	Clatskanie PUD, Wauna Substation		8,360,000
	Clatskanie PUD, Gas Turbine		6,294,000
	Columbia River PUD		22,064,171
	Western Oregon Electric Coop, Inc (WOEC), Headquarters		821,500
	WOEC Warehouse		420,000
	WOEC Overhead Transmission Lines		22,950,000
	WOEC Underground Transmission Lines		6,900,000
	WOEC Storage Buildings		140,000
	WOEC Substation 1		2,000,000
	WOEC Substation 2		2,000,000
	WOEC Substation 3		2,000,000
	WOEC Substation 4		2,000,000
	Deer Island Water Works		Unknown
	Fishhawk Lake Recreation Club Inc, Sewage Treatment Plant		Unknown
	McNulty Water PUD Association		Unknown

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Quincy Water Association		21,080
	Woodson Water Association		185,020
	Scappoose Water Treatment Plant – Primary		Unknown
	Scappoose Water Treatment Plant – Secondary		Unknown
	Scappoose Waste Water Treatment Plant		Unknown
	St. Helens Waste Water / Sewage Treatment Plant		27,266,567
	Vernonia Water Treatment Plant		3,134,000
	Vernonia Waste Water Treatment Plant		Unknown
Dams	Vernonia Log Pond		Unknown
	James O. Fisher Reservoir		Unknown
	Petes Slough		Unknown
	Rainier City Reservoir		Unknown
	Deep Lake Reservoir		Unknown
	Ruby Lake Reservoir		Unknown
	Millionaire Lake Reservoir		Unknown
	Floeter Pond		Unknown
	Salmonberry Reservoir		Unknown
	Sherman Stock Reservoir # 1		Unknown
	Sherman Stock Reservoir # 2		Unknown
	Bauder Reservoir		Unknown
	Beaver Drainage District	P.O. Box 201, Clatskanie, OR 97016	Unknown
	Clatskanie Drainage Improvement Company	P.O. Box 201, Clatskanie, OR 97016	Unknown
	Columbia Drainage #1	33491 NW Reeder Road, Portland, OR 97231	Unknown
	Deer Island Drainage	St. Helens, OR 97051	Unknown

**Table A-7. Columbia County Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup> (\$)
	Fishhawk Lake	9997 Beach Drive, Clatskanie, OR (Birkenfeld, OR)	982 Acre Ft (Recreation)
	John Drainage Improvement Company	79338 Stewart Creek Road, Clatskanie, OR 97016	Unknown
	Marshland Drainage Improvement	12589 Hwy 30, Clatskanie, OR 97016	1,000
	Marshland Drainage Improvement	12589 Hwy 30, Clatskanie, OR 97016	4,500
	Magruder Drainage Improvement Company	15914 Colvin Road, Clatskanie, OR 97016	Unknown
	Midland Drainage Improvement	15694 Luxford Road, Clatskanie, OR 97016	680,720
	Rainier Drainage Improvement	75442 Fern Hill Road, Rainier, OR 97048	Unknown
	Sauvie Island Drainage Improvement	34856 E. Columbia Avenue, Scappoose, OR 97056	Unknown
	Scappoose Drainage Improvement	53466 E. Honeyman Road, Scappoose, OR 97056	Unknown
	Westland Drainage Improvement Company	P.O. Box 201, Clatskanie, OR 97016	Unknown
	Clatsop Diking Improvement Company	P.O. Box 201, Clatskanie, OR 97016	Unknown
	Woodson Drainage District	77521 Woodson Road, Clatskanie, OR 97016	Unknown
	Clatsop Diking Improvement Company	P.O. Box 201, Clatskanie, OR 97016	Unknown

## Vulnerability Analysis

The vulnerability analysis development process is discussed in Section 6.2. The results of the analysis are presented in the following hazard exposure analysis overviews. Tables A-8, A-9, and A-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table A-8. Columbia County Potential Hazard Exposure Analysis Overview – Population and Buildings</b>							
			<b>Population</b>	<b>Buildings</b>			
<b>Hazard Type</b>	<b>Hazard Area</b>	<b>Methodology</b>		<b>Number</b>	<b>Residential</b>		<b>Non-Residential</b>
				<b>Number</b>	<b>Value (\$)¹</b>	<b>Number</b>	<b>Value (\$)¹</b>
Flood	Moderate 5	00-year floodplain	31,889 9	,337	1,407,085,900	49 un	known
	High 1	00-year floodplain	22,145 8.	686	1,308,980	48 un	known
Winter Storm		descriptive	49,163	17,572 2	,648,100,400	91	unknown
Landslide	Moderate >14	-32 degrees	34,155 1	3,075	1,970,402,500	63 un	known
	High >32	-56 degrees	21,896 8	,437	1,271,455,900	34 un	known
Wildland Fire	Moderate M	oderate fuel rank	44,470 1	6,784	2,529,348,800	91 un	known
	High	High fuel rank	38,825 1	4,793	2,229,305,100	75 un	known
	Very High	Very high fuel rank	25,791 9	,856	1,485,299,200	38 un	known
	Extreme Extrem	e fuel rank	11,856 4,	559	687,041,300	20 un	known
Earthquake	Strong 9	-20% (g)	44,113 1	6,552	2,494,386,400	91 un	known
	Very strong	20-40% (g)	726 40	4	60,882,800	0 u	nknown
	Severe >40	-60% (g)	0 0		0	0 0	
Volcano		descriptive	49,163	17,572	2,648,100,400	91 un	known
Wind		descriptive	49,163	17,572	2,648,100,400	91 un	known
Erosion		within 300' of potential areas of erosion	-- 92	5	139,397,500	11	unknown
ENSO (El Niño and La Niña)		descriptive	49,163	--	--	--	--
Expansive Soils	Low <3%	percent	-- 1	4,482	2,182,437,400	71 un	known
	Moderate 3-	6 percent	15,320 6,	038	909,926,600	26 un	known
	High 6-	9%	623 25	0	37,675,000	0 u	nknown
	Very High	>9%	0 0		0	0 0	
Drought		descriptive	-- --		--	-- --	

**Table A-8. Columbia County Potential Hazard Exposure Analysis Overview – Population and Buildings**

			Population Number	Buildings			
				Residential		Non-Residential	
Hazard Type	Hazard Area	Methodology	Number	Number	Value (\$)¹	Number	Value (\$)¹
Dam Failure	High	Inundation area	7,261 5,	717	861,551,900	40 un	known
Disruption of Utility and Transportation Systems	descri	ptive	49,163 -	-	--	unknown	unknown
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	21,870 8	,179	1,232,575,300	56	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	unknown u	nknown	unknown	unknown	unknown
Terrorism		descriptive	-- --		--	--	--
Infectious Disease Epidemic		descriptive	49,163 --		--	--	--

¹ Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$150,700 per structure).

Note – population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. ¼-mile buffered EHS sites were unable to be determined due to the use of census block data.

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**Table A-9. Columbia County Potential Hazard Exposure Analysis Overview – Critical Facilities**

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	6	13.5M	7	7M	7	21M	-- -- --			--
	High	100-year floodplain	8	13.3M	14	10.5M	--	--	3 341K 9			21.3M
Winter Storm			25 24.3M		36 32.6M	55		201.2M	16	792K	122	15M
Landslide	Moderate >14-32	degrees	15	19.2M	20	9.6M 32		82.8M 7		720K	73	7.9M
	High	>32-56 degrees	8	14.4M	6 1.1M 7		42M	4	175K	27	3.2M	
Wildland Fire	Moderate	Moderate fuel rank	25	24.3M	32 31.8M	54		200M	16	792K	116	14.7M
	High	High fuel rank	19	21.6M	27	3.2M	39	129.9M	9	450K	94	12.5M
	Very High	Very high fuel rank	5	1M	14	26.3M	17	48.7M	3	175K	37	4.8M
	Extreme	Extreme fuel rank	1	150K	2	425K	-- --		-- --		2	unknown
Earthquake	Strong	9-20% (g)	25 24.4M		35 32.5M	55		201.2M	16	792K	118	15.1M
	Very strong	20-40% (g)	-- --		1	67K	-- --		-- --		4	unknown
	Severe	>40-60% (g)	-- --		-- -- -- --			-- -- --				--
Volcano			25 24.3M		36 32.6M	55		201.2M	16	792K	122	15M
Wind			25 24.3M		36 32.6M	55		201.2M	16	792K	122	15M
Erosion		within 300' of potential areas of erosion	8	13.5M	3	3M	6 20.4M 4			341K	10	1.6M
ENSO (El Niño and La Niña)		descriptive	25	26M	36	33M	57	162M	16	792K	117	15M
Expansive Soils	Low	<3% percent	-- --		-- -- -- --			-- -- --				--
	Moderate	3-6 percent	-- --		1	8.8K	-- --		-- --		1	840K
	High	6-9%	-- --		-- -- -- --			-- -- --				--
	Very High	>9%	-- --		-- -- -- --			-- -- --				--
Drought		descriptive	25	26M	36	33M	57	162M	16	792K	117	15M
Dam Failure	High	Inundation area	9	14.5M	5 5.3M 9			13.2M	4	unknown	29	4.1M
Disruption of Utility and Transportation Systems		descriptive	25	26M	36	33M	57	162M	16	792K	117	15M
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	15	6.3M	17 25.4M	32		131.4M	14	792K	70	9.8M
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	17	19M 13		27M	39	154.3M	13	792K	62	9.6M
Terrorism		descriptive	25	26M	36	33M	57	162M	16	792K	117	15M
Infectious Disease Epidemic		descriptive	25	26M	36	33M	57	162M	16	792K	117	15M

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Table A-10. Columbia County Potential Hazard Exposure Analysis Overview – Critical Infrastructure

Hazard Type	Hazard Area	Methodology	Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams	
			Miles	Value (\$)¹	Miles	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	--	----			21	21.9M	2	unknown	9	6.5M	4	unknown
	High	100-year floodplain	--	----			88	64M	2	unknown	9	6.5M	8	680K
Winter Storm			--	--	unknown	unknown	100	73M	9	720K	29	84.2K	20	686K
Landslide	Moderate	>14-32 degrees	1 unknown	unknown	--	--	75	49.4M	4	719K	19	39.7M	13	unknown
	High	>32-56 degrees	--	----			43	29.4M	3	719K	4	32.2M	8	unknown
Wildland Fire	Moderate	Moderate fuel rank	--	--	--	--	98	69.3M	8	720K	26	68.1M	15	681K
	High	High fuel rank	--	--	--	--	91	66M	5	719K	20	37.1M	14	unknown
	Very High	Very high fuel rank	--	--	--	--	55	35.6M	--	--	10	33.5M	9	unknown
	Extreme	Extreme fuel rank	--	--	--	--	4	2.3M	--	--	1	1.6M	2	unknown
Earthquake	Strong	9-20% (g)	--	--	--	--	95	67.8M	9	719K	22	67.7M	16	680K
	Very strong	20-40% (g)	--	--	--	--	6	8M	--	--	7	16.5M	4	5K
	Severe	>40-60% (g)	--	-----	----	----								--
Volcano			--	--	unknown	unknown	100	73M	9	720K	29	84.2K	20	686K
Wind			--	--	unknown	unknown	100	73M	9	720K	29	84.2K	20	686K
Erosion		within 300' of potential areas of erosion	--	----			10	7M	2	720K	4	1.1M	2	unknown
ENSO (El Niño and La Niña)		descriptive	4	206M	51	unknown	--	--	9	720K	38	123M	29	686K
Expansive Soils	Low	<3% percent	--	-----	----	----								--
	Moderate	3-6 percent	--	-----	----	----								--
	High	6-9%	--	-----	----	----							1	unknown
	Very High	>9%	--	-----	----	----								--
Drought		descriptive	4	206M	51	unknown	--	--	9	720K	38	123M	29	686K
Dam Failure	High	Inundation area	--	--	--	--	17	19.7M	5	720K	11	33.5M	9	680K
Disruption of Utility and Transportation Systems		descriptive	4	206M	51	unknown	?	?	9	720K	38	123M	29	686K
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	--	--	2	unknown	25	21.5M	5	unknown	13	32.8M	6	680K
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites					18	11M	5	718K	16	34.3M	1	680K
Terrorism		descriptive	4	206M	51	unknown	--	--	9	720K	38	123M	29	686K
Infectious Disease Epidemic		descriptive	4	206M	51	unknown	--	--	9	720K	38	123M	29	686K

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section provides a summary of County vulnerabilities and impacts from natural hazards in addition to the identified technological and manmade hazards in the 2009 Columbia County MHMP.

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for Columbia County. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

In Columbia County, 8,868 residential structures (worth \$1.3M), 48 non-residential structures (value unknown), eight government facilities (worth \$13.3M), 14 emergency response facilities (worth \$10.5M), three care facilities (worth \$341K), nine educational facilities (worth \$21.3M), 25 community facilities (worth \$5.3M), 88 bridges (worth \$64M), two transportation facilities (value unknown), eight dams (worth \$680K) and nine utilities (worth \$6.5M) within the boundaries of the 100-year floodplain.

There are 9,337 residential structures (worth \$1.4B), 49 non-residential structures (value unknown), six government facilities (worth \$13.5M), seven emergency response facilities (worth \$7M), six care facilities (worth \$517K), seven educational facilities (worth \$21M), 12 community facilities (worth \$3.2M), 21 bridges (worth \$21.9M), two transportation facilities (value unknown), four dams (value unknown) and nine utilities (worth \$6.5M) are within the boundaries of the 500-year floodplain, and therefore considered at moderate risk.

### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind, and floods are often widespread. A single event is capable of impacting all people, critical facilities, and infrastructure within Columbia County. Therefore the entire population (49,163 people per the 2007 PSU estimate), including 17,572 residential structures (worth \$2.6B), 91 non-residential structures (value unknown), 25 government facilities (worth 24.3M), 36 emergency response facilities (worth \$32.6M), 55 educational facilities (worth \$201.2M), 16 care facilities (worth \$792K), 122 community facilities (worth \$15M), the Western Pacific Railroad (value unknown), nine transportation facilities (worth \$720K), 100 bridges (worth \$73M), 29 utilities (worth \$84.2M) and 20 dams (worth \$686K).

### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation and rail routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility

disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and wastewater utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within Columbia County. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

Using these guidelines, Columbia County has facilities located in areas of both moderate and high risk. The moderate risk category contains 34,155 residential structures (worth \$2B), 63 non-residential structures (value unknown), 15 government facilities (worth \$19.2M), 20 emergency response facilities (worth \$9.6M), seven care facilities (worth \$720K), 32 educational facilities (worth \$82.8M), 73 community facilities (worth \$7.9M), 75 bridges (worth \$49.4M) four transportation facilities (worth \$719K), 13 dams (value unknown), 19 utilities (worth \$39.7M), and one highway (value unknown).

The high risk category contains 8,437 residential structures (worth \$1.3B), 34 non-residential structures (value unknown), eight government facilities (worth \$14.4M), six emergency response facilities (worth \$1.1M), four care facilities (worth \$175K), seven educational facilities (worth \$42M), 27 community facilities (worth \$3.2M), 43 bridges (worth \$29.4M), three transportation facilities (worth \$719K), eight dams (value unknown) and four utilities (worth 32.2M).

### ***Wildland Fires***

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel risk values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

Columbia County has critical facilities and infrastructure located within areas of moderate, high, very high, and extreme risk. Moderate risk areas contain 16,784 residential structures (worth \$2.5B), 91 non-residential structures (value unknown), 25 government facilities (worth 24.3M), 32 emergency response facilities (worth \$31.8M), 54 educational facilities (worth \$200M), 16 care facilities (worth \$792K), 116 community facilities (worth \$14.7M), eight transportation facilities (worth \$720K), 98 bridges (worth \$69.3M), 26 utilities (worth \$68.1M) and 15 dams (worth \$681K).

High risk areas contain 14,793 residential structures (worth \$2.2B), 75 non-residential structures (value unknown), 19 government facilities (worth \$21.6M), 27 emergency response facilities (worth \$3.2M), 39 educational facilities (worth \$129.9M), nine care facilities (worth \$450K), 94 community facilities (worth \$12.5M), five transportation (worth \$719K), 91 bridges (worth \$66M), 14 dams (value unknown), and 20 utilities (worth \$37.1M).

Very high risk areas contain 9,856 residential structures (worth \$1.5B), 38 non-residential structures (value unknown), five government facilities (worth \$1M), 14 emergency response facilities (worth \$26.3M), 17 educational facilities (worth \$48.7M), three care facilities (worth

\$175K), 37 community facilities (worth \$4.8M), 55 bridges (worth \$35.6M), nine dams (value unknown), and ten utilities (worth \$33.5M).

Extreme risk areas contain 4,559 residential structures (worth \$687M), 20 non-residential structures (value unknown), one government facility (worth \$150K), two emergency response facilities (worth \$425K), two community facilities (value unknown), four bridges (worth \$2.3M) two dams (value unknown), and one utility (worth \$1.6M).

### *Earthquake*

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslides, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

Columbia County has critical facilities and infrastructure located within areas of strong and very strong perceived shaking. Strong risk areas contain 16,552 residential structures (worth \$2.5B), 913 non-residential structures (value unknown), 25 government facilities (worth \$24.4M), 35 emergency response facilities (worth \$32.5M), 55 educational facilities (worth \$201.2M), 16 care facilities (worth \$792K), 118 community facilities (worth \$15.1M), nine transportation facilities (worth 719K), 95 bridges (worth \$67.8M), 16 dams (worth \$680K), and 22 utilities (worth \$67.7M).

Very strong risk areas contain 404 residential structures (worth \$60.8M), one emergency facility (worth \$67K), four community facilities (value unknown), four dams (worth \$5K), six bridges (worth \$8M), and seven utilities (worth \$16.5M).

### *Volcano*

A volcanic eruption would have a minor impact on Columbia County due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006)

Columbia County will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies.

Buildings, streets, and roads throughout the entire county would require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services. Water treatment facilities may require additional attention to address high turbidity water. River traffic along the Columbia River could be disrupted due to sedimentation from a large eruption from Mt. St. Helens or Mt. Hood and dredging to restore channel depths may be necessary. Injuries associated with respiratory problems may result. (Goettel 2005)

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within Columbia County are at risk. This represents the entire population (49,163 people), including 17,572 residential structures (worth \$2.6B), 91 non-residential structures (value unknown), 25 government facilities (worth 24.3M), 36 emergency response facilities (worth \$32.6M), 55 educational facilities (worth \$201.2M), 16 care facilities (worth \$792K), 122 community facilities (worth \$15M), the Western Pacific Railroad (value unknown), nine transportation facilities (worth \$720K), 100 bridges (worth \$73M), 29 utilities (worth \$84.2M) and 20 dams (worth \$686K).

### *Wind*

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within the Columbia County are equally at risk of a windstorm event including the entire population (49,163 people), including 17,572 residential structures (worth \$2.6B), 91 non-residential structures (value unknown), 25 government facilities (worth 24.3M), 36 emergency response facilities (worth \$32.6M), 55 educational facilities (worth \$201.2M), 16 care facilities (worth \$792K), 122 community facilities (worth \$15M), the Western Pacific Railroad (value unknown), nine transportation facilities (worth \$720K), 100 bridges (worth \$73M), 29 utilities (worth \$84.2M) and 20 dams (worth \$686K).

### *Erosion*

Riverine erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available, however, descriptions of several localized areas were identified during the development of this document and are identified only by location on a map referencing the river or stream reach described. Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

In Columbia County, 925 residential structures (worth \$139.4M), 11 non-residential structures (value unknown), eight government facilities (worth \$13.5M), three emergency response facilities (worth \$3M), six educational facilities (worth \$20.4M), four care facilities (worth \$341K), ten community facilities (worth \$1.6M), two transportation facilities (worth \$720K), ten bridges (worth \$7M), two dams (value unknown), and four utilities (worth \$1.1M) are considered to be at risk.

### ***ENSO (El Niño and La Niña)***

ENSO events cause large scale weather pattern changes throughout Columbia County, and across the entire State of Oregon. El Niño periods are generally drier, with an increased likelihood of drought, while La Niña periods tend to be wetter and colder, with an increased risk of winter storm and the associated hazards it brings, particularly flooding and landslides.

The changes wrought by ENSO are on a very large scale, so it is difficult to quantify their impacts locally. Instead, ENSO is manifested in the hazards it influences, such as winter storms, flooding, landslides, and drought. Therefore, the facilities impacted have been summarized under those categories.

### ***Expansive Soils***

Shrinking and swelling soils can lead to damaged foundations and structures. The most common damage includes cracking and loss of integrity of building foundations and walls of residential and light (one-or two-story) buildings, highways, canals, and reservoir linings, and retaining walls. (PCCDD 2006, US Army 1983)

Using NRCS soils data, risk for shrink-swell potential was calculated using the linear extensibility of low (less than 3 percent), moderate (3-6 percent), high (6-9 percent), and very high (greater than 9 percent).

In Columbia County, 14,482 residential structures (worth \$2.2B) and 71 non-residential structures (value unknown) with a low risk. There are 6,038 residential structures (worth \$909M), 26 non-residential structures (value unknown), one government facility (value \$8.8K), one emergency response facility (value unknown), and one community facility (value \$840K) are considered to be at moderate risk, while 250 residential structures (worth \$37.7M) and one dam (value unknown), is considered at high risk of expansive soils.

### ***Drought***

State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks are present to humans and resources. Agriculture, fishing, and timber have historically been impacted, as well as local and regional economies.

### ***Dam Failure***

US Army Corps of Engineers inundation data for the Columbia River and the PacifiCorp inundation data for the Lewis River in the State of Washington were used to determine the impacts from dam failure upriver from Columbia County. Any facilities located within the inundation area are considered to be at high risk of inundation. This includes 5,717 residential structures (worth \$861.5M), 40 non-residential structures (value unknown), nine government facilities (value \$14.5M), five emergency response facilities (worth \$5.3M), nine educational facilities (value \$13.2M), 29 community facilities (value \$4.1M), four care facilities (value unknown), five transportation facilities (worth \$720K), 17 bridges (worth \$19.7M), 11 utilities (worth \$33.5M), and nine dams (worth \$680K).

### ***Disruption of Utility and Transportation Systems***

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

### ***Hazardous Material Event***

The National Response Center and the EPA's Environmental Facts Multisystem Query were used to locate hazardous waste handling facilities and businesses that generate hazardous waste from their activities. Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 – mile radius of those are considered at risk.

In Columbia County 8,179 residential structures (worth \$1.2B), 56 non-residential structures (value unknown), 15 government facilities (worth \$6.3M), 17 emergency response facilities (worth \$25.4M), 32 educational facilities (worth \$131.4M), 14 care facilities (worth \$792K), 70 community facilities (worth \$9.8M), five transportation facilities (value unknown), 25 bridges (worth \$21.5M), three highways (values unknown), two railroads (value unknown), 13 utilities (worth \$32.8M), and six dams (worth \$680K) are considered at risk of being affected by a hazardous materials event.

Facilities considered at risk near buffered EHS Sites include 17 government facilities (worth \$19M), 13 emergency response facilities (worth \$27M), 39 educational facilities (worth \$154.3M), 13 care facilities (worth \$792K), 62 community facilities (worth \$9.6M), five transportation facilities (worth \$718K), 18 bridges (worth \$11M), 16 utilities (worth \$34.3M), and one dam (worth \$680K).

### ***Terrorism***

It is difficult to determine the scope of any terrorist threat to Columbia County. Although there seem to be few high-profile targets present, it is impossible to predict future terrorist events. Depending on the extent of the action, the community may suffer economic loss, disruption of utilities, and cleanup relating to explosions and other facility damages. Structural damage, injuries or casualties may occur, however, it is beyond the scope of this analysis to estimate losses.

### ***Infectious Disease Epidemic***

The consequences of a pandemic as described in Chapter 5 could be devastating. In the event of a poor-fit vaccine or very limited vaccine supply, the public health measures that would work best include: isolation and quarantine; restricting movement between and within communities; prohibiting public gatherings and group activities; and closing schools.

The county and state have isolation and quarantine laws; cities can also apply quarantines and restrict public movement in a public health emergency. The recently passed public health



emergency law in Oregon provides a process for such mechanisms to be implemented. (L. Rivers, personal communication; K. Ladd, personal communication)

Impacts associated with infectious disease epidemics in general have the potential to include loss of life and shutdown of critical facilities. Furthermore, an epidemic level of infectious disease in the community could overwhelm local resources, although there are no structural risks or losses associated with this hazard. The entire population of 49,163 is at risk from the effects of an infectious disease epidemic.

## MITIGATION STRATEGY

### IDENTIFYING MITIGATION ACTIONS

The following section defines identification and analysis of mitigation actions as stipulated in DMA 2000 and its implementing regulations.

#### DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions

##### Identification and Analysis of Mitigation Actions

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

##### Element

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

The County proceeded to evaluate potential mitigation actions once they reviewed their existing Mitigation Goals (MHMP Section 7.1) and determined their applicability to current needs (Table A-13).

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table A-11 depicts the County's "considered" mitigation actions developed during this mitigation planning process and their existing mitigations' action status (completed, deleted, deferred, and ongoing). Table A-12 depicts the evaluation criteria used as the basis for prioritizing mitigation actions. The revised list in Table A-14 delineates those actions the County will strive to implement within this five year planning cycle.

The Steering Committee determined there was no benefit for segregating the flood mitigation actions as was the process used in the 2005 HMP. They determined not to stipulate whether a flood mitigation action addressed facilities "inside" or "outside" the mapped floodplain. From this point forward, flood mitigation actions will address County and private infrastructure outside incorporated city jurisdictions but within identified flood hazard areas.

**DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance**

**National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Element**

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze, and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

As stated within the MHMP, Columbia County, and the Cities of Clatskanie, Columbia City, Prescott, Rainier, Scappoose, St Helens, and Vernonia all actively participate in FEMA's National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance. The City of Scappoose has exceeded NFIP minimum requirements to receive a Community Rating System (CRS) rating of "7."

Each jurisdiction's Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties to assure an effective flood mitigation program.

Mitigation Action Items Considered.

<b>Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered</b> <b>(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)</b>			
<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
<b>Natural Hazards</b>			
<i>Multi-Hazard</i>			
Multi-Hazard	<i>New</i>	Considered 2008	Inventory and protect critical facility glass breakage associated with wind, seismic, fire, terrorism, and other hazards to ensure occupant safety.
Multi-Hazard	<i>New Ongoing &amp; Partially Complete</i>	Considered 2008	Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods as applicable)
Multi-Hazard	<i>New Ongoing &amp; Partially Complete</i>	Considered 2008	Review ordinances and develop outreach programs to assure propane tanks are properly anchored and hazardous materials are properly stored and protected from known natural hazards such as seismic or flooding events.
Multi-Hazard	<i>New</i>	Considered 2008	Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc. to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
Multi-Hazard	<i>New</i>	Considered 2008	Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
Multi-Hazard	<i>New</i>	Considered 2008	Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short-term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)
Multi-Hazard	<i>New</i>	Considered 2008	Install lightening rods and lightening grade surge protection devices on critical electronic components such as warning systems, communications equipment, and computers for critical facilities.
Multi-Hazard	<i>New</i>	Considered 2008	Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered**  
**(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
Multi-Hazard	<i>New</i>	Considered 2008	Explore the need for, develop, and implement hazard zoning ordinances for high-risk hazard area land-use.
Multi-Hazard	<i>New</i>	Considered 2008	Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
Multi-Hazard	<i>New</i>	Considered 2008	Install storm shutters, hurricane clips, bracing systems, etc. as part of retrofit to meet applicable building codes while reducing disaster damages.
Multi-Hazard	<i>New Ongoing &amp; Partially Complete</i>	As part of new development	Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
Multi-Hazard	<i>New</i>	Considered 2008	Retrofit structures to protect them from seismic, flood, high wind, earthquake, or other natural hazard events.
Multi-Hazard	<i>New Ongoing &amp; Partially Complete</i>	Considered 2008	Acquire, demolish, or relocate structures from hazard prone areas. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
Multi-Hazard	<i>New</i>	Considered 2008	Harden utility headers located along transportation corridors and river embankments to mitigate potential flood, debris, and erosion damages.
Multi-Hazard	<i>New Ongoing &amp; Partially Complete</i>	Considered 2008	Establish a plan to develop a sustainable process to implement, monitor, and evaluate countywide mitigation actions.
Multi-Hazard	<i>New Ongoing &amp; Partially Complete</i>	Considered 2008	Identify and pursue funding opportunities to implement mitigation actions.
Multi-Hazard	<i>New Ongoing</i>	Considered 2008	Develop public and private sector partnerships to foster hazard mitigation activities.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered  
(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

Hazard	Status <i>Complete, Deferred, Deleted, Ongoing, or New</i>	Comment	Description
<b><i>Flood – Within mapped floodplain</i></b>			
Flood Within (ST1)	<i>Ongoing</i>	<i>Completed</i>	(FWST1) Complete inventory of critical facilities within 100-year and 500-year floodplains, with GIS mapping if possible.
Flood Within (ST2)	<i>Ongoing</i>		(FWST2) Complete inventory of residential and commercial buildings within 100-year and 500-year floodplains, with GIS mapping if possible.
Flood Within (ST3)	<i>Ongoing</i>		(FWST3) Consult with property owners and explore mitigation actions for any Columbia County properties on FEMA's national repetitive loss list
Flood Within (LT1)	<i>Deleted</i>	Combined with FWLT2 in 2008 update	(FWLT1) Obtain survey elevation data for critical facilities, residential buildings and commercial buildings within the 100- year floodplain and establish flood mitigation priorities.
Flood Within (LT2)	Deferred	Lack funding and staff	(FWLT2) Explore mitigation options with property owners and implement mitigation measures for critical facilities within the 100-year floodplain and for other structures deep within the 100-year floodplain.
<b><i>Flood – Outside mapped floodplain</i></b>			
Flood Outside(ST1)	<i>Ongoing</i>		(FOST1) Develop and maintain an inventory of locations subject to frequent storm water flooding.
Flood Outside (LT1)	<i>Ongoing</i>		(FOLT1) Determine and implement mitigation measures such as upsizing culverts or storm water drainage ditches for locations with repetitive flooding and significant damages or road closures,
Flood Outside (LT2)	<i>Ongoing</i>		(FOLT2) Support FIRM Update.
Flood	<i>Ongoing</i>	Considered 2008	Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.
Flood	<i>Ongoing</i>		Develop, implement, and enforce floodplain management ordinances.
Flood	<i>New</i>	Considered 2008	Request DOGAMI debris flow/Lahar data be included in FIRM update.
Flood	<i>New</i>	Considered 2008	Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data.
Flood	<i>New</i>	Considered 2008	Install new streamflow and rainfall measuring gauges.
Flood	<i>New Ongoing</i>	Considered 2008	Develop or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered**  
**(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
Flood	<i>New Ongoing</i>	Considered 2008	Construct earthen berms to divert flood flows into bridge or culvert openings. The earth fill should be erosion-resistant and the berms covered with erosion-resistant fabric, armoring materials, or vegetation.
Flood	<i>New Ongoing</i>	Considered 2008	Increase culvert size to increase its drainage efficiency.
<b>Winter Storms</b>			
Winter Storms (ST1)	<i>Ongoing</i>		(WSST1) Complete the inventory of locations in Columbia County subject to frequent storm water flooding.
Winter Storms (ST2)	<i>Ongoing</i>		(WST2) Enhance tree trimming efforts especially for transmission lines and trunk distribution lines.
Winter Storms (ST3)	<i>Ongoing</i>		(WST3) Encourage prudent tree planting (avoid service lines) and safe, professional tree trimming where necessary.
Winter Storms (ST4)	<i>Ongoing</i>	Partially complete	(WSST4) Ensure that all critical facilities in Columbia County have backup power and emergency operations plans to deal with power outages.
Winter Storms (LT1)	<i>Ongoing</i>		(WLT1) Determine and implement mitigation measures such as upsizing culverts or storm water drainage ditches for locations with repetitive flooding and significant damages or road closures.
Winter Storms (LT2)	Deferred	Lack funding and staff	(WLT2) Consider upgrading lines and poles to improve wind/ice loading, undergrounding critical lines, and adding interconnect switches to allow alternative feed paths and disconnect switches to minimize outage areas.
Winter Storms (LT3)	<i>Ongoing</i>		(WSLT3) Encourage new developments to include underground power lines
Winter Storms	<i>New</i>	Considered 2008	Install new streamflow and precipitation measuring gauges and develop monitoring and early warning program.
Winter Storms	<i>New</i>	Considered 2008	Develop outreach program with school districts.
Winter Storms	<i>New</i>	Considered 2008	Implement and enforce the most current Uniform International, and State, Building Codes to ensure structures can withstand winter storm hazards such as high winds, rain, water and snow.
Winter Storms	<i>New</i>	Considered 2008	Increase power line wire size and incorporate quick disconnects (break away devices) to reduce load on power lines to prevent severe wind or winter ice storm event failure.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered  
(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

Hazard	Status <i>Complete, Deferred, Deleted, Ongoing, or New</i>	Comment	Description
<b><i>Landslide</i></b>			
Landslide (ST1)	<i>Ongoing Complete</i>		(LST1) Complete the inventory of locations where critical facilities, other buildings and infrastructure are subject to landslides.
Landslide LT1)	<i>Ongoing</i>		(LLT 1) Consider landslide mitigation actions for slides seriously threatening critical facilities, other buildings or infrastructure.
Landslide (LT2)	<i>Ongoing Complete</i>		(LLT2) Limit future development in high landslide potential areas.
Landslide	<i>New</i>	Considered 2008	Develop comprehensive geological landslide and rockslide prone area maps. (LIDAR)
<b><i>Wildland Fire</i></b>			
Wildland Fire (ST1)	<i>Ongoing</i>		(WFST1) Identify specific parts of Columbia County at high risk for urban/wildland urban interface fires because of fuel loading, topography and prevailing construction practices.
Wildland Fire (ST2)	<i>Ongoing</i>		(WFST2) Identify evacuation routes and procedures for high risk areas and educate the public.
Wildland Fire (ST3)	<i>Complete</i>		(WFST3) Develop Community Wildland Fire Protection Plans for all at-risk communities.
Wildland Fire (LT1)	<i>Ongoing</i>		(WFLT1) Encourage fire-safe construction practices for existing and new construction in high risk areas.
Wildland Fire (LT2)	<i>Ongoing</i>		(WFLT2) Enhance home landscape cleanup (defensible space) and debris disposal programs.
Wildland Fire (LT3)	<i>Ongoing</i>		(WFLT3) Identify potential fuel breaks and fuel reduction zones and implement mitigation actions.
Wildland Fire (LT4)	<i>Complete</i>		(WFLT4) Implement SB360 Wildland Urban Interface Act of 1997 in Columbia County.
Wildland Fire	<i>New</i>	Considered 2008	Identify critical facilities and vulnerable populations based on mapped high hazard areas.
<b><i>Earthquake</i></b>			
Earthquake (ST1)	Deferred	Lack funding and staff	(EST1) Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.
Earthquake (ST2)	Deleted	Lack of funding and staff	(EST2) Complete inventory of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1940s homes and homes with cripple wall foundations.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered**  
**(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
Earthquake (ST3)	<i>Ongoing</i>		(EST3) Disseminate FEMA pamphlets to educate homeowners about structural and non-structural retrofitting of vulnerable homes and encourage retrofit.
Earthquake (ST4)	<i>Ongoing</i>		(EST4) Complete seismic vulnerability analysis of important public facilities with significant seismic vulnerabilities.
Earthquake (LT1)	Deferred	Lack funding and staff	(ELT1) Obtain funding and retrofit important public facilities with significant seismic vulnerabilities.
Earthquake (LT2)	<i>Ongoing</i>		(ELT2) Retrofit bridges that are not seismically adequate for lifeline transportation routes.
Earthquake	<i>New</i>	Considered 2008	Supplement State Seismic Needs Analysis data (schools, fire, law enforcement). Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.
Earthquake	<i>New</i>	Considered 2008	Identify high seismic hazard areas; develop a wood-frame residential building inventory and an outreach program to educate population concerning facilities particularly vulnerable to earthquake damage, such as pre-1940s homes and homes with cripple wall foundations.
Earthquake	<i>New</i>	Considered 2008	Retrofit important public facilities with significant seismic vulnerabilities, such as unreinforced masonry construction.
Earthquake	<i>New</i>	Considered 2008	Complete seismic vulnerability analysis of important public facilities with significant seismic vulnerabilities.
<b>Volcano</b>			
Volcano (ST1)	<i>Ongoing &amp; Partially Complete</i>		(VST1) Update public emergency notification procedures and develop an outreach program for ash fall events.
Volcano (ST2)	<i>Ongoing</i>		(VST2) Update emergency response planning for ash fall events.
Volcano (ST3)	<i>Deleted</i>	The water treatment plants are owned and operated by other jurisdictions.	(VST3) Evaluate capability of water treatment plants to deal with high turbidity from ash falls and upgrade treatment facilities and emergency response plans to deal with ash falls.



**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered  
(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

Hazard	Status <i>Complete, Deferred, Deleted, Ongoing, or New</i>	Comment	Description
Volcano (ST4)	<i>Deleted</i>	This item would be addressed by the jurisdiction in which the storm water drainage systems are located.	(VST4) Evaluate ash impact on storm water drainage system and develop mitigation actions if necessary.
Volcano	<i>New</i>	Considered 2008	Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.
Volcano	<i>New</i>	Considered 2008	Upgrade water treatment facilities’ physical plant to deal with ash falls. Prioritize and initiate actions to fill capability gaps.
<b>Technological Hazards</b>			
<b><i>Dam Failure</i></b>			
Dam Failure (ST1)	Deferred	Lack dam inundation data to enable completion	(DFST1) Prepare high resolution dam failure inundation area maps; use to update emergency response plans, evacuation route identification, public notification, and evacuation procedures.
Dam Failure (LT2)	<i>Ongoing</i>		(DFLT1) Encourage the USACOE to prioritize dams according to hazard risks such as seismic vulnerability and make seismic improvements as necessary.
Dam Failure (LT3)	<i>Ongoing</i>	Identify funding source	(DFLT2) Evaluate the adequacy of dams and dike systems for both floods and earthquakes and implement mitigation measures as necessary.
Dam Failure	<i>New</i>	Considered 2008	Implement land use and management strategies where dam or levee failure threats dictate.
<b><i>Disruption of Utilities and Transportation Systems (DUTS)</i></b>			
DUTS (ST1)	<i>Ongoing</i>		(DUTSST1) Educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.
DUTS (ST2)	<i>Ongoing</i>	Partially complete	(DUTSST2) Review and update emergency operations plans for utility disruptions or roads.
DUTS (ST3)	<i>Ongoing</i>	Partially complete	(DUTSST3) Ensure that all critical facilities in Columbia County have backup power and emergency operations plans to deal with power outages.
DUTS	<i>New</i>	Considered 2008	Purchase backup power systems for all identified critical facilities.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered  
(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
DUTS	<i>Ongoing</i>	Considered 2008	Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.
DUTS	<i>New</i>	Considered 2008	Identify and prioritize all “jurisdiction owned” & “non-jurisdiction owned” critical facilities that have backup power and emergency operations plans.
<b><i>Hazardous Materials (HAZMAT)</i></b>			
HAZMAT (ST1)	<i>Ongoing &amp; Partially Complete</i>		(HAZMATST1) Ensure that first responders have readily available site-specific knowledge of hazardous chemical inventories in Columbia County.
HAZMAT (ST2)	<i>Ongoing &amp; Partially Complete</i>		(HAZMATST 2) Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents.
HAZMAT (ST3)	Deferred	Lack funding and staff	(HAZMATST3) Evaluate existing security measures for sites with large quantities of hazardous materials or any quantities of extremely hazardous substances and enhance security as necessary.
HAZMAT (ST4)	Deferred	Lack funding and staff	(HAZMATST4) Evaluate seismic bracing/anchoring for sites with large quantities of hazardous substances (HS) or any quantities of extremely hazardous substances (EHS).
HAZMAT	<i>New</i>	Considered 2008	Train Public Works staff to identify extremely hazardous substances and to follow EMS protocols.
<b><i>Terrorism</i></b>			
Terrorism (ST1)	<i>Ongoing</i>		(TST1) Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.
Terrorism (LT1)	<i>Ongoing</i>		(TLT1) Upgrade physical security detection and response capability for critical facilities using information obtained in Terrorism (ST1) action item. Include water systems and any (eco-terrorism) major timber industry facilities and sites with large quantities of hazardous materials.
<b><i>Newly Identified Hazards</i></b>			
<b><i>Wind</i></b>			
Wind	<i>New</i>	Considered 2008	Review ordinances and develop outreach programs to assure mobile homes and manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable) (Based on wind exposure areas)

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered**  
**(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
Wind	<i>New</i>	Considered 2008	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.
Wind	<i>New</i>	Considered 2008	Corridor tree removal to protect utilities.
Wind	<i>New</i>	Considered 2008	Increase power line wire size and incorporate quick disconnects (breakaway devices) to reduce ice load power line failure during severe wind or winter ice storm events.
<b><i>Erosion</i></b>			
Erosion	<i>New</i>	Considered 2008	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.
Erosion	<i>New</i>	Considered 2008	Enforce through existing ordinance new construction standards regarding development in erosion hazard areas.
Erosion	<i>New</i>	Considered 2008	Relocate buildings that are at risk of being affected by erosion.
Erosion	<i>New</i>	Considered 2008	Apply for grants/funds to implement riverbank protection methods. (USDA Watershed Council)
Erosion	<i>New</i>	Considered 2008	Hold series of community meetings and other outreach efforts to provide erosion hazard specific information to residents dependent upon erosion hazard location data.
Erosion	<i>New</i>	Considered 2008	Develop and provide information to all residents on riverbank erosion and methods to prevent it in an easily distributed format,
Erosion	<i>New</i>	Considered 2008	Install riprap, or pilings to harden or armor a stream bank where severe erosion occurs.
Erosion	<i>New</i>	Considered 2008	Install bank protection such as rock, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection.
Erosion	<i>New</i>	Considered 2008	Develop outreach program to educate the public concerning planting processes and materials used to stabilize hill slopes or stream banks. This is known as bio-engineering; which uses logs, root wads, or wood debris or other vegetation to reduce scour and erosion. (OSU)
Erosion	<i>New</i>	Considered 2008	Install embankment protection such as vegetation, riprap, gabion baskets, sheet piling, and walls to reduce or eliminate erosion.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered**  
**(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
Erosion	<i>New</i>	Considered 2008	Consider under new construction. Install walls at the end of a drainage structure to prevent embankment erosion at its entrance or outlet. Construct a rock or concrete structure to dissipate energy or reduce flow velocity to prevent erosion of the streambed and banks. Install flared outlets or end sections at culvert entrances and outlets to match the embankment slope to reduce erosion and scour at the entrance and exit points during high flow.
<b><i>ENSO (El Niño / La Niña)</i></b>			
ENSO	<i>New</i>	Considered 2008	Educate public regarding weather patterns associated with El Niño / La Niña.
<b><i>Expansive Soils</i></b>			
Expansive Soils	<i>New</i>	Considered 2008	Develop and maintain inventory of expansive soils throughout Columbia County.
<b><i>Drought</i></b>			
Drought	<i>New</i>	Considered 2008	Prepare high resolution dam failure inundation area maps; use to update emergency response plans, evacuation route identification, public notification, and evacuation procedures.
Drought	<i>New</i>	Considered 2008	Encourage the USACOE to prioritize dams according to hazard risks such as seismic vulnerability and make seismic improvements as necessary.
Drought	<i>New</i>	Considered 2008	Evaluate the adequacy of dams and dike systems for both floods and earthquakes and implement mitigation measures as necessary.
<b><i>Infectious Disease Epidemic</i></b>			
Infectious Disease Epidemic	<i>New</i>	Considered 2008	Develop a public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.
Infectious Disease Epidemic	<i>New</i>	Considered 2008	Identify sectors of the population that are vulnerable to potential infectious diseases and develop strategies to communicate and serve those identified populations.
Infectious Disease Epidemic	<i>New</i>	Considered 2008	Determine public health authorities and responsibilities during disaster and emergency situations, e.g., quarantine, shelter hygiene, public sanitation, and immunization.
Infectious Disease Epidemic	<i>New</i>	Considered 2008	Research and obtain necessary specialized training for public health officials to respond to an infectious disease epidemic.
Infectious Disease Epidemic	<i>New</i>	Considered 2008	Identify state and federal resources for establishing and improving public health response capacity.

**Table A-11. Columbia County Mitigation Actions – Existing and Newly Considered  
(Blue text items are the County’s pre-identified Mitigation Action Items – 2005)**

<b>Hazard</b>	<b>Status Complete, Deferred, Deleted, Ongoing, or New</b>	<b>Comment</b>	<b>Description</b>
Infectious Disease Epidemic	<i>New</i>	Considered 2008	Identify appropriate manpower to respond to an infectious disease epidemic.
Infectious Disease Epidemic	<i>New</i>	Considered 2008	Establish a detection and information dissemination system for infectious disease epidemic.

## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

### DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions

#### Implementation of Mitigation Actions

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

#### Element

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on September 22, 2008 to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the County Mitigation Action Plan update. Table A-11 identifies the status of Columbia County’s existing Mitigation Actions and provided comments for each action that incurred a status change (completed, deleted, deferred, or ongoing).

The Committee then met on October 2, 2008 to determine the responsible agency and potential funding sources. The County Mitigation Action Plan Table A-14 represents mitigation projects and programs to be implemented through the cooperation of multiple entities.

The Columbia County Steering Committee evaluated the simplified STAPLEE evaluation criteria (shown below) and the Benefit-Cost Analysis Fact Sheet (Appendix N) for prioritizing its newly “considered” mitigation actions along with the “current status” of existing mitigation actions listed in Table A-11. The committee members have a broad countywide knowledge base. The committee includes a County commissioner and members from County level emergency management, County road department, County land development services, County economic development, C911CD, local industry, electric utilities, and fire protection districts. The diversity of the steering committee and the knowledge base of the committee spanning nearly 200 years in Columbia County were factors in the decision-making process.

Mr. Frank Hupp stated the Steering Committee did not use the STAPLEE/E criteria per say, however, the general format of STAPLEE/E was followed throughout the discussion and decision making process. The committee members reviewed and discussed each item, then the Committee determined the priority order by committee member consensus. Subsequently, those

actions listed in Table A-14 are the highest priority for the County. They are listed by hazard, in priority order only within each hazard.

<b>Table A-12. Evaluation Criteria for Mitigation Actions</b>		
<b>Evaluation Category</b>	<b>Discussion “It is important to consider...”</b>	<b>Considerations</b>
<b>Social</b>	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
<b>Technical</b>	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
<b>Administrative</b>	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance/operations
<b>Political</b>	What the community and its members feel about issues related to the environment, economic development, safety, and emergency management.	Political support Local champion Public support
<b>Legal</b>	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Local, State, and Federal authority Potential legal challenge
<b>Economic</b>	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
<b>Environmental</b>	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, State, and Federal laws

Upon review and consensus, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for Columbia County and responsible entities to implement during the 5-year planning cycle of this version of the MHMP. As such, the Steering Committee determined that only the existing and new mitigation actions that received a high priority ranking would be included in the countywide Mitigation Action Plan. Table A-14 depicts the County’s mitigation actions grouped by hazard and in descending priority order within each hazard.

## MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED

Columbia County reviewed the existing Mitigation Goals from the 2005 plan and determined they meet the County’s needs and subsequently implemented the Goals in Table A-13 for the current planning period.

**Table A-13. Columbia County Mitigation Goals**

Goal Number	Goal Description
1	<b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.
2	<b>Protect Critical Facilities and Enhance Emergency and Essential Services</b> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<b>Reduce the Threat to Property</b> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<b>Create a Disaster Resistant and Disaster-Resilient Economy</b> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<b>Increase Public Awareness, Education, Outreach, and Partnerships</b> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, businesses, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, businesses, and industry.</li> </ul>

## IMPLEMENTING A MITIGATION ACTION PLAN

The following section defines the mitigation action identification process for Columbia County as stipulated in DMA 2000 and its implementing regulations. DMA 2000 Requirements: Mitigation Strategy – Identification of Multi-Jurisdictional Mitigation Actions

### Identification of Multi-Jurisdictional Mitigation Actions

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

#### Element

- Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?
- Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.



Table A-14 displays the Columbia County Mitigation Action Plan matrix that lists mitigation actions by hazard and are only prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity with potential funding sources identified.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

<b>Table A-14. Columbia County Mitigation Action Plan Matrix</b> <b>(Blue text items are the County's 2005 pre-identified Mitigation Action Items)</b> <i>(Listed in priority order within each hazard)</i>						
Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Natural Hazards</b>						
<i>Multi-Hazard</i>						
Multi-Hazard	Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.	LDS (Land Development Services)	2010 LD	S	BC: TBD TF: Yes	<i>This one probably needs to be implemented into LDS process from here forward. Also broken into smaller pieces.</i>
Multi-Hazard	Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.	LDS 2010		LDS	BC: TBD TF: Yes	<i>Important! However, when protecting the floodway remember that there must be a viable, affordable place to relocate. Otherwise people will ignore the program or just leave.</i>
Multi-Hazard	Develop outreach program with school districts.	HSEMC (Homeland Security and Emergency Management Commission) School Districts	2010	HSEMC, School District	BC: TBD TF: Yes	<i>Also important – Have we received participation of the school districts on this?</i>

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County’s 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Multi-Hazard	Establish a plan to develop a sustainable process to implement, monitor, and evaluate countywide mitigation actions.	HSEMC On	going	HSEMC, EM	BC: TBD TF: Yes	
Multi-Hazard	Develop and expand public and private sector partnerships to foster hazard mitigation activities.	CEPA/LEPC (Community Emergency Planning Association/Local Emergency Planning Committee)	Ongoing	CEPA, HSEMC	BC: TBD TF: Yes	<i>Don’t overlook local resources. Inter-county agreements.</i>
Multi-Hazard	Update or develop, implement, and maintain jurisdictional debris management plans.	LDS, Solid Waste, and EM (Emergency Management)	Ongoing	LDS, EMPG	BC: TBD TF: Yes	
Multi-Hazard	<i>(2005 WSST1) Identify, develop, and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe storms.</i>	Facility Owners, HSEMC	Ongoing	HSEMC, Facility Owners	BC: TBD TF: Yes	<i>First identify. That allows division into bite sized chunks. Ability to sand roads critical.</i>
Multi-Hazard	<i>(2005 WSST4, &amp; DUTS 2&amp;3) Identify and prioritize all “jurisdiction owned” &amp; “non-jurisdiction owned” critical facilities and determine if they have emergency backup power systems and emergency operations plans. Develop a list of the critical facilities lacking emergency back-up power systems and / or emergency operations plans and seek funding to purchase backup power systems and develop emergency operations plans.</i>	HSEMC, EM, Facility Owners	2012	HSEMC, Facility Owners	BC: TBD TF: Yes	<i>Combined action from Winter Storm and Disruption of Utilities and Transportation Systems.</i>

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County's 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Multi-Hazard	Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods as applicable)	LDS	Ongoing LD	S	BC: TBD TF: Yes	
Multi-Hazard	Review ordinances and develop outreach programs to assure propane tanks are properly anchored and hazardous materials are properly stored and protected from known natural hazards such as seismic or flooding events.	LDS, Fire Districts	Ongoing	LDS, Fire Districts	BC: TBD TF: Yes	
Multi-Hazard	Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.	LDS O	ngoing	Fee Supported, LDS	BC: TBD TF: Yes	
Multi-Hazard	Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.	Community Action Team (CAT), LDS	Ongoing	HMGP, HMA, RL	BC: TBD TF: Yes	
Multi-Hazard	Establish a plan to develop a sustainable process to implement, monitor, and evaluate countywide mitigation actions.	EM	Ongoing EM		BC: TBD TF: Yes	
Multi-Hazard	Identify and pursue funding opportunities to implement mitigation actions.	EM	Ongoing EM		BC: TBD TF: Yes	
Multi-Hazard	Develop and expand public and private sector partnerships to foster hazard mitigation activities.	EM O	ngoing	HSEMC, CEPA	BC: TBD TF: Yes	
<b>Flood</b>						
Flood	(2005 FST3) Develop and implement mitigation actions for repetitive loss properties.	LDS, Floodplain Administrator	Ongoing LD	S	BC: TBD TF: Yes	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
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*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Flood	(2005 FLT1) Establish flood mitigation priorities for critical facilities, commercial structures, and residential buildings located within the 100- year floodplain using survey elevation data.	LDS, Floodplain Administrator	Ongoing	LDS	BC: TBD TF: Yes	
Flood	(2005 FLT2) Implement mitigation measures identified by critical facilities' owners, and other facility owners, to protect facilities located within the 100-year floodplain.	Facility Owners	2013	LDS	BC: TBD TF: Yes	
Flood	Pursue the purchase and installation of new streamflow and precipitation measuring gauges and develop monitoring and early warning program.	Board of County Commissioners (BOCC), NWS, USGS	2013	NOAA/ NWS, HMGP, HMA	BC: TBD TF: Yes	
Flood	(2005 FST1) Complete inventory of critical facilities within 100-year and 500-year floodplains, with GIS mapping if possible.	LDS, Road Dept	Ongoing	LDS, Road Dept	BC: TBD TF: Yes	
Flood	(2005 FST2) Complete inventory of residential and commercial buildings within 100-year and 500-year floodplains, with GIS mapping if possible.	LDS	Ongoing	LDS	BC: TBD TF: Yes	
Flood	(2005 FOST1) Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data. (blue text modified from original)	LDS, Road Dept	Ongoing	LDS, Road Dept	BC: TBD TF: Yes	
Flood	(2005 FOLT1) Determine and implement mitigation measures such as upsizing culverts or storm water drainage ditches for locations with repetitive flooding and significant damages or road closures.	Road Dept, EM	Ongoing	Road Dept, EM	BC: TBD TF: Yes	
Flood	Develop an outreach program to educate the public concerning NFIP participation benefits, floodplain	LDS, Floodplain Administrator	Ongoing	LDS, EM	BC: TBD TF: Yes	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
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*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
	development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.					
Flood	Develop, implement, and enforce floodplain management ordinances.	LDS, Floodplain Administrator	Ongoing LD	S	BC: TBD TF: Yes	
Flood	Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.	LDS, Floodplain Administrator, BOCC	Ongoing LD	S	BC: TBD TF: Yes	
Flood	Construct earthen berms to divert flood flows into bridge or culvert openings. The earth fill should be erosion-resistant and the berms should be covered with erosion-resistant fabric, armoring materials, or vegetation.	Road Dept	Ongoing	Road Dept	BC: TBD TF: Yes	
Flood	Increase culvert size to increase its drainage efficiency.	Road Dept, ODOT	Ongoing	Road Dept	BC: TBD TF: Yes	
<b>Winter Storms</b>						
Winter Storm	(2005 WSST2) Enhance tree-trimming efforts especially for transmission lines and trunk distribution lines.	BPA, West Oregon Electric Coop, local PUDs	Ongoing	Utility Companies	BC: TBD TF: Yes	
Winter Storm	(2005 WSST3) Encourage prudent tree planting (avoid service lines) and safe, professional tree trimming where necessary.	Columbia County Hazard Mitigation Advisory Committee	Ongoing H	SEMC	BC: TBD TF: Yes	
Winter Storm	(2005 WLT1) Determine and implement mitigation measures such as upsizing culverts or storm water drainage ditches for locations with repetitive flooding and significant damages or road closures.	Road Dept, cities	Ongoing	Road Dept HMGP, HMA	BC: TBD TF: Yes	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
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*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Winter Storm	(2005 WSLT2) Consider upgrading lines and poles to improve wind/ice loading, undergrounding critical lines, and adding interconnect switches to allow alternative feed paths and disconnect switches to minimize outage areas.	BPA, West Oregon Electric Coop, local PUDs	Ongoing	Utility Companies, HMGP, HMA	BC: TBD TF: Yes	
Winter Storm	(2005 LT3) Encourage new developments to include underground power lines.	LDS, cities	Ongoing	LDS	BC: TBD TF: Yes	
Winter Storm	Implement and enforce the most current Uniform International, and State, Building Codes to ensure structures can withstand winter storm hazards such as high winds, rain, water, and snow.	LDS O	ngoing	Fee Supported	BC: TBD TF: Yes	
<b>Landslide</b>						
Landslide	Develop comprehensive geological landslide and rockslide prone area maps. (LIDAR)	DOGAMI, LDS, and EM	2011 G	rants	BC: TBD TF: Yes	
Landslide	(2005 LST1) Complete a landslide location inventory, identify threatened critical facilities and other buildings and infrastructure.	DOGAMI and LDS	Ongoing	LDS	BC: TBD TF: Yes	
Landslide	(2005 LLT 1) Develop prioritized list of mitigation actions for threatened critical facilities and other buildings or infrastructure.	LDS and EM	Ongoing	LDS, EM	BC: TBD TF: Yes	
Landslide	(2005 LLT2) Limit future development in high landslide potential areas.	LDS Ongoing		LDS	BC: TBD TF: Yes	
<b>Wildland Fire</b>						
Wildland Fire	Provide wildland fire information in an easily distributed format for all residents.	County Fire Defense Board, Fire Districts, and ODF (Oregon Department of Forestry)	Ongoing	Fire Boards FMAP	BC: TBD TF: Yes	Relatively easily done, low cost per capita.

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
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*(Listed in priority order within each hazard)*

<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency (Lead) <sup>1</sup></b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
Wildland Fire	Conduct residential audits for wildland and building fire hazard identification then develop a public outreach program to convey the findings.	Fire Districts and ODF	Ongoing	Fire Boards, FMAP	BC: TBD TF: Yes	Much of the preparation is done. A contractor could easily complete.
Wildland Fire	Develop public outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs.	Fire Districts and ODF	Ongoing	Fire Boards, FMAP	BC: TBD TF: Yes	
Wildland Fire	(2005 WFST1) Identify specific parts of Columbia County at high risk for urban/wildland urban interface fires because of fuel loading, topography, and prevailing construction practices.	County Fire Defense Board, Fire Districts	Ongoing	Fire Boards, FMAP	BC: TBD TF: Yes	
Wildland Fire	(2005 WFST2) Identify evacuation routes and procedures for high risk areas and educate the public.	County Fire Defense Board, Fire Districts, law enforcement, County Roads, public works	Ongoing	Fire Boards, FMAP	BC: TBD TF: Yes	
Wildland Fire	(2005 WFLT1) Encourage fire-safe construction practices for existing and new construction in high risk areas.	LDS, County Fire Devense Board, Fire Districts	Ongoing	LDS, Fire Boards, FMAP	BC: TBD TF: Yes	
Wildland Fire	(2005 WFLT2) Enhance home landscape cleanup (defensible space) and debris disposal programs.	County Fire Defense Board, Fire Districts	Ongoing	Fire Boards, FMAP	BC: TBD TF: Yes	
Wildland Fire	(2005 WFLT3) Identify potential fuel breaks and fuel reduction zones and implement mitigation actions.	County Fire Defense Board, Fire Districts	Ongoing	Fire Boards, FMAP	BC: TBD TF: Yes	
Wildland Fire	(2005 WFLT4) Implement SB360 Wildland Urban Interface Act of 1997 in Columbia County.	LDS, County Fire Devense Board, Fire Districts	Ongoing	LDS, Fire Districts, FMAP	BC: TBD TF: Yes	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County’s 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Wildland Fire	Promote FireWise building siting, design, and construction materials.	County Fire Defense Board, Fire Districts	Ongoing	Fire Districts, FMAP	BC: TBD TF: Yes	
Wildland Fire	Develop outreach program to educate and encourage fire-safe construction practices for existing and new construction in high-risk areas.	County Fire Defense Board, Fire Districts, ODF	Ongoing	LDS, Fire Districts, FMAP	BC: TBD TF: Yes	
Wildland Fire	Enhance home landscape cleanup (defensible space) and debris disposal programs.	Fire Districts, ODF	Ongoing	Fire Districts, FMAP, HSGP, HMGP	BC: TBD TF: Yes	
<b><i>Earthquake</i></b>						
Earthquake	(2005 EST4) Complete seismic vulnerability analysis of essential public and commercial facilities with significant seismic vulnerabilities.	Facility Owners	Ongoing	Facility Owners	BC: TBD TF: Yes	
Earthquake	(2005 EST3) Disseminate FEMA pamphlets and other literature to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.	All Departments	Ongoing	FEMA	BC: TBD TF: Yes	Relatively easily done, low cost per capita.
Earthquake	(2005 EST1) Supplement State Seismic Needs Analysis data. Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.	County, cities, special districts	Ongoing Grants		BC: TBD TF: Yes	Reworded to better meet the County’s needs.
Earthquake	(2005 ELT1) Obtain funding and retrofit important public facilities with significant seismic vulnerabilities.	County, cities, special districts	Ongoing Grants		BC: TBD TF: Yes	
Earthquake	(2005 ELT2) Retrofit bridges that are not seismically adequate for lifeline transportation routes.	Road Dept	Ongoing	Road Dept	BC: TBD TF: Yes	



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<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency (Lead) <sup>1</sup></b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
Earthquake	Update existing (or adopt the most current) Uniform Building Code.	LDS O	ngoing	Fee Supported	BC: TBD TF: Yes	
Earthquake	Implement and enforce the Uniform, International, and State Building Codes.	LDS O	ngoing	Fee Supported	BC: TBD TF: Yes	
Earthquake	Inspect and/or certify all new construction.	LDS	Ongoing	Fee Supported	BC: TBD TF: Yes	
Earthquake	Develop public outreach program to train earthquake safety; perform drop-cover-hold drills at schools and public facilities.	LDS, EM School Districts	Ongoing	Fire Districts	BC: TBD TF: Yes	
Earthquake	Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current Building Codes.	LDS, Facility Owners	Ongoing	Facility Owners	BC: TBD TF: Yes	
<b>Volcano</b>						
Volcano (ST2)	(2005 VST2) Evaluate and update emergency operations planning and develop client focused outreach programs for ash fall events affecting river, air, and highway transportation, water treatment plants, and stormwater drainage systems, and industrial facilities and operations.	Affected Agencies/ EM	2011	EM	BC: TBD TF: Yes	Re-worded and combined existing mitigation action items to better meet needs.
Volcano (ST1)	(2005 VST1) Update public emergency notification procedures and develop an outreach program for ash fall events.	CEPA, CCOM, local emergency services agencies	Ongoing	C911CD	BC: TBD TF: Yes	
<b>Wind</b>						
Wind	Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable) (Based on wind exposure areas)	LDS Ongoing		LDS	BC: TBD TF: Yes	High frequency, moderate damage, significant utility outages over short duration (less than a week).

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County's 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Wind	Corridor tree removal to protect utilities.	PUD's and Power Companies	Ongoing	Electric Power Companies, HMPG, HMA	BC: TBD TF: Yes	<i>Sounds like the utilities are already on this one.</i>
Wind	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.	PUD's and Power Companies	Ongoing	Electric Power Companies	BC: TBD TF: Yes	
<b><i>Erosion</i></b>						
Erosion	Hold series of community meetings and other outreach efforts to provide erosion hazard specific information to residents dependent upon erosion hazard location data.	Watershed Councils, NWRC&D (National Resource Conservation Service, US Department of Agriculture, Northwest Resource Conservation & Development)	2009/2011	Watershed Councils	BC: TBD TF: Yes	
Erosion	Apply for grant funds to implement stream bank protection methods. (USDA Watershed Council)	Watershed Councils, NWRC&D	Ongoing	Watershed Councils	BC: TBD TF: Yes	
Erosion	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.	Watershed Councils, Army Corps of Engineers (USACOE), Public Works Departments, Friends of Streams and Creeks Organizations, Home Owners	Ongoing	Watershed Councils	BC: TBD TF: Yes	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
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<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency (Lead) <sup>1</sup></b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
Erosion	Enforce through existing ordinance new construction standards regarding development in erosion hazard areas.	LDS O	ngoing	Fee Supported, LDS	BC: TBD TF: Yes	
Erosion	Relocate buildings that are at risk of being affected by erosion.	Building Owners	Ongoing	Building Owners, HMGP, HMA	BC: TBD TF: Yes	
Erosion	Develop and provide information to all residents on riverbank erosion and methods to prevent it in an easily distributed format.	Watershed Councils	Ongoing	Watershed Councils	BC: TBD TF: Yes	
Erosion	Install riprap or pilings to harden or armor a stream bank where severe erosion occurs.	Property Owners	Ongoing	Property Owners, HMGP, HMA	BC: TBD TF: Yes	
Erosion	Install bank protection such as rock, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection.	Property Owners	Ongoing	Property Owners, HMGP, HMA	BC: TBD TF: Yes	
Erosion	Develop outreach program to educate the public concerning planting processes and materials used to stabilize hill slopes or stream banks. This is known as bio-engineering; which uses logs, root wads, wood debris, or other vegetation to reduce scour and erosion. (OSU)	Watershed Councils, USACE, Public Works Departments, Friends of Streams and Creeks Organizations, Home Owners	Ongoing	Watershed Councils	BC: TBD TF: Yes	
Erosion	Install embankment protection such as vegetation, riprap, gabion baskets, sheet piling, and walls to reduce or eliminate erosion.	Property Owners	Ongoing	Property Owners, HMGP,	BC: TBD TF: Yes	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County’s 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
				HMA		
Erosion	Consider under new construction. Install walls at the end of a drainage structure to prevent embankment erosion at its entrance or outlet. Construct a rock or concrete structure to dissipate energy or reduce flow velocity to prevent erosion of the streambed and banks. Install flared outlets or end sections at culvert entrances and outlets to match the embankment slope to reduce erosion and scour at the entrance and exit points during high flow.	LDS, Property Owners	Ongoing	Property Owners, HMGP, HMA	BC: TBD TF: Yes	
<b><i>ENSO (El Niño / La Niña)</i></b>						
ENSO	Educate public regarding weather patterns associated with El Niño / La Niña.	County, City and Special districts	2010	NWS, Grants	BC: TBD TF: Yes	
<b><i>Expansive Soils</i></b>						
Expansive Soils	Develop and maintain inventory of expansive soils throughout Columbia County.	NWRC&D, LDS	Ongoing	NWRC&D, LDS	BC: TBD TF: Yes	
<b><i>Drought</i></b>						
Drought	Develop educational programs and initiatives related to water conservation and irrigation during drought periods.	Oregon Department of Water Resources, NWRC&D, Water System Owners	2013	NWRC&D	BC: TBD TF: Yes	Moderate frequency, low impact in most parts of the county. Higher risk of wildfire, though.

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County's 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Technological and Manmade Hazards</b>						
<i><b>Dam Failure</b></i>						
Dam Failure	(2005 DFLT2) Evaluate the adequacy of dams and levee systems for Columbia County for both floods and earthquakes, identify funding, and implement mitigation, land use, and management measures as necessary.	Diking Districts with LDS coordination	2009	LDS, USACOE	BC: TBD TF: Yes	
Dam Failure	(2005 DFST1) Prepare high resolution dam failure inundation area maps; use to update emergency response plans, evacuation route identification, public notification, and evacuation procedures.	LDS, USACOE, PacifiCorp	Ongoing	LDS, USACOE, PacifiCorp, DOGAMI	BC: TBD TF: Yes	
Dam Failure	(2005 DFLT2) Encourage the USACOE to prioritize dams according to hazard risks such as seismic vulnerability and make seismic improvements as necessary.	Columbia County Hazard Mitigation Advisory Committee, USACOE	Ongoing	HSEMC	BC: TBD TF: Yes	
<i><b>Disruption of Utilities and Transportation Systems (DUTS)</b></i>						
DUTS	(2005 DUTSST1) Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.	All Agencies	Ongoing	HSEMC	BC: TBD TF: Yes	
DUTS	(2005 DUTSST2) Review and update emergency response plans for utility disruptions or road closures.	Utility Companies, Road Dept	Ongoing	HSEMC	BC: TBD TF: Yes	Relatively easily done, relatively low cost, high value during Hazard event

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County's 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b><i>Hazardous Materials (HAZMAT)</i></b>						
HAZMAT	Train Public Works staff to identify extremely hazardous substances and to follow EMS protocols.	Road Dept, CEPA/LEPC	2009/2012	Road Dept, CEPA, CERCLA, SARA	BC: TBD TF: Yes	
HAZMAT	Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.	CEPA/LEPC 20	08/2012	HSEMC, CEPA	BC: TBD TF: Yes	
HAZMAT	<i>(2005 HAZMATST 2) Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.</i>	Fire Districts, law enforcement agencies	Ongoing	<i>Fire Districts, Law Enforcement, CERCLA, SARA</i>	<i>BC: TBD TF: Yes</i>	
HAZMAT	<i>(2005 HAZMATST1) Ensure that first responders have readily available site-specific knowledge of hazardous chemical inventories in Columbia County.</i>	Fire Districts, law enforcement agencies	Ongoing	<i>Fire Districts, Law Enforcement, CERCLA, SARA</i>	<i>BC: TBD TF: Yes</i>	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County's 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
HAZMAT	(2005 HAZMATST3) Evaluate existing security measures for sites with large quantities of hazardous substance (HS) or any quantities of extremely hazardous substances (EHS) and enhance security as necessary.	local facility managers	Ongoing	CEPA, CERCLA, SARA	BC: TBD TF: Yes	
HAZMAT	(2005 HAZMATST4) Evaluate seismic bracing/anchoring for sites with large quantities of hazardous substances (HS) or any quantities of extremely hazardous substances (EHS).	local facility managers	Ongoing	CEPA, HMGP, HMA	BC: TBD TF: Yes	
<b><i>Terrorism</i></b>						
Terrorism	(2005 TST2) Identify and evaluate physical security, detection, and response capability for critical facilities using information obtained from hazard assessments and risk analysis. Include water systems, any high-profile facilities with large quantities of hazardous substances (HS), and extremely hazardous substances (EHS), Trojan Nuclear Power Plant, gas pipelines, power line corridors, and bridges.	HSEMC, Critical Facility Owners, Law Enforcement, and CEPA/LEPC	2008/2013	HSEMC, Law Enforcement, CEPA, HSGP, CEDAP,	BC: TBD TF: Yes	I do not see our County as a target for major terrorist attacks at this time. However, lower impact publicity seekers will continue to attack logging and other political targets.
Terrorism	(2005 TST1) Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.	All Agencies	Ongoing	HSEMC, All Agencies, HSGP	BC: TBD TF: Yes	Development and training of local and regional IMTs, resource support & planning.
<b><i>Infectious Disease Epidemic (IDE)</i></b>						
IDE	Develop a public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.	State of Oregon Department of Public Health (ODPH), Columbia Health District (CHD)	Ongoing	ODPH, CHD	BC: TBD TF: Yes	

**Table A-14. Columbia County Mitigation Action Plan Matrix**  
**(Blue text items are the County’s 2005 pre-identified Mitigation Action Items)**  
*(Listed in priority order within each hazard)*

Hazard	Description	Managing Department / Agency (Lead) <sup>1</sup>	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>IDE</b>	Identify sectors of the population that are vulnerable to potential infectious diseases and develop strategies to communicate and serve those identified populations.	ODPH, CHD	Ongoing	ODPH, CHD	BC: TBD TF: Yes	
<b>IDE</b>	Determine public health authorities and responsibilities during disaster and emergency situations, e.g., quarantine, shelter hygiene, public sanitation, and immunization.	ODPH, CHD	Ongoing	ODPH, CHD	BC: TBD TF: Yes	
<b>IDE</b>	Research and obtain necessary specialized training for public health officials to respond to an infectious disease epidemic.	ODPH, CHD	Ongoing	ODPH, CHD	BC: TBD TF: Yes	
<b>IDE</b>	Identify state and federal resources for establishing and improving public health response capacity.	ODPH, CHD	Ongoing	ODPH, CHD	BC: TBD TF: Yes	
<b>IDE</b>	Identify appropriate work force to respond to an infectious disease epidemic.	ODPH, CHD	Ongoing	ODPH, CHD	BC: TBD TF: Yes	
<b>IDE</b>	Establish a detection and information dissemination system for infectious disease epidemic.	ODPH, CHD	Ongoing	ODPH, CHD	BC: TBD TF: Yes	
<b>IDE</b>	Develop a public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.	ODPH, CHD	Ongoing	ODPH, CHD	BC: TBD TF: Yes	

<sup>1</sup> The Managing Department / Agency (Lead) will coordinate with all other involved departments or agencies.



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**Appendix B**  
**City of Clatskanie**

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This Appendix contains the specific City of Clatskanie information to support the Columbia County 2009 Multi-Jurisdictional Hazard Mitigation Plan update.

This section further supports the County’s planning process by summarizing the review and incorporation of existing, plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan’s development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

The City of Clatskanie is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the City organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats.

Table B-1 contains the City’s Steering Committee participant list to augment the Columbia County planning elements.

<b>Table B-1. City of Clatskanie Steering Committee</b>	
<b>Name</b>	<b>Agency/Department/Affiliation</b>
Diane Pohl (Steering Committee Leader)	Mayor
Ray Pohl	Emergency Committee/Planning Commissioner
David True	Public Works Director
Marvin Hoover	Police Chief
Frank Hupp	Columbia County Emergency Management

Table B-2 contains a summary of the City’s public involvement and planning meeting activities.

<b>Table B-2. City of Clatskanie’s Public Involvement Mechanisms</b>	
<b>Mechanism</b>	<b>Description</b>
Radio Station (Longview) 105.5 fm (Country Station)	Public Information Officer to contact radio station.
Word of Mouth	Citizen Corps and door-to-door notification.
Utility Bills (1 <sup>st</sup> day of the month) (Card)	VIA U.S. Mail
Clatskanie Chief (Newspaper) (weekly)	VIA Delivery-Editor is local
Longview Daily News (daily)	VIA Delivery-Reporter is local
Website City	Website- <a href="http://www.clatskanieor.govoffice2.com">www.clatskanieor.govoffice2.com</a>
Local internet webpage	<a href="http://www.clatskanie.com">www.clatskanie.com</a>
April Kickoff Newsletter	Explained plan development process and solicited input and comments on initial hazard screening and critical facilities information.
August 14, 2008 Countywide Public Meeting, 10 a.m., 2 p.m., & 6 p.m., Columbia County 911 Center, St Helens, OR	Presented draft risk assessment results and provided opportunity to comment.

**CAPABILITY ASSESSMENT**

Table B-3, B-4 and B-5 contain the City’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table B-3. City of Clatskanie’s Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	Clatskanie Transportation System Plan (1997)	Presents suggested improvements for each of the transportation system elements; preliminary planning level cost estimates, an implementation scheme recommends which improvements should be made during the first decade and which should be scheduled for the second decade along with suggested land use ordinance modifications.
	Clatskanie Transportation Refinement Plan (2005)	Presents Clatskanie requested improvements to The Oregon Department of Transportation (ODOT) preservation and enhancement project on US Highway 30 (US 30) through the City of Clatskanie in 2007.
	Flood Hazard Mitigation Plan (1999)	Presents Flood Hazard Mitigation Plan for areas within the City limits and Urban Growth Boundary for inclusion into other City and County Hazard Mitigation Plans for a comprehensive county-wide mitigation planning effort.
	Potential Flood Level Mitigation by Downstream Channel Deepening, Lower Clatskanie River, OR, (1997)	An evaluation to determine potential for reducing flood levels with the City by dredging the downstream navigation channel to improve flow conveyance in the lower Clatskanie River
	City of Clatskanie Comprehensive Plan	Identifies the long-range land use policy for the city providing a framework for decision-making processes and a means of directing community efforts towards sound future growth, better understanding between the public and private efforts for a beautiful and livable community.
	City of Clatskanie Emergency Operations Plan (2006)	Identifies emergency planning, policies, procedures, and response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies.
Programs	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods.
Policies and Ordinances	Clatskanie Development Code	Guides development and land-use within the City
	Clatskanie Municipal Code	Chapter 9 Land-Use and Development Code

<b>Table B-4. City of Clatskanie Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	City Engineer: Dave True (DT) City Planner: Mark Barnes (MB) Planning Commissioner: Ray Pohl (RP)
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	City Engineer: Dave True
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	City Planner: Mark Barnes
Floodplain manager	State Flood Plain Manager: Christine Shirley
Personnel skilled in GIS and/or HAZUS-MH	Columbia County: Joe Flori
Director of Emergency Services	Fire Chief: Columbia County Emergency Management: Frank Hupp
Finance (grant writers, purchasing)	City Finance Manager: Sharry Hilton
Public Information Officers	EOC Appointed: Chief Marvin Hoover (MH)

<b>Table B-5. City of Clatskanie Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	Yes
Authority to levy taxes for specific purposes	No
Incur debt through general obligation bonds	No
Incur debt through special tax and revenue bonds	Yes
Incur debt through private activity bonds	Yes
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

<b>DMA 2000 Requirements: Risk Assessment: Identifying Hazards</b>
<b>Identifying Hazards</b>
<b>Requirement §201.6(c)(2)(i):</b> [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.
<b>Element</b>
<ul style="list-style-type: none"> <li>■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?</li> </ul>
Source: FEMA, July 2008.

The City of Clatskanie’s Steering Committee determined that the following natural hazards could potentially threaten the community.

<b><i>Natural Hazards</i></b>	
Flood X	
Winter Storm	X
Landslide X	
Fire (Wildland/Urban)	X
Earthquake X	
Volcano X	
Wind* X	
Erosion* X	
ENSO (El Niño and La Niña)*	
Expansive Soils*	X
Drought*	
<b><i>Technological Hazards</i></b>	
Dam Failure	
Disruption of Utility and Transportation Systems	X
Hazardous Materials	X
Terrorism X	
Infectious Disease Epidemic*	X

## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes community specific vulnerability information for the City of Clatskanie to augment the MHMP development process. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment ]must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

The City of Clatskanie actively participates in FEMA's National Flood Insurance Program (NFIP) and has implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.



The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**  
**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.  
**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**  
**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area  
**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS**

### **Asset Inventory**

Asset inventory is the first step of a vulnerability analysis. Assets within each community that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

The asset inventory delineates the City’s existing building and infrastructure assets and insured values and are identified in detail in Tables B-6A, B-6B and B-7.

Tables B-8, 9, and 10 portray the City’s critical infrastructure numbers and values, and their potential vulnerability by hazard type.

The City of Clatskanie seeks to protect its population by supporting Columbia County and Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### **Population and Building Stock**

Population data listed in Table B-6A were obtained from the 2000 U.S. Census and Portland State University. It comprises census block level data, and estimates from university conducted community research.

The City’s existing building and infrastructure and insured values are identified in Tables B-6A, B-6B, and B-7.

<b>Table B-6A. City of Clatskanie Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2005 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
1,528 1,	660	1,710	666	73,260,000

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$110,000 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table B-6B. City of Clatskanie NFIP Insurance Report</b>								
<b>City of</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Average Premium (\$)</b>	<b>Total Claims Since 1978</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>
Clatskanie 23,183		15 20		3,581,600 1,	159.151	6	416,095 1	

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

<b>Table B-7. City of Clatskanie Critical Facilities and Infrastructure</b>			
<b>Facility Type</b>	<b>Name / Number</b>	<b>Address</b>	<b>Value<sup>1</sup></b>
Government	City of Clatskanie-City Hall, Administrative Office	95 N Nehalem Street	\$300,000
	City Hall, Parking Lot	95 S Nehalem Street	\$39,880
	City Public Works Shop	520 SW Bryant	\$250,000
	Cemetery	800 NE Wood Lane	\$1,000
	Cemetery	800 NE Wood Lane	\$2,000
	Beaver Property-Agricultural land	Clatskanie District Road	\$161,950

**Appendix B**  
**City of Clatskanie**

**Table B-7. City of Clatskanie Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Beaver Property-Burner, Abandoned Mill Equipment-Vacant	Erickson Dike Road	\$10,000
	Beaver Property-Chamber Storage Bldg. Records/Equipment Storage	Erickson Dike Road	\$20,200
	Beaver Property-Pole Yard/Old Office-Leased to PUD-storage	1215 Erickson Dike Road	\$75,000
	Between Bel Air Dr. and Highway 47-Vacant Land	SW Orchard Street	\$34,800
	Between Bel Air Dr. and SW Orchard St.-Vacant Land	SW Orchard Street	\$65,410
	Between Bel Air Dr. and SW Orchard St.-Vacant	SW Orchard Street	\$31,500
	Between Bel Air Dr. and SW Orchard St.-Vacant	SW Orchard Street	\$221,360
	Between Bel Air Dr. and SW Orchard St.-Vacant Land	SW Orchard Street	\$10,000
	City Parking Lot-Downtown	135 N Nehalem Street	\$9,400
	City Park-Vacant-NE Corner NE Lillich St. and NE Park St.	Corner of NE Park Street and Lillich Street	\$250,000
	City Park and Pool	300 NE Park Street	\$500,000
	ROW and Dock	End of SW Tichenor Street, North of Highway 30	\$96,900
	Public Works Storage Highway 47 City Shop	Corner of SW Norman and Hwy 47	\$200,000
	Legion Lane-Paved Road	NE Legion Lane	\$148,210
	Lower Shop Road-Vacant	520 SW Bryant	\$10,000
	Vacant Land	North of Highway 30 Bridge, South Bank of Clatskanie River	\$2,700
	Vacant Land	North Nehalem Street, 50 W Columbia River Hwy	\$4,450
	Vacant Land	Corner of SE Bellflower St. & SE Conyers St.	\$1,000
	City owned Timber Land	Highway 47	\$10,000,000+
	City owned Timber Land	Highway 47	\$10,000,000+
	City owned Timber Land	Highway 47	\$4,000,000

**Appendix B  
City of Clatskanie**

**Table B-7. City of Clatskanie Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Vacant Land	Corner of Shasta Way and Haven Acres Road	\$142,600
Emergency Response	Police Station	195 SE 2 <sup>nd</sup> Street	\$250,000
	Clatskanie Rural Fire Protection District- Substation 3	79704 Quincy Mayger Rd	\$217,000
	Clatskanie Rural Fire Protection District- Substation 2	80694 Mayger Fill Rd	\$64,000
	Clatskanie Rural Fire Protection District- Substation 1	76015 Atkins Rd	\$238,000
	Clatskanie Rural Fire Protection District Main Station	280 Se 3rd St	\$481,450
Educational	Bryant House Preschool	265 S Nehalem St	\$100,000
	Clatskanie Head Start Program	365 SW High School Dr	\$726,000
	Clatskanie Elementary School	815 S Nehalem St	\$267,970
	Clatskanie Middle/High School	471 SW Bel Air Dr	\$577,470
	Clatskanie School District 6J Office	555 SW Bryant St	\$224,000
Care Facility	Clatskanie Family Health Center	401 SW Bel Air Dr	\$175,000
	Clatskanie Senior Center	620 SW Tichenor St	\$275,000
	John Briggs MD		\$125,000
Community	City Park-Pool, Basketball Court, Tennis Court, Playground, Skate Park, Ball Field, Restrooms, Ball Fields	7-4-8-DB 4      900, 5600, 5500	\$1,000,000
	Turning Point Community Service Center	220 W Columbia River Hwy	\$75,000
	The Clatskanie Chief Newspaper	148 N Nehalem Street	
	Clatskanie Parks and Recreation	300 NE Park Street	\$10,800
	Clatskanie Parks and Recreation	300 NE Park Street	\$30,480
	Clatskanie Public Library	11 Lillich St	\$1,500,000
	Apostolic Lutheran Church	18558 Beaver Falls Road	\$600,000
	Clatskanie Baptist Church	415 S Nehalem Street	\$224,000
	Clatskanie Presbyterian Church	215 S Nehalem Street	\$296,160
	Clatskanie United Methodist Church	290 S Nehalem Street	\$71,300
	Faith Lutheran Church Elca	1010 NE 5th Street	\$148,210

**Appendix B**  
**City of Clatskanie**

**Table B-7. City of Clatskanie Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Gateway Worship Center	610 NW 5th Street	\$250,000
	Great Vow Zen Monastery	79640 Quincy Mayger Road	\$275,000
	Maplewood Cemetery	585 SE Cowyers Street	\$36,070
	Mayger-Downing Community Church	80072 Life Lane	\$323,220
	St John the Baptist Catholic Church	SW High St	\$300,000
	The Church at Beaver Creek	Beaver Falls Rd \$	275,000
State and Federal Highways	Highway 47		.5 MILES
	Highway 30		1.25 MILES
Railroads	Portland and Western Railroad		2 MILES
	Burtllington Northern Railroad	Parallels Highway 30	2 MILES
Bridges	Highway 30 Clatskanie River Bridge	Located at Milepost 61.3	\$14,000,000
Transportation Facilities	Fire Dept Heliport	280 SE 3 <sup>rd</sup> St.	\$10,000
Utilities	Mist Natural Gas Facility	South of City	\$7,800,000
	City of Clatskanie-City Sewer Treatment Plant	7-4-8-AC 3100 End of NW 4 <sup>th</sup> Street	\$7,000,000
	City of Clatskanie-1A Sewer Pump Station	7-4-8-DB 601 50 NW 4 <sup>th</sup> Street	\$350,000
	City of Clatskanie-City Reservoir, Water Plant	7-4-8-CC 300 520 SW Bryant Street	\$4,000,000
	City of Clatskanie-Main Sewer Lift Station-Grannis Square	350 W Columbia River Hwy	\$300,000
	City of Clatskanie-Poplar St. Water Pump Station	NE 8 <sup>th</sup> & NE Poplar	\$50,000
	Clatskanie PUD Office	469 N Nehalem St	\$500,000
	Clatskanie PUD	469 N Nehalem St	\$4,500
	Clatskanie PUD	469 N Nehalem St	\$30,480
	Clatskanie PUD	469 N Nehalem St	\$4,450
	Clatskanie PUD	469 N Nehalem St	\$39,880
	Clatskanie PUD	469 N Nehalem St	\$9,400
	Clatskanie PUD	469 N Nehalem St	\$10,160
Marshland Drainage Improvement Company	12588 Highway 30	\$4,500	

**Table B-7. City of Clatskanie Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Marshland Drainage Improvement Company	12589 Highway 30	\$1,000
	Midland Drainage Improvement Company	15694 Luxford Road	\$680,720
	Quincy Water Association	77285 Woodson Road	\$21,080
	Woodson Water Association	77285 Woodson Road	\$185,020
Dams	West Creek Dam-1 (1910)		\$5,000,000
	Roaring Creek Dam-1		\$5,000,000
	Roaring Creek Dam-2		\$5,000,000
Dams	West Creek Dam-2 (1953)		\$5,000,000

**Sources:** FEMA HAZUS-MH, local jurisdictions.

<sup>1</sup>Estimated and/or insured structural value for critical facilities and estimated values for critical infrastructure.

NA = Not Available.

### Vulnerability Analysis

The vulnerability analysis development process is discussed in Section 6.2. The results of the analysis are presented in the following hazard exposure analysis overviews. Tables B-8, B-9, and B-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table B-8. City of Clatskanie Potential Hazard Exposure Analysis Overview-Population and Buildings</b>							
<b>Hazard Type</b>	<b>Hazard Area</b>	<b>Methodology</b>	<b>Population Number</b>	<b>Buildings</b>			
				<b>Residential</b>		<b>Non-Residential</b>	
				<b>Number</b>	<b>Value (\$)<sup>1</sup></b>	<b>Number</b>	<b>Value (\$)<sup>1</sup></b>
Flood	Moderate 500-	year floodplain	--	381	41,910,000	6	unknown
	High 100-	year floodplain	--	353	38,830,000	6	unknown
Winter Storm		descriptive 1,660		792	87,120,000	unknown	unknown
Landslide	Moderate >14-32	degrees	--	725	79,750,000	5	unknown
	High >32-56	degrees	--	455	50,050,000	1	unknown
Wildland Fire	Moderate	Moderate fuel rank	--	764	84,040,000	6	unknown
	High	High fuel rank	--	735	80,850,000	5	unknown
	Very High	Very high fuel rank	--	511	56,210,000	1	unknown
	Extreme	Extreme fuel rank	--	184	20,240,000	1	unknown
Earthquake	Strong 9-20%	(g)	--	792	87,120,000	6	unknown
	Very strong	20-40% (g)	--	0		0	unknown
	Severe >40-60%	(g)	--	0		0	unknown
Volcano		descriptive	1,660	792	87,120,000	unknown	unknown
Wind		descriptive	1,660	792	87,120,000	unknown	unknown
Erosion		within 300' of potential areas of erosion	-- 178		19,580,000	2	unknown
Expansive Soils	Low <3%	percent	--	790	86,900,000	6	unknown
	Moderate 3-6	percent	--	26	2,860,000	2	unknown
	High 6-9%		--	--	--	0	unknown
	Very High	>9%	--	--	--	0	unknown
Drought		descriptive --		--	--	-- --	
Disruption of Utility and Transportation Systems		descriptive	1,660	-- --		--	--
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- 716		78,760,000	6	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	unknown unknown		unknown	unknown	unknown
Terrorism		descriptive --		--	--	-- --	
Infectious Disease Epidemic		descriptive	1,660	--	--	--	--

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$110,000 per structure).

Note-population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. 0.25-mile buffered EHS sites were unable to be determined due to the use of census block data.

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Table B-9. City of Clatskanie Potential Hazard Exposure Analysis Overview-Critical Facilities

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	6	1M	3	731K	---				4	523K
	High	100-year floodplain	7	1.2M	4	978K	---	--	--	-	7	839K
Winter Storm		Descriptive	28	27M	5	1.3M	5	4.3M	3	575K	17	5.4M
Landslide	Moderate	>14-32 degrees	7	569K	4 1.	2M	5 1.	8M	2	450K	12	2.6M
	High	>32-56 degrees	5 46	3K			3	1.5M	1 17	5K	3	1.2M
Wildland Fire	Moderate	Moderate fuel rank	12	1.6M 5		1.2M 5		1.9M 2		450K	14	2.6M
	High	High fuel rank	9 1.	2M	4 1.	2M	4 1.	8M	1	175K	11	2M
	Very High	Very high fuel rank	10	463M	1	238K	3	1.6M	1	175K	3	1.1M
	Extreme	Extreme fuel rank	-----	-----								
Earthquake	Strong	9-20% (g)	12	1.6M 5		1.2M 5		1.9M 2		450K	14	2.6M
	Very strong	20-40% (g)	-----	-----								
	Severe	>40-60% (g)	-----	-----								
Volcano	Moderate		12	1.6M 5		1.2M 5		1.9M 2		450K	14	2.6M
Wind	Moderate		12	1.6M 5		1.2M 5		1.9M 2		450K	14	2.6M
Erosion		within 300' of potential areas of erosion	4	800K	1	481K	-----				4	116K
El Nino and La Nina		Descriptive	28	27M	5	1.3M	5	4.3M	3	575K	17	5.4M
Expansive Soils	Low	<3% percent	-----	-----								
	Moderate	3-6 percent	7	1.2M	4	950K	-----				4	189K
	High	6-9%	-----	-----								
	Very High	>9%	-----	-----								
Drought		Descriptive	28	27M	5	1.3M	5	4.3M	3	575K	17	5.4M
Disruption of Utility and Transportation Systems	Descriptive		28	27M	5	1.3M	5	4.3M	3	575K	17	5.4M
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	9 1.	3M	5 1.	2M	4 1.	6M	2	450K	13	2.3M
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	8	1.4M	3	969K	5	1.9M	2	450K	11	1.4M
Terrorism		Descriptive	28	27M	5	1.3M	5	4.3M	3	575K	17	5.4M
Infectious Disease Epidemic		Descriptive	28	27M	5	1.3M	5	4.3M	3	575K	17	5.4M

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**Table B-10. City of Clatskanie Potential Hazard Exposure Analysis Overview-Critical Infrastructure**

Hazard Type	Hazard Area	Methodology	Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams	
			Miles	Value (\$)¹	Miles	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	-- -- --			--	1	14M	1	10K	13	8.6M		
	High	100-year floodplain	-- -- --			--	1	14M	1	10K	12	8.6M	2	10M
Winter Storm		descriptive	1.75	unknown	2	unknown	1	14M	1	10K	18	21M	4	20M
Landslide	Moderate >14	-32 degrees	-- -- --			--	1	14M	1	10K	10	5M	2	10M
	High	>32-56 degrees	-- -- --			-- -- --					9	4.6M	--	--
Wildland Fire	Moderate	Moderate fuel rank	-- -- --			--	1	14M	1	10K	15	12.7M	2	10M
	High	High fuel rank	--	--	--	--	1	14M	1	10K	12	12M 2		10M
	Very High	Very high fuel rank	-- -- --			-- -- --					2	4M	2	10M
	Extreme	Extreme fuel rank	-- -- --			-- -- --						-- --		--
Earthquake	Strong	9-20% (g)	2	unknown 1		unknown 1		14M	1	10K	15	12.7M	2	10M
	Very strong	20-40% (g)	-- -- --			-- -- --						-- --		--
	Severe	>40-60% (g)	-- -- --			-- -- --						-- --		--
Volcano	Moderate		2	unknown 1		unknown 1		14M	1	10K	15	12.7	2	10M
Wind	Moderate		2	unknown 1		unknown 1		14M	1	10K	15	12.7	2	10M
Erosion		within 300' of potential areas of erosion	-- -- --			--	1	14M	1	10K	9	7.9M	--	--
El Nino and La Nina		descriptive	1.75	unknown	2	unknown	1	14M	1	10K	18	21M	4	20M
Expansive Soils	Low	<3% percent	-- -- --			-- -- --						-- --		--
	Moderate	3-6 percent	-- -- --			--	1	14M	1	10K	11	8.6M	2	10K
	High	6-9%	-- -- --			-- -- --						-- --		--
	Very High	>9%	-- -- --			-- -- --						-- --		--
Drought		descriptive	1.75	unknown	2	unknown	1	14M	1	10K	18	21M	4	20M
Disruption of Utility and Transportation Systems	descri	ptive	1.75	unknown	2	unknown	1	14M	1	10K	18	21M	4	20M
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- -- --			-- -- --			1	10K	13	8.6M	--	--
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	2 un	known	1	unknown	--	--	1	10K	11	12M	--	--
Terrorism		descriptive	1.75	unknown	2	unknown	1	14M	1	10K	18	21M	4	20M
Infectious Disease Epidemic		descriptive	1.75	unknown	2	unknown	1	14M	1	10K	18	21M	4	20M

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section provides a summary of the City of Clatskanie's vulnerabilities and impacts from natural hazards in addition to the identified technological and manmade hazards in the 2009 Columbia County MHMP.

### **SUMMARY OF HAZARD VULNERABILITY AND IMPACTS**

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

#### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for the City of Clatskanie. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

There are 353 residential structures (worth \$38.8M), six non-residential structures (value unknown), seven government facilities (worth \$1.2M), four emergency response facilities (worth \$948K), seven community facilities (worth \$839K), one bridge (worth \$14M), one transportation facility (worth \$10K), two dams (worth \$10M) and 12 utilities (worth \$8.6M) within the boundaries of the 100-year floodplain.

There are 381 residential structures (worth \$ 41.9M), six non-residential structures (value unknown), six government facilities (worth \$1M), 3 emergency response facilities (worth \$731K), four community facilities (worth \$523K), one bridge (worth \$14M), one transportation facilities (worth \$10K), and 13 utilities (worth \$8.6M) within the 500-year floodplain.

#### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind and floods, are often widespread. A single event is capable of impacting all people, critical facilities and infrastructure within the City of Clatskanie, and therefore the entire population (1,660 people), including 792 residential structures (worth \$87.1M), 12 government facilities (worth \$1.6M), five emergency response facilities (worth \$1.2M), five educational facilities (worth \$1.9M), two care facilities (worth \$450K), 14 community facilities (worth \$2.6M), two highways (values unknown), one railroad (value unknown), one bridge (worth \$14M), one ground and air facility (worth \$10K), 15 utilities (worth \$12.7M), and two dams (worth \$10M) are at risk.

#### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation and rail routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points.

Initial debris clearing from emergency routes and high traffic areas may be required. Water and waste water utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within the City of Clatskanie. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

There are 725 residential structures (worth \$79.8M), five non-residential structures (value unknown), seven government facilities (worth \$569K), four emergency response facilities (worth \$1.2M), five educational facilities (worth \$1.8M), two care facilities (worth \$450K), 12 community facilities (worth \$2.6M), one bridge (worth \$14M), one transportation facility (worth \$10K), two dams (worth \$10M) and ten utilities (worth \$5M) are in the moderate landslide risk area.

There are 455 residential structures (worth \$50M), one non-residential structures (value unknown), five government facilities (worth \$463K), three educational facilities (worth \$1.5M), one care facility (worth \$175K), three community facilities (worth \$1.2M) and nine utilities (worth \$4.6M) are in the high landslide risk area.

### ***Wildland Fires***

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

There are 764 residential structures (worth \$84M), six non-residential structures (value unknown), 12 government facilities (worth \$1.6M), five emergency response facilities (worth \$1.2M), five educational facilities (worth \$1.9M), two care facilities (worth \$450K), 14 community facilities (worth \$2.6M), one bridge (worth \$14M), one transportation facility (worth \$10K), 15 utilities (worth \$12.7M), and two dams (worth \$10M) are located in moderate fire risk areas.

There are 735 residential structures (worth \$80.9M), five non-residential structures (value unknown), nine government facilities (worth \$1.2M), four emergency response facilities (worth \$1.2M), four educational facilities (worth \$1.8M), one care facility (worth \$175K), 11 community facilities (worth \$2M), one bridge (worth \$14M), one transportation facility (worth \$10K), 12 utilities (worth \$12M), and two dams (worth \$10M) are located in the high fire risk areas.

There are 511 residential structures (worth \$56.2M), one non-residential structures (value unknown), five government facilities (worth \$463K), one emergency response facility (worth \$238K), three educational facilities (value \$1.6M), one care facility (worth \$175K), three community facilities (worth \$1.1M), two dams (worth \$10M) and two utilities (worth \$4M) are located in very high fire risk areas.

There are 184 residential structures (worth \$20.2M), one non-residential structures (value unknown), and no critical facilities located in the extreme fire risk area.

### ***Earthquake***

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslide, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

All people, critical facilities and infrastructure within the City of Clatskanie, and therefore the entire population (1,660 people), including 792 residential structures (worth \$87.1M), six non-residential structures (value unknown), 12 government facilities (worth \$1.6M), five emergency response facilities (worth \$1.2M), five educational facilities (worth \$1.9M), two care facilities (worth \$450K), 14 community facilities (worth \$2.6M), two highways (values unknown), one railroad (value unknown), one bridge (worth \$14M), one transportation facility (worth \$10K), 15 utilities (worth \$12.7M), and two dams (worth \$10M) are located in the strong shaking (9-20 percent) area.

### ***Volcano***

A volcanic eruption would have a minor impact on the City of Clatskanie due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006)

The City of Clatskanie will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies.

Buildings, streets, and roads throughout the city may require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services. Water treatment facilities may require additional attention to address high turbidity water. Injuries associated with respiratory problems may result. (Goettel 2005)

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within the City of Clatskanie are at risk including the entire population (1,660 people), 792

residential structures (worth \$87.1M), 12 government facilities (worth \$1.6M), five emergency response facilities (worth \$1.2M), five educational facilities (worth \$1.9M), two care facilities (worth \$450K), 14 community facilities (worth \$2.6M), two highways (values unknown), one railroad (value unknown), one bridge (worth \$14M), one transportation facility (worth \$10K), 15 utilities (worth \$12.7M), and two dams (worth \$10M).

### ***Wind***

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within the City of Clatskanie are equally at risk of a windstorm event including all people, critical facilities and infrastructure, and therefore the entire population (1,660 people), including 792 residential structures (worth \$87.1M), 12 government facilities (worth \$1.6M), five emergency response facilities (worth \$1.2M), five educational facilities (worth \$1.9M), two care facilities (worth \$450K), 14 community facilities (worth \$2.6M), two highways (values unknown), one railroad (value unknown), one bridge (worth \$14M), one transportation facility (worth \$10K), 15 utilities (worth \$12.7M), and two dams (worth \$10M).

### ***Erosion***

Riverine erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available, however, descriptions of several localized areas were identified during the development of this document and are identified only by location on a map referencing the river or stream reach described. Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

There are 178 residential structures (worth \$19.6M), two non-residential structures (value unknown), four government facilities (worth \$800K), one emergency response facility (worth \$481K), four community facilities (worth \$116K), one transportation facility (worth \$10K), one bridge (worth \$14M), and nine utilities (worth \$7.9M) identified in the City of Clatskanie to be at risk from erosion impacts.

### ***Expansive Soils***

Shrinking and swelling soils can lead to damaged foundations and structures. The most common damage includes cracking and loss of integrity of building foundations and walls of residential and light (one-or two-story) buildings, highways, canal and reservoir linings, and retaining walls. (PCCDD 2006, US Army 1983)

Using NRCS soils data, risk for shrink-swell potential was calculated using the linear extensibility of moderate (3-6 percent), high (6-9 percent), and very high (greater than 9 percent).

There are 790 residential structures (worth \$86.9M) and six non-residential structures (value unknown) located in the expansive soils low risk area.



There are 26 residential structures (worth \$2.9M), two non-residential structures (value unknown), seven government facilities (worth \$1.2M), four emergency response facilities (worth \$950K), four community facilities (worth \$189K), one bridge (worth \$14M), one transportation facility (worth \$10K), 11 utilities (worth \$8.6M) and two dams (worth \$10M) identified in the expansive soils moderate risk area.

### ***Drought***

State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks are present to humans and resources. Agriculture, fishing, and timber have historically been impacted, as well as local and regional economies.

### ***Disruption of Utility and Transportation Systems***

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

### ***Hazardous Material Event***

The National Response Center and the EPA's Environmental Facts Multi-system Query were used to locate hazardous waste handling facilities and businesses that generate hazardous waste from their activities. Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 mile radius of those are considered at risk.

There are 716 residential structures (worth \$78.8M), six non-residential structures (value unknown), nine government facilities (worth \$1.3M), five emergency response facilities (worth \$1.2M), four educational facilities (worth \$1.6M), two care facilities (worth \$450K), 13 community facilities (worth \$2.3M), two highways (values unknown), one railroad (values unknown), one bridge (worth \$14M), one transportation facility (worth \$10K), and 13 utilities (worth \$8.6M) located within 0.25 mile from a transportation route and may be at risk from a hazardous material event.

Facilities considered at risk near 0.25 mile-buffered EHS Sites include eight government facilities (worth \$1.4M), three emergency response facilities (worth \$969K), five educational facilities (worth \$1.9M), two care facilities (worth \$450K), 11 community facilities (worth \$1.4M), two highways (values unknown), one railroad (values unknown), one transportation facility (worth \$10K), and 11 utilities (worth \$12M).

### ***Terrorism***

It is difficult to determine the scope of any terrorist threat to the City of Clatskanie. Although there seem to be several high-profile targets present, it is impossible to predict future terrorist events. Depending on the extent of the action, the community may suffer economic loss,

disruption of utilities, and cleanup relating to explosions and other facility damages. Structural damage, injuries or casualties may occur, however, it is beyond the scope of this analysis to estimate losses.

### ***Infectious Disease Epidemic***

The consequences of a pandemic as described in Chapter 5 could be devastating. In the event of a poor-fit vaccine or very limited vaccine supply, the public health measures that would work best include: isolation and quarantine; restricting movement between and within communities; prohibiting public gatherings and group activities; and closing schools.

The county and state have isolation and quarantine laws; cities can also apply quarantines and restrict public movement in a public health emergency. The recently passed public health emergency law in Oregon provides a process for such mechanisms to be implemented. (L. Rivers, personal communication; K. Ladd, personal communication)

Impacts associated with infectious disease epidemics in general have the potential to include loss of life and shutdown of critical facilities. Furthermore, an epidemic level of infectious disease in the community could overwhelm local resources, although there are no structural risks or losses associated with this hazard. The entire population of 1,660 is at risk from the effects of an infectious disease epidemic.

## **MITIGATION STRATEGY**

### **IDENTIFYING MITIGATION ACTIONS**

The following section defines mitigation action identification and analysis as stipulated in DMA 2000 and its implementing regulations.

#### **DMA 2000 Requirements: Mitigation Strategy-Identification and Analysis of Mitigation Actions**

##### **Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

##### **Element**

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

The Steering Committee assessed whether to adopt Columbia County’s mitigation goals listed in Table B-11, or to revise them to more fully meet the City’s needs. The City then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals.

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table B-12 depicts the City’s “considered” mitigation actions developed during this

mitigation planning process. The revised list in Table B-14 delineates those actions the City will strive to implement within this five year planning cycle.

**DMA 2000 Requirements: Mitigation Strategy-National Flood Insurance Program (NFIP) Compliance**

**National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Element**

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

The City of Clatskanie actively participates in FEMA's National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City's Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized City appropriate actions to assure an effective flood mitigation program.

**MITIGATION GOALS AND ACTION ITEMS CONSIDERED**

<b>Table B-11. 2006 Columbia County Mitigation Goals-Considered</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	Reduce the threat to life safety
2	Protect critical facilities and enhance emergency and essential services.
3	Reduce the threat to property.
4	Create a disaster resistant and disaster resilient economy.
5	Increase public awareness, education, outreach, and partnerships.

<b>Table B-12. 2008 City of Clatskanie Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
<b>Natural Hazards</b>			
<i>Multi-Hazard</i>			
Multi-Hazard Ongoing			Develop and incorporate building ordinances commensurate with building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.
Multi-Hazard Consi	der		Review ordinances and develop outreach programs to assure mobile homes and manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods as applicable)
Multi-Hazard Consi	der		Review and develop outreach programs to assure fuel oil and propane tanks are properly anchored and hazardous materials are properly stored and protected from known natural hazards such as seismic or flooding events.
Multi-Hazard Ongoing			Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
Multi-Hazard Ongoing			Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
Multi-Hazard Consi	der		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load and wind storm power line failure during severe wind or winter ice storm events.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
Multi-Hazard Ongoing			Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)
Multi-Hazard Ongoing			Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
Multi-Hazard Ongoing			Explore the need for, develop, and implement hazard zoning ordinances for high-risk hazard area land-use.
Multi-Hazard Ongoing			Based on known high-risk hazard areas, identify hazard-specific signage needs and purchase and install hazard warning signs near these areas to notify and educate the public of potential hazards.
Multi-Hazard Ongoing			Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
Multi-Hazard Ongoing			Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
Multi-Hazard Consi	der		Develop vegetation projects to restore clear cut and riverine erosion damage and to increase landslide susceptible slope stability.
Multi-Hazard Consi	der		Retrofit structures to protect them from seismic, floods, high winds, earthquakes, or other natural hazards.
Multi-Hazard Consi	der		Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
Multi-Hazard Consi	der		Harden utility headers located along river embankments to mitigate potential flood, debris, and erosion damages.
Multi-Hazard Consi	der		Establish a formal role for the jurisdictional Hazard Mitigation Planning Committees to develop a sustainable process to implement, monitor, and evaluate citywide mitigation actions.
Multi-Hazard	Consider		Identify and pursue funding opportunities to implement mitigation actions.
Multi-Hazard	Consider		Develop public and private sector partnerships to foster hazard mitigation activities.
Multi-Hazard Consi	der		Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
<i>Flood</i>			
Flood C	onsider		Develop and maintain GIS mapped critical facility inventory for all structures located within 100-year and 500-year floodplains.
Flood C	onsider		Develop and maintain GIS mapped inventory, and develop prioritized list of residential and commercial buildings within 100-year and 500-year floodplains.
Flood C	onsider		Develop and maintain GIS mapped inventory of repetitive loss properties to include the types and numbers of properties.
Flood	On-going		Develop and implement mitigation actions for repetitive loss properties.
Flood On	-going		Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data.
Flood On	-going		Implement mitigation measures identified by critical facilities' owners, and other facility owners, to protect facilities located within the 100-year floodplain.
Flood C	onsider		Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data.
Flood C	onsider		Request DOGAMI debris flow and lahar data be included in FIRM updates. Use the updated FIRMS for land use and mitigation planning.
Flood On	-going		Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.
Flood C	onsider		Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.
Flood	On-going		Develop, implement, and enforce floodplain management ordinances.
Flood	Consider		Acquire, relocate, elevate, or otherwise flood-proof identified properties.
Flood	Consider		Acquire, relocate, elevate, or otherwise flood-proof critical facilities.
Flood	On-going		Install new streamflow and precipitation measuring gauges.
Flood On	-going		Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.
Flood On	-going		Construct earthen berms to divert flood flows into bridge or culvert openings. The earth fill should be erosion-resistant and the berms should be covered with erosion-resistant fabric, armoring materials, or vegetation.
Flood	On-going		Increase culvert size to increase its drainage efficiency.
Flood C	onsider		Construct debris basins to retain debris in order to prevent downstream drainage structure clogging.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
Flood C	onsider		Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings. Water ultimately returning to its watercourse at a reduced flow rate.
Flood C	onsider		Install triangular or circular flow deflectors on or immediately upstream from bridge footings to deflect water flow and reduce flow velocities preventing footing scour.
Flood On	-going		Construct low water crossings in a road prism to carry flood flows from an intermittent drainage
Flood	Consider		Construct a high water overflow crossing to carry flood flows from over bank areas.
Flood C	onsider		Realign bridge piers & abutments to be parallel with the stream's centerline. This prevents pier and abutment undermining and reduces debris catchment.
Flood On	-going		Create relief drainage ditch opening using a culvert, bridge, or multiple culverts; to relieve rapid water accumulation during high water flow events. .
Flood On	-going		Raise bridge height or convert bridge from a multi-span to single span to increase water flow and reduce debris catchment.
Flood C	onsider		Construct spur dikes along the embankments to direct flood flows into a bridge opening or On-going away from a continuous impact site.
Flood On	-going		Construct concrete wing walls at culvert or bridge entrances and outlets to direct water flow into their openings
Flood C	onsider		Provide flood protection to mitigate damage and contamination of wastewater treatment systems.
Flood On	-going		Develop and implement flood risk reduction program and outreach efforts considering upstream storage, channel improvements, including dredging.
Flood C	onsider		Evaluate the adequacy of dike systems for both floods and earthquakes and implement mitigation measures as necessary.
Flood C	onsider		Construct permanent berm along same section of the Clatskanie River along Conyers Street top prevent area flooding during high-water/flood events.
<b>Winter Storm</b>			
Winter Storms	Consider		Develop and implement strategies and educational outreach programs for debris management from severe winter storms.
Winter Storms	On-going		Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.
Winter Storms	On-going		Update or develop, implement, and maintain jurisdictional debris management plans.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
Winter Storms	On-going		Develop critical facility list needing emergency back-up power systems, prioritize, seek funding and implement mitigation actions.
Winter Storms	On-going		Develop and maintain severe winter storm public outreach program defining mitigation activity benefits through educational outreach aimed at households and businesses while targeting of special needs populations.
Winter Storms	Consider		Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.
Winter Storms	On-going		Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or On-going eliminate power outages from severe winter storms. Consider developing incentive programs.
Winter Storms	On-going		Develop personal use and educational outreach training for a “safe tree harvesting” program. Implement along utility and road corridors, preventing potential winter storm damage.
Winter Storms	On-going		Purchase NOAA Weather radios and develop a web portal linking residents to various weather information sites. (NWS, FEMA, The Weather Channel).
Winter Storms	On-going		Install new streamflow and precipitation measuring gauges and develop monitoring and early warning program.
Winter Storms	Consider		Develop outreach program with school district contests having students develop, display, and explain mitigation projects or initiatives.
Winter Storms	On-going		Develop early warning test program partnering with NOAA, City Police, Fire Departments, and Volunteer Fire Department to coordinate tests.
Winter Storms	On-going		Implement and enforce the most current Uniform International, and State, Building Codes to ensure structures can withstand winter storm hazards such as high winds, rain, water and snow.
Winter Storms	On-going		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line severe wind or winter ice storm event failure.
Winter Storms	Consider		Review critical facilities and government building energy efficiency, winter readiness, and electrical protection capability. Identify, prioritize, and implement infrastructure upgrade or rehabilitation project prioritization and development.
<b><i>Landslide</i></b>			
Landslide Consi	der		Complete a landslide location inventory, identify threatened critical facilities and other buildings and infrastructure.
Landslide Consi	der		Develop prioritized list of mitigation actions for threatened critical facilities and other buildings or infrastructure.



**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
Landslide On	-going		Develop process to limit future development in high landslide potential areas (permitting, geotechnical review, soil stabilization techniques, etc).
Landslide Consi	der		Update the storm water management plan to include regulations to control runoff, both for flood reduction and to minimize saturated soils on steep slopes that can cause landslides.
Landslide	On-going		Develop comprehensive geological landslide and rockslide prone area maps.
Landslide On	-going		Develop a vegetation management plan addressing slope-stabilizing root strength while facilitating precipitation containment.
Landslide	On-going		Identify and seasonally restrict recreational and construction activities in high landslide areas.
Landslide Consi	der		Develop, implement and enforce property development landslide risk assessment procedures to identify potential facility vulnerability.
<b><i>Wildland Fire</i></b>			
Wildland Fire	Consider		Identify critical facilities and vulnerable populations based on mapped high hazard areas.
Wildland Fire	On-going		Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
Wildland Fire	On-going		Develop Community Wildland Fire Protection Plans for all at-risk communities.
Wildland Fire	Consider		Provide real-time internet access and interagency cooperation to decrease wildland fire warning times.
Wildland Fire	Consider		Hold FireWise workshop to educate residents and contractors concerning fire resistant landscaping.
Wildland Fire	Consider		Promote FireWise building siting, design, and construction materials.
Wildland Fire	Consider		Retrofit structures with FireWise building design materials.
Wildland Fire	Consider		Develop FireWise Public Service Announcements (PSA).
Wildland Fire	Consider		Provide wildland fire information in an easily distributed format for all residents.
Wildland Fire	Consider		Schedule and perform government facility "fire drills" at least twice per year.
Wildland Fire	Consider		Conduct residential audits for wildland and building fire hazard identification then develop an outreach program to convey the findings.
Wildland Fire	On-going		Develop, adopt, and enforce burn ordinances that require burn permits, restrict campfires, and controls outdoor burning.
Wildland Fire	Consider		Develop outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
<i>Earthquake</i>			
Earthquake C	onsider		Supplement State Seismic Needs Analysis data (schools, fire, law enforcement). Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.
Earthquake On	-going		Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.
Earthquake On	-going		Retrofit important public facilities with significant seismic vulnerabilities, such as unreinforced masonry construction.
Earthquake	On-going		Retrofit bridges that are not seismically adequate for lifeline transportation routes.
Earthquake	On-going		Update existing (or adopt the most current) Uniform Building Code
Earthquake	On-going		Implement and enforce the Uniform, International, and State Building Codes.
Earthquake	On-going		Inspect and/or certify all new construction.
Earthquake C	onsider		Develop public outreach program to train earthquake safety; perform drop-cover-hold drills at schools and public facilities.
Earthquake C	onsider		Develop outreach program to educate population concerning household, business, and public facility mitigation measures. For example, staff public information tables at fairs, safety events, and festivals.
Earthquake C	onsider		Develop outreach program to educate residents concerning benefits of increased seismic resistance and modern building code compliance during rehabilitation or major repairs for residences or businesses.
Earthquake C	onsider		Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current Building Codes.
Earthquake C	onsider		Identify and prioritize a list of critical facilities with unreinforced masonry problems including non-structural projects such as brick chimney bracing or replacement, water heater bracing, and anchoring, etc.
Earthquake C	onsider		Evaluate critical public facility seismic performance for fire stations, public works buildings, potable water systems, wastewater systems, electric power systems, and bridges within the jurisdiction.
Earthquake C	onsider		Develop outreach program for educating private facilities concerning alternative or emergency power source acquisition to enable them to deliver food, fuel, and medical services during disaster emergency response and recovery efforts.
Earthquake On	-going		Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
Earthquake On	-going		Develop partnerships to mitigate hazards that result in jurisdictional facility lifeline or emergency transportation route closures.
<b><i>Volcano</i></b>			
Volcano On	-going		Update public emergency notification procedures and develop an outreach program for ash fall events.
Volcano C	onsider		Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.
Volcano C	onsider		Evaluate capability of water treatment plants to deal with high turbidity from ash falls, update emergency response plans, and upgrade treatment facilities' physical plant to deal with ash falls. Prioritize and initiate actions to fill capability gaps.
Volcano	Consider		Evaluate ash impact on storm water drainage system and develop mitigation actions.
<b><i>Wind</i></b>			
Wind On	-going		Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable)
Wind On	-going		Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.
Wind On	-going		Revise requirements to place utilities underground to reduce power disruption from wind storm / tree blow down damage when upgrading or during new development.
Wind On	-going		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line failure during severe wind or winter ice storm events.
<b><i>Erosion</i></b>			
Erosion On	-going		Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.
Erosion			Relocate buildings that are at risk of being affected by erosion.
Erosion	On-going		Apply for grants/funds to implement riverbank protection methods.
Erosion On	-going		Hold series of community meetings and other outreach efforts to provide erosion hazard specific information to residents.
Erosion C	onsider		Develop and provide information to all residents on riverbank erosion and methods to prevent it in an easily distributed format
Erosion On	-going		Install riprap, or pilings to harden or "armor" a stream bank where severe erosion occurs.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
Erosion On	-going		Install bank protection such as rock, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection.
Erosion On	-going		Develop outreach program to educate the public concerning planting processes and materials used to stabilize hill slopes or stream banks. This is known as bio-engineering, which uses logs, root wads, or wood debris or other vegetation to reduce scour and erosion.
Erosion On	-going		Install embankment protection such as vegetation, riprap, gabion baskets, sheet piling, and walls to reduce or eliminate erosion.
Erosion On	-going		Install walls at the end of a drainage structure to prevent embankment erosion at its entrance or outlet (end walls).
Erosion On	-going		Install flared outlets or end sections at culvert entrances and outlets to match the embankment slope to reduce erosion and scour at the entrance and exit points during high flow.
Erosion C	onsider		Install flow diverters a short distance into a water body, tied into the bank, to protect from erosion at their end. Designed to redirect water flow away from embankments.
Erosion C	onsider		Install channel lining using pipe, rock, concrete, or asphalt to reduce scouring embankments and ditch bottom erosion.
Erosion	Consider		Install bank revetment protection to prevent erosion.
Erosion C	onsider		Shore up or install pilings along Clatskanie River bank that runs parallel to Conyers Street in downtown section to prevent erosion of river bank leading to erosion of material under the street itself.
<b><i>Expansive Soil</i></b>			
Expansive Soils	Consider		Review construction codes to require non-absorbent fill soils that slope away from foundations for a minimum of five feet to prevent ponding and water retention.
Expansive Soils	On-going		Require building design, engineering, and construction processes that address expansive soil conditions at potentially affected building sites.
Expansive Soils	Consider		Plant trees a distance equal to their mature height away from a structure built on expansive soils. Minimum distance from foundation is 15 feet.
Expansive Soils	On-going		Require road design, engineering, and construction processes that address expansive soil conditions. Water absorption prevention, impermeable membrane, soil compaction, and drainage methods need to be considered once geologic studies determine soil composition.
<b><i>Disruption of Utility and Transport Systems (DUTS)</i></b>			
DUTS	On-going		Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.
DUTS	On-going		Review and update emergency response plans for utility disruptions.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
DUTS	On-going		Review and update emergency response plans for transportation route disruptions.
DUTS	Consider		Identify and prioritize all “jurisdiction owned” & “non-jurisdiction owned” critical facilities that have backup power and emergency operations plans.
<b><i>Hazardous Materials (HAZMAT)</i></b>			
HAZMAT On	-going		Annually review and update HAZMAT inventories and ensure that emergency responders are trained for site-specific incidents.
HAZMAT On	-going		Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.
HAZMAT On	-going		Evaluate existing security measures for sites with large quantities of hazardous substances (HS) or any quantities of extremely hazardous substances (EHS) and enhance security as necessary.
HAZMAT Consi	der		Evaluate seismic bracing/anchoring for sites with large quantities of HS or any quantities of EHS.
HAZMAT	On-going		Train Public Works staff to identify EHS and to follow EMS protocols.
HAZMAT On	-going		Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.
HAZMAT On	-going		Research, develop, and implement methods to protect waterways from hazardous materials events.
HAZMAT On	-going		Prepare a site-specific summary of hazardous materials used, stored, and commonly transported in the jurisdictional area. The summary should include mapped facility locations with a hazardous materials inventory, emergency response protocols, and mitigation actions.
<b><i>Terrorism</i></b>			
Terrorism On	-going		Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.
Terrorism On	-going		Upgrade physical security, detection, and response capability for critical facilities using information obtained from hazard assessments and risk analysis. Include water systems and any high-profile facilities such as major timber industry facilities and sites with large quantities of hazardous substances (HS) and extremely hazardous substances (EHS).
<b><i>Infectious Disease Epidemic (IDE)</i></b>			
IDE On	-going		Develop a public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.

**Table B-12. 2008 City of Clatskanie Mitigation Actions Considered**

Hazard	Status	Comment	Description
IDE On	-going		Identify sectors of the population that are vulnerable to potential infectious diseases and develop strategies to communicate and serve those identified populations.
IDE On	-going		Determine public health authorities and responsibilities during disaster and emergency situations, e.g., quarantine, shelter hygiene, public sanitation, and immunization.
IDE On	-going		Research and obtain necessary specialized training for public health officials to respond to an infectious disease epidemic.
IDE On	-going		Identify state and federal resources for establishing and improving public health response capacity.
IDE	On-going		Identify appropriate manpower to respond to an infectious disease epidemic.
IDE	On-going		Establish a detection and information dissemination system for infectious disease epidemic.

## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

### DMA 2000 Requirements: Mitigation Strategy-Implementation of Mitigation Actions

#### Implementation of Mitigation Actions

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

#### Element

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on October 23, 2008 to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the Mitigation Action Plan. The Committee also determined the responsible agency and potential funding sources. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities.

The City of Clatskanie Steering Committee evaluated the Benefit-Cost Analysis Fact Sheet (Appendix N) for prioritizing its “considered” mitigation actions listed in Table B-12. The Steering Committee determined that the committee consisted of sufficient expertise to select those mitigation actions that would most benefit the City without using the STAPLE-E evaluation tool. Upon review, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for the City and responsible entities to implement during the 5-year lifespan of this version of the HMP. As such, the Steering Committee determined that only the mitigation actions that received a high priority ranking would be included in the City’s Mitigation Action Plan. Table B-14 depicts the City’s highest priority mitigation actions grouped by hazard and in descending priority order within each hazard.

## MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED

The City of Clatskanie reviewed the Columbia County goals, determined they meet their needs, and adopted the goals in Table B-13 for the current planning period.

<b>Table B-13. City of Clatskanie Mitigation Goals</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	Reduce the threat to life safety
2	Protect critical facilities and enhance emergency and essential services.
3	Reduce the threat to property.
4	Create a disaster resistant and disaster resilient economy.
5	Increase public awareness, education, outreach, and partnerships.

## IMPLEMENTING A MITIGATION ACTION PLAN

### DMA 2000 Requirements: Mitigation Strategy-Identification of Multi-Jurisdictional Mitigation Actions

#### Identification of Multi-Jurisdictional Mitigation Actions

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

#### Element

- Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?
- Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

This appendix identifies action items specific to the City of Clatskanie. Since the update includes incorporation of the City of Clatskanie as part of the MHMP, all actions in this appendix are considered new.



Table B-14 displays the City of Clatskanie’s Mitigation Action Plan matrix that lists mitigation actions by hazard and are only prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity with potential funding sources identified.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

<b>Table B-14. City of Clatskanie Mitigation Action Plan Matrix</b>						
<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
<b>Natural Hazards</b>						
<i>Multi-Hazard</i>						
MH	Review ordinances and develop outreach programs to assure mobile homes and manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods are applicable)	Greg Hinkelman/City Manager	0-2 years	General Fund	BC: TBD TF: Yes	
MH	Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use transportation plans, etc. to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.	Greg Hinkelman/ City Manager Mark Barnes/Land Use Planning Consultant	0-2 years	General Fund	BC: TBD TF: Yes	
MH	Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)	Dave True/Public Works	0-4 years	Grant Tim. Fund	BC: TBD TF: Yes	
MH	Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.	Greg Hinkelman/City Manager	0-2 years	Grant	BC: TBD TF: Yes	Use of Citizen Corps

**Table B-14. City of Clatskanie Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
MH	Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning.	Greg Hinkelman/City Manager	0-3 years	Grant	BC: TBD TF: Yes	
<b><i>Flood</i></b>						
Flood	Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100-year and 500-year floodplains.	Dave True/Public Works	0-3 years	General Fund	BC: TBD TF: Yes	
Flood	Request DOGAMI debris flow and lahar data be included in FIRM updates. Use the updated FIRMS for land use and mitigation planning.	Greg Hinkelman/City Manager	0-4 years	General Fund	BC: TBD TF: Yes	
Flood	Develop, implement and enforce floodplain management ordinances.	Greg Hinkelman/City Manager	0-2 years	General Fund	BC: TBD TF: Yes	
Flood	Develop or revise, adopt, and enforce storm water ordinances and regulations to manage runoff from new development, including buffers and retention basins.	Greg Hinkelman/City Manager Dave True/Public Works	0-3 years	General Fund	BC: TBD TF: Yes	
Flood	Provide Flood protection to mitigate damage and contamination of wastewater treatment systems.	Dave True/Public Works	0-3 years	Capital Improvements	BC: TBD TF: Yes	
Flood	Construct permanent berm along same section of the Clatskanie River along Conyers Street to prevent area flooding during high-water flood events.	City of Clatskanie, Public Works	0-3 years	FEMA 404 Grant	BC: TBD TF: Yes	
<b><i>Winter Storms</i></b>						
Winter Storms	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.	Dave True/Public Works	0-4 years	Grant	BC: TBD TF: Yes	

**Table B-14. City of Clatskanie Mitigation Action Plan Matrix**

<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
Winter Storms	Update or develop, implement, and maintain jurisdictional debris management plans.	Dave True/Public Works	0-4 years	Grant	BC: TBD TF: Yes	
Winter Storms	Develop critical facility list needing emergency back-up power systems, prioritize, seek funding, and implement mitigation actions.	Greg Hinkelman/City Manager	0-3 years	Grant	BC: TBD TF: Yes	
Winter Storms	Develop and maintain severe winter storm public outreach program defining mitigation activity benefits through educational outreach aimed at households and businesses while targeting special needs populations.	Greg Hinkelman/City Manager	0-5 years	Grant	BC: TBD TF: Yes	
Winter Storms	Purchase NOAA weather radios and develop a web portal linking residents to various weather information sites. (NWS, FEMA, The Weather channel).	Greg Hinkelman/City Manager	0-5 years	Grant	BC: TBD TF: Yes	Citizen Corps
Winter Storms	Develop early warning test program partnering with NOAA, City Police, Fire Departments, and Volunteer Fire Department to coordinate tests.	Greg Hinkelman/City Manager	0-4 years	General Fund	BC: TBD TF: Yes	
<b>Landslide</b>						
Landslide	Develop process to limit future development in high landslide potential areas (permitting, geotechnical review, soil stabilization techniques, etc.).	Greg Hinkelman/City Manager	0-5 years	General Fund	BC: TBD TF: Yes	
<b>Wildland Fires</b>						
Wildland Fire	Identify evacuation routes away from hazard areas and develop outreach program to educate the public concerning warnings and evaluation procedures.	Greg Hinkelman Dave True/Public Works	0-3 years	General Fund	BC: TBD TF: Yes	Jurisdiction of Clatskanie Rural Fire Protection District

**Table B-14. City of Clatskanie Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b><i>Earthquake</i></b>						
Earth Quake	Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit projects.	Greg Hinkelman/City Manager	0-2 years	General Fund	BC: TBD TF: Yes	
Earth Quake	Inspect and/or certify all new construction.	Greg Hinkelman/City Manager	0-1 year	General Fund	BC: TBD TF: Yes	Currently implemented.
Earth Quake	Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.	Dave True/Public Works	0-4 years	General Fund	BC: TBD TF: Yes	
<b><i>Volcano</i></b>						
Volcano	Update public emergency notification procedures and develop and outreach program for ash fall events.	Police Department	0-2 years	General Fund	BC: TBD TF: Yes	
<b><i>Wind</i></b>						
Wind	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm/tree blow down damage.	Dave True/Public Works	0-4 years	Capital Improvements	BC: TBD TF: Yes	
<b><i>Erosion</i></b>						
Erosion	Apply for grants/funds to implement riverbank protection methods.	Greg Hinkelman/City Manager Dave True/Public Works	0-5 years	Grant	BC: TBD TF: Yes	
Erosion	Shore up or install pilings along Clatskanie River bank that runs parallel to Conyers Street in downtown section to prevent erosion of river bank leading to erosion of material under the street itself	City of Clatskanie/Public Works	0-3 years	FEMA 404 Grant	BC: TBD TF: Yes	

**Table B-14. City of Clatskanie Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b><i>Expansive Soils</i></b>						
Expansive Soils	Review construction codes to require non-absorbent fill soils that slope away from foundations for a minimum of five feet to prevent ponding and water retention.	Greg Hinkelman/City Manager Dave True/Public Works	0-2 years	Grant	BC: TBD TF: Yes	
Expansive Soils	Require building design, engineering, and construction processes that address expansive soil conditions at potentially affected building sites.	Greg Hinkelman/City Manager Dave True/Public Works	0-3 years	General Fund	BC: TBD TF: Yes	Through City Council Action
<b>Manmade and Technological Hazards</b>						
<b><i>Disruption of Utilities and Transportation Systems (DUTS)</i></b>						
DUTS	Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.	Greg Hinkelman/City Manager	0-2 years	General Fund	BC: TBD TF: Yes	Citizen Corps
DUTS	Review and update emergency response plans for utility disruptions.	Greg Hinkelman/City Manager	0-2 years	General Fund	BC: TBD TF: Yes	Through 72-hour Emergency Plan
<b><i>Hazardous Materials (HAZMAT)</i></b>						
HAZMAT	Annually review and update HAZMAT inventories and ensure that emergency responders are trained for site-specific incidents.	Dave True/Public Works	0-3 years	General Fund	BC: TBD TF: Yes	
HAZMAT	Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.	Dave True/Public Works	0-3 years	General Fund	BC: TBD TF: Yes	

**Table B-14. City of Clatskanie Mitigation Action Plan Matrix**

<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
HAZMAT	Train public Works staff to identify extremely hazardous substances (EHS) and to follow EMS protocols.	Dave True/Public Works	0-5 years	Grant/General Fund	BC: TBD TF: Yes	
<b><i>Terrorism</i></b>						
Terrorism	Upgrade physical security, detection, and response capability for critical facilities using information obtained from hazard assessments and risk analysis. Include water systems and any high-profile facilities, such as major timber industry facilities and sites with large quantities of hazardous substances (HS) and extremely hazardous substances (EHS).	Dave True/Public Works	0-5 years	Grant	BC: TBD TF: Yes	
<b><i>Infectious Disease Epidemic</i></b>						
Infectious Disease Epidemic	Establish a detection and information dissemination system for infectious disease epidemic.	Greg Hinkelman/City Manager	0-1 year	Grant	BC: TBD TF: Yes	With County Public Health

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**Appendix C**  
**Columbia City**

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This Appendix contains specific Columbia City information to support the Columbia County 2009 Multi-Jurisdictional Hazard Mitigation Plan update.

This section further supports the County's planning process by summarizing the review and incorporation of existing plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan's development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

Columbia City is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the City organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats.

Table C-1 contains the City's Steering Committee participant list to augment the Columbia County planning elements.

<b>Table C-1. Columbia City Steering Committee</b>	
<b>Name</b>	<b>Agency/Department/Affiliation</b>
Leahnette Rivers	City Administrator/Recorder - Columbia City
Lisa Smith	City Planner - Columbia City
Jeff Anderson	Public Works Superintendent - Columbia City
Mike Reedy	Chief of Police - Columbia City
Karen Ladd	Administrator, Columbia Health District Public Health
Frank Hupp	Columbia County Emergency Management

Table C-2 contains a summary of the City's public involvement and planning meeting activities.

<b>Table C-2. Columbia City Public Involvement Mechanisms</b>	
<b>Mechanism</b>	<b>Description</b>
04/30/2008	Newsletter mailed with water utility bills
05/01/2008	Newspaper article and survey
06/03/2008	Steering Committee Meeting
07/21/2008	Public Notice of County Meeting Posted / Publicized
April Kickoff Newsletter	Explained plan development process and solicited input and comments on initial hazard screening and critical facilities information.
August 14, 2008, Countywide Public Meeting, 10 a.m., 2 p.m., & 6 p.m., Columbia County 911 Center, St. Helens, OR	Presented draft risk assessment results and provided opportunity to comment.
09/04/2008	Steering Committee Meeting
09/08/2008	Steering Committee Meeting
10/30/08	Steering Committee Meeting-project prioritization/agency identification

**CAPABILITY ASSESSMENT**

Table C-3, C-4, and C-5 contain the City’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table C-3. Columbia City Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	City of Columbia Comprehensive Plan, 2003	Provides overall guidance for a community's land use, economic development, and resource management. <a href="http://www.columbia-city.org/Ordinances/Comp%20Plan/draft_comp_plan_amend.htm">http://www.columbia-city.org/Ordinances/Comp%20Plan/draft_comp_plan_amend.htm</a>
	Columbia City Municipal Waterworks Emergency Response Plan 10/28/05	Provides overall guidance for Public Works water emergency responsibilities and authority.
	Transportation System Plan (2001)	Provides overall guidance for the community's transportation system development and resource management.
	Columbia City Water Curtailment Plan 10/5/00	Provides overall guidance to meet minimum supply needs encountered during water shortages.
	Columbia County Comprehensive Emergency Management Plan 9/11/02	Provides overall guidance for a community's land use, economic development, resource management, and disaster emergency management.
	Columbia City Emergency Operations Plan 6/19/08	Provides overall guidance for emergency management responsibilities and authority.
	Columbia City Municipal Waterworks Emergency Response Plan 10/28/05	Provides overall guidance for Public Works water emergency responsibilities and authority.
	Transportation System Plan (2001)	Provides overall guidance for the community's transportation system development and resource management.
	Parks Master Plan	Provides overall guidance for the community's park system, a 20 year planning/growth process. Park needs of future population.
	Water Master Plan	Provides overall guidance for the community's water use and future development requirements. 20 year planning horizon.
	Wastewater Master Plan	Provides overall guidance for the community's wastewater use and future development requirements 20 year planning horizon.
	Water Management and Conservation Plan	Provides overall guidance for the community's water use and conservation efforts.
Programs	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods.

**Table C-3. Columbia City Legal and Regulatory Resources Available for Hazard Mitigation**

Regulatory Tool	Name	Effect on Hazard Mitigation
Policies (Municipal Codes)	City Charter	To provide for the government of Columbia City, Columbia County, Oregon; and to repeal all charter provisions of the city enacted prior to the time that this charter takes effect except as hereinafter specifically retained. <a href="http://www.columbia-city.org/Ordinances/Ordinances.htm">http://www.columbia-city.org/Ordinances/Ordinances.htm</a>
	Columbia City Development Code	Provides the principal means for the implementation of the Columbia City Comprehensive Plan. The provisions of this Ordinance shall be deemed the minimum requirements for the preservation of the public safety, health, convenience, comfort, prosperity, and general welfare of the people of Columbia City, Oregon. This Ordinance is designed to: <ul style="list-style-type: none"> <li>• Regulate the division of land and to classify, designate and regulate the location of building, structures and land;</li> <li>• Divide the City into zones to carry out these regulations and provide for their enforcement;</li> <li>• Promote public health, safety, convenience and general welfare;</li> <li>• Promote coordinated development with consideration for the City’s natural environment, amenities, views, and the appearance of its buildings and open spaces;</li> <li>• Achieve a balanced and efficient land use pattern to protect and enhance real property values;</li> <li>• Promote safe, efficient traffic movement;</li> <li>• Avoid uses and development that might be detrimental to the stability and livability of the City; and</li> <li>• Insure adequate provisions for community utilities and facilities.</li> </ul> <a href="http://www.columbia-city.org/Ordinances/Dev%20Code/draft_dev_code.htm">http://www.columbia-city.org/Ordinances/Dev%20Code/draft_dev_code.htm</a>
	2007 Columbia City Water Quality Report	An annual report of the outcome of our many water quality tests. This report explains water supply capability.
	City Ordinances	Provide guidance for land-use and development and requirements to follow building and fire codes. <a href="http://www.columbia-city.org/Ordinances/Ordinances.htm">http://www.columbia-city.org/Ordinances/Ordinances.htm</a>
	Flood Hazard Overlay section of the Columbia City Development Code 6/10/03 as amended	Provides the City's Flood Management Program

<b>Table C-4. Columbia City Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	Contract Planner Contract Engineer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Public Works Contract Engineer Contract Building Official
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	Contract Planner Contract Engineer Contract Building Official
Floodplain manager	City Administrator, Building Secretary, Contract Planner and Contract Building Official
Personnel skilled in GIS and/or HAZUS-MH	no
Director of Emergency Services	City Administrator (will defer to Columbia County in the event of major disaster)
Finance (grant writers, purchasing)	City Administrator
Public Information Officers	City Administrator or Mayor

<b>Table C-5. Columbia City Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	yes
Authority to levy taxes for specific purposes	yes, with voter approval
Incur debt through general obligation bonds	yes, with voter approval
Incur debt through special tax and revenue bonds	yes, with voter approval
Incur debt through private activity bonds	no
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Used to finance future fire protection facilities' construction and other fire capital expenditures to protect new development.. The City Council or Fire District may charge fire mitigation fees to ensure new development pays their fair share of constructing these improvements.

## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

<b>DMA 2000 Requirements: Risk Assessment: Identifying Hazards</b>
<b>Identifying Hazards</b>
<b>Requirement §201.6(c)(2)(i):</b> [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.
<b>Element</b>
<ul style="list-style-type: none"> <li>■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?</li> </ul>
Source: FEMA, July 2008.

Columbia City’s Steering Committee determined that the following hazards could potentially threaten the community.

<b><i>Natural Hazards</i></b>	
Flood	X
Winter Storm	X
Landslide	X
Fire (Wildland/Urban)	X
Earthquake	X
Volcano	X
Wind*	X
Erosion*	X
ENSO (El Niño / La Niña)*	
Expansive Soils*	
Drought*	
<b><i>Technological Hazards</i></b>	
Dam Failure	X
Disruption of Utility and Transportation Systems	X
Hazardous Materials	X
Terrorism	X
Infectious Disease Epidemic	X

## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes community specific vulnerability information for Columbia City to augment the MHMP development process. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

Columbia City actively participates in FEMA's National Flood Insurance Program (NFIP) and has implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**

**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction’s risks where they vary from the risks facing the entire planning area

**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS**

### **Asset Inventory**

Asset inventory is the first step of a vulnerability analysis. Assets within each community that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

The asset inventory delineates the City’s existing building and infrastructure assets and insured values and are identified in detail in Tables C-6A, C-6B, and C-7.

Tables C-8, 9, and 10 portray the City’s critical infrastructure numbers and values, and their potential vulnerability by hazard type.

Columbia City seeks to protect its population by supporting Columbia County and Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### **Population and Building Stock**

Population data listed in Table C-6A were obtained from the 2000 U.S. Census and Portland State University. It comprises census block level data, and estimates from university conducted community research.

The City’s existing building and infrastructure and insured values are identified in Tables C-6A, C-6B, and C-7.



<b>Table C-6A. Columbia City Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2005 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
1,571	1,785	1,955	824	142,140,000

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$172,500 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table C-6B. Columbia City NFIP Insurance Report</b>								
<b>City of</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Average Premium (\$)</b>	<b>Total Claims Since 1978</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>
Columbia City	7,706	10	18	4,777,300	42	8.11	0	0

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

<b>Table C-7. Columbia City Critical Facilities and Infrastructure</b>			
<b>Facility Type</b>	<b>Name / Number</b>	<b>Address</b>	<b>Value<sup>1</sup></b>
Government	Shop Garage	1755 2 <sup>nd</sup> Place	\$32,960
	Shop 17	55 2 <sup>nd</sup> Place	\$200,000
	Shop Office	1755 2 <sup>nd</sup> Place	\$30,900
	City Hall	1840 Second Street	\$454,230
Emergency Response	Oregon State Forestry	405 E Street	\$250,000
	City of Columbia City Police Department	1840 Second Street	See City Hall
	Columbia Rural Fire and Rescue Fire Station - Columbia City	400 G Street	\$26,000

**Appendix C  
Columbia City**

**Table C-7. Columbia City Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
Educational	Columbia City Elementary School	2000 Second Street	\$4,400,000
Care Facility	Riverside Home	1730 6 <sup>th</sup> Street	\$102,000
	Life House Home	1455 2 <sup>nd</sup> Street	\$131,120
Community	Columbia City Community Hall	1850 2 <sup>nd</sup> Street	\$618,000
	Columbia City Sports & Recreation	320 A Street	\$752,500
	International Church Foursquare Gospel	1955 Second Street	\$509,800
	Columbia City Community Library	205 I Street	\$83,100
	Caples House Museum and Knapp Social Center	1925 1st Street	\$750,000
	Harvard Park	3025 Sixth Street	\$160,000
	Jim Bundy Memorial Park	390 "E" Street	\$350,000
	Datis Park	1990 The Strand	\$200,000
	Carolyn King Park	855 "K" Street	\$50,000
	Pixie Park	1910 The Strand	\$300,000
	Ruth Rose Richardson Memorial Park	1900 First Street	\$300,000
	Columbia City Mini-Mart (gas and groceries)	300 A Street	\$603,600
	State and Federal Highways	US Highway 30	
City Streets			13.3 miles
City Retaining Wall		1750 Third Street	\$150,000
Railroads	Portland and Western Railroad		2 miles
Bridges	L St Rail Bridge		\$1,500,000
Transportation Facilities	Port of St Helens - Columbia City Industrial Park & Admin Office	2305 Second Street	\$2,937,200
Utilities	Sewer Lift Station 1	505 "K" Street	\$93,730
	Sewer Lift Station 2	3660 Tahoma Street	\$93,730
	Sewer Lift Station 3	1910 The Strand	\$93,730
	Sewer Lift Station 4	1228 Spinnaker Way	\$166,860
	Pump House	855 "K" Street	\$74,160
	Sewer Compressor Vault	505 "K" Street	\$14,736
	Well Pump House	1755 2nd Place	\$237,500
	SH Ranney (PW) Well #1	62400 Columbia River Hwy	Individual values unknown
	SH Ranney (PW) Well #2	2260 The Strand	

**Table C-7. Columbia City Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	SH Ranney (PW) Well #3	1680 Second Street	Well development is tied into distribution piping and RR crossing. They're bundled. \$300,000
	Water Tank (200K gallon capacity)	855 "K" Street	\$251,320
	City Water Reservoir (1 M gallon capacity)	855 "K" Street	\$1,664,480
	City Fencing	855 "K" Street	\$10,005
	City Water Tank (200K gallon capacity)	36401 Miloris Way	\$251,320
	City Fencing	Miloris Way	\$10,005
	City Water Pump Station	Hwy 30 & L Street.	\$56,650
	City Sewer Flow Monitoring Station	Hwy 30 & Oregon Street.	\$22,101
Utilities	City Sewer Collection System	City-wide	13 miles
	City Water Distribution System	City-wide	15.4 miles
	Fiber Optics	Hwy 30 & RR corridor	Same length of city & railroad- 2 miles (x 2 sets =4 miles)
	City Groundwater Well #1 (47 gpm capacity)	1755 2 <sup>nd</sup> Place	\$400,000
	City Groundwater Well #2 (250 gpm capacity)	1755 2 <sup>nd</sup> Place	
	City Storm Water System	City-wide	

**Sources:** FEMA HAZUS-MH, local jurisdictions.

<sup>1</sup>Estimated and/or insured structural value for critical facilities and estimated values for critical infrastructure.

NA = Not Available.

**Vulnerability Analysis**

The vulnerability analysis development process is thoroughly discussed in the Columbia County MHMP, Section 6, which generated the following Hazard Exposure Analysis Overviews. Tables C-8, C-9, and C-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table C-8. Columbia City Potential Hazard Exposure Analysis Overview – Population and Buildings</b>							
			<b>Population</b>	<b>Buildings</b>			
<b>Hazard Type</b>	<b>Hazard Area</b>	<b>Methodology</b>		<b>Number</b>	<b>Residential</b>		<b>Non-Residential</b>
				<b>Number</b>	<b>Value (\$)<sup>1</sup></b>	<b>Number</b>	<b>Value (\$)<sup>1</sup></b>
Flood	Moderate 5	00-year floodplain	--	301	51,922,500	0 u	nknown
	High 1	00-year floodplain	--	301	51,922,500	0	unknown
Winter Storm		descriptive	1,955	824	142,140,000	4	unknown
Landslide	Moderate >14	-32 degrees	--	647	111,607,500	4	unknown
	High >32	-56 degrees	--	368	64,480,000	0	unknown
Wildland Fire	Moderate M	oderate fuel rank	--	813	140,242,500	4	unknown
	High	High fuel rank	--	552	95,220,000	0	unknown
	Very High	Very high fuel rank	--	249	42,952,500	0	unknown
	Extreme Extrem	e fuel rank	--	0	--	0	unknown
Earthquake	Strong 9	-20% (g)	--	824	142,140,000	4	unknown
	Very strong	20-40% (g)	--	0	--	0	unknown
	Severe >40	-60% (g)	--	0	--	0	unknown
Volcano		descriptive	1,955	824	142,140,000	4	unknown
Wind		descriptive	1,955	824	142,140,000	4	unknown
Erosion		within 300' of potential areas of erosion	--	-	--	unknown	unknown
Dam Failure	High	Inundation area	--	331	57,097,500	unknown	unknown
Disruption of Utility and Transportation Systems		descriptive	--	--	-----		
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- 74	8	129,030,000	4	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites*	--	-	--	unknown	unknown
Terrorism		descriptive	--	--	-----		
Infectious Disease Epidemic		descriptive	1,955	--	-----		

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$172,500 per structure).  
 Note – population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. \*0.25-mile buffered EHS sites were unable to be determined due to the use of census block data.

Table C-9. Columbia City Potential Hazard Exposure Analysis Overview – Critical Facilities

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	---	---								
	High	100-year floodplain	---	---					1	131K	2	500K
Winter Storm	Moderate		4	718K 3 276K 1				4.4M	2 233K		12	4.7M
Landslide	Moderate	>14-32 degrees	3 264K 2 276K				--	--	2 233K 3 483K			
	High	>32-56 degrees	5 150K		--	--	3	1.5M	1 175K 3			1.2M
Wildland Fire	Moderate	Moderate fuel rank	4	718K 3 276K 1				4.4M	2 233K 8			3.2M
	High	High fuel rank	4	7.18K	3 276K		--	--	2 233K 5			1.6M
	Very High	Very high fuel rank	---	---							1	50K
	Extreme	Extreme fuel rank	---	---								
Earthquake	Strong	9-20% (g)	4 718K 3 276K 1					4.4M	2 233K		12	4.7M
	Very strong	20-40% (g)	---	---								
	Severe	>40-60% (g)	---	---								
Volcano	Moderate		4 718K 3 276K 1				4.4M	2 233K		12	4.7M	
Wind	Moderate		4 718K 3 276K 1				4.4M	2 233K		12	4.7M	
Erosion		within 300' of potential areas of erosion	---	---								
Dam Failure	High	Inundation area	---	---					1	131K	4	1.6M
Disruption of Utility and Transportation Systems		descriptive	---	---								
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	4 720K 3 276K 1					4.4M	2 233K		12	4.7M
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	4	720K 3 276K 1				4.4M	2 233K		11	4.6M
Terrorism		descriptive	4	718K	3	276K	1	4.4M	2	233K	12	4.7M
Infectious Disease Epidemic		descriptive	---	---								

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Table C-10. Columbia City Potential Hazard Exposure Analysis Overview – Critical Infrastructure

Hazard Type	Hazard Area	Methodology	Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams		
			Miles	Value (\$)¹	Miles	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	
Flood	Moderate	500-year floodplain	-- -- --									-- --		--	
	High	100-year floodplain	-- -- --								3	260K	--	--	
Winter Storm	Moderate		1 unknown	150K	1 unknown	unknown	1	unknown	2.9M	1	2.9M	17	3.4M	--	--
Landslide	Moderate	>14-32 degrees	1 unknown	150K	--	--	1	1.5M	--	--	13	3.3M	--	--	
	High	>32-56 degrees	-- -- --								9	4.6M	--	--	
Wildland Fire	Moderate	Moderate fuel rank	--	--	--	--	1	1.5M	2.9M		15	3.3M	--	--	
	High	High fuel rank	-- -- --						1	2.9M	13	3.3M	--	--	
	Very High	Very high fuel rank	-- -- --								6	2.3M	--	--	
	Extreme	Extreme fuel rank	-- -- --									-- --		--	
Earthquake	Strong	9-20% (g)	1 unknown	150K	1 unknown	unknown	1	1.5M		1	2.9M	17	3.4M	--	--
	Very strong	20-40% (g)	-- -- --									-- --		--	
	Severe	>40-60% (g)	-- -- --									-- --		--	
Volcano	Moderate		1 unknown	150K	1	unknown	unknown	1	1.5M	2.9M		17	3.4M	--	--
Wind	Moderate		1 unknown	150K	1	unknown	unknown	1	1.5M	2.9M		17	3.4M	--	--
Erosion		within 300' of potential areas of erosion	-- -- --									-- --		--	
Dam Failure	High	Inundation area	-- -- --									4	352K	--	--
Disruption of Utility and Transportation Systems	descriptive		15	150K	2	unknown	1	1.5M		1	3M	23	3.7M	--	--
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	--	--	--	--	1	1.5M	2.9M			17	3.4M	--	--
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	--	--	--	--	1	1.5M	2.9M			12	1.1M	--	--
Terrorism	descriptive		15	150K	2	unknown	1	1.5M		1	3M	23	3.7M	--	--
Infectious Disease Epidemic	descriptive		-- -- --									-- --		--	

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section provides a summary of Columbia City's vulnerabilities and impacts from natural hazards in addition to technological and manmade hazards identified in the 2009 Columbia County MHMP.

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for Columbia City. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

There are 301 residential structures (worth \$51.9M), one care facility (worth \$131K), two community facilities (worth \$500K) and three utilities (worth \$260K) within the boundaries of the 100-year floodplain. There are 301 residential structures (worth \$51.9M) and no critical facilities within the 500-year floodplain.

### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind and floods, are often widespread. A single event is capable of impacting all people, critical facilities and infrastructure within Columbia City, and therefore the entire population (1,955 people), including 824 residential structures (worth \$142.1 M), four government facilities (worth \$718K), three emergency response facilities (worth \$276K), one education facility (worth \$4.4M), two care facilities (worth \$233K), 12 community facilities (worth \$4.7M), 17 utilities (worth \$3.4M), one state and federal highway (worth \$150K), one transportation facility (worth \$2.9M), one railroad facility (value unknown) and one bridge (worth \$1.5M) are at risk.

### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation and rail routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and waste-water utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within Columbia City. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

There are 647 residential structures (worth \$111.6M), four non-residential structures (value unknown), three government facilities (worth \$264K), two emergency response facilities (worth \$276K), two care facilities (worth \$233K), three community facilities (worth \$483K), 13 utilities (worth \$3.3M), one state and federal highway (worth \$150K), and one bridge (worth \$1.5M) in the moderate landslide risk area.

There are 368 residential structures (worth \$64.5M), five government facilities (worth \$464K), one care facility (worth \$175K), three educational facilities (worth \$1.5M), three community facilities (worth \$1.2M), and nine utilities (worth \$4.6M) located in the high landslide risk area.

### *Wildland Fires*

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

There are 824 residential structures (worth \$142.1M), four non-residential structures (value unknown), four government facilities (worth \$718K), three emergency response facilities (worth \$276K), one education facility (worth \$4.4M), two care facilities (worth \$233K), eight community facilities (worth \$3.2M), 15 utilities (worth \$3.3M), one transportation facility (worth \$2.9M), and one bridge (worth \$1.5M) located in moderate fire risk areas.

There are 552 residential structures (worth \$95.2M), four government facilities (worth \$718K), three emergency response facilities (worth \$276K), two care facilities (worth \$233K), five community facilities (worth \$1.6M), 13 utilities (worth \$3.3M), and one transportation facility (worth \$2.9M) located in the high fire risk areas.

There are 249 residential structures (worth \$43M), one community facility (value \$50K), and six utilities (value \$2.3M) located in very high fire risk areas with no critical facilities identified in the extreme fire risk area.

### *Earthquake*

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslide, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

Due to Columbia City's proximity to the eastern portion of the county, all people, critical facilities and infrastructure within Columbia City, and therefore the entire population (1,955 people), including 824 residential structures (worth \$142.1M), four non-residential structures

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(value unknown), four government facilities (worth \$718K), three emergency response facilities (worth \$276K), one education facility (worth \$4.4M), two care facilities (worth \$233K), 12 community facilities (worth \$4.7M), 17 utilities (worth \$3.4M), one state and federal highway (worth \$150K), one transportation facility (worth \$2.9M), one railroad facility (value unknown) and one bridge (worth \$1.5M) are located in the strong shaking (9-20 percent) area.

### *Volcano*

A volcanic eruption would have a minor impact on Columbia City due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006)

Columbia City will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies.

Buildings streets and roads throughout the city may require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services. Water treatment facilities may require additional attention to address high turbidity water. River traffic along the Columbia River could be disrupted due to sedimentation from a large eruption from Mt. St. Helens or Hood and dredging to restore channel depths may be necessary. Injuries associated with respiratory problems may result. (Goettel 2005)

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within Columbia City are at risk including the entire population (1,955 people), 824 residential structures (worth \$142.1 M), four government facilities (worth \$718K), three emergency response facilities (worth \$276K), one education facility (worth \$4.4M), two care facilities (worth \$233K), 12 community facilities (worth \$4.7M), 17 utilities (worth \$3.4M), one state and federal highway (worth \$150K), one transportation facility (worth \$2.9M), one railroad facility (value unknown), and one bridge (worth \$1.5M).

### *Wind*

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within Columbia City are equally at risk of a windstorm event including all people, critical facilities and infrastructure, and therefore the entire population (1,955 people), including 824 residential structures (worth \$142.1 M), four government facilities (worth \$718K), three emergency response facilities (worth \$276K), one education facility (worth \$4.4M), two care

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facilities (worth \$233K), 12 community facilities (worth \$4.7M), 17 utilities (worth \$3.4M), one state and federal highway (worth \$150K), one transportation facility (worth \$2.9M), one railroad facility (value unknown) and one bridge (worth \$1.5M).

### *Erosion*

Riverine erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available, however, descriptions of several localized areas were identified during the development of this document and are identified only by location on a map referencing the river or stream reach described. Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

The City of St. Helens owned Water Treatment Plant is located in the vicinity of the Columbia River and McBride Creek confluence, north of Columbia City. Columbia City relies on this facility for their water treatment needs. This facility does experience periodic erosion events and is prone to potential debris damage.

### *Dam Failure*

US Army Corps of Engineers inundation data for the Columbia River and the PacifiCorp inundation data for the Lewis River in the State of Washington were used to determine the impacts from dam failure upriver from Columbia County. Any facilities located within the inundation area are considered to be at high risk of inundation. Facilities located within the inundation area include 331 residential structures (worth \$57.1M), one care facility (value \$131K), four community facilities (\$1.6M) and four utilities (value \$352K).

### *Disruption of Utility and Transportation Systems*

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

### *Hazardous Material Event*

The National Response Center and the EPA's Environmental Facts Multisystem Query were used to locate hazardous waste handling facilities and businesses that generate hazardous waste from their activities. Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 mile radius of those are considered at risk.

There are 748 residential structures (worth \$129M), four non-residential structures (value unknown), four government facilities (worth \$720K), three emergency response facilities (worth \$276K) one education facility (worth \$4.4M), two care facilities (worth \$233K), 12 community

facilities (worth \$4.7M), one transportation facility (worth \$2.9M), one bridge (worth \$1.5M) and 17 utilities (worth \$3.4M) located with a 0.25 mile radius of a transportation route and may be at risk from a hazardous material event.

Facilities considered at risk near buffered EHS Sites include four government facilities (worth \$720K), three emergency response facilities (worth \$276K) one education facility (worth \$4.4M), two care facilities (worth \$233K), 11 community facilities (worth \$4.6M), one transportation facility (worth \$2.9M), one bridge (worth \$1.5M) and 12 utilities (worth \$1.1M).

### *Terrorism*

It is difficult to determine the scope of any terrorist threat to Columbia City. Although there seem to be few high-profile targets present, it is impossible to predict future terrorist events. Depending on the extent of the action, the community may suffer economic loss, disruption of utilities, and cleanup relating to explosions and other facility damages. Structural damage, injuries or casualties may occur, however, it is beyond the scope of this analysis to estimate losses.

### *Infectious Disease Epidemic*

The consequences of a pandemic as described in Chapter 5 could be devastating. In the event of a poor-fit vaccine or very limited vaccine supply, the public health measures that would work best include: isolation and quarantine; restricting movement between and within communities; prohibiting public gatherings and group activities; and closing schools.

The county and state have isolation and quarantine laws; cities can also apply quarantines and restrict public movement in a public health emergency. The recently passed public health emergency law in Oregon provides a process for such mechanisms to be implemented. (L. Rivers, personal communication; K. Ladd, personal communication)

Impacts associated with infectious disease epidemics in general have the potential to include loss of life and shutdown of critical facilities. Furthermore, an epidemic level of infectious disease in the community could overwhelm local resources, although there are no structural risks or losses associated with this hazard. The entire population of 1,955 is at risk from the effects of an infectious disease epidemic.

## **MITIGATION STRATEGY**

### **IDENTIFYING MITIGATION ACTIONS**

The following section defines mitigation action identification and analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions**

**Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Element**

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

The Steering Committee assessed whether to adopt Columbia County’s hazard mitigation goals listed in Table C-11, or to revise them to better meet the City’s needs. The Steering Committee then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals.

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table C-12 depicts the City’s considered mitigation actions developed during this mitigation planning process. The revised list in Table C-14 delineates those actions the City will strive to implement within this five year planning cycle.

**DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance**

**National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Element**

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

Columbia City actively participates in FEMA’s National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized City appropriate actions to assure an effective flood mitigation program.

**Mitigation Goals and Action Items Considered**

<b>Table C-11. 2005 Columbia County Mitigation Goals-Considered</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	<p><b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.</p>
2	<p><b>Protect Critical Facilities and Enhance Emergency and Essential Services</b></p> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

<b>Table C-12. Columbia City Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
<b>Natural Hazards</b>			
<i>Multi-Hazard (MH)</i>			
MH	Consider		Develop, implement, and maintain jurisdictional debris management plans.
MH	Ongoing		Develop and incorporate ordinances commensurate with development and building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.
MH	Ongoing		Review ordinances and develop outreach programs to assure manufactured homes and buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods as applicable)
MH	Ongoing		Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
MH	Ongoing		Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
MH	Ongoing		Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and schools, and water and sewage pump stations, etc.)
MH	Ongoing		Electronic surge protection devices on critical electronic components such as warning systems, communications equipment, and computers for critical facilities.
MH	Ongoing		Distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
MH	Ongoing		Explore the need for, develop, and implement hazard zoning ordinances for high-risk hazard area land-use.
MH	Ongoing		Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
MH	Ongoing		Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
MH C	onsider		Retrofit structures to protect them from seismic, floods, high winds, earthquakes, or other natural hazards.
MH C	onsider		Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
MH C	onsider		Harden utility headers located along river embankments to mitigate potential flood, debris, and erosion damages.



<b>Table C-12. Columbia City Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
MH C	onsider		Establish a formal role for the jurisdictional Hazard Mitigation Planning Committees to develop a sustainable process to implement, monitor, and evaluate citywide mitigation actions.
MH	<i>Ongoing</i>		Identify and pursue funding opportunities to implement mitigation actions.
MH	<i>Ongoing</i>		Develop public and private sector partnerships to foster hazard mitigation activities.
MH C	onsider		Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning.
<b><i>Flood</i></b>			
Flood C	onsider		Develop and maintain GIS mapped critical facility inventory for all structures located within 100-year and 500-year floodplains.
Flood C	onsider		Develop and maintain GIS mapped inventory, and develop prioritized list of residential and commercial buildings within 100-year and 500-year floodplains.
Flood C	onsider		Develop and maintain GIS mapped inventory of repetitive loss properties to include the types and numbers of properties.
Flood	<i>Ongoing</i>		Develop and implement mitigation actions for repetitive loss properties.
Flood	<i>Ongoing</i>		Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data.
Flood	<i>Ongoing</i>		Implement mitigation measures identified by critical facilities' owners, and other facility owners, to protect facilities located within the 100-year floodplain.
Flood	<i>Ongoing</i>		Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.
Flood	<i>Ongoing</i>		Develop, implement, and enforce floodplain management ordinances.
Flood	Consider		Acquire, relocate, elevate, or otherwise flood-proof critical facilities.
Flood	<i>Ongoing</i>		Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.
Flood	<i>Ongoing</i>		Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate. Water ultimately returning to its watercourse at a reduced flow rate.
Flood	<i>Ongoing</i>		Provide flood protection to mitigate damage and contamination of wastewater systems.
<b><i>Winter Storm</i></b>			
Winter Storms	<i>Ongoing</i>		Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.
Winter Storms	Consider		Develop critical facility list needing emergency back-up power systems, prioritize, seek funding and implement mitigation actions.
Winter Storms	Consider		Develop and maintain severe winter storm public outreach program defining mitigation activity benefits through educational outreach aimed at households and businesses while targeting of special needs populations.

<b>Table C-12. Columbia City Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Winter Storms	<i>Ongoing</i>		Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.
Winter Storms	<i>Ongoing</i>		Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or eliminate power outages from severe winter storms. Consider developing incentive programs.
Winter Storms	<i>Ongoing</i>		Develop early warning test program partnering with NOAA, City Police, Fire Departments, and Volunteer Fire Department to coordinate tests.
Winter Storms	<i>Ongoing</i>		Review critical facilities and government building energy efficiency, winter readiness, and electrical protection capability. Identify, prioritize, and implement infrastructure upgrade or rehabilitation project prioritization and development.
<b>Landslide</b>			
Landslide	<i>Ongoing</i>		Complete a landslide location inventory, identify threatened critical facilities and other buildings and infrastructure.
Landslide Consi	der		Develop prioritized list of mitigation actions for threatened critical facilities and other buildings or infrastructure.
Landslide	<i>Ongoing</i>		Develop process to limit future development in steep slope areas (permitting, geotechnical review, soil stabilization techniques, etc).
Landslide	<i>Ongoing</i>		Update the storm water management plan to include regulations to control runoff, both for flood reduction and to minimize saturated soils on steep slopes that can cause landslides.
Landslide	<i>Ongoing</i>		Develop comprehensive geological landslide and rockslide prone area maps.
Landslide	<i>Ongoing</i>		Identify and seasonally restrict construction activities in steep slope areas.
<b>Wildland Fire</b>			
Wildland Fire	<i>Ongoing</i>		Identify critical facilities and vulnerable populations based on mapped high hazard areas.
Wildland Fire	Consider		Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
Wildland Fire	<i>Ongoing</i>		Develop Community Wildland Fire Protection Plans for all at-risk communities.
Wildland Fire	Consider		Hold FireWise workshop to educate residents and contractors concerning fire resistant landscaping.
Wildland Fire	Consider		Promote FireWise building siting, design, and construction materials.
Wildland Fire	Consider		Develop FireWise Public Service Announcements (PSA).
Wildland Fire	Consider		Provide wildland fire information in an easily distributed format for all residents.
Wildland Fire	Consider		Schedule and perform government facility "fire drills" at least twice per year.
Wildland Fire	<i>Ongoing</i>		Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.
Wildland Fire	Consider		Develop outreach program to educate and encourage fire-safe construction practices for existing and new construction in high risk areas.

<b>Table C-12. Columbia City Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Wildland Fire	<i>Ongoing</i>		Identify, develop, and implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.
<b>Earthquake</b>			
Earthquake C	onsider		Supplement State Seismic Needs Analysis data (schools, fire, law enforcement). Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.
Earthquake C	onsider		Identify high seismic hazard areas; develop a wood-frame residential building inventory and an outreach program to educate population concerning facilities particularly vulnerable to earthquake damage, such as pre-1940s homes and homes with cripple wall foundations.
Earthquake C	onsider		Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.
Earthquake C	onsider		Retrofit important public facilities with significant seismic vulnerabilities, such as unreinforced masonry construction.
Earthquake	<i>Ongoing</i>		Retrofit bridges that are not seismically adequate for lifeline transportation routes.
Earthquake	<i>Ongoing</i>		Update existing (or adopt the most current) Uniform Building Code
Earthquake	<i>Ongoing</i>		Implement and enforce the Uniform, International, and State Building Codes.
Earthquake	<i>Ongoing</i>		Inspect and/or certify all new construction.
Earthquake	<i>Ongoing</i>		Develop outreach program to educate residents concerning benefits of increased seismic resistance and modern building code compliance during rehabilitation or major repairs for residences or businesses.
Earthquake C	onsider		Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current Building Codes.
Earthquake C	onsider		Evaluate critical public facility seismic performance for fire stations, public works buildings, potable water systems, wastewater systems, electric power systems, and bridges within the jurisdiction.
Earthquake C	onsider		Develop outreach program for educating private facility owners/operators concerning alternative or emergency power source acquisition to enable them to deliver food, fuel, and medical services during disaster emergency response and recovery efforts.
Earthquake	<i>Ongoing</i>		Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.
Earthquake	<i>Ongoing</i>		Develop partnerships to mitigate hazards that result in jurisdictional facility lifeline or emergency transportation route closures.
<b>Volcano</b>			
Volcano C	onsider		Update public emergency notification procedures and develop an outreach program for ash fall events.

<b>Table C-12. Columbia City Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Volcano C	onsider		Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.
Volcano C	onsider		Evaluate capability of water treatment plants to deal with high turbidity from ash falls, update emergency response plans, and upgrade treatment facilities' physical plant to deal with ash falls. Prioritize and initiate actions to fill capability gaps.
Volcano	Consider		Evaluate ash impact on storm water drainage system and develop mitigation actions.
<b>Wind</b>			
Wind	<i>Ongoing</i>		Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable)
Wind C	onsider		Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.
Wind	<i>Ongoing</i>		Revise requirements to place utilities underground to reduce power disruption from wind storm / tree blow down damage when upgrading or during new development.
Wind	<i>Ongoing</i>		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line failure during severe wind or winter ice storm events.
<b>Erosion</b>			
Erosion C	onsider		Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop and implement mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.
Erosion	Consider		Apply for grants/funds to implement riverbank protection methods.
Erosion C	onsider		Periodically provide available information to residents on riverbank erosion and methods to prevent it in an easily distributed format.
Erosion	Consider		Install riprap, or pilings to harden or "armor" a stream bank where severe erosion occurs.
Erosion C	onsider		Install bank protection such as rock, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection.
Erosion	<i>Ongoing</i>		Harden culvert entrance with asphalt, concrete, rock, to reduce erosion or scour.
Erosion	<i>Ongoing</i>		Construct a structure to dissipate energy or reduce flow velocity to prevent erosion of the streambed and banks.
<b>Technological and Manmade Hazards</b>			
<b>Dam Failures</b>			
Dam Failure	Consider		Obtain high resolution dam failure inundation area maps from USACOE & Pacific Corp; use to update emergency response plans, evacuation route identification, public notification, and evacuation procedures.
Dam Failure	Consider		Implement land use and management strategies where dam failure threats dictate.

<b>Table C-12. Columbia City Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Dam Failure	<i>Ongoing</i>		Encourage the USACOE and Pacific Corp to conduct assessments for dams upstream of populated areas.
<b><i>Disruption of Utilities and Transportation (DUTS)</i></b>			
DUTS	<i>Ongoing</i>		Continue outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.
DUTS	<i>Ongoing</i>		Identify and prioritize all “jurisdiction owned” & “non-jurisdiction owned” critical facilities that have backup power and emergency operations plans.
<b><i>Hazardous Materials (HAZMAT)</i></b>			
HAZMAT	<i>Ongoing</i>		Annually review, map, and update HAZMAT inventories and ensure that emergency responders are trained for site-specific incidents.
HAZMAT	<i>Ongoing</i>		Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous substances (HS) and extremely hazardous substances (EHS) incidents for emergency and first responders and public works staff.
HAZMAT	<i>Ongoing</i>		Evaluate existing security measures for sites with large quantities of HS or any quantities of EHS and enhance security as necessary.
HAZMAT	<i>Ongoing</i>		Evaluate seismic bracing/anchoring for sites with large quantities of HS or any quantities of EHS.
HAZMAT	<i>Ongoing</i>		Periodically provide available outreach materials to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.
HAZMAT Consi	der		Research, develop, and implement methods to protect waterways and ground water systems from hazardous materials events.
HAZMAT	<i>Ongoing</i>		Prepare a site-specific summary of hazardous materials used, stored, and commonly transported in the jurisdictional area. The summary should include mapped facility locations with a hazardous materials inventory, emergency response protocols, and mitigation actions.
<b><i>Terrorism</i></b>			
Terrorism	<i>Ongoing</i>		Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.
Terrorism	<i>Ongoing</i>		Upgrade physical security, detection, and response capability for critical facilities using information obtained from hazard assessments and risk analysis. Include water systems and any high-profile facilities such as major timber industry facilities and sites with large quantities of HS and EHS.
Terrorism C	onsider		
<b><i>Infectious Disease Epidemic(IDE)</i></b>			
<b><i>IDE</i></b>	Consider		Coordinate and implement the Columbia County Health District’s public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.

<b>Table C-12. Columbia City Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
<i>IDE</i>	<i>Ongoing</i>		Identify sectors of the population that are vulnerable to potential infectious diseases and develop strategies to communicate and serve those identified populations.
<i>IDE</i>	Consider		Cooperate with the Columbia County Health District’s during disaster and emergency situations, e.g., quarantine, shelter hygiene, public sanitation, and immunization.
<i>IDE</i>	Consider		Research and obtain necessary specialized training for public health officials to respond to an infectious disease epidemic.
<i>IDE</i>	<i>Ongoing</i>		Identify state and federal resources for establishing and improving public health response capacity.
<i>IDE</i>	<i>Ongoing</i>		Identify appropriate volunteer manpower to respond to an infectious disease epidemic.
<i>IDE</i>	<i>Ongoing</i>		Establish a detection and information dissemination system for infectious disease epidemic.
<i>IDE</i>	<i>Ongoing</i>		Periodically provide available outreach materials to educate the public regarding public health issues.
<i>IDE</i>	Consider		Identify locations within the jurisdiction which could be used for mass health aide during an emergency event.

## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

### DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions

#### Implementation of Mitigation Actions

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

#### Element

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on October 30, 2008 to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the Mitigation Action Plan. The Committee then determined the responsible agency and potential funding sources. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities.

The Columbia City Steering Committee evaluated the Benefit-Cost Analysis Fact Sheet (Appendix N) for prioritizing its “considered” mitigation actions listed in Table E-12. The Steering Committee determined that the committee consisted of sufficient expertise to select those mitigation actions that would most benefit the City without using the STAPLE-E evaluation tool. Upon review, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the HMP and are appropriate and feasible for the City and responsible entities to implement during the 5-year lifespan of this version of the HMP. As such, the Steering Committee determined that only the mitigation actions that received a high priority ranking would be included in the City’s Mitigation Action Plan. Table C-14 depicts the City’s mitigation actions grouped by hazard and in descending priority order within each hazard.

**MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED**

Columbia City reviewed the Columbia County goals and determined they meet the City’s needs and subsequently adopted the Goals in Table C-13 for the current planning period.

<b>Table C-13. Columbia City Mitigation Goals</b>	
<b>Goal Number</b>	<b>Goal Description</b>
<b>1</b>	<b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.
<b>2</b>	<b>Protect Critical Facilities and Enhance Emergency and Essential Services</b> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, businesses, and industry.</li> </ul>
<b>3</b>	<b>Reduce the Threat to Property</b> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, businesses, industries and the citizens of Columbia City.</li> </ul>
<b>4</b>	<b>Create a Disaster Resistant and Disaster-Resilient Economy</b> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local and County organizations, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
<b>5</b>	<b>Increase Public Awareness, Education, Outreach, and Partnerships</b> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, businesses, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, businesses, and industry.</li> </ul>

**IMPLEMENTING A MITIGATION ACTION PLAN**

The following section defines the mitigation action identification process for each participating jurisdiction as stipulated in DMA 2000 and its implementing regulations.

<p><b>DMA 2000 Requirements: Mitigation Strategy – Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Requirement §201.6(c)(3)(iv):</b> For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.</p> <p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?</li> <li>■ Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?</li> </ul> <p>Source: FEMA, July 2008.</p>
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This appendix identifies action items specific to Columbia City. Since the update includes incorporation of Columbia City as part of the MHMP, all actions in this appendix are considered new. Table C-14 displays Columbia City’s Mitigation Action Plan matrix that lists mitigation actions by hazard and are only prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity with potential funding sources identified.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

<b>Table C-14. Columbia City Mitigation Action Plan Matrix</b>						
<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
<b>Natural Hazards</b>						
<i>Multi-Hazard (MH)</i>						
MH	Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and schools, and water and sewage pump stations, etc.)	Public Works	1 yr	General Fund, HS, HMGP	BC: TBD TF: Yes	
MH	Electronic surge protection devices on critical electronic components such as warning systems, communications equipment, and computers for critical facilities.	Public Works	1 yr	General Fund	BC: TBD TF: Yes	
MH	Update or develop, implement, and maintain jurisdictional debris management plans.	City Admin/ Public Works	1-3 yrs	General Fund	BC: TBD TF: Yes	
MH	Develop and implement strategies and educational outreach programs for debris management.	City Admin/ Public Works	1-3 yrs (Plan) 3-5 (outreach)	General Fund	BC: TBD TF: Yes	
MH	Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and	City Admin/ Planning	1-5 yrs	General Fund	BC: TBD TF: Yes	

**Table C-14. Columbia City Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
	facilitate using multiple funding source consideration.					
MH	Develop outreach program for educating private facility owners/operators concerning alternative or emergency power source acquisition to enable them to deliver services during disaster emergency response and recovery efforts.	City Admin Public Works	2-5 yrs	General Fund	BC: TBD TF: Yes	
MH	Develop critical facility list needing emergency back-up power systems, prioritize, seek funding and implement mitigation actions.	Public Works	1-2 yrs	General Fund	BC: TBD TF: Yes	
<b>Flood</b>						
Flood	Develop, implement, and enforce floodplain management ordinances.	City Admin	1-3 yrs	General Fund	BC: TBD TF: Yes	
Flood	Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.	City Admin/Planning/ Public Works	Ongoing	General Fund	BC: TBD TF: Yes	
Flood	Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate. Water ultimately returning to its watercourse at a reduced flow rate.	Public Works/ Engineers	0-5 yrs	Street Fund, FMA, HMGP, PDM	BC: TBD TF: Yes	
Flood	Implement flood protection to mitigate damage and contamination of wastewater systems.	Public Works	5-10 yrs	Sewer Fund, FMA, HMGP, PDM	BC: TBD TF: Yes	
<b>Winter Storm</b>						
Winter Storm	Develop and implement programs to coordinate maintenance and mitigation activities to reduce public infrastructure from severe winter storms.	Public Works	Ongoing	General Fund	BC: TBD TF: Yes	

**Table C-14. Columbia City Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Winter Storm	Review critical facilities and government building energy efficiency, winter readiness, and electrical protection capability. Identify, prioritize, and implement infrastructure upgrade or rehabilitation project prioritization and development.	Public Works	Ongoing	General Fund, HMGP	BC: TBD TF: Yes	
<b><i>Landslide</i></b>						
Landslide	Develop process to limit future development in steep slope areas (permitting, geotechnical review, soil stabilization techniques, etc).	Planning/ Engineering	1-3 yrs	General Fund	BC: TBD TF: Yes	
<b><i>Wildland Fire</i></b>						
Wildland Fire	Develop Community Wildland Fire Protection Plan	Fire District	Ongoing	General Fund, FMAP	BC: TBD TF: Yes	
Wildland Fire	Provide wildland fire information in an easily distributed format for all residents.	City Admin Fire District	Ongoing	General Fund, FMAP	BC: TBD TF: Yes	
Wildland Fire	Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.	City Admin/ Fire District	Ongoing	General Fund	BC: TBD TF: Yes	
<b><i>Earthquake</i></b>						
EQ	Retrofit the two 200K gallon water storage reservoirs (Upper and Lower) they have significant seismic vulnerabilities.	City Admin/Public Works/Engineering	3-5 yrs	Water Review, HMGP, PDM	BC: TBD TF: Yes	
EQ	Identify, evaluate, and prioritize critical public facilities' seismic performance.	City Admin/ Public Works/ Engineering	3-5 yrs	General Fund	BC: TBD TF: Yes	

**Table C-14. Columbia City Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b><i>Volcano</i></b>						
Volcano	Evaluate ash impact on storm water drainage system and develop mitigation actions.	Public Works/ Engineering	3-5 yrs	General Fund	BC: TBD TF: Yes	
Volcano	Update public emergency notification procedures and develop an outreach program for ash fall events.	City Admin	Ongoing	General Fund, NOAA/ NWS, HMGP	BC: TBD TF: Yes	
<b><i>Wind</i></b>						
Wind	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.	Public Works	1-5 yrs	General Fund, Utility Co., HMGP, PDM	BC: TBD TF: Yes	
<b><i>Erosion</i></b>						
Erosion	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop and implement mitigation initiatives	Public Works	3-5 yrs	General Fund, HMGP, PDM	BC: TBD TF: Yes	
Erosion	Periodically provide available information to residents on riverbank erosion and methods to prevent it in an easily distributed format.	Public Works	3-5 yrs	General Fund	BC: TBD TF: Yes	
Erosion	Install riprap, or pilings to harden or "armor" a stream bank where severe erosion occurs.	Public Works	3-5 yrs	General Fund, FMA, HMGP, PDM	BC: TBD TF: Yes	

**Table C-14. Columbia City Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Man Made and Technological Hazards</b>						
<i>Dam Failure</i>						
Dam Failure	Obtain high resolution dam failure inundation area maps from USACOE and Pacific Corp; use to update emergency response plans, evacuation route identification, public notification, and evacuation procedures.	City Admin	3-5 yrs	General Fund	BC: TBD TF: Yes	
<i>Disruption of Utilities and Transportation Systems (DUTS)</i>						
DUTS	Continue outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.	City Admin	1-2 yrs	General Fund	BC: TBD TF: Yes	
<i>Hazardous Materials (HAZMAT)</i>						
HAZMAT	Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous substances (HS) and extremely hazardous substances (EHS) incidents for emergency and first responders and public works staff.	Public Works Fire District	1-3 yrs	General Fund, CERCLA, SARA	BC: TBD TF: Yes	
HAZMAT	Prepare a site-specific summary of hazardous materials used, stored, and commonly transported in the jurisdictional area. The summary should include mapped facility locations with a hazardous materials inventory, emergency response protocols, and mitigation actions.	Admin 1-	3 yrs	Water Fund, CERCLA, SARA	BC: TBD TF: Yes	
HAZMAT	Research, develop, and implement methods to protect waterways and ground water systems from hazardous materials events.	Public Works Fire District	1-3 yrs	General Fund, CERCLA, SARA	BC: TBD TF: Yes	

**Table C-14. Columbia City Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b><i>Terrorism</i></b>						
Terrorism	Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.	Police Dept / School District/ HSEMC	1-3 yrs	General Fund, HSGP	BC: TBD TF: Yes	
Terrorism	Upgrade physical security, detection, and response capability for critical facilities using information obtained from hazard assessments and risk analysis. Include water systems and any high-profile facilities such as major timber industry facilities and sites with large quantities of hazardous substances (HS) and extremely hazardous substances (EHS).	Public Works/Police Dept/HSEMC	3-5 yrs	General Fund, HSGP, CEDAP,	BC: TBD TF: Yes	
<b><i>Infectious Disease Epidemic (IDE)</i></b>						
IDE	Coordinate and implement the Columbia County Health District’s public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.	Public Health	1-3 yrs	General Fund, County CDC Public Health Funds	BC: TBD TF: Yes	
IDE	Cooperate with the Columbia County Health District’s during disaster and emergency situations, e.g., quarantine, shelter hygiene, public sanitation, and immunization.	City Admin	1-3 yrs	General Fund	BC: TBD TF: Yes	

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**Appendix D**  
**City of Prescott**

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The Appendix contains specific City of Prescott information to support the Columbia County Multi-Jurisdictional Hazard Mitigation Plan update.

This section further supports the County’s planning process by summarizing the review and incorporation of existing plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan’s development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

The City of Prescott is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the City organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats.

Table D-1 contains the City’s Steering Committee participant list to augment the Columbia County MHMP planning elements.

<b>Table D-1. City of Prescott Steering Committee</b>	
<b>Name</b>	<b>Agency/Department/Affiliation</b>
Kevin Miller (Lead)	Mayor
Jeff Sanders	Prescott City Council
Bob Ashline	Prescott City Council
Joe Balcuns	Prescott City Council
Starr Sanders	City/Finance/Director/Treasurer
James Larson	Prescott City Council/Public Works/
Frank Hupp	Columbia County Emergency Management

Table D-2 contains the summary of the City’s public involvement and planning meeting activities.

<b>Table D-2. City of Prescott Public Involvement Mechanisms</b>	
<b>Mechanism</b>	<b>Description</b>
April Kickoff Newsletter	Explained plan development process and solicited input and comments.
August 14, 2008 Countywide Public Meeting, 10 a.m., 2 p.m., & 6 p.m., Columbia County 911 Center, St Helens, OR	Presented draft risk assessment results and provided opportunity to comment.
City Council Public Meetings	On Dec 9, 2008 the City Council met with Frank Hupp of Columbia County Emergency Management to discuss the purpose and the options of the Multi-jurisdictional Hazard Mitigation Plan. The City Council meeting is an open public meeting. The meeting date and time was known by the residents of the City of Prescott.
Reader Boards	One is at the city hall, one at the bus stop at the intersection of Doane Road and Riverview Street and one at the entrance to Prescott Beach County Park.

**CAPABILITY ASSESSMENT**

Table D-3, D-4, and D-5 contain the City’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table D-3. City of Prescott Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	Development / Land Use Plan	The City of Prescott has had an active Land Use Plan since the mid 1970’s.
Programs	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods.
Policies (Municipal Codes)	Land Use Ordinance	The City of Prescott has land use ordinances and incorporates the County ordinances into the City’s land use planning.
	Zoning and Planning Ordinances	The City of Prescott has zoning and planning ordinances.
	Building Codes	The City of Prescott has adopted and enforces the Columbia County and State of Oregon building codes.

<b>Table D-4. City of Prescott Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	Contractor
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Contractor
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	Contractor
Floodplain manager	City of Prescott Mayor in conjunction with the Columbia County floodplain manager
Personnel skilled in GIS and/or HAZUS-MH	None
Finance (grant writers, purchasing)	City of Prescott Treasurer
Public Information Officers	City of Prescott Mayor

<b>Table D-5. City of Prescott Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	yes
Authority to levy taxes for specific purposes	(measure 5) w/ a cap w/ voter approval (cannot exceed cap)
Incur debt through general obligation bonds	no
Incur debt through special tax and revenue bonds	yes
Incur debt through private activity bonds	yes
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

<b>DMA 2000 Requirements: Risk Assessment: Identifying Hazards</b>
<b>Identifying Hazards</b>
<b>Requirement §201.6(c)(2)(i):</b> [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.
<b>Element</b>
<ul style="list-style-type: none"> <li>■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?</li> </ul>
Source: FEMA, July 2008.

The City of Prescott’s Steering Committee determined that the following hazards could potentially threaten the community.

<b><i>Natural Hazards</i></b>	
Flood X	
Winter Storm (Drought & ENSO)	X
Landslide X	
Fire (Wildland/Urban)	X
Earthquake X	
Volcano X	
Wind* X	
Erosion*	
ENSO (El Niño / La Niña)	
Expansive Soils*	
Drought	
<b><i>Technological Hazards</i></b>	
Dam Failure	X
Disruption of Utility and Transportation Systems	X
Hazardous Materials	X
Terrorism	
Infectious Disease Epidemic	

## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes community specific vulnerability information for the City of Prescott to augment the MHMP development process. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

The City of Prescott actively participates in FEMA's National Flood Insurance Program (NFIP) and has implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized County or community appropriate actions to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**

**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area

**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS**

### **Asset Inventory**

Asset inventory is the first step of a vulnerability analysis. Assets within a community that may be affected by hazard events include population, residential and nonresidential buildings, and critical facilities and infrastructure.

The asset inventory delineates the City’s existing building and infrastructure assets and insured values are identified in detail in Tables D-6A, D-6B, and D-7.

Tables D-8, D-9, and D-10 portray the critical infrastructure numbers and values, and their potential vulnerability by hazard type.

The City of Prescott seeks to protect its population by supporting Columbia County and Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### ***Population and Building Stock***

Population data listed in Table D-6A were obtained from the 2000 U.S. Census and Portland State University. It comprises census block level data, and estimates from university conducted community research.

The City’s existing building and infrastructure assets and insured values and are identified in detail in Tables D-6A, D-6B and D-7.

<b>Table D-6A. City of Prescott Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2005 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
72 60		60	55	5,846,500

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$132,300 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table D-6B. City of Prescott NFIP Insurance Report</b>								
<b>City of</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Average Premium (\$)</b>	<b>Total Claims Since 1978</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>
Prescott 30	4	0 1		350,000 30	4.00	0	0 0	

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

<b>Table D-7. City of Prescott Critical Facilities and Infrastructure</b>			
<b>Facility Type</b>	<b>Name / Number</b>	<b>Address</b>	<b>Value<sup>1</sup></b>
Government	City Hall	72742 Blakely Street Prescott, OR N 46°03.378 W -122°53.273	100,000



**Appendix D**  
**City of Prescott**

**Table D-7. City of Prescott Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	City Hall Maintenance Building	72742 Blakely Street Prescott, OR N 46°03.378 W -122°53.273	50,000
	Administrative Office (at Mayors residence)	72610 Dwight Street Prescott, OR	\$0
	Administrative Office (at Treasurers residence)	32824 Graham Rd Prescott, OR	\$0
Emergency Response	None		
Education No	ne		
Care Facilities	None		
Community	Park (County)	Prescott Beach (County Park) N 46°03.378 W -122°53.401	(Outside of city limits of Prescott)
	Church	None in City limits of Prescott	
State and Federal Highways	Hwy 30 W/S route		0 miles within city. Highway 30 is approximately .25 miles away.
Railroads	Portland and Western Railroad (industrial only)		The Railroad skirts the western edge of Prescott for approximately .5 mile.
Bridges No	ne		
Transportation Facilities	None		
Utilities	Well	3	5,000
	Well House		15,000
			30,000

**Table D-7. City of Prescott Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
			30,000
			30,000
			50,000
Dams No	ne		

**VULNERABILITY ANALYSIS**

The vulnerability analysis development process is thoroughly discussed in the Columbia County MHMP, Section 6, which generated the following Hazard Exposure Analysis Overviews. Tables D-8, D-9, and D-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table D-8. City of Prescott Potential Hazard Exposure Analysis Overview-Population and Buildings</b>							
			Population Number	Buildings			
Hazard Type	Hazard Area	Methodology		Residential		Non-Residential	
				Number	Value (\$)¹	Number	Value (\$)¹
Flood	Moderate 50	0-year floodplain	--	18	2,381,400	unknown	unknown
	High 1	00-year floodplain	--	18	2,381,400	unknown	unknown
Winter Storm		descriptive	60	55	5,846,500	unknown	unknown
Landslide	Moderate >14	-32 degrees	--	28	3,704,400	unknown	unknown
	High >32	-56 degrees	--	27	3,572,100	unknown	unknown
Wildland Fire	Moderate M	oderate fuel rank	--	32	4,233,600	unknown	unknown
	High	High fuel rank	--	29	3,836,700	unknown	unknown
	Very High	Very high fuel rank	--	25	3,307,500	unknown	unknown
	Extreme Extrem	e fuel rank	--	--	--	unknown	unknown
Earthquake	Strong 9-	20% (g)	60	55	5,846,500	unknown	unknown
	Very strong	20-40% (g)	--	--	--	unknown	unknown
	Severe >40	-60% (g)	--	--	--	unknown	unknown
Volcano		descriptive	60	55	5,846,500	unknown	unknown
Wind		descriptive	60	55	5,846,500	unknown	unknown
Dam Failure	High	Inundation area	--	32	4,233,600	unknown	unknown
Disruption of Utility and Transportation Systems	descriptiv	e	60 55		5,846,500	unknown u	nknown
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- --		--	unknown u	nknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites*	-- --		--	unknown u	nknown

¹ Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$132,300 per structure).

Note-population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. \*0.25-mile buffered EHS sites were unable to be determined due to the use of census block data.

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Table D-9. City of Prescott Potential Hazard Exposure Analysis Overview-Critical Facilities

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate 500-	year floodplain	--	--	--	--	--	--	--	--	--	--
	High 100-	year floodplain	3	150K	--	--	--	--	--	--	1 unknown	--
Winter Storm		descriptive	4	150K	--	--	--	--	--	--	1 unknown	--
Landslide	Moderate >14-32	degrees	4	150K	--	--	--	--	--	--	--	--
	High >32-56	degrees	3	150K	--	--	--	--	--	--	--	--
Wildland Fire	Moderate	Moderate fuel rank	4	150K	--	--	--	--	--	--	1	unknown
	High	High fuel rank	4	150K	--	--	--	--	--	--	--	--
	Very High	Very high fuel rank	4	150K	--	--	--	--	--	--	--	--
	Extreme	Extreme fuel rank	--	--	--	--	--	--	--	--	--	--
Earthquake	Strong 9-20%	(g)	4	150K	--	--	--	--	--	--	1	unknown
	Very strong	20-40% (g)	--	--	--	--	--	--	--	--	--	--
	Severe >40-60%	(g)	--	--	--	--	--	--	--	--	--	--
Volcano		descriptive	4	150K	--	--	--	--	--	--	1	unknown
Wind		descriptive	4	150K	--	--	--	--	--	--	1	unknown
Dam Failure	High	Inundation area	4	150K	--	--	--	--	--	--	1	unknown
Disruption of Utility and Transportation Systems		descriptive	4	150K	none	none	none	none	none	none	2	unknown
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	4	159K	--	--	--	--	--	--	1	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	--	--	--	--	--	--	--	--	--	--

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**Table D-10 City of Prescott Potential Hazard Exposure Analysis Overview-Critical Infrastructure**

		Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams		
Hazard Type	Hazard Area	Methodology	Miles	Value (\$)¹	Miles	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate 500-	year floodplain	--	--	--	--	--	--	--	--	--	--	--	--
	High 100-	year floodplain	--	--	--	--	--	--	--	--	3 110K	--	--	--
Winter Storm		descriptive	--	--	--	--	--	--	--	--	3 110K	--	--	--
Landslide	Moderate >14-32	degrees	--	--	--	--	--	--	--	--	3 110K	--	--	--
	High >32-56	degrees	--	--	--	--	--	--	--	--	3 110K	--	--	--
Wildland Fire	Moderate	Moderate fuel rank	--	--	--	--	--	--	--	--	3 110K	--	--	--
	High	High fuel rank	--	--	--	--	--	--	--	--	3 110K	--	--	--
	Very High	Very high fuel rank	--	--	--	--	--	--	--	--	3 110K	--	--	--
	Extreme	Extreme fuel rank	--	--	--	--	--	--	--	--	--	--	--	--
Earthquake	Strong 9-20%	(g)	--	--	--	--	--	--	--	--	3 110K	--	--	--
	Very strong	20-40% (g)	--	--	--	--	--	--	--	--	--	--	--	--
	Severe >40-60%	(g)	--	--	--	--	--	--	--	--	--	--	--	--
Volcano		descriptive	--	--	--	--	--	--	--	--	3 110K	--	--	--
Wind		descriptive	--	--	--	--	--	--	--	--	3 110K	--	--	--
Dam Failure	High	Inundation area	--	--	--	--	--	--	--	--	3 110K	--	--	--
Disruption of Utility and Transportation Systems	descriptive		.25 Miles	unknown	.5 Miles	unknown	none	none	none	none	6	190K	none	none
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	--	--	1 unknown	unknown	--	--	--	--	3 110K	--	--	--
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	--	--	--	--	--	--	--	--	--	--	--	--

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section describes community specific vulnerabilities and impacts from natural hazards in addition to technological and manmade hazards identified in the 2009 Columbia County MHMP.

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for the City of Prescott. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

There are 18 residential structures (worth \$2.4M), three government facilities (worth \$150K), one community facility (value unknown), and three utilities (worth \$110K) within the boundaries of the 100-year floodplain. There are 18 residential structures (worth \$2.4M) and no critical facilities within the 500-year floodplain.

### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind and floods, are often widespread. A single event is capable of impacting all people, critical facilities and infrastructure within the City of Prescott, and therefore the entire population (60 people), including 55 residential structures (worth \$5.8 M), four government facilities (worth \$150K), one community facility (value unknown), and three utilities (worth \$110K) are at risk.

### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation and rail routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along river embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and waste water utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within the City of Prescott. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

There are 28 residential structures (worth \$3.7M), four government facilities (worth \$150K) and three utilities (worth \$110K) in the medium landslide risk area. Twenty-seven residential

structures (worth \$3.6M), three government facilities (worth \$150K) and three utilities (worth \$110K) are located in the high landslide risk area.

### *Wildland Fires*

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

There are 32 residential structures (worth \$4.2M), four government facilities (worth \$150K), one community facility (value unknown), and three utilities (worth \$110K) located in moderate fire risk areas.

There are 29 residential structures (worth \$3.8M), four government facilities (worth \$150K) and three utilities (worth \$110K) located in high risk areas. There are 25 residential structures (worth \$3.3M), four government facilities (worth \$150K), and three utilities (worth \$110K) located in the very high fire risk areas. There are no critical facilities located in the extreme fire risk area.

### *Earthquake*

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslide, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

Due to the City of Prescott's proximity to the eastern portion of the county, all people, critical facilities and infrastructure within the City of Prescott, and therefore the entire population (60 people), including 55 residential structures (worth \$5.8 M), four government facilities (worth \$150K), one community facility (value unknown), and three utilities (worth \$110K) are at risk.

### *Volcano*

A volcanic eruption would have a minor impact on the City of Prescott due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ash fall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team, 2006)

The City of Prescott will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of

suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies. Respiratory injuries may be prevalent.

Buildings, streets, and roads throughout the city may require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services and water treatment facilities.

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within the City of Prescott are at risk including the entire population (60 people), including 55 residential structures (worth \$5.8 M), four government facilities (worth \$150K), one community facility (value unknown), and three utilities (worth \$110K).

### *Wind*

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within the City of Prescott are equally at risk of a windstorm event including all people, critical facilities and infrastructure, and therefore the entire population (60 people), including 55 residential structures (worth \$5.8 M), four government facilities (worth \$150K), one community facility (value unknown), and three utilities (worth \$110K).

### *Dam Failure*

The City of Prescott is located on the Columbia River and is susceptible to the effects of dam failure from upriver dams. The US Army Corps of Engineers inundation data for the Columbia River and the PacificCorp inundation data for the Lewis River in the State of Washington were used to determine the impacts from dam failure upriver from the City of Prescott. Facilities located within the inundation area include 32 residential structures (worth \$4.2M), four government facilities (worth \$150K), one community facility (value unknown), and three utilities (worth \$110K).

### *Disruption of Utility and Transportation Systems*

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

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### *Hazardous Material Event*

The National Response Center and the EPA’s Environmental Facts Multi-system Query were used to locate hazardous waste handling facilities and businesses that generate hazardous waste from their activities. Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 mile radius of those are considered at risk.

Four government facilities (worth \$159K), one community facility (value unknown), three utilities (worth \$110K), one highway (value unknown) and one railroad (value unknown) located within 0.25 mile from a transportation route and may be at risk from a hazardous material event. One de-commissioned nuclear power plant borders the City of Prescott. The Trojan Nuclear Power plant is owned by Portland General Electric.

## **MITIGATION STRATEGY**

### **IDENTIFYING MITIGATION ACTIONS**

The following section defines identification and analysis of mitigation actions as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions**

**Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Element**

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

The Steering Committee assessed whether to adopt Columbia County’s hazard mitigation goals listed in Table D-11, or to revise them to better meet the City’s needs. The City then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals.

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table D-12 depicts the City’s considered mitigation actions developed during this mitigation planning process. The revised list in Table D-14 delineates those actions the City will strive to implement within this five year planning cycle.

**DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance**

**National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

<p>Element</p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?</li> <li>■ Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?</li> </ul> <p>Source: FEMA, July 2008.</p>
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The City of Prescott actively participates in FEMA’s National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized City appropriate actions to assure an effective flood mitigation program.

### Mitigation Goals and Action Items Considered

<b>Table D-11. 2005 Columbia County Mitigation Goals-Considered</b>	
<b>Goal Number</b>	<b>Goal Description</b>
<b>1</b>	<p><b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.</p>
<b>2</b>	<p><b>Protect Critical Facilities and Enhance Emergency and Essential Services</b></p> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
<b>3</b>	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
<b>4</b>	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
<b>5</b>	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

**Table D-12. City of Prescott Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b> <i>Ongoing, Consider</i>	<b>Comment</b>	<b>Description</b>
<b>Natural Hazards</b>			
<b>Multi-Hazard (MH)</b>			
MH C	onsider		Develop and incorporate building ordinances commensurate with building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.
MH C	onsider		Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
MH C	onsider		Install lightening grade surge protection devices on critical electronic components such as warning systems, communications equipment, and computers for critical facilities.
MH C	onsider		Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
MH C	onsider		Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
MH C	onsider		Establish a formal role for the jurisdictional Hazard Mitigation Planning Committees to develop a sustainable process to implement, monitor, and evaluate citywide mitigation actions.
MH	Consider		Identify and pursue funding opportunities to implement mitigation actions.
MH	Consider		Develop public and private sector partnerships to foster hazard mitigation activities.
MH C	onsider		Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning.
<b>Flood</b>			
Flood	Consider		Develop and implement mitigation actions for repetitive loss properties.
Flood C	onsider		Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.
Flood	Consider		Develop, implement, and enforce floodplain management ordinances.
Flood C	onsider		Develop outreach program to educate residents concerning flood proofed well and sewer/septic installation.
<b>Winter Storm</b>			
Winter Storms	Consider		Update or develop, implement, and maintain jurisdictional debris management plans.
Winter Storms	Consider		Develop and maintain severe winter storm public outreach program defining mitigation activity benefits through educational outreach aimed at households and businesses while targeting of special needs populations.
Winter Storms	Consider		Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.

**Table D-12. City of Prescott Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b> <i>Ongoing, Consider</i>	<b>Comment</b>	<b>Description</b>
<b><i>Landslide</i></b>			
Landslide	Consider		Limit future development in high landslide potential Areas
Landslide Consi	der		Develop, implement, and enforce property development landslide risk assessment procedures to identify potential facility vulnerability.
<b><i>Wildland Fire</i></b>			
Wildland Fire	Consider		Develop, adopt, and enforce burn ordinance that require burn permits, restricts campfires, and controls outdoor burning.
Wildland Fire	Consider		Develop outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs.
<b><i>Earthquake(EQ)</i></b>			
Earthquake C	onsider		Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.
Earthquake	Consider		Implement and enforce the Uniform, International, and State Building Codes.
<b><i>Volcano</i></b>			
Volcano	Consider		Evaluate ash impact on storm water drainage system and develop mitigation actions if necessary.
<b><i>Wind</i></b>			
Wind	Consider		Conduct corridor tree removal to protect utilities
Wind C	onsider		Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable)
<b><i>Erosion</i></b>			
Erosion	Consider		Apply for grants/funds to implement riverbank protection methods.
Erosion C	onsider		Install bank protection such as rock, vegetation, or other armoring or protective materials to provide river bank protection.
Erosion C	onsider		Develop outreach program to educate the public concerning planting processes and materials used to stabilize hill slopes or stream banks. This is known as bio-engineering; which uses logs, root wads, or wood debris or other vegetation to reduce scour and erosion.
<b>Technological and Manmade Hazards</b>			
<b><i>Dam Failure</i></b>			
Dam Failure	Consider		Implement land use and management strategies where dam failure threats dictate.
<b><i>Disruption of Utilities and Transportation Systems (DUTS)</i></b>			
DUTS Consi	der		Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.

**Table D-12. City of Prescott Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b> <i>Ongoing, Consider</i>	<b>Comment</b>	<b>Description</b>
<b><i>Hazardous Materials (HAZMAT)</i></b>			
HAZMAT Consi	der		Train Public Works staff to identify extremely hazardous substances (EHS) and to follow EMS protocols.
HAZMAT Consi	der		Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.



## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

### DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions

#### Implementation of Mitigation Actions

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

#### Element

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on December 9, 2008 to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the Mitigation Action Plan. The Committee then determined the responsible agency and potential funding sources. The Mitigation Action Plan represents the City's mitigation projects to be implemented through the cooperation of multiple entities.

The City of Prescott is an extremely small community with limited resources and capability. The City's Steering Committee evaluated the Benefit-Cost Analysis Fact Sheet (Appendix N) for prioritizing its "considered" mitigation actions listed in Table E-12. The Steering Committee determined that the committee consisted of sufficient expertise to select those mitigation actions that would most benefit the City without using the STAPLE-E evaluation tool. Upon review, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the HMP and are appropriate and feasible for the City and responsible entities to implement during the 5-year lifespan of this version of the HMP. As such, the Steering Committee determined that only those mitigation actions that received a high priority ranking would be included in their Mitigation Action Plan. Table D-14 depicts the City's mitigation actions grouped by hazard and in descending priority order within each hazard.

## MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED

The City of Prescott reviewed the County's Mitigation Goals and determined they meet the City's needs and subsequently implemented the Goals in Table D-13 for the current planning period.

<b>Table D-13. City of Prescott Mitigation Goals</b>	
<b>Goal Number</b>	<b>Goal Description</b>
<b>1</b>	<b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.
<b>2</b>	<b>Protect Critical Facilities and Enhance Emergency and Essential Services</b> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
<b>3</b>	<b>Reduce the Threat to Property</b> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
<b>4</b>	<b>Create a Disaster Resistant and Disaster-Resilient Economy</b> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
<b>5</b>	<b>Increase Public Awareness, Education, Outreach, and Partnerships</b> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

## IMPLEMENTING A MITIGATION ACTION PLAN

The following section defines the mitigation action identification process for each participating jurisdiction as stipulated in DMA 2000 and its implementing regulations.

<p style="text-align: center;"><b>DMA 2000 Requirements: Mitigation Strategy-Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Requirement §201.6(c)(3)(iv):</b> For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.</p> <p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?</li> <li>■ Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?</li> </ul> <p>Source: FEMA, July 2008.</p>
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**Appendix D**  
**City of Prescott**

This appendix identifies actions items specific to the City of Prescott. Since the update includes incorporation of the City of Prescott as part of the MHMP, all actions in this appendix are considered new. Table D-14 displays the City of Prescott’s Mitigation Action Plan matrix that lists mitigation actions by hazard and are prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity with potential funding sources identified.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

<b>Table D-14. City of Prescott Mitigation Action Plan Matrix</b>						
<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
<b>Natural Hazards</b>						
<i>Multi-Hazard (MH)</i>						
MH	Identify and pursue funding opportunities to implement mitigation actions.	City Council	1-5 years	General Funds	TBD	* Recommend to do this one.
<i>Flood</i>						
Flood	Develop, implement, and enforce floodplain management ordinances.	City Council	1-5 years	General Funds	TBD	Already being done through County Land Development Services permitting procedures.
<i>Wildland Fire</i>						
Wildland Fire	Develop outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs. (Website)	City Council	1-5 years	General Funds	TBD	Can get information from Columbia River Fire & Rescue and insert into water bill.
<i>Earthquake (EQ)</i>						
EQ	Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.	City Council	1-5 years	General Funds	TBD	Can get the pamphlets free from FEMA and insert into water bill

**Table D-14. City of Prescott Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Manmade and Technological Hazards</b>						
<i>Disruption of Utilities and Transportation Systems</i>						
DUTS	Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.	City Council	1-5 years	General Funds	TBD	Could be a pamphlet from American Red Cross inserted into water bill.
<i>Hazardous Materials (HAZMAT)</i>						
HAZMAT	Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.	City Council	1-5 years	General Funds	TBD	Could get a pamphlet from Waste Management or County Land Development Services and insert into water bill.

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**Appendix E**  
**City of Rainier**

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This appendix contains the specific City of Rainier information to support the Columbia County 2009 Multi-Jurisdictional Hazard Mitigation Plan update.

This section further supports the County’s planning process by summarizing the review and incorporation of existing plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan’s development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

The City of Rainier is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the City organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats.

Table E-1 contains the City’s Steering Committee participant list to augment the Columbia County MHMP planning elements.

<b>Table E-1. City of Rainier Steering Committee</b>	
<b>Name</b>	<b>Agency/Department/Affiliation</b>
Lars Gare	City Administrator
Ralph Painter	Police Chief
Darrel Lockard	Public Works Director
Frank Hupp	Columbia County Emergency Management

Table E-2 contains the summary of the City’s public involvement and planning meeting activities.

<b>Table E-2. Public Involvement Mechanisms</b>	
<b>Mechanism</b>	<b>Description</b>
Public Bulletin Boards	Posted the planning activity newsletter at several locations for public comment.
April Kickoff Newsletter	Explained plan development process and solicited input and comments.
August 14, 2008 Countywide Public Meeting, 10 a.m., 2 p.m., & 6 p.m., Columbia County 911 Center, St Helens, OR	Presented risk assessment results and provided opportunity to comment.



**CAPABILITY ASSESSMENT**

Table E-3, E-4, and E-5 contain the City’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table E-3. City of Rainier Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	Comprehensive Plan	Guides the City’s governance and development process
	Transportation System Plan	Analyzes the City’s Transportation Systems and delineates problems and future initiatives
	Water Quality Report, 2005	This report details where our water comes from, what it contains, and the risks our water testing and treatment are designed to prevent.
Programs	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods.
Policies (Municipal Codes)	Municipal Code	Delineates responsibilities and authorities supporting the Comprehensive Plan and guides development, building, permitting, and siting locations.
	Zoning Ordinance, Title 18	Delineates responsibilities and authorities supporting the Comprehensive Plan
	Building and Construction Ordinance, Title 15	Defines that “building and related activities shall comply with the State Building Code standards, adopted by the Director of the Oregon Department of Commerce, and the Fire and Life Safety Code standards, adopted by the State Fire Marshal, as these codes apply at the time of the building or related activity.”

<b>Table E-4. City of Rainier Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	Contractor
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Contractor
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	Contractor
Floodplain manager	no
Personnel skilled in GIS and/or HAZUS-MH	no-rely on County
Director of Emergency Services	Police chief: Chief Ralph Painter
Finance (grant writers, purchasing)	Engineer/Planning consultant:
Public Information Officers	no

<b>Table E-5. City of Rainier Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	yes
Authority to levy taxes for specific purposes	yes
Incur debt through general obligation bonds	yes-with voter approval
Incur debt through special tax and revenue bonds	no
Incur debt through private activity bonds	no
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment: Identifying Hazards**

**Identifying Hazards**  
**Requirement §201.6(c)(2)(i):** [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.  
**Element**  
 ■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?  
 Source: FEMA, July 2008.

The City of Rainier's Steering Committee determined that the following hazards could potentially threaten the community.

<b><i>Natural Hazards</i></b>	
Flood	X
Winter Storm	X
Landslide	X
Fire (Wildland/Urban)	X
Earthquake	X
Volcano	X
Wind*	X
Erosion*	X
ENSO (El Niño / La Niña)*	
Expansive Soils*	X
Drought*	
<b><i>Technological Hazards</i></b>	
Dam Failure	
Disruption of Utility and Transportation Systems	X
Hazardous Materials	X
Terrorism	
Infectious Disease Epidemic	

## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes community specific vulnerability information for the City of Rainier to augment the MHMP development process. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following section defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

The City of Rainier actively participates in FEMA's National Flood Insurance Program (NFIP) and has implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City's Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**

**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area

**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS**

### **Asset Inventory**

Asset inventory is the first step of a vulnerability analysis. Assets within each community that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

The asset inventory delineates the City's existing building and infrastructure assets and insured values and are identified in detail in Tables E-6A, E-6B and E-7.

Tables E-8, E-9, and E-10 portray the City's critical infrastructure numbers and values, and their potential vulnerability by hazard type.

The City of Rainier seeks to protect its population by supporting Columbia County and Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### **Population and Building Stock**

Population data listed in Table E-6A were obtained from the 2000 U.S. Census and Portland State University. It comprises census block level data, and estimates from university conducted community research.

The City's existing building and infrastructure and insured values are identified in Tables E-6A, E-6B, and E-7.

<b>Table E-6A. City of Rainier Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2005 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
1,687	1,760	1,775	870	108,837,000

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$125,100 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table E-6B. City of Rainier NFIP Insurance Report</b>								
<b>City of</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Average Premium (\$)</b>	<b>Total Claims Since 1978</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>
Rainier 1,	015	04		770,000.25	3.75	3	2,129.0	

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

<b>Table E-7. City of Rainier Critical Facilities and Infrastructure</b>			
<b>Facility Type</b>	<b>Name / Number</b>	<b>Address</b>	<b>Value<sup>1</sup></b>
Government	City Hall/Administrative Office/Courthouse/Police Station/Library	106 B Street West Rainier, OR 97048 N 46°05.334; W 122°56.167	2,750,100 (building) 280,160 (contents)
Emergency Response	Columbia River Fire and Rescue District - Fernhill Station	73153 Doan Rd	343,200
	Columbia River Fire and Rescue District - Goble Station	69321 Nicolai Rd	343,200
	Columbia River Fire and Rescue District - Rainier Station	211 W 2nd St	73,200

**Appendix E**  
**City of Rainier**

**Table E-7. City of Rainier Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
Educational	Hudson Park Elementary	28176 Old Rainier Rd Rainier, OR	3,286,730
	Rainier Junior/Senior High School	28170 Old Rainier Rd Rainier, OR	6,525,050
	Little Rascals Academy (Preschool / Day Care)	308 3 <sup>rd</sup> Street West	
	North Columbia Academy (Charter School)	305 W 3rd St	Value unknown
	Rainier School District Office	28168 Old Rainier Rd Rainier, OR	89,988
	Rainier School Commons	28170 Old Rainier Rd Rainier, OR	11,391,800
	Rainier School Gymnasium	28170 Old Rainier Rd Rainier, OR	1,349,300
	Rainier School Complex Portables	28170 Old Rainier Rd Rainier, OR	420,987
	Rainier School Industrial Tech Shops	28170 Old Rainier Rd Rainier, OR	1,616,070
	Rainier Maintenance Building	28170 Old Rainier Rd Rainier, OR	82,400
	Midco (Bus Garage)	28170 Old Rainier Rd Rainier, OR	355,612
Care Facility	Rainier Senior Center (including Senior Center Restrooms)	48 West 7 <sup>th</sup> St Rainier, OR N46°05.598; W 122°56.637	859,020 (building) 116,957 (contents)
Community	City of Rainier Riverfront Park	7th St N 46°05.495; W 122°56.465	500,000
	Hudson-Parcher Park	75503 Larson Rd Rainier, OR	839,586
	Alston's Corner Assembly of God	25272 Alston Rd	\$109,140
	Calvary Chapel	24056 Beaver Falls Rd	\$128,260
	Rainier Community Church of God	321 W C St	\$672,310
	United Methodist Episcopal Church	1st St & C St	\$133,470
	Rainier Assembly of God Church	75951 Rockcrest Rd	\$946,250
Rainier Cong of Jehovah's Witnesses	25381 Wonderly Rd	\$183,130	

**Table E-7. City of Rainier Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Nativity of the Blessed Virgin Mary Roman Catholic Church	204 C Street E	
	Shiloh Basin Community Church	67043 Nicolai Rd	
	Columbia Bible Church	407 E 2nd St	
	Riverside Community Church	305 W 3rd St	
	The Church of Jesus Christ of Latter-Day Saints, Rainier Ward,	27410 Parkdale Rd	
	Rainier City Marina (old one) (including rest room)	217 East A Street N 46°05.404; W 122°56.016	217,330 (building) 1,030 (contents)
	Rainier Marina (new one)	E 3rd St N 46°05.544; W 122°56.549	
	Rainier Boat Launch	E 3rd St N 46°05.624; W 122°56.583	
	Rainier Senior Center	27410 Parkdale Rd	
State and Federal Highways	US 30	1.5 miles at 385,000 per mile (est)	\$577,500
	City-Owned		How many miles?
Railroads Po	rtland/Western Short-line Railroad	1.5 miles	How many miles?
Bridges	C Street Bridge		\$757,714 (est.)
	Louis & Clark Bridge		
Transportation Facilities	Department of Public Works Shop		201,880 (building) 153,698 (contents)
Utilities	Wastewater Treatment Plant		9,000,000
	Mill Pumphouse		36,050
	Sewer Pump Stations		
	Rock Crest Sewer Pump Stations		188,490
	Water Treatment Plant (new)		3,969,620 (building) 69,010 (contents)
	Water Treatment Plant (old)		523,300 (building) 42,230 (contents)
	Water Tank (Reservoir)		452,170



**Table E-7. City of Rainier Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Water Tank High Level Reservoir		451,140
	Water Tank (Reservoir)		52,530
	Water Tank (Reservoir)		575,770
	Reservoir Pump Station		
	Highway 30 Pump House Pump Station		47,380 (building) 6,180 (contents)
	City Marina Pump Station		139,990 (building) 5,150 (contents)
	Clatskanie PUD, Rainier Substation		\$1,636,440
	Power Substations		
Dams	Rainier Watershed Reservoir		
	Fox Creek Timber Dam, gravity feed water system		484,100

**Sources:** FEMA HAZUS-MH, local jurisdictions.

<sup>1</sup>Estimated and/or insured structural value for critical facilities and estimated values for critical infrastructure.

NA = Not Available.

**VULNERABILITY ANALYSIS**

The vulnerability analysis development process is thoroughly discussed in the Columbia County MHMP, Section 6, which generated the following Hazard Exposure Analysis Overviews. Tables E-8, E-9, and E-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table E-8. City of Rainier Potential Hazard Exposure Analysis Overview-Population and Buildings</b>							
<b>Hazard Type</b>	<b>Hazard Area</b>	<b>Methodology</b>	<b>Population Number</b>	<b>Buildings</b>			
				<b>Residential</b>		<b>Non-Residential</b>	
				<b>Number</b>	<b>Value (\$)¹</b>	<b>Number</b>	<b>Value (\$)¹</b>
Flood	Moderate 500-y	ear floodplain	--	111	13,886,100	1	unknown
	High 100-y	ear floodplain	--	34	4,253,400	0	--
Winter Storm		descriptive	1,775	870	108,837,000	7	unknown
Landslide	Moderate >14-32	degrees	--	856	107,085,600	7	unknown
	High >32-56	degrees	--	568	71,056,800	1	unknown
Wildland Fire	Moderate	Moderate fuel rank	--	848	106,084,800	7	unknown
	High	High fuel rank	--	763	95,451,300	7	unknown
	Very High	Very high fuel rank	--	519	64,926,900	0	--
	Extreme	Extreme fuel rank	--	236	29,523,600	0	--
Earthquake	Strong 9-20%	(g)	--	870	108,837,000	7	unknown
	Very strong	20-40% (g)	--	0	--	0	--
	Severe >40-60%	(g)	--	0	--	0	--
Volcano		descriptive	1,775	870	108,837,000	7	unknown
Wind		descriptive	1,775	870	108,837,000	7	unknown
Erosion		within 300' of potential areas of erosion	-- 207		25,895,700	1	unknown
Expansive Soils	Low <3%	percent	--	574	71,807,400	1	unknown
	Moderate 3-6	percent	--	57	7,130,700	1	unknown
	High 6-9%		--	0	--	0	--
	Very High	>9%	--	0	--	0	--
Disruption of Utility and Transportation Systems	descriptiv	e	1,775	-- --		--	--
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- 695		86,944,500	7	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	-- --		--	--	--

¹ Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$125,100 per structure).  
Note-population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. \*0.25-mile buffered EHS sites were unable to be determined due to the use of census block data.

Table E-9. City of Rainier Potential Hazard Exposure Analysis Overview-Critical Facilities

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	--	--	--	--	--	--	--	--	3	1.6M
	High	100-year floodplain	--	--	1	73K	--	--	--	--	6	1.7M
Winter Storm		descriptive	1	3M	3	760K	11	25.1M	1	976K	17	3.7M
Landslide	Moderate	>14-32 degrees	1	3M	3	760K	11	25.1M	--	--	12	1.3M
	High	>32-56 degrees	--	--	--	--	--	--	--	--	--	--
Wildland Fire	Moderate	Moderate fuel rank	1	3M	3	760K	11	25.1M	1	976K	17	3.7M
	High	High fuel rank	1	3M	3	760K	11	25.1M	1	976K	15	3.5M
	Very High	Very high fuel rank	--	--	2	700K	7	21.7M	--	--	3	128M
	Extreme	Extreme fuel rank	--	--	--	--	--	--	--	--	--	--
Earthquake	Strong	9-20% (g)	1	3M	3	760K	11	25.1M	1	976K	17	3.7M
	Very strong	20-40% (g)	--	--	--	--	--	--	--	--	--	--
	Severe	>40-60% (g)	--	--	--	--	--	--	--	--	--	--
Volcano		descriptive	1	3M	3	760K	11	25.1M	1	976K	17	3.7M
Wind		descriptive	1	3M	3	760K	11	25.1M	1	976K	17	3.7M
Erosion		within 300' of potential areas of erosion	1	3M	1	73K	2	unknown	--	--	5	1.3M
Expansive Soils	Low	<3% percent	--	--	--	--	--	--	--	--	--	--
	Moderate	3-6 percent	--	--	--	--	--	--	--	--	3	1.9M
	High	6-9%	--	--	--	--	--	--	--	--	1	840K
	Very High	>9%	--	--	--	--	--	--	--	--	--	--
Disruption of Utility and Transportation Systems		descriptive	1	3M	3	760K	11	25M	1	1M	17	3.7M
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	1	3M	1	73K	4	3.4M	1	1M	13	2.9M
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	1	3M	1	73K	4	757K	--	--	11	2.8M

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Table E-10 City of Rainier Potential Hazard Exposure Analysis Overview-Critical Infrastructure

Hazard Type	Hazard Area	Methodology	Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams	
			Miles	Value (\$)¹	Miles	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	-- --		-- --		1	unknown	-- --		3	340K	--	--
	High	100-year floodplain	-- --		-- --				2	355K	2	9.1M	--	--
Winter Storm		descriptive	1 unknown	unknown	1 unknown	unknown	2	758K	2	355K	13	17.1 M	2	484K
Landslide	Moderate	>14-32 degrees	--	--	--	--	2	758K	2	355K	10	1.7M	2	484K
	High	>32-56 degrees	-- --		-- --		2	758K	-- --		4	1.1M	2	484K
Wildland Fire	Moderate	Moderate fuel rank	1 unknown	unknown	1 unknown	unknown	2	758K	2	355K	12	17M	1	484K
	High	High fuel rank	1 unknown	unknown	1 unknown	unknown	2	758K	2	355K	12	17M	2	484K
	Very High	Very high fuel rank	-- --		-- --						5	1.7M	2	484K
	Extreme	Extreme fuel rank	-- --		-- --		1	758K	-- --		-- --			--
Earthquake	Strong	9-20% (g)	1 unknown	unknown	1 unknown	unknown	2	758K	2	355K	13	171.M	2	484K
	Very strong	20-40% (g)	-- --		-- --						-- --			--
	Severe	>40-60% (g)	-- --		-- --						-- --			--
Volcano		descriptive	1 unknown	unknown	1 unknown	unknown	2	758K	2	355K	13	171.M	2	484K
Wind		descriptive	1 unknown	unknown	1 unknown	unknown	2	758K	2	355K	13	171.M	2	484K
Erosion		within 300' of potential areas of erosion	--	--	--	--	1	760K	1	355K	1	9M	--	--
Expansive Soils	Low	<3% percent	-- --		-- --						-- --			--
	Moderate	3-6 percent	-- --		-- --		1	unknown	-- --		1	188K	--	--
	High	6-9%	-- --		-- --						-- --			--
	Very High	>9%	-- --		-- --						-- --			--
Disruption of Utility and Transportation Systems		descriptive	unknown	580K	1.5	unknown	2	758K	1	356K	14	18M	2	484K
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- --		-- --		2	757K	1	355K	5	9.8M --		--
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	--	--	--	--	2	757K	1	355K	8	16M --		--

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section describes community specific vulnerabilities and impacts from technological and manmade hazards in addition to the natural hazards identified in the 2009 Columbia County MHMP.

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for the City of Rainier. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

There are 34 residential structures (worth \$4.3M), one emergency response facility (worth \$73K), one care facility (worth \$976K), six community facilities (worth \$1.7M), one transportation facility (worth \$355K), and two utilities (worth \$9.1M) within the boundaries of the 100-year floodplain.

There are 111 residential structures (worth \$13.9M), one non-residential structure (value unknown), three community facilities (worth \$1.6M), one bridge (value unknown) and three utilities (worth \$370K) within the 500-year floodplain.

### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind and floods, are often widespread. A single event is capable of impacting all people, critical facilities and infrastructure within the City of Rainier.

The entire population (1,755 people), including 870 residential structures (worth \$108.8M), 7 non-residential structures (value unknown), one government facility (worth \$3M), three emergency response facilities (worth \$760K), 11 educational facilities (worth \$25.1M), one care facility (worth \$976K), 17 community facilities (value \$3.7M), one highway (value unknown), one railroad (value unknown), two bridges (worth \$758K), two transportation facilities (worth \$355K), 13 utilities (worth \$17.1M) and two dams (worth \$484K) are at risk.

### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation and rail routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and

waste water utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within the City of Rainier. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

There are 856 residential structures (worth \$107M), seven non-residential structures (value unknown), one government facility (worth \$3M), three emergency response facilities (worth \$760K), 11 educational facilities (worth \$25.1M), 12 community facilities (worth \$1.3M), two bridges (worth \$758K), one transportation facility (worth \$356K), two dams (worth \$484K) and ten utilities (worth \$1.7M) in the moderate landslide risk area.

There are 568 residential structures (worth \$71M), one non-residential structures (value unknown), two bridges (worth \$758K), two dams (worth \$484K), and four utilities (worth \$1.1M) in the high landslide risk area.

### ***Wildland Fires***

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

There are 848 residential structures (worth \$106.1M), seven non-residential structures (value unknown), one government facility (worth \$3M), three emergency response facilities (worth \$760K), 11 educational facilities (worth \$25.1M), one care facility (worth \$976K), 17 community facilities (value \$3.7M), one highway (value unknown), one railroad (value unknown), two bridges (worth \$758K), two transportation facilities (worth \$355K), 12 utilities (worth \$17M) and one dam (worth \$484K) located in moderate fire risk areas.

There are 763 residential structures (worth \$95.5M), seven non-residential structures (value unknown), one government facility (worth \$3M), three emergency response facilities (worth \$760K), 11 educational facilities (worth \$25.1M), one care facility (worth \$976K), 15 community facilities (value \$3.5M), one highway (value unknown), one railroad (value unknown), two bridges (worth \$758K), two transportation facilities (worth \$355K), 12 utilities (worth \$17M) and two dams (worth \$484K) located in the high fire risk areas.

There are 519 residential structures (worth \$64.9M), two emergency response facilities (worth \$700K), seven educational facilities (worth \$21.7M), three community facilities (worth \$128M), one bridge (worth \$758K), two dams (worth \$484K) and five utilities (worth \$1.7M) located in very high fire risk areas.

There are 236 residential structures (worth \$29.5M) and one bridge (worth \$758K) located in the extreme fire risk area.



### *Earthquake*

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslide, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

Due to the City of Rainier's proximity to the eastern portion of the county, all people, critical facilities and infrastructure within the City of Rainier, and therefore the entire population (1,755 people), including 870 residential structures (worth \$108.8M), 7 non-residential structures (value unknown), one government facility (worth \$3M), three emergency response facilities (worth \$760K), 11 educational facilities (worth \$25.1M), one care facility (worth \$976K), 17 community facilities (value \$3.7M), one highway (value unknown), one railroad (value unknown), two bridges (worth \$758K), two transportation facilities (worth \$355K), 13 utilities (worth \$17.1M) and two dams (worth \$484K) are located in the strong shaking (9-20 percent) area.

### *Volcano*

A volcanic eruption would have a minor impact on the City of Rainier due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006)

The City of Rainier will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies.

Buildings streets and roads throughout the city may require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services. Water treatment facilities may require additional attention to address high turbidity water. Injuries associated with respiratory problems may result. (Goettel 2005)

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within the City of Rainier are at risk including the entire population (1,755 people), including 870 residential structures (worth \$108.8M), 7 non-residential structures (value unknown), one government facility (worth \$3M), three emergency response facilities (worth \$760K), 11

educational facilities (worth \$25.1M), one care facility (worth \$976K), 17 community facilities (value \$3.7M), one highway (value unknown), one railroad (value unknown), two bridges (worth \$758K), two transportation facilities (worth \$355K), 13 utilities (worth \$17.1M) and two dams (worth \$484K).

### *Wind*

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within the City of Rainier are equally at risk of a windstorm event including all people, critical facilities and infrastructure, and therefore the entire population (1,755 people), including 870 residential structures (worth \$108.8M), 7 non-residential structures (value unknown), one government facility (worth \$3M), three emergency response facilities (worth \$760K), 11 educational facilities (worth \$25.1M), one care facility (worth \$976K), 17 community facilities (value \$3.7M), one highway (value unknown), one railroad (value unknown), two bridges (worth \$758K), two transportation facilities (worth \$355K), 13 utilities (worth \$17.1M) and two dams (worth \$484K).

### *Erosion*

Riverine erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available, however, descriptions of several localized areas were identified during the development of this document and are identified only by location on a map referencing the river or stream reach described. Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

There are 207 residential structures (worth \$25.9M), one non-residential structures (value unknown), one government facility (worth \$3M), one emergency response facility (worth \$73K), two educational facilities (values unknown), five community facilities (worth \$1.3M), one bridge (worth \$760K), one transportation facility (worth \$355K) and one utility (worth \$9M) identified in the City of Rainier to be at risk from erosion impacts.

### *Expansive Soils*

Shrinking and swelling soils can lead to damaged foundations and structures. The most common damage includes cracking and loss of integrity of building foundations and walls of residential and light (one-or two-story) buildings, highways, canal and reservoir linings, and retaining walls. (PCCDD 2006, US Army 1983)

Using NRCS soils data, risk for shrink-swell potential was calculated using the linear extensibility of moderate (3-6 percent), high (6-9 percent), and very high (greater than 9 percent).

There are 574 residential structures (worth \$71.8M), one non-residential structures (value unknown), three community facilities (worth \$1.9M), one utility (worth \$188K), and one bridge (value unknown) identified in the expansive soils low risk area.

There are 57 residential structures (worth \$7.1M) one non-residential structures (value unknown), and one community facility (worth \$840K) identified in the expansive soils moderate risk area.

### ***Disruption of Utility and Transportation Systems***

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

### ***Hazardous Material Event***

The National Response Center and the EPA's Environmental Facts Multi-system Query were used to locate hazardous waste handling facilities and businesses that generate hazardous waste from their activities. (In Progress) Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 mile radius of those are considered at risk.

There are 695 residential structures (worth \$86.9M), seven non-residential structures (value unknown), one government facility (worth \$3M), one emergency response facility (value \$73K), four educational facilities (worth \$3.4M), one care facility (worth \$1M), 13 community facilities (value \$2.9M), two bridges (worth \$757K), one transportation facility (worth \$355K), and five utilities (worth \$9.8M) located with 0.25 mile from a transportation route and may be at risk from a hazardous material event.

Facilities considered at risk near 0.25 mile-buffered EHS Sites include one government facility (worth \$3M), one emergency response facility (value \$73K), four educational facilities (worth \$3.4M), 11 community facilities (value \$2.8M), two bridges (worth \$757K), one transportation facility (worth \$355K), and eight utilities (worth \$16M).

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## MITIGATION STRATEGY

### IDENTIFYING MITIGATION ACTIONS

The following section defines identification and analysis of mitigation actions as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions**

**Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Element**

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

The Steering Committee assessed whether to adopt Columbia County’s hazard mitigation goals listed in Table E-11, or to revise them to better meet the City’s needs. The City then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals.

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table E-12 depicts the City’s “considered” mitigation actions developed during this mitigation planning process. The revised list in Table E-14 delineates those actions the City will strive to implement within this five year planning cycle.

**DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance**

**National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Element**

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

The City of Rainier actively participates in FEMA’s National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They

subsequently selected and prioritized City appropriate actions to assure an effective flood mitigation program.

### Mitigation Goals and Action Items Considered

<b>Table E-11. 2005 Columbia County Mitigation Goals-Considered</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	<p><b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.</p>
2	<p><b>Protect Critical Facilities and Enhance Emergency and Essential Services</b></p> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

<b>Table E-12. City of Rainier Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status Consider Ongoing</b>	<b>Comment</b>	<b>Description</b>
<b>Natural Hazards</b>			
<b>Multi-Hazard (MH)</b>			
MH	<b>Ongoing</b>		Develop and incorporate building ordinances commensurate with building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.
MH C	onsider		Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
MH C	onsider		Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
MH O	ngoing		Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)
MH C	onsider		Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
MH	<b>Ongoing</b>		Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
MH C	onsider		Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
<b>Flood</b>			
Flood C	onsider		Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.
Flood C	onsider		Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data.
Flood	Consider		Acquire, relocate, elevate, or otherwise flood-proof critical facilities.
Flood C	onsider		Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings. Water ultimately returning to its watercourse at a reduced flow rate.
<b>Winter Storm</b>			
Winter Storms	Consider		Develop and implement severe winter storm debris management plan, strategies, and educational outreach programs.
Winter Storms	Consider		Develop and implement tree clearing mitigation programs to keep trees from threatening lives,

**Table E-12. City of Rainier Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b> <i>Consider</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
			property, and public infrastructure from severe weather events.
Winter Storms	Consider		Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or eliminate power outages from severe winter storms. Consider developing incentive programs.
<b><i>Landslide</i></b>			
Landslide	<b><i>Ongoing</i></b>		Develop process to limit future development in high landslide potential areas (permitting, geotechnical review, soil stabilization techniques, etc).
Landslide Consi	der		Update the storm water management plan to include regulations to control runoff, both for flood reduction and to minimize saturated soils on steep slopes that can cause landslides.
<b><i>Wildland Fire</i></b>			
Wildland Fire	Consider		Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
Wildland Fire	Consider		Provide wildland fire information in an easily distributed format for all residents.
Wildland Fire	<b><i>Ongoing</i></b>		Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.
Wildland Fire	Consider		Develop outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs.
Wildland Fire	Consider		Identify, develop, and implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.
<b><i>Earthquake</i></b>			
Earthquake C	onsider		Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.
Earthquake	Consider		Retrofit important public facilities with significant seismic vulnerabilities.
Earthquake C	onsider		Develop public outreach program to train earthquake safety; perform drop-cover-hold drills at schools and public facilities.
Earthquake C	onsider		Evaluate critical public facility seismic performance i.e. fire stations, public works buildings, potable water systems, wastewater systems, electric power systems, and bridges etc.
<b><i>Volcano</i></b>			
Volcano C	onsider		Update public emergency notification procedures and develop an outreach program for ash fall events.
Volcano C	onsider		Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.
Volcano C	onsider		Evaluate ash impact on storm water drainage, and water treatment systems. Develop mitigation actions.

<b>Table E-12. City of Rainier Mitigation Actions Considered</b>			
<b>Hazard</b>	<b>Status</b> <i>Consider</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
<b><i>Wind</i></b>			
Wind C	onsider		Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.
Wind C	onsider		Revise requirements to place utilities underground to reduce power disruption from wind storm / tree blow down damage when upgrading or during new development.
<b><i>Erosion</i></b>			
Erosion	Consider		Apply for grants/funds to implement riverbank protection methods.
Erosion Co	mplete		Install embankment protection such as vegetation, riprap, gabion baskets, sheet piling, and walls to reduce or eliminate erosion.
<b><i>Expansive Soils</i></b>			
Expansive Soils	<b><i>Ongoing</i></b>		Require building design, engineering, and construction processes that address expansive soil conditions at potentially affected building sites.
Expansive Soils	Consider		Review construction codes to require non-absorbent fill soils that slope away from foundations for a minimum of five feet to prevent ponding and water retention.
<b><i>Disruption of Utilities and Transportation Systems (DUTS)</i></b>			
DUTS Consi	der		Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.
DUTS	Consider		Review and update emergency response plans for utility and transportation disruptions.
<b><i>HAZMAT</i></b>			
HAZMAT Consi	der		Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.
HAZMAT Consi	der		Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.
HAZMAT Consi	der		Research, develop, and implement methods to protect waterways from hazardous materials events.



## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

### DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions

#### Implementation of Mitigation Actions

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

#### Element

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on numerous occasions to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the Mitigation Action Plan. The Committee then determined the responsible agency and potential funding sources. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities.

The City of Rainier Steering Committee evaluated the Benefit-Cost Analysis Fact Sheet (Appendix N) for prioritizing its “considered” mitigation actions listed in Table E-12. The Steering Committee determined that the committee consisted of sufficient expertise to select those mitigation actions that would most benefit the City without using the STAPLE-E evaluation tool. Upon review, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for the City and responsible entities to implement during the 5-year lifespan of this version of the MHMP. As such, the Steering Committee determined that only the mitigation actions that received a high priority ranking would be included in the City’s Mitigation Action Plan. Table E-14 depicts the City’s mitigation actions grouped by hazard and in descending priority order within each hazard.

## MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED

The City of Rainier reviewed the County’s Mitigation goals and determined they meet the City’s needs and subsequently adopted the Goals in Table E-13 for the current planning period.

<b>Table E-13. City of Rainer Mitigation Goals</b>	
<b>Goal Number</b>	<b>Goal Description</b>
<b>1</b>	<b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.
<b>2</b>	<b>Protect Critical Facilities and Enhance Emergency and Essential Services</b> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
<b>3</b>	<b>Reduce the Threat to Property</b> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
<b>4</b>	<b>Create a Disaster Resistant and Disaster-Resilient Economy</b> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
<b>5</b>	<b>Increase Public Awareness, Education, Outreach, and Partnerships</b> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

## IMPLEMENTING A MITIGATION ACTION PLAN

The following section defines the mitigation action identification process for each participating jurisdiction as stipulated in DMA 2000 and its implementing regulations.

<p style="text-align: center;"><b>DMA 2000 Requirements: Mitigation Strategy-Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Requirement §201.6(c)(3)(iv):</b> For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.</p> <p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?</li> <li>■ Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?</li> </ul> <p>Source: FEMA, July 2008.</p>
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**Appendix E**  
**City of Rainier**

This appendix identifies action items specific to the City of Rainier. Since the update includes incorporation of the City of Rainier as part of the MHMP, all actions in this appendix are considered new. Table E-14 displays the City of Rainier’s Mitigation Action Plan matrix that lists mitigation actions by hazard and are prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

<b>Table E-14. City of Rainier Mitigation Action Plan Matrix</b>						
<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
<b>Natural Hazards</b>						
<i>Multi-Hazard (MH)</i>						
MH	Develop and incorporate building ordinances commensurate with building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
MH	Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.	City Admin/Planning	Ongoing	General Fund	BC: TBD** TF: Yes	
MH	Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. water and sewage pump stations, etc.)	City Admin	Ongoing	General Fund	BC: TBD** TF: Yes	
MH	Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
MH	Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.	City Admin/Public Works	Ongoing	General Fund, HMA, HMGP	BC: TBD** TF: Yes	

**Table E-14. City of Rainier Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
MH	Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.	City Admin/Public Works/Building Dept	Ongoing	General Fund, HMA, HMGP	BC: TBD** TF: Yes	
MH	Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.	City Admin	Ongoing	General Fund, HMA, HMGP, NRCS	BC: TBD** TF: Yes	
<b>Flood</b>						
Flood	Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
Flood	Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100-year floodplain using survey elevation data.	City Admin/	Ongoing	General Fund	BC: TBD** TF: Yes	
Flood	Acquire, relocate, elevate, or otherwise flood-proof critical facilities.	City Admin	Ongoing	General Fund, HMA, HMGP, NRCS	BC: TBD** TF: Yes	
Flood	Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings. Water ultimately returning to its watercourse at a reduced flow rate.	City Admin/Public Works	Ongoing	General Fund, HMA, HMGP	BC: TBD** TF: Yes	
<b>Winter Storm</b>						
Winter Storm	Develop and implement severe winter storm debris management plan, strategies, and educational outreach programs.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
Winter Storm	Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.	City Admin/Public Works	Ongoing	General Fund, HMA, HMGP	BC: TBD** TF: Yes	

**Table E-14. City of Rainier Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Winter Storm	Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or eliminate power outages from severe winter storms. Consider developing incentive programs.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
<b>Landslide</b>						
Landslide	Develop process to limit future development in high landslide potential areas (permitting, geotechnical review, soil stabilization techniques, etc).	City Admin/Planning/ Building Dept	Ongoing	General Fund	BC: TBD** TF: Yes	
Landslide	Update the storm water management plan to include regulations to control runoff, both for flood reduction and to minimize saturated soils on steep slopes that can cause landslides.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
Landslide	Identify and seasonally restrict recreational and construction activities in high landslide areas.	City Admin/Building Dept	Ongoing	General Fund	BC: TBD** TF: Yes	
<b>Wildland Fire</b>						
Wildland Fire	Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.	City Admin/Fire Dept	Ongoing	General Fund, FMAP	BC: TBD** TF: Yes	
Wildland Fire	Provide wildland fire information in an easily distributed format for all residents.	City Admin/Fire Dept	Ongoing	General Fund, FMAP	BC: TBD** TF: Yes	
Wildland Fire	Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.	City Admin/Fire Dept	Ongoing	General Fund	BC: TBD** TF: Yes	
Wildland Fire	Develop outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs.	City Admin/Fire Dept	Ongoing	General Fund, FMAP	BC: TBD** TF: Yes	
Wildland Fire	Identify, develop, and implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.	City Admin/Fire Dept	Ongoing	General Fund, FMAP	BC: TBD** TF: Yes	

**Appendix E**  
**City of Rainier**

**Table E-14. City of Rainier Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Earthquake</b>						
Earthquake	Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.	City Admin/Public Works	Ongoing	General Fund, HMGP	BC: TBD** TF: Yes	
Earthquake	Retrofit important public facilities with significant seismic vulnerabilities.	City Admin/Public Works	Ongoing	General Fund, HMA, HMGP	BC: TBD** TF: Yes	
Earthquake	Develop public outreach program to train earthquake safety; perform drop-cover-hold drills at schools and public facilities.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
Earthquake	Evaluate critical public facility seismic performance i.e. fire stations, public works buildings, potable water systems, wastewater systems, electric power systems, and bridges etc.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
<b>Volcano</b>						
Volcano	Update public emergency notification procedures and develop an outreach program for ash fall events.	City Admin/Public Works	Ongoing	General Fund, NOAA/ NWS	BC: TBD** TF: Yes	
Volcano	Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.	City Admin/Public Works	Ongoing	General Fund, NOAA/ NWS	BC: TBD** TF: Yes	
Volcano	Evaluate ash impact on storm water drainage, and water treatment systems. Develop mitigation actions.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
<b>Wind</b>						
Wind	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.	City Admin/Public Works	Ongoing	General Fund, Utility Co., HMGP	BC: TBD** TF: Yes	
Wind	Revise requirements to place utilities underground to reduce power disruption from wind storm / tree blow down damage when upgrading or during new development.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
<b>Erosion</b>						

**Table E-14. City of Rainier Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Erosion	Apply for grants/funds to implement riverbank protection methods.	City Admin/Public Works	Ongoing	General Fund, USACOE, HMGP	BC: TBD** TF: Yes	
<b><i>Expansive Soils</i></b>						
Expansive Soils	Require building design, engineering, and construction processes that address expansive soil conditions at potentially affected building sites.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
Expansive Soils	Review construction codes to require non-absorbent fill soils that slope away from foundations for a minimum of five feet to prevent ponding and water retention.	City Admin/Public Works	Ongoing	General Fund	BC: TBD** TF: Yes	
<b>Manmade and Technological Hazards</b>						
<b><i>Disruption of Utilities and Transportation Systems (DUTS)</i></b>						
DUTS	Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.	City Admin/Public Works	Ongoing	General Fund, EF&S	BC: TBD** TF: Yes	
DUTS	Review and update emergency response plans for utility and transportation disruptions.	City Admin/Public Works	Ongoing	General Fund, HSGP	BC: TBD** TF: Yes	
<b><i>Hazardous Materials</i></b>						
HAZMAT	Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.	City Admin/Public Works	Ongoing	General Fund, CERCLA, SARA	BC: TBD** TF: Yes	
HAZMAT	Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.	City Admin/Public Works	Ongoing	General Fund, CERCLA, SARA	BC: TBD** TF: Yes	
HAZMAT	Research, develop, and implement methods to protect waterways from hazardous materials events.	City Admin/Public Works	Ongoing	General Fund, CERCLA, SARA	BC: TBD** TF: Yes	

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**Appendix F**  
**City of St. Helens**

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This appendix contains the specific City of St. Helens information to support the Columbia County Multi-Jurisdictional Hazard Mitigation Plan update.

This section further supports the County's planning process by summarizing the review and incorporation of existing plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan's development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

The City of St. Helens is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the City organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats.

Table F-1 contains the City’s Steering Committee participant list to augment the Columbia County MHMP planning elements.

<b>Table F-1. City of St. Helens Steering Committee</b>	
Members	Position
Skip Baker (Lead)	Community Development Director
Dale Goodman	Public Works Director
Neil Shepard	Public Works Supervisor
Dave Elder	Public Works Assistant
Sue Nelson	City Engineer
Frank Hupp	County Emergency Management

Table F-2 contains the summary of the City’s public involvement and planning meeting activities.

<b>Table F-2. Public Involvement Mechanisms</b>	
Mechanism	Description
MHMP newsletter: placed Planning Process Newsletter on website 07/09/08	Explained the planning initiative
April Kickoff Newsletter	Explained plan development process and solicited input and comments.
August 14, 2008 Countywide Public Meeting, 10 a.m., 2 p.m., & 6 p.m., Columbia County 911 Center, St. Helens, OR	Presented draft risk assessment results and provided opportunity to comment.

**CAPABILITY ASSESSMENT**

Table F-3, F-4, and F-5 contain the City’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table F-3. City of St. Helens Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	St. Helens Comprehensive Plan	Guides City governance, land use, and development.
Policies (Municipal Codes)	Title 17 Community Development Regulations	As a means of promoting the general health, safety, and welfare of the public, this code is designed to set forth the standards and procedures governing the development and use of land in the city of St. Helens and to implement the St. Helens comprehensive plan.
	St. Helens Municipal Code	The St. Helens Municipal Code is hereby adopted as the official city code of the city of St. Helens. The code shall be cited as the “St. Helens Municipal Code.” It consists of the ordinances of the city that have ongoing effect and which have not expired according to their terms.
	Engineering Standards Manual	The purpose of this title is to set standards for the construction of public improvements to serve new and future developments and for the reconstruction of existing facilities to upgrade existing infrastructure.
	St. Helens City Charter	To provide for the government of the city of St. Helens, Columbia County, Oregon; and to repeal all charter provisions of the city enacted prior to the time that this charter takes effect.

<b>Table F-4. City of St. Helens Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	City Engineer: Sue Nelson City Planner: Jacob Graichen
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	City Engineer (Civil-non structural) Building Officials
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	City Engineer: Sue Nelson
Floodplain manager	City Planner: Jacob Graichen
Personnel skilled in GIS and/or HAZUS-MH Yes-Plann	ing Assistant
Director of Emergency Services Yes-Po	lice Chief
Finance (grant writers, purchasing)	Finance Director Grant Writer
Public Information Officers	Melinda Duran (Municipal Court Clerk) Contractor

<b>Table F-5. City of St. Helens Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	Yes
Authority to levy taxes for specific purposes	Yes-with voter approval
Incur debt through general obligation bonds	yes
Incur debt through special tax and revenue bonds	yes
Incur debt through private activity bonds	unknown
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

<b>DMA 2000 Requirements: Risk Assessment: Identifying Hazards</b>
<b>Identifying Hazards</b>
<b>Requirement §201.6(c)(2)(i):</b> [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.
<b>Element</b>
<ul style="list-style-type: none"> <li>■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?</li> </ul>
Source: FEMA, July 2008.

The City of Helen’s Steering Committee determined that the following hazards could potentially threaten the community.

<i><b>Natural Hazards</b></i>	
Flood	X
Winter Storm	X
Landslide	X
Fire (Wildland/Urban)	X
Earthquake	X
Volcano	X
Wind*	X
Erosion*	X
ENSO (El Niño / La Niña)*	
Expansive Soils*	
Drought*	
<i><b>Technological Hazards</b></i>	
Dam Failure	X
Disruption of Utility and Transportation Systems (DUTS)	X
Hazardous Materials	X
Terrorism	X
Infectious Disease Epidemic	

## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes community specific vulnerability information for the City of St. Helens to augment the MHMP development process. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following section defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

The City of St. Helens actively participates in FEMA's National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.



The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized County or community appropriate actions to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**  
**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.  
**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**  
**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area  
**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS: SPECIFIC STEPS**

### **Asset Inventory**

Asset inventory is the first step of a vulnerability analysis. Assets within each community that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

The asset inventory delineates the City’s existing building and infrastructure assets and insured values are identified in detail in Tables F-6A, F-6B, and F-7.

Tables F-8, F-9, and F-10 portray the critical infrastructure numbers and values, and their potential vulnerability by hazard type.

The City of St. Helens seeks to protect its population by supporting Columbia County and Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### **Population and Building Stock**

Population data listed in Table F-6A were obtained from the 2000 U.S. Census and Portland State University. It comprises census block level data, and estimates from university conducted community research.

The City’s existing building and infrastructure and insured values are identified in Tables B-6A, F-6B, and F-7.

<b>Table F-6A. City of St. Helens Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2005 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
10,019 11	,795	12,075	4,109	512,392,300

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$124,700 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table F-6B. City of St. Helens NFIP Insurance Report</b>								
<b>City of</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Average Premium (\$)</b>	<b>Total Claims Since 1978</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>
St. Helens	34,826	27 68		13,357,800 5	12.15	17	195,846 1	

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

**Table F-7. City of St. Helens Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
Government	St. Helens City Hall	265 Strand St	\$2,750,000
	St. Helens Parks Dept	477 18 <sup>th</sup> St S	\$1,860,160
	City Shops (Public Works)	984 Oregon Street	\$461,229
	VAGT Building	257-277 Strand Street	1,750,000
Emergency Response	Columbia River Fire & Rescue	270 Columbia Blvd	\$563,680
	St. Helens Police Department	150 S 13th St	\$1,648,847
	Emergency Operations Center	230 The Strand	\$4,468,000
Educational	McBride Elementary School	2774 Columbia Blvd	\$32,300
	Lewis & Clark Intermediate School	111 S 9th St	Unknown
	St. Helens Middle School	354 N 15th St	Unknown
	St. Helens High School	2375 Gable Rd	Unknown
	Columbia County Education Campus	474 16th N 16th Street	Unknown
	St. Helens Arthur Academy (Mastery Learning Institute)	33035 Pittsburgh Road	\$500,000
	St. Helens School District Office	475 16th N 16th Street	\$146,300
	Columbia Learning Center	375 S 18th Street	\$1,860,160
Care Facility	Portland Community College, St. Helens Center	1510 St. Helens St.	\$194,000
	Legacy Good Samaritan Hospital & Medical Center	500 N Columbia River Hwy	\$7,185,890
	Legacy Urgent Care Clinic	500 N Columbia River Hwy	Unknown
	Columbia Community Mental Health	124 Forest Park	\$226,400
	Legacy Labs St. Helens	500 N Columbia River Hwy	Unknown
	CHD Public Health Authority	2370 Gable Rd	\$104,000
	St. Helens Vet Clinic	203 S Columbia Park Hwy	\$322,920
Community	St. Helens Senior Center	375 S 15th St	\$2,103,070
	St. Helens City Library	375 S 18th St	\$3,139,384
	McCormick Park	475 S 18th St & Portland Road	\$1,537,187
	Campbell Park	Vernonia & Allendale Dr	\$427,303
	Columbia View Park	Strand St & Columbia River	\$287,813
	Civic Pride Park	111 S 9th St	\$11,883
	Godfrey Park	N 4th St	\$33,802

**Table F-7. City of St. Helens Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Heinie Heumann Park	S 15th St & Tualatin St	\$11,667
	Little League Park	6th St & West St	\$66,730
	Columbia Botanical Garden	N 6th St	Unknown
	Sand Island Marine Park	.75 mi from 265 Strand St	\$1,866,393
	Ascension Lutheran Church	1911 Columbia Blvd	Unknown
	Buccini Hall	165 S 145h St	Unknown
	Bethel Fellowship	104 N Vernonia Rd	\$127,600
	Calvary Chapel	213 S 1st St	Unknown
	Calvary Lutheran	58251 S Division Rd	\$191,340
	Christ Episcopal Church	35350 E Division Rd	\$292,700
	Church of Christ	295 S 18th St	Unknown
	Church of the Nazarene	2360 Gable Rd	
	First Christian Church	185 S 12th St	Unknown
	First Evangelical Church of St. Helens	225 3 <sup>rd</sup> St N	\$135,840
	First Lutheran Church Elca	360 Wyeth St	Unknown
	First Missionary Baptist Church	2625 Gable Rd	Unknown
	First United Methodist Church	560 Columbia Blvd	\$192,080
	Plymouth Presbyterian Church	2615 Sykes Rd	Unknown
	St Frederic Catholic Church	175 13th St S	\$390,800
	St. Helens Community Bible Church	35031 Millard Rd	\$79,700
	Sunset Park Community Church	164 Sunset Blvd	\$86,200
	The Church of Jesus Christ of Latter-Day Saints	2755 Sykes Rd	Unknown
	Yankton Baptist Church	33579 Pittsburgh Rd	\$45,400

**Table F-7. City of St. Helens Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
State and Federal Highways	US Hwy 30		Approx 5 miles long
Railroads	Portland & Western Railroad		Approx. 5 miles long
Bridges	Milton Creet Bicycle Bridge	GPS Coordinates 45deg51min1.47 secN 122deg48min52.41secW	\$546,000
	Old Portland Road Bridge	18th St and Old Portland Rd	\$1,500,000
	McNulty Way Bridge	58645 McNulty Way	\$1,754,691
	Tree Farm North Bridge	Salmonbery - 1 mile from 309C	\$82,507
	Milton Way Bridge	Milton Way	\$982,230
	Columbia Blvd Bridge	155 S Columbia River Hwy/Columbia Blvd	\$1,300,000
Transportation Facilities	Port of St. Helens	530 MILTON WAY	\$178,700
Utilities	Columbia River PUD		\$166,400
	Waste Water Treatment Plant		\$27,266,567
	Columbia County Talk Radio KOHI AM 1600		Unknown
	Water Reservoir - Old and New		\$4,112,483
	Water Reservoir - West Hill		\$2,000,000
	Boise Cascade Landfill		Unknown
	Department of Public Works		\$1,878,104
	Pump Station #12		\$198,265
	Pump Station #11		\$132,768
	Pump Station #9 (Yachts Landing)		\$77,342
	Pump Station #8 (Clark St)		\$47,486
	Pump Station #7 (McNulty Creek)		\$225,607
	Pump Station #6		\$62,430
	Pump Station #5 (Elks)		\$177,590
	Pump Station #4 (True Value)		\$80,140
	Pump Station #3 (Kozy)		\$106,170
	Pump Station #2 (River)		\$264,748
	Pump Station #1(Klondike)		\$163,899
Pump Station		258605	

**Table F-7. City of St. Helens Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Fuel Tanks		32,295
	Waste Water Treatment Plant		\$27,266,567
	Water Filtration Facility		\$12,526,345
Dams	Salmonberry		No value

**Sources:** FEMA HAZUS-MH, City of St. Helens

<sup>1</sup>Estimated and/or insured structural value for critical facilities and estimated values for critical infrastructure.

NA = Not Available.

## VULNERABILITY ANALYSIS

The vulnerability analysis development process is thoroughly discussed in the Columbia County MHMP, Section 6, which generated the following Hazard Exposure Analysis Overviews. Tables F-8, F-9, and F-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table F-8. City of St. Helens Potential Hazard Exposure Analysis Overview-Population and Buildings</b>							
			Population Number	Buildings			
Hazard Type	Hazard Area	Methodology		Residential		Non-Residential	
			Number	Number	Value (\$)¹	Number	Value (\$)¹
Flood	Moderate 500-y	ear floodplain	--	886	110,484,200	11	unknown
	High 100-y	ear floodplain	--	903	112,604,100	11	unknown
Winter Storm		descriptive	12,075	4,109	512,392,300	31	unknown
Landslide	Moderate >14-32	degrees	--	2,402	299,529,400	17	unknown
	High >32-56	degrees	--	1,062	132,431,400	11	unknown
Wildland Fire	Moderate	Moderate fuel rank	--	3,760	468,872,000	31	unknown
	High	High fuel rank	--	3,395	423,356,500	25	unknown
	Very High	Very high fuel rank	--	1,420	177,074,000	15	unknown
	Extreme	Extreme fuel rank	--	10	1,247,000	0	unknown
Earthquake	Strong 9-20%	(g)	--	3,772	470,368,400	31	unknown
	Very strong	20-40% (g)	--	0	--	0	unknown
	Severe >40-60%	(g)	--	0	--	0	unknown
Volcano		descriptive	12,075	4,109	512,392,300	31	unknown
Wind		descriptive	12,075	4,109	512,392,300	31	unknown
Erosion		within 300' of potential areas of erosion	-- 540		67,338,000	8	unknown
Dam Failure	High	Inundation area	--	853	106,369,100	13	unknown
Disruption of Utility and Transportation Systems	descriptiv	e	12,075	--	--	31	unknown
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- 1,333		166,225,100	16	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites*	-- --		--	--	unknown
Terrorism		descriptive	--	--	--	--	unknown

¹ Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$124,700 per structure).

Note-population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. \*0.25-mile buffered EHS sites were unable to be determined due to the use of census block data.





Table F-9. City of St. Helens Potential Hazard Exposure Analysis Overview-Critical Facilities

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate 500-	year floodplain	3	6.4M	1	4.5M	--	--			3	3.7M
	High	100-year floodplain	3	6.4M 1 4.5M			--	--	1	323K	4	3.8M
Winter Storm		descriptive	4	6.8M 3 6.7M 9 2.7M 7 9.9M							29	9M
Landslide	Moderate	>14-32 degrees	2	4.5M	2	5M	3 694K 1	226K			11	668K
	High	>32-56 degrees	1	2.7M 1 4.5M 1				unknown	1	226K	4	230K
Wildland Fire	Moderate	Moderate fuel rank	4	6.8M 3 6.7M 9 2.7M 7 9.9M							28	7M
	High	High fuel rank	4	6.8M 3 6.7M 6 2.6M 3					653K		23	6.5M
	Very High	Very high fuel rank	--	--	--	--	1 500K 1	226K 1				45K
	Extreme	Extreme fuel rank	--	--	--	--						--
Earthquake	Strong	9-20% (g)	4	6.8M 3 6.7M 9 2.7M 7 9.9M							29	9M
	Very strong	20-40% (g)	--	--	--	--						--
	Severe	>40-60% (g)	--	--	--	--						--
Volcano		descriptive	4	6.8M	3 6.7M 9 2.7M 7 9.9M						29	9M
Wind		descriptive	4	6.8M	3	6.7M 9 2.7M 7 9.9M					29	9M
Erosion		within 300' of potential areas of erosion	2	4.5M	1	4.5M	--	--			3	2.1M
Dam Failure	High	Inundation area	2	4.5M	1	4.5M	--	--			2	1.9M
Disruption of Utility and Transportation Systems		descriptive	4	6.8M	3	6.7M	9	2.7M	7	10M	29	9M
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	1	461K	--	--	5 340K 6			7.8M	9	660K
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	4	6.8M	3 6.7M 7 2.2M 6 7.8M						26	8.5M
Terrorism		descriptive	4	6.8M	3	6.7M	9	2.7M	7	10M	29	9M

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**Table C-10 City of St. Helens Potential Hazard Exposure Analysis Overview-Critical Infrastructure**

		Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams		
Hazard Type	Hazard Area	Methodology	Miles	Value (\$) <sup>1</sup>	Miles	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>
Flood	Moderate	500-year floodplain	-- -- -- --				3	3.8M	-- --		1	80K	--	--
	High	100-year floodplain	-- -- -- --				5	6.1M	-- --		4	392K	--	--
Winter Storm		descriptive	5 unknown		5 unknown		6	6M	1	178K	22	77M	1	unknown
Landslide	Moderate	>14-32 degrees	-- -- -- --				3	3.8M	-- --		8	46.6M	--	--
	High	>32-56 degrees	-- -- -- --				--	--	-- -- -- -- --				--	--
Wildland Fire	Moderate	Moderate fuel rank	-- -- -- --				5	6M	1	178K	13	48.7M	--	--
	High	High fuel rank	-- -- -- --				5	6M	1	178K	13	48.7M	--	--
	Very High	Very high fuel rank	-- -- -- --				3	3.8M	-- --		1	27.3M	--	--
	Extreme	Extreme fuel rank	-- -- -- --				--	--	-- -- -- -- --				--	--
Earthquake	Strong	9-20% (g)	-- -- -- --				5	6M	1	178K	13	48.7M	--	--
	Very strong	20-40% (g)	-- -- -- --				--	--	-- -- -- -- --				--	--
	Severe	>40-60% (g)	-- -- -- --				--	--	-- -- -- -- --				--	--
Volcano		descriptive	5 unknown		5 unknown		6	6M	1	178K	22	77M	1	unknown
Wind		descriptive	5 unknown		5 unknown		6	6M	1	178K	22	77M	1	unknown
Erosion		within 300' of potential areas of erosion	-- -- -- --				--	--	-- -- -- -- --				--	--
Dam Failure	High	Inundation area	-- -- -- --				1	1.7M	-- --		4	27.8M	--	--
Disruption of Utility and Transportation Systems		descriptive	5 unknown		5 unknown		6	6M	1	178K	22	77M	1	unknown
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	1 unknown		1 unknown		3	4M	1	178K	7	14.7M	--	--
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites					5	6.1M	1	178K	8	15M	--	--
Terrorism		descriptive	5	unknown	5 unknown		6	6M	1	178K	22	77M	1	unknown
Infectious Disease Epidemic		descriptive	5 unknown		5 unknown		6	6M	1	178K	22	77M	1	unknown

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section describes Community specific vulnerabilities and impacts from technological and manmade hazards in addition to the natural hazards identified in the 2009 Columbia County MHMP.

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for Columbia County. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

There are 903 residential structures (worth \$112.6M), 11 non-residential structures (value unknown), three government facilities (worth \$6.4M), one emergency response facility (worth \$4.5M), one care facility (worth \$323K), four community facilities (worth \$3.8M), five bridges (worth \$6.1M), and four utilities (worth \$392K) within the boundaries of the 100-year floodplain.

There are 886 residential structures (worth \$110.5M), 11 non-residential structures (value unknown), three government facilities (worth \$6.4M), one emergency response facility (worth \$4.5M), three community facilities (worth \$3.7M), three bridges (worth \$3.8M), and one utility (worth \$80K) located within the 500-year floodplain.

### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind and floods, are often widespread. A single event is capable of impacting all people, critical facilities and infrastructure within the City of St. Helens, and therefore the entire population (12,075 people), including 4,109 residential structures (worth \$512M), 31 non-residential structures (value unknown), four government facilities (worth \$6.8M), three emergency response facilities (worth \$6.7M), nine educational facilities (worth \$2.7M) seven care facilities (worth \$9.9M), 29 community facilities (worth \$9M), five miles of highway and rail (value unknown), one transportation facility (worth \$175K), 22 utilities (worth \$77M), five bridges (worth \$6M), one transportation facility (worth \$178K), and one dam (value unknown) is at risk.

### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation and rail routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and

waste water utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within the City of St. Helens. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

There are 2,402 residential structures (worth \$299.5M), 17 non-residential structures (value unknown), two government facilities (worth \$4.5M), two emergency response facilities (worth \$5M), three educational facilities (worth \$694K), one care facility (worth \$226K), 11 community facilities (worth \$668K), three bridges (worth \$3.8M) and eight utilities (worth \$46.6M) in the moderate landslide risk area.

There are 1,062 residential structures (worth \$132.4M), 11 non-residential structures (value unknown), one government facility (worth \$2.7M), one emergency response facility (worth \$4.5M), one educational facility (value unknown), one care facility (worth \$226K), four community facilities (worth \$230K), and three utilities (worth \$27.7M) in the high landslide risk area.

### ***Wildland Fires***

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

There are 3,706 residential structures (worth \$468.9M), 31 non-residential structures (value unknown), four government facilities (worth \$6.8M), three emergency response facilities (worth \$6.7M), nine educational facilities (worth \$2.7M) seven care facilities (worth \$9.9M), 28 community facilities (worth \$7M), five bridges (worth \$6M), one transportation facility (worth \$178K), and 13 utilities (worth \$48.7M) located in the moderate fire risk areas.

There are 3,395 residential structures (worth \$423.4M), 25 non-residential structures (value unknown), four government facilities (worth \$6.8M), three emergency response facilities (worth \$6.7M), six educational facilities (worth \$2.6M) three care facilities (worth \$653K), 23 community facilities (worth \$6.5M), five bridges (worth \$6M), one transportation facility (worth \$178K), and 13 utilities (worth \$48.7M) located in the high fire risk areas.

There are 1,420 residential structures (worth \$177.1M), 15 non-residential structures (value unknown), one educational facility (worth \$500K), one care facility (worth \$226K), one community facility (worth \$45K), three bridges (worth \$3.8M) and one utility (worth \$27.3M) located in very high fire risk areas. There were ten residential structures (worth \$1.3M) and no critical facilities identified in the extreme fire risk area.

### ***Earthquake***

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity

to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslide, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

Due to the City of Helens proximity to the eastern portion of the county, all people, critical facilities and infrastructure within the City of St. Helens, and therefore the entire population (12,075 people), including 4,109 residential structures (worth \$512M), 31 non-residential structures (value unknown), four government facilities (worth \$6.8M), three emergency response facilities (worth \$6.7M), nine educational facilities (worth \$2.7M) seven care facilities (worth \$9.9M), 29 community facilities (worth \$9M), five miles of highway and rail (value unknown), one transportation facility (worth \$175K), 22 utilities (worth \$77M), five bridges (worth \$6M), one transportation facility (worth \$178K), and one dam (value unknown) are located in the strong shaking (9-20 percent) area.

### *Volcano*

A volcanic eruption would have a minor impact on City of St. Helens due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006)

The City of St. Helens will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies.

Buildings streets and roads throughout the city may require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services. Water treatment facilities may require additional attention to address high turbidity water. River traffic along the Columbia River could be disrupted due to sedimentation from a large eruption from Mt. St. Helens or Hood and dredging to restore channel depths may be necessary. Injuries associated with respiratory problems may result. (Goettel 2005)

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within the City of St. Helens are at risk including the entire population (12,075 people), including 4,109 residential structures (worth \$512M), 31 non-residential structures (value unknown), four government facilities (worth \$6.8M), three emergency response facilities (worth \$6.7M), nine educational facilities (worth \$2.7M) seven care facilities (worth \$9.9M), 29

community facilities (worth \$9M), five miles of highway and rail (value unknown), one transportation facility (worth \$175K), 22 utilities (worth \$77M), five bridges (worth \$6M), one transportation facility (worth \$178K), and one dam (value unknown).

### *Wind*

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within the City of St. Helens are equally at risk of a windstorm event including the entire population (12,075 people), including 4,109 residential structures (worth \$512M), 31 non-residential structures (value unknown), four government facilities (worth \$6.8M), three emergency response facilities (worth \$6.7M), nine educational facilities (worth \$2.7M) seven care facilities (worth \$9.9M), 29 community facilities (worth \$9M), five miles of highway and rail (value unknown), one transportation facility (worth \$175K), 22 utilities (worth \$77M), five bridges (worth \$6M), one transportation facility (worth \$178K), and one dam (value unknown) is at risk.

### *Erosion*

Riverine erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available, however, descriptions of several localized areas were identified during the development of this document and are identified only by location on a map referencing the river or stream reach described. Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

The City of St. Helens has 540 residential structures (worth \$67.3M), eight non-residential structures (value unknown), two government facilities (worth \$4.5M), one emergency response facility (worth \$4.5M), three community facilities (worth \$2.1M) and one utility (worth \$263K) that may be at risk from erosion impacts.

### *Dam Failure*

US Army Corps of Engineers inundation data for the Columbia River and the PacifiCorp inundation data for the Lewis River in the State of Washington were used to determine the impacts from dam failure upriver from Columbia County. There are 853 residential structures (worth \$106.4M), 13 non-residential structures (value unknown), two government facilities (value \$4.5M), one emergency response facility (value \$4.5M), two community facilities (value \$1.9M), one bridge (value \$1.7M), and four utilities (value \$27.8M) located in the inundation area.

### *Disruption of Utility and Transportation Systems*

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital



supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

### ***Hazardous Material Event***

The National Response Center and the EPA’s Environmental Facts Multisystem Query were used to locate hazardous waste handling facilities and businesses that generate hazardous waste from their activities. (In Progress) Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 mile radius of those are considered at risk.

There are 1,333 residential structures (worth \$166.3M), 16 non-residential structures (value unknown), one government facility (worth \$461K), five educational facilities (worth \$340K), six care facilities (worth \$7.8M), nine community facilities (worth \$660K), one highway (value unknown), one railroad (value unknown), three bridges (worth \$4M), one transportation facility (worth \$178K), and seven utilities (worth \$14.7M) considered at risk along transportation routes.

Facilities considered at risk near 0.25 mile-buffered EHS sites include four government facilities (worth \$6.8M), three emergency response facilities (worth \$6.7M) seven educational facilities (worth \$2.2M), six care facilities (worth \$7.8M), 26 community facilities (worth \$8.5M), five bridges (worth \$6.1M), one transportation facility (worth \$178K), and eight utilities (worth \$15M).

### ***Terrorism***

It is difficult to determine the scope of any terrorist threat to the City of St. Helens. Although there seem to be few high-profile targets present, it is impossible to predict future terrorist events. Depending on the extent of the action, the community may suffer economic loss, disruption of utilities, and cleanup relating to explosions and other facility damages. Structural damage, injuries or casualties may occur, however, it is beyond the scope of this analysis to estimate losses.

## **MITIGATION STRATEGY**

### **IDENTIFYING MITIGATION ACTIONS**

The following section defines identification and analysis of mitigation actions as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions**

**Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Element**

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

The Steering Committee assessed whether to adopt Columbia County’s hazard mitigation goals listed in Table F-11, or to revise them to better meet the City’s needs. The City then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals.

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table F-12 depicts the City’s “considered” mitigation actions developed during this mitigation planning process. The revised list in Table F-14 delineates those actions the City will strive to implement within this five year planning cycle.

**DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance**

**National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Element**

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze, and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

The City of St. Helens actively participates in FEMA’s National Flood Insurance Program (NFIP) and has implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized City appropriate actions to assure an effective flood mitigation program.

**Mitigation Goals and Action Items Considered**

<b>Table F-11. 2005 Columbia County Mitigation Goals-Considered</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	<p><b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.</p>
2	<p><b>Protect Critical Facilities and Enhance Emergency and Essential Services</b></p> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

**Table F-12. City of St. Helens Mitigation Actions Considered**

Hazard	Status	Comment	Description
<b>Natural Hazards</b>			
<i>Multi-Hazard (MH)</i>			
MH Co	Complete		Develop and incorporate building ordinances commensurate with building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.
MH Co	Complete		Review ordinances and develop outreach programs to assure mobile homes and manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods as applicable)
MH Co	Complete		Review ordinances and develop outreach programs to assure fuel oil and propane tanks are properly anchored and hazardous materials are properly stored and protected from known natural hazards such as seismic or flooding events.
MH	<b>Ongoing</b>	Ordinances already exist	Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
MH Co	Complete		Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
MH	<b>Ongoing</b>	Some units purchased for some locations.	Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)
MH C	Consider	A few rods in place We get very few strikes	Install lightning rods and lightning grade surge protection devices on critical electronic components such as warning systems, communications equipment, and computers for critical facilities.
MH	Consider	We will develop a plan	Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
MH C	Consider	We will review issues and address with ordinances where applicable	Explore the need for, develop, and implement hazard zoning ordinances for high-risk hazard area land-use.
MH C	Consider	Where signs will help or protect the public	Based on known high-risk hazard areas, identify hazard-specific signage needs and purchase and install hazard warning signs near these areas to notify and educate the public of potential hazards.
MH	<b>Ongoing</b>	We are working on identified repeat flooding areas to correct	Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
MH Co	Complete	Ordinances exist	Install storm shutters, hurricane clips, bracing systems etc. to meet or exceed applicable building codes while reducing disaster damages.
MH	Consider	This will be done where	Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information

**Table F-12. City of St. Helens Mitigation Actions Considered**

Hazard	Status	Comment	Description
		applicable	obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
MH n	/a	We do not have landslide issues within the city	Develop vegetation projects to restore clear cut and riverine erosion damage and to increase landslide susceptible slope stability.
MH C	onsider	We will do this as money and opportunity allows	Retrofit structures to protect them from seismic, floods, high winds, earthquakes, or other natural hazards.
MH Co	mplete	We have rules to control this and presently do not have public buildings in harms way	Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
MH C	onsider	As bridges are replaced this will normally be accomplished	Harden utility headers located along river embankments to mitigate potential flood, debris, and erosion damages.
MH Co	mplete	Public Works and City Council will do this	Establish a formal role for the jurisdictional Hazard Mitigation Planning Committees to develop a sustainable process to implement, monitor, and evaluate citywide mitigation actions.
MH	<b>Ongoing</b>	On going process	Identify and pursue funding opportunities to implement mitigation actions.
MH C	onsider	We have such a mechanism in CEPA	Develop public and private sector partnerships to foster hazard mitigation activities.
MH	<b>Ongoing</b>	Partly exists already	Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning.
<b>Flood</b>			
Flood	<b>Ongoing</b>	GIS already has flood maps and buildings. Partially complete	Develop and maintain GIS mapped critical facility inventory for all structures located within 100-year and 500-year floodplains.
Flood	Complete	Most buildings mapped	Develop and maintain GIS mapped inventory, and develop prioritized list of residential and commercial buildings within 100-year and 500-year floodplains.
Flood C	onsider	Can be done as funds allow	Develop and maintain GIS mapped inventory of repetitive loss properties to include the types and numbers of properties.
Flood	<b>Ongoing</b>	Engineering is working on this.	Develop and implement mitigation actions for repetitive loss properties.
Flood C	omplete	Locations already identified	Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data.
Flood	<b>Ongoing</b>	Awaiting state input	Request DOGAMI debris flow and lahar data be included in FIRM updates. Use the updated FIRMS for land use and mitigation planning.
Flood	<b>Ongoing</b>	Work is being done to mitigate or consider such	Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.

**Table F-12. City of St. Helens Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Flood C	onsider	We will work on this as time and funds allow	Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.
Flood	Complete	Done	Develop, implement, and enforce floodplain management ordinances.
Flood C	onsider	We will work on this as time and funds allow	Develop outreach program to educate residents concerning flood proofed well and sewer/septic installation.
Flood C	onsider	We will work on this as time and funds allow	Install new streamflow and rainfall measuring gauges.
Flood	<b>Ongoing</b>	Rules exist as do programs to accomplish	Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.
Flood C	onsider	We will accomplish where applicable	Construct earthen berms to divert flood flows into bridge or culvert openings. The earth fill should be erosion-resistant and the berms should be covered with erosion-resistant fabric, armoring materials, or vegetation.
Flood	<b>Ongoing</b>	We will accomplish where applicable and as funds are available	Increase culvert size to increase its drainage efficiency.
Flood	<b>Ongoing</b>	Where applicable	Construct debris basins to retain debris in order to prevent downstream drainage structure clogging.
Flood	Complete	Done where applicable	Install debris cribs over culvert inlets to prevent inflow of coarse bed-load and light floating debris.
Flood C	onsider	We will review for applicability	Construct debris deflectors to deflect the major portion of debris away from culvert entrances and bridge piers. They are normally "V" shaped.
Flood C	onsider	Where applicable and when funds available	Install debris fins upstream of a culvert to align debris so that the debris will pass through a drainage opening without clogging the inlet. They are sometimes used on bridge piers to deflect drifting materials.
Flood	<b>Ongoing Complete</b>	Done on new development and will review for older areas	Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings. Water ultimately returning to its watercourse at a reduced flow rate.
Flood C	onsider	Will review for applicability	Install triangular or circular flow deflectors on or immediately upstream from bridge footings to deflect water flow and reduce flow velocities preventing footing scour.
Flood C	onsider	We will review for applicability	Construct a high water overflow crossing to carry flood flows from over bank areas.
Flood C	onsider	We will review for applicability	Create relief drainage ditch opening using a culvert, bridge, or multiple culverts; to relieve rapid water accumulation during high water flow events. .
Flood C	onsider	We will review for applicability	Modify existing culverts by developing a ring compression, by flattening, or beveling the end of a circular culvert to match the angle of the embankment. May need to install flanges to stiffen the beveled section of the culvert.
Flood	Consider	We will review for	Construct spur dikes along the embankments to direct flood flows into a bridge opening or away

**Table F-12. City of St. Helens Mitigation Actions Considered**

Hazard	Status	Comment	Description
		applicability	from a continuous impact site.
Flood C	Consider	We will review for applicability	Construct concrete wing walls at culvert or bridge entrances and outlets to direct water flow into their openings
Flood	Complete	Done	Provide flood protection to mitigate damage and contamination of wastewater treatment systems.
Flood C	Consider	We will review for applicability	Develop and implement flood risk reduction program and outreach efforts considering upstream storage, channel improvements, and flood walls or levee construction.
<b>Winter Storms</b>			
Winter Storms	Consider	Need to develop a program	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.
Winter Storms	Complete	We will add back up power as funding allows.	Develop critical facility list needing emergency back-up power systems, prioritize, seek funding and implement mitigation actions.
Winter Storms	Consider	We will review as to applicability	Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.
Winter Storms	Complete	Rules exists for this	Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or eliminate power outages from severe winter storms. Consider developing incentive programs.
Winter Storms	<b>Ongoing</b>	Partly done with power provider	Develop personal use and educational outreach training for a “safe tree harvesting” program. Implement along utility and road corridors, preventing potential winter storm damage.
Winter Storms	Complete	City has linkage and contacts	Purchase NOAA Weather radios and develop a web portal linking residents to various weather information sites. (NWS, FEMA, The Weather Channel).
Winter Storms	<b>Ongoing</b>	Partially Complete City has some equip for measuring and warning	Install new streamflow and precipitation measuring gauges and develop monitoring and early warning program.
Winter Storms	Consider	We will review with School District	Develop outreach program with school district contests having students develop, display, and explain mitigation projects or initiatives.
Winter Storms	Consider	We will review with applicable agencies	Develop early warning test program partnering with NOAA, City Police, Fire Departments, and Volunteer Fire Department to coordinate tests.
Winter Storms	Complete	Rules exist	Implement and enforce the most current Uniform International, and State, Building Codes to ensure structures can withstand winter storm hazards such as high winds, rain, water and snow.
Winter Storms	Consider	Power company issue (Community Partner)	Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line severe wind or winter ice storm event failure.
Winter Storms	Consider	We will review for applicability	Review critical facilities and government building energy efficiency, winter readiness, and electrical protection capability. Identify, prioritize, and implement infrastructure upgrade or rehabilitation project prioritization and development.
<b>Landslide</b>			
Landslide	Complete	Done by State	Develop comprehensive geological landslide and rockslide prone area maps.

**Table F-12. City of St. Helens Mitigation Actions Considered**

Hazard	Status	Comment	Description
Landslide Co	mplete	Rules exist	Develop, implement and enforce property development landslide risk assessment procedures to identify potential facility vulnerability.
<b>Wildland Fire</b>			
Wildland Fire	<b>Ongoing</b>	Partially Complete In process and should be done by Dec 2009	Identify critical facilities and vulnerable populations based on mapped high hazard areas.
Wildland Fire	Consider	We will review and apply where needed	Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
Wildland Fire	Complete	Fire District has done	Develop Community Wildland Fire Protection Plans for all at-risk communities.
Wildland Fire	Consider	We will work on this	Provide real-time internet access and interagency cooperation to decrease wildland fire warning times.
Wildland Fire	Complete	Done by fire district	Hold FireWise workshop to educate residents and contractors concerning fire resistant landscaping.
Wildland Fire	Consider	Need property rules	Promote FireWise building siting, design, and construction materials.
Wildland Fire	Complete	Done	Develop FireWise Public Service Announcements (PSA).
Wildland Fire	Consider	We will do this	Provide wildland fire information in an easily distributed format for all residents.
Wildland Fire	Consider	We should and could	Schedule and perform government facility "fire drills" at least twice per year.
Wildland Fire	Complete	Fire district is leading this	Conduct residential audits for wildland and building fire hazard identification then develop an outreach program to convey the findings.
Wildland Fire	Complete	Rules exist	Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.
Wildland Fire	Consider	We will look at this to implement	Develop outreach program to educate and encourage fire-safe construction practices for existing and new construction in high risk areas.
Wildland Fire	Consider	Fire District is conduct this	Develop outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs.
Wildland Fire	Consider	We will accomplish this as time and money is available	Identify, develop, and implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.
<b>Earthquake</b>			
Earthquake	Consider	Can do when funded	Supplement State Seismic Needs Analysis data (schools, fire, law enforcement). Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.
Earthquake C	onsider	We will accomplish as time allows	Identify high seismic hazard areas; develop a wood-frame residential building inventory and an outreach program to educate population concerning facilities particularly vulnerable to earthquake damage, such as pre-1940s homes and homes with cripple wall foundations.
Earthquake	<b>Ongoing</b>	Available at City Hall	Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.



**Table F-12. City of St. Helens Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Earthquake C	onsider	As funds allow	Retrofit important public facilities with significant seismic vulnerabilities, such as unreinforced masonry construction.
Earthquake	Consider	We will review	Retrofit bridges that are not seismically adequate for lifeline transportation routes.
Earthquake	Complete	Done	Update existing (or adopt the most current) Uniform Building Code
Earthquake	Complete	Done	Implement and enforce the Uniform, International, and State Building Codes.
Earthquake	Complete	Done	Inspect and/or certify all new construction.
Earthquake C	onsider	We will consider as advised and as funded	Develop public outreach program to train earthquake safety; perform drop-cover-hold drills at schools and public facilities.
Earthquake C	onsider	As personnel and funding allows	Develop outreach program to educate population concerning household, business, and public facility mitigation measures. For example, staff public information tables at fairs, safety events, and festivals.
Earthquake C	onsider	As personnel and funding allows	Develop outreach program to educate residents concerning benefits of increased seismic resistance and modern building code compliance during rehabilitation or major repairs for residences or businesses.
Earthquake C	onsider	Some are earthquake and others not and will have to wait for funding	Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current Building Codes.
Earthquake C	omplete	Inventory made but priorities not set	Identify and prioritize a list of critical facilities with unreinforced masonry problems including non-structural projects such as brick chimney bracing or replacement, water heater bracing, and anchoring, etc.
Earthquake C	onsider	We will review and fund as allowed	Evaluate critical public facility seismic performance for fire stations, public works buildings, potable water systems, wastewater systems, electric power systems, and bridges within the jurisdiction.
Earthquake C	onsider	Possibly done with other outreaches	Develop outreach program for educating private facilities concerning alternative or emergency power source acquisition to enable them to deliver food, fuel, and medical services during disaster emergency response and recovery efforts.
Earthquake	Will do	Will inform utilities	Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.
Earthquake W	ill do	Will collaborate	Develop partnerships to mitigate hazards that result in jurisdictional facility lifeline or emergency transportation route closures.
<b><i>Volcano</i></b>			
Volcano C	onsider	Tree developed already	Update public emergency notification procedures and develop an outreach program for ash fall events.
Volcano	Consider	Have such rules	Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.
Volcano	Consider	We will look at this	Evaluate ash impact on storm water drainage system and develop mitigation actions.

**Table F-12. City of St. Helens Mitigation Actions Considered**

Hazard	Status	Comment	Description
<b>Wind</b>			
Wind Co	Complete	Existing rules	Review ordinances and develop outreach programs to assure mobile homes and manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable)
Wind	<b>Ongoing</b>	New development is to underground	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.
Wind Co	Complete	Done	Revise requirements to place utilities underground to reduce power disruption from wind storm / tree blow down damage when upgrading or during new development.
Wind C	Consider	Power company will review	Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line failure during severe wind or winter ice storm events.
Wind	Consider	Seldom have high winds	Develop prioritized location list to construct safe rooms to provide tornado and severe wind shelters for public and private use. Projects must meet requirements in FEMA 320 and FEMA 361.
<b>Erosion</b>			
Erosion	<b>Ongoing</b>	Being done for at least one project	Apply for grants/funds to implement riverbank protection methods.
Erosion C	Consider	We will look to see if it applies	Develop and provide information to all residents on riverbank erosion and methods to prevent it in an easily distributed format
Erosion	<b>Ongoing</b>	One place identified so far	Install riprap, or pilings to harden or "armor" a stream bank where severe erosion occurs.
Erosion	<b>Ongoing</b>	One place identified	Install bank protection such as rock, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection.
Erosion C	Consider	We will review where applicable	Harden culvert entrance bottoms with asphalt, concrete, rock, to reduce erosion or scour.
Erosion	Consider	Engineering will comply	Install walls at the end of a drainage structure to prevent embankment erosion at its entrance or outlet. (end walls).
Erosion C	Consider	We will review for applicability	Install flared outlets or end sections at culvert entrances and outlets to match the embankment slope to reduce erosion and scour at the entrance and exit points during high flow.
Erosion C	Consider	We will review for applicability	Install flow diverters a short distance into a water body, tied into the bank, to protect from erosion at their end. Designed to redirect water flow away from embankments.
Erosion C	Consider	We will review for applicability	Install channel lining using pipe, rock, concrete, or asphalt to reduce scouring embankments and ditch bottom erosion.
Erosion C	Consider	We will review for applicability	Install bank revetment protection to prevent erosion.
<b>ENSO (El Niño/La Niña)</b>			
ENSO (El Niño/La Niña)	<b>Will do</b>	Will use public forums and news articles	Educate public regarding weather patterns associated with El Niño / La Niña.

**Table F-12. City of St. Helens Mitigation Actions Considered**

Hazard	Status	Comment	Description
<b><i>Expansive Soils</i></b>			
Expansive Soils	Complete	Rules exist	Require building design, engineering, and construction processes that address expansive soil conditions at potentially affected building sites.
Expansive Soils	Consider	We will review for applicability	Plant trees a distance equal to their mature height away from a structure built on expansive soils. Minimum distance from foundation is 15 feet.
Expansive Soils	Complete	Rules exist	Require road design, engineering, and construction processes that address expansive soil conditions. Water absorption prevention, impermeable membrane, soil compaction, and drainage methods need to be considered once geologic studies determine soil composition.
<b><i>Disruption of Utility and Transportation Systems (DUTS)</i></b>			
Disruption of Utility and Transportation Systems (DUTS)	Consider	News articles and public forum	Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.
DUTS	Complete	Plan developed	Review and update emergency response plans for utility disruptions.
DUTS	Complete	Plan developed	Review and update emergency response plans for transportation route disruptions.
DUTS Consi	der	Will accomplish as time and funds permit	Identify and prioritize all “jurisdiction owned” & “non-jurisdiction owned” critical facilities that have backup power and emergency operations plans.
DUTS Consi	der	Will accomplish as time and funds permit	Purchase backup power systems for all identified critical facilities.
<b><i>HAZMAT</i></b>			
HAZMAT Co	mplete	Plan developed	Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.
HAZMAT Co	mplete	Trained to handle substances that the City controls	Train Public Works staff to identify extremely hazardous substances (EHS) and to follow EMS protocols.
HAZMAT	<b><i>Ongoing</i></b>	County plan	Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.
HAZMAT	<b><i>Will do</i></b>	Will accomplish as part of emergency plan	Research, develop, and implement methods to protect waterways from hazardous materials events.
HAZMAT	Complete	Fire District has it	Prepare a site-specific summary of hazardous materials used, stored, and commonly transported in the jurisdictional area. The summary should include mapped facility locations with a hazardous materials inventory, emergency response protocols, and mitigation actions.
<b><i>Terrorism</i></b>			
Terrorism	<b><i>Ongoing</i></b>	Emergency Plans being developed	Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.
Terrorism Co	mplete	City critical facilities secured to level we see	Upgrade physical security, detection, and response capability for critical facilities using information obtained from hazard assessments and risk analysis. Include water systems and any

**Table F-12. City of St. Helens Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
		as necessary	high-profile facilities such as major timber industry facilities and sites with large quantities of hazardous substances (HS) and extremely hazardous substances (EHS).
Infectious Disease Epidemic (IDE)	Complete Plan	exists	Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.
IDE	<b><i>Ongoing</i></b>	Participating in exercises	Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.

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## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions**

**Implementation of Mitigation Actions**

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in **section (c)(3)(ii)** will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

**Element**

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on November 6, 2008 to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the Mitigation Action Plan. The Committee then determine the responsible agency and potential funding sources. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities.

The City of St. Helens Steering Committee evaluated the Benefit-Cost Analysis Fact Sheet (Appendix N) for prioritizing its “considered” mitigation actions listed in Table F-12. The Steering Committee determined that the committee consisted of sufficient expertise to select those mitigation actions that would most benefit the City without using the STAPLE-E evaluation tool. Upon review, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for the City and responsible entities to implement during the 5-year lifespan of this version of the MHMP. As such, the Steering Committee determined that only the mitigation actions that received a high priority ranking would be included in the City’s Mitigation Action Plan. Table B-14 depicts the City’s mitigation actions grouped by hazard and in descending priority order within each hazard.

## MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED

The City of St. Helens reviewed the Columbia County goals and modified them to better meet the City's needs and subsequently adopted the Goals in Table F-13 for the current planning period.

<b>Table F-13. City of St. Helens Mitigation Goals</b>	
<b>Goal Number</b>	<b>Goal Description</b>
<b>1</b>	Complete the City's Emergency Management Plan.
<b>2</b>	Address flood issues found in Dec 2007 event.
<b>3</b>	Improve communications within and to the public.
<b>4</b>	Practice emergency procedures periodically.
<b>5</b>	Improve facilities in need of upgrade to overcome hazards.

## IMPLEMENTING A MITIGATION ACTION PLAN

The following section defines the mitigation action identification process for each participating jurisdiction as stipulated in DMA 2000 and its implementing regulations.

<b>DMA 2000 Requirements: Mitigation Strategy-Identification of Multi-Jurisdictional Mitigation Actions</b>
<p><b>Identification of Multi-Jurisdictional Mitigation Actions</b></p> <p><b>Requirement §201.6(c)(3)(iv):</b> For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.</p> <p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?</li> <li>■ Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?</li> </ul> <p>Source: FEMA, July 2008.</p>

**Appendix F**  
**City of St. Helens**

This appendix identifies action items specific to the City of St. Helens. Since the update includes incorporation of the City of St. Helens as part of the MHMP, all actions in this appendix are considered new. Table F-14 displays the City of St. Helens Mitigation Action Plan matrix that lists mitigation actions by hazard and are prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity with potential funding sources identified.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

**Table F-14. City of St. Helens Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Natural Hazards</b>						
<b>Multi-Hazard (MH)</b>						
MH	Educate staff and public about possible hazard events	HZMP committee	2 yrs	General	BC: TBD TF: Yes	Public forums, newsletter articles, etc.
MH	Install lighting rods to protect City's communications and electronic gear	HZMP committee	2-5 yrs	General /enterprise	BC: TBD TF: Yes	No plans needed
MH	Install hazard warning signs where applicable	HZMP committee	2-5 yrs	General /enterprise	BC: TBD TF: Yes	Study areas of concern
MH	Purchase and install generators	PW	2-5 yrs	Enterprise/General	BC: TBD TF: Yes	Capitol Improvement Plans
MH	Educate all on safety issues of hazards/mitigation procedures	HZMP 1-	2 yrs	General	BC: TBD TF: Yes	Articles, meetings, forums
MH	Create or improve ordinances	HZMP/Admin	2-3 yrs	General	BC: TBD TF: Yes	Need recommendations where ordinances are needed
MH	Formalize HZMP comm. roles	Admin/PW	1-2 yrs	Gen/Other	BC: TBD TF: Yes	PW primarily manages this function.
MH	Integrate the Mitigation Plan into Emer Plans	Emer Mgmt Comm	1-2 yrs	General	BC: TBD TF: Yes	Most is already in the plan
<b>Flood</b>						
Flood	GIS updates on flood areas and hazards	Plan/GIS	2-3 yrs	General/Enterprise	BC: TBD TF: Yes	In process

**Appendix F**  
**City of St. Helens**

**Table F-14. City of St. Helens Mitigation Action Plan Matrix**

<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
Flood	Develop GIS maps on repeat hazard damages	Plan/GIs	2-3 yrs	Enterprise	BC: TBD TF: Yes	none
Flood	Develop plan to mitigate repeat flooding issues	Eng/PW	1-2 yrs	Enterprise	BC: TBD TF: Yes	Started 1 yr ago
Flood	Request DOGAMI debris flow data	Eng/Plan	1 yr	General	BC: TBD TF: Yes	none
Flood	Develop program to educate public on floods	Eng/Plan	1 yr	General	BC: TBD TF: Yes	Articles in newsletter and public forums
Flood	Develop mitigation programs for flooding	Eng/PW	1-10 yrs	Enterprise	BC: TBD TF: Yes	Storm water control programs being implemented
<b>Winter Storms</b>						
WS	Improve plans and exercise	Admin/safety	1-2 yrs	General	BC: TBD TF: Yes	Plan exists and needs updates
WS	Develop early warning system/program	Eng/PW	1-2 yrs	Enterprise	BC: TBD TF: Yes	Partially completed and needs more work.
<b>Wildfires</b>						
WF	Develop an education program on wildfire issues	Eng/PW/Fire Dept	1 yr	General	BC: TBD TF: Yes	An outreach program has started with meetings
<b>Earthquake</b>						
Earthquake	Survey and retrofit buildings as required	HZMP/Building	2-10 yrs	General	BC: TBD TF: Yes	Determine where applicable and how to fund
Earthquake	Develop public ed program	Admin	1-3 yrs	General	BC: TBD TF: Yes	Public forums and news articles
Earthquake	Develop plans to handle when it happens	Emer Mgmt Comm	1 yr	General	BC: TBD TF: Yes	Emergency plans at city level are in process/county plan is completed
<b>Volcano</b>						
Volcano	Include in emergency management plan	Emer/HZMP	1-3 yrs	General	BC: TBD	



**Appendix F**  
**City of St. Helens**

**Table F-14. City of St. Helens Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
					TF: Yes	
Volcano	Evaluate impact on infrastructure	Eng/PW	2-4 yrs	Enterprise	BC: TBD TF: Yes	Studies must be accomplished but there is some history on it.
<b><i>ENSO (El Niño/La Niña)</i></b>						
ENSO	Educate public on this subject	PW/Admin	1-3 yrs	General	BC: TBD TF: Yes	Public forums and articles in the newsletters
<b>Manmade and Technological Hazards</b>						
<b><i>Hazardous Materials</i></b>						
Hazmat	Research, develop and implement methods to protect waterways from hazardous materials	Eng/Fire Dept	2-4 yrs	Enterprise	BC: TBD TF: Yes	On-going program started several years ago
<b><i>Terrorism</i></b>						
Terrorism	Enhance emergency plans	Emer Mgmt Comm	1 yr	General	BC: TBD TF: Yes	On-going program started three years ago.



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**Appendix G**  
**City of Scappoose**

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This appendix contains the specific City of Scappoose information to support the Columbia County Multi-Jurisdictional Hazard Mitigation Plan update.

This section further supports the County’s planning process by summarizing the review and incorporation of existing plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan’s development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

The City of Scappoose is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the City organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats.

Table G-1 contains the City’s Steering Committee participant list to augment the Columbia County MHMP planning elements.

<b>Table G-1. City of Scappoose Steering Committee</b>	
Member	Position
Jon Hanken, Lead	City Manager
Doug Greisen	Police Chief
Mike Greisen	Fire Chief
Frank Hupp	Columbia County Emergency Management

Table G-2 contains the summary of the City’s public involvement and planning meeting activities.

<b>Table G-2. City of Scappoose Public Involvement Mechanisms</b>	
Mechanism	Description
April Kickoff Newsletter	Explained plan development process and solicited input and comments.
August 14, 2008 Countywide Public Meeting, 10 a.m., 2 p.m., & 6 p.m., Columbia County 911 Center, St Helens, OR	Presented draft risk assessment results and provided opportunity to comment.
Public Hearing	November 3, 2008, Public Meeting at the City Council Meeting to discuss plan contents.
City of Scappoose website	The City of Scappoose will place a copy of the public input form on the City’s website.
City of Scappoose website	The City of Scappoose will place a copy of the Hazard Mitigation plan on the City’s website.

**CAPABILITY ASSESSMENT**

Table G-3, G-4, and G-5 contain the City’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table G-3. City of Scappoose Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	Emergency Operations Plan (2002)	Identifies emergency planning, policies, procedures, and response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies.
	Comprehensive Plan (1991)	Location of future growth by classification
	Transportation Plans	Defines transportation infrastructure and delineates problem areas. Street layout incorporated.
	Defines water and sewer infrastructure	Water and Sewer Plan
	Storm Water Plans	Defines storm water management process
	Floodplain Management Plan	CRS community, has CRS rating of “7” for reduced insurance premium costs to participants
	Scappoose Comprehensive Urban Forestry Management Plan: Street Trees	Defines forestry management plan and long-term potential for future development
Programs	Business Plan	Defines future goals for the community
	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods.
Policies (Municipal Codes)	Scappoose Municipal Code of Ordinances (2006)	Floodplain, steep slope, cut and fill regs-All development regulated by the code. Includes Floodplain ordinances
	State Building Code	Seismic standards-updates regularly
	City of Scappoose Charter of 1992	Identifies city boundaries, governance, and plan and project approval process

<b>Table G-4. City of Scappoose Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	City Engineer-Gordon Monroe (contract-with Kennedy Jenks) City Planner-Brian Varricchione - Staff
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	City Engineer-Monroe (contract) - Infrastructure and Building Official (Don Sallee-Staff) - Buildings
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	City Engineer-Monroe (contract) - Infrastructure and Building Official (Don Sallee-Staff) - Buildings
Floodplain manager	City Planner-Brian Varricchione - Staff
Personnel skilled in GIS and/or HAZUS-MH	No, but have contract service to create a GIS system Brian Varricchione
Director of Emergency Services	County EOC Local EOM-Jon Hanken, Incident commander; Doug Greisen ( police Chief) and Mike Greisen (Fire Chief) alternate or situational ICs
Finance (grant writers, purchasing)	Jon Hanken-City Manager and Jill Herr-Finance Administrator City of Scappoose
Public Information Officers	Jon Hanken-City Manager

<b>Table G-5. City of Scappoose Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	Yes
Authority to levy taxes for specific purposes	Yes w/ voter approval
Incur debt through general obligation bonds	Yes
Incur debt through special tax and revenue bonds	Yes
Incur debt through private activity bonds	No
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.



## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment: Identifying Hazards**

**Identifying Hazards**  
**Requirement §201.6(c)(2)(i):** [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.  
**Element**  
 ■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?  
 Source: FEMA, July 2008.

The City of Scappoose’s Steering Committee determined that the following hazards could potentially threaten the community.

<b><i>Natural Hazards</i></b>	
Flood	X
Winter Storm	X
Landslide	X
Fire (Wildland/Urban)	X
Earthquake	X
Volcano	X
Wind*	X
Erosion*	X
ENSO (El Niño / La Niña)*	
Expansive Soils*	
Drought*	X
<b><i>Technological Hazards</i></b>	
Dam Failure	X
Disruption of Utility and Transportation Systems (DUTS)	X
Hazardous Materials	X
Terrorism	X
Infectious Disease Epidemic	X

## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes community specific vulnerability information for the City of Scappoose to augment the MHMP development process. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following section defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

The City of Scappoose actively participates in FEMA's National Flood Insurance Program (NFIP) and has implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties to assure an effective flood mitigation program. They subsequently selected and prioritized County or community appropriate actions to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**

**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction’s risks where they vary from the risks facing the entire planning area

**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS: SPECIFIC STEPS**

### **Asset Inventory**

Asset inventory is the first step of a vulnerability analysis. Assets within each community that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

The asset inventory delineates the City’s existing building and infrastructure assets and insured values and are identified in detail in Tables G-6A, G-6B and G-7.

Tables G-8, G-9, and G-10 portray the City’s critical infrastructure numbers and values, and their potential vulnerability by hazard type.

The City of Scappoose seeks to protect its population by supporting Columbia County and Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### **Population and Building Stock**

Population data listed in Table G-6A were obtained from the 2000 U.S. Census and Portland State University. It comprises census block level data, and estimates from university conducted community research.

The City’s existing building and infrastructure and insured values are identified in Tables G-6A, G-6B, and G-7.

<b>Table G-6A. City of Scappoose Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2005 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
4,976	5,700	6,090	2,171	327,169,700

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$150,700 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table G-6B. City of Scappoose NFIP Insurance Report</b>										
<b>City of</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Average Premium (\$)</b>	<b>Total Claims Since 1978</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>		
Scappoose 62	,697	75	13	3	25,198,500	4	71.41	21	123,448	2

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

<b>Table G-7. City of Scappoose Critical Facilities and Infrastructure</b>			
<b>Facility Type</b>	<b>Name / Number</b>	<b>Address</b>	<b>Value<sup>1</sup></b>
Government	Scappoose City Hall (includes Police Department and Municipal Court)	33568 E Columbia Ave	1,082,112
Emergency Response	Scappoose Rural Fire District	52751 Columbia River Hwy	2,309,000
Educational	Scappoose Peterson Elementary School	52181 SW E M Watts Rd	3,608,198
	Warren Elementary School, Bldg 1	34555 Berg Rd Warren, OR	3,958,084
	Warren Elementary School, Bldg 2	34555 Berg Rd Warren, OR	153,556

**Table G-7. City of Scappoose Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Warren Elementary School, Maintenance Shop Bldg	34555 Berg Rd Warren, OR	230,000
	Scappoose Grant Watts Elementary School	52000 SE 3rd PL	955,504
	Sauvie Island Elementary School	14445 NW Charlton Rd Portland, OR	1,212,872
	Scappoose Middle School	52265 Columbia River Hwy	603,435
	Scappoose High School	33700 SE High School Way	9,745,976
	Scappoose School District Office	33589 SE High School Way	219,834
	OHSU Family Medicine Clinic	Old Portland Road	Unknown
Community	Watts House Pioneer Museum	52432 SE 1st St	Unknown
	Scappoose Public Library	52469 SE 2nd St	1,543,000
	South County Spotlight (Newspaper)	52039 Columbia River Highway	Unknown
	Scappoose Four Square Church	54287 North Columbia River Highway	Unknown
	Seventh Day Adventist Church	52487 Columbia River Hwy	Unknown
	Church of Jesus Christ	53987 Columbia River Highway	\$135,820
	Jehovah's Witnesses of Scappoose	54116 Paradise Lane	\$11,330
	Apostolic Church of Scappoose	33781 SE Elm St	Unknown
	Grace Lutheran Church	51737 South Columbia River Highway	\$48,000
	St Wenceslause Catholic Church	51555 Old Portland Rd	Unknown
	Morning Star Worship Center	33404 SW JP West Rd	Unknown
	New Life Fellowship of Scappoose	33470 Chinook Plaza #157	Unknown
	Columbia Bible Presbyterian Church of Scappoose	33342 Meadow Dr	Unknown
	Scappoose Senior Center	33342 SW Meadow Dr	Unknown
	Creekside Baptist Church	51681 SW Old Portland Rd	\$693,290
Chapman Community Church	28693 Melling Dr	\$77,600	
State and Federal Highways	US Hwy 30	3 miles at \$385,000 per mile	1,155,000
Railroads	Portland Western (short line with switching facility and staging line)	3	miles
Bridges	Bridge #1	Hwy 30	\$2.6M
	Bridge # 2 (County #7)	EJ Smith Road	\$688,128
	Bridge # 3 (County #1)	EM Watts Street	\$805,827

**Table G-7. City of Scappoose Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Bridge # 4 (County #6)	JP West Road	\$469,504
	Bridge # 5 (County #10)	Scappoose Vernonia Hwy	\$935,245
	Bridge # 6 County #121)	Dutch Canyon Road	\$259,983
Transportation Facilities	Scappoose Airpark (non towered) with Heliport	Airport Road	Unknown
	First Student Bus Line Inc	Hwy 30	Unknown
Utilities	Wireless company/tower @ high school		Unknown
	Qwest Telephone		Unknown
	Water Treatment Plant		\$6,000,000
	Miller Road Water Treatment Plan		\$4,500,000
	Waste Water Treatment Plant		\$15,000,000
	Dutch Canyon Well		\$199,196
	Reservoirs (3-storage tanks) (2M, 1M, and 350K gallon)		\$4,500,000
	Reservoirs (2-storage tanks) 350K gallon capacity 300K gallon capacity		\$1,500,000
	Columbia River PUD Power Plant/Substations		Sunknown
Dams	Gourley Creek Dam		\$1,500,000
	South Fork Dam		\$1,500,000
	Lacey Creek Dam		\$750,000

**Sources:** FEMA HAZUS-MH, local jurisdictions, City of Scappoose.

<sup>1</sup>Estimated and/or insured structural value for critical facilities and estimated values for critical infrastructure.

NA = Not Available.

## VULNERABILITY ANALYSIS

The vulnerability analysis development process is thoroughly discussed in the Columbia County MHMP, Section 6, which generated the following Hazard Exposure Analysis Overviews. Tables G-8, G-9, and G-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table G-8. City of Scappoose Potential Hazard Exposure Analysis Overview-Population and Buildings</b>							
			<b>Population</b>	<b>Buildings</b>			
<b>Hazard Type</b>	<b>Hazard Area</b>	<b>Methodology</b>		<b>Number</b>	<b>Residential</b>		<b>Non-Residential</b>
			<b>Number</b>		<b>Value (\$)¹</b>	<b>Number</b>	<b>Value (\$)¹</b>
Flood	Moderate 5	00-year floodplain	-- 1,	328	200,129,600	7 u	nknown
	High 1	00-year floodplain	-- 87	4	131,711,800	6 u	nknown
Winter Storm		descriptive	6,090 2,	171	327,169,700	14 un	known
Landslide	Moderate >14	-32 degrees	-- 70	5	106,243,500	3 u	nknown
	High >32	-56 degrees	-- 34	4	51,840,800	3 u	nknown
Wildland Fire	Moderate M	oderate fuel rank	-- 2,	170	327,019,000	14 un	known
	High	High fuel rank	-- 88	2	132,917,400	8 u	nknown
	Very High	Very high fuel rank	-- 43	3	65,253,100	3 u	nknown
	Extreme Extrem	e fuel rank	-- 11	6	17,481,200	0 u	nknown
Earthquake	Strong 9	-20% (g)	-- 2,	171	327,169,700	14 un	known
	Very strong	20-40% (g)	-- 0		--	0 u	nknown
	Severe >40	-60% (g)	-- 0		--	0 u	nknown
Volcano		descriptive	6,090 2,	171	327,169,700	14 un	known
Wind		descriptive	6,090 2,	171	327,169,700	14 un	known
Erosion		within 300' of potential areas of erosion	-- 49		7,384,300	unknown	unknown
Drought		descriptive	-- --		--	--	unknown
Dam Failure	High	Inundation area	-- 1,	049	158,084,300	6	unknown
Disruption of Utility and Transportation Systems	descri	ptive	6,090 --		--	--	unknown

**Table G-8. City of Scappoose Potential Hazard Exposure Analysis Overview-Population and Buildings**

			Population	Buildings			
				Residential		Non-Residential	
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- 82	5	124,327,800	9	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	-- --		--	--	--
Terrorism		descriptive	-- --		--	--	--
Infectious Disease Epidemic		descriptive	6,090 --		--	--	--

Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$150,700 per structure).

Note-population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. \*0.25 mile-buffered EHS sites were unable to be determined due to the use of census block data.



**Table G-9. City of Scappoose Potential Hazard Exposure Analysis Overview-Critical Facilities**

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate 500-	year floodplain	--	--	1	2.3M	2	13.3M	none	none	4	unknown
	High	100-year floodplain	--	--	1	2.3M	1	3.6M	none	none	3	78K
Winter Storm		descriptive	1	1.1M	1	2.5M	10	20.7M	none	none	16	2.5M
Landslide	Moderate	>14-32 degrees	--	--	--	--	3	7.7M	none	none	3	213K
	High	>32-56 degrees	--	--	--	--			none	none	1	77K
Wildland Fire	Moderate	Moderate fuel rank	1	1.1M	1	2.3M	9	19.5M	none	none	16	2.5M
	High	High fuel rank	--	--	--	--	6	17.9M	none	none	4	272K
	Very High	Very high fuel rank	--	--	--	--	--	--	none	none	1	78K
	Extreme	Extreme fuel rank	--	--	--	--			none	none	--	--
Earthquake	Strong	9-20% (g)	1	1.1M	1	2.3M	10	20.7M	none	none	16	2.5M
	Very strong	20-40% (g)	--	--	--	--			none	none	--	--
	Severe	>40-60% (g)	--	--	--	--			none	none	--	--
Volcano		descriptive	1	1.1M	1	2.3M	10	20.7M	none	none	16	2.5M
Wind		descriptive	1	1.1M	1	2.3M	10	20.7M	none	none	16	2.5M
Erosion		within 300' of potential areas of erosion	--	--	--	--	1	3.6M	none	none	--	--
Drought		descriptive	1	1.1M	1	2.3M	10	21M	none	none	16	2.5M
Dam Failure	High	Inundation area	1	1M	1	2.3M	5	12.7M			7	1.7M
Disruption of Utility and Transportation Systems		descriptive	1	1.1M	1	2.3M	10	21M	none	none	16	2.5M
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	1	1.1M	1	2.3M	8	15.8M	none	none	15	2.4M
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	1	1.1M	1	2.3M	8	15.8M	none	none	14	2.4M
Terrorism		descriptive	1	1.1M	1	2.3M	10	21M	none	none	16	2.5M
Infectious Disease Epidemic		descriptive	1	1.1M	1	2.3M	10	21M	none	none	16	2.5M

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**Table G-10. City of Scappoose Potential Hazard Exposure Analysis Overview-Critical Infrastructure**

Hazard Type	Hazard Area	Methodology	Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams		
			Miles	Value (\$)¹	Miles	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	
Flood	Moderate	500-year floodplain	----			--		5	5.1M	--	--	3	19.5M	--	--
	High	100-year floodplain	----			--		6	5.7M	--	--	2	15.2M	--	--
Winter Storm			1 unknown	unknown	1 unknown	unknown	6	5.7M	2	unknown	5	24.2M	--	--	
Landslide	Moderate	>14-32 degrees	----			--		1	260K	--	--	2	4.7M	--	--
	High	>32-56 degrees	----			--			--	--	--		--	--	--
Wildland Fire	Moderate	Moderate fuel rank	1 unknown	unknown	1 unknown	unknown	6	5.7M	2	unknown	5	24.2M	--	--	
	High	High fuel rank	----			--			--	1	unknown	3	4.7M	--	--
	Very High	Very high fuel rank	----			--			--	--	--		--	--	--
	Extreme	Extreme fuel rank	----			--			--	--	--		--	--	--
Earthquake	Strong	9-20% (g)	1 unknown	unknown	1 unknown	unknown	6	5.7M	2	unknown	5	24.2M	--	--	
	Very strong	20-40% (g)	----			--			--	--	--		--	--	--
	Severe	>40-60% (g)	----			--			--	--	--		--	--	--
Volcano			1 unknown	unknown	1 unknown	unknown	6	5.7M	2	unknown	5	24.2M	--	--	
Wind			1 unknown	unknown	1 unknown	unknown	6	5.7M	2	unknown	5	24.2M	--	--	
Erosion		within 300' of potential areas of erosion	----			--		6	5.7M	--	--	1	unknown	--	--
Drought		descriptive	3	1.2M	3	unknown	6	5.8M	2	unknown	9	32M	3	3.8M	
Dam Failure	High	Inundation area	--	--	--	--	2	3.6M	2	unknown	4	19.7M			
Disruption of Utility and Transportation Systems		descriptive	3	1.2M	3	unknown	6	5.8M	2	unknown	9	32M	3	3.8M	
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	1 unknown	unknown	1 unknown	unknown	4	4.7M	1	unknown	2	200K	--	--	
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	--	--	--	--	4	4.7M	2	unknown	5	24.2M	--	--	
Terrorism		descriptive	3	1.2M	3	unknown	6	5.8M	2	unknown	9	32M	3	3.8M	
Infectious Disease Epidemic		descriptive	3	1.2M	3	unknown	6	5.8M	2	unknown	9	32M	3	3.8M	

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section describes community specific vulnerabilities and impacts from natural hazards in addition to technological and manmade hazards identified in the 2009 Columbia County MHMP.

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for the City of Scappoose. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

There are 874 residential structures (worth \$131.7M), six non-residential structures (value unknown), one emergency response facility (worth \$2.3M), one educational facility (worth \$3.6M), three community facilities (worth \$78K), six bridges (worth \$5.7M) and two utilities (worth \$15.2M) within the boundaries of the 100-year floodplain.

There are 1,328 residential structures (worth \$200.1M), seven non-residential structures (value unknown), one emergency response facility (worth \$2.3M), two educational facilities (worth \$13.3M), four community facilities (value unknown), five bridges (worth \$5.1M) and three utilities (worth \$19.5M) within the 500-year floodplain.

### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind and floods, are often widespread. A single event is capable of impacting all people, critical facilities and infrastructure within the City of Scappoose, and therefore the entire population (6,090 people), including 2,171 residential structures (worth \$327.2M), 14 non-residential structures (value unknown), one government facility (worth \$1.1M), one emergency response facility (worth \$2.3M), ten educational facilities (worth \$20.7M), 16 community facilities (value \$2.5M), six bridges (worth \$5.7M), one highway (value unknown), one railroad (value unknown), two transportation facilities (value unknown), and five utilities (worth \$24.2M) are located in the winter storm area.

### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation and rail routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and

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waste water utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within the City of Scappoose. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

There are 705 residential structures (worth \$106.2M), three non-residential structures (value unknown), three educational facilities (worth \$7.7M), three community facilities (worth \$213K), one bridge (worth \$260K) and two utilities (worth \$4.7M) in the medium landslide risk area. There are 344 residential structures (worth \$51.8M), three non-residential structures (value unknown), and one community facility (worth \$77K) in the high landslide risk area.

### *Wildland Fires*

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

There are 2,170 residential structures (worth \$327M), 14 non-residential structures (value unknown), one government facility (worth \$1.1M), one emergency response facility (worth \$2.3M), nine educational facilities (worth \$19.5M), 16 community facilities (value \$2.5M), six bridges (worth \$5.7M), one highway (value unknown), one railroad (value unknown), two transportation facilities (value unknown), and five utilities (worth \$24.2M) located in moderate fire risk areas.

There are 882 residential structures (worth \$132.9M), eight non-residential structures (value unknown), six educational facilities (worth \$17.9M), four community facilities (value \$272K), one transportation facility (value unknown), two bridges (worth \$2.8M), and three utilities (value \$4.7M) located in the high fire risk areas.

There are 433 residential structures (worth \$65.3M), three non-residential structures (value unknown), one community facility (worth \$78K), and two utilities (worth \$4.7M) located in very high fire risk areas. There were 116 residential structures (worth \$17.5M) and no critical facilities identified in the extreme fire risk area.

### *Earthquake*

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslide, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the

far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

Due to City of Scappoose's proximity to the eastern portion of the county, all people, critical facilities and infrastructure within the City of Scappoose, and therefore the entire population (6,090 people), including 2,171 residential structures (worth \$327.2M), 14 non-residential structures (value unknown), one government facility (worth \$1.1M), one emergency response facility (worth \$2.3M), ten educational facilities (worth \$20.7M), 16 community facilities (value \$2.5M), six bridges (worth \$5.7M), one highway (value unknown), one railroad (value unknown), two transportation facilities (value unknown), and five utilities (worth \$24.2M) are located in the strong shaking (9-20 percent) area.

### *Volcano*

A volcanic eruption would have a minor impact on The City of Scappoose due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006)

The City of Scappoose will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and rock. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies.

Buildings streets and roads throughout the city may require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services. Water treatment facilities may require additional attention to address high turbidity water. River traffic along the Columbia River could be disrupted due to sedimentation from a large eruption from Mt. St. Helens or Hood and dredging to restore channel depths may be necessary. Injuries associated with respiratory problems may result. (Goettel 2005)

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within the City of Scappoose are at risk including the entire population (6,090 people), including 2,171 residential structures (worth \$327.2M), 14 non-residential structures (value unknown), one government facility (worth \$1.1M), one emergency response facility (worth \$2.3M), ten educational facilities (worth \$20.7M), 16 community facilities (value \$2.5M), six bridges (worth \$5.7M), one highway (value unknown), one railroad (value unknown), two transportation facilities (value unknown), and five utilities (worth \$24.2M).

### *Wind*

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can

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include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within the City of Scappoose are equally at risk of a windstorm event including all people, critical facilities and infrastructure, and therefore the entire population (6,090 people), including 2,171 residential structures (worth \$327.2M), 14 non-residential structures (value unknown), one government facility (worth \$1.1M), one emergency response facility (worth \$2.3M), ten educational facilities (worth \$20.7M), 16 community facilities (value \$2.5M), six bridges (worth \$5.7M), one highway (value unknown), one railroad (value unknown), two transportation facilities (value unknown), and five utilities (worth \$24.2M).

### *Erosion*

Riverine and stream erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available; however, descriptions of several localized areas were identified during the development of this document and are identified only by location on a map referencing the river or stream reach described. Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

The City of Scappoose has 49 residential structures (worth \$7.4M), one educational facility (worth \$3.6M), and six bridges (worth \$5.7M) within potential erosion hazard areas. There is also one pump station (value unknown) and sewer and water lines (values unknown) in close proximity (within 30 feet) of Scappoose Creek which poses an erosion threat to the infrastructure.

### *Drought*

State-wide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks are present to humans and resources. Agriculture, fishing, and timber have historically been impacted, as well as local and regional economies.

### *Dam Failure*

US Army Corps of Engineers inundation data for the Columbia River and the PacifiCorp inundation data for the Lewis River in the State of Washington were used to determine the impacts from dam failure upriver from the City of Scappoose. There are 1,049 residential structures (worth \$158M), six non-residential structures (value unknown), one government facility (value \$1M), one emergency response facility (value \$2.3M), five educational facilities (worth \$12.7M), seven community facilities (value \$1.7M), two bridges (worth \$3.6M), two transportation facilities (value unknown), and four utilities (value \$19.7M) located in the inundation area.

### *Disruption of Utility and Transportation Systems*

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital



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supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

### ***Hazardous Material Event***

The National Response Center and the EPA's Environmental Facts Multisystem Query were used to locate hazardous waste handling facilities and businesses that generate hazardous waste from their activities. (In Progress) Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 mile radius of those are considered at risk.

There are 825 residential structures (worth \$124.3M), nine non-residential structures (value unknown), one government facility (worth \$1.1M), one emergency response facility (worth \$2.3M), eight educational facilities (worth \$15.8M), 15 community facilities (worth \$2.4M), one highway (value unknown), one railroad (value unknown), 4 bridges (worth \$4.7M), one transportation facility (value unknown), and two utilities (worth \$200K) located within 0.25 mile of a transportation route and may be at risk from a hazardous material event.

Facilities considered at risk near 0.25 mile-buffered EHS Sites include one government facility (worth \$1.1M), one emergency response facility (worth \$2.3M), eight educational facilities (worth \$15.8M), 14 community facilities (worth \$2.4M), 4 bridges (worth \$4.7M), two transportation facilities (value unknown), and five utilities (worth \$24.2M).

### ***Terrorism***

It is difficult to determine the scope of any terrorist threat to the City of Scappoose. Although there seem to be few high-profile targets present, it is impossible to predict future terrorist events. Depending on the extent of the action, the community may suffer economic loss, disruption of utilities, and cleanup relating to explosions and other facility damages. Structural damage, injuries or casualties may occur, however, it is beyond the scope of this analysis to estimate losses.

### ***Infectious Disease Epidemic***

The consequences of a pandemic as described in Chapter 5 could be devastating. In the event of a poor-fit vaccine or very limited vaccine supply, the public health measures that would work best include: isolation and quarantine; restricting movement between and within communities; prohibiting public gatherings and group activities; and closing schools.

The county and state have isolation and quarantine laws; cities can also apply quarantines and restrict public movement in a public health emergency. The recently passed public health emergency law in Oregon provides a process for such mechanisms to be implemented. (L. Rivers, personal communication; K. Ladd, personal communication)

Impacts associated with infectious disease epidemics in general have the potential to include loss of life and shutdown of critical facilities. Furthermore, an epidemic level of infectious disease in the community could overwhelm local resources, although there are no structural risks or losses

associated with this hazard. The entire population of 6,090 is at risk from the effects of an infectious disease epidemic.

## MITIGATION STRATEGY

### IDENTIFYING MITIGATION ACTIONS

The following section defines identification and analysis of mitigation actions as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions**

**Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Element**

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

The Steering Committee assessed whether to adopt Columbia County’s hazard mitigation goals listed in Table G-11, or to revise them to better meet the City’s needs. The City then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals.

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table G-12 depicts the City’s “considered” mitigation actions developed during this mitigation planning process. The revised list in Table G-14 delineates those actions the City will strive to implement within this five year planning cycle.

**DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance**

**National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Element**

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

The City of Scappoose actively participates in FEMA’s National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized City appropriate actions to assure an effective flood mitigation program.

### MITIGATION GOALS AND ACTION ITEMS CONSIDERED

<b>Table G-11. 2005 Columbia County Mitigation Goals-Considered</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	<b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.
2	<b>Protect Critical Facilities and Enhance Emergency and Essential Services</b> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<b>Reduce the Threat to Property</b> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<b>Create a Disaster Resistant and Disaster-Resilient Economy</b> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<b>Increase Public Awareness, Education, Outreach, and Partnerships</b> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

**Table G-12. City of Scappoose Mitigation Actions Considered**

Hazard	Status	Comment	Description
<i>Natural Hazards</i>			
<i>Multi-Hazard</i>			
MH	<i>Ongoing</i>		Develop and incorporate building ordinances commensurate with building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.
MH	<i>Ongoing</i>		Review ordinances and develop outreach programs to assure mobile homes and manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods as applicable)
MH	<i>Ongoing</i>		Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
MH	<i>Ongoing</i>		Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
MH	<i>Ongoing</i>		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load and wind storm power line failure during severe wind or winter ice storm events.
MH	<i>Ongoing</i>		Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)
MH C	onsider		Install lightening grade surge protection devices on critical electronic components such as warning systems, communications equipment, and computers for critical facilities.
MH	<i>Ongoing</i>		Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
MH	<i>Ongoing</i>		Explore the need for, develop, and implement hazard zoning ordinances for high-risk hazard area land-use.
MH	<i>Ongoing</i>		Based on known high-risk hazard areas, identify hazard-specific signage needs and purchase and install hazard warning signs near these areas to notify and educate the public of potential hazards.
MH	<i>Ongoing</i>		Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
MH	<i>Ongoing</i>		Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
MH	<i>Ongoing</i>		Develop vegetation projects to restore clear cut and riverine erosion damage and to increase landslide susceptible slope stability.
MH	<i>Ongoing</i>		Retrofit structures to protect them from seismic, floods, high winds, earthquakes, or other natural hazards.
MH	<i>Ongoing</i>	1 City Admin/PW	Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
MH	<i>Ongoing</i>		Harden utility headers located along river embankments to mitigate potential flood, debris, and erosion damages.

**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
MH	<i>Ongoing</i>		Establish a formal role for the jurisdictional Hazard Mitigation Planning Committees to develop a sustainable process to implement, monitor, and evaluate citywide mitigation actions.
MH	<i>Ongoing</i>	<sup>2</sup> City Admin	Identify and pursue funding opportunities to implement mitigation actions.
MH	<i>Ongoing</i>		Develop public and private sector partnerships to foster hazard mitigation activities.
MH	<i>Ongoing</i>		Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning.
MH	<i>Ongoing</i>		Review City insurance to ensure infrastructure is properly covered.
<b>Flood</b>			
Flood	<i>Ongoing</i>		Develop and maintain GIS mapped critical facility inventory for all structures located within 100-year and 500-year floodplains.
Flood	<i>Ongoing</i>		Develop and maintain GIS mapped inventory, and develop prioritized list of residential and commercial buildings within 100-year and 500-year floodplains.
Flood	<i>Ongoing</i>	<sup>1</sup> City Admin/PW	Develop and maintain GIS mapped inventory of repetitive loss properties to include the types and numbers of properties.
Flood	<i>Ongoing</i>	<sup>2</sup> City Admin/PW	Develop and implement mitigation actions for repetitive loss properties.
Flood	<i>Ongoing</i>		Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data.
Flood	<i>Ongoing</i>		Implement mitigation measures identified by critical facilities' owners, and other facility owners, to protect facilities located within the 100-year floodplain.
Flood	<i>Ongoing</i>		Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data.
Flood C	onsider		Request DOGAMI debris flow and lahar data be included in FIRM updates. Use the updated FIRMS for land use and mitigation planning.
Flood C	onsider		Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.
Flood	<i>Ongoing</i>		Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.
Flood	<i>Ongoing</i>		Develop, implement, and enforce floodplain management ordinances.
Flood	<i>Ongoing</i>		Develop outreach program to educate residents concerning flood proofed well and sewer/septic installation.
Flood	<i>Ongoing</i>		Acquire, relocate, elevate, or otherwise flood-proof identified properties.
Flood	<i>Ongoing</i>		Acquire, relocate, elevate, or otherwise flood-proof critical facilities.
Flood	<i>Ongoing</i>		Install new streamflow and rainfall measuring gauges.
Flood	<i>Ongoing</i>		Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new

**Table G-12. City of Scappoose Mitigation Actions Considered**

Hazard	Status	Comment	Description
			development, including buffers and retention basins.
Flood C	onsider		Construct earthen berms to divert flood flows into bridge or culvert openings. The earth fill should be erosion-resistant and the berms should be covered with erosion-resistant fabric, armoring materials, or vegetation.
Flood	<b>Ongoing</b>		Increase culvert size to increase its drainage efficiency.
Flood	<b>Ongoing</b>		Construct debris basins to retain debris in order to prevent downstream drainage structure clogging.
Flood	Consider		Install debris cribs over culvert inlets to prevent inflow of coarse bed-load and light floating debris.
Flood C	onsider		Construct debris deflectors to deflect the major portion of debris away from culvert entrances and bridge piers. They are normally "V" shaped.
Flood C	onsider		Install debris fins upstream of a culvert to align debris so that the debris will pass through a drainage opening without clogging the inlet. They are sometimes used on bridge piers to deflect drifting materials.
Flood C	onsider		Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings. Water ultimately returning to its watercourse at a reduced flow rate.
Flood C	onsider		Install triangular or circular flow deflectors on or immediately upstream from bridge footings to deflect water flow and reduce flow velocities preventing footing scour.
Flood	Consider		Construct low water crossings in a road prism to carry flood flows from an intermittent drainage
Flood	Consider		Construct a high water overflow crossing to carry flood flows from over bank areas.
Flood C	onsider		Realign bridge piers & abutments to be parallel with the stream's centerline. This prevents pier and abutment undermining and reduces debris catchment.
Flood C	onsider		Create relief drainage ditch opening using a culvert, bridge, or multiple culverts; to relieve rapid water accumulation during high water flow events. .
Flood C	onsider		Raise bridge height or convert bridge from a multi-span to single span to increase water flow and reduce debris catchment.
Flood C	onsider		Modify existing culverts by developing a ring compression, by flattening, or beveling the end of a circular culvert to match the angle of the embankment. May need to install flanges to stiffen the beveled section of the culvert.
Flood C	onsider		Construct spur dikes along the embankments to direct flood flows into a bridge opening or away from a continuous impact site.
Flood	Consider		Construct concrete wing walls at culvert or bridge entrances and outlets to direct water flow into their openings
Flood	Consider		Provide flood protection to mitigate damage and contamination of wastewater treatment systems.
Flood C	onsider		Develop and implement flood risk reduction program and outreach efforts considering upstream storage, channel improvements, and flood walls or levee construction.
Flood	<b>Ongoing</b>		Develop and maintain GIS mapped critical facility inventory for all structures located within 100-year and 500-year floodplains.
Flood	<b>Ongoing</b>		Develop and maintain GIS mapped inventory, and develop prioritized list of residential and commercial buildings within 100-year and 500-year floodplains.

**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Flood	<i>Ongoing</i>		Develop and maintain GIS mapped inventory of repetitive loss properties to include the types and numbers of properties.
Flood	<i>Ongoing</i>		Develop and implement mitigation actions for repetitive loss properties.
<b>Winter Storm</b>			
Winter Storm	<i>Ongoing</i>		Develop and implement strategies and educational outreach programs for debris management from severe winter storms.
Winter Storm	<i>Ongoing</i>		Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.
Winter Storm	<i>Ongoing</i>		Update or develop, implement, and maintain jurisdictional debris management plans.
Winter Storm	<i>Ongoing</i>	1 City Admin/PW/ PD/Fire District	Develop critical facility list needing emergency back-up power systems, prioritize, seek funding and implement mitigation actions.
Winter Storm	<i>Ongoing</i>	2 City Admin/PW/ PD/Fire District	Develop and maintain severe winter storm public outreach program defining mitigation activity benefits through educational outreach aimed at households and businesses while targeting of special needs populations.
Winter Storm	<i>Ongoing</i>		Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.
Winter Storm	<i>Ongoing</i>		Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or eliminate power outages from severe winter storms. Consider developing incentive programs.
Winter Storm	Consider		Develop personal use and educational outreach training for a “tree safety” program. Implement along utility and road corridors, preventing potential winter storm damage.
Winter Storms	<i>Ongoing</i>		Purchase NOAA Weather radios and develop a web portal linking residents to various weather information sites. (NWS, FEMA, The Weather Channel).
Winter Storms	Consider		Install new streamflow and precipitation measuring gauges and develop monitoring and early warning program.
Winter Storms	Consider		Develop outreach program with school district contests having students develop, display, and explain mitigation projects or initiatives.
Winter Storms	Consider		Develop early warning test program partnering with NOAA, City Police, Fire Departments, and Volunteer Fire Department to coordinate tests.
Winter Storms	<i>Ongoing</i>		Implement and enforce the most current Uniform International, and State, Building Codes to ensure structures can withstand winter storm hazards such as high winds, rain, water and snow.
Winter Storms	<i>Ongoing</i>		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line severe wind or winter ice storm event failure.
Winter	<i>Ongoing</i>		Review critical facilities and government building energy efficiency, winter readiness, and electrical protection

**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Storms			capability. Identify, prioritize, and implement infrastructure upgrade or rehabilitation project prioritization and development.
<b>Landslide</b>			
Landslide	<i>Ongoing</i>	<sup>1</sup> City Admin/PW	Complete a landslide location inventory, identify threatened critical facilities and other buildings and infrastructure using GIS.
Landslide	<i>Ongoing</i>		Develop prioritized list of mitigation actions for threatened critical facilities and other buildings or infrastructure.
Landslide	<i>Ongoing</i>		Develop process to limit future development in high landslide potential areas (permitting, geotechnical review, soil stabilization techniques, etc).
Landslide	<i>Ongoing</i>		Update the storm water management plan to include regulations to control runoff, both for flood reduction and to minimize saturated soils on steep slopes that can cause landslides.
Landslide	Consider		Develop comprehensive geological landslide and rockslide prone area maps.
Landslide	<i>Ongoing</i>		Develop a vegetation management plan addressing slope-stabilizing root strength while facilitating precipitation containment.
Landslide	Consider		Identify and seasonally restrict recreational and construction activities in high landslide areas.
Landslide	<i>Ongoing</i>		Develop, implement and enforce property development landslide risk assessment procedures to identify potential facility vulnerability.
<b>Wildland Fire</b>			
Wildland Fire	<i>Ongoing</i>		Identify critical facilities and vulnerable populations based on mapped high hazard areas.
Wildland Fire	<i>Ongoing</i>		Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
Wildland Fire	<i>Ongoing</i>		Develop Community Wildland Fire Protection Plans for all at-risk communities.
Wildland Fire	<i>Ongoing</i>		Provide real-time internet access and interagency cooperation to decrease wildland fire warning times.
Wildland Fire	<i>Ongoing</i>		Hold FireWise workshop to educate residents and contractors concerning fire resistant landscaping.
Wildland Fire	<i>Ongoing</i>		Promote FireWise building siting, design, and construction materials.
Wildland Fire	<i>Ongoing</i>		Retrofit structures with FireWise building design materials.
Wildland Fire	<i>Ongoing</i>		Develop FireWise Public Service Announcements (PSA).
Wildland Fire	<i>Ongoing</i>		Provide wildland fire information in an easily distributed format for all residents.
Wildland Fire	<i>Ongoing</i>		Schedule and perform government facility "fire drills" at least twice per year.
Wildland Fire	<i>Ongoing</i>		Conduct residential audits for wildland and building fire hazard identification then develop an outreach program to convey the findings.
Wildland Fire	<i>Ongoing</i>	<sup>2</sup> City Admin Fire District	Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.
Wildland Fire	<i>Ongoing</i>	1	Develop outreach program to educate and encourage fire-safe construction practices for existing and new



**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
		City Admin Fire District	construction in high risk areas.
Wildland Fire	<i>Ongoing</i>		Develop outreach program to educate and encourage home landscape cleanup (defensible space) and define debris disposal programs.
Wildland Fire	<i>Ongoing</i>		Identify, develop, and implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.
<b>Earthquake</b>			
Earthquake	<i>Ongoing</i>		Supplement State Seismic Needs Analysis data (schools, fire, law enforcement). Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.
Earthquake	<i>Ongoing</i>	<b>1</b> City Admin/PW/ PD/FD/School D/Utilities	Identify high seismic hazard areas using GIS; develop a wood-frame residential building inventory and an outreach program to educate population concerning facilities particularly vulnerable to earthquake damage, such as pre-1940s homes and homes with cripple wall foundations.
Earthquake	<i>Ongoing</i>		Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.
Earthquake	<i>Ongoing</i>		Retrofit important public facilities with significant seismic vulnerabilities, such as unreinforced masonry construction.
Earthquake	<i>Ongoing</i>		Retrofit bridges that are not seismically adequate for lifeline transportation routes.
Earthquake	<i>Ongoing</i>	<b>2</b> City Admin/PW/ PD/FD/School D/Utilities	Update existing (or adopt the most current) Uniform Building Code
Earthquake	<i>Ongoing</i>		Implement and enforce the Uniform, International, and State Building Codes.
Earthquake	<i>Ongoing</i>		Inspect and/or certify all new construction.
Earthquake	<i>Ongoing</i>		Develop public outreach program to train earthquake safety; perform drop-cover-hold drills at schools and public facilities.
Earthquake	<i>Ongoing</i>		Develop outreach program to educate population concerning household, business, and public facility mitigation measures. For example, staff public information tables at fairs, safety events, and festivals.
Earthquake	<i>Ongoing</i>		Develop outreach program to educate residents concerning benefits of increased seismic resistance and modern building code compliance during rehabilitation or major repairs for residences or businesses.
Earthquake	<i>Ongoing</i>		Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current Building Codes.
Earthquake	<i>Ongoing</i>		Identify and prioritize a list of critical facilities with unreinforced masonry problems including non-structural

**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
			projects such as brick chimney bracing or replacement, water heater bracing, and anchoring, etc.
Earthquake	<i>Ongoing</i>		Evaluate critical public facility seismic performance for fire stations, public works buildings, potable water systems, wastewater systems, electric power systems, and bridges within the jurisdiction.
Earthquake C	Consider		Develop outreach program for educating private facilities concerning alternative or emergency power source acquisition to enable them to deliver food, fuel, and medical services during disaster emergency response and recovery efforts.
Earthquake	<i>Ongoing</i>		Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.
Earthquake	<i>Ongoing</i>		Develop partnerships to mitigate hazards that result in jurisdictional facility lifeline or emergency transportation route closures.
<b>Volcano</b>			
Volcano	<i>Ongoing</i>		Update public emergency notification procedures and develop an outreach program for ash fall events.
Volcano	<i>Ongoing</i>	<b>1 City Admin/PW/ PD/FD/School D/Utilities</b>	Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.
Volcano C	Consider		Evaluate capability of water treatment plants to deal with high turbidity from ash falls, update emergency response plans, and upgrade treatment facilities' physical plant to deal with ash falls. Prioritize and initiate actions to fill capability gaps.
Volcano	Consider		Evaluate ash impact on storm water drainage system and develop mitigation actions.
<b>Wind</b>			
Wind	<i>Ongoing</i>		Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable)
Wind	<i>Ongoing</i>	<b>City Admin/PW</b>	Identify using GIS and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.
Wind	<i>Ongoing</i>		Revise requirements to place utilities underground to reduce power disruption from wind storm / tree blow down damage when upgrading or during new development.
Wind	<i>Ongoing</i>		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line failure during severe wind or winter ice storm events.
<b>Erosion</b>			
Erosion	<i>Ongoing</i>		Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.
Erosion	Consider		Relocate buildings that are at risk of being affected by erosion.
Erosion	<i>Ongoing</i>	<b>1</b>	Apply for grants/funds to implement streambank protection methods.

**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
		<b>City Admin PW Scappoose Bay Watershed Council</b>	
Erosion	<i>Ongoing</i>		Hold series of community meetings and other outreach efforts to provide erosion hazard specific information to residents.
Erosion	<i>Ongoing</i>		Develop and provide information to all residents on riverbank erosion and methods to prevent it in an easily distributed format
Erosion	<i>Ongoing</i>		Develop outreach program to educate the public concerning planting processes and materials used to stabilize hill slopes or stream banks. This is known as bio-engineering; which uses logs, root wads, or wood debris or other vegetation to reduce scour and erosion.
Erosion	Consider		Harden culvert entrance bottoms to reduce erosion or scour.
Erosion	<i>Ongoing</i>	<b>2 City Admin PW Scappoose Bay Watershed Council</b>	Install embankment protection such as vegetation and other bio-engineered materials to reduce or eliminate erosion.
Erosion C	onsider		Install walls at the end of a drainage structure to prevent embankment erosion at its entrance or outlet. (end walls).
Erosion	<i>Ongoing</i>		Construct a rock or concrete structure to dissipate energy or reduce flow velocity to prevent erosion of the streambed and banks.
Erosion	<i>Ongoing</i>		Install flared outlets or end sections at culvert entrances and outlets to match the embankment slope to reduce erosion and scour at the entrance and exit points during high flow.
Erosion	Consider		Install bank revetment protection to prevent erosion.
<b><i>Drought</i></b>			
Drought	<i>Ongoing</i>	<b>1 City Admin</b>	Develop educational programs and initiatives related to water conservation and irrigation during drought periods.
<b><i>Dam Failure</i></b>			
Dam Failure	Consider		Prepare high resolution dam failure inundation area maps; use to update emergency response plans, evacuation route identification, public notification, and evacuation procedures.
Dam Failure	<i>Ongoing</i>		Encourage the USACOE to prioritize dams according to hazard risks such as seismic vulnerability and make seismic improvements as necessary.
Dam Failure	Consider		Implement land use and management strategies where dam failure threats dictate.

**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
Dam Failure	Consider		Encourage the USACOE to conduct assessments for dams upstream of heavily populated areas.
Dam Failure	<i>Ongoing</i>	<b>1</b> <b>City</b> <b>Admin/PW/</b> <b>Scappoose</b> <b>Drainage Corp</b>	Evaluate the adequacy of dike systems for both floods and earthquakes and implement mitigation measures as necessary.
<b>Disruption of Utility and Transportation Systems (DUTS)</b>			
DUTS	<i>Ongoing</i>	<b>1</b> <b>City Admin</b> <b>PD/FD/PW/School</b> <b>District/Utilities</b>	Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.
DUTS	<i>Ongoing</i>		Review and update emergency response plans for utility disruptions.
DUTS	<i>Ongoing</i>		Review and update emergency response plans for transportation route disruptions.
DUTS	<i>Ongoing</i>		Identify and prioritize all “jurisdiction owned” & “non-jurisdiction owned” critical facilities that have backup power and emergency operations plans.
DUTS	<i>Ongoing</i>		Purchase backup power systems for all identified critical facilities.
<b>Hazardous Materials (HAZMAT)</b>			
HAZMAT	Consider		Annually review and update HAZMAT inventories and ensure that emergency responders are trained for site-specific incidents.
HAZMAT	<i>Ongoing</i>	<b>1</b> <b>City Admin</b> <b>PD/FD/PW/School</b> <b>District</b>	Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.
HAZMAT	<i>Ongoing</i>		Evaluate existing security measures for sites with large quantities of hazardous substances (HS) or any quantities of extremely hazardous substances (EHS) and enhance security as necessary.
HAZMAT	<i>Ongoing</i>		Evaluate seismic bracing/anchoring for sites with large quantities of hazardous substances (HS) or any quantities of extremely hazardous substances (EHS).
HAZMAT	Consider		Train Public Works staff to identify extremely hazardous substances (EHS) and to follow EMS protocols.
HAZMAT	Consider		Develop outreach program to educate the public regarding chemical hazards, safe handling, storage, and disposal procedures.
HAZMAT	Consider		Research, develop, and implement methods to protect waterways from hazardous materials events.
HAZMAT	<i>Ongoing</i>		Prepare a site-specific summary of hazardous materials used, stored, and commonly transported in the jurisdictional area. The summary should include mapped facility locations with a hazardous materials inventory, emergency response protocols, and mitigation actions.

**Table G-12. City of Scappoose Mitigation Actions Considered**

<b>Hazard</b>	<b>Status</b>	<b>Comment</b>	<b>Description</b>
<i><b>Terrorism</b></i>			
Terrorism	<i><b>Ongoing</b></i>	<b>1 City Admin PD/FD/PW/School District/Utilities</b>	Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.
Terrorism	<i><b>Ongoing</b></i>		Upgrade physical security, detection, and response capability for critical facilities using information obtained from hazard assessments and risk analysis. Include water systems and any high-profile facilities such as major timber industry facilities and sites with large quantities of hazardous substances (HS) and extremely hazardous substances (EHS).
<i><b>Infectious Disease Epidemic</b></i>			
Infectious Disease Epidemic	<i><b>Ongoing</b></i>	<b>1 County Public Health Department PD/FD/School D</b>	Develop a public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.
Infectious Disease Epidemic	<i><b>Ongoing</b></i>		Identify sectors of the population that are vulnerable to potential infectious diseases and develop strategies to communicate and serve those identified populations.
Infectious Disease Epidemic	<i><b>Ongoing</b></i>		Determine public health authorities and responsibilities during disaster and emergency situations, e.g., quarantine, shelter hygiene, public sanitation, and immunization.
Infectious Disease Epidemic	<i><b>Ongoing</b></i>		Research and obtain necessary specialized training for public health officials to respond to an infectious disease epidemic.
Infectious Disease Epidemic	<i><b>Ongoing</b></i>		Identify state and federal resources for establishing and improving public health response capacity.
Infectious Disease Epidemic	<i><b>Ongoing</b></i>		Identify appropriate manpower to respond to an infectious disease epidemic.

## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions**

**Implementation of Mitigation Actions**

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

**Element**

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on October 14, 2008 to evaluate and prioritize each of the mitigation actions to determine which considered actions would be included in the Mitigation Action Plan. The Committee then conferred on multiple dates to determine the responsible agency and potential funding sources. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities.

To complete this task, the Steering Committee reviewed the simplified STAPLEE evaluation criteria and the Benefit-Cost Analysis Fact Sheet (Appendix N) to consider the opportunities and constraints of implementing each particular mitigation action.

<b>STAPLEE Evaluation Criteria for Mitigation Actions</b>		
<b>Evaluation Category</b>	<b>Discussion “It is important to consider...”</b>	<b>Considerations</b>
<b>Social</b>	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
<b>Technical</b>	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
<b>Administrative</b>	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance/operations

**Appendix G**  
**City of Scappoose**

<b>STAPLEE Evaluation Criteria for Mitigation Actions</b>		
<b>Evaluation Category</b>	<b>Discussion “It is important to consider...”</b>	<b>Considerations</b>
<b>Political</b>	What the community and its members feel about issues related to the environment, economic development, safety, and emergency management.	Political support Local champion Public support
<b>Legal</b>	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Local, State, and Federal authority Potential legal challenge
<b>Economic</b>	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
<b>Environmental</b>	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, State, and Federal laws

Upon review, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for the City and responsible entities to implement during the 5-year lifespan of this version of the MHMP. As such, the Steering Committee determined that only the mitigation actions that received a high priority ranking would be included in the City’s Mitigation Action Plan. Table G-14 depicts the City’s mitigation actions grouped by hazard and in descending priority order within each hazard.

**MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED**

The City of Scappoose reviewed the Columbia County goals and determined they meet the City’s needs and subsequently implemented the Goals in Table G-13 for the current planning period.

<b>Table G-13. City of Scappoose Mitigation Goals</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	<p><b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.</p>
2	<p><b>Protect Critical Facilities and Enhance Emergency and Essential Services</b></p> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>



## IMPLEMENTING A MITIGATION ACTION PLAN

The following section defines the mitigation action identification process for each participating jurisdiction as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy-Identification of Multi-Jurisdictional Mitigation Actions**

**Identification of Multi-Jurisdictional Mitigation Actions**

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

**Element**

- Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?
- Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

This appendix identifies action items specific to the City of Scappoose. Since the update includes incorporation of the City of Scappoose as part of the MHMP, all actions in this appendix are considered new. Table G-14 displays the City of Scappoose's Mitigation Action Plan matrix that lists mitigation actions by hazard and are only prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

**Table G-14. City of Scappoose Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<i><b>Multi-Hazard (MH)</b></i>						
MH	Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.	City Admin/PW	Ongoing	Sewer Fund, FMA, HMGP, PDM	BC: TBD TF: Yes	
MH	Identify and pursue funding opportunities to implement mitigation actions.	City Admin	Ongoing	General Fund	BC: TBD TF: Yes	
<i><b>Flood</b></i>						
Flood	Develop and maintain GIS mapped inventory of repetitive loss properties to include the types and numbers of properties.	City Admin/PW	Ongoing	General Fund	BC: TBD TF: Yes	
Flood	Develop and implement mitigation actions for repetitive loss properties.	City Admin/PW	Ongoing	Sewer Fund, FMA, HMGP, PDM	BC: TBD TF: Yes	
<i><b>Winter Storm</b></i>						
Winter Storm	Develop critical facility list needing emergency back-up power systems, prioritize, seek funding and implement mitigation actions.	City Admin/PW/ PD/Fire District	Ongoing	General Fund	BC: TBD TF: Yes	
Winter Storm	Develop and maintain severe winter storm public outreach program defining mitigation activity benefits through educational outreach aimed at households and businesses while targeting of special needs populations.	City Admin/PW/ PD/Fire District	Ongoing	General Fund, HMGP	BC: TBD TF: Yes	

**Table G-14. City of Scappoose Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<i><b>Landslide</b></i>						
Landslide	Complete a landslide location inventory, identify threatened critical facilities and other buildings and infrastructure using GIS.	City Admin/PW	Ongoing	General Fund	BC: TBD TF: Yes	
<i><b>Wildland Fire</b></i>						
Wildland Fire	Develop outreach program to educate and encourage fire-safe construction practices for existing and new construction in high risk areas.	City Admin Fire District	Ongoing	General Fund, FMAP	BC: TBD TF: Yes	
Wildland Fire	Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.	City Admin Fire District	Ongoing	General Fund	BC: TBD TF: Yes	
<i><b>Earthquake</b></i>						
Earthquake	Use GIS to identify high seismic hazard areas and develop a wood-frame residential building inventory and an outreach program to educate population concerning facilities particularly vulnerable to earthquake damage, such as pre-1940s homes and homes with cripple wall foundations.	City Admin /PW/PD/FD/School District/Utilities	Ongoing	General Fund	BC: TBD TF: Yes	
Earthquake	Update existing (or adopt the most current) Uniform Building Code	City Admin /PW/PD/FD/School District/Utilities	Ongoing	General Fund	BC: TBD TF: Yes	
<i><b>Volcano</b></i>						
Volcano	Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.	City Admin /PW/PD/FD/School District/Utilities	Ongoing	General Fund, NOAA/ NWS, HMGP	BC: TBD TF: Yes	

**Table G-14. City of Scappoose Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<i>Wind</i>						
Wind	Use GIS to identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.	City Admin /PW	Ongoing	General Fund	BC: TBD TF: Yes	
<i>Erosion</i>						
Erosion	Apply for grants/funds to implement streambank protection methods.	City Admin /PW/Scappoose Bay Watershed Council	Ongoing	General Fund	BC: TBD TF: Yes	
Erosion	Install embankment protection such as vegetation and other bio-engineered materials to reduce or eliminate erosion.	City Admin /PW/Scappoose Bay Watershed Council	Ongoing	General Fund, HMA, HMGP	BC: TBD TF: Yes	
<i>Drought</i>						
Drought	Develop educational programs and initiatives related to water conservation and irrigation during drought periods.	City Admin	Ongoing	General Fund	BC: TBD TF: Yes	
<i>Dam Failure</i>						
Dam Failure	Evaluate the adequacy of dike systems for both floods and earthquakes and implement mitigation measures as necessary.	City Admin /PW/Scappoose Drainage Corp	Ongoing	General Fund	BC: TBD TF: Yes	
<i>Disruption of Utility and Transportation Systems (DUTS)</i>						
(DUTS)	Develop outreach program to educate and encourage residents to maintain several days of emergency supplies for power outages or road closures.	City Admin PD/FD/PW/School District/Utilities	Ongoing	General Fund	BC: TBD TF: Yes	

**Table G-14. City of Scappoose Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<i><b>Hazardous Materials (HAZMAT)</b></i>						
HAZMAT	Enhance emergency planning, emergency response training, and equipment acquisition to address hazardous materials incidents for emergency and first responders and public works staff.	City Admin PD/FD/PW/School District/Utilities	Ongoing	General Fund, CERCLA, SARA	BC: TBD TF: Yes	
<i><b>Terrorism</b></i>						
Terrorism	Enhance emergency planning, organization, equipment, exercise, and emergency response training to address all potential terrorism incidents.	City Admin PD/FD/PW/School District/Utilities	Ongoing	General Fund, HSGP	BC: TBD TF: Yes	
<i><b>Infectious Disease Epidemic</b></i>						
Infectious Disease Epidemic	Develop a public health emergency response operations plan that includes, but is not limited to, identification and an inventory of sites with the capacity to treat large numbers of infected individuals and identification of a quarantine facility.	County Public Health Department (Lead) City Admin PD/FD/School District	Ongoing	General Fund, County CDC Public Health Funds	BC: TBD TF: Yes	

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**Appendix H**  
**City of Vernonia**

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This appendix contains the specific City of Vernonia information to support the Columbia County Multi-Jurisdictional Hazard Mitigation Plan update.

This section supports the County’s planning process by summarizing the review and incorporation of existing plans, studies, and reports used to develop this MHMP.

**DMA 2000 Requirements: Planning Process**

**Multi-Jurisdictional Planning Participation**

**Requirement §201.6(a)(3):** Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

**Element**

- Does the new or updated plan describe how each jurisdiction participated in the plan’s development?
- Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

**Planning Process**

**Requirement §201.6(b):** An open public involvement process is essential to the development of an effective plan.

**Documentation of the Planning Process**

**Requirement §201.6(b):** In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

**Element**

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

**Requirement §201.6(c)(1):** [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

**Element**

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)
- Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

Source: FEMA, July 2008.

The City of Vernonia is dedicated to mitigating potential natural and technological hazard threats to its population and infrastructure. To fulfill that goal, the City organized a Hazard Mitigation Plan development Steering Committee dedicated to identifying hazard threats and developing actions to mitigate damage and life losses from those threats.

Table H-1 contains the City’s Steering Committee participant list to augment the Columbia County MHMP planning elements.

<b>Table H-1. City of Vernonia Steering Committee</b>	
Dan Brown	Planning Commission, City of Vernonia
Maggie Peyton	Upper Nehalem Watershed Council Coordinator
Paul Epler	Fire Chief, City of Vernonia
Sandy Welch	Director, Vernonia Cares Food Bank
Marc Farmer	General Manager, West Oregon Electric Coop
Jim Tierney	Committee Chair, Unmet Needs
Bill Haack	Columbia County Flood Relief
Jim Johnson	Interim City Administrator
Sally Harrison	Mayor
Frank Hupp	Columbia County Project Coordinator

Table H-2 contains the summary of the City’s public involvement and planning meeting activities.

<b>Table H-2. Public Involvement Mechanisms</b>	
Mechanism	Description
News Media-newspapers	The City of Vernonia will provide reporters with information for writing articles about what Vernonia is doing in the following papers-Vernonia’s Voice, Hillsboro Argus, The Independent. Also, we will provide press releases and dates of meetings and/or workshops.
Flyer Dissemination-PSAs	Information pieces about the Hazard Mitigation Plan update process, including the dates of meetings, will be posted in conspicuous places around town.
April Kickoff Newsletter	Explained plan development process and solicited input and comments.
August 14, 2008 Countywide Public Meeting, 10 a.m., 2 p.m., & 6 p.m., Columbia County 911 Center, St Helens, OR	Presented draft risk assessment results and provided opportunity to comment.
Email	The Community Learning Center has a large email list and information will be distributed this way.
City of Vernonia Website	Information and meeting times will be posted on the City’s website
Columbia County Flood Relief Website	Information and meeting times will be posted on CCFR’s website.

## CAPABILITY ASSESSMENT

Table B-3, B-4, and B-5 contain the City’s resources used to support planning activities, including the reports and studies reviewed as part of the update process.

<b>Table H-3. City of Vernonia Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
Plans	Emergency Operations Plan (Fire District)	Delineates emergency operation’s responsibilities and authorities
	Comprehensive Plan 1996	Guides Community development and governance
	Transportation Plan	Defines transportation policies, development, and requirements. This mitigation plan should identify potential road erosion, service disruption, and upgrade projects.
	Hazard Mitigation	Defines risk, vulnerability, and proposed actions
	Utilities Emergency Operations Plan	Delineates emergency operation’s responsibilities and authorities
	Water System Master Plan	Delineates the 500 year flood hazard area, riparian streams and water bodies, wetlands, natural drainage ways and steep slope areas
	Soil Conservation Service (USDA) General Soil Engineering Survey (1972)	General study categorizing soil types throughout the community. Not detailed enough for operational planning.
	Natural Drainage Ways Map	Depicts natural drainage ways to maximize topography for setback development and reduce drainage way filling. This will decrease erosion or need for elaborate storm drain construction.
	Ben Shumaker’s Report of the Vernonia Plan	Assessment of Vernonia’s Multi-Hazard Mitigation Plan
Vernonia Community Development Plan	This plan coupled with the Community Needs Survey guides future growth and funding opportunities	
Programs	Site Development Review	Reviews floodplain development requirements to ensure NFIP compliance.
Policies (Municipal Codes)	City Ordinance 711 City of Vernonia Zoning Ordinance	Encourages the most appropriate land use, property value stabilization and conservation, aids fire and protection rendering, provides adequate light, air, and open space, lessens congestion, encourages orderly City growth, prevents undue population concentration, facilitates adequate utility space provision, and generally promotes public health, safety, convenience, and welfare.
	Article XVI Trans Planning, Standards & Procedures	Provides standards and procedures to implement provisions of the State Transportation Planning Rule (OAR 660, Div 12) and local, regional, and state transportation plans.
	Ordinance 712, 722, and 725	Flood hazard related Ordinance
	Ordinance 478	Regulates land use and structures and establishes zones in the City

<b>Table H-3. City of Vernonia Legal and Regulatory Resources Available for Hazard Mitigation</b>		
<b>Regulatory Tool</b>	<b>Name</b>	<b>Effect on Hazard Mitigation</b>
	Ordinance 487	Land subdivision and partitioning standards and procedures, declaring an emergency, delineates slope hazard criteria
	Ordinance 633	Enactment of Flood Damage Prevention Ordinance

<b>Table H-4. City of Vernonia Administrative and Technical Resources for Hazard Mitigation</b>	
<b>Staff/Personnel Resources</b>	<b>Department/Division Position</b>
Planner(s) or engineer(s) with knowledge of land development and land management practices	City Planner-Carole Connell City Engineer (contractor-Civil)
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	City Engineer (Building Department-contractor)
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	Yes, Aldie Howard
Floodplain manager	Yes-Dan Brown
Personnel skilled in GIS and/or HAZUS-MH Su	rveyor-KLS Surveying
Director of Emergency Services	(Frank/ w County) Police Chief?-Mathew J. Workman Fire Chief-Paul Epler
Finance (grant writers, purchasing)	Yes Joann Glass
Public Information Officers	City Administrator

<b>Table H-5. City of Vernonia Financial Resources for Hazard Mitigation</b>	
<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
General funds	Yes
Authority to levy taxes for specific purposes	Yes
Incur debt through general obligation bonds	Yes-with voter approval
Incur debt through special tax and revenue bonds	Yes-with voter approval
Incur debt through private activity bonds	Yes-with voter approval

**Table H-5. City of Vernonia Financial Resources for Hazard Mitigation**

<b>Financial Resources</b>	<b>Effect on Hazard Mitigation</b>
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which is available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only.
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United States Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Used to finance future fire protection facilities' construction and other fire capital expenditures to protect new development.. The City Council or Fire District may charge fire mitigation fees to ensure new development pays their fair share of constructing these improvements.

## HAZARD IDENTIFICATION AND SCREENING

The following section defines hazard identification as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment: Identifying Hazards**

**Identifying Hazards**  
**Requirement §201.6(c)(2)(i):** [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.  
**Element**  
 ■ Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?  
 Source: FEMA, July 2008.

The City of Vernonia’s Steering Committee determined that the following natural hazards could potentially threaten the community. Those marked with an (\*) were identified as new hazards in addition to those identified in the City of Vernonia’s 2005 Hazard Mitigation Plan.

<i><b>Natural Hazards</b></i>	
Flood X	
Winter Storm	X
Landslide X	
Fire (Wildland/Urban)	X
Earthquake X	
Volcano X	
Wind* X	
Erosion* X	
ENSO (El Niño / La Niña)*	
Expansive Soils*	X
Drought*	
<i><b>Technological Hazards</b></i>	
Dam Failure	X
Disruption of Utility and Transportation Systems	X
Hazardous Materials	X
Terrorism	
Infectious Disease Epidemic	

## OVERVIEW OF VULNERABILITY ANALYSIS

This section summarizes community specific vulnerability information for the City of Vernonia to augment the MHMP development process. It comprises:

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.
- Assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

The following section defines vulnerability analysis as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview**

**Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

**Element**

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the new or updated plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

**DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties**

**Assessing Vulnerability: Addressing Repetitive Loss Properties**

**Requirement §201.6(c)(2)(ii):** [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures**

**Assessing Vulnerability: Identifying Structures**

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Element**

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

The City of Vernonia actively participates in FEMA's National Flood Insurance Program (NFIP) and has implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties to assure an effective flood mitigation program. They subsequently selected and prioritized County or community appropriate actions to assure an effective flood mitigation program.

**DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses**

**Assessing Vulnerability: Estimating Potential Losses**  
**Requirement §201.6(c)(2)(ii)(B):** [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.  
**Element**

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

**DMA 2000 Recommendations: Multi-Jurisdictional Risk Assessment**

**Assessing Vulnerability: Multi-Jurisdictional Risk Assessment**  
**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area  
**Element**

- Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

Source: FEMA, July 2008.

## **VULNERABILITY ANALYSIS**

Asset inventory is the first step of a vulnerability analysis. Assets within each community that may be affected by hazard events include population, residential and nonresidential buildings, and critical facilities and infrastructure. The Steering Committee identified critical facilities and asset information throughout the 2009 plan update process.

The asset inventory delineates the City’s existing building and infrastructure assets and insured values are identified in detail in Tables H-6A, H-6B and H-7.

Tables H-8, H-9, and H-10 portray the critical infrastructure numbers and values, and their potential vulnerability by hazard type.

The City of Vernonia seeks to protect its population by supporting Columbia County and Oregon State initiatives, ordinances, building codes, and development regulations. One of the most important initiatives is to prohibit or not allow future development of buildings, infrastructure and critical facilities in identified high hazard areas. Any essential infrastructure component will undergo stringent review to ensure potential hazard risk will be mitigated.

### **Population and Building Stock**

Population data listed in Table B-6A were obtained from the 2000 U.S. Census and Portland State University. It comprises census block level data, and estimates from university conducted community research.

The City’s existing building and infrastructure and insured values are identified in Tables H-6A, H-6B, and H-7.



<b>Table H-6A. City of Vernonia Estimated Population and Building Inventory</b>				
<b>Population</b>			<b>Residential Buildings</b>	
<b>2000 Census</b>	<b>Estimated 2005 Census</b>	<b>Estimated 2007 Census<sup>2</sup></b>	<b>Total Building Count</b>	<b>Total Value of Buildings (\$)<sup>1</sup></b>
2,228	2,275	2,365	879	101,348,700

**Source:** FEMA HAZUS-MH, Version 2006 and U.S. Census 2000.

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$115,300 per structure).

<sup>2</sup> Portland State University (PSU) 2007 Oregon Population Report.

<b>Table H-6B. City of Vernonia NFIP Insurance Report</b>									
<b>City of</b>	<b>Total Premiums (\$)</b>	<b>Policies A-Zone</b>	<b>Total Policies</b>	<b>Total Coverage (\$)</b>	<b>Average Premium (\$)</b>	<b>Total Claims Since 1978</b>	<b>Total Paid Since 1978 (\$)</b>	<b>Rep Loss Properties<sup>2</sup></b>	
Vernonia	153,434	13	4	249	45,450,800	616.21	222	12,161,122	5

**Source:** FEMA SQANet.

<sup>2</sup>Content and building claims.

<b>Table H-7. City of Vernonia Critical Facilities and Infrastructure</b>			
<b>Facility Type</b>	<b>Name / Number</b>	<b>Address</b>	<b>Value<sup>1</sup></b>
Government	Vernonia City Hall	1001 Bridge St	\$1,358,640
	Vernonia City Library	701 Weed St	\$896,000
	Vernonia Public Works Shop	1625 Washington St	\$289,000
Emergency Response	Vernonia Rural Protection Fire Department	633 Nehalem St	\$107,000
	Vernonia Police Department	1001 Bridge St	\$1,358,640 (included with City Hall)
Education	Vernonia School District Office	475 Bridge St	\$278,988
	Vernonia Elementary School	199 Bridge St	\$8,193,558

**Table H-7. City of Vernonia Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Vernonia Middle School	249 Bridge St	\$4,326,000
	Vernonia High School	299 Bridge St	\$698,578
	Vernonia Learning Center	939 Bridge St	\$500,000
	Vernonia Headstart	500 California Ave	Unknown
Care Facility	Vernonia Providence Clinic	510 Bridge St	\$269,640
	Vernonia Senior Center	446 Bridge St	\$72,030
Community	Vernonia Pioneer Museum	511 E Bridge St	Est. \$500,000
	Airport Park	next to Vernonia Municipal Airport	Est. \$100,000
	Anderson Park	S end of Adams Ave and Jefferson Ave	Est. \$200,000
	Hawkins Park	end of Park Dr	Est. \$200,000
	Spencer Park	N end of Missouri Ave	Est. \$100,000
	Vernonia Lake	E of downtown	Est. \$200,000
	St Mary's Catholic Church	960 Missouri Ave	\$839,060
	Vernonia Christian Church		Unknown
	First Baptist Church	652 A St	\$286,180
	Vernonia Foursquare Church	850 Madison Ave	\$40,110
	Assembly of God Church	660 Jefferson St	\$65,970
	Church of Jesus Christ of Latter Day Saints	1350 E Knott Ave	Unknown
	Nehalem Bible Church	Grant Ave. & North St	Unknown
	Seventh Day Adventist Church	1294 Nehalem St	\$28,670
	Vernonia Community Church	957 State Ave	\$894,350
	St Augustine Episcopal Church		Unknown
	County Museum		Unknown
	State and Federal Highways	State Hwy 47 (Bridge Street)	
Railroads	<b>NONE</b>		
Bridges	Rock Creek Bridge		Unknown
	Nehalem River Bridge		Unknown
Transportation Facilities	Vernonia Municipal Airport	15915 Airport Way	Est. \$500,000
Utilities	West Oregon Electric Office		\$993,750
	Verizon Telephone Exchange Office		\$1,000,000
	At&T Wireless Tower		

**Table H-7. City of Vernonia Critical Facilities and Infrastructure**

Facility Type	Name / Number	Address	Value <sup>1</sup>
	Columbia 911 Microwave Tower		\$35,000
	Vernonia Water Reservoir		\$667,000
	Vernonia Water Reservoir		\$1,341,000
	Vernonia Water Treatment Plant		\$3,134,000
Utilities	Sewage Pumping Station #2		\$153,000
	Sewage Pumping Station #3		\$193,000
	Sewage Lagoon #1		\$772,000
	Sewage Lagoon #2		\$561,000
	Sewage Lagoon #3		\$701,000
	Sewage Headworks		\$162,000
	Vernonia Transfer Station		Est. \$100,000
	West OR Elec Co-op Electrical Power Substations		\$48,600
	Dams	Vernonia Log Pond Earthen Dam	

**Sources:** FEMA HAZUS-MH, local jurisdictions.

<sup>1</sup>Estimated and/or insured structural value for critical facilities and estimated values for critical infrastructure.

NA = Not Available.

## VULNERABILITY ANALYSIS

The vulnerability analysis development process is thoroughly discussed in the Columbia County MHMP, Section 6, which generated the following Hazard Exposure Analysis Overviews. Tables H-8, H-9, and H-10 depict in tabular form results obtained from the GIS analysis depicted in hazard figures located in Appendix I.

<b>Table H-8. City of Vernonia Potential Hazard Exposure Analysis Overview-Population and Buildings</b>							
			Population Number	Buildings			
				Residential		Non-Residential	
Hazard Type	Hazard Area	Methodology		Number	Value (\$) <sup>1</sup>	Number	Value (\$) <sup>1</sup>
Flood	Moderate 500-y	ear floodplain	--	636	73,330,800	0	unknown
	High 100-y	ear floodplain	--	683	78,749,900	0	unknown
Winter Storm		descriptive	2,365	1,009	116,337,700	4	unknown
Landslide	Moderate >14-32	degrees	--	793	91,432,900	3	unknown
	High >32-56	degrees	--	321	37,011,300	3	unknown
Wildland Fire	Moderate	Moderate fuel rank	--	994	114,608,200	4	unknown
	High	High fuel rank	--	852	98,235,600	4	unknown
	Very High	Very high fuel rank	--	544	62,723,200	3	unknown
	Extreme	Extreme fuel rank	--	9	1,037,700	3	unknown
Earthquake	Strong 9-20%	(g)	--	1,009	116,337,700	4	unknown
	Very strong	20-40% (g)	--	0	--	0	unknown
	Severe >40-60%	(g)	--	0	--	0	unknown
Volcano		descriptive	2,365	1,009	116,337,700	4	unknown
Wind		descriptive	2,365	1,009	116,337,700	4	unknown
Erosion		within 300' of potential areas of erosion	-- --		--	--	unknown
Expansive Soils	Low <3%	percent	--	809	93,277,700	3	unknown
	Moderate 3-6	percent	--	202	23,290,600	0	unknown
	High 6-9%		--	0	--	0	unknown
	Very High	>9%	--	0	--	0	unknown
Dam Failure	High	Inundation area	--	0	--	0	unknown
Disruption of Utility and Transportation Systems	descriptiv	e	2,365	--	--	--	unknown
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	-- 979		112,878,700	3	unknown
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	-- --		--	--	unknown

<sup>1</sup> Average insured structural value of all residential buildings (including single-family dwellings, mobile homes, etc., is \$115,300 per structure).

Note-population by parcel was not available at the time this document was prepared. Once this data is available, a useful analysis of population and residential structures by hazard can easily be completed. \*0.25 mile-buffered EHS sites were unable to be determined due to the use of census block data.

Table H-9. City of Vernonia Potential Hazard Exposure Analysis Overview-Critical Facilities

Hazard Type	Hazard Area	Methodology	Government		Emergency Response		Educational		Care		Community	
			No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹	No.	Value (\$)¹
Flood	Moderate	500-year floodplain	1	289K	--	--	5	13.5M	2	342K	9	1.2M
	High	100-year floodplain	1	289K	--	--	5	13.5M	2	342K	9	960K
Winter Storm		descriptive	3	2.5M	2	1.5M	6	14M	2	342K	15	2.2M
Landslide	Moderate	>14-32 degrees	1	289K	1	107K	1	unknown	1	270K	5	868K
	High	>32-56 degrees	--	--	--	--	1	unknown	--	--	1	unknown
Wildland Fire	Moderate	Moderate fuel rank	3	2.5M	2	1.5M	6	14M	2	342K	15	2.2M
	High	High fuel rank	1	269K	1	107K	1	unknown	--	--	8	943K
	Very High	Very high fuel rank	1	290K	--	--	1	unknown	--	--	1	unknown
	Extreme	Extreme fuel rank	--	--	--	--	--	--	--	--	--	--
Earthquake	Strong	9-20% (g)	3	2.5M	2	1.5M	6	14M	2	342K	15	2.2M
	Very strong	20-40% (g)	--	--	--	--	--	--	--	--	--	--
	Severe	>40-60% (g)	--	--	--	--	--	--	--	--	--	--
Volcano		descriptive	3	2.5M	2	1.5M	6	14M	2	342K	15	2.2M
Wind		descriptive	3	2.5M	2	1.5M	6	14M	2	342K	15	2.2M
Erosion		within 300' of potential areas of erosion	3	2.5M	1	1.4M	5	14M	2	342K	7	106K
Expansive Soils	Low	<3% percent	--	--	--	--	--	--	--	--	--	--
	Moderate	3-6 percent	--	--	--	--	--	--	--	--	--	--
	High	6-9%	--	--	--	--	--	--	--	--	--	--
	Very High	>9%	--	--	--	--	--	--	--	--	--	--
Dam Failure	High	Inundation area	--	--	--	--	--	--	--	--	--	--
Disruption of Utility and Transportation Systems		descriptive	3	2.6M	2	1.5M	6	14M	2	342K	17	4.4M
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	2	2.2M	2	1.4M	6	13.9M	2	342K	15	2.1M
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	2	2.2M	2	1.4M	6	13.9M	2	342K	14	2.1M

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Table H-10. City of Vernonia Potential Hazard Exposure Analysis Overview-Critical Infrastructure

Hazard Type	Hazard Area	Methodology	Highways		Railroads		Bridges		Transportation Facilities		Utilities		Dams	
			Miles	Value (\$) <sup>1</sup>	Miles	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>	No.	Value (\$) <sup>1</sup>
Flood	Moderate	500-year floodplain	-----				2	unknown	-- --		6	4.2M	--	--
	High	100-year floodplain	-----				2	unknown	1	unknown	8	4.5M	--	--
Winter Storm		descriptive	1 unknown	unknown	--	--	2	unknown	1	unknown	10	8.3M	--	--
Landslide	Moderate	>14-32 degrees	1 unknown	unknown	--	--	1	unknown	--	--	5	6M	--	--
	High	>32-56 degrees	-----				-----				1	3.1M	--	--
Wildland Fire	Moderate	Moderate fuel rank	1 unknown	unknown	--	--	2 unknown		1 unknown		10	8.3M	--	--
	High	High fuel rank	-----				-- --		1	unknown	8	5.1M	--	--
	Very High	Very high fuel rank	-----				-----				3	4M	--	--
	Extreme	Extreme fuel rank	-----				-----				2	115K	--	--
Earthquake	Strong	9-20% (g)	1 unknown	unknown	--	--	2	unknown	1	unknown	10	8.3M	--	--
	Very strong	20-40% (g)	-----				-----	-- --					--	--
	Severe	>40-60% (g)	-----				-----	-- --					--	--
Volcano		descriptive	1 unknown	unknown	--	--	2 unknown		1 unknown		10	8.3M	--	--
Wind		descriptive	1 unknown	unknown	--	--	2 unknown		1 unknown		10	8.3M	--	--
Erosion		within 300' of potential areas of erosion	-----				2	unknown	-- --		3	2.15M	--	--
Expansive Soils	Low	<3% percent	-----				-----	-- --					--	--
	Moderate	3-6 percent	-----				-----	-- --					--	--
	High	6-9%	-----				-----	-- --					--	--
	Very High	>9%	-----				-----	-- --					--	--
Dam Failure	High	Inundation area	-----				-----	-- --					--	--
Disruption of Utility and Transportation Systems		descriptive	3	unknown	none	none	2	unknown	1	500K	15	8.8M	1	unknown
Hazardous Material Event	1/4-mile buffered transportation routes	1/4-mile buffered transportation routes	1 unknown	unknown --		--	2	unknown --		--	8	4.5M	--	--
	1/4-mile buffered EHS sites	1/4-mile buffered EHS sites	-----				2	unknown	-- --		8	4.5M	--	--

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## **SUMMARY OF VULNERABILITIES AND IMPACTS TO IDENTIFIED HAZARDS**

The following section describes community specific vulnerabilities and impacts from natural hazards in addition to technological and manmade hazards identified in the 2009 Columbia County MHMP.

The following is derived from the best available data for facility locations and values. In many cases, values were unavailable, and therefore the totals listed below should be considered incomplete and likely less than the actual costs associated with the respective hazards.

### ***Flood***

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for the City of Vernonia. The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

The City of Vernonia has 683 residential structures (worth \$78.7M), one government facilities (worth \$289K), five educational facilities (worth \$13.5M), two care facilities (worth \$342K), seven community facilities (worth \$960K), two bridges (values unknown), one transportation facility (value unknown) and eight utilities (worth \$4.5M) within the boundaries of the 100-year floodplain.

There are 636 residential structures (worth \$73.3M), one government facility (worth \$289K), five educational facilities (worth \$13.5M), two care facilities (worth \$342K), nine community facilities (worth \$1.2M), two bridges (values unknown) and six utilities (worth \$4.2M) within the 500-year floodplain.

### ***Winter Storm***

The natural hazards resulting from winter storms, such as ice, cold, wind and floods, are often widespread. A single event is capable of impacting all people, critical facilities and infrastructure within the City of Vernonia, and therefore the entire population (2,365 people), including 1,009 residential structures (worth \$101.4M), four non-residential structures (value unknown), three government facilities (worth \$2.5M), two emergency response facilities (worth \$1.5M), six educational facilities (worth \$14M), two care facilities (worth \$342K), 15 community facilities (worth \$2.2M), one highway (value unknown), two bridges (values unknown), one transportation facility (value unknown), and ten utilities (worth \$8.3M).

### ***Landslide***

The potential impacts from landslides can be widespread. Potential debris flows and landslides can impact transportation routes, utility systems, and water and waste treatment infrastructure along with public, private, and business structures located adjacent to steep slopes, along riverine embankments, or within alluvial fans or natural drainages. Response and recovery efforts will likely vary from minor cleanup to more extensive utility system rebuilding. Utility disruptions are usually local and terrain dependent. Damages may require reestablishing electrical, communication, and gas pipeline connections occurring from specific breakage points. Initial debris clearing from emergency routes and high traffic areas may be required. Water and waste

water utilities may need treatment to quickly improve water quality by reducing excessive water turbidity and reestablishing waste disposal capability.

USGS elevation datasets were used to determine the landslide hazard areas within the City of Vernonia. Risk was assigned based on slope angle. A slope angle less than 14 degrees was assigned a low risk, a slope angle between 14 and 32 degrees was assigned a medium risk, and a slope angle greater than 32 degrees was assigned a high risk.

The City of Vernonia has 793 residential structures (worth \$91.4M), three non-residential structures (value unknown), one government facility (worth \$289K), one emergency response facility (worth \$107K), one educational facility (value unknown), one care facility (worth \$270K), five community facilities (worth \$868K), one highway (value unknown), one bridge (value unknown), and five utility facilities (worth \$6M) located in the moderate landslide risk area.

There are 321 residential structures (worth \$37M), three non-residential structures (value unknown), one educational facility (value unknown), one community facilities (value unknown), and one utility (worth \$3.1M) located in the high landslide risk area.

### ***Wildland Fires***

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel values. Risk levels of moderate, high, very high, and extreme were assigned to the entire region based on the results of this modeling.

The City of Vernonia has 994 residential structures (worth \$114.6M), four non-residential structures (value unknown), three government facilities (worth \$2.5M), two emergency response facilities (worth \$1.5M), six educational facilities (worth \$14M), two care facilities (worth \$342K), 15 community facilities (worth \$2.2M), one highway (value unknown), two bridges (values unknown), one transportation facility (value unknown), and ten utilities (worth \$8.3M) located in moderate fire risk areas.

There are 852 residential structures (worth \$98.2M), four non-residential structures (value unknown), one government facility (worth \$269K), one emergency response facility (worth \$107K), one educational facility (value unknown), eight community facilities (worth 934K), one bridge (value unknown), one transportation facility (value unknown), and eight utilities (worth \$5.1M) are located in the high fire risk areas.

There are 544 residential structures (worth \$62.7M), three non-residential structures (value unknown), one government facility (worth \$290K), one educational facility (value unknown), one community facility (value unknown), and three utilities (worth \$4M) are located in the very high risk area. Nine residential structures (worth \$1.03M), three non-residential structures (value unknown), and two utilities (value \$115,300) are located in the extreme fire hazard area. No facilities are located in areas of extreme risk.

### *Earthquake*

Based on PGA shake maps produced by the USGS, the western portion of Columbia County is likely to experience higher levels of shaking than the eastern portion, as a result of its proximity to the Cascadia Subduction Zone. Ground movement in both areas, however, is likely to cause damage to weak, unreinforced masonry buildings, and to induce small landslides along unstable slopes. As well as landslide, earthquakes can trigger other hazards such as dam failure and disruption of transportation and utility systems.

The eastern portion of Columbia County is likely to experience strong shaking should a subduction zone earthquake occur (9-20 percent of the acceleration of gravity). In contrast, the far western portion of the county is likely to experience very strong shaking (20-25 percent). This rating represents the peak acceleration of the ground caused by the earthquake.

The entire City of Vernonia is equally vulnerable to earthquake impacts, including the entire population (2,365 people), 1,009 residential structures (worth \$101.4M), four non-residential structures (value unknown), three government facilities (worth \$2.5M), two emergency response facilities (worth \$1.5M), six educational facilities (worth \$14M), two care facilities (worth \$342K), 15 community facilities (worth \$2.2M), one highway (value unknown), two bridges (values unknown), one transportation facility (value unknown), and ten utilities (worth \$8.3M) located in the strong shaking (9-20 percent) area.

### *Volcano*

A volcanic eruption would have a minor impact on the City of Vernonia due to the proximity to volcanoes within the Cascade region. The major resources of concern include air quality and waterway sedimentation. During previous eruptions, ashfall has drifted to the east of the volcanoes. (State Interagency Hazard Mitigation Team 2006)

The City of Vernonia will likely only experience damage from volcanic eruption columns and clouds which contain volcanic gases, minerals, and ash. The columns and clouds form rapidly and extend several miles above an eruption. Solid particles within the clouds present a serious aviation threat, can distribute acid rain (sulfur dioxide gas and water), can create risk of suffocation (carbon dioxide is heavier than air and collects in valleys and depressions threatening human and animals), and pose a toxic threat from fluorine which clings to ash particles potentially poisoning grazing livestock and contaminating domestic water supplies.

Buildings streets and roads throughout the city may require minor cleanup with negligible impacts. Temporary utility interruptions are likely, and minor cleanup may be required for electrical and other utility services. Water treatment facilities may require additional attention to address high turbidity water. Injuries associated with respiratory problems may result. (Goettel 2005)

Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all critical facilities and infrastructure within the City of Vernonia are at risk including the entire population (2,365 people), 1,009 residential structures (worth \$101.4M), four non-residential structures (value unknown), three government facilities (worth \$2.5M), two emergency response facilities (worth \$1.5M), six educational facilities (worth \$14M), two care facilities (worth \$342K), 15 community facilities

(worth \$2.2M), one highway (value unknown), two bridges (values unknown), one transportation facility (value unknown), and ten utilities (worth \$8.3M).

### *Wind*

Many buildings, utilities and transportation systems in open areas, natural grasslands, or agricultural lands are especially vulnerable to wind damage. Impacts associated with wind can include damage to power lines, trees, and structures, and can also cause temporary disruptions of power. Additionally, high winds can cause significant damage to forestlands.

All areas within the City of Vernonia are equally at risk of a windstorm event including all people, critical facilities and infrastructure, and therefore the entire population (2,365 people), 1,009 residential structures (worth \$101.4M), four non-residential structures (value unknown), three government facilities (worth \$2.5M), two emergency response facilities (worth \$1.5M), six educational facilities (worth \$14M), two care facilities (worth \$342K), 15 community facilities (worth \$2.2M), one highway (value unknown), two bridges (values unknown), one transportation facility (value unknown), and ten utilities (worth \$8.3M).

### *Erosion*

Riverine erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available, however, descriptions of several localized areas were identified during the development of this document and are identified only by location on a map referencing the river or stream reach described. Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

The City of Vernonia has three government facilities (worth \$2.5M), one emergency response facility (worth \$1.4M), five educational facilities (worth \$14M) two care facilities (worth \$342K), seven community facilities (worth \$106K), two bridges (values unknown), and three utilities (worth \$2.15M) at risk from erosion impacts.

### *Expansive Soils*

Shrinking and swelling soils can lead to damaged foundations and structures. The most common damage includes cracking and loss of integrity of building foundations and walls of residential and light (one-or two-story) buildings, highways, canal and reservoir linings, and retaining walls. (PCCDD 2006, US Army 1983)

Using NRCS soils data, risk for shrink-swell potential was calculated using the linear extensibility of moderate (3-6 percent), high (6-9 percent), and very high (greater than 9 percent).

The City of Vernonia has 809 residential structures (worth \$93.3M), three non-residential structures (value unknown), and no critical facilities located in expansive soils low (<3%) risk areas. There are 202 residential structures (worth \$23.9M) located in expansive soils moderate (3-6%) risk areas. There are no facilities located in high expansive soils risk areas.

### *Dam Failure*

US Army Corps of Engineers inundation data for the Columbia River were used to determine the impacts from dam failure upriver from Columbia County. No critical facilities within the City of Vernonia are located in a potential dam failure risk area.

### *Disruption of Utility and Transportation Systems*

Transportation system disruption impacts range from effects on life, health, and safety (emergency vehicle mobility, access to hospitals, access to evacuation routes, access to vital supplies if transport is seriously disrupted for a long time) to the economic effects of delays, lost commerce, and lost time. Similarly, disruption of utility systems can affect the county at the level of commerce and recreation as well as at the level of fundamental health and safety. County-wide as well as localized areas of disruption are likely to impact all residents equally. Structural damage from disruption to these systems is not expected; rather the risks are present to residents and those traveling in the area.

### *Hazardous Material Event*

The National Response Center and the EPA's Environmental Facts Multi-system Query were used to locate hazardous materials and waste handling facilities and businesses that generate hazardous materials or waste from their activities. Transportation routes likely to carry hazardous waste were examined, and all facilities within a 0.25 miles radius of those are considered at risk.

The City of Vernonia has 979 residential structures (worth \$ 113.9M), three non-residential structures (value unknown), two government facilities (worth \$2.2M), two emergency response facilities (worth \$1.4M), six educational facilities (worth \$13.9M), two care facilities (worth \$342K), 15 community facilities (worth \$2.1M), one highway (value unknown), two bridges (values unknown), and eight utilities (value \$4.5M) considered to be at risk of a hazardous substance along a transportation route.

Facilities considered at risk near 0.25 mile-buffered EHS Sites include two government facilities (worth \$2.2M), two emergency response facilities (worth \$1.4M), six educational facilities (worth \$13.9M), two care facilities (worth \$342K), 14 community facilities (worth \$2.1M), two bridges (values unknown), and eight utilities (value \$4.5M).

## **MITIGATION STRATEGY**

### **IDENTIFYING MITIGATION ACTIONS**

The following section defines identification and analysis of mitigation actions as stipulated in DMA 2000 and its implementing regulations.

**DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions**

**Identification and Analysis of Mitigation Actions**

**Requirement §201.6(c)(3)(ii):** [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

<p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?</li> <li>■ Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?</li> <li>■ Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?</li> </ul> <p>Source: FEMA, July 2008.</p>
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The Steering Committee assessed whether to update the City of Vernonia’s existing hazard mitigation goals listed in Table H-11, or to revise them to meet the City’s changing needs. The City then proceeded to evaluate potential mitigation actions after finalizing the mitigation goals.

Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Table H-12 depicts the City’s “considered” mitigation actions developed during this mitigation planning process and their existing mitigations’ action status (completed, deleted, deferred, and ongoing). The revised list in Table H-14 delineates those actions the City will strive to implement within this five year planning cycle.

<p><b>DMA 2000 Requirements: Mitigation Strategy - National Flood Insurance Program (NFIP) Compliance</b></p>
<p><b>National Flood Insurance Program (NFIP) Compliance</b></p> <p><b>Requirement §201.6(c)(3)(ii):</b> [The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.</p> <p><b>Element</b></p> <ul style="list-style-type: none"> <li>■ Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?</li> <li>■ Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?</li> </ul> <p>Source: FEMA, July 2008.</p>

The City of Vernonia actively participates in FEMA’s National Flood Insurance Program (NFIP) and have implemented floodplain policies, regulations, and ordinances to protect their threatened population and infrastructure to assure NFIP compliance.

The City’s Mitigation Strategy identified and analyzed potential flood mitigation actions that would fulfill NFIP initiatives, specifically addressing repetitive loss (RL) properties. They subsequently selected and prioritized City appropriate actions to assure an effective flood mitigation program.

**MITIGATION GOALS AND ACTION ITEMS CONSIDERED**

<b>Table H-11. 2005 City of Vernonia Mitigation Goals-Considered</b>	
<b>Goal Number</b>	<b>Goal Description</b>
1	<b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.
2	<b>Protect Critical Facilities and Enhance Emergency and Essential Services</b> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> </ul>

## Appendix H City of Vernonia

	<ul style="list-style-type: none"> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
3	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
4	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
5	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

**Table H-12. City of Vernonia Mitigation Actions Considered**

*(The City's existing mitigation actions from the 2005 MHMP are depicted in blue text and indicate status changes. Red text depict changes to better focus the action.)*

<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
<b>Natural Hazards</b>			
<b>Multi-Hazard (MH)</b>			
MH Short-Term #1	<i>Ongoing</i>		Establish a formal role for the Vernonia Hazard Mitigation Planning Committee to develop a sustainable process to encourage, implement, monitor, and evaluate citywide mitigation actions
MH Short-Term #2	<i>Ongoing</i>	Description changed to refine the City's needs	Identify and pursue funding opportunities to implement mitigation actions. <span style="color: red;">Review ranking in third year and re-rank as appropriate.</span>
MH Short-Term #3	<i>Ongoing</i>		Develop public and private sector partnerships to foster hazard mitigation activities
MH Short-Term #4	<i>Ongoing</i>		Develop detailed inventories of at-risk buildings and infrastructure and prioritize mitigation actions, especially for critical buildings and infrastructure
MH Long-Term #1	<i>Ongoing</i>		Develop education programs aimed at mitigating the risk posed by hazards
MH Long-Term #2	<i>Ongoing</i>		Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning
MH	<i>Ongoing</i>		Develop and incorporate building ordinances commensurate with building codes to reflect survivability from wind, seismic, fire, and other hazards to ensure occupant safety.
MH	<i>Ongoing</i>		Review ordinances and develop outreach programs to assure manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, and other methods as applicable)
MH	<i>Ongoing</i>		Review ordinances and develop outreach programs to assure fuel oil and propane tanks are properly anchored and hazardous materials are properly stored and protected from known natural hazards such as seismic or flooding events.
MH	<i>Ongoing</i>		Cross reference and incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, land use, transportation plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
MH	<i>Ongoing</i>		Develop and incorporate mitigation provisions and recommendations into zoning ordinances and



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<b>Hazard</b>	<b>Status</b> <i>Completed</i> <i>Deferred</i> <i>Deleted</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
			community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
MH	<i>Ongoing</i>	About 65% done	Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load and wind storm power line failure during severe wind or winter ice storm events.
MH	<i>Ongoing</i>		Purchase and install generators with main power distribution disconnect (break away) switches (break away) for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)
MH	<i>Ongoing</i>		Install lightening rods and lightening grade surge protection devices on critical electronic components such as warning systems, communications equipment, and computers for critical facilities.
MH	<i>Ongoing</i>		Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
MH	<i>Ongoing</i>		Explore the need for, develop, and implement hazard zoning ordinances for high-risk hazard area land-use.
MH	<i>Ongoing</i>		Based on known high-risk hazard areas, identify hazard-specific signage needs and purchase and install hazard warning signs near these areas to notify and educate the public of potential hazards.
MH	<i>Ongoing</i>		Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to acquire, relocate, elevate, and/or flood proof to protect the threatened population.
MH	<i>Ongoing</i>		Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
MH	<i>Ongoing</i>		Develop vegetation projects to restore clear cut and riverine erosion damage and to increase landslide susceptible slope stability.

**Table H-12. City of Vernonia Mitigation Actions Considered**

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<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
MH	<i>Ongoing</i>		Retrofit structures to protect them from seismic, floods, high winds, earthquakes, or other natural hazards.
MH	<i>Ongoing</i>		Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
MH	New Consi	der	Harden utility headers located along river embankments to mitigate potential flood, debris, and erosion damages.
MH	<i>Ongoing</i>		Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning.
<b><i>Flood</i></b>			
Flood Short-Term #1	<i>Ongoing</i>	CDBG application submitted to State for Facilities Plan	Provide flood protection for the wastewater treatment system to avoid repetition of the extensive damage and environmental contamination that occurred in the 1996 floods.
Flood Short-Term #2	<i>Ongoing</i>	GIS being established <i>*Changed to refine the City's needs and to address repetitive loss properties</i>	Complete inventory of buildings and infrastructure within the 100-year and 500-year floodplains, with GIS mapping if possible, <b>to include critical facilities, residential and commercial structures, and repetitive loss properties.</b>
Flood Long-Term #1	<i>Ongoing</i>	Meeting with State scheduled for discussion of upstream storage and/or damming	Evaluate the feasibility of reducing flood risk in Vernonia by upstream storage, channel improvements and flood walls or levees and implement such measures if possible
Flood Long-Term #2	<i>Ongoing</i>	Columbia County Flood Relief is now implementing this action	Reduce flood risk for individual buildings, utilities and other infrastructure by implementation of cost effective mitigation measures including acquisition, relocation, elevation, and flood proofing.
Flood	<i>Ongoing</i>		Develop and implement mitigation actions for repetitive loss properties.
Flood	<i>Ongoing</i>		Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data.

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<b>Hazard</b>	<b>Status</b> <i>Completed</i> <i>Deferred</i> <i>Deleted</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
Flood	<i>Ongoing</i>		Implement mitigation measures identified by critical facilities' owners, and other facility owners, to protect facilities located within the 100-year floodplain.
Flood	<i>Ongoing</i>		Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data.
Flood	<i>Ongoing</i>		Request DOGAMI debris flow and lahar data be included in FIRM updates. Use the updated FIRMS for land use and mitigation planning.
Flood	<i>Ongoing</i>		Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.
Flood	<i>Ongoing</i>		Develop, implement, and enforce floodplain management ordinances.
Flood	<i>Ongoing</i>		Develop outreach program to educate residents concerning flood proofed well and sewer/septic installation.
Flood	<i>Ongoing</i>		Acquire, relocate, elevate, or otherwise flood-proof identified properties.
Flood	<i>Ongoing</i>		Acquire, relocate, elevate, or otherwise flood-proof critical facilities.
Flood	<i>Ongoing</i>		Install new streamflow and rainfall measuring gauges.
Flood	<i>Ongoing</i>		Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.
Flood	<i>Ongoing</i>		Dry flood proof non-residential structures.
Flood	<i>Ongoing</i>		Dry flood proof historic structures.
Flood	<i>Ongoing</i>		Construct earthen berms to divert flood flows into bridge or culvert openings. The earth fill should be erosion-resistant and the berms should be covered with erosion-resistant fabric, armoring materials, or vegetation.
Flood	<i>Ongoing</i>		Increase culvert size to increase its drainage efficiency.

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<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
Flood New		Consider	Construct debris basins to retain debris in order to prevent downstream drainage structure clogging.
Flood New		Consider	Install debris cribs over culvert inlets to prevent inflow of coarse bed-load and light floating debris.
Flood New		Consider	Construct debris deflectors to deflect the major portion of debris away from culvert entrances and bridge piers. They are normally "V" shaped.
Flood New		Consider	Install debris fins upstream of a culvert to align debris so that the debris will pass through a drainage opening without clogging the inlet. They are sometimes used on bridge piers to deflect drifting materials.
Flood	<b>Ongoing</b>		Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings. Water ultimately returning to its watercourse at a reduced flow rate.
Flood	<b>Ongoing</b>		Construct an emergency spillway at a dam or other structure to relieve excess water contained during high flow periods to reduce dam failure potential.
Flood	<b>Ongoing</b>		Construct floodwalls around the perimeter of a "facility" and extending above the highest flood elevation to keep floodwaters away from the facility. Floodwalls can be made from gabion baskets, concrete, large riprap, etc. Floodwalls should be used with caution as they can also act as a catchment preventing drainage away from the facility.
Flood	<b>Ongoing</b>		Install triangular or circular flow deflectors on or immediately upstream from bridge footings to deflect water flow and reduce flow velocities preventing footing scour.
Flood New		Consider	Construct low water crossings in a road prism to carry flood flows from an intermittent drainage
Flood New		Consider	Construct a high water overflow crossing to carry flood flows from over bank areas.
Flood New		Consider	Realign bridge piers & abutments to be parallel with the stream's centerline. This prevents pier and abutment undermining and reduces debris catchment.
Flood New		Consider	Create relief drainage ditch opening using a culvert, bridge, or multiple culverts; to relieve rapid water accumulation during high water flow events. .

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<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
Flood New		Consider	Raise bridge height or convert bridge from a multi-span to single span to increase water flow and reduce debris catchment.
Flood	<b>Ongoing</b>		Modify existing culverts by developing a ring compression, by flattening, or beveling the end of a circular culvert to match the angle of the embankment. May need to install flanges to stiffen the beveled section of the culvert.
Flood New		Consider	Construct spur dikes along the embankments to direct flood flows into a bridge opening or away from a continuous impact site.
Flood New		Consider	Construct concrete wing walls at culvert or bridge entrances and outlets to direct water flow into their openings
Flood	<b>Ongoing</b>		Provide flood protection to mitigate damage and contamination of wastewater treatment systems.
Flood	<b>Ongoing</b>		Develop and implement flood risk reduction program and outreach efforts considering upstream storage, channel improvements, and flood walls or levee construction.
<b>Winter Storm</b>			
Winter Storm Short-Term #1	<b>Ongoing</b>		Ensure that critical public buildings and other critical facilities have adequate backup emergency power sources
Winter Storm Short-Term #2	<b>Ongoing</b>		Encourage private facilities that provide important services such as food, fuel, and medical services to have adequate emergency power sources
Winter Storm Long-Term #1	<b>Ongoing</b>	Utility is planning to move headquarters facility and substation	Encourage Western Oregon Electric Coop to evaluate and harden vulnerable elements of the electric power system
Winter Storm Long-Term #2	<b>Ongoing</b>		Encourage state and county highway departments to mitigate hazards that result in closures of the lifeline transportation routes to/from Vernonia
Winter Storm	<b>Ongoing</b>		Develop and implement strategies and educational outreach programs for debris management from severe winter storms.
Winter Storms	<b>Ongoing</b>		Develop and implement programs to coordinate maintenance and mitigation activities to reduce

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<b>Hazard</b>	<b>Status</b> <i>Completed</i> <i>Deferred</i> <i>Deleted</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
			risk to public infrastructure from severe winter storms.
Winter Storms	<i>Ongoing</i>		Update or develop, implement, and maintain jurisdictional debris management plans.
Winter Storms	<i>Ongoing</i>		Develop and maintain severe winter storm public outreach program defining mitigation activity benefits through educational outreach aimed at households and businesses while targeting of special needs populations.
Winter Storms	<i>Ongoing</i>		Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.
Winter Storms	<i>Ongoing</i>		Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or eliminate power outages from severe winter storms. Consider developing incentive programs.
Winter Storms	<i>Ongoing</i>		Develop personal use and educational outreach training for a “safe tree harvesting” program. Implement along utility and road corridors, preventing potential winter storm damage.
Winter Storms	<i>Ongoing</i>		Purchase NOAA Weather radios and develop a web portal linking residents to various weather information sites. (NWS, FEMA, The Weather Channel).
Winter Storms	<i>Ongoing</i>		Install new streamflow and precipitation measuring gauges and develop monitoring and early warning program.
Winter Storms	New	Consider	Develop outreach program with school district contests having students develop, display, and explain mitigation projects or initiatives.
Winter Storms	New	Consider	Develop early warning test program partnering with NOAA, City Police, Fire Departments, and Volunteer Fire Department to coordinate tests.
Winter Storms	<i>Ongoing</i>		Implement and enforce the most current Uniform International, and State, Building Codes to ensure structures can withstand winter storm hazards such as high winds, rain, water and snow.
Winter Storms	<i>Ongoing</i>		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line severe wind or winter ice storm event failure.

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<b>Hazard</b>	<b>Status</b> <i>Completed</i> <i>Deferred</i> <i>Deleted</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
<b><i>Landslide</i></b>			
Landslide Short-Term #1	<i>Ongoing</i>		Complete the inventory of locations where critical facilities, other buildings and infrastructure are subject to landslides
Landslide Long-Term #1	<i>Ongoing</i>		Ensure that future development properly considers landslide hazard areas within Vernonia
Landslide New		Consider	Develop prioritized list of mitigation actions for threatened critical facilities and other buildings or infrastructure.
Landslide New		Consider	Update the storm water management plan to include regulations to control runoff, both for flood reduction and to minimize saturated soils on steep slopes that can cause landslides.
Landslide New		Consider	Develop comprehensive geological landslide and rockslide prone area maps.
Landslide New		Consider	Develop a vegetation management plan addressing slope-stabilizing root strength while facilitating precipitation containment.
Landslide New		Consider	Develop, implement, and enforce property development landslide risk assessment procedures to identify potential facility vulnerability.
<b><i>Wild Fire</i></b>			
Wildland Fire Short-Term #1	<i>Ongoing</i>		Educate residents and business owners about fire safe practices such as vegetation control and encourage fire safe designs for new construction
Wildland Fire Short-Term #2	<i>Ongoing</i>		Provide and maintain defensible space around critical city buildings and infrastructure
Wildland Fire Short-Term #3	<i>Ongoing</i>		Implement fuel reduction measures and ensure defensible space around buildings in the OA Hill and Corey Hill area
Wildland Fire	New	Consider	Identify critical facilities and vulnerable populations based on mapped high hazard areas.
Wildland Fire	New	Consider	Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
Wildland Fire	<i>Ongoing</i>		Develop Community Wildland Fire Protection Plans for all at-risk communities.

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<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
Wildland Fire	New	Consider	Provide real-time internet access and interagency cooperation to decrease wildland fire warning times.
Wildland Fire	New	Consider	Hold FireWise workshop to educate residents and contractors concerning fire resistant landscaping.
Wildland Fire	New	Consider	Promote FireWise building siting, design, and construction materials.
Wildland Fire	New	Consider	Retrofit structures with FireWise building design materials.
Wildland Fire	New	Consider	Develop FireWise Public Service Announcements (PSA).
Wildland Fire	New	Consider	Provide wildland fire information in an easily distributed format for all residents.
Wildland Fire	New	Consider	Schedule and perform government facility "fire drills" at least twice per year.
Wildland Fire	New	Consider	Conduct residential audits for wildland and building fire hazard identification then develop an outreach program to convey the findings.
Wildland Fire	New	Consider	Develop, adopt, and enforce burn ordinances that require burn permits, restricts campfires, and controls outdoor burning.
Wildland Fire	New	Consider	Identify, develop, and implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.
<b><i>Earthquake</i></b>			
Earthquake Short-Term #1	<b><i>Ongoing and Completed</i></b>	Seismic investigation of Elem is now occurring; HS has been demolished	Seismic retrofits for the Vernonia Elementary School and High School, both of which are high risk, unreinforced masonry buildings.
Earthquake Short-Term #2	<b><i>Ongoing</i></b>		Evaluate the seismic performance of critical public facilities, including the fire station, public works building, potable water system, wastewater system, electric power system, and bridges within and to/from Vernonia.
Earthquake Short-Term #3	<b><i>Ongoing</i></b>		Complete inventory of residential and commercial buildings that may be particularly vulnerable to earthquake damage, including pre-1940s homes, homes with cripple wall foundations, and unreinforced or lightly reinforced masonry buildings.
Earthquake Short-	<b><i>Ongoing</i></b>		Disseminate FEMA pamphlets to educate homeowners and business owners about structural and nonstructural



**Table H-12. City of Vernonia Mitigation Actions Considered**

*(The City's existing mitigation actions from the 2005 MHMP are depicted in blue text and indicate status changes. Red text depict changes to better focus the action.)*

<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
Term #4			retrofitting of vulnerable buildings and encourage retrofit
Earthquake Long-Term #1	<i>Ongoing</i>		Obtain additional funding and retrofit other important public facilities with significant seismic vulnerabilities
Earthquake	<i>Ongoing</i>		Supplement State Seismic Needs Analysis data (schools, fire, law enforcement). Complete inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage.
Earthquake New		Consider	Retrofit important public facilities with significant seismic vulnerabilities, such as unreinforced masonry construction.
Earthquake New		Consider	Retrofit bridges that are not seismically adequate for lifeline transportation routes.
Earthquake	<i>Ongoing</i>		Update existing (or adopt the most current) Uniform Building Code
Earthquake	<i>Ongoing</i>		Implement and enforce the Uniform, International, and State Building Codes.
Earthquake	<i>Ongoing</i>		Inspect and/or certify all new construction.
Earthquake	<i>Ongoing</i>		Develop public outreach program to train earthquake safety; perform drop-cover-hold drills at schools and public facilities.
Earthquake New		Consider	Develop outreach program to educate population concerning household, business, and public facility mitigation measures. For example, staff public information tables at fairs, safety events, and festivals.
Earthquake New		Consider	Develop outreach program to educate residents concerning benefits of increased seismic resistance and modern building code compliance during rehabilitation or major repairs for residences or businesses.
Earthquake	<i>Ongoing</i>		Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current Building Codes.
Earthquake New		Consider	Identify and prioritize a list of critical facilities with unreinforced masonry problems including non-structural projects such as brick chimney bracing or replacement, water heater bracing, and

**Table H-12. City of Vernonia Mitigation Actions Considered**

*(The City's existing mitigation actions from the 2005 MHMP are depicted in blue text and indicate status changes. Red text depict changes to better focus the action.)*

<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
			anchoring, etc.
Earthquake New		Consider	Develop outreach program for educating private facilities concerning alternative or emergency power source acquisition to enable them to deliver food, fuel, and medical services during disaster emergency response and recovery efforts.
Earthquake New		Consider	Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.
Earthquake New		Consider	Develop partnerships to mitigate hazards that result in jurisdictional facility lifeline or emergency transportation route closures.
<b><i>Volcano</i></b>			
Volcano Short-Term #1	<b><i>Ongoing</i></b>		Update public emergency notification procedures and emergency response planning for ash fall events
Volcano Short-Term #2	<b><i>Ongoing</i></b>		Evaluate capability of water treatment plant and electric power system to deal ash falls and upgrade emergency response plans
Volcano New		Consider	Update emergency response planning and develop client focused outreach program for ash fall events affecting river, air, and highway transportation, and industrial facilities and operations.
Volcano New		Consider	Evaluate ash impact on storm water drainage system and develop mitigation actions.
<b><i>Wind</i></b>			
Wind	<b><i>Ongoing</i></b>		Review ordinances and develop outreach programs to assure mobile homes and manufactured buildings are protected from severe wind and flood hazards. (Anchoring, elevation, siting, and other methods as applicable)
Wind	<b><i>Ongoing</i></b>	About 65% done	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.
Wind	<b><i>Ongoing</i></b>		Revise requirements to place utilities underground to reduce power disruption from wind storm / tree blow down damage when upgrading or during new development.
Wind	<b><i>Ongoing</i></b>		Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice

**Table H-12. City of Vernonia Mitigation Actions Considered**

*(The City's existing mitigation actions from the 2005 MHMP are depicted in blue text and indicate status changes. Red text depict changes to better focus the action.)*

<b>Hazard</b>	<b>Status</b> <i>Completed</i> <i>Deferred</i> <i>Deleted</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
			load power line failure during severe wind or winter ice storm events.
<b>Erosion</b>			
Erosion New		Upper Nehalem Watershed District is working on erosion issues in Vernonia	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.
Erosion	<b>Ongoing</b>		Relocate buildings that are at risk of being affected by erosion.
Erosion	<b>Ongoing</b>		Apply for grants/funds to implement riverbank protection methods.
Erosion New		Consider	Hold series of community meetings and other outreach efforts to provide erosion hazard specific information to residents.
Erosion New		Consider	Develop and provide information to all residents on riverbank erosion and methods to prevent it in an easily distributed format
Erosion New		Consider	Install riprap, or pilings to harden or "armor" a stream bank where severe erosion occurs.
Erosion New		Consider	Install bank protection such as rock, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection.
Erosion	<b>Ongoing</b>		Develop outreach program to educate the public concerning planting processes and materials used to stabilize hill slopes or stream banks. This is known as bio-engineering; which uses logs, root wads, or wood debris or other vegetation to reduce scour and erosion.
Erosion New		Consider	Harden culvert entrance bottoms with asphalt, concrete, rock, to reduce erosion or scour.
Erosion	<b>Ongoing</b>		Install embankment protection such as vegetation, riprap, gabion baskets, sheet piling, and walls to reduce or eliminate erosion.
Erosion New		Consider	Install walls at the end of a drainage structure to prevent embankment erosion at its entrance or outlet. (end walls).
Erosion	New	Consider	Construct a rock or concrete structure to dissipate energy or reduce flow velocity to prevent erosion

**Table H-12. City of Vernonia Mitigation Actions Considered**

*(The City's existing mitigation actions from the 2005 MHMP are depicted in blue text and indicate status changes. Red text depict changes to better focus the action.)*

<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
			of the streambed and banks.
Erosion New		Consider	Install flared outlets or end sections at culvert entrances and outlets to match the embankment slope to reduce erosion and scour at the entrance and exit points during high flow.
Erosion New		Consider	Install flow diverters a short distance into a water body, tied into the bank, to protect from erosion at their end. Designed to redirect water flow away from embankments.
Erosion New		Consider	Install channel lining using pipe, rock, concrete, or asphalt to reduce scouring embankments and ditch bottom erosion.
Erosion New		Consider	Install bank revetment protection to prevent erosion.
<b><i>Expansive Soils</i></b>			
Expansive Soils	New	Consider	Review construction codes to require non-absorbent fill soils that slope away from foundations for a minimum of five feet to prevent ponding and water retention.
Expansive Soils	New	Consider	Require building design, engineering, and construction processes that address expansive soil conditions at potentially affected building sites.
Expansive Soils	New	Consider	Plant trees a distance equal to their mature height away from a structure built on expansive soils. Minimum distance from foundation is 15 feet.
Expansive Soils	New	Consider	Require road design, engineering, and construction processes that address expansive soil conditions. Water absorption prevention, impermeable membrane, soil compaction, and drainage methods need to be considered once geologic studies determine soil composition.
<b><i>Dam Failure</i></b>			
Dam Failure	New	Consider	Prepare high resolution dam failure inundation area maps; use to update emergency response plans, evacuation route identification, public notification, and evacuation procedures.
Dam Failure	New	Consider	Encourage the USACOE to prioritize dams according to hazard risks such as seismic vulnerability and make seismic improvements as necessary.
Dam Failure	New	Consider	Implement land use and management strategies where dam failure threats dictate.

**Table H-12. City of Vernonia Mitigation Actions Considered**

*(The City's existing mitigation actions from the 2005 MHMP are depicted in blue text and indicate status changes. Red text depict changes to better focus the action.)*

<b>Hazard</b>	<b>Status Completed Deferred Deleted Ongoing</b>	<b>Comment</b>	<b>Description</b>
Dam Failure	New	Consider	Encourage the USACOE to conduct assessments for dams upstream of heavily populated areas.
Dam Failure	New	Consider	Evaluate the adequacy of dike systems for both floods and earthquakes and implement mitigation measures as necessary.
<b><i>Disruption of Utility and Transport Systems (DUTS)</i></b>			
DUTS Short-Term #1	<i>Ongoing</i>		Educate and encourage residents to maintain several days of emergency supplies for power outages or road closures
DUTS Short-Term #2	<i>Ongoing</i>		Review and update emergency response plans for disruptions of utilities or roads
DUTS Short-Term #3	<i>Ongoing</i>		Ensure that all public and private critical facilities in Vernonia have backup power and emergency operations plans to deal with power outages
DUTS New		Consider	Identify and prioritize all “jurisdiction owned” & “non-jurisdiction owned” critical facilities that have backup power and emergency operations plans.
<b><i>Hazardous Materials (HAZMAT)</i></b>			
HAZMAT Short-Term #1	<i>Ongoing</i>		Ensure that first responders have readily available site specific knowledge of hazardous chemical inventories in Vernonia
HAZMAT Short-Term #2	<i>Ongoing</i>		Enhance emergency planning, emergency response training and equipment to address hazardous materials incidents.
HAZMAT Short Term #3	<i>Ongoing</i>		Educate public regarding chemical hazards and flooding. Instruct proper storage to prevent contamination.
HAZMAT New		Consider	Evaluate existing security measures for sites with large quantities of hazardous substances (HS) or any quantities of extremely hazardous substances (EHS) and enhance security as necessary.
HAZMAT New		Consider	Evaluate seismic bracing/anchoring for sites with large quantities of HS or any quantities of EHS.
HAZMAT New		Consider	Train Public Works staff to identify EHS and to follow EMS protocols.
HAZMAT New		Consider	Research, develop, and implement methods to protect waterways from hazardous materials events.
HAZMAT	New	Consider	Prepare a site-specific summary of hazardous materials used, stored, and commonly transported in

**Table H-12. City of Vernonia Mitigation Actions Considered**

*(The City's existing mitigation actions from the 2005 MHMP are depicted in blue text and indicate status changes. Red text depict changes to better focus the action.)*

<b>Hazard</b>	<b>Status</b> <i>Completed</i> <i>Deferred</i> <i>Deleted</i> <i>Ongoing</i>	<b>Comment</b>	<b>Description</b>
			the jurisdictional area. The summary should include mapped facility locations with a hazardous materials inventory, emergency response protocols, and mitigation actions.
Terrorism Short-Term #1	<b>Deleted</b>	The Steering Committee determined the City does not have a viable terrorism threat	Enhance emergency planning, emergency response training and equipment to address potential terrorism incidents.
Terrorism Long-Term #1	<b>Deleted</b>	The Steering Committee determined the City does not have a viable terrorism threat	Upgrade physical security detection and response capability for critical facilities, including water systems and for any high-profile facilities such as major timber industry facilities and sites with large quantities of hazardous materials

## EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The following section defines mitigation action evaluation and implementation as stipulated in DMA 2000 and its implementing regulations.

### DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions

#### Implementation of Mitigation Actions

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization 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.

#### Element

- Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)
- Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources, and the timeframe to complete the action?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- Does the updated plan identify the completed, deleted, or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

The Steering Committee met on November 6, 2008 to evaluate and prioritize each of the mitigation actions to determine which “considered” and “existing” mitigation actions would be included in the Mitigation Action Plan and the status or changes needed for the “existing” mitigation actions. The Committee also discussed the responsible agency and potential funding sources. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities. Table H-12 identifies the status of the City of Vernonia’s existing Mitigation Actions and provided comments for each action that incurred a status change, and if not completed, an explanation of why (if that information was available).

The City of Vernonia Steering Committee reviewed the simplified STAPLEE evaluation criteria (shown below) and the Benefit-Cost Analysis Fact Sheet (Appendix N) to consider the opportunities and constraints of implementing each particular mitigation action.

<b>Evaluation Criteria for Mitigation Actions</b>		
<b>Evaluation Category</b>	<b>Discussion “It is important to consider...”</b>	<b>Considerations</b>
<b>Social</b>	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
<b>Technical</b>	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts

<b>Evaluation Criteria for Mitigation Actions</b>		
<b>Evaluation Category</b>	<b>Discussion “It is important to consider...”</b>	<b>Considerations</b>
<b>Administrative</b>	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance/operations
<b>Political</b>	What the community and its members feel about issues related to the environment, economic development, safety, and emergency management.	Political support Local champion Public support
<b>Legal</b>	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Local, State, and Federal authority Potential legal challenge
<b>Economic</b>	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA Benefit-Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
<b>Environmental</b>	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, State, and Federal laws

Upon review, the Steering Committee assigned a high priority ranking to actions that best fulfill the goals of the MHMP and are appropriate and feasible for the City and responsible entities to implement during the 5-year lifespan of this version of the MHMP. As such, the Steering Committee determined that only the mitigation actions that received a high priority ranking would be included in the City’s Mitigation Action Plan. Table H-14 depicts the City’s mitigation actions grouped by hazard and in descending priority order within each hazard.



**MITIGATION GOALS AND ACTIONS PRIORITIZED & ASSIGNED**

The City of Vernonia reviewed their existing goals from the 2005 plan and determined they meet the City’s needs and subsequently implemented the Goals in Table H-13 for the current planning period.

<b>Table H-13. City of Vernonia Mitigation Goals</b>	
<b>Goal Number</b>	<b>Goal Description</b>
<b>1</b>	<p><b>Reduce the Threat to Life Safety</b> Enhance life safety by minimizing the potential for deaths and injuries in future disaster events.</p>
<b>2</b>	<p><b>Protect Critical Facilities and Enhance Emergency and Essential Services</b></p> <ul style="list-style-type: none"> <li>• Implement activities or projects to protect critical facilities and infrastructure.</li> <li>• Seek opportunities to enhance, protect, and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.</li> </ul>
<b>3</b>	<p><b>Reduce the Threat to Property</b></p> <ul style="list-style-type: none"> <li>• Seek opportunities to protect, enhance and integrate emergency and essential services.</li> <li>• Strengthen emergency operations plans and procedures by increasing collaboration and coordination among public agencies, non-profit organizations, business, industry and the citizens of Columbia County.</li> </ul>
<b>4</b>	<p><b>Create a Disaster Resistant and Disaster-Resilient Economy</b></p> <ul style="list-style-type: none"> <li>• Develop and implement activities to protect economic well-being and vitality while reducing economic hardship in post disaster situations.</li> <li>• Reduce insurance losses and repetitive claims for chronic hazard events.</li> <li>• Work with State and Federal Partners to reduce short-term and long-term recovery and reconstruction costs.</li> <li>• Work with local organization, such as Columbia Emergency Planning Association (CEPA).</li> <li>• Expedite pre-disaster and post-disaster grants and program funding.</li> </ul>
<b>5</b>	<p><b>Increase Public Awareness, Education, Outreach, and Partnerships</b></p> <ul style="list-style-type: none"> <li>• Coordinate and collaborate, where possible, risk reduction outreach efforts with the Oregon Partners for Disaster Resistance &amp; Resilience and other public and private organizations.</li> <li>• Develop and implement risk reduction education programs to increase awareness among citizens, local, county, and regional agencies, non-profit organizations, business, and industry.</li> <li>• Promote insurance coverage for catastrophic hazards</li> <li>• Strengthen communication and coordinate participation in and between public agencies, citizens, nonprofit organizations, business, and industry.</li> </ul>

## IMPLEMENTING A MITIGATION ACTION PLAN

The following section defines the mitigation action identification process for each participating jurisdiction as stipulated in DMA 2000 and its implementing regulations.

### DMA 2000 Requirements: Mitigation Strategy-Identification of Multi-Jurisdictional Mitigation Actions

#### Identification of Multi-Jurisdictional Mitigation Actions

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

#### Element

- Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?
- Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?

Source: FEMA, July 2008.

Table H-14 displays the City of Vernonia's Mitigation Action Plan matrix that lists mitigation actions by hazard and are only prioritized within each hazard, not in total. Each mitigation action will be implemented and administered by the applicable managing department, agency, or responsible entity.

*\*\*Whenever TBD is used, it means that a benefit/cost analysis will be completed as a project is developed to validate the most appropriate mitigation action.*

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Multi-Hazard(MH)</b>						
MH Short-Term #1	Establish a formal role for the Vernonia Hazard Mitigation Planning Committee to develop a sustainable process to encourage, implement, monitor, and evaluate citywide mitigation actions	City of Vernonia City Council	1 year	Staff time only	BC: TBD TF: Yes	
MH Short-Term #3	Develop public and private sector partnerships to foster hazard mitigation activities	City of Vernonia City Administration	0-5 years	General funds	BC: TBD TF: Yes	
MH Short-Term #4	Develop detailed inventories of at-risk buildings and infrastructure and prioritize mitigation actions, especially for critical buildings and infrastructure	City of Vernonia City Administration	0-2 years	General funds	BC: TBD TF: Yes	
MH Long-Term #1	Develop education programs aimed at mitigating the risk posed by hazards	City of Vernonia City Administration	0-2 years	General funds	BC: TBD TF: Yes	
MH Long-Term #2	Integrate the Mitigation Plan findings into planning and regulatory documents and programs and into enhanced emergency planning	City of Vernonia City Administration	0-2 years	General funds	BC: TBD TF: Yes	
MH Short-Term #2	Identify and pursue funding opportunities to implement mitigation actions. Review ranking in third year and re-rank as appropriate.	City of Vernonia City Administration; County staff; Fire District staff	0-5 years Ongoing	General funds	BC: TBD TF: Yes	Review ranking in third year and re-rank as appropriate.
MH	Purchase and install generators with main power distribution disconnect (break away) switches (break away) for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage pump stations, etc.)	City of Vernonia City Administration and PW staff; County staff; Fire District staff; School District; owners of privately-owned critical facilities	0-2 years	General Funds, HMGP, PDM, FMA, HS	BC: TBD TF: Yes	It may be possible to use utility funds for water plant and wastewater facilities.

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
MH	Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.	Vernonia Hazard Mitigation Advisory Committee	0-2 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	
MH	Explore the need for, developing and implementing hazard zoning ordinances for high-risk hazard area land-use.	City Administration	1 year	Staff time only.	BC: TBD TF: Yes	First item for Planning Commission will likely be the issue of no more construction in floodway.
MH	Acquire, demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.	City Administration/County Emergency Management	0-2 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	Columbia County Flood Relief is taking the lead on these projects.
<b>Flood</b>						
Flood Short-Term #2	Complete inventory of buildings and infrastructure within the 100-year and 500-year floodplains, with GIS mapping if possible, to include critical facilities, residential and commercial structures, and repetitive loss properties.	City Administration	1 year	General Fund; Utility Funds, HS	BC: TBD TF: Yes	City developing new GIS that will assist effort
Flood Long-Term #1	Evaluate the feasibility of reducing flood risk in Vernonia by upstream storage, channel improvements and flood walls or levees and implement such measures if possible	City Administration & Planning/ State/ USACOE	5 years	General Funds, HMGP, PDM, FMA	BC: Is determined when project is identified. TF: Yes	Mayor and City Administrator will meet with State Water Resources staff in Nov/Dec 2008

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Flood Long-Term #2	Reduce flood risk for individual buildings, utilities and other infrastructure by implementation of cost effective mitigation measures including acquisition, relocation, elevation, and flood proofing.	City Administration; Columbia County Flood Relief;	0-2 years	General Funds, HMGP, PDM, FMA	BC: Varies with individual project. TF: Yes	Columbia County Flood Relief is taking the lead on these projects.
Flood	Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data.	Vernonia Hazard Mitigation Advisory Committee	0-2 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	
Flood	Implement mitigation measures identified by critical facilities' owners, and other facility owners, to protect facilities located within the 100-year floodplain.	Vernonia Hazard Mitigation Advisory Committee	0-5 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	
Flood	Develop, implement, and enforce floodplain management ordinances.	City Administration	0-2 years; then ongoing	General Funds	BC: TBD TF: Yes	
Flood	Acquire, relocate, elevate, or otherwise flood-proof identified properties.	County Emergency Management	0-3 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	Columbia County Flood Relief is lead on these projects.
Flood	Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.	City and County Administrations	0-2 years	General Funds	BC: TBD TF: Yes	

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Flood	Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings. Water ultimately returning to its watercourse at a reduced flow rate.	City/County/State	0-5 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	
Flood Short-Term #1	Provide flood protection for the wastewater treatment system to avoid repetition of the extensive damage and environmental contamination that occurred in the 1996 floods.	City Administration, Public Works	0-2 years	General Funds, NRCS	BC: TBD TF: Yes	CDBG-funded Facilities Plan will determine location of new wastewater facility
Flood	Ensure that critical public buildings and other critical facilities have adequate backup emergency power sources	Vernonia Hazard Mitigation Advisory Committee	0-2 years	General Funds, HMGP, PDM	BC: TBD TF: Yes	
Flood	Encourage private facilities that provide important services such as food, fuel, and medical services to have adequate emergency power sources	Vernonia Hazard Mitigation Advisory Committee	0-2 years	General Funds	BC: TBD TF: Yes	
Flood and Winter Storm	Encourage West Oregon Electric Coop to evaluate and harden vulnerable elements of the electric power system	West Oregon Electric Coop	0-5 years	General Funds	BC: TBD TF: Yes	
Flood	Provide flood protection for the wastewater treatment system to avoid repetition of the extensive damage and environmental contamination.	City Administration and Public Works	0-2 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	
Flood	Develop and implement flood risk reduction program and outreach efforts considering upstream storage, channel improvements, and flood walls or levee construction.	City Administration & Planning/ State/ USACOE	0-2 years	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b>Winter Storms</b>						
Winter Storm Short-Term #1	Ensure that critical public buildings and other critical facilities have adequate backup emergency power sources	Vernonia Hazard Mitigation Advisory Committee	0-2 years	General Funds	BC: TBD TF: Yes	
Winter Storm Short-Term #2	Encourage private facilities that provide important services such as food, fuel, and medical services to have adequate emergency power sources	Vernonia Hazard Mitigation Advisory Committee	0-2 years	General Funds	BC: TBD TF: Yes	
Winter Storm Long-Term #1	Encourage Weste Oregon Electric Coop to evaluate and harden vulnerable elements of the electric power system	West Oregon Elec Coop	Ongoing	General Funds	BC: TBD TF: Yes	Utility is planning to move headquarters facility and substation
Winter Storm Long-Term #2	Encourage state and county highway departments to mitigate hazards that result in closures of the lifeline transportation routes to/from Vernonia	State ODOT/County Public Works	Ongoing	General funds; gas tax revenues	BC: TBD TF: Yes	
Winter Storm	Develop early warning test program partnering with NOAA, City Police, Fire Departments, and Volunteer Fire Department to coordinate tests.	Vernonia Hazard Mitigation Advisory Committee	0-2 years	General Funds, NWS, NOAA, HMGP, PDM, Fire Mitigation	BC: TBD TF: Yes	
<b>Landslide</b>						
Landslide Short-Term #1	Complete the inventory of locations where critical facilities, other buildings and infrastructure are subject to landslides	City Administration and County planning staff	<b>Ongoing</b>		BC: TBD TF: Yes	

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
Landslide Long-Term #1	Ensure that future development properly considers landslide hazard areas within Vernonia	City Administration and County planning staff	<i>Ongoing</i>		BC: TBD TF: Yes	
<b>Wildland Fire</b>						
Wildland Fire	Educate residents and business owners about fire safe practices such as vegetation control and encourage fire safe designs for new construction	Vernonia Volunteer Fire Department	Ongoing	Fire Dept General Funds	BC: TBD TF: Yes	
Wildland Fire	Provide and maintain defensible space around critical city buildings and infrastructure	Vernonia Volunteer Fire Department	Ongoing	Fire Dept General Funds	BC: TBD TF: Yes	
Wildland Fire	Implement fuel reduction measures and ensure defensible space around buildings in the OA Hill and Corey Hill area	Vernonia Volunteer Fire Department	Ongoing	Fire Dept General Funds	BC: TBD TF: Yes	
<b>Earthquake</b>						
Earthquake Short-Term #1	Seismic retrofits for the Vernonia Elementary School and High School, both of which are high risk, unreinforced masonry buildings.	Vernonia School District	Ongoing	Bond funding; School District General funds	BC: TBD TF: Yes	
Earthquake Short-Term #2	Evaluate the seismic performance of critical public facilities, including the fire station, public works building, potable water system, wastewater system, electric power system, and bridges within and to/from Vernonia.	State, City Administration and City/County Public Works; West Oregon Electric Coop	Ongoing	State; City Administration;	BC: TBD TF: Yes	
Earthquake Short-Term #3	Complete inventory of residential and commercial buildings that may be particularly vulnerable to earthquake damage, including pre-1940s homes, homes with cripple wall foundations, and unreinforced or lightly reinforced	City Administration	0-5 years	General Funds	BC: TBD TF: Yes	



**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
	masonry buildings.					
Earthquake Short-Term #4	Disseminate FEMA pamphlets to educate homeowners and business owners about structural and nonstructural retrofitting of vulnerable buildings and encourage retrofit	Vernonia Hazard Mitigation Advisory Committee	Ongoing	General Funds	BC: TBD TF: Yes	
Earthquake Long-Term #1	Obtain additional funding and retrofit other important public facilities with significant seismic vulnerabilities	Vernonia Hazard Mitigation Advisory Committee	Ongoing	General Funds	BC: TBD TF: Yes	
<b>Volcano</b>						
Volcano Short-Term #1	Update public emergency notification procedures and emergency response planning for ash fall events	Vernonia Hazard Mitigation Advisory Committee	Ongoing	General Funds	BC: TBD TF: Yes	
Volcano Short-Term #2	Evaluate capability of water treatment plant and electric power system to deal ash falls and upgrade emergency response plans	Vernonia Public Works and Western Oregon Electric Coop	Ongoing	General Funds	BC: TBD TF: Yes	
<b>Wind</b>						
Wind	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.	West Oregon Electric Coop	0-2 years	Utility company funds	BC: TBD TF: Yes	About 65% done
<b>Erosion</b>						
Erosion	Install embankment protection such as vegetation, riprap, gabion baskets, sheet piling, and walls to reduce or eliminate erosion.	Public Works	Ongoing	General Funds, HMGP, PDM, FMA	BC: TBD TF: Yes	

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

Hazard	Description	Managing Department / Agency	Timeframe	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility	Comments
<b><i>Expansive Soils</i></b>						
Expansive Soils	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.	Upper Nehalem Watershed District	0-2 years	General Funds, HMGP, PDM, FMA, NRCS	BC: TBD TF: Yes	Upper Nehalem Watershed District is working on erosion issues in Vernonia
<b><i>Dam Failure</i></b>						
Dam Failure	Implement land use and management strategies where dam failure threats dictate.	City Administration	1-5 years	General Funds	BC: TBD TF: Yes	
<b><i>Disruption of Utilities and Transportation Systems (DUTS)</i></b>						
DUTS Short-Term #1	Educate and encourage residents to maintain several days of emergency supplies for power outages or road closures	Vernonia Hazard Mitigation Advisory Committee	Ongoing	General Funds	BC: TBD TF: Yes	
DUTS Short-Term #2	Review and update emergency response plans for disruptions of utilities or roads	Vernonia Hazard Mitigation Advisory Committee	Ongoing	General Funds	BC: TBD TF: Yes	
DUTS Short-Term #3	Ensure that all public and private critical facilities in Vernonia have backup power and emergency operations plans to deal with power outages	Vernonia Hazard Mitigation Advisory Committee	0-2 Years Ongoing	General Funds	BC: TBD TF: Yes	
<b><i>Hazardous Materials (HAZMAT)</i></b>						
HAZMAT Short-Term #1	Ensure that first responders have readily available site specific knowledge of hazardous chemical inventories in Vernonia	City Admin, Police, Fire, Public Works	0-2 years Ongoing	General Funds	BC: TBD TF: Yes	
HAZMAT	Enhance emergency planning, emergency response	City Admin, Police,	Ongoing	General	BC: TBD	

**Table H-14. City of Vernonia Mitigation Action Plan Matrix**

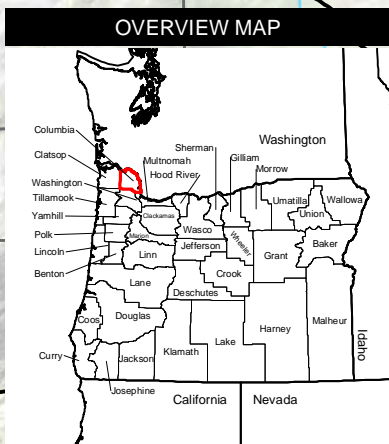
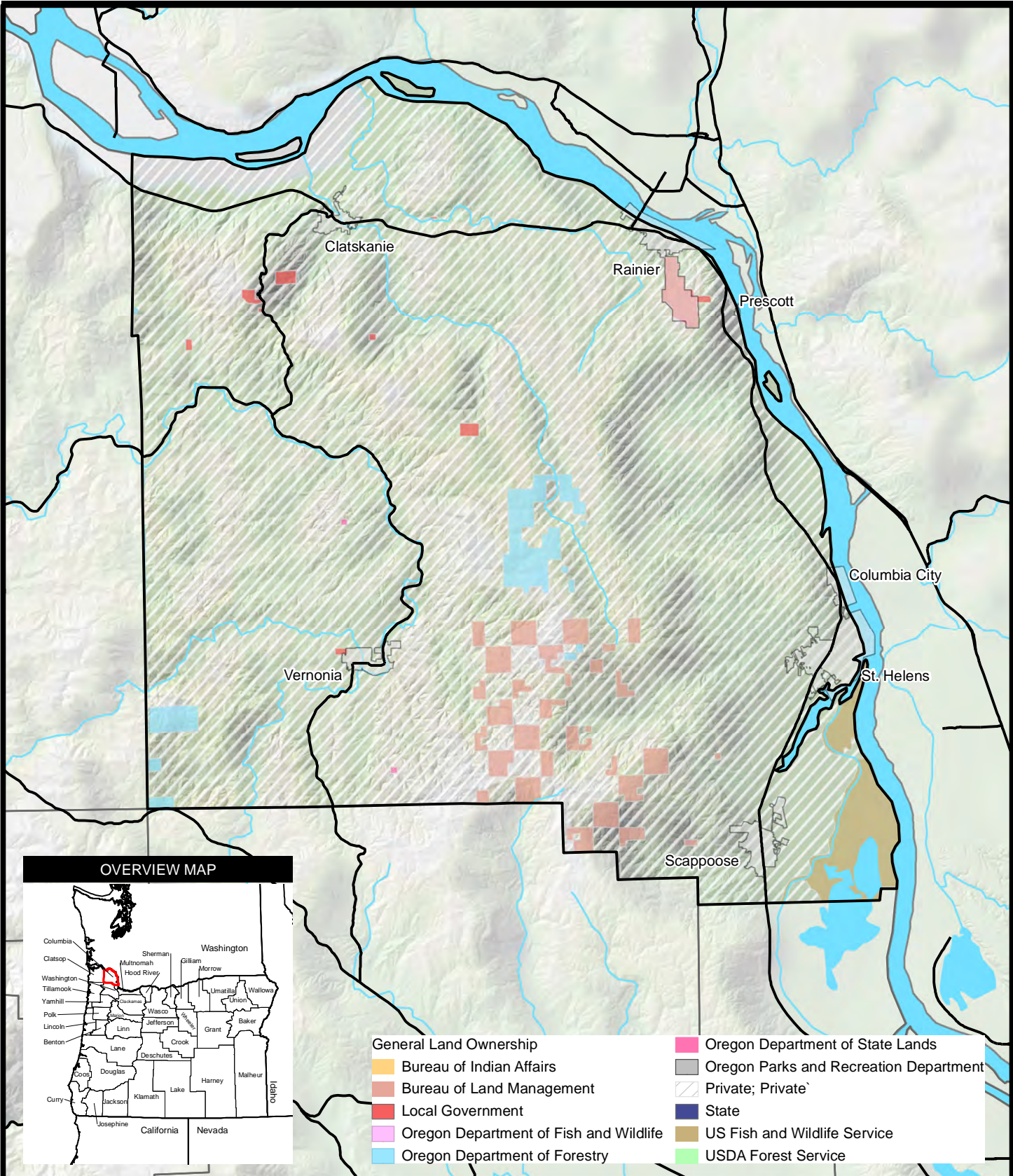
<b>Hazard</b>	<b>Description</b>	<b>Managing Department / Agency</b>	<b>Timeframe</b>	<b>Potential Funding Source(s)</b>	<b>Benefit-Costs / Technical Feasibility</b>	<b>Comments</b>
Short-Term #2	training and equipment to address hazardous materials incidents.	Fire, Public Works		Funds	TF: Yes	
HAZMAT Short Term #3	Educate public regarding chemical hazards and flooding. Instruct proper storage to prevent contamination.	City Admin, Police, Fire, Public Works	Ongoing	General Funds	BC: TBD TF: Yes	

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**Appendix I**  
**Figures**

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General Land Ownership	
	Bureau of Indian Affairs
	Bureau of Land Management
	Local Government
	Oregon Department of Fish and Wildlife
	Oregon Department of Forestry
	Oregon Department of State Lands
	Oregon Parks and Recreation Department
	Private; Private`
	State
	US Fish and Wildlife Service
	USDA Forest Service

**LEGEND**

	City		Major Road or Highway
	City Limits		Streams & Waterways
	County Boundary		Lakes & Waterbodies

**LOCATION AND  
GENERAL LAND OWNERSHIP  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

5 0 5  
Miles



SOURCES: Ownership (FEMA), ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:  
I-1**





Land Cover	
	Evergreen Forest
	Mixed Forest
	Shrub/Scrub
	Grassland/Herbaceous
	Pasture/Hay
	Cultivated Crops
	Woody Wetlands
	Emergent Herbaceous Wetlands
	Open Water
	Developed, Open Space
	Developed, Low Intensity
	Developed, Medium Intensity
	Developed, High Intensity
	Barren Land (Rock/Sand/Clay)
	Deciduous Forest

**LEGEND**

	City		Major Road or Highway
	City Limits		Streams & Waterways
	County Boundary		Lakes & Waterbodies

**LAND COVER  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

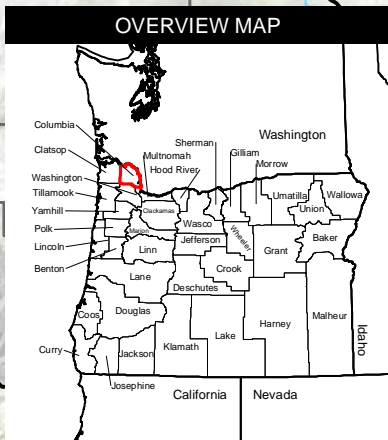
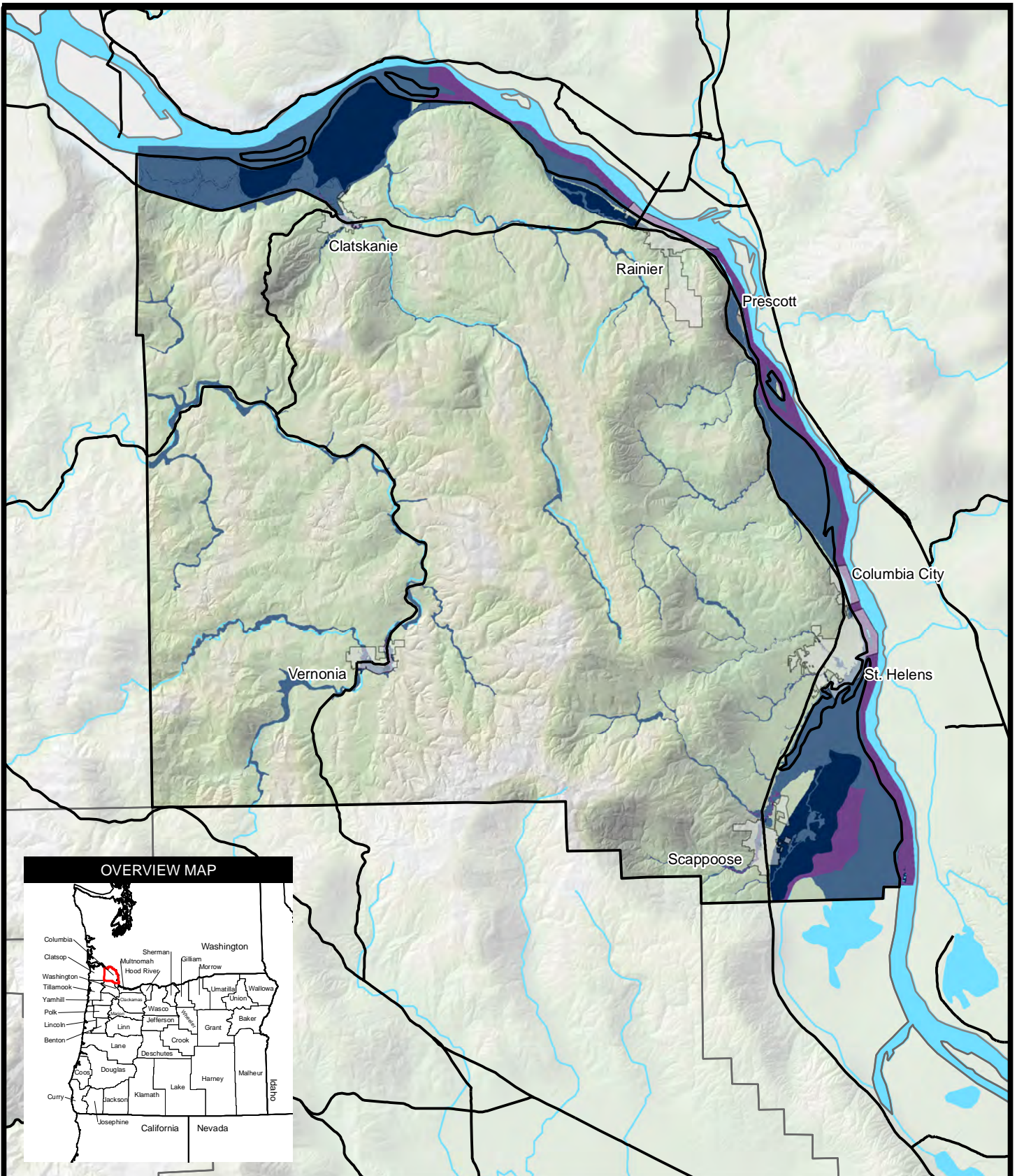
5 0 5  
Miles

Columbia County  
Oregon

SOURCES: ESRI (highways 1996), USGS (land cover, counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:**  
I-2

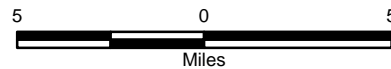




**LEGEND**

- |                       |                         |
|-----------------------|-------------------------|
| <b>FLOOD ZONE</b>     | ▲ City                  |
| ■ 100-Year Flood Zone | □ County Boundary       |
| ■ 500-Year Flood Zone | — Major Road or Highway |
| ■ Designated Floodway | ~ Streams & Waterways   |
|                       | ☪ Lakes & Waterbodies   |

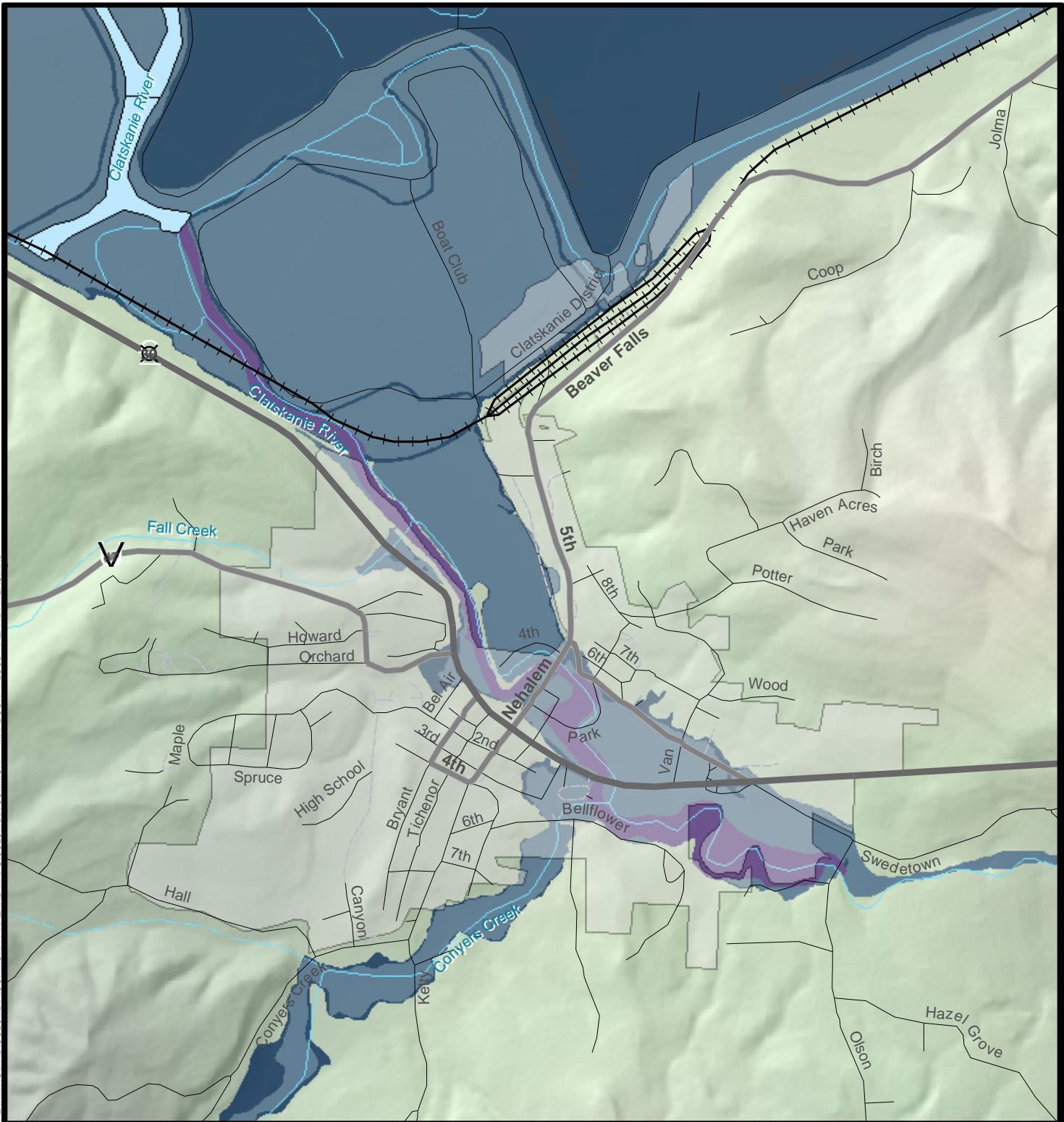
**FLOOD HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: Flood Zones (FEMA), ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:**  
I-3

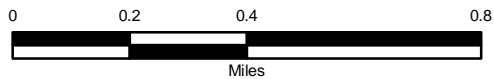
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**OVERVIEW MAP**



**CITY OF CLATSKANIE  
FLOOD HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**











SOURCES: Flood (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-3B

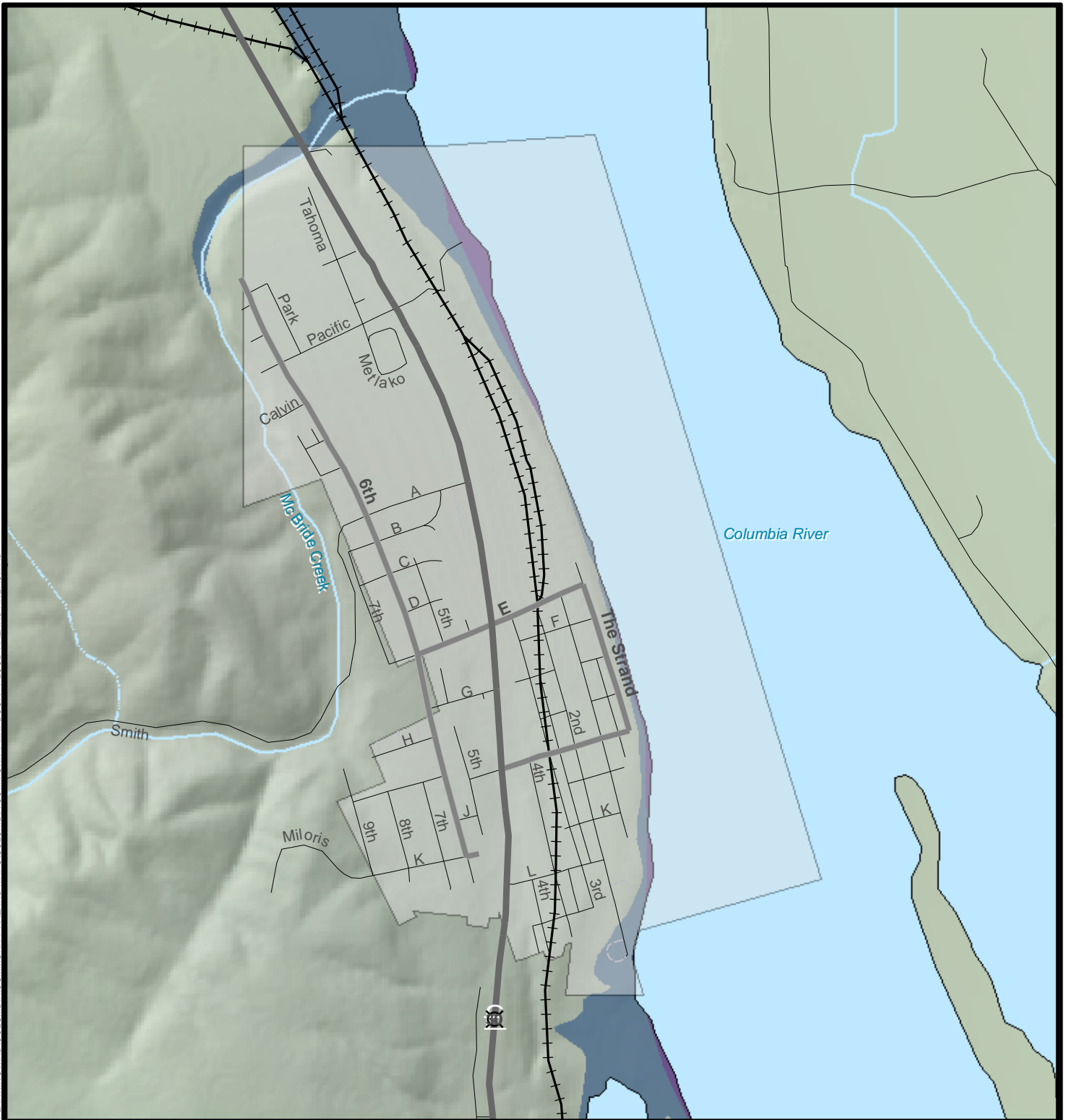
**LEGEND**

**FEMA Flood Zones**

-  Designated Floodway
-  100-Year Flood Zone
-  500-Year Flood Zone
-  City Limits
-  Streets & Highways
-  Railroads
-  Lakes & Waterbodies
-  Streams & Waterways





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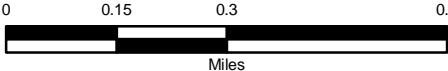
**OVERVIEW MAP**















## COLUMBIA CITY FLOOD HAZARD AREA COLUMBIA COUNTY HAZARD MITIGATION PLAN



Miles

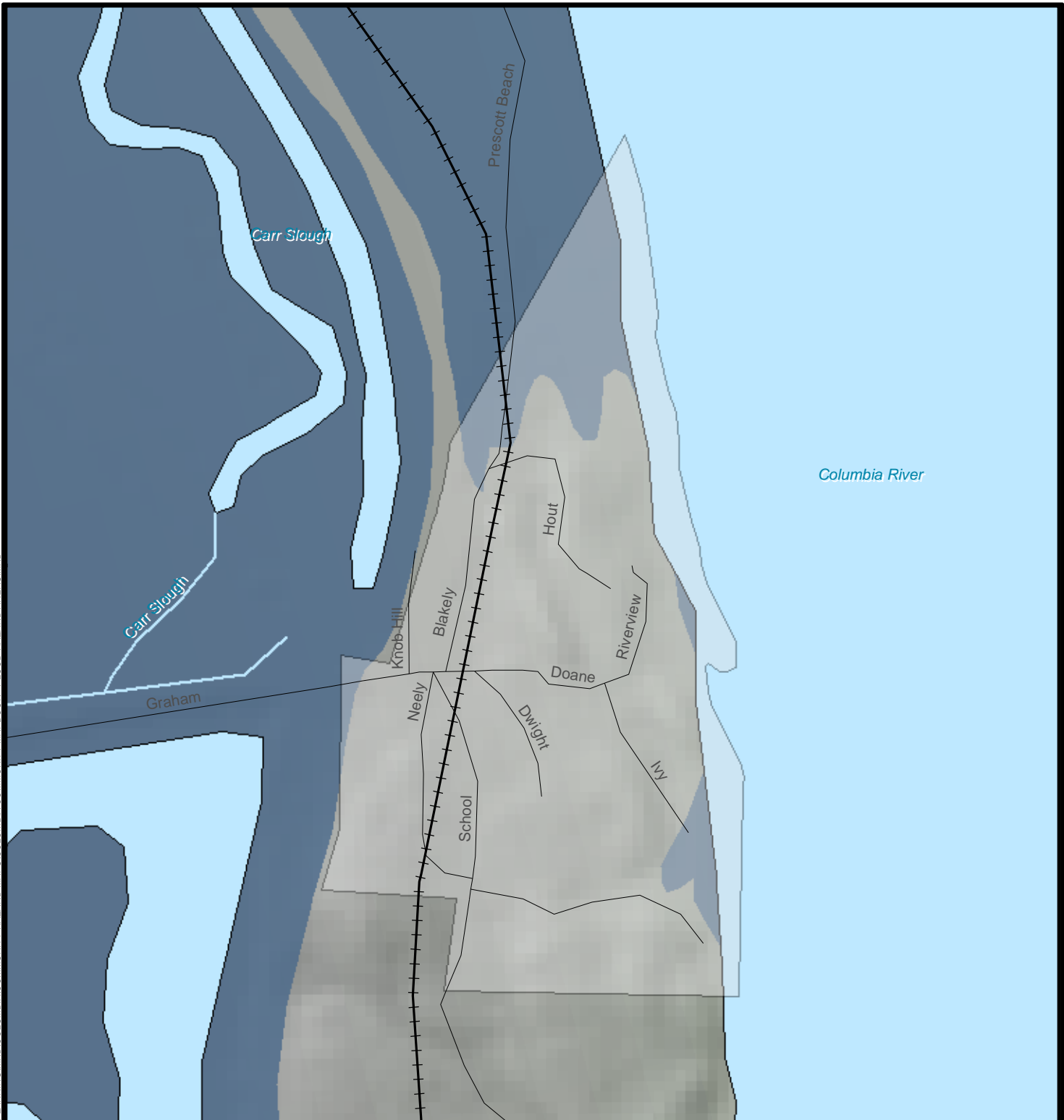
SOURCES: Flood (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

**LEGEND**

- FEMA Flood Zones**
-  Designated Floodway
  -  100-Year Flood Zone
  -  500-Year Flood Zone
  -  City Limits
  -  Streets & Highways
  -  Railroads
  -  Lakes & Waterbodies
  -  Streams & Waterways

**FIG. NO:**  
I-3C

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OVERVIEW MAP



**CITY OF PRESCOTT**  
**FLOOD HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**

0      0.05      0.1      0.2  
 Miles

Columbia County  
  
 Oregon

LEGEND









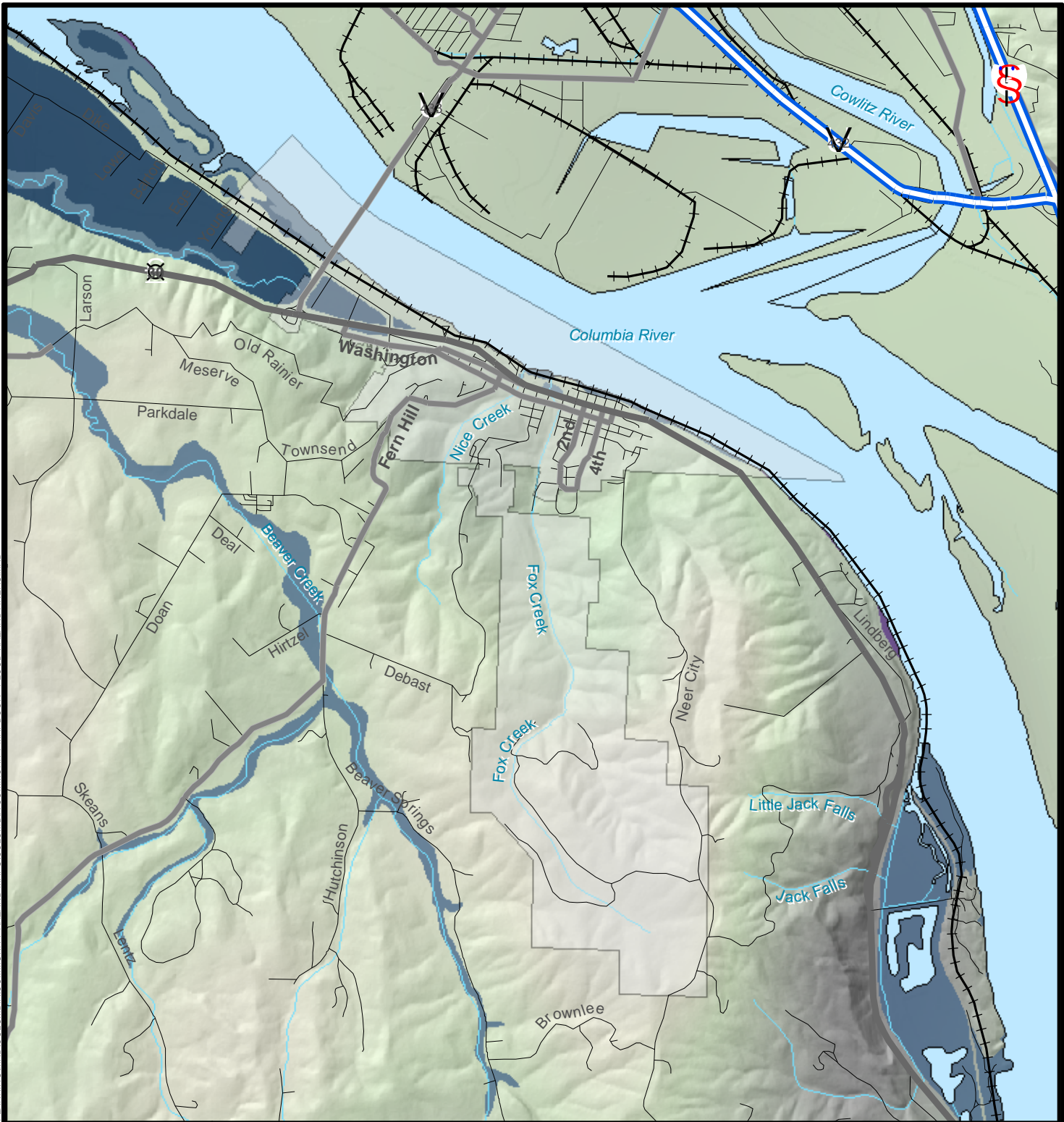
- FEMA Flood Zones
-  Designated Floodway
  -  100-Year Flood Zone
  -  500-Year Flood Zone
  -  City Limits
  -  Streets & Highways
  -  Railroads
  -  Lakes & Waterbodies
  -  Streams & Waterways

FIG. NO:  
I-3D


SOURCES: Flood (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008


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**OVERVIEW MAP**







## CITY OF RAINIER FLOOD HAZARD AREA COLUMBIA COUNTY HAZARD MITIGATION PLAN



Miles

**SOURCES:** Flood (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) **CREATED BY:** TCS, Fall 2008

**FIG. NO:**  
I-3E

**LEGEND**

- FEMA Flood Zones**
- Designated Floodway
  - 100-Year Flood Zone
  - 500-Year Flood Zone
  - City Limits
  - Streets & Highways
  - ++ Railroads
  - Lakes & Waterbodies
  - Streams & Waterways




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OVERVIEW MAP






## CITY OF ST. HELENS

### FLOOD HAZARD AREA

### COLUMBIA COUNTY

### HAZARD MITIGATION PLAN



Columbia County



Oregon

LEGEND

FEMA Flood Zones

- Designated Floodway
- 100-Year Flood Zone
- 500-Year Flood Zone
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

SOURCES: Flood (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-3F

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**OVERVIEW MAP**



**CITY OF SCAPPOOSE  
FLOOD HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



**LEGEND**

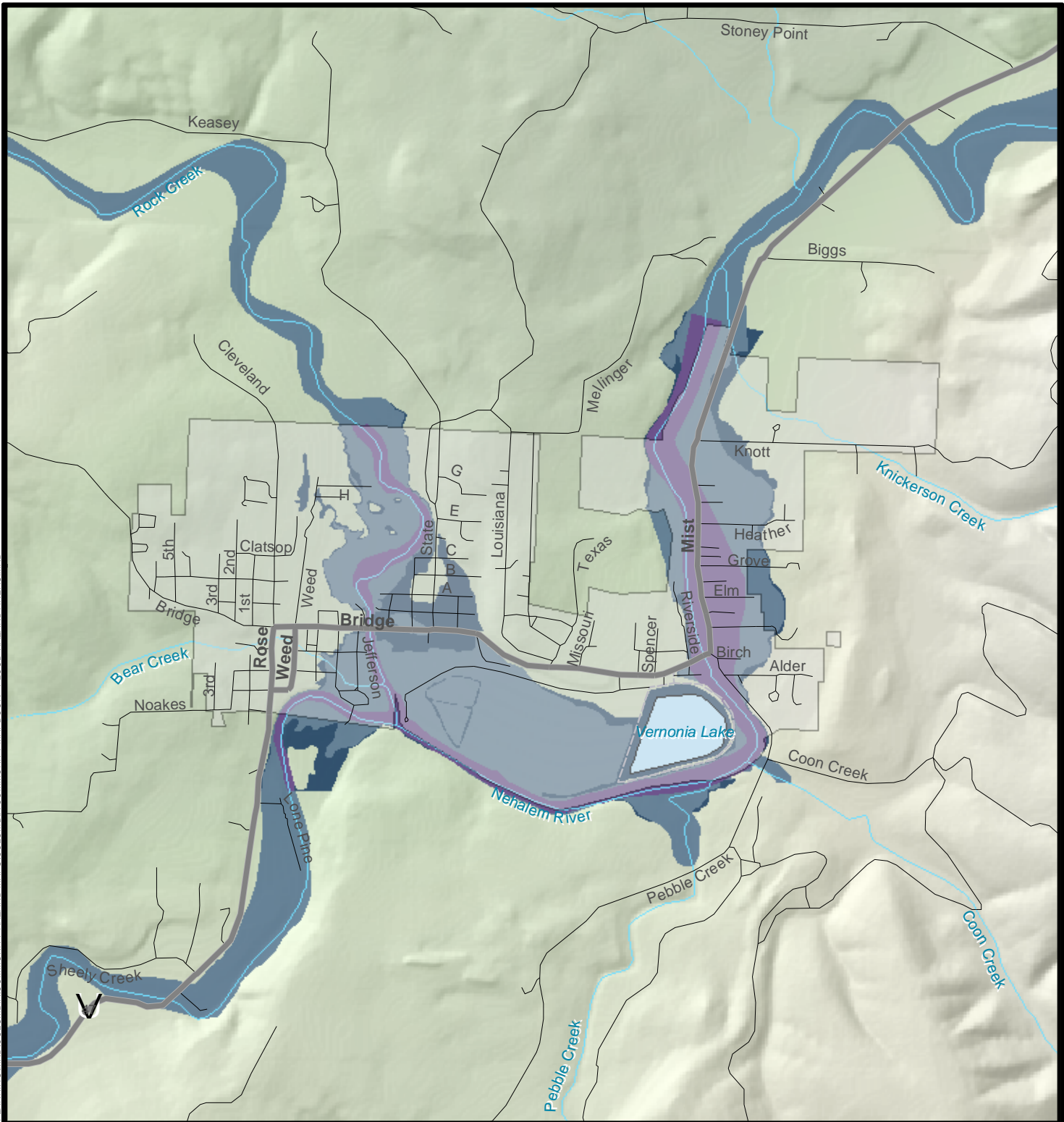
- FEMA Flood Zones**
- Designated Floodway
  - 100-Year Flood Zone
  - 500-Year Flood Zone
  - City Limits
  - Streets & Highways
  - Railroads
  - Lakes & Waterbodies
  - Streams & Waterways

SOURCES: Flood (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-3G



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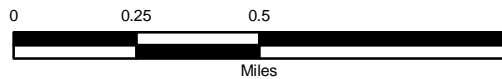


OVERVIEW MAP



**CITY OF VERNONIA**  
**FLOOD HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**

Columbia County




SOURCES: Flood (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

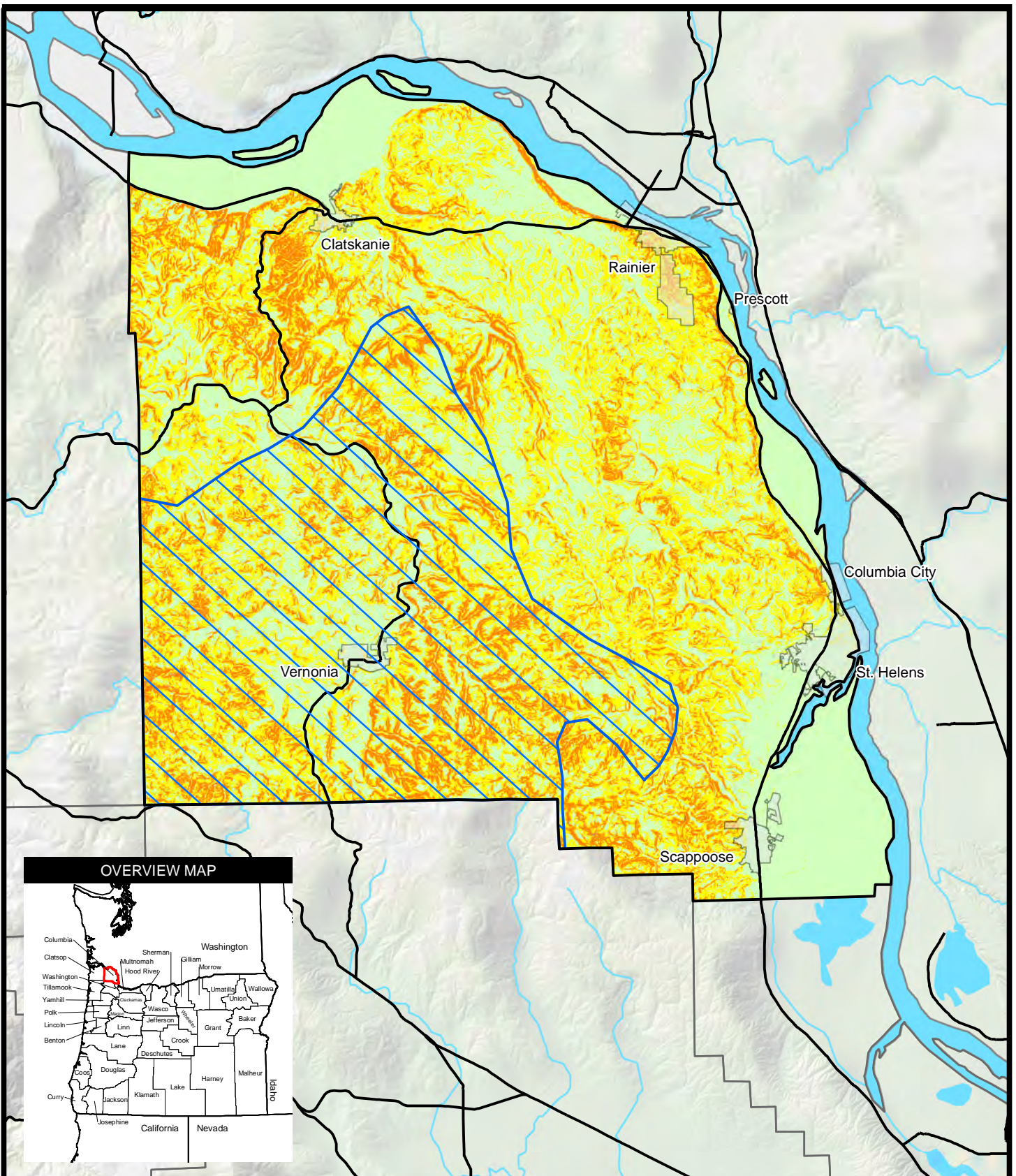
FIG. NO:  
I-3H

LEGEND

FEMA Flood Zones

-  Designated Floodway
-  100-Year Flood Zone
-  500-Year Flood Zone
-  City Limits
-  Streets & Highways
-  Railroads
-  Lakes & Waterbodies
-  Streams & Waterways

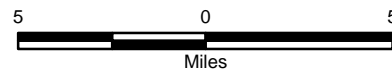




**LEGEND**

- |   |                         |
|---|-------------------------|
| <b>Landslide Incidence and Susceptibility</b> | ▲ City                  |
| ▭ Moderate Potential                          | ▭ City Limits           |
| <b>Slope Inclination Failure Hazard Area</b>  | ▭ County Boundary       |
| ▭ Low (<14 degrees)                           | — Major Road or Highway |
| ▭ Moderate (14-32 degrees)                    | ~ Streams & Waterways   |
| ▭ High (>32 degrees)                          | ▭ Lakes & Waterbodies   |

**LANDSLIDE HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

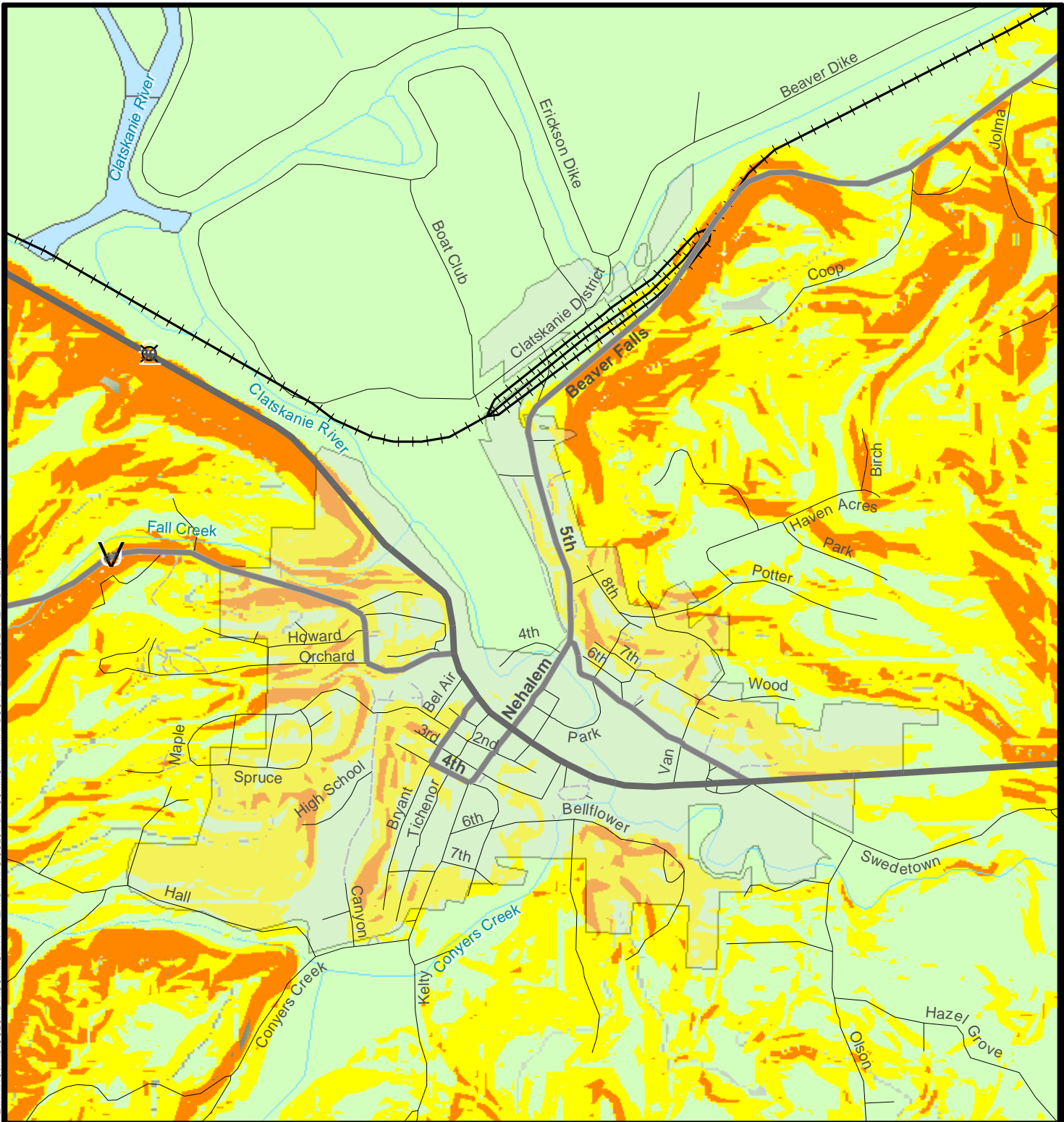


SOURCES: Slope Inclination (FEMA), ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade)  
MAP DATA: July, 2008

FIG. NO:  
I-4



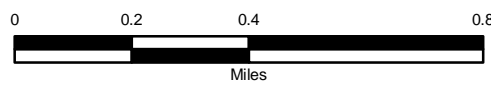
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**OVERVIEW MAP**



**CITY OF CLATSKANIE**  
**LANDSLIDE HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Landslide (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

Columbia County



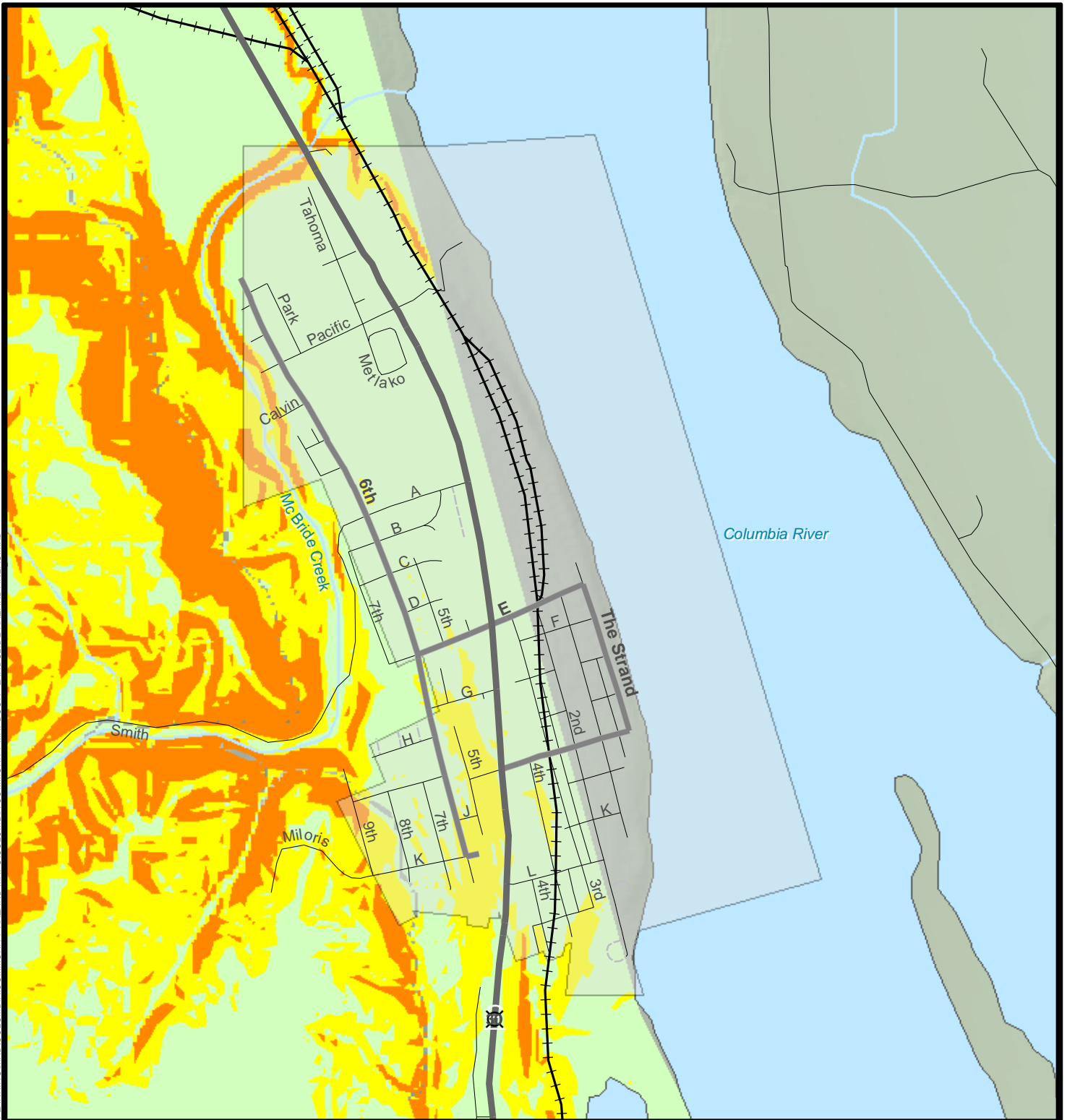
Oregon

**LEGEND**

- Landslide Incidence and Susceptibility**
- Moderate Potential
- Slope Inclination Failure Hazard Area**
- Low (<14 degrees)
  - Moderate (14-32 degrees)
  - High (>32 degrees)
- Other Symbols:**
- City Limits
  - Streets & Highways
  - Railroads
  - Lakes & Waterbodies
  - Streams & Waterways


FIG. NO:  
I-4B

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OVERVIEW MAP







**COLUMBIA CITY**

**LANDSLIDE HAZARD AREA**

**COLUMBIA COUNTY**

**HAZARD MITIGATION PLAN**














Miles

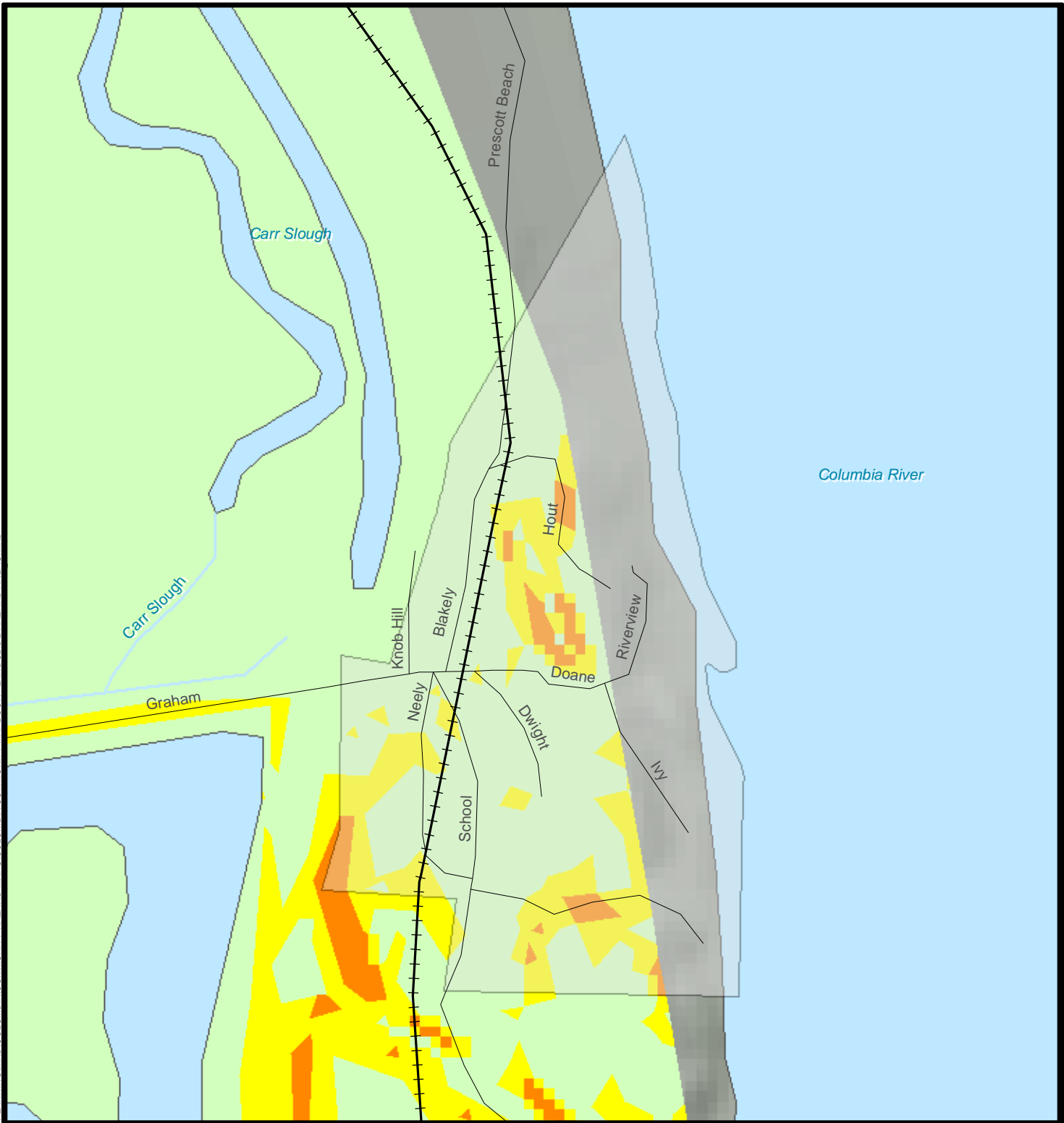
SOURCES: Landslide (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-4C

LEGEND

- Landslide Incidence and Susceptibility**
-  Moderate Potential
- Slope Inclination Failure Hazard Area**
-  Low (<14 degrees)
  -  Moderate (14-32 degrees)
  -  High (>32 degrees)
-  City Limits
  -  Streets & Highways
  -  Railroads
  -  Lakes & Waterbodies
  -  Streams & Waterways

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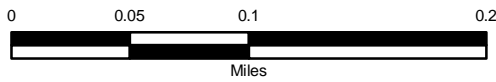


**OVERVIEW MAP**



**CITY OF PRESCOTT**










**LANDSLIDE HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: Landslide (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-4D

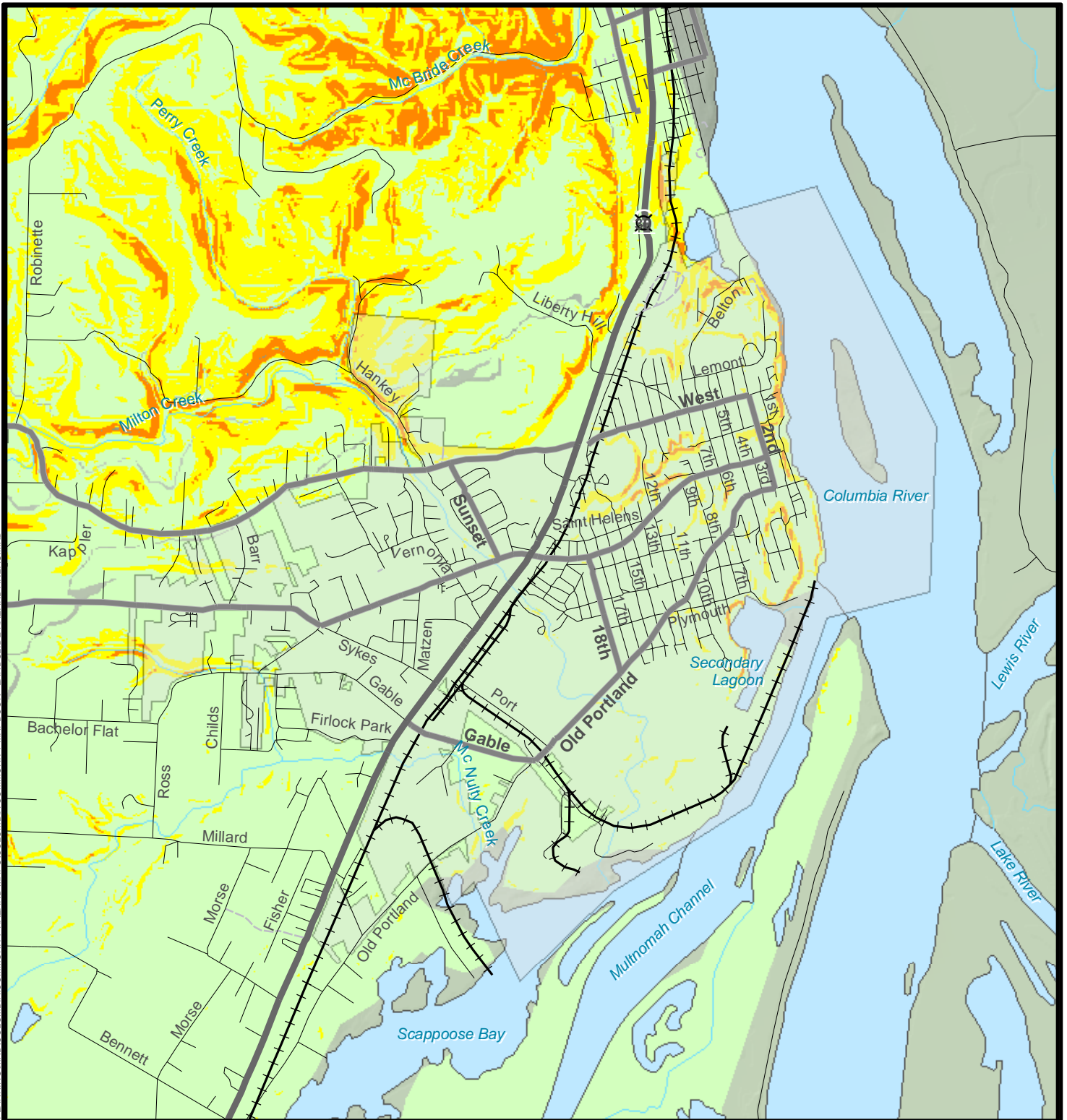
**LEGEND**

-  Moderate Potential
- Slope Inclination Failure Hazard Area**
-  Low (<14 degrees)
-  Moderate (14-32 degrees)
-  High (>32 degrees)
-  City Limits
-  Streets & Highways
-  Railroads
-  Lakes & Waterbodies
-  Streams & Waterways





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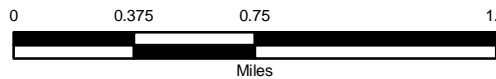


OVERVIEW MAP



**CITY OF ST. HELENS**  
**LANDSLIDE HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**

Columbia County



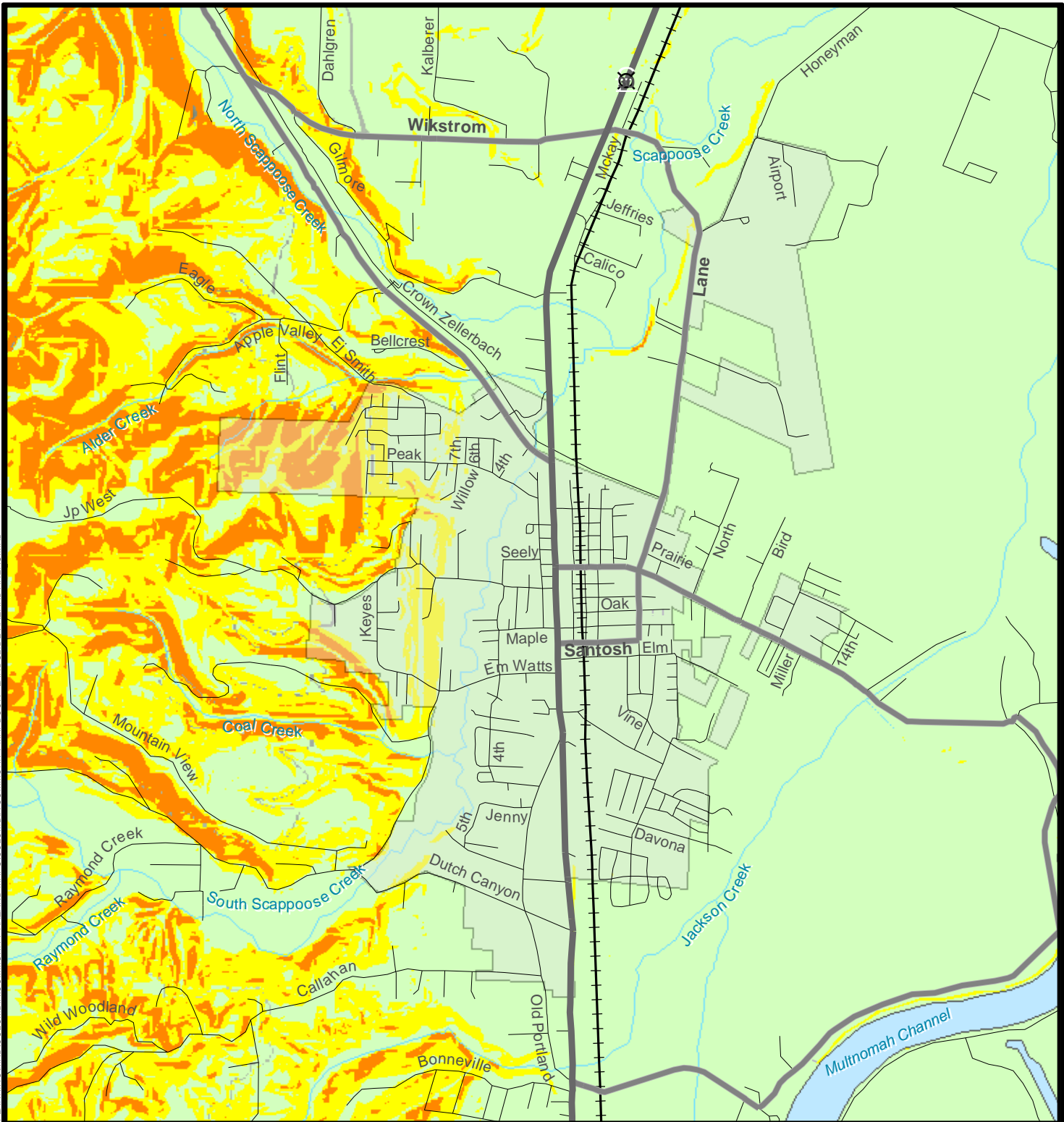
SOURCES: Landslide (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-4F

LEGEND

- Moderate Potential
- Slope Inclination Failure Hazard Area**
- Low (<14 degrees)
- Moderate (14-32 degrees)
- High (>32 degrees)
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

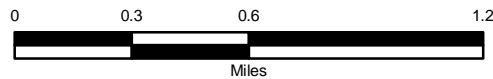
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**OVERVIEW MAP**



**CITY OF SCAPPOOSE**  
**LANDSLIDE HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Landslide (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

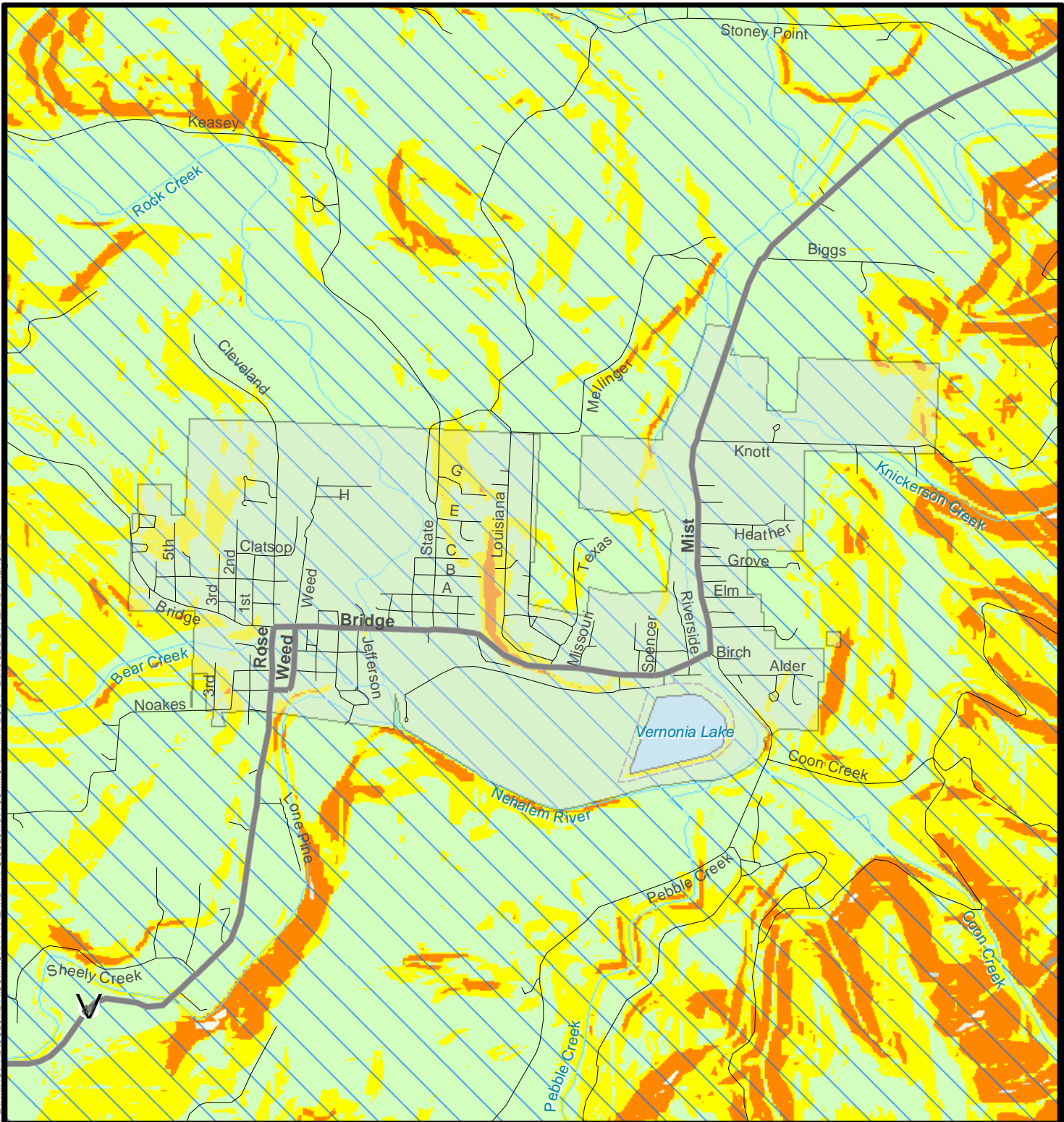
FIG. NO:  
I-4G

**LEGEND**

- Moderate Potential
- Slope Inclination Failure Hazard Area**
- Low (<14 degrees)
- Moderate (14-32 degrees)
- High (>32 degrees)
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways



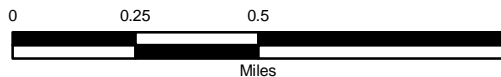
M:\PROJECTS\2008\153.000\2933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - LANDSLIDE HAZARD AREAS.MXD



**OVERVIEW MAP**



**CITY OF VERNONIA**  
**LANDSLIDE HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Landslide (FEMA), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

Columbia County



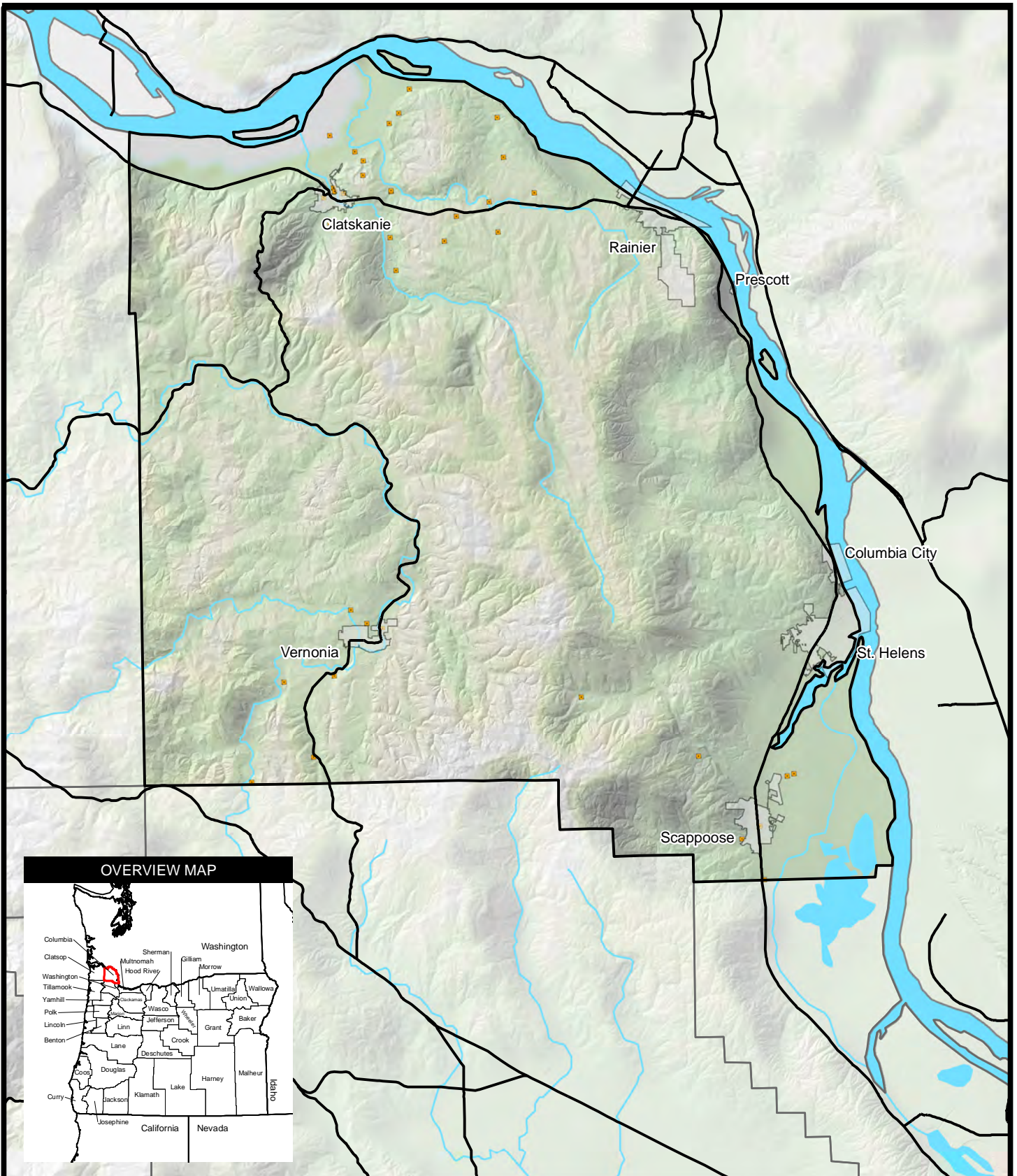
Oregon

**LEGEND**

- Moderate Potential
- Slope Inclination Failure Hazard Area**
- Low (<14 degrees)
- Moderate (14-32 degrees)
- High (>32 degrees)
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

FIG. NO:  
I-4H

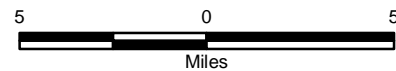




**LEGEND**

- Local Reported Fires (1996-2003)
- ▲ City
- ▭ City Limits
- ▭ County Boundary
- Major Road or Highway
- ~ Streams & Waterways
- ☪ Lakes & Waterbodies

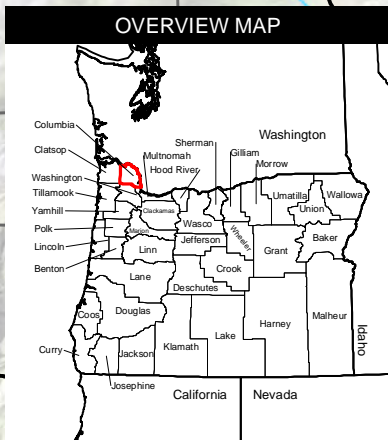
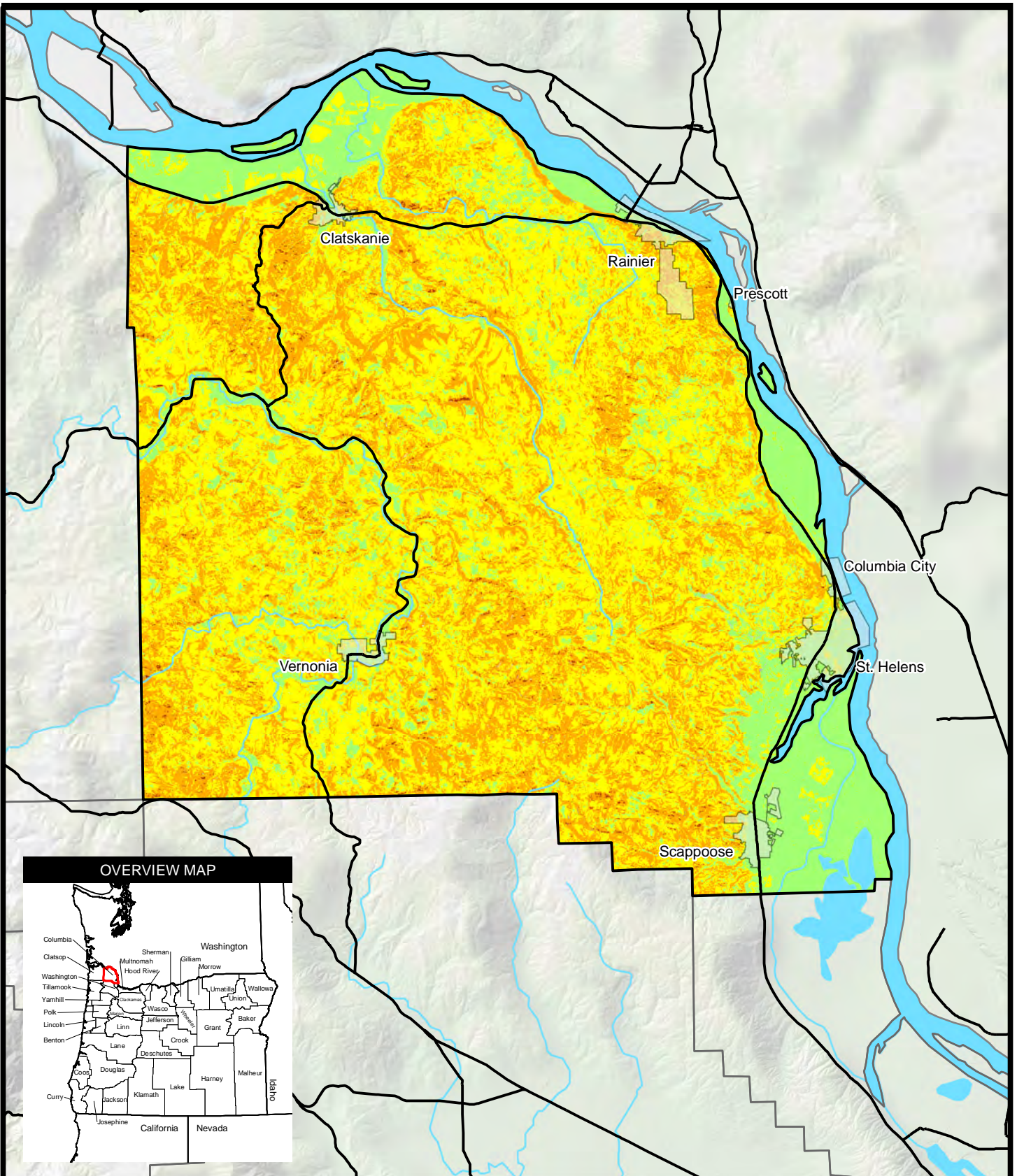
**HISTORIC FIRES  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: Fire (Oregon), ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

FIG. NO:  
I-5

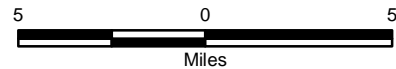




**LEGEND**

- |                           |                                |
|---------------------------|--------------------------------|
| <b>Wildland Fire Risk</b> | <b>City</b>                    |
| <b>Moderate</b>           | <b>City Limits</b>             |
| <b>High</b>               | <b>County Boundary</b>         |
| <b>Very High</b>          | <b>Major Road or Highway</b>   |
| <b>Extreme</b>            | <b>Lakes &amp; Waterbodies</b> |
|                           | <b>Streams &amp; Waterways</b> |

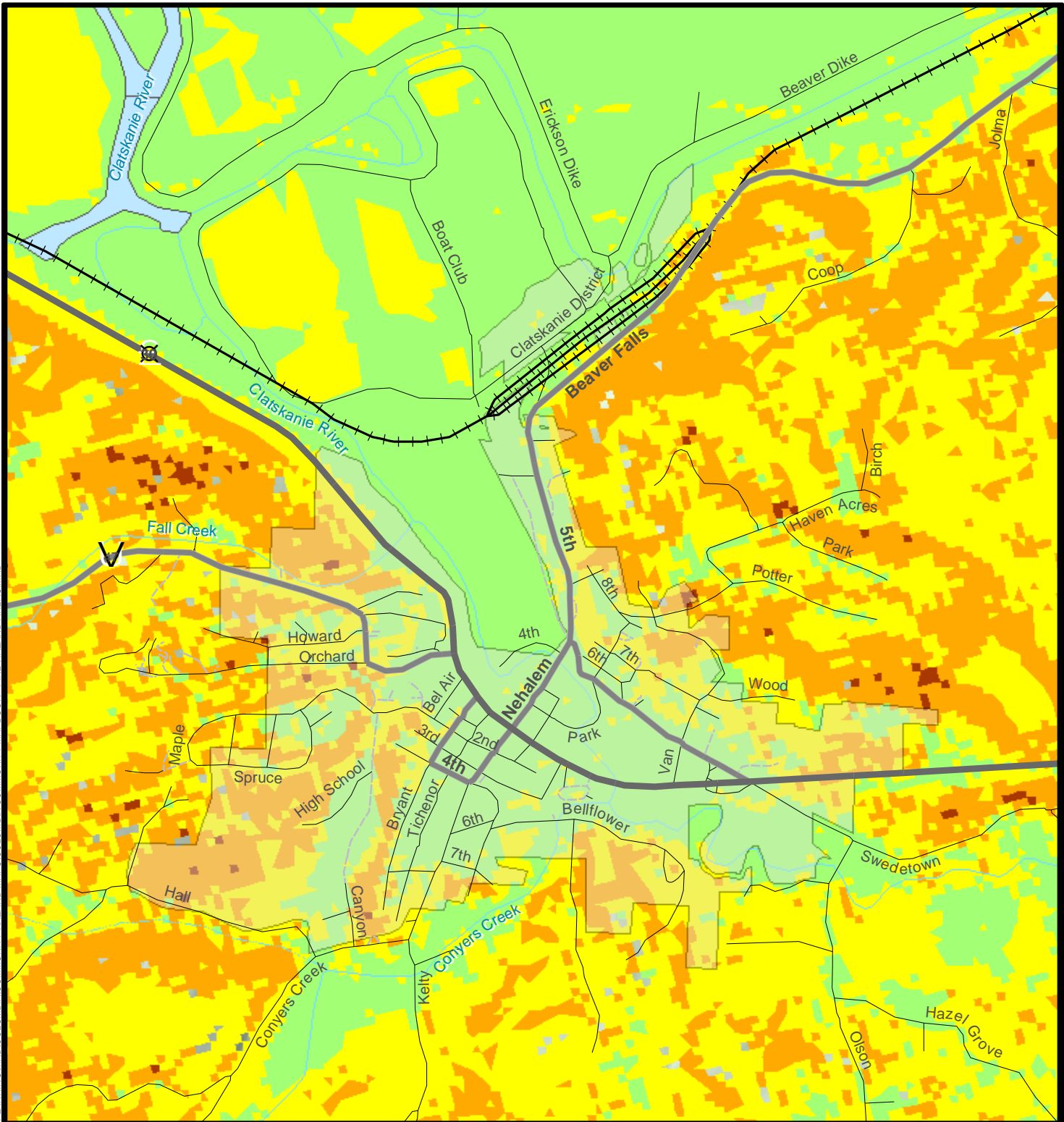
**FIRE HAZARDS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: ESRI (highways 1996), USGS (wildland fire, counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

FIG. NO:  
I-6

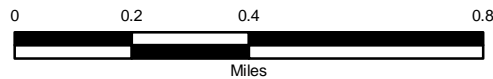
M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\MD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY HAZARD MAPBOOK - FIRE HAZARD AREAS.MXD



**OVERVIEW MAP**



**CITY OF CLATSKANIE**  
**FIRE HAZARD AREAS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Roads (ESRI), Wildland Fire, Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-6B

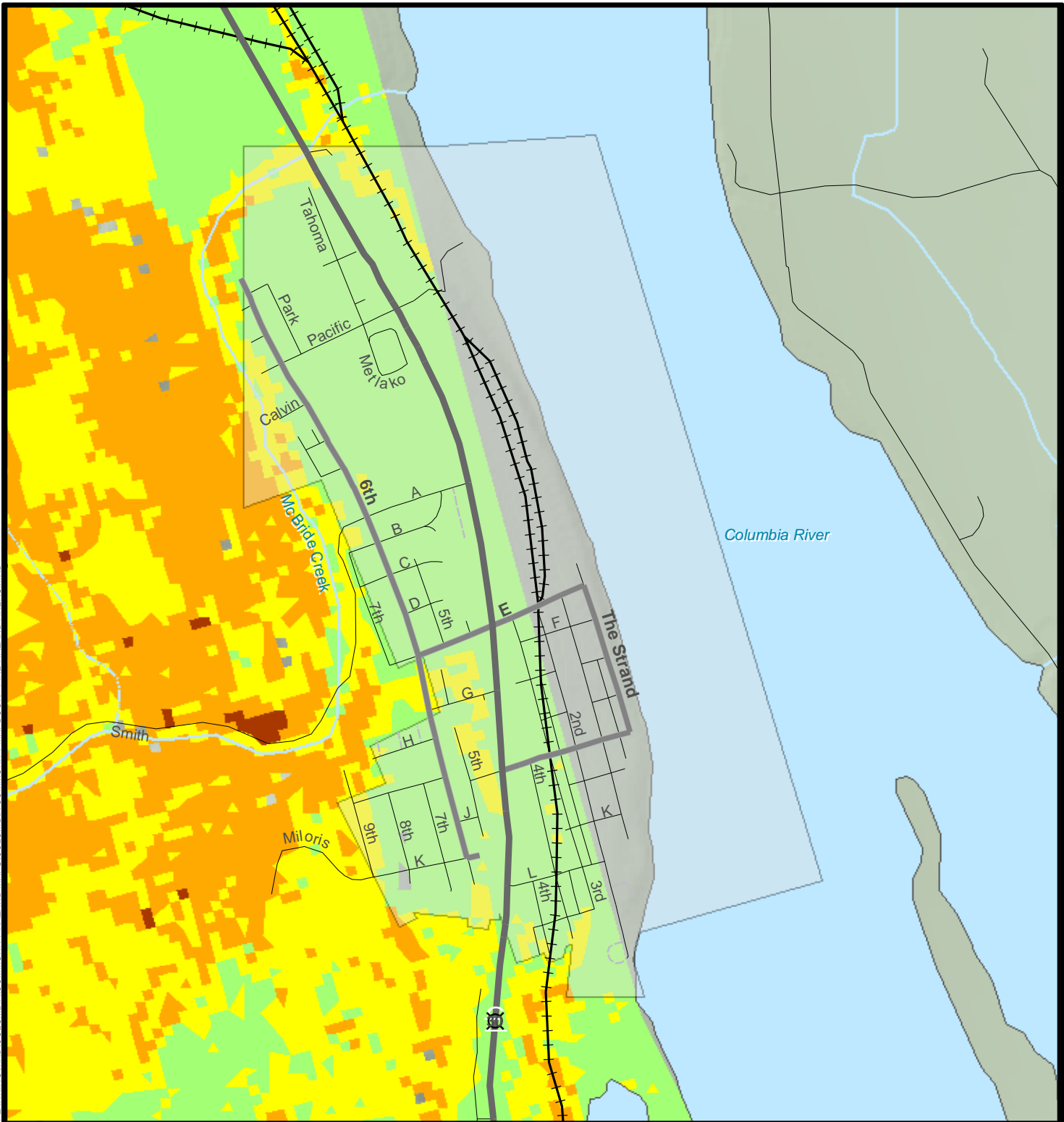
**LEGEND**

**Wildland Fire Risk**

- Moderate
- High
- Very High
- Extreme
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways



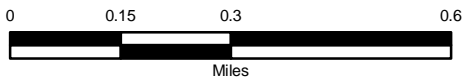
M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\MXD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - FIRE HAZARD AREAS.MXD



OVERVIEW MAP



**COLUMBIA CITY**  
**FIRE HAZARD AREAS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Roads (ESRI), Wildland Fire, Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

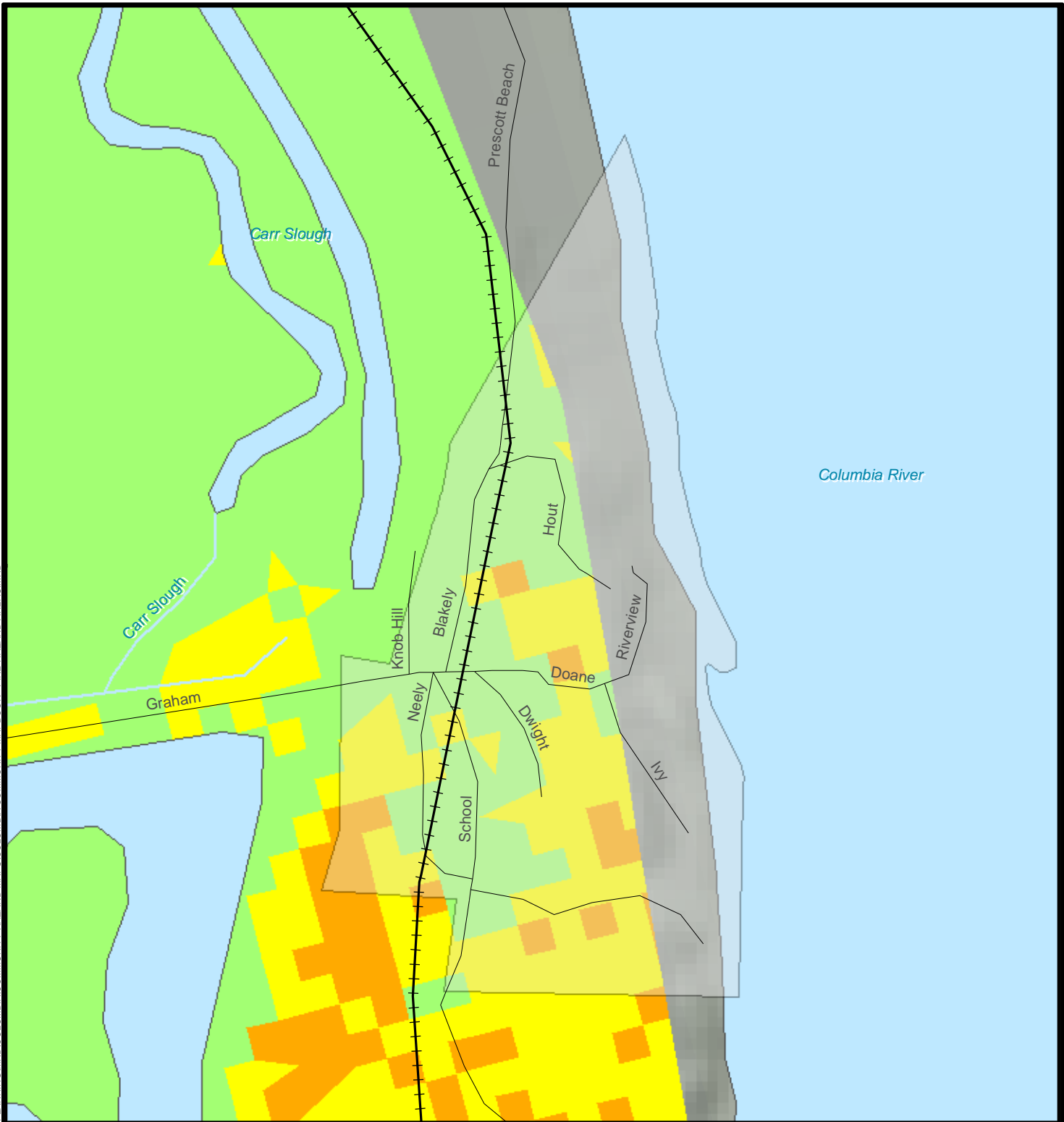
FIG. NO:  
I-6C

LEGEND

Wildland Fire Risk

- Moderate
- High
- Very High
- Extreme
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

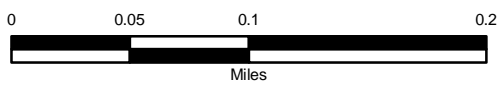
M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\MD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - FIRE HAZARD AREAS.MXD



OVERVIEW MAP



**CITY OF PRESCOTT**  
**FIRE HAZARD AREAS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



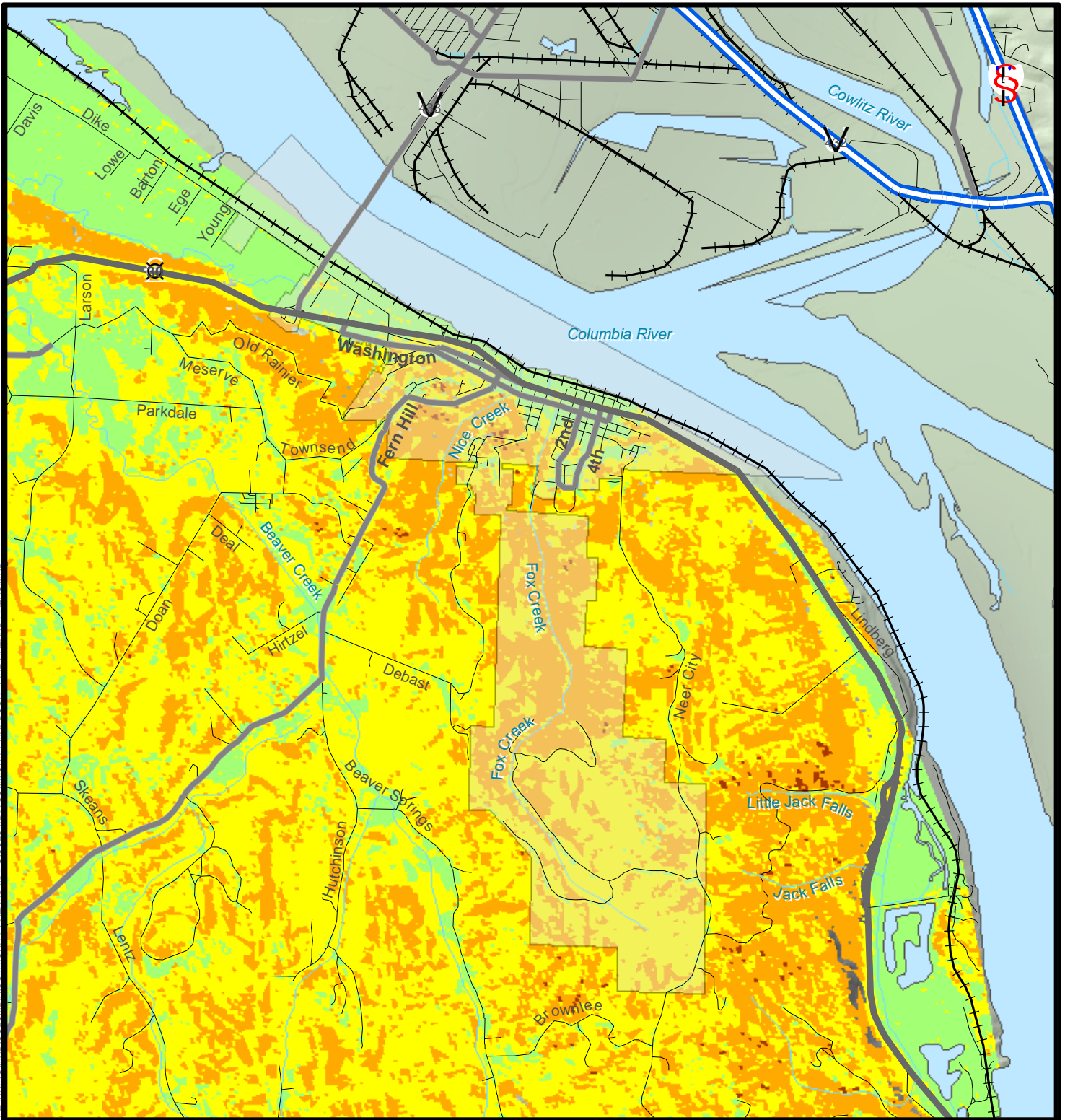
SOURCES: Roads (ESRI), Wildland Fire, Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-6D

LEGEND

- Wildland Fire Risk**
- Moderate
  - High
  - Very High
  - Extreme
  - City Limits
  - Streets & Highways
  - Railroads
  - Lakes & Waterbodies
  - Streams & Waterways

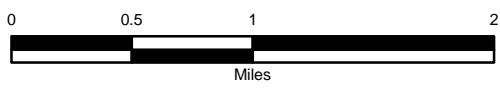
M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\MD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - FIRE HAZARD AREAS.MXD



OVERVIEW MAP



**CITY OF RAINIER**  
**FIRE HAZARD AREAS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



LEGEND

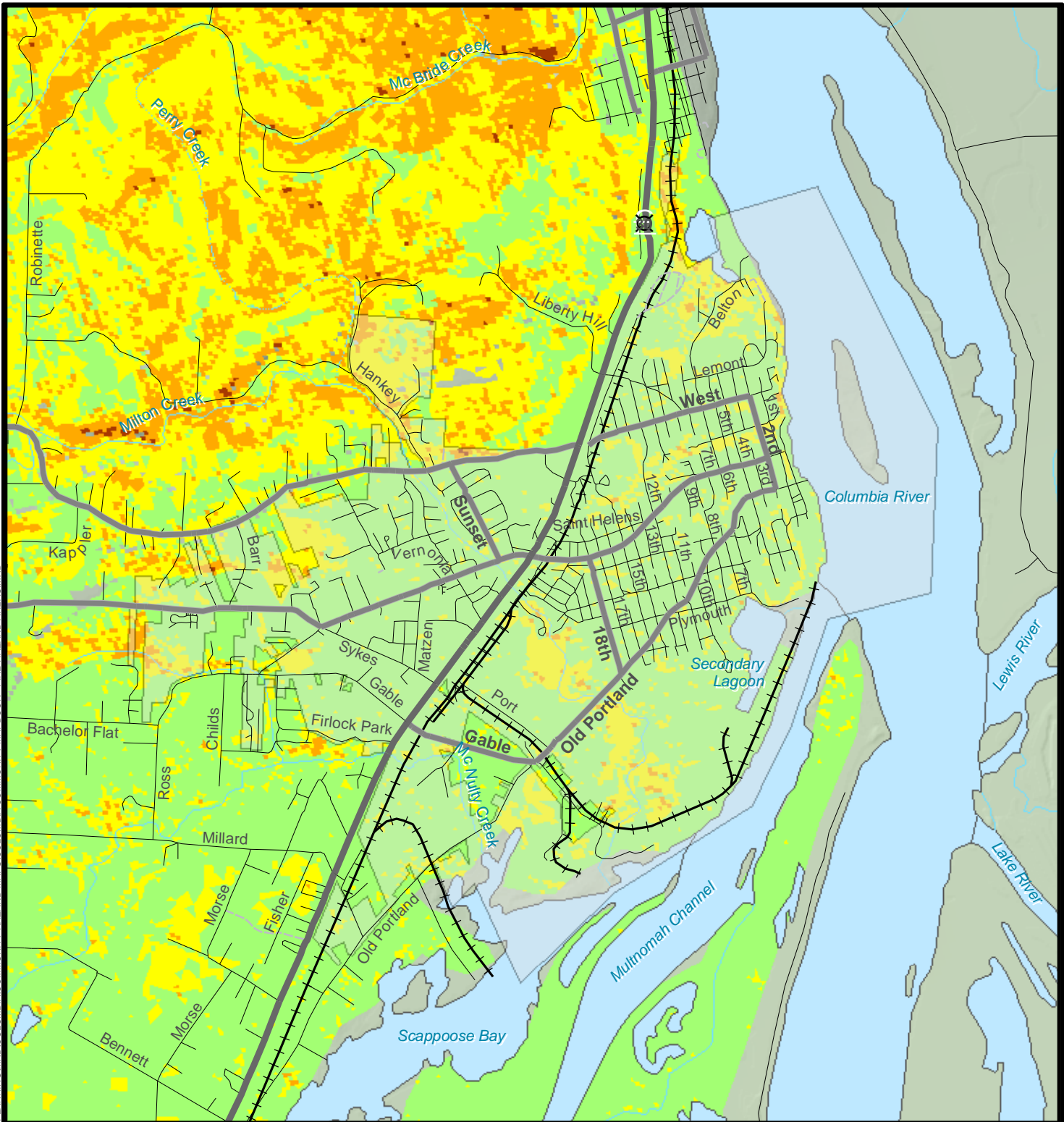
Wildland Fire Risk

- Moderate
- High
- Very High
- Extreme
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

SOURCES: Roads (ESRI), Wildland Fire, Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-6E

M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - FIRE HAZARD AREAS.MXD

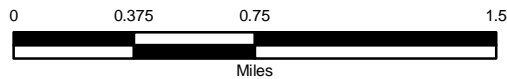


OVERVIEW MAP



**CITY OF ST. HELENS**  
**FIRE HAZARD AREAS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**

Columbia County



LEGEND

Wildland Fire Risk

- Moderate
- High
- Very High
- Extreme

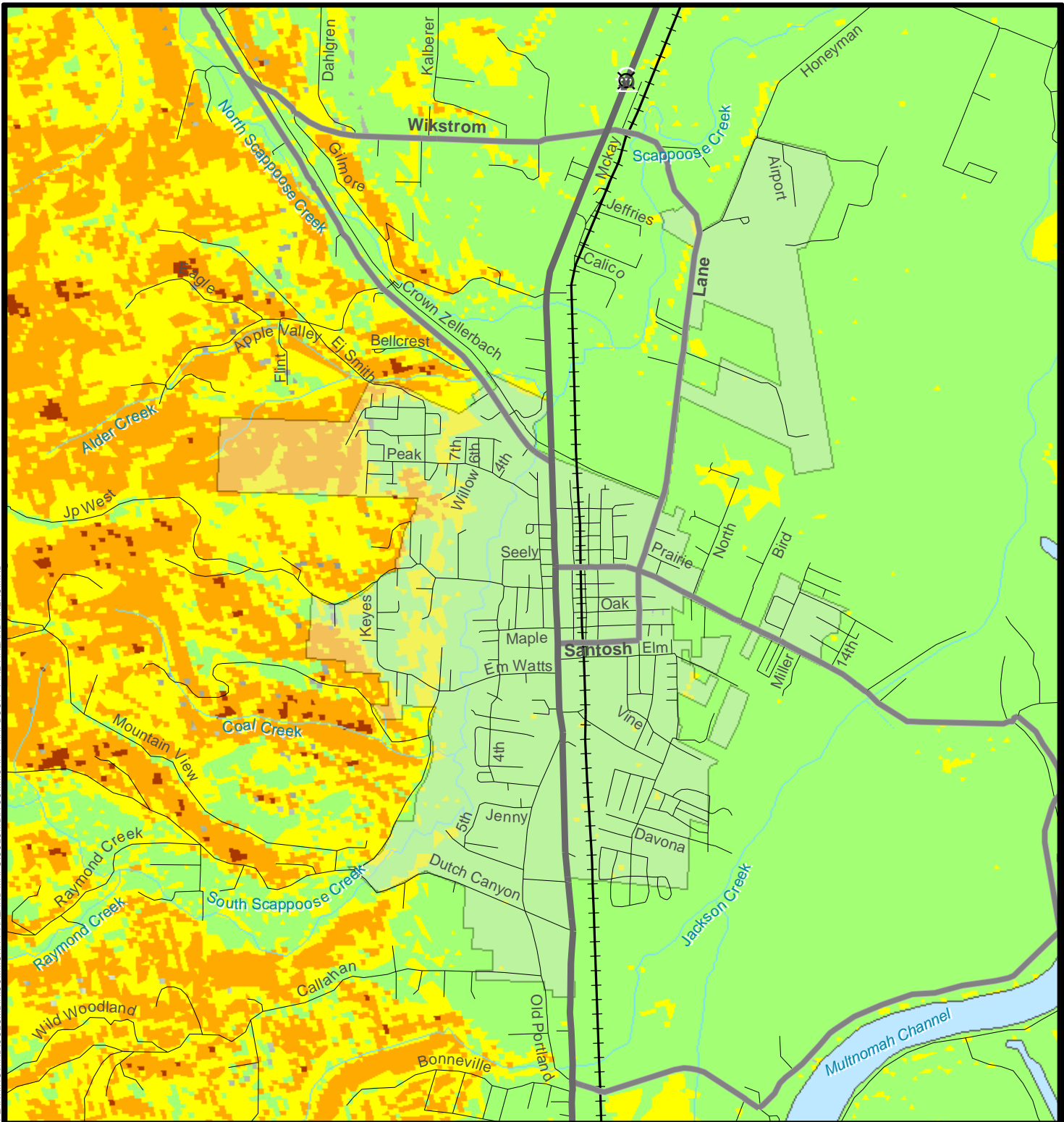
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

SOURCES: Roads (ESRI), Wildland Fire, Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-6F



M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - FIRE HAZARD AREAS.MXD



OVERVIEW MAP



**CITY OF SCAPPOOSE**  
**FIRE HAZARD AREAS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Roads (ESRI), Wildland Fire, Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-6G

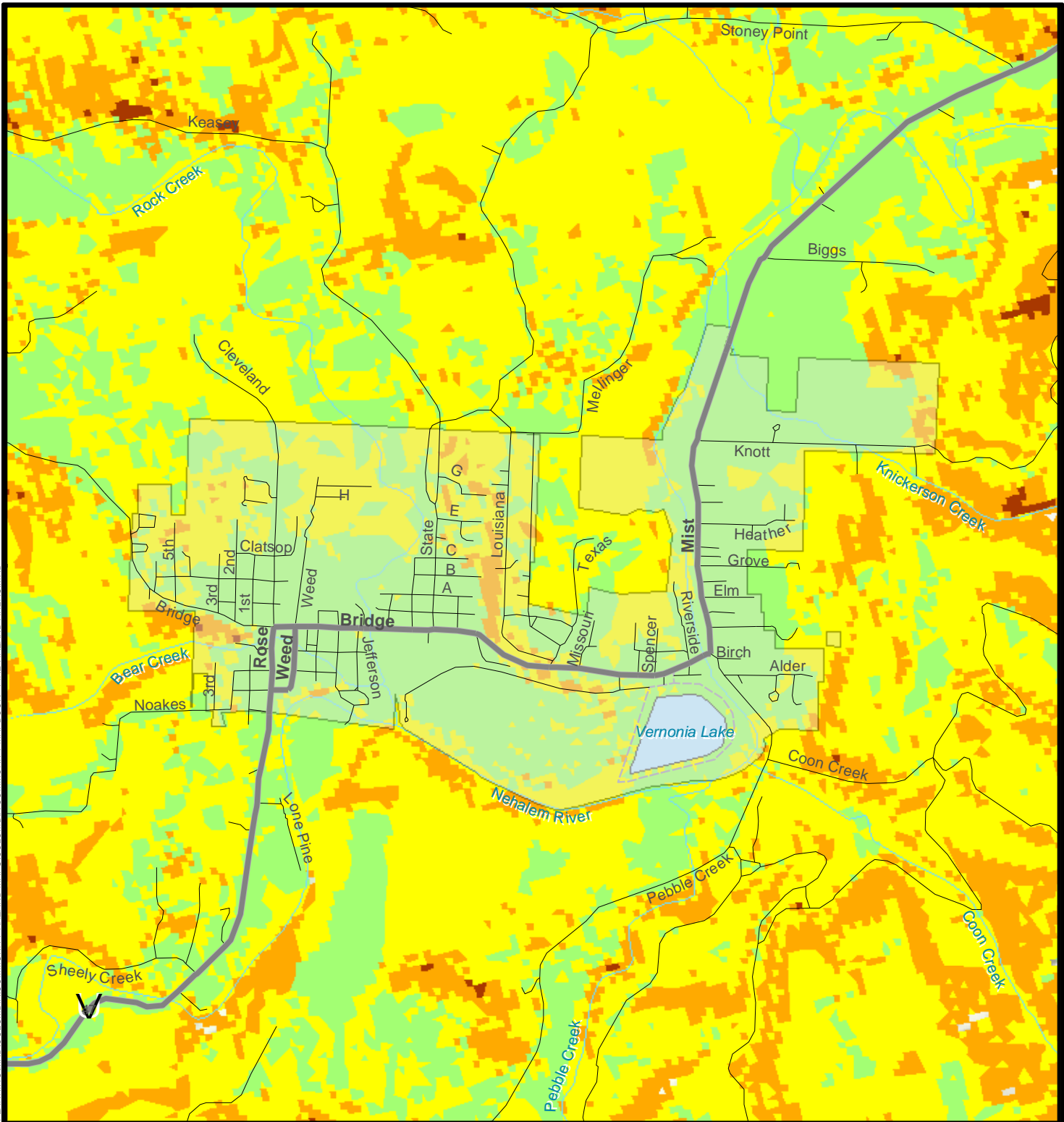
LEGEND

Wildland Fire Risk

- Moderate
- High
- Very High
- Extreme
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways



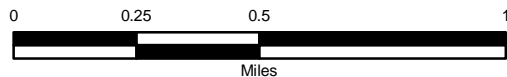
M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - FIRE HAZARD AREAS.MXD



OVERVIEW MAP



**CITY OF VERNONIA**  
**FIRE HAZARD AREAS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



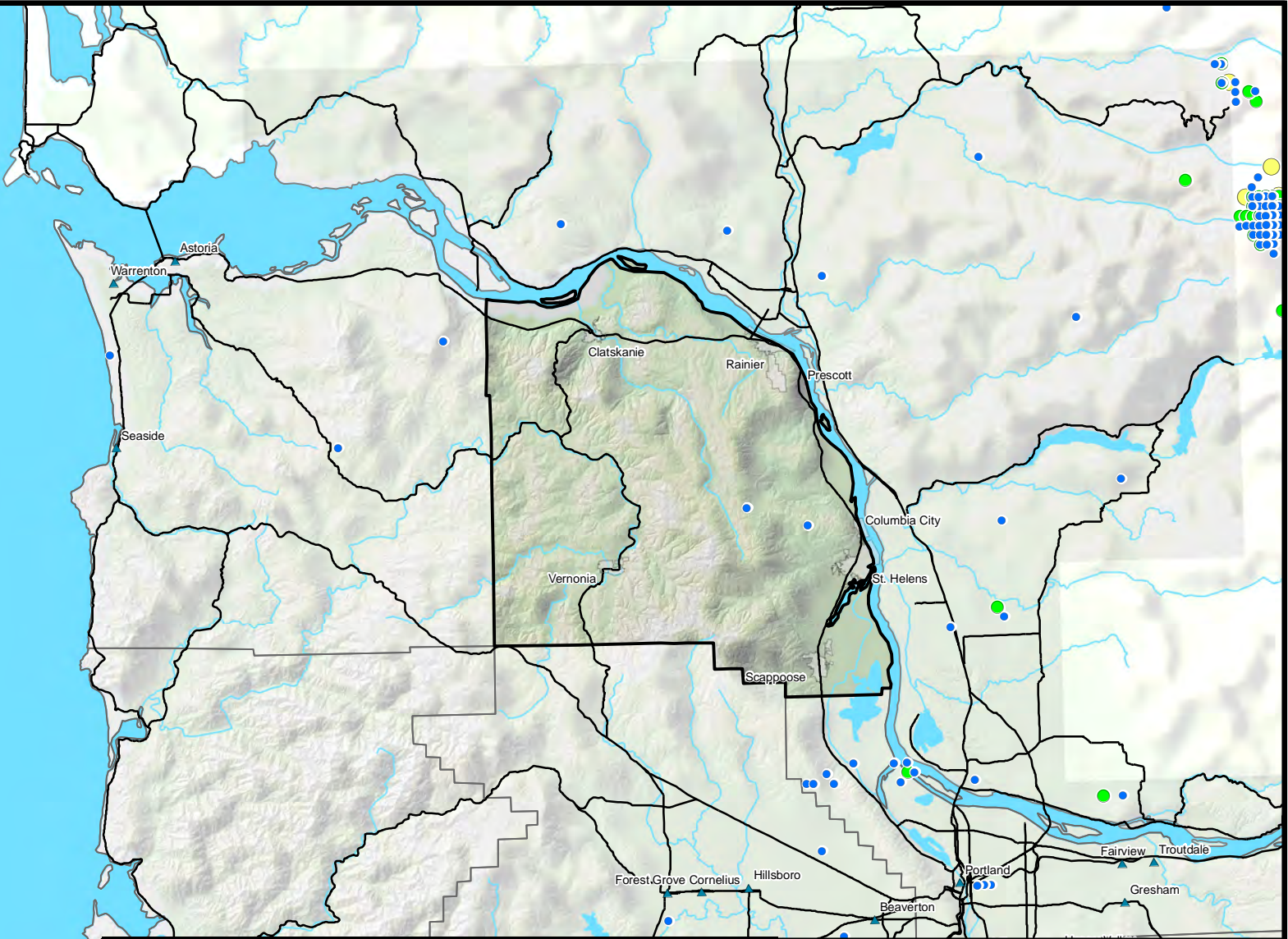
SOURCES: Roads (ESRI), Wildland Fire, Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-6H

LEGEND

Wildland Fire Risk

- Moderate
- High
- Very High
- Extreme
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways



**LEGEND**

● <b>Earthquake Magnitude (M)</b>	▲ <b>City</b>
● <b>M &lt; 3.9</b>	□ <b>County Boundary</b>
● <b>M 4.0-4.9</b>	— <b>Major Road or Highway</b>
● <b>M &gt; 4.9</b>	▭ <b>City Limits</b>
	— <b>Streams &amp; Waterways</b>
	■ <b>Lakes &amp; Waterbodies</b>

**HISTORIC EARTHQUAKES 1840-2007  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

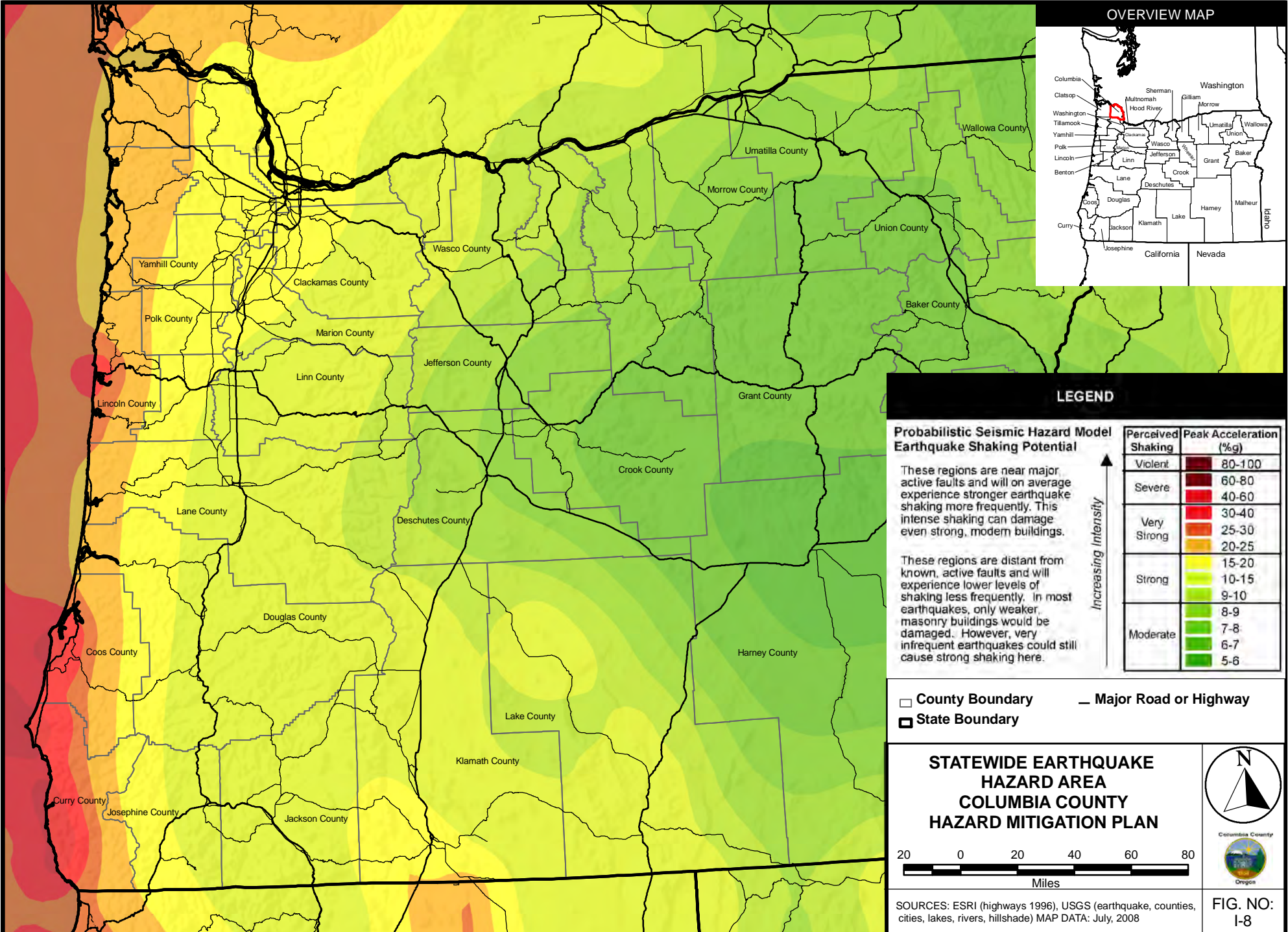
5 0 5 10 15  
Miles



SOURCES: ESRI (highways 1996), USGS (earthquake, counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:**  
I-7





**OVERVIEW MAP**



**LEGEND**

**Probabilistic Seismic Hazard Model  
Earthquake Shaking Potential**

These regions are near major active faults and will on average experience stronger earthquake shaking more frequently. This intense shaking can damage even strong, modern buildings.

These regions are distant from known, active faults and will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking here.

Increasing Intensity ↑

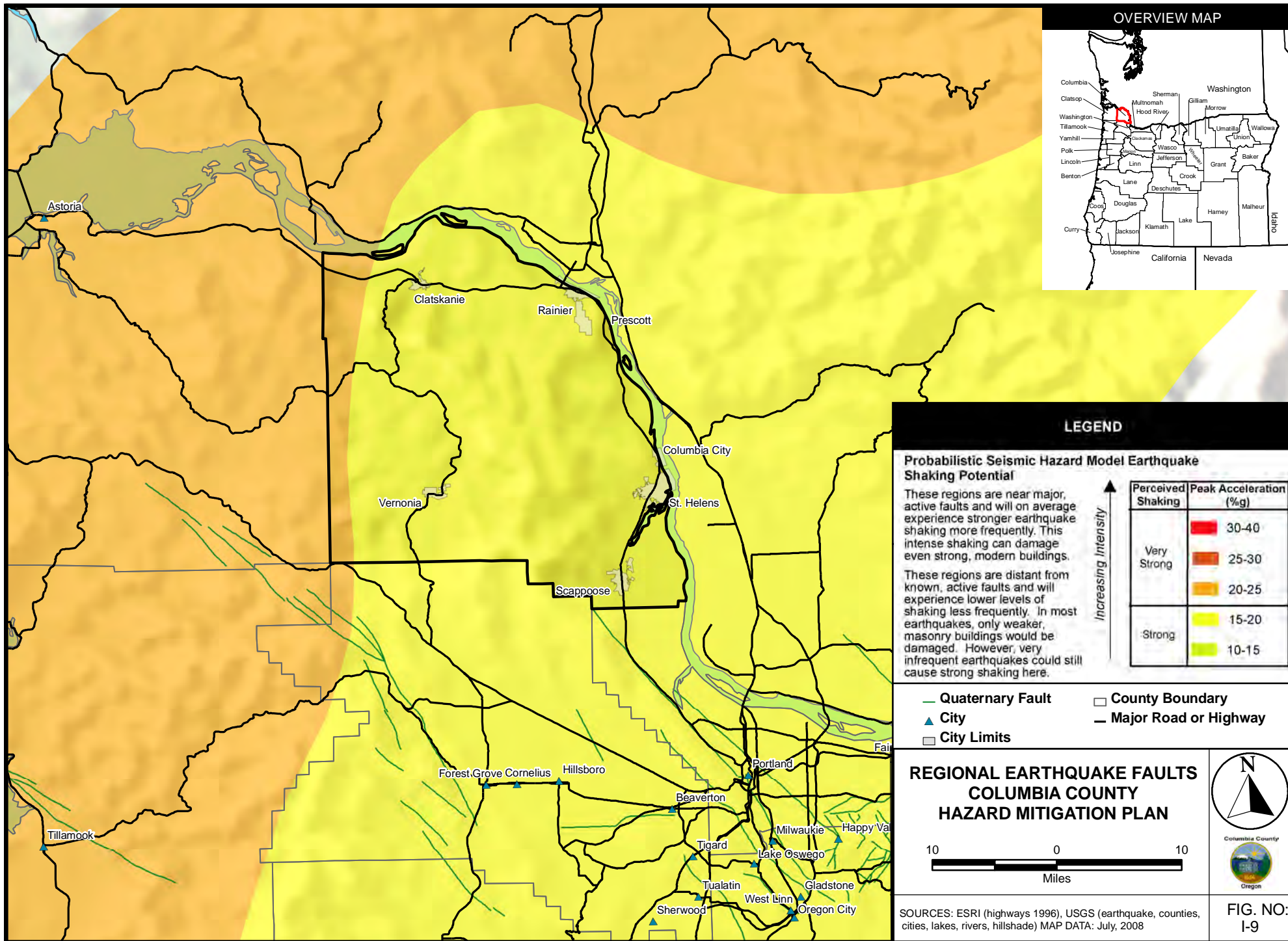
Perceived Shaking	Peak Acceleration (%g)
Violent	80-100
Severe	60-80
Very Strong	40-60
	30-40
Strong	25-30
	20-25
Moderate	15-20
	10-15
	9-10
	8-9
Moderate	7-8
	6-7
	5-6

- County Boundary
- ▬ Major Road or Highway
- ▭ State Boundary

**STATEWIDE EARTHQUAKE HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

Miles

Columbia County  
Oregon



OVERVIEW MAP



LEGEND

Probabilistic Seismic Hazard Model Earthquake Shaking Potential

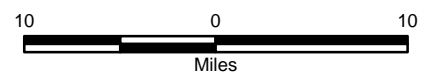
These regions are near major, active faults and will on average experience stronger earthquake shaking more frequently. This intense shaking can damage even strong, modern buildings.

These regions are distant from known, active faults and will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking here.

Perceived Shaking	Peak Acceleration (%g)
Strong	25-30
	10-15

- Quaternary Fault
- ▲ City
- City Limits
- County Boundary
- Major Road or Highway

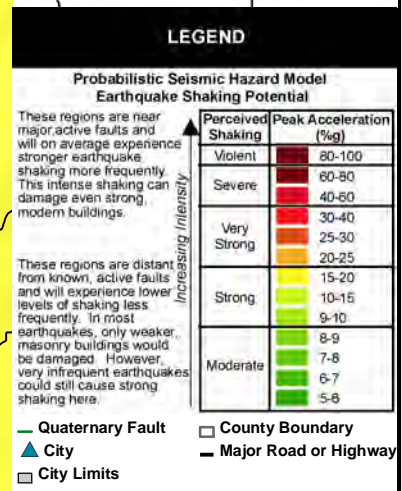
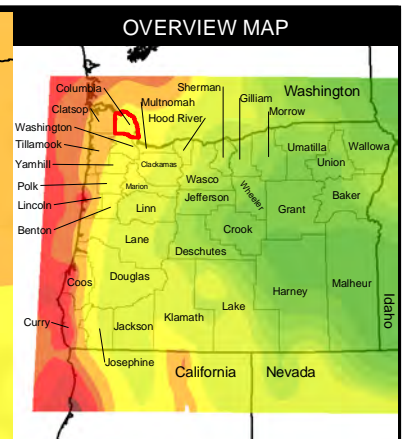
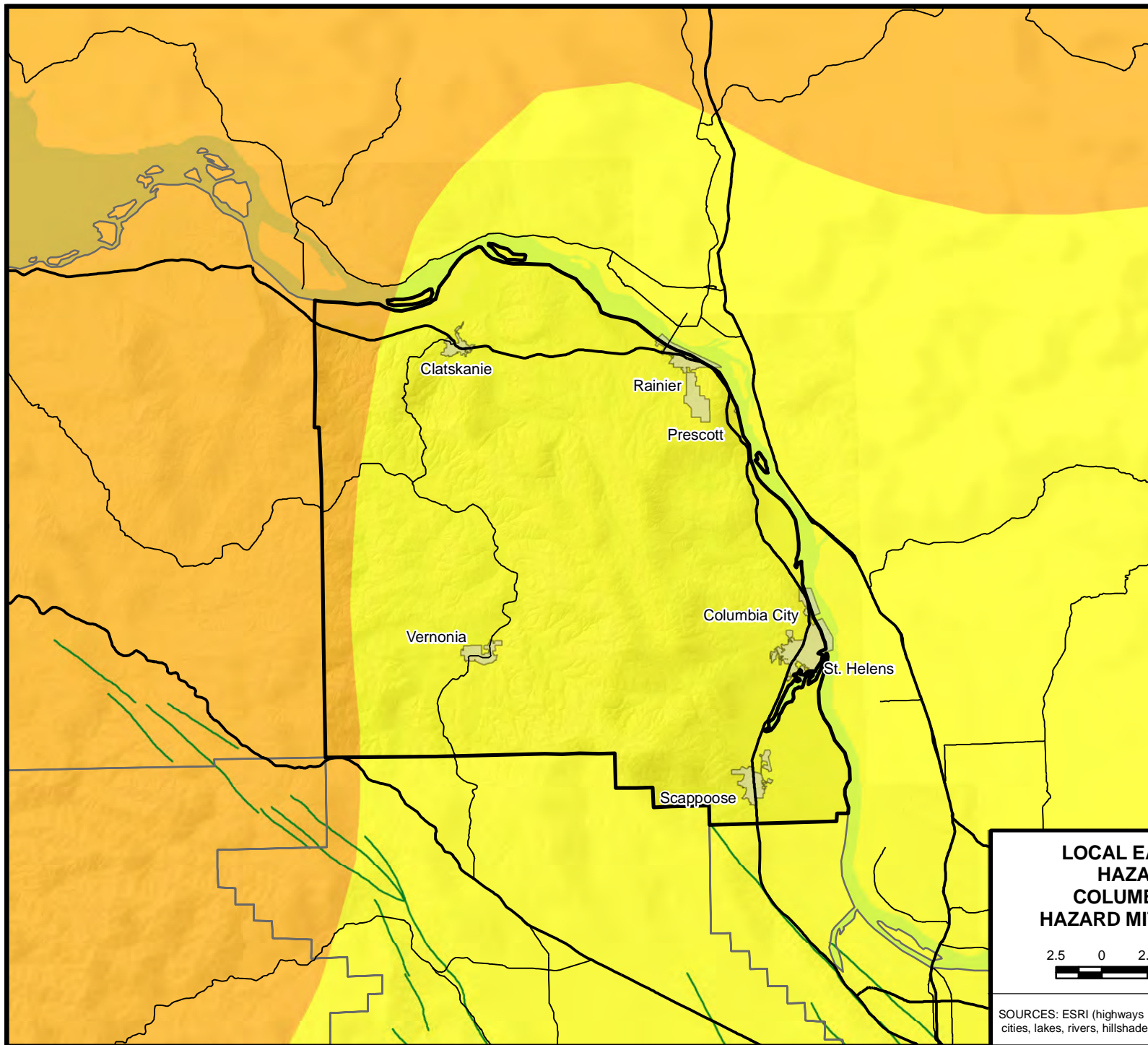
REGIONAL EARTHQUAKE FAULTS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN



SOURCES: ESRI (highways 1996), USGS (earthquake, counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

FIG. NO:  
I-9





## LOCAL EARTHQUAKE HAZARD AREA

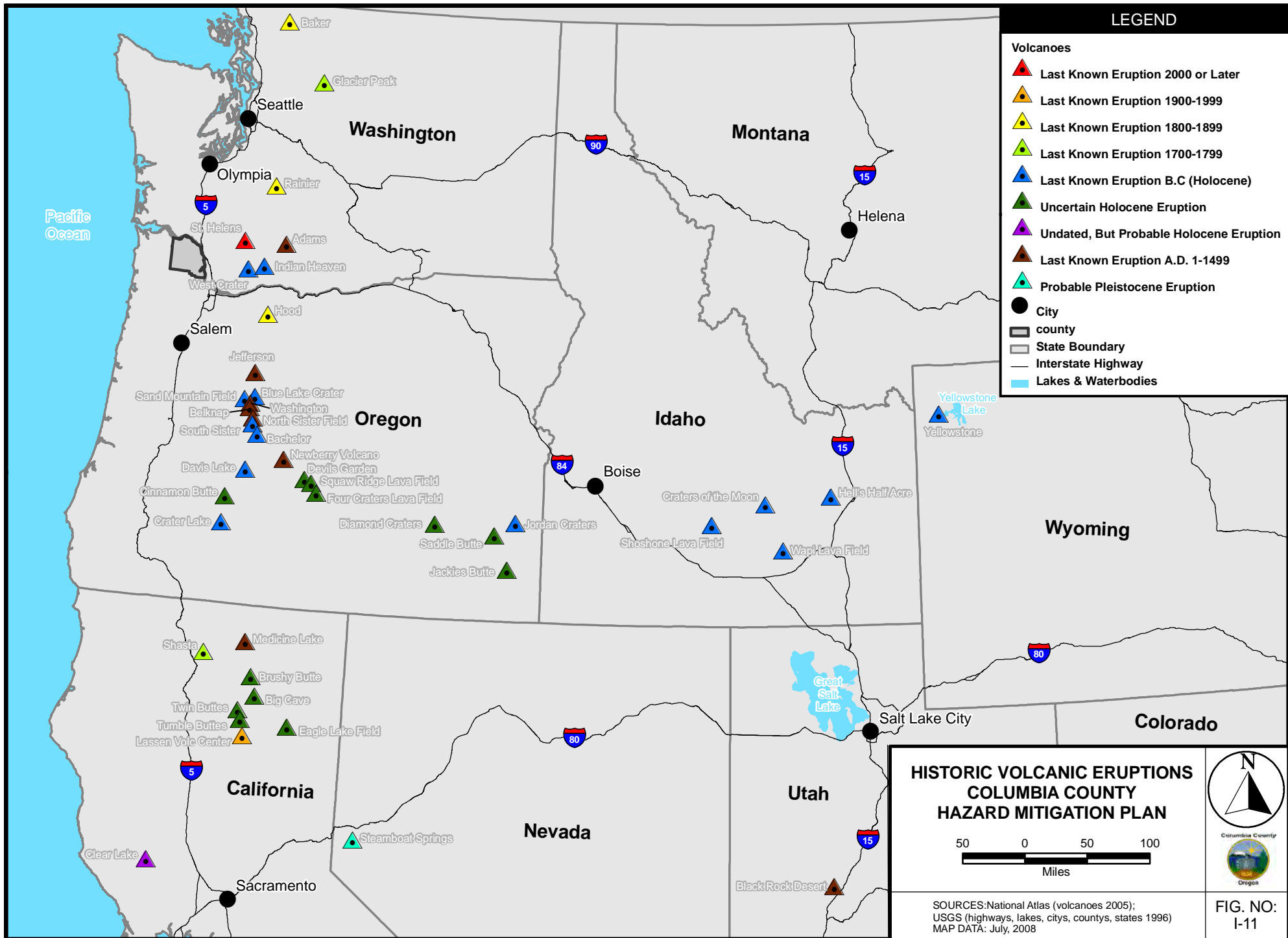
## COLUMBIA COUNTY HAZARD MITIGATION PLAN

Miles

Columbia County  
Oregon

SOURCES: ESRI (highways 1996), USGS (earthquake, counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:**  
I-10



Pacific Ocean

Washington

Montana

Oregon

Idaho

Wyoming

California

Nevada

Utah

Colorado

Seattle  
 Olympia  
 St. Helens  
 Rainier  
 Adams  
 Indian Heaven  
 West Crater  
 Hood  
 Salem  
 Jefferson  
 Sand Mountain Field  
 Blue Lake Crater  
 Belknap  
 Washington  
 North Sister Field  
 South Sister  
 Bachelor  
 Davis Lake  
 Newberry Volcano  
 Devils Garden  
 Squaw Ridge Lava Field  
 Cinnamon Butte  
 Four Craters Lava Field  
 Crater Lake  
 Diamond Craters  
 Saddle Butte  
 Jordan Craters  
 Shoshone Lava Field  
 Wapiti Lava Field  
 Jackies Butte  
 Shasta  
 Medicine Lake  
 Brushy Butte  
 Big Cave  
 Twin Buttes  
 Tumble Buttes  
 Lassen Volc Center  
 Eagle Lake Field  
 Clear Lake  
 Steamboat Springs

Yellowstone Lake  
 Yellowstone

Craters of the Moon  
 Hell's Half Acre

Great Salt Lake

Black Rock Desert

5

90

15

84

15

80

80

15

Sacramento

Salt Lake City

**HISTORIC VOLCANIC ERUPTIONS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

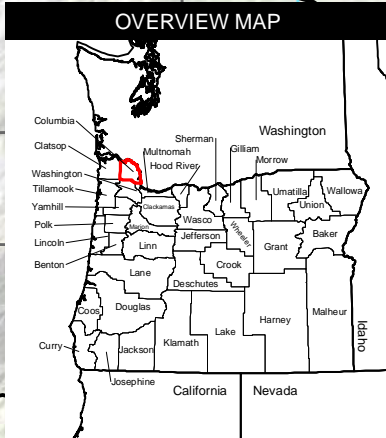
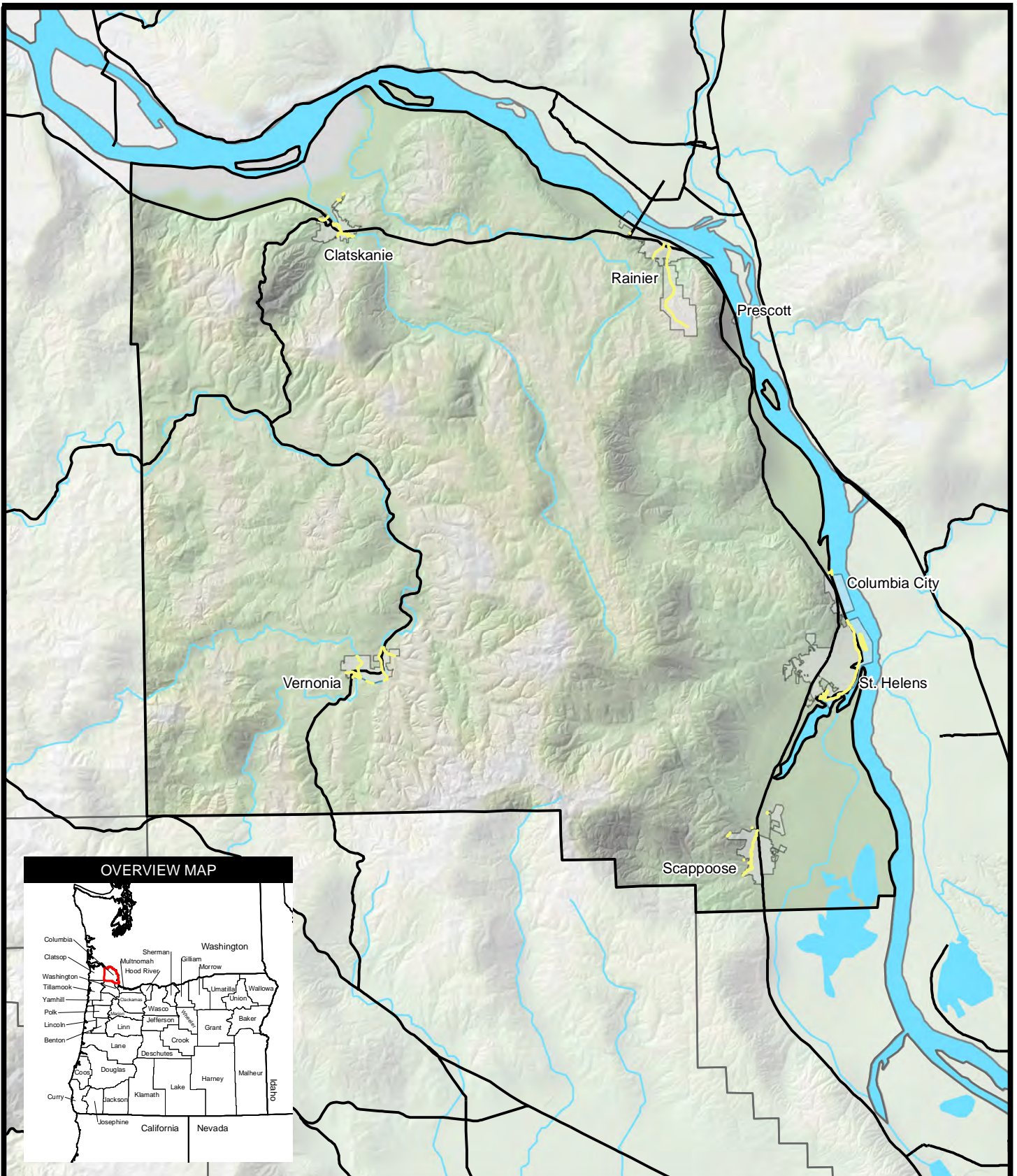
50 0 50 100  
Miles



SOURCES: National Atlas (volcanoes 2005); USGS (highways, lakes, cities, countys, states 1996)  
MAP DATA: July, 2008

FIG. NO:  
I-11

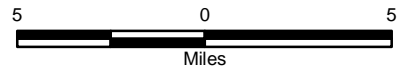




**LEGEND**

- City Limits
- County Boundary
- Major Road or Highway
- Streams & Waterways
- Lakes & Waterbodies

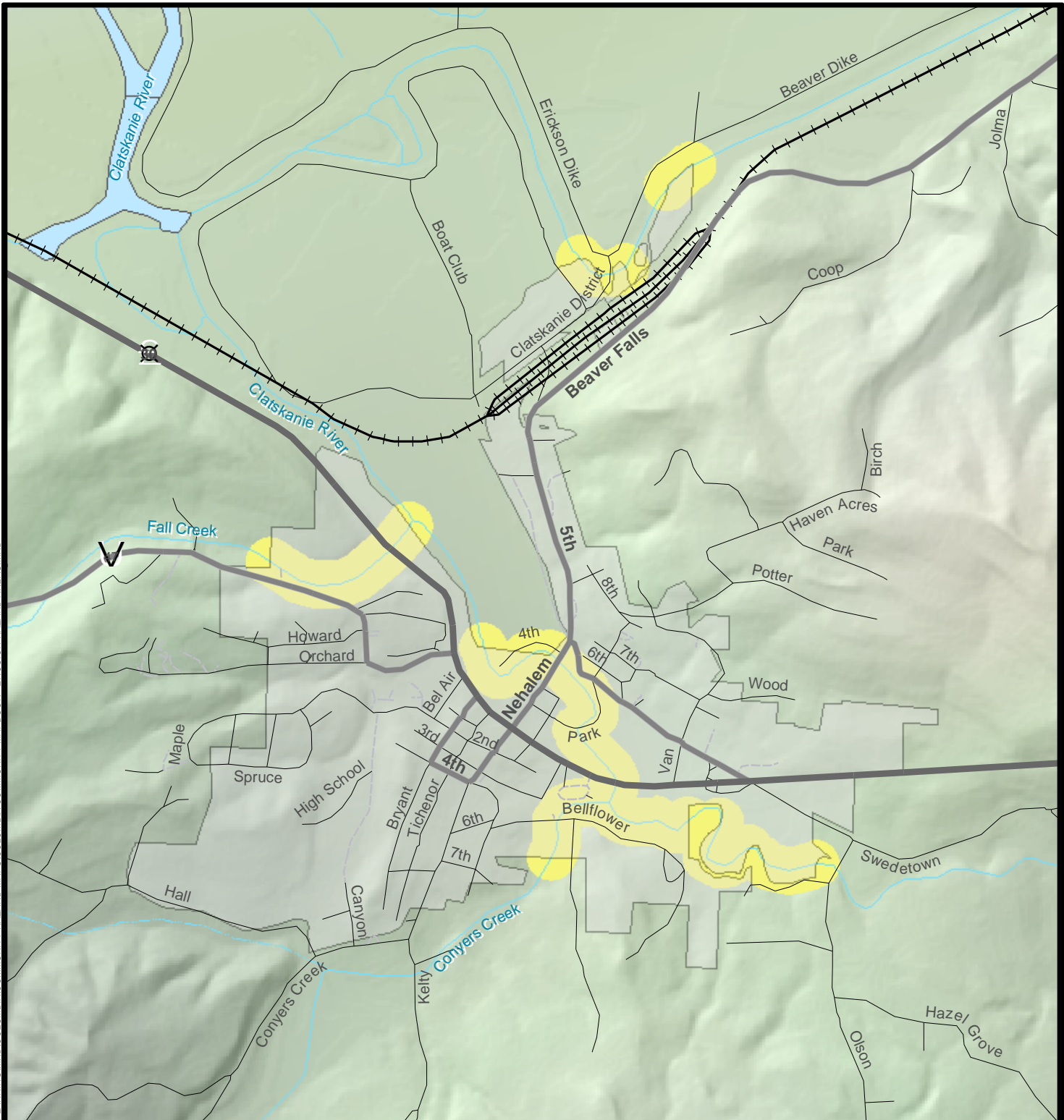
**EROSION HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:  
I-12**

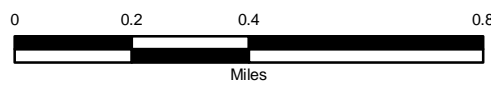
M:\PROJECTS\2\0081\53\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY HAZARD MAPBOOK - EROSION HAZARD AREAS.MXD



OVERVIEW MAP



**CITY OF CLATSKANIE**  
**EROSION HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



LEGEND

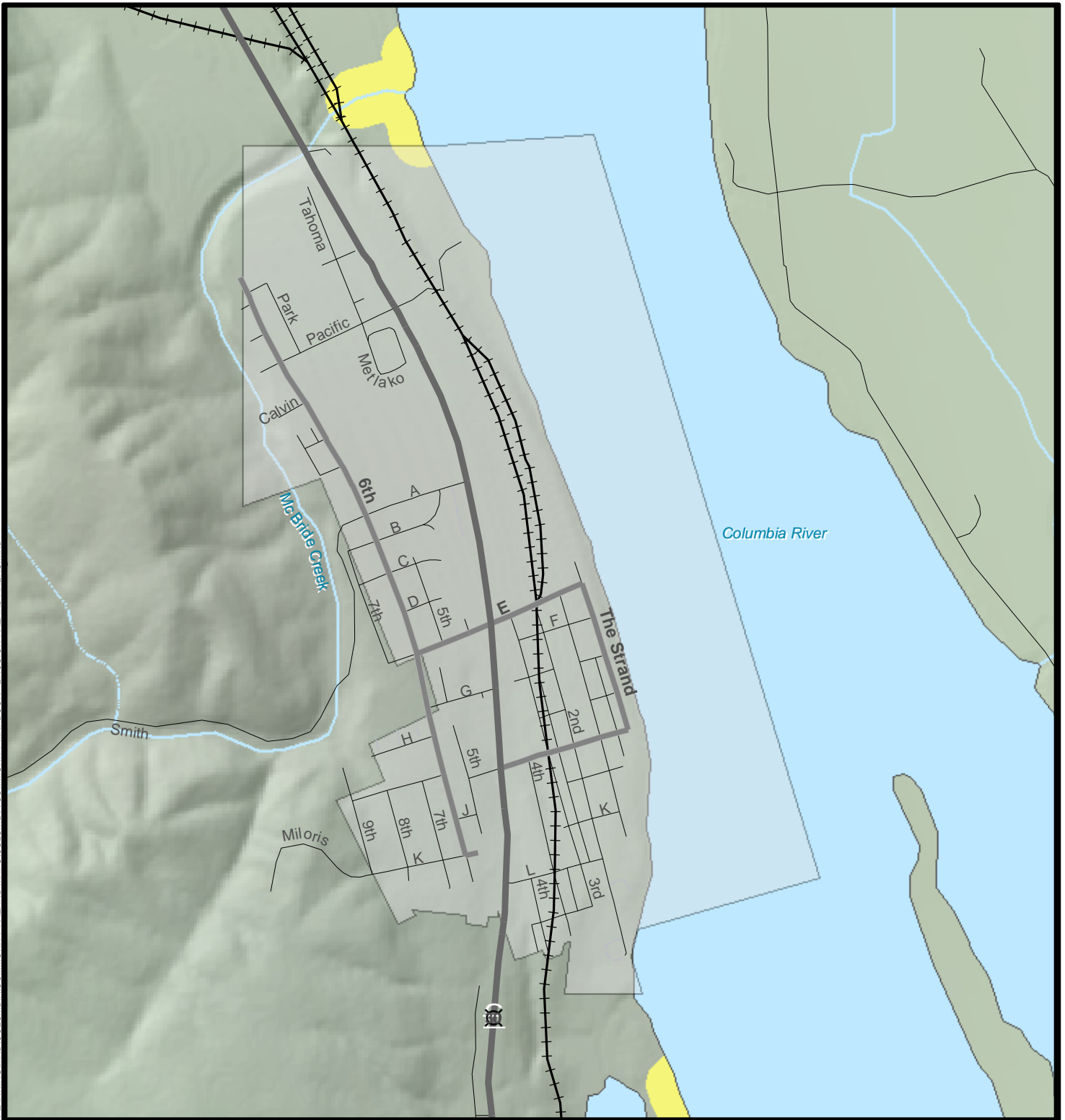
- Potential Erosion Hazard
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

SOURCES: Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-12B



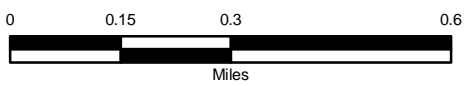
M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - EROSION HAZARD AREAS.MXD









OVERVIEW MAP



**COLUMBIA CITY**  
**EROSION HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



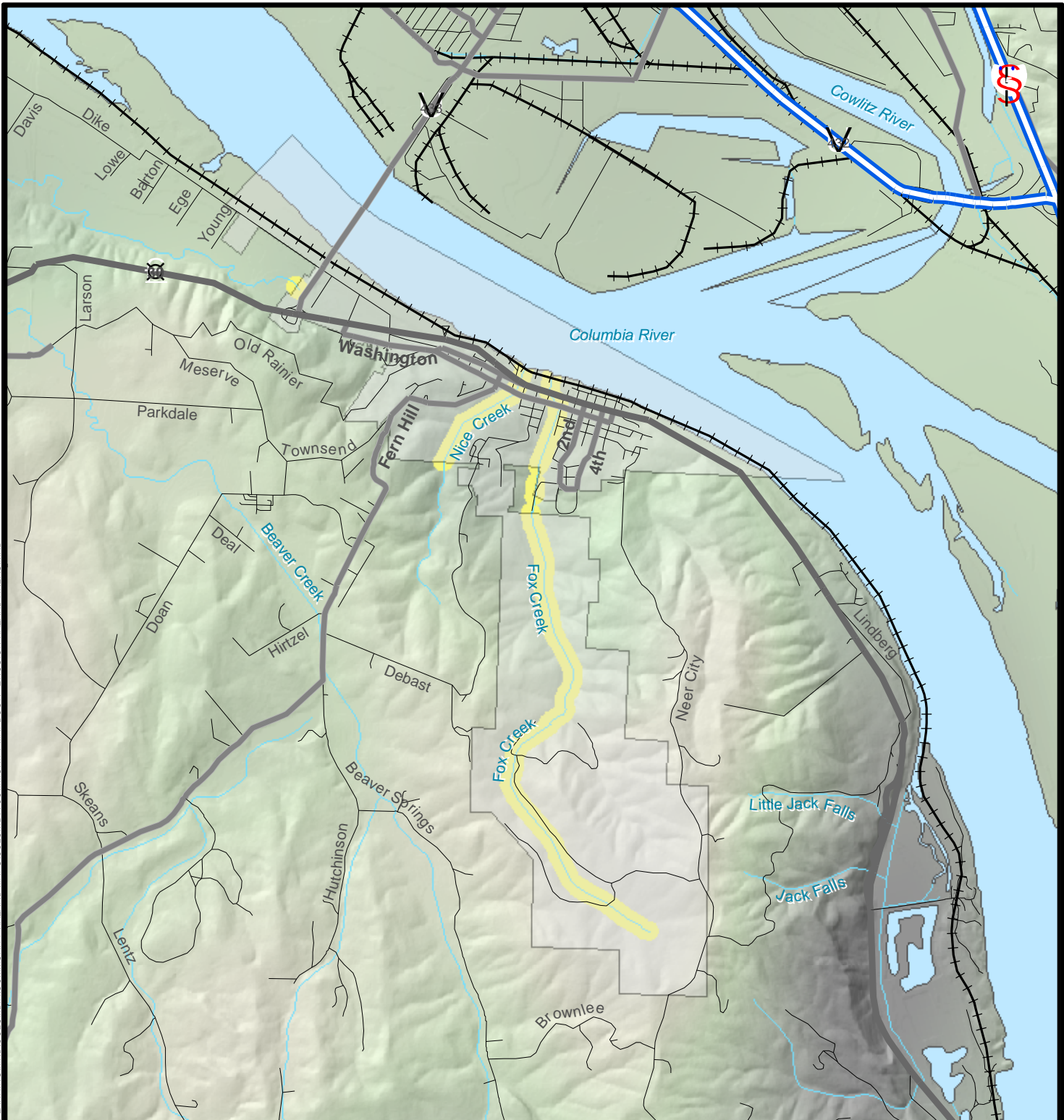
LEGEND

-  Potential Erosion Hazard
-  City Limits
-  Streets & Highways
-  Railroads
-  Lakes & Waterbodies
-  Streams & Waterways

SOURCES: Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-12C

M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\DC\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY HAZARD AREAS.MXD



OVERVIEW MAP



CITY OF RAINIER  
EROSION HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN



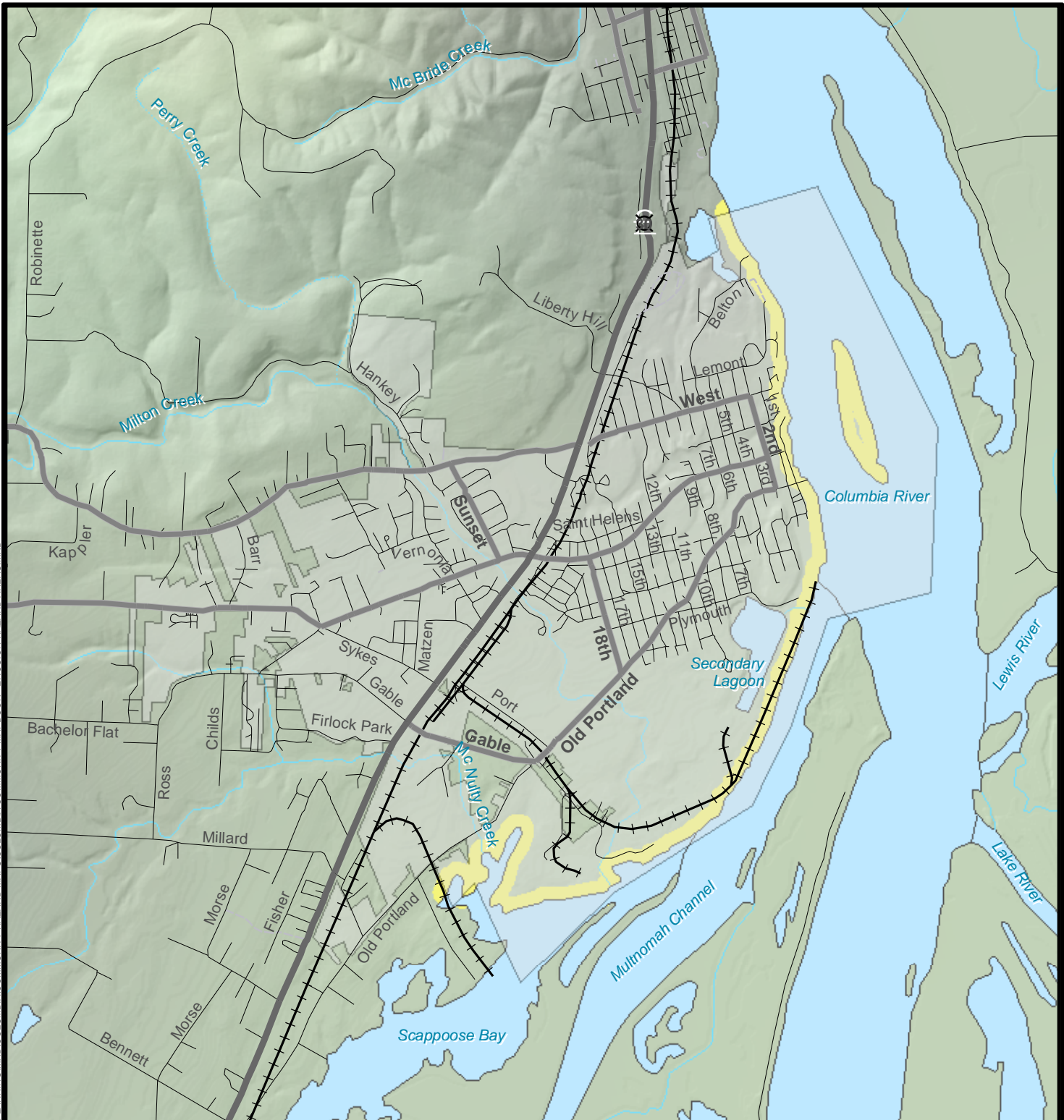
LEGEND

- Potential Erosion Hazard
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

SOURCES: Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-12D

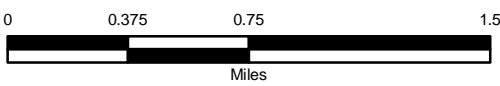
M:\PROJECTS\2008\15300293 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY HAZARD AREAS.MXD



**OVERVIEW MAP**



**CITY OF ST. HELENS**  
**EROSION HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

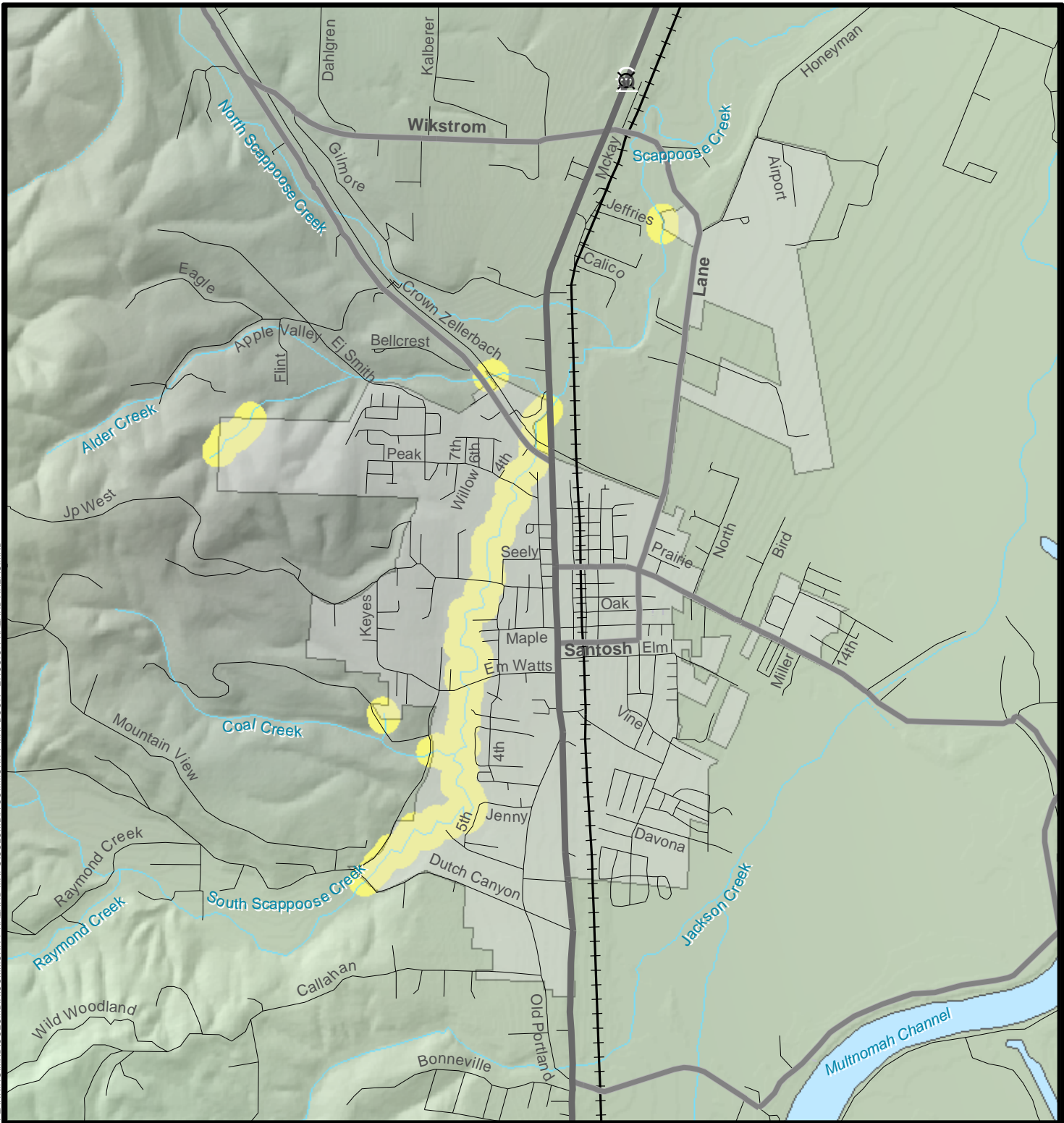
FIG. NO:  
I-12E

**LEGEND**

- Potential Erosion Hazard
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways



M:\PROJECTS\2008\153\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY HAZARD AREAS.MXD



**OVERVIEW MAP**



**CITY OF SCAPPOOSE**  
**EROSION HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



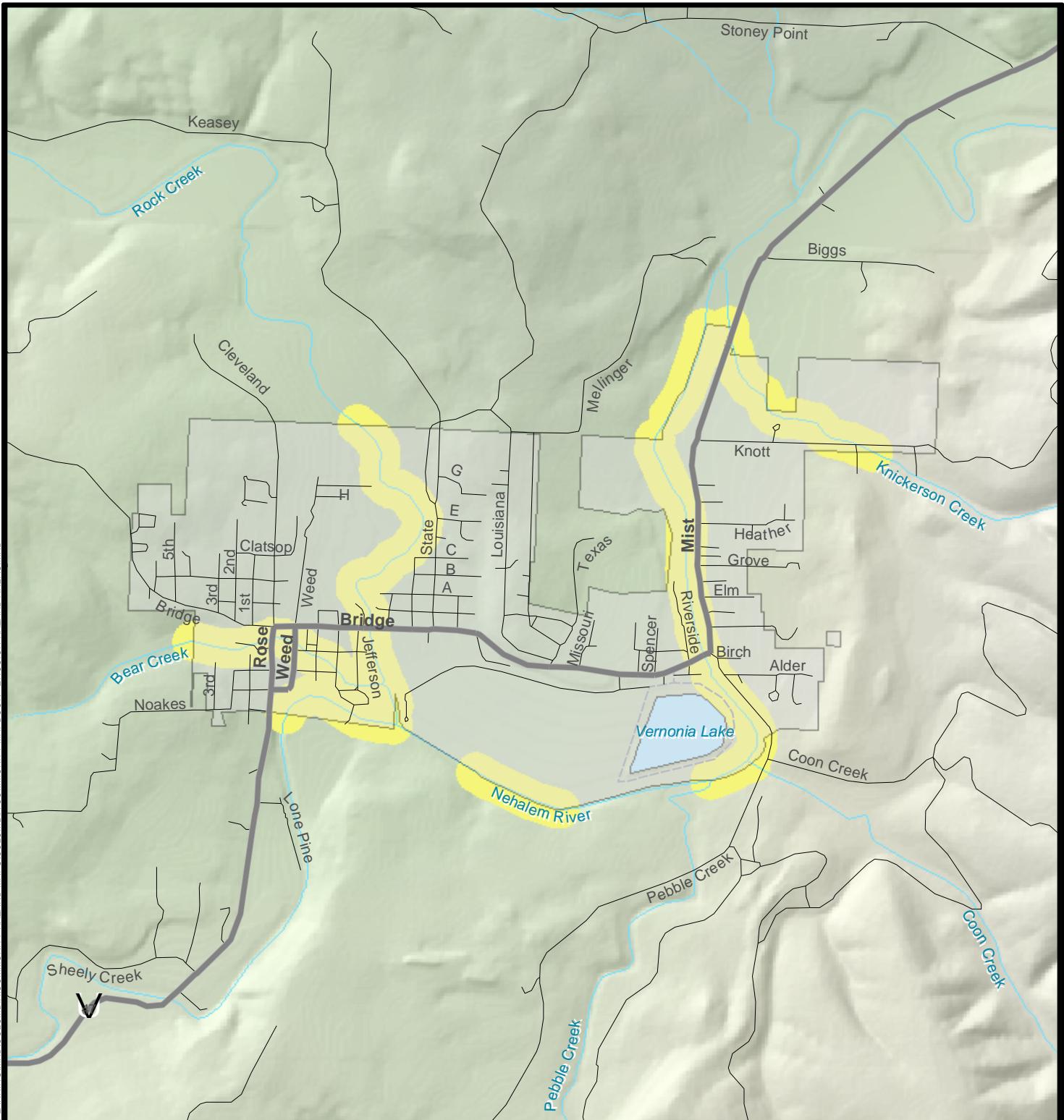
**LEGEND**

- Potential Erosion Hazard
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

SOURCES: Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-12F

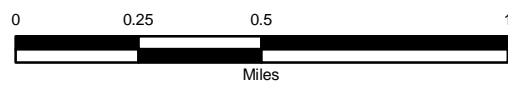
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

OVERVIEW MAP



**CITY OF VERNONIA**  
**EROSION HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



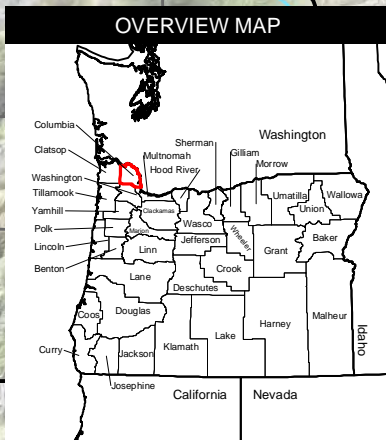
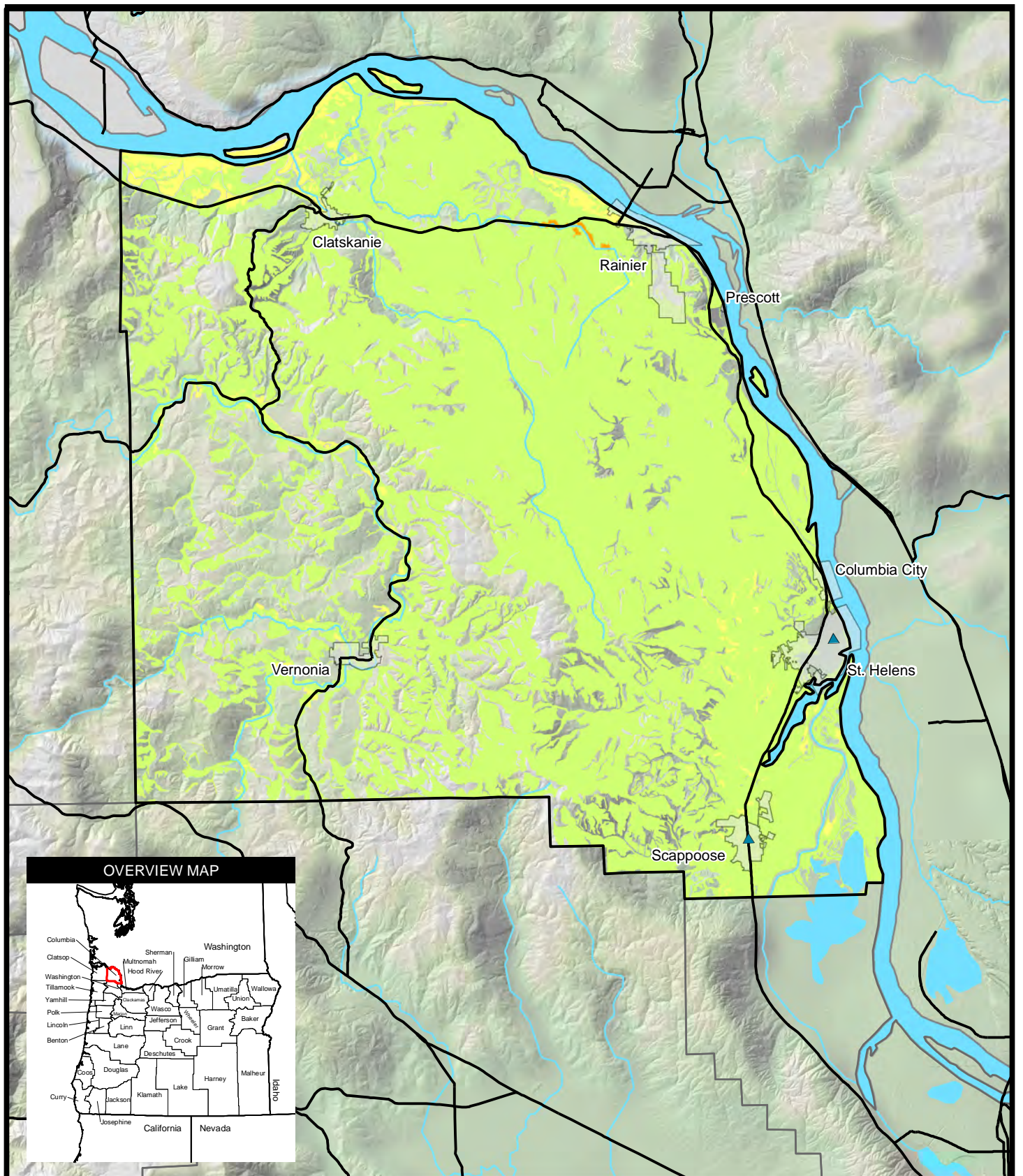
LEGEND

-  Potential Erosion Hazard
-  City Limits
-  Streets & Highways
-  Railroads
-  Lakes & Waterbodies
-  Streams & Waterways

SOURCES: Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-12G

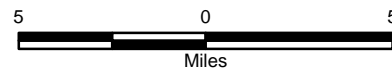




**LEGEND**

- |                        |                         |
|------------------------|-------------------------|
| <b>Expansive Soils</b> | ▲ City                  |
| ■ Low                  | ▭ City Limits           |
| ■ Moderate             | ▭ County Boundary       |
| ■ High                 | — Major Road or Highway |
| ■ Very High            | ~ Streams & Waterways   |
|                        | ■ Lakes & Waterbodies   |

**EXPANSIVE SOIL HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

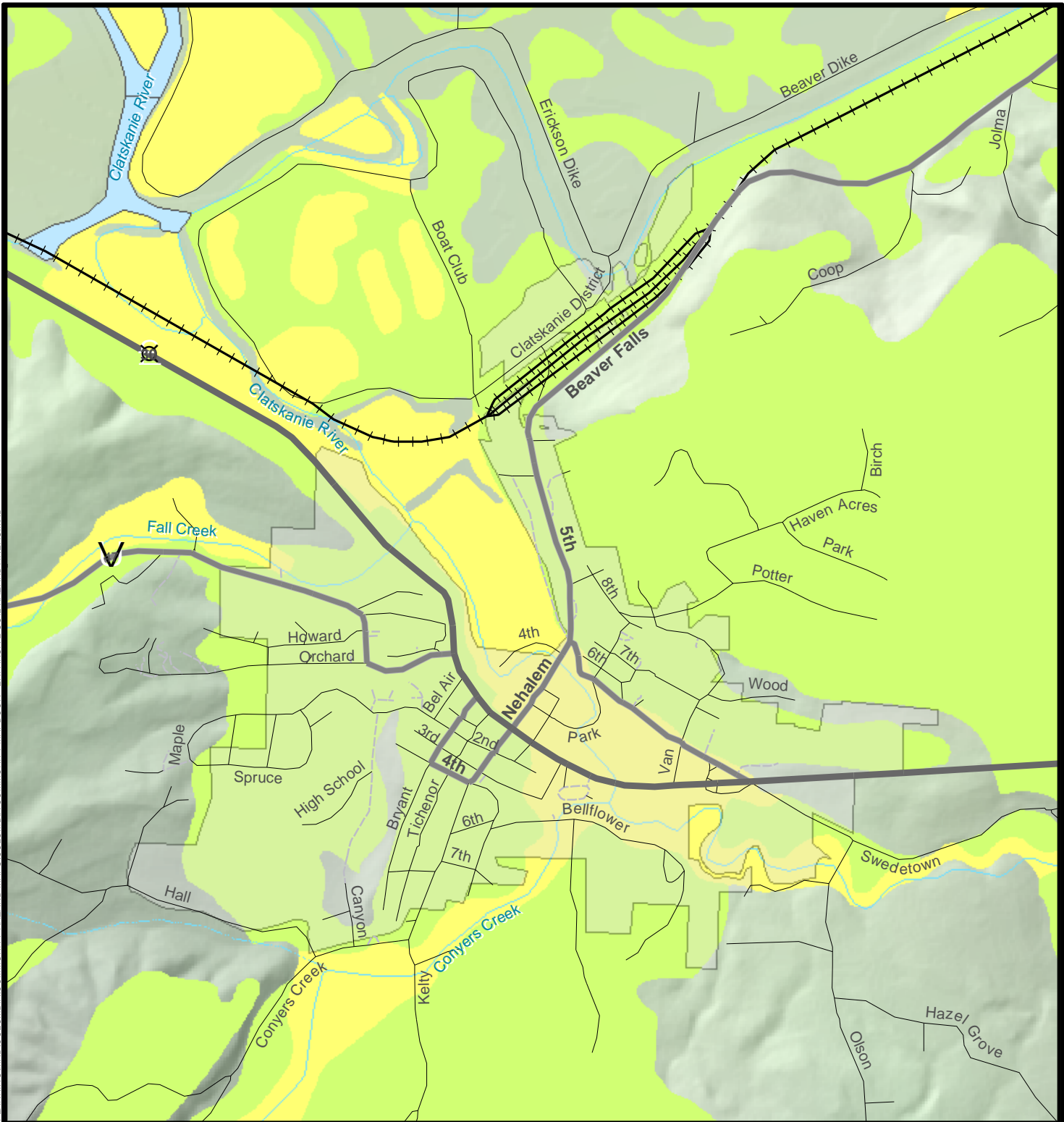


SOURCES: Soil (SSURGO) ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

FIG. NO:  
I-13



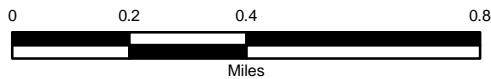
M:\PROJECTS\2\0081\53\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - EXPANSIVE SOIL HAZARD AREAS.MXD



**OVERVIEW MAP**



**CITY OF CLATSKANIE  
EXPANSIVE SOIL HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



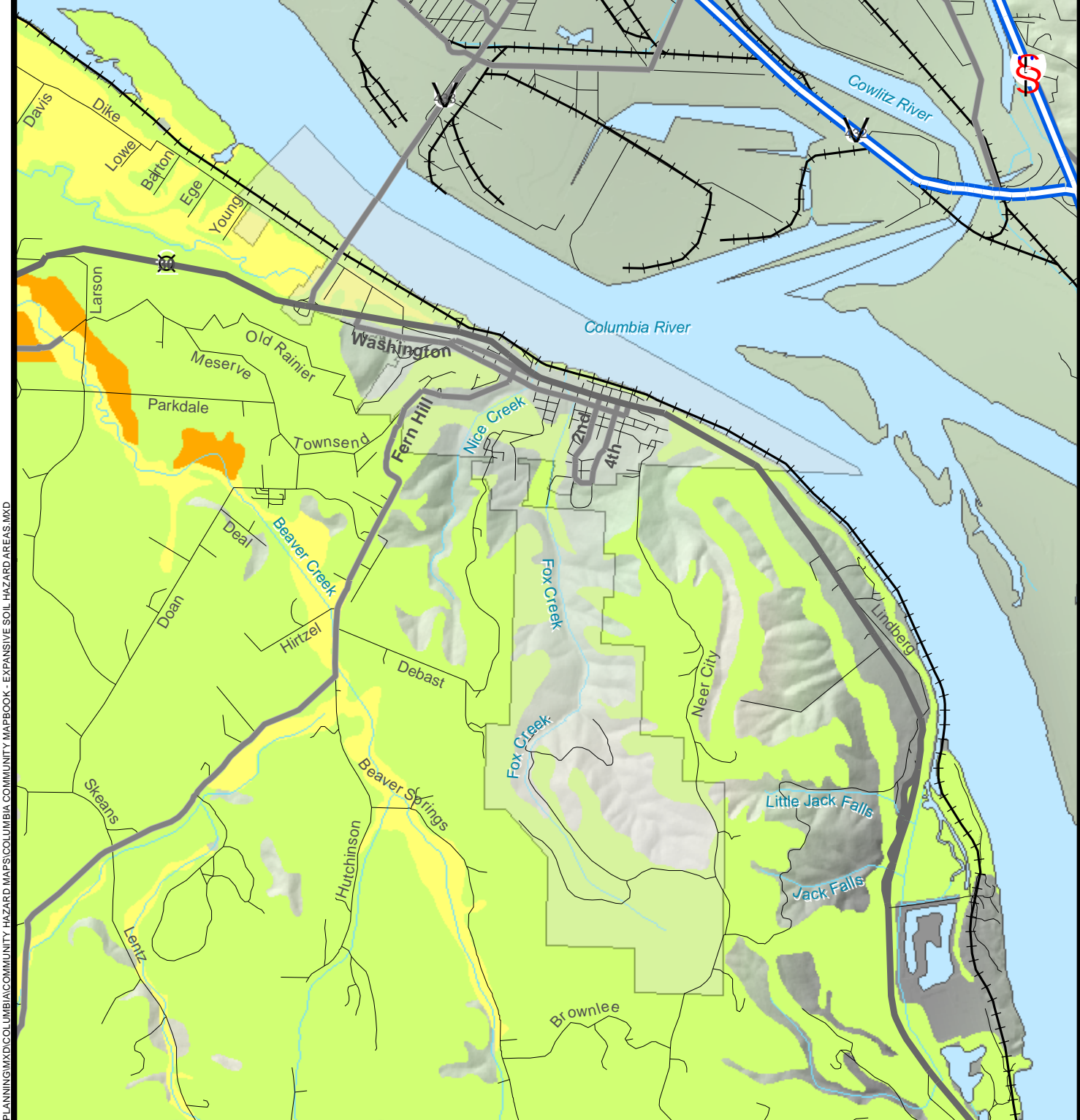
SOURCES: Soil (SSURGO), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-13B

**LEGEND**

**Expansive Soils**

- Low
- Moderate
- High
- Very High
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

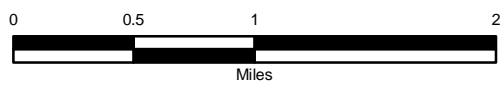


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**OVERVIEW MAP**



**CITY OF RAINIER  
EXPANSIVE SOIL HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



**LEGEND**

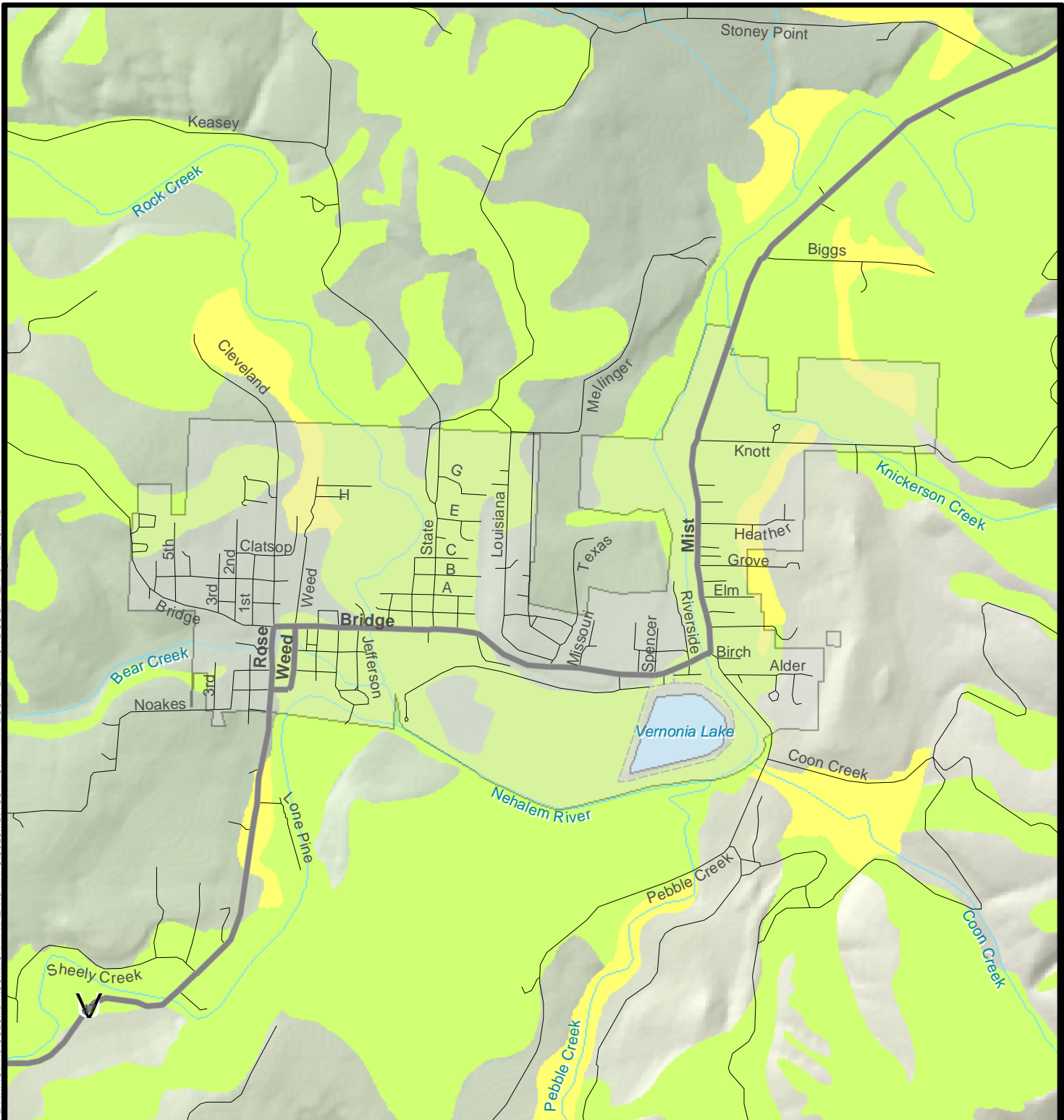
- Expansive Soils**
- Low
  - Moderate
  - High
  - Very High
  - City Limits
  - Streets & Highways
  - Railroads
  - Lakes & Waterbodies
  - Streams & Waterways

SOURCES: Soil (SSURGO), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-13C



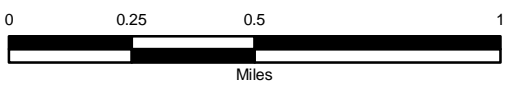
M:\PROJECTS\2\0081\53\002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY HAZARD MAPBOOK - EXPANSIVE SOIL HAZARD AREAS.MXD



**OVERVIEW MAP**



**CITY OF VERNONIA**  
**EXPANSIVE SOIL HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



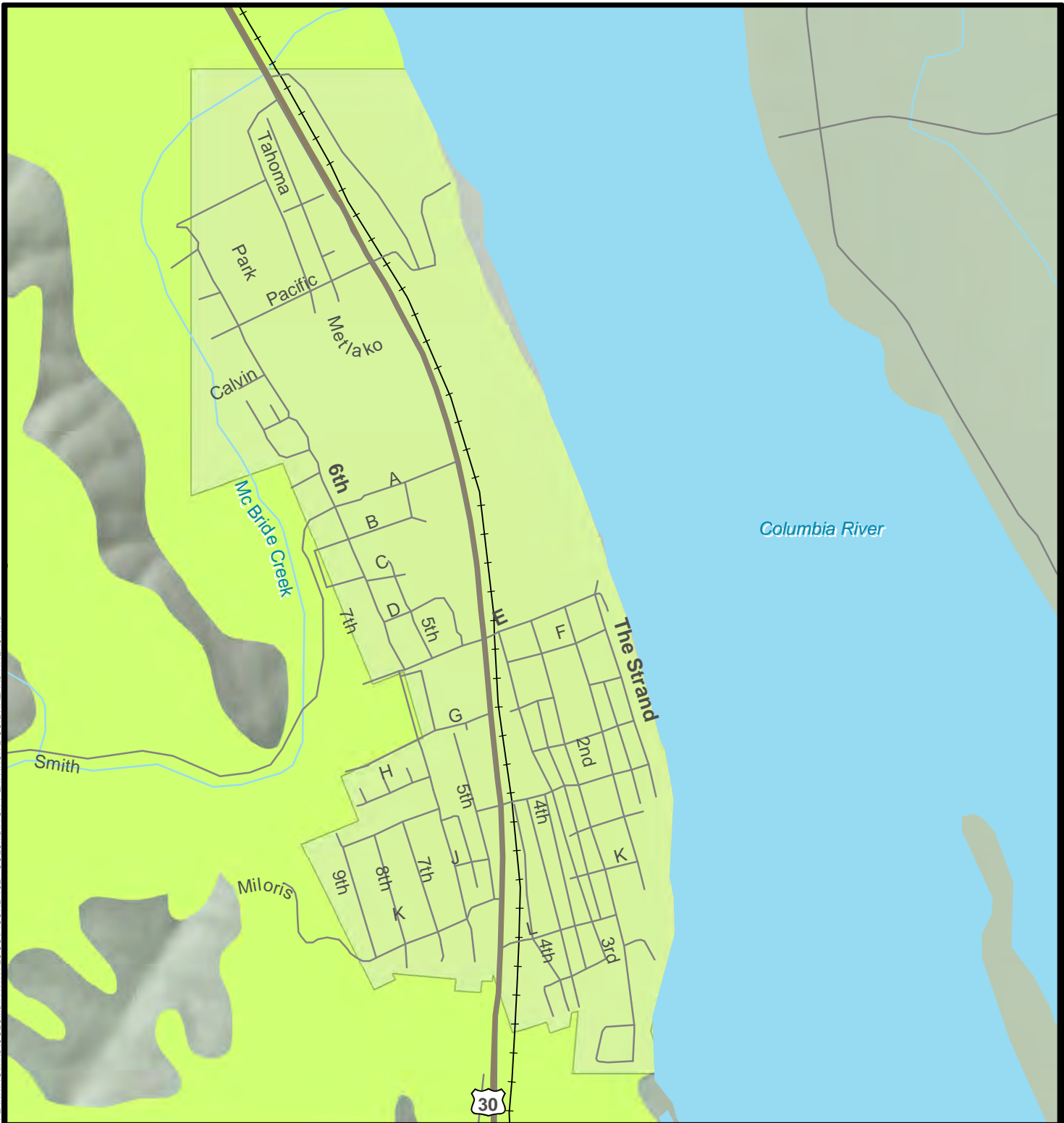
SOURCES: Soil (SSURGO), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-13D

**LEGEND**

- Expansive Soils**
- Low
  - Moderate
  - High
  - Very High
  - City Limits
  - Streets & Highways
  - Railroads
  - Lakes & Waterbodies
  - Streams & Waterways

M:\PROJECTS\2\00\81153\00293 - FEMA - OREGON HAZARD MITIGATION PLANNING\MXD\COLUMBIA WITH LOGO\FIGURE 13E - COLUMBIA CITY EXPANSIVE SOIL HAZARD AREAS.MXD

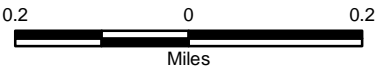


OVERVIEW MAP



COLUMBIA CITY

EXPANSIVE SOIL HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN



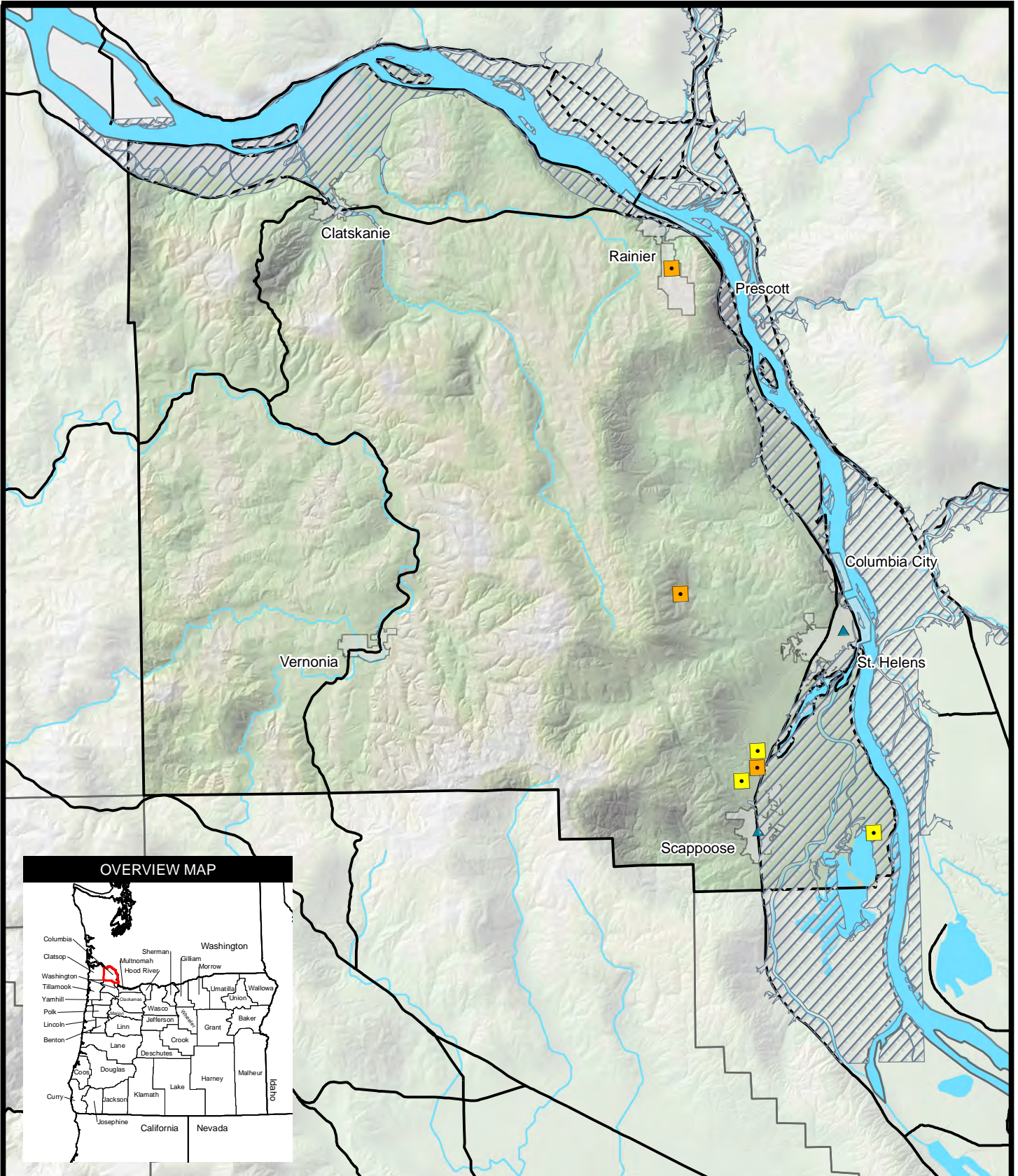
LEGEND

- Expansive Soils
  - Low
  - Moderate
  - High
  - Very High
- City Limits
- Streets & Highways
- Lakes & Waterbodies
- Streams & Waterways

SOURCES: Soil (SSURGO), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-13E

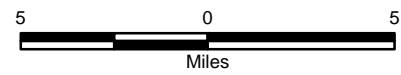




**LEGEND**

- |                                 |                                |
|---------------------------------|--------------------------------|
| <b>Dam Hazard</b>               | <b>City</b>                    |
| <b>Low</b>                      | <b>County Boundary</b>         |
| <b>Significant</b>              | <b>Major Road or Highway</b>   |
| <b>Columbia Inundation Zone</b> | <b>Streams &amp; Waterways</b> |
|                                 | <b>Lakes &amp; Waterbodies</b> |

**DAM LOCATION  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

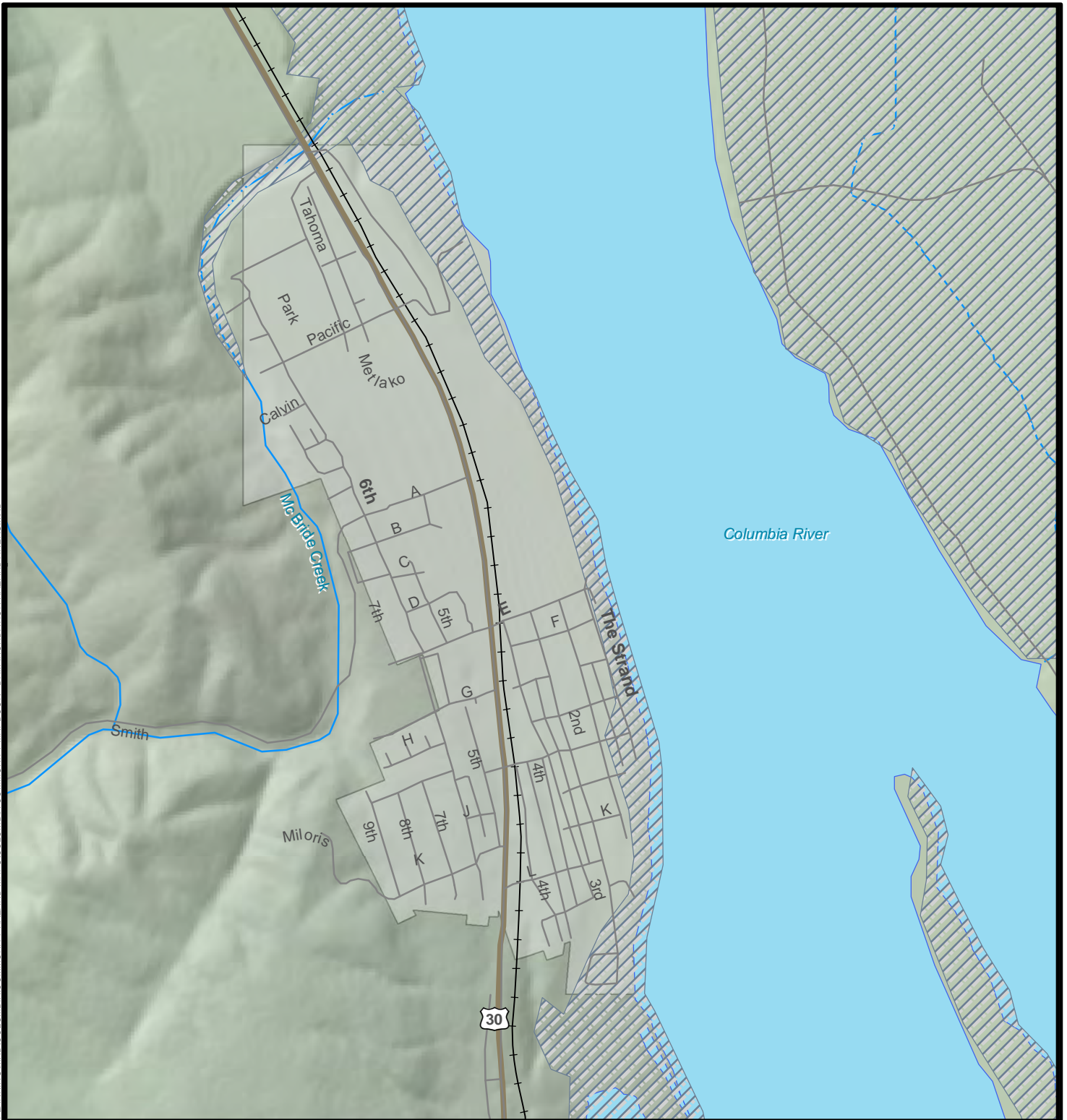


SOURCES: Dam Hazards (OWRD, 2007), Inundation (U.S. Army Corp of Engineers, 1989), ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:  
I-14**



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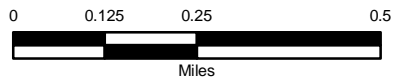


OVERVIEW MAP



COLUMBIA CITY

DAM INUNDATION HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN



SOURCES: Inundation (U.S. Army Corp of Engineers, 1989),  
Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS)  
CREATED BY: TCS, Fall 2008

Columbia County



Oregon

LEGEND







-  streets
-  Columbia Inundation Zone
-  City Limits
-  ORRailroad\_NAD83
-  Lakes & Waterbodies
-  Streams & Waterways

FIG. NO:  
I-14B

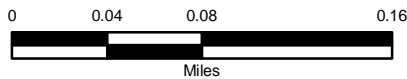
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OVERVIEW MAP









**CITY OF PRESCOTT**  
**DAM INUNDATION HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Inundation (U.S. Army Corp of Engineers, 1989),  
Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS)  
CREATED BY: TCS, Fall 2008

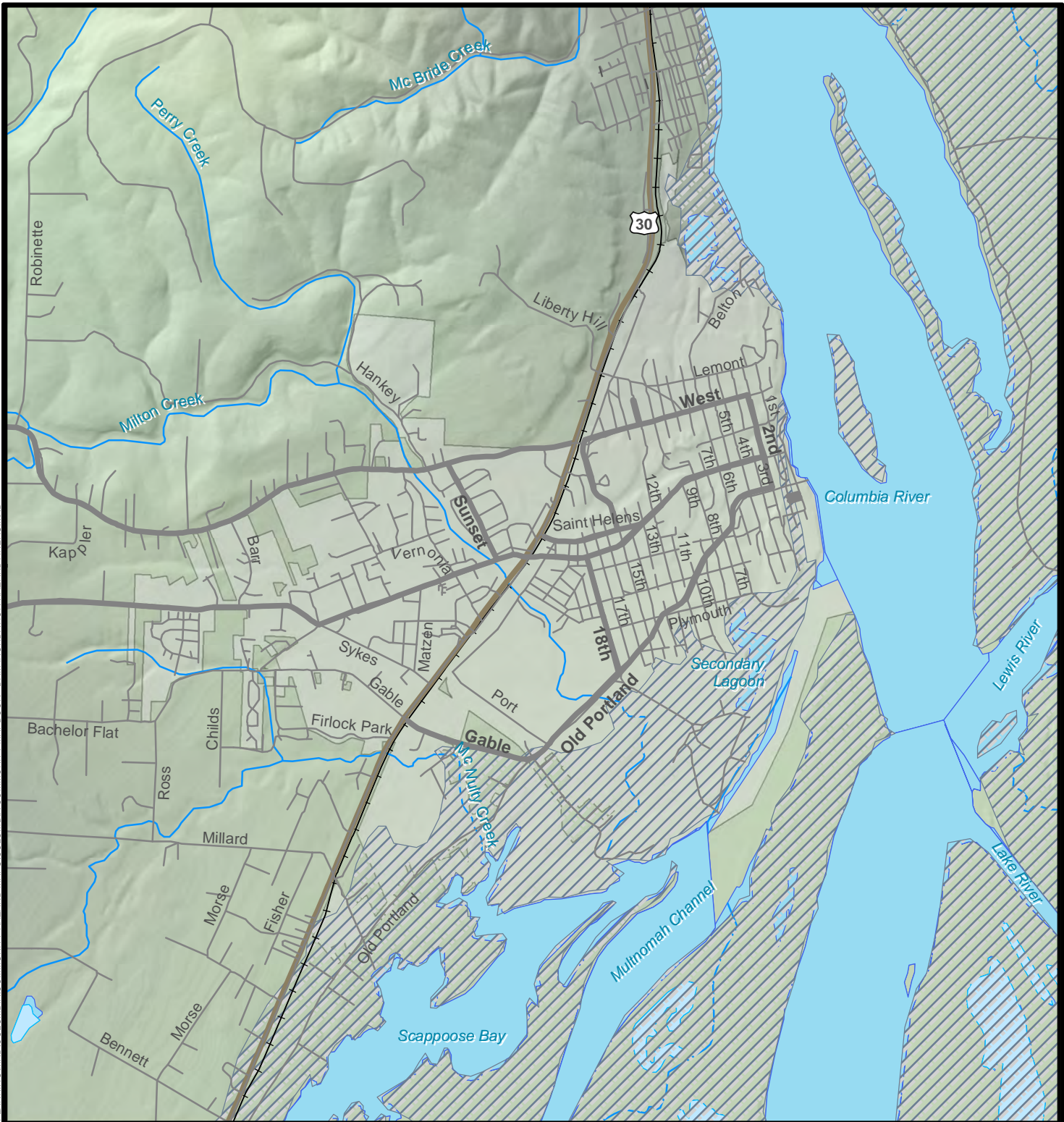
FIG. NO:  
I-14C

LEGEND

-  streets
-  Columbia Inundation Zone
-  City Limits
-  ORRailroad\_NAD83
-  Lakes & Waterbodies
-  Streams & Waterways



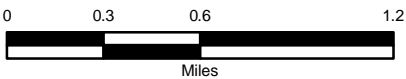
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OVERVIEW MAP



**CITY OF ST. HELENS**  
**DAM INUNDATION HAZARD AREA**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Inundation (U.S. Army Corp of Engineers, 1989),  
 Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS)  
 CREATED BY: TCS, Fall 2008

Columbia County



Oregon

LEGEND

- streets
- Columbia Inundation Zone
- City Limits
- ORRailroad\_NAD83
- Lakes & Waterbodies
- Streams & Waterways

FIG. NO:  
I-14D



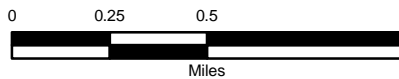


OVERVIEW MAP



CITY OF SCAPPOOSE

DAM INUNDATION HAZARD AREA  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN



SOURCES: Inundation (U.S. Army Corp of Engineers, 1989),  
Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS)  
CREATED BY: TCS, Fall 2008

Columbia County



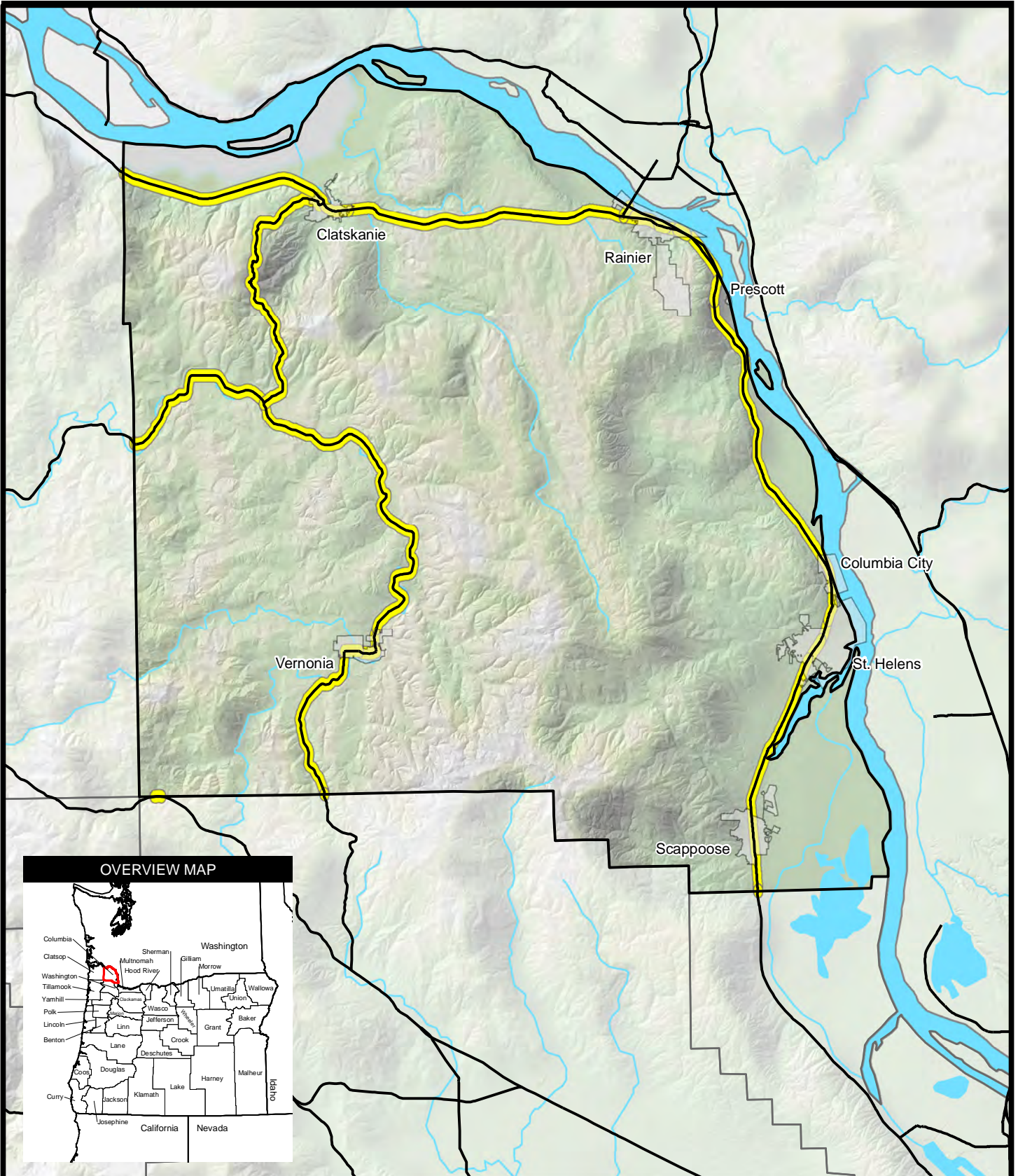
Oregon

LEGEND

- streets
- Columbia Inundation Zone
- City Limits
- ORRailroad\_NAD83
- Lakes & Waterbodies
- Streams & Waterways

FIG. NO:  
I-14E

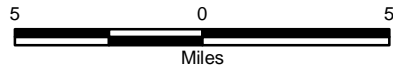




**LEGEND**

- |                                      |                       |
|--------------------------------------|-----------------------|
| <b>Hazardous Materials Transport</b> | County Boundary       |
| Quarter Mile Corridor                | Major Road or Highway |
| City                                 | Streams & Waterways   |
| City Limits                          | Lakes & Waterbodies   |

**HAZARDOUS MATERIALS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

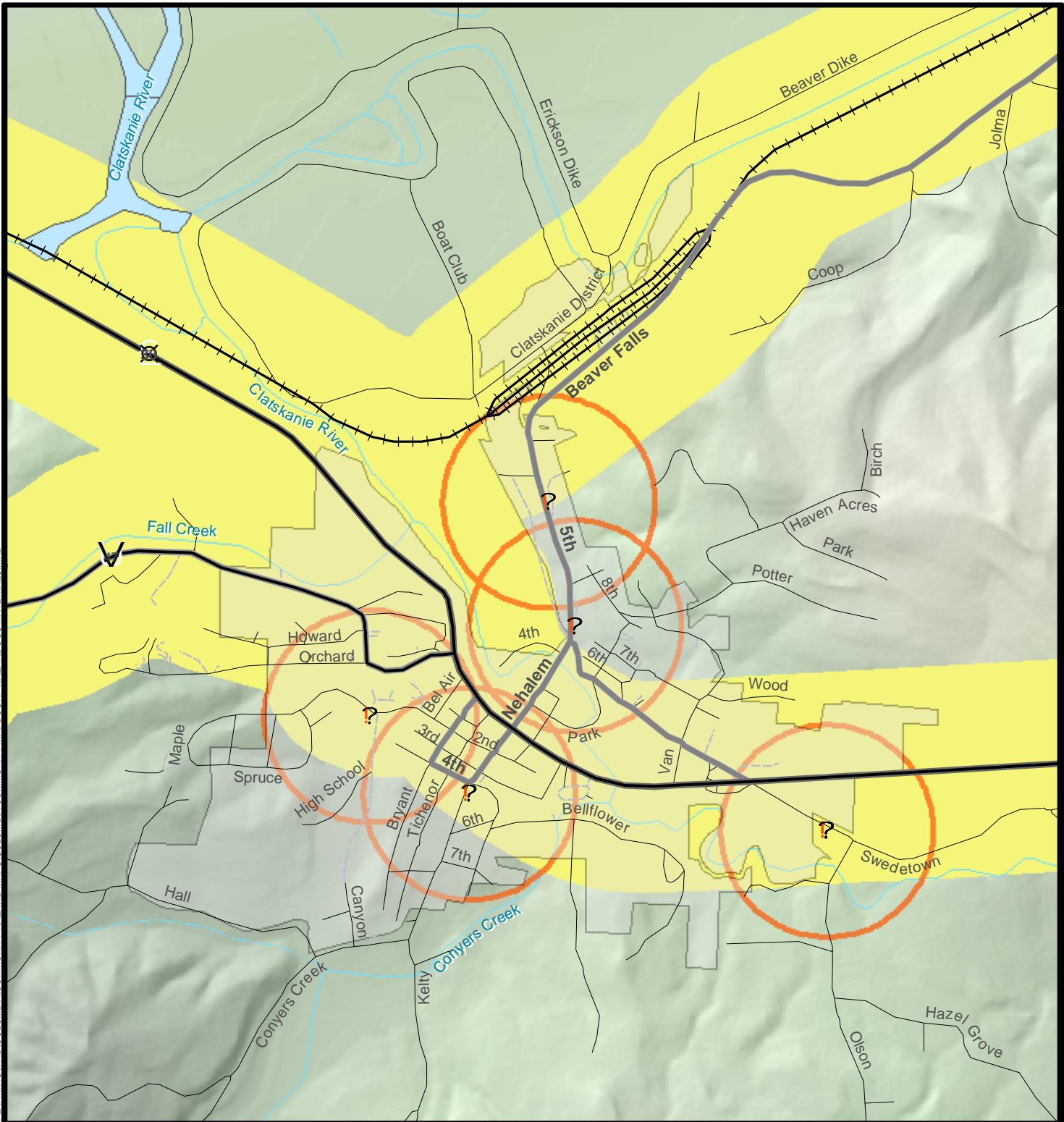


SOURCES: Critical facilities (Oregon), ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:**  
I-15



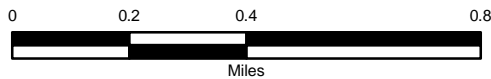
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**OVERVIEW MAP**



**CITY OF CLATSKANIE  
HAZARDOUS MATERIALS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

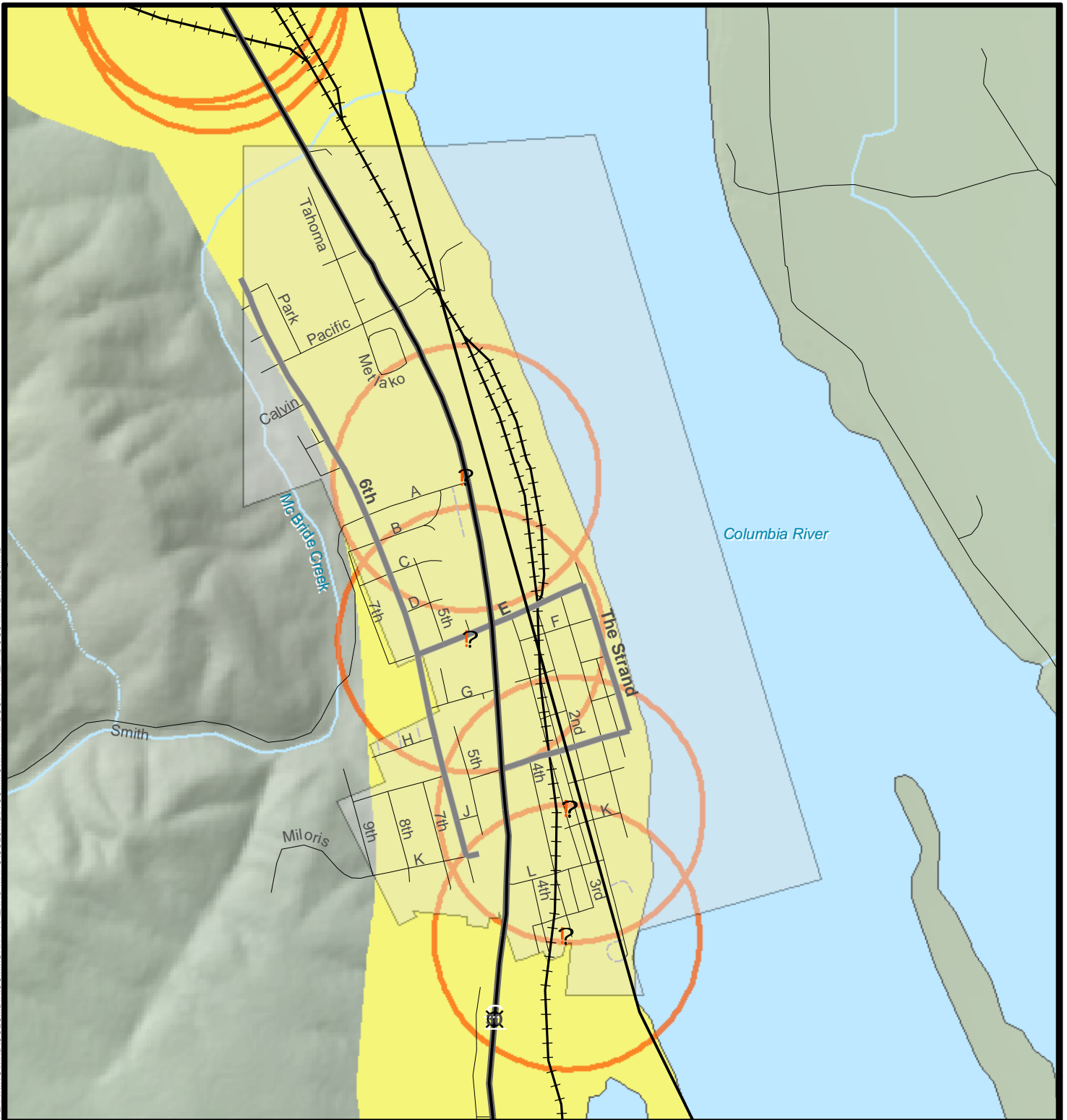


SOURCES: EHS Sites (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-15B


**LEGEND**


- 1/4-Mile Corridor Along Active Freight Rail and Highways
- EHS Site 1/4-Mile Buffer
- EHS Site
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways



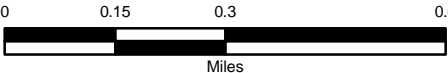
OVERVIEW MAP







## COLUMBIA CITY HAZARDOUS MATERIALS COLUMBIA COUNTY HAZARD MITIGATION PLAN



Miles

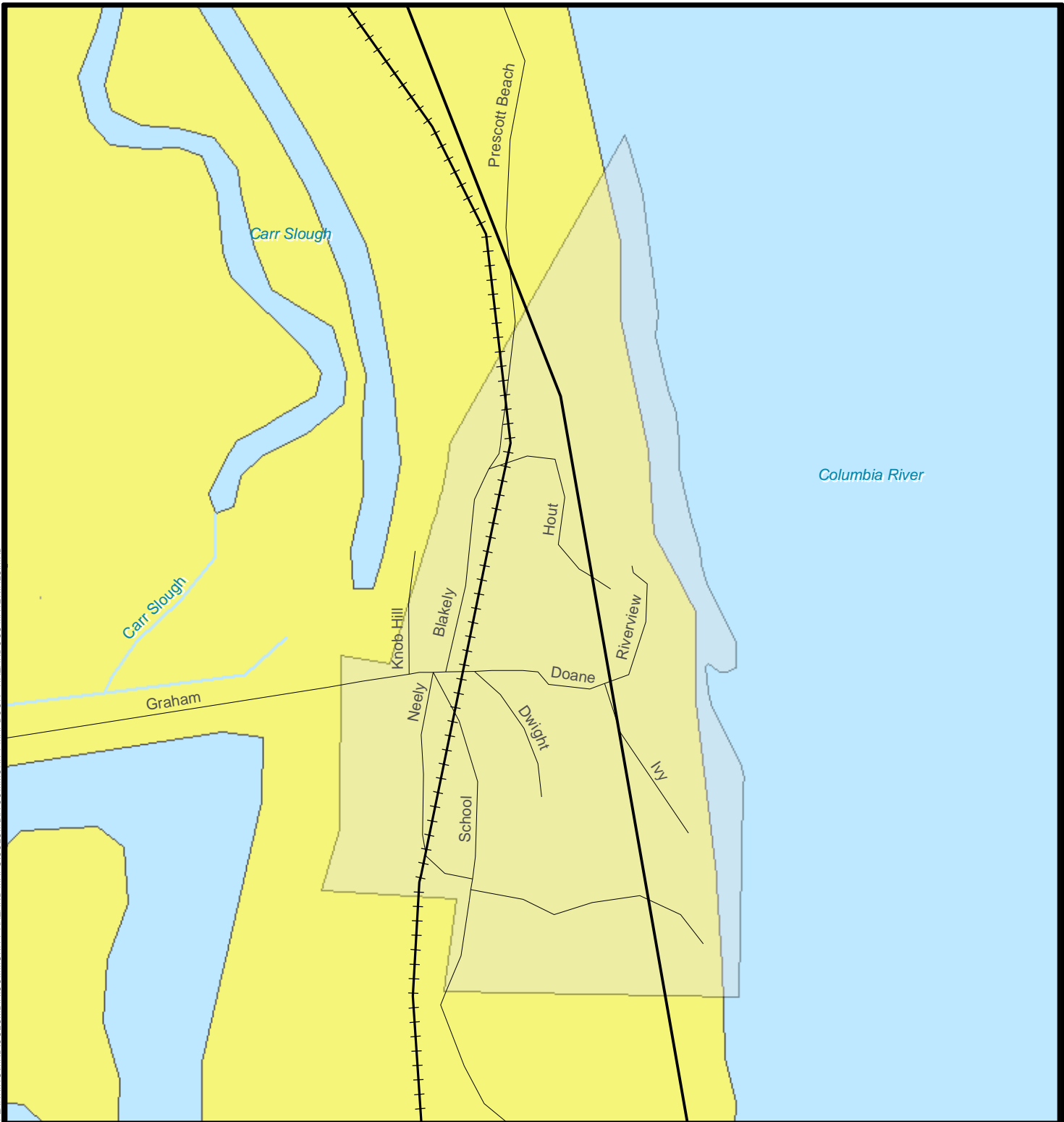
SOURCES: EHS Sites (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-15C

LEGEND

- 1/4-Mile Corridor Along Active Freight Rail and Highways
- EHS Site 1/4-Mile Buffer
- EHS Site
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

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OVERVIEW MAP



**CITY OF PRESCOTT  
HAZARDOUS MATERIALS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: EHS Sites (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

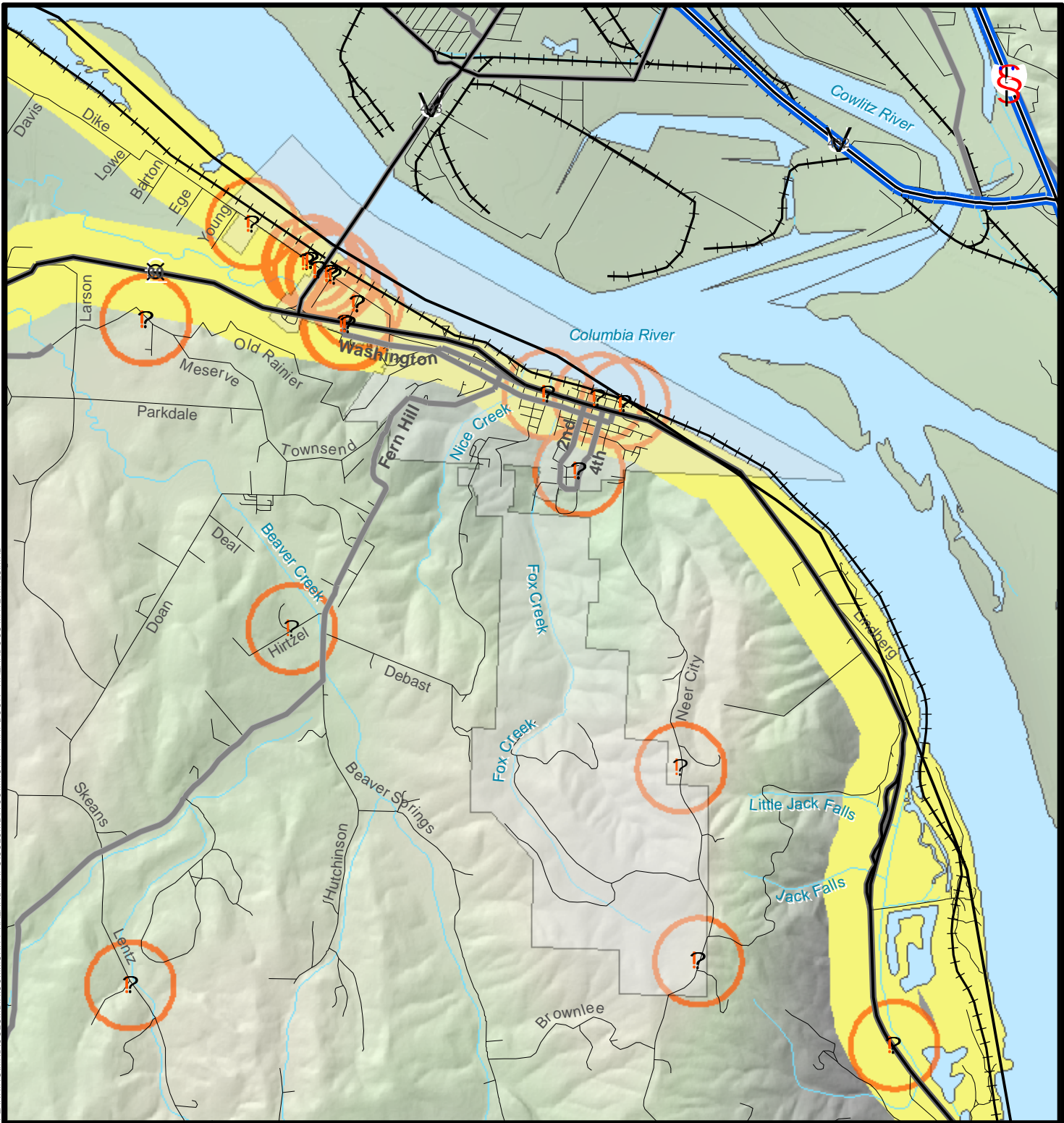
FIG. NO:  
I-15D

LEGEND

- 1/4-Mile Corridor Along Active Freight Rail and Highways
- EHS Site 1/4-Mile Buffer
- EHS Site
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways



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## CITY OF RAINIER HAZARDOUS MATERIALS COLUMBIA COUNTY HAZARD MITIGATION PLAN



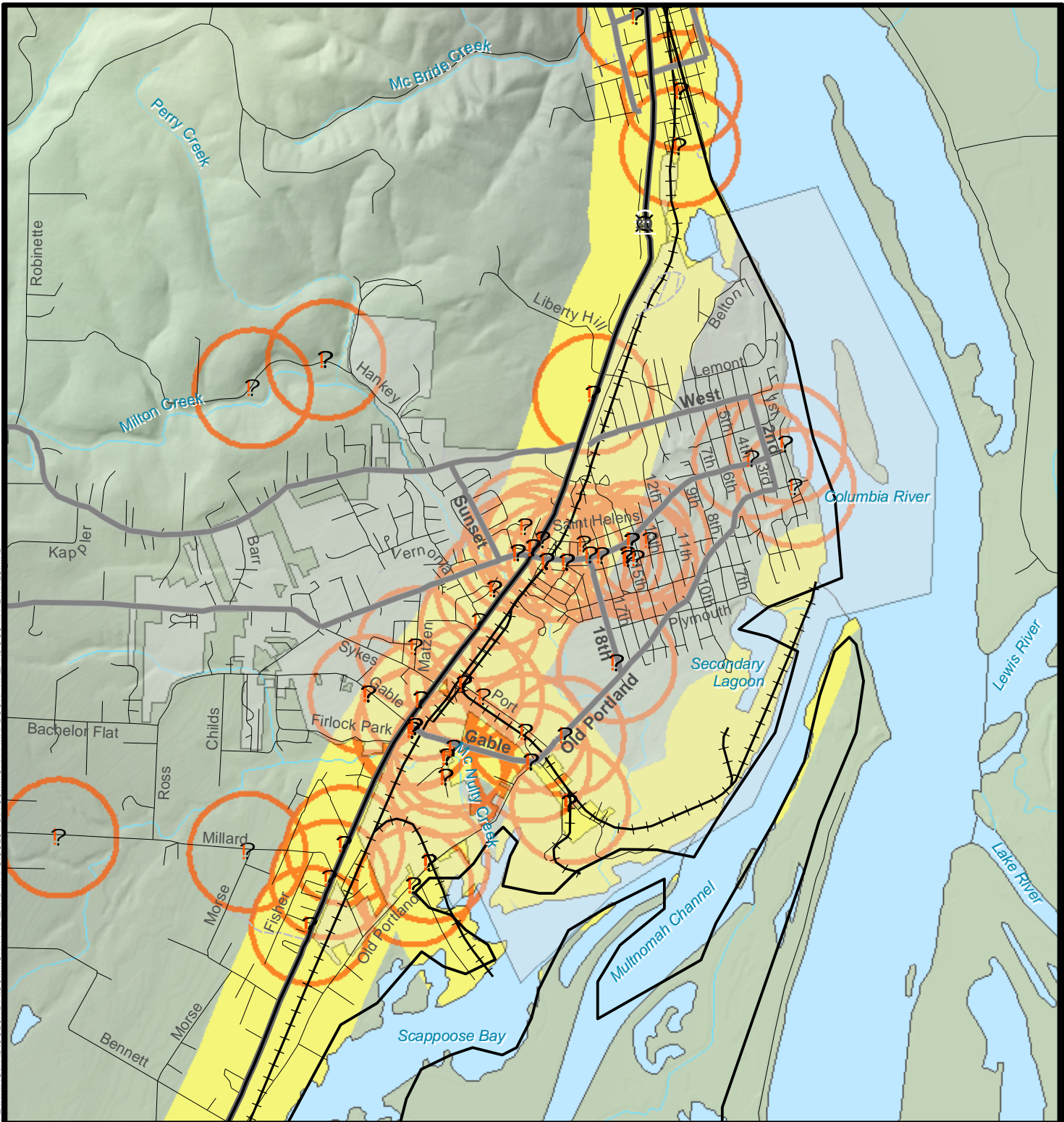
SOURCES: EHS Sites (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008



FIG. NO:  
I-15E

- ### LEGEND
- 1/4-Mile Corridor Along Active Freight Rail and Highways
  - EHS Site 1/4-Mile Buffer
  - EHS Site
  - City Limits
  - Streets & Highways
  - Railroads
  - Lakes & Waterbodies
  - Streams & Waterways

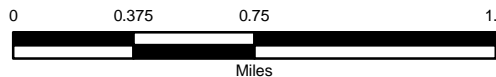
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OVERVIEW MAP



**CITY OF ST. HELENS**  
**HAZARDOUS MATERIALS**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: EHS Sites (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

Columbia County

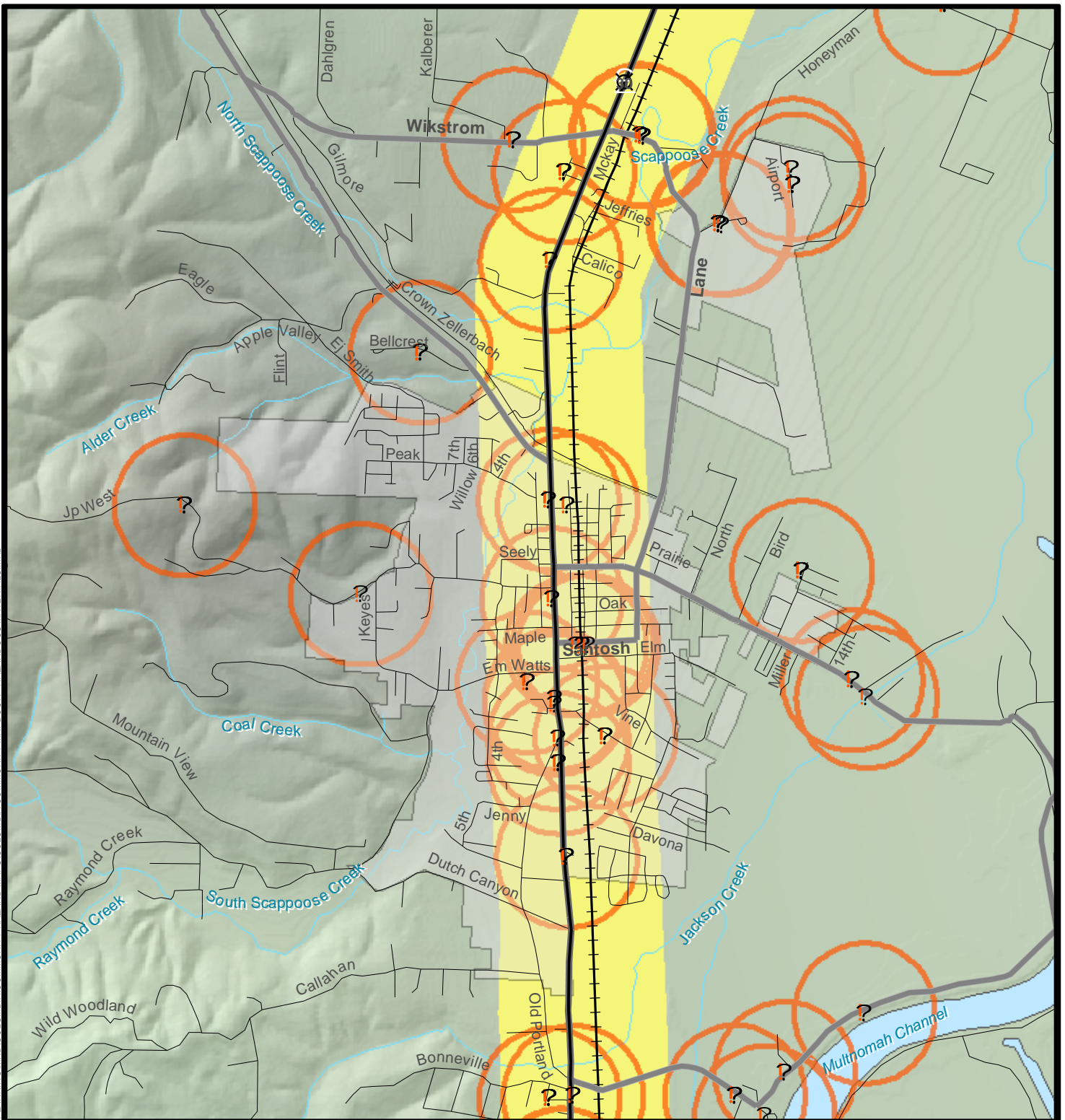


LEGEND

- 1/4-Mile Corridor Along Active Freight Rail and Highways
- EHS Site 1/4-Mile Buffer
- EHS Site
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

FIG. NO:  
I-15F

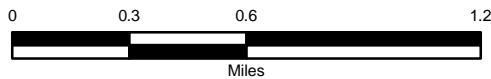




**OVERVIEW MAP**



**CITY OF SCAPPOOSE  
HAZARDOUS MATERIALS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



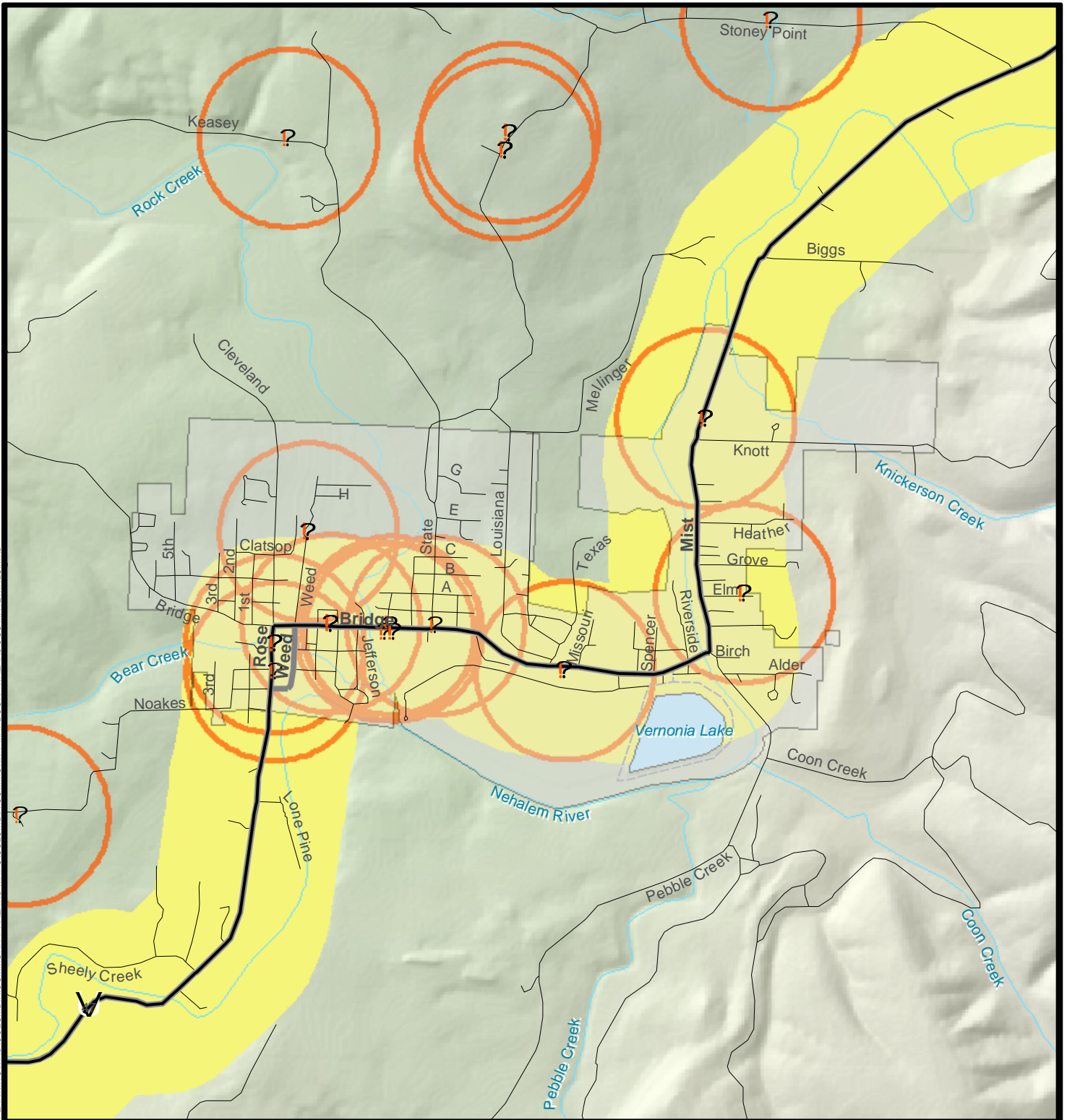
SOURCES: EHS Sites (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-15G

**LEGEND**

- 1/4-Mile Corridor Along Active Freight Rail and Highways
- EHS Site 1/4-Mile Buffer
- EHS Site
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

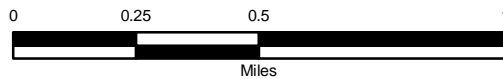
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**OVERVIEW MAP**



**CITY OF VERNONIA  
HAZARDOUS MATERIALS  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: EHS Sites (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

Columbia County



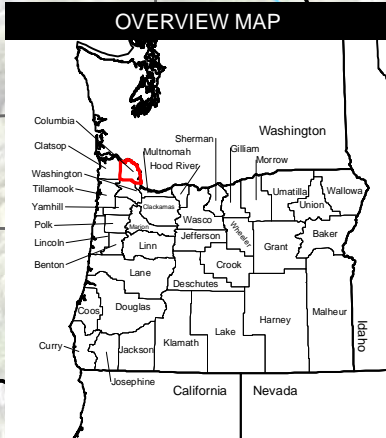
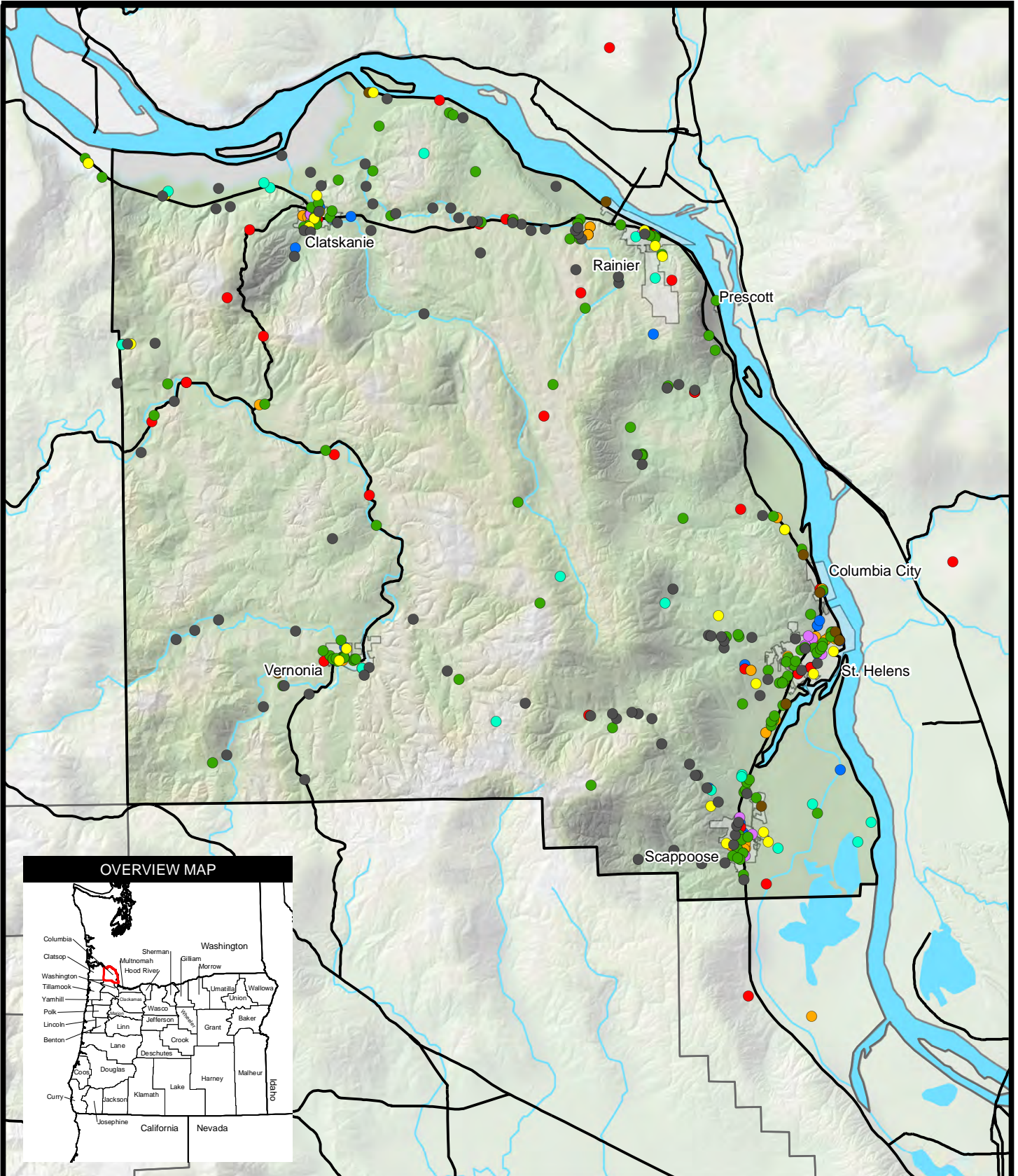
Oregon

**LEGEND**

- 1/4-Mile Corridor Along Active Freight Rail and Highways
- EHS Site 1/4-Mile Buffer
- EHS Site
- City Limits
- Streets & Highways
- Railroads
- Lakes & Waterbodies
- Streams & Waterways

FIG. NO:  
I-15H

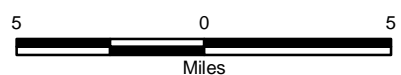




**LEGEND**

- |   |  |  |
|---|--|--|
| <span style="color: purple;">●</span> Care Facility | <span style="color: red;">●</span> Emergency Response        | <span style="border: 1px solid grey; display: inline-block; width: 15px; height: 10px;"></span> City Limits      |
| <span style="color: green;">●</span> Community      | <span style="color: blue;">●</span> Government               | <span style="border: 2px solid black; display: inline-block; width: 15px; height: 10px;"></span> County Boundary |
| <span style="color: cyan;">●</span> Dams            | <span style="color: brown;">●</span> Ground & Air Facilities | <span style="border-bottom: 2px solid black; display: inline-block; width: 20px;"></span> Major Road or Highway  |
| <span style="color: orange;">●</span> Educational   | <span style="color: yellow;">●</span> Utilities              | <span style="color: blue; font-size: 2em;">~</span> Streams & Waterways  |
| <span style="color: grey;">▲</span> City            |  | <span style="color: lightblue; font-size: 2em;">~</span> Lakes & Waterbodies                                     |

**CRITICAL FACILITIES  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**

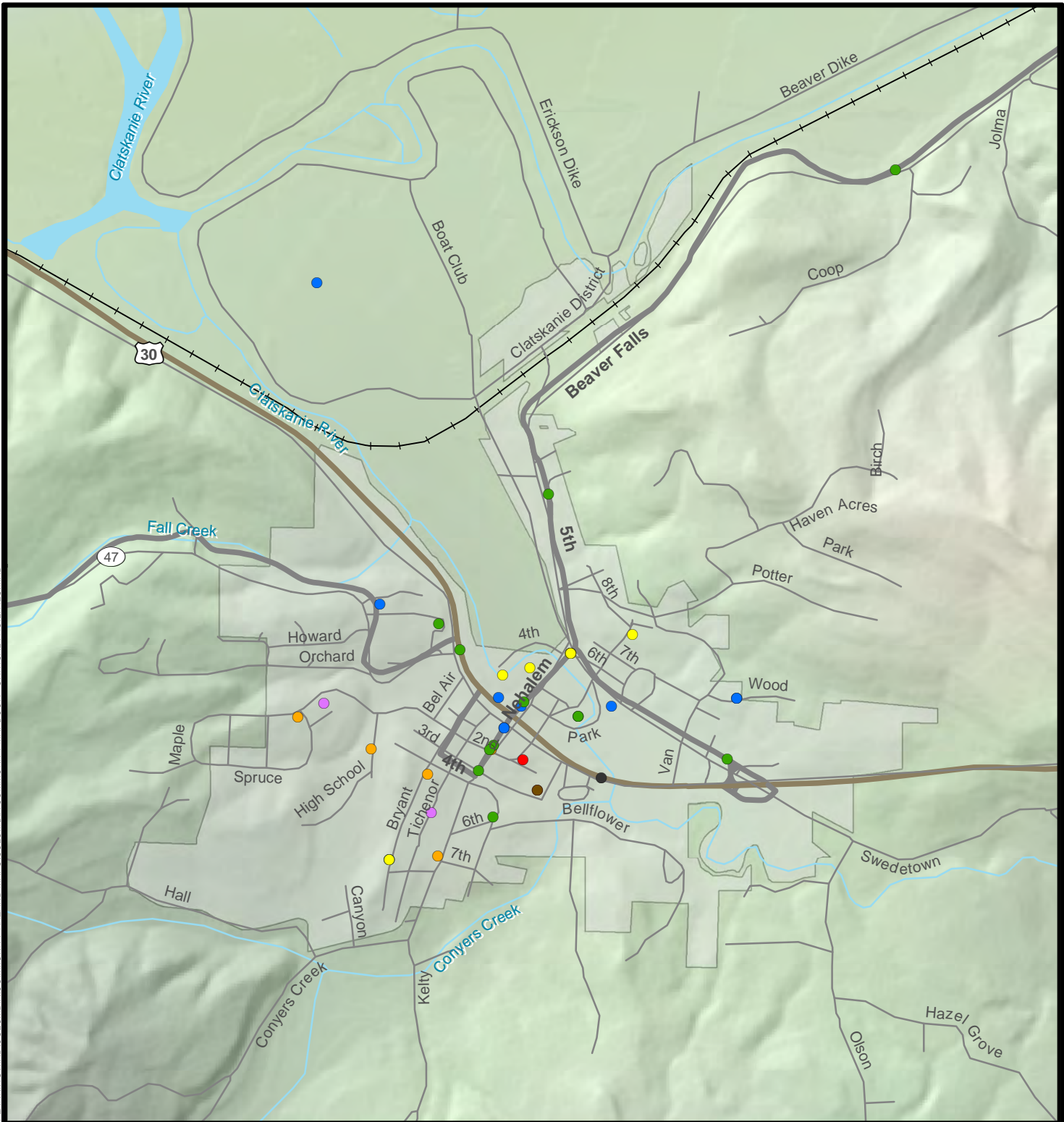


SOURCES: Critical Facilities (Oregon), ESRI (highways 1996), USGS (counties, cities, lakes, rivers, hillshade) MAP DATA: July, 2008

**FIG. NO:  
I-16**



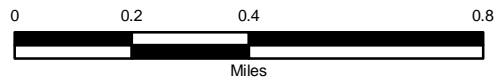
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**OVERVIEW MAP**



**CITY OF CLATSKANIE  
CRITICAL FACILITIES  
COLUMBIA COUNTY  
HAZARD MITIGATION PLAN**



SOURCES: Critical Facilities (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

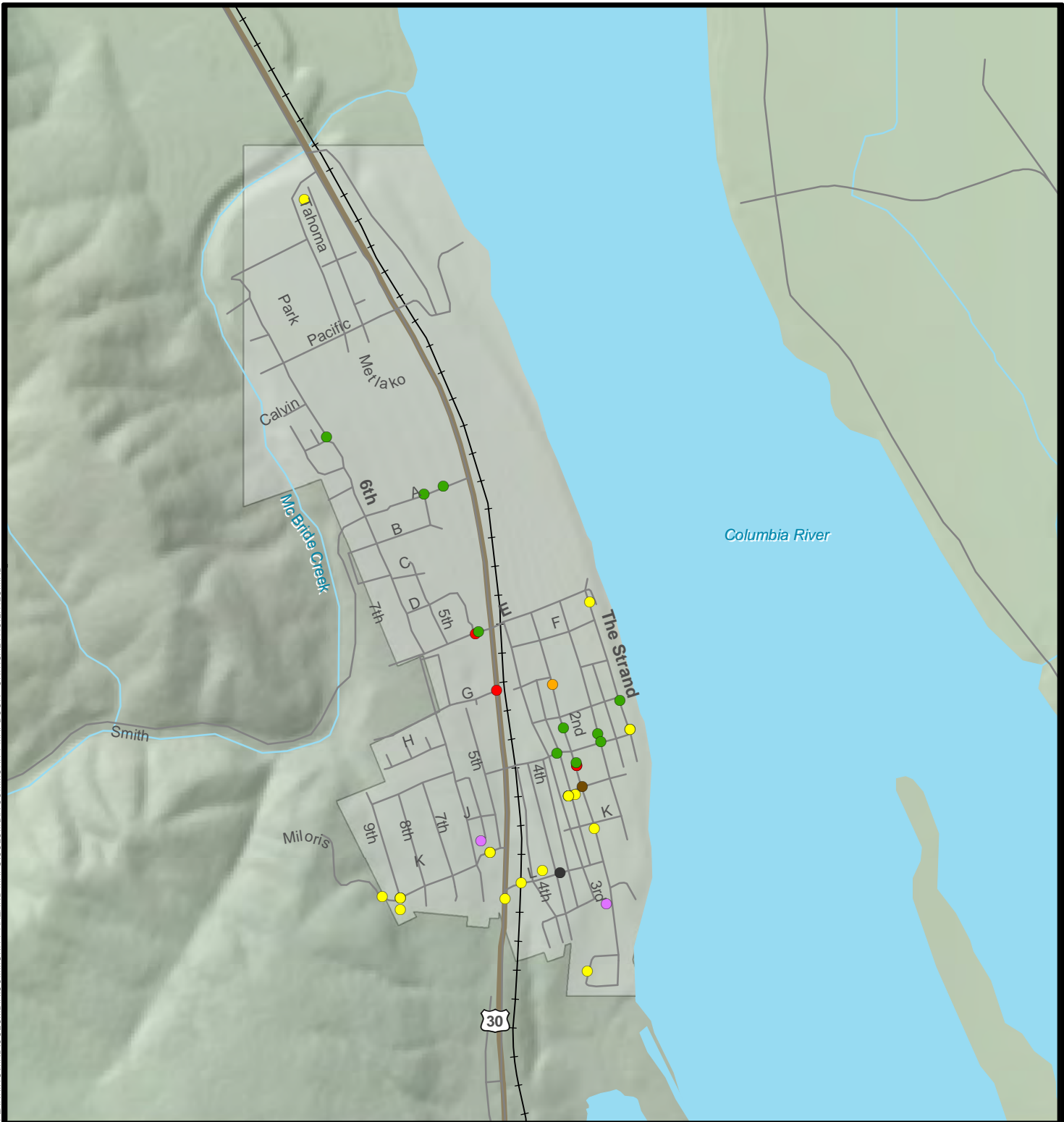
FIG. NO:  
I-17

**LEGEND**

- Bridges
- Care Facility
- Community
- Dams
- Educational
- Emergency Response
- Government
- Ground & Air Facilities
- Utilities
- City Limits
- Streets & Highways
- ~ Lakes & Waterbodies
- ~ Streams & Waterways

NOTE: Critical facility coordinates were obtained from publicly available mapping databases.

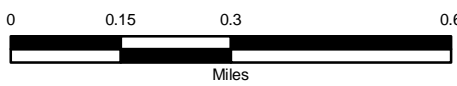
M:\PROJECTS\2008\153002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - CRITICAL FACILITIES.MXD



OVERVIEW MAP



**COLUMBIA CITY**  
**CRITICAL FACILITIES**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Critical Facilities (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-18

LEGEND

- Bridges
- Care Facility
- Community
- Dams
- Educational
- Emergency Response
- Government
- Ground & Air Facilities
- Utilities
- City Limits
- Streets & Highways
- ~ Lakes & Waterbodies
- ~ Streams & Waterways

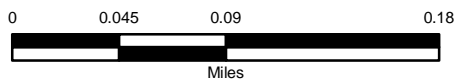
NOTE: Critical facility coordinates were obtained from publicly available mapping databases.



OVERVIEW MAP



**CITY OF PRESCOTT**  
**CRITICAL FACILITIES**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Critical Facilities (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

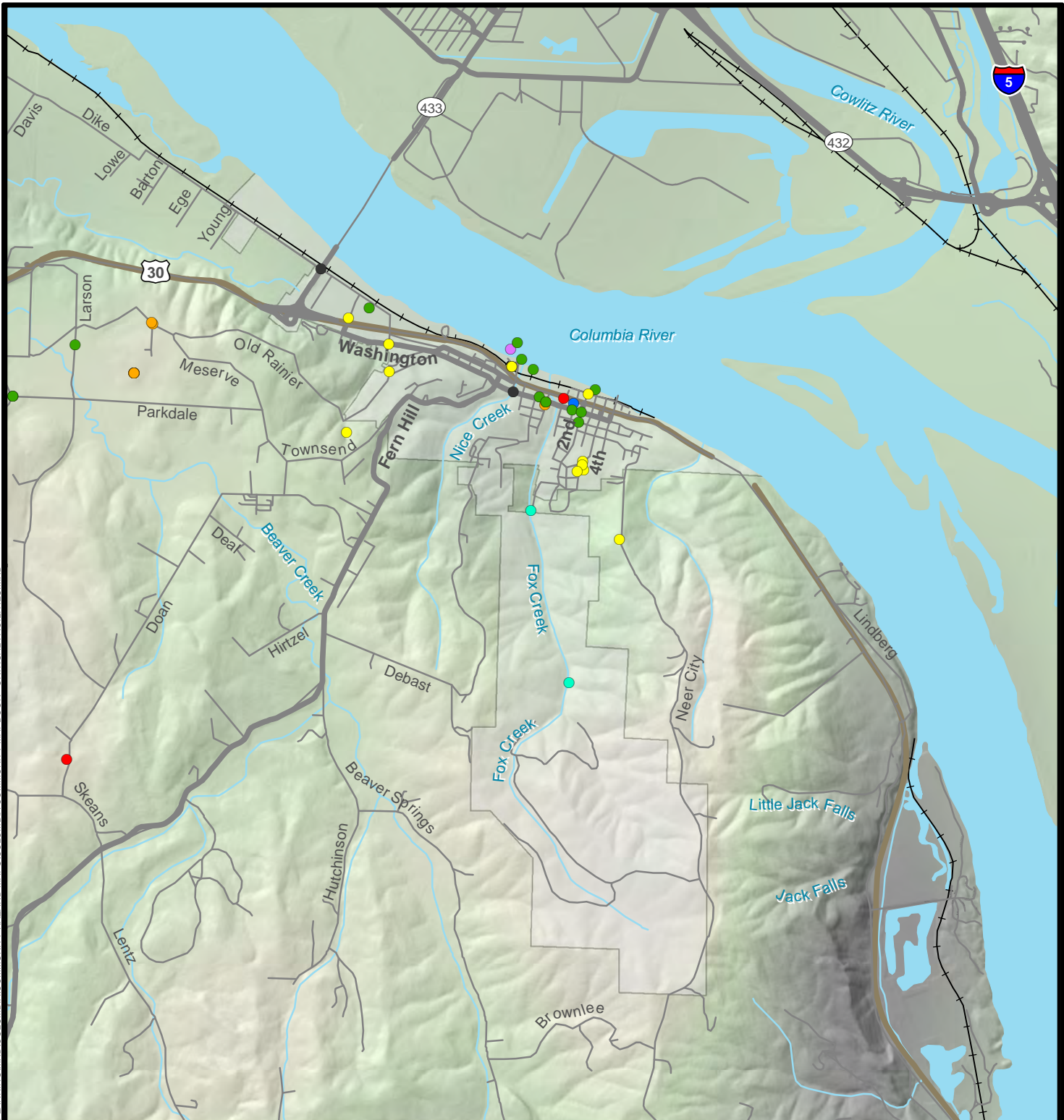
FIG. NO:  
I-19

LEGEND

- Bridges
- Care Facility
- Community
- Dams
- Educational
- Emergency Response
- Government
- Ground & Air Facilities
- Utilities
- City Limits
- Streets & Highways
- Lakes & Waterbodies
- Streams & Waterways



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**CITY OF RAINIER**  
**CRITICAL FACILITIES**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**

0      0.45      0.9      1.8  
Miles

SOURCES: Critical Facilities (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

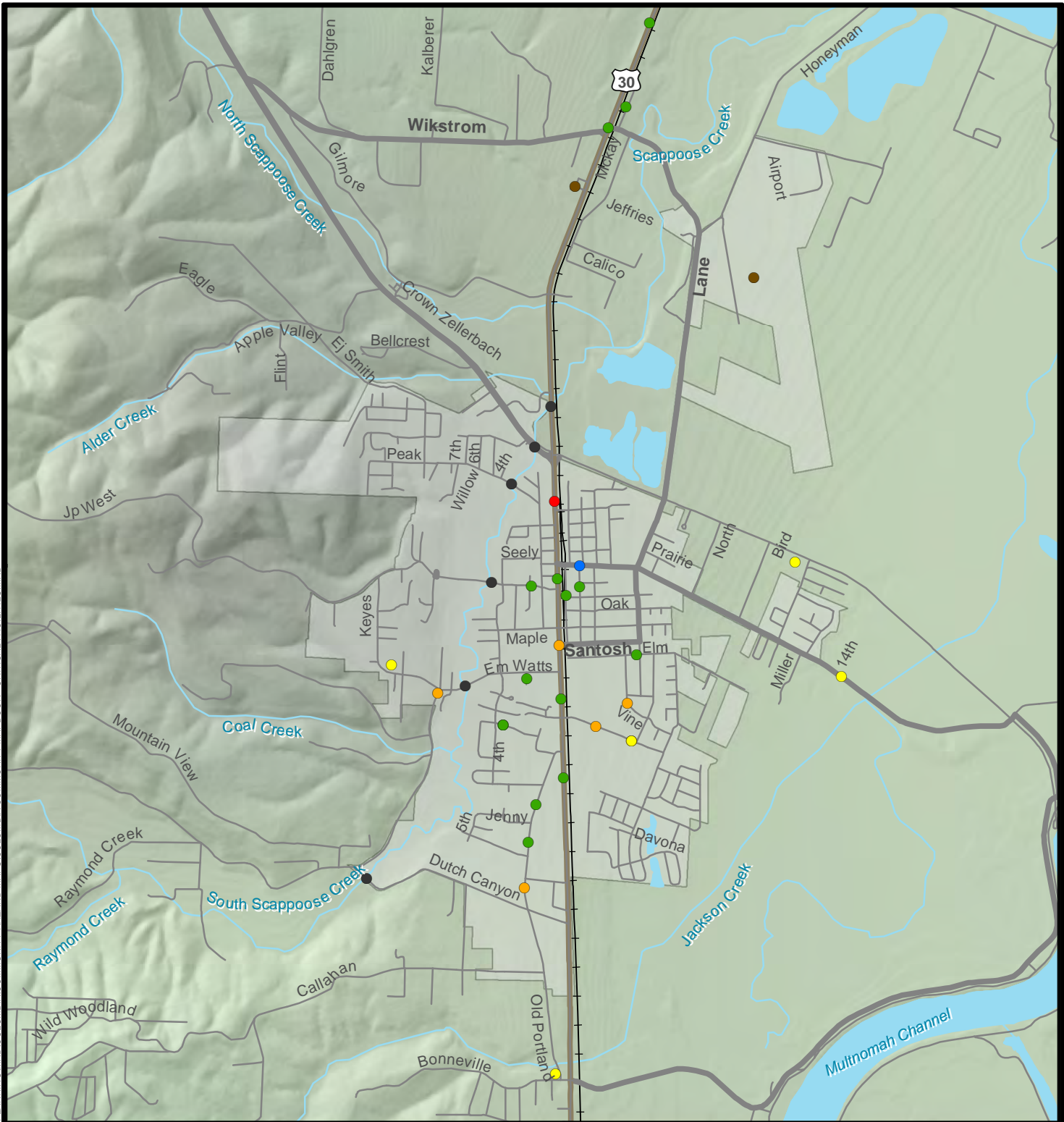


**LEGEND**

	Bridges
	Care Facility
	Community
	Dams
	Educational
	Emergency Response
	Government
	Ground & Air Facilities
	Utilities
	City Limits
	Streets & Highways
	Lakes & Waterbodies
	Streams & Waterways

**FIG. NO:**  
I-20

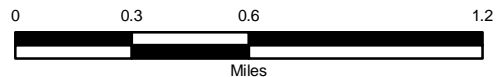
NOTE: Critical facility coordinates were obtained from publicly available mapping databases.



OVERVIEW MAP



**CITY OF SCAPPOOSE**  
**CRITICAL FACILITIES**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Critical Facilities (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

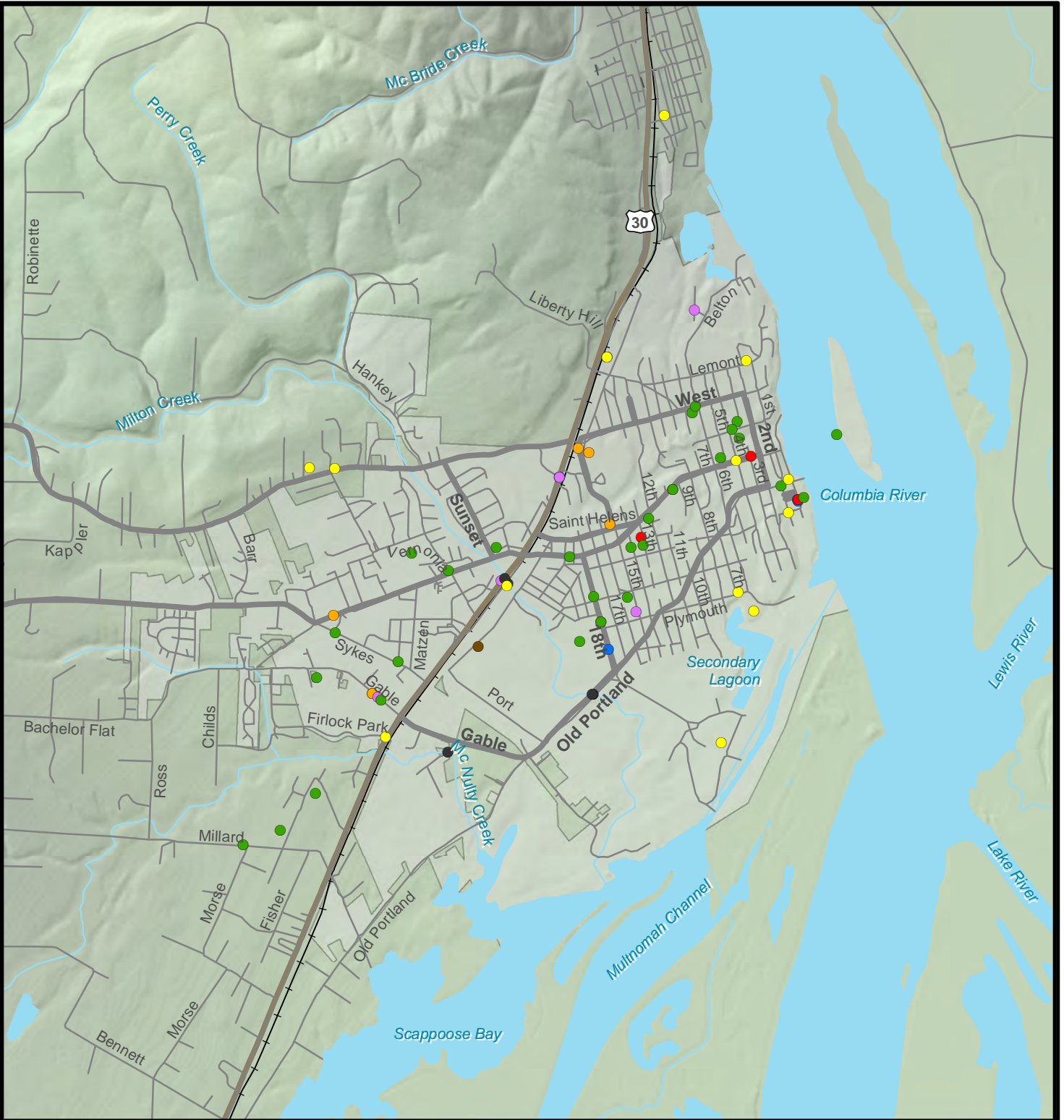
FIG. NO:  
I-21

LEGEND

- Bridges
- Care Facility
- Community
- Dams
- Educational
- Emergency Response
- Government
- Ground & Air Facilities
- Utilities
- City Limits
- Streets & Highways
- Lakes & Waterbodies
- Streams & Waterways



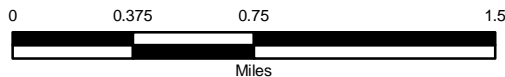
M:\PROJECTS\2008\153002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\MXD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - CRITICAL FACILITIES.MXD



OVERVIEW MAP



**CITY OF ST. HELENS**  
**CRITICAL FACILITIES**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Critical Facilities (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

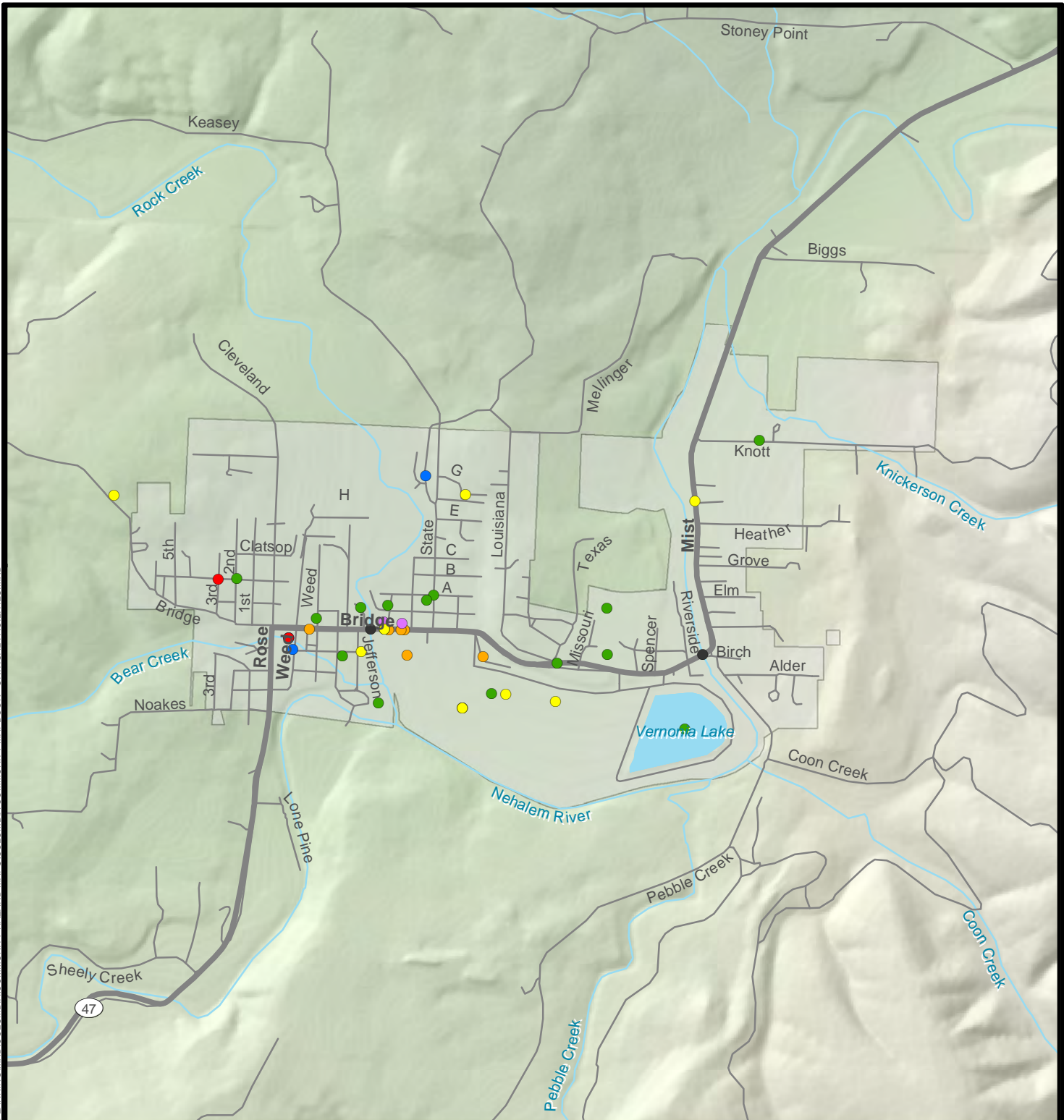
FIG. NO:  
I-22

LEGEND

- Bridges
- Care Facility
- Community
- Dams
- Educational
- Emergency Response
- Government
- Ground & Air Facilities
- Utilities
- City Limits
- Streets & Highways
- ~ Lakes & Waterbodies
- ~ Streams & Waterways

NOTE: Critical facility coordinates were obtained from publicly available mapping databases.

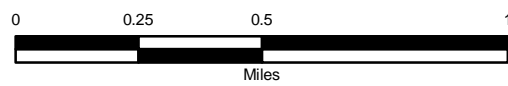
M:\PROJECTS\2008\153002933 - FEMA - OREGON HAZARD MITIGATION PLANNING\CD\COLUMBIA\COMMUNITY HAZARD MAPS\COLUMBIA COMMUNITY MAPBOOK - CRITICAL FACILITIES.MXD



OVERVIEW MAP



**CITY OF VERNONIA**  
**CRITICAL FACILITIES**  
**COLUMBIA COUNTY**  
**HAZARD MITIGATION PLAN**



SOURCES: Critical Facilities (Oregon), Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008

FIG. NO:  
I-23

LEGEND

- Bridges
- Care Facility
- Community
- Dams
- Educational
- Emergency Response
- Government
- Ground & Air Facilities
- Utilities
- City Limits
- Streets & Highways
- ~ Lakes & Waterbodies
- ~ Streams & Waterways

NOTE: Critical facility coordinates were obtained from publicly available mapping databases.





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**Appendix J**  
**FEMA Crosswalk**

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**Appendix K**  
**Adoption Resolution**

To be completed after FEMA pre-adoption approval

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**Appendix L**  
**Steering Committee Meetings**



*Laura Young, URS, May 20, 2008 – URS Notes added to agenda items.*

## Introductions of Steering Committee Members

### Purpose of the Committee

Re-confirm Mission Statement and Goals – *reviewed 2005 goals – accepted – URS recommended waiting until after completion of the risk assessment to evaluate goals and will revisit once completed.*

### Review Mitigation Planning Flowchart

Main Focus Items for this Review – *discussed the need for updated historical data, particularly from the 2007 winter storm/flood event. Also discussed that several types of hazard impacts are discussed in the winter storm hazard profile, and the decision to follow the State of Oregon format for that hazard.*

- Update Historical Data
- Floods
- Wildland Fires
- Winter Storms

Review Action Items from FEMA / URS – reviewed action items – done or not? Priority or not? Who is going to do it? – *reviewed action items (flood, winter storms, landslide, wildland fire, earthquake). Still need to review volcano, dam safety, utility & transportation system disruption, hazmat, and terrorism. Discussed the need to identify specifics for each mitigation action (who is responsible for implementation (position & department), how it is going to be funded, timeframe to implement, statement on the benefit-costs, and technical feasibility).*

- *Flood (within FEMA-mapped floodplains)*
  - *Short-Term 1 & 2 will be completed by URS during the course of this project*
  - *Short-Term 3 – continue*
  - *Long-Term 1 – continue – change responsible department to surveyors*
  - *Long-Term 2 – re-evaluate after risk assessment*
- *Flood (outside FEMA-mapped floodplains)*

- *Short-Term 1 – revised to include “based on 2007 USACOE flood data”*
- *Long-Term 1 – continue*
- *Add Short-Term 2 – request DOGAMI debris flow/Lahar data be included in FIRM update*
- *Add Long-Term 2 – Support FIRM update*
- *Winter Storms*
  - *Short-Term 1 – not completed*
  - *Short-Term 2 – continue*
  - *Short-Term 3 – continue*
  - *Short-Term 4 – modified from “Ensure that all” to “Identify”*
  - *Long-Term 1 – continue*
  - *Long-Term 2 – continue*
  - *Long-Term 3 – continue*
- *Landslide*
  - *Short-Term 1 - will be completed by URS during the course of this project*
  - *Long-Term 1 - re-evaluate after risk assessment*
  - *Long-Term 2 – team expressed difficulty in implementation – re-evaluate after risk assessment and further discussion is needed regarding the County’s ability to implement land use controls in all high hazard areas*
- *Wildland/Urban Interface Fire*
  - *Short-Term 1 – modify to identify critical facilities and vulnerable populations based on mapped high hazard areas that have already been identified*
  - *Short-Term 2 – continue*
  - *Short-Term 3 – completed – remove from action list*
  - *Long-Term 1 – continue*
  - *Long-Term 2 – continue*



- *Long-Term 3 – partially completed (identify potential fuel breaks) continue*
- *Long-Term 4 – completed – remove from action list*
- *Earthquake*
  - *Short-Term 1 – obtain State data (schools, fire, law enforcement) and continue*
  - *Short-Term 2 – modify to include “high hazard areas”*
  - *Short-Term 3 – continue*
  - *Short-Term 4 – obtain State data (schools, fire, law enforcement) and continue*
  - *Long-Term 1 – continue*
  - *Long-Term 2 – continue*
- *Volcano (action review pending)*
- *Dam Safety (action review pending)*
- *Utility and Transportation System Disruption (action review pending)*
- *Hazmat Incident (action review pending)*
- *Terrorism (action review pending)*

#### Identify Any Additional Hazard Items

*Additional hazards identified for profile: dams and wind storms.  
Potential for pandemic/epidemic – team will review URS prepared materials for discussion.*

#### Additional Discussion Items

- Roles of:
  1. Hazard Mitigation Advisory Committee
  2. Hazard Mitigation Steering Committee
  3. Role of CEPA

#### Next Meeting

Date/Time

Items for Agenda

*Laura Young, URS, May 20, 2008 – URS Notes added to agenda items.*

## Introductions of Steering Committee Members

### Purpose of the Committee

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- Floods
- Wildland Fires
- Winter Storms

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- *Add Long-Term 2 – Support FIRM update*
- *Winter Storms*
  - *Short-Term 1 – not completed*
  - *Short-Term 2 – continue*
  - *Short-Term 3 – continue*
  - *Short-Term 4 – modified from “Ensure that all” to “Identify”*
  - *Long-Term 1 – continue*
  - *Long-Term 2 – continue*
  - *Long-Term 3 – continue*
- *Landslide*
  - *Short-Term 1 - will be completed by URS during the course of this project*
  - *Long-Term 1 - re-evaluate after risk assessment*
  - *Long-Term 2 – team expressed difficulty in implementation – re-evaluate after risk assessment and further discussion is needed regarding the County’s ability to implement land use controls in all high hazard areas*
- *Wildland/Urban Interface Fire*
  - *Short-Term 1 – modify to identify critical facilities and vulnerable populations based on mapped high hazard areas that have already been identified*
  - *Short-Term 2 – continue*
  - *Short-Term 3 – completed – remove from action list*
  - *Long-Term 1 – continue*
  - *Long-Term 2 – continue*

- *Long-Term 3 – partially completed (identify potential fuel breaks) continue*
- *Long-Term 4 – completed – remove from action list*
- *Earthquake*
  - *Short-Term 1 – obtain State data (schools, fire, law enforcement) and continue*
  - *Short-Term 2 – modify to include “high hazard areas”*
  - *Short-Term 3 – continue*
  - *Short-Term 4 – obtain State data (schools, fire, law enforcement) and continue*
  - *Long-Term 1 – continue*
  - *Long-Term 2 – continue*
- *Volcano (action review pending)*
  - *Short-Term 1 – completed (ongoing)*
  - *Short-Term 2 – continue (add river & air transport + and effects to industry/operational)*
  - *Short-Term 3 – continue*
  - *Short-Term 4 – continue*
- *Dam Safety (action review pending)*
  - *Add dykes & dyke districts to language*
  - *Short-Term 1 – modify to address adding dam failure component to county eop (including evacuation routes) (attempt to obtain inundation data)*
  - *Long-Term 1 – revise to prioritize dams and include land management*
  - *Long-Term 2 - revisit*
- *Utility and Transportation System Disruption (action review pending)*
  - *Short-Term 1 – continue*
  - *Short-Term 2 – separate into 2 actions (1 for utilities and 1 for roads) – also identify responsible parties. Help utilities formalize (ask the question - would PDM cover mutual aid agreements).*

- *Short-Term 3 – modify to identify & prioritize all “county-owned” & “non county-owned” critical facilities that have backup power and EOPs.*
- *Hazmat Incident (action review pending)*
  - *Short-Term 1 – revise to annually review and update inventories and training for EMS*
  - *Short-Term 2 – ongoing (add public works)*
  - *Short-Term 3 – modify*
  - *Short-Term 4 – modify – remove “upgrade...” and identify whether the county or LEPC has authority ( county will ask fire marshal regarding authority)*
  - *Short-Term 5 – Train Public Works staff to identify EHS & Notify EMS*
- *Terrorism (action review pending)*
  - *Short-Term 1 - Modify to include planning, organization, equipment and exercise – ongoing*
  - *Long-Term 1 - modify*

#### Identify Any Additional Hazard Items

*Additional hazards identified for profile: dams and wind storms. Potential for pandemic/epidemic – team will review URS prepared materials for discussion.*

#### Additional Discussion Items

- Roles of:
  1. Hazard Mitigation Advisory Committee
  2. Hazard Mitigation Steering Committee
  3. Role of CEPA

#### Next Meeting

Date/Time

Items for Agenda

Review & Edit Appendix A

Columbia County Multi-Hazard Mitigation Plan Steering Committee

Oct 20, 2008  
 Sept 22, 2008

Organization	Initials	Name	Primary Phone	Cell Phone	Email
Columbia County					
Commissioner		Tony Hyde	503-397-4322	503-312-4456	tony.hyde@co.columbia.or.us
Land Development Services		Todd Dugdale	503-368-7207	503-369-1713	todd.dugdale@co.columbia.or.us
County Roads		Lenny Welter	503-366-3963	503-369-5179	lenny.welter@co.columbia.or.us
Economic Development		Janet Wright	503-397-1035	503-369-2964	janet.wright@co.columbia.or.us
Boise Inc. & CEPA		Diane Dillard	503-397-9203	503-396-7087	dianedillard@boisepaper.com
Columbia River F&R Board Chair				503-397-2990	dillardd@crfr.com
CR11CD		Lee Knowlton	503-397-7255 x 2222	503-369-1967	lknowlton@columbia911.com
Clatskanie PUD		Gail Rakitnich	503-728-2163	503-308-2600	clatspud@clatskaniepud.com
Clatskanie Rural Fire		Dick Long	503-728-2025	503-791-0413	longdick@charterinternet.com
Columbia River F&R		Terry Grice	503-397-2990	503-369-3303	gricet@crfr.com
Columbia River PUD		Brian Fawcett	503-366-3261		bpfawcett@crpud.org
First-Birkenfeld F&R		Dave Crawford	503-755-2710	503-791-4628	Crawford_df@yahoo.com
Scappoose RFD		Milke Greisen	503-543-5026		mgreisen@srfd.us
Colco Emergency Management		Vicki Harguth	503-366-3905	503-784-4262	vicki.harguth@co.columbia.or.us
		Frank Hupp	503-366-3927	503-201-7495	frank.hupp@co.columbia.or.us
		Kerry Kraft	503-366-3934		kerry.kraft@co.columbia.or.us
URS, Technical Services Group		Laura Young	800-909-6787; 1; 9686	907-261-9704	laura_young@urscorp.com
		Scott Simmons	800-909-6787; 1; 7466		
On Distribution List:					
Oregon Emergency Management		Dennis Sigrist	503-378-2911		dsigrist@oem.state.or.us
FEMA, Mitigation Planning		Kristen Meyers	425-487-4543		kristen.meyers@dhs.gov
Columbia County, Emergency Recovery		Bill Haack		503-367-7221	bill.haack@co.columbia.or.us
					clvrst@comcast.net

Determine Responsible Department / Agency

Columbia County Multi-Hazard Mitigation Plan Steering Committee

Oct 2  
Sept 22, 2008

Organization	Initials	Name	Primary Phone	Cell Phone	Email
Columbia County Commissioner		Tony Hyde	503-397-4322	503-312-4456	tony.hyde@co.columbia.or.us
Land Development Services	JDS	Todd Dugdale	503-366-7207	503-369-1713	todd.dugdale@co.columbia.or.us
County Roads		Lorrey Welter	503-366-3963	503-369-5179	lorrey.welter@co.columbia.or.us
Economic Development		Janet Wright	503-397-1035	503-369-2964	janet.wright@co.columbia.or.us
Boise Inc. & CEPA		Diane Dillard	503-397-9203	503-396-7067	dianedillard@boisepaper.com
Columbia River F&R Board Chair				503-397-2990	dillardd@crfr.com
C911CD	WV	Lee Knowlton	503-397-7255 x 2222	503-369-1967	lknowlton@co.columbia911.com
Clatskanie PUD		Gail Rakitnich	503-728-2163	503-308-2600	glatstkn@clatskaniepud.com
Clatskanie Rural Fire		Dick Long	503-728-2025	503-791-0413	longd@clatskanieinternet.com
Columbia River F&R	RL	Terry Grice	503-397-2990	503-369-3303	gricet@crfr.com
Columbia River PUD	BF	Brian Fawcett	503-366-3261		bfawcett@crpud.org
Mist-Birkenfeld F&R		Dave Crawford	503-755-2710	503-791-4628	Crawford_dj@yahoo.com
Scappoose RFD	SP	Mike Greisen	503-543-5026		mgreisen@srfd.us
Colco Emergency Management	HA	Vicki Harguith	503-366-3905	503-784-4262	vicki.harguith@co.columbia.or.us
		Frank Hupp	503-366-3927	503-201-7495	frank.hupp@co.columbia.or.us
		Kerry Kraft	503-366-3934		kerry.kraft@co.columbia.or.us
URS, Technical Services Group		Laura Young	800-909-6787, 1; 9686	907-261-9704	laura_young@urscorp.com
		Scott Simmons	800-909-6787, 1; 7466		
On Distribution List:					
Oregon Emergency Management		Dennis Sigrist	503-378-2911		dsigrist@oem.state.or.us
FEMA, Mitigation Planning		Kristen Meyers	425-487-4543		kristen.meyers@dhs.gov
Columbia County, Emergency Recovery		Bill Haack		503-367-7221	bill.haack@co.columbia.or.us
					clvrst@comcast.net

Prioritize Action Items

Columbia County Multi-Hazard Mitigation Plan Steering Committee

Sept 22, 2008

Organization	Initials	Name	Primary Phone	Cell Phone	Email
Columbia County					
Commissioner	<i>JH</i>	Tony Hyde	503-397-4322	503-312-4456	tony.hyde@co.columbia.or.us
Land Development Services	<i>JD</i>	Todd Dugdale	503-366-7207	503-369-1713	todd.dugdale@co.columbia.or.us
County Roads	<i>LRW</i>	Lanny Weiler	503-366-3963	503-369-5179	lanny.weiler@co.columbia.or.us
Economic Development		Janet Wright	503-397-1035	503-368-2964	janet.wright@co.columbia.or.us
Boise Inc. & CEPA		Diane Dillard	503-397-9203	503-396-7067	dianedillard@boisepaper.com
Columbia River F&R Board Chair				503-397-2990	dillard@crf.com
C911CD	<i>WL</i>	Lee Knowlton	503-397-7255 x 2222	503-369-1967	lknowlton@columbia911.com
Clatskanie PUD	<i>GR</i>	Gail Rakitnitch	503-728-2163	503-309-2442	clatspu@clatskaniepud.com
Clatskanie Rural Fire	<i>DL</i>	Dick Long	503-728-2025	503-791-0413	longcfd@charterinternet.com
Columbia River F&R	<i>TR</i>	Terry Grice	503-397-2990	503-369-3303	gricet@crf.com
Columbia River PUD	<i>BF</i>	Brian Fawcett	503-366-3261		bifawcett@crpud.org
Mist-Birkenfeld F&R		Dave Crawford	503-755-2710	503-791-4628	Crawford_df@yahoo.com
Scappoose RFD		Mike Greisen	503-543-5026		mgreisen@srfd.us
Colco Emergency Management	<i>VA</i>	Vicki Harguith	503-366-3905	503-784-4262	vicki.harguith@co.columbia.or.us
	<i>FR</i>	Frank Hupp	503-366-3927	503-201-7495	frank.hupp@co.columbia.or.us
	<i>KK</i>	Kerry Kraft	503-366-3934		kerry.kraft@co.columbia.or.us
URS, Technical Services Group		Laura Young	800-909-6787, 1; 9686	907-261-9704	laura_young@urscorp.com
		Scott Simmons	800-909-6787, 1; 7466		
On Distribution List:					
Oregon Emergency Management		Dennis Sigrist	503-378-2911		dsigrist@oem.state.or.us
FEMA, Mitigation Planning		Kristen Meyers	425-487-4543		kristen.meyers@dhs.gov
Columbia County, Emergency Recovery		Bill Haack		503-367-7221	bill.haack@co.columbia.or.us
					clvst@comcast.net



**ELIGIBLE AND INELIGIBLE HAZARD MITIGATION ACTIVITIES**

**COST-SHARE:**

Up to 75 percent Federal cost share. Small and impoverished communities may be eligible for up to a 90 percent Federal cost-share.

**ELIGIBLE PROJECT ACTIVITIES:**

- Public awareness and education (brochures, workshops, videos, etc.)
- Voluntary acquisition of real property (i.e., structures and land, where necessary) for conversion to open space in perpetuity (any hazard)
- Relocation of public or private structures (any hazard)
- Elevation of existing public or private structures to avoid coastal or riverine flooding
- Seismic structural retrofitting and nonstructural retrofitting of existing public or private structures to meet or exceed applicable building codes relative to hazard mitigation
- Hydrologic and Hydraulic studies/analyses, engineering studies, and drainage studies for the purpose of project design and feasibility determination
- Vegetation management for wildfire
- Shoreline stabilization
- Landslide stabilization
- Wetland restoration
- Protective measures for utilities (e.g., electric and gas), water and sanitary sewer systems, and/or infrastructure (e.g., roads and bridges)
- Stormwater management projects (culverts, retention basins, diversions, flapgates/floodgates) to reduce or eliminate long-term risk from flood hazards
- Localized flood control projects, such as certain ring levees, bank stabilization, and floodwall systems that are designed specifically to protect critical facilities (defined as Hazardous Materials Facilities, Emergency Operation Centers, Power Facilities, Water Facilities, Sewer and Wastewater Treatment Facilities, Communications Facilities, Emergency Medical Care Facilities, Fire Protection, and Emergency Facilities) and that do not constitute a section of a larger flood control system
- Any of the above mitigation projects for a critical facility, as defined above, may include the purchase of a generator or related equipment purchases (e.g., generator hookups) as a functional portion to the larger eligible mitigation project sub-application, as long as the generator or related equipment purchase directly relates to the hazard(s) that threatens the critical facility

**INELIGIBLE PLANNING ACTIVITIES:**

- Flood studies or flood mapping
- Mapping activities that are not part of a risk assessment
- Risk assessments, technical assistance, studies, or workshops not resulting in a FEMA-approved hazard mitigation plan

## Appendix L Steering Committee Meetings

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- Information dissemination activities exceeding 10 percent of the total cost of the planning sub-application or that are not tied directly to a PDM planning sub-application
- Any ground disturbing activity that would initiate the environmental review and compliance process
- Pre-award activities not directly related to the development of the planning sub-application or implementing the proposed planning activity and limited revisions and amendments that do not result in a comprehensive hazard mitigation plan update

### **INELIGIBLE PROJECT ACTIVITIES:**

- Major flood control projects
- Water quality infrastructure projects
- Projects that address ecological issues related to land and forest management
- Warning and alert notification systems
- Phased or partial projects
- Studies that do not result in a project (e.g., engineering designs, feasibility studies, or drainage studies that are not integral to a proposed project);
- Flood studies or flood mapping (general H&H studies not integral to project design)
- Dry flood proofing of residential structures
- Generators for noncritical facilities
- Generators and related equipment (e.g., generator hookups) for critical facilities that are not part of a larger eligible mitigation project sub-application and are not directly related to the hazard(s) that threaten that critical facility
- Any mitigation activities involving demolishing an existing structure (i.e., commercial or residential building) and building a new structure (i.e., demolition/ rebuild) in floodplains
- Projects that solely address a man-made hazard
- Response and communication equipment
- Projects that solely address maintenance or repairs of existing structures, facilities, or infrastructure (e.g., dredging and removal)
- Localized flood control projects that do not protect a critical facility or constitute a part of a larger project
- Any project for which another Federal agency has primary authority

**Table 7-3 Evaluation Criteria for Mitigation Actions**

<b>Evaluation Category</b>	<b>Discussion</b> “It is important to consider...”	<b>Considerations</b>
<b>Social</b>	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
<b>Technical</b>	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
<b>Administrative</b>	If the community has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.	Staffing Funding allocation Maintenance/operations
<b>Political</b>	What the community and its members feel about issues related to the environment, economic development, safety, and emergency management.	Political support Local champion Public support
<b>Legal</b>	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Local, State, and Federal authority Potential legal challenge
<b>Economic</b>	If the action can be funded with current or future internal and external sources, if the costs seem reasonable for the size of the project, and if enough information is available to complete a FEMA BCA.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA BCA
<b>Environmental</b>	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, State, and Federal laws



**Appendix M**  
**Public Outreach**



# HMTAP First Step Meeting

April 9, 2008

## CITIES

		Primary Phone	Cell Phone	Email
<b>Clatskanie</b>				
Mayor	Diane Pohl	503-728-3258	503-308-2663	<a href="mailto:mayor@clatskanie.com">mayor@clatskanie.com</a>
Public Works Director	Dave True	503-741-0802		<a href="mailto:true@clatskanie.com">true@clatskanie.com</a>
Police Chief	Marvin Hoover	503-728-2145	503-741-0806	<a href="mailto:mhoover59@charterinternet.com">mhoover59@charterinternet.com</a>
City Planning Commission	Ray Pohl	503-728-3258	503-308-2663	<a href="mailto:mayor@clatskanie.com">mayor@clatskanie.com</a>
<b>Columbia City</b>				
City Administrator	Leahnette Rivers	503-397-4010		<a href="mailto:lrivers@columbia-city.org">lrivers@columbia-city.org</a>
<b>Prescott</b>				
Mayor	Kevin Miller	503-556-2135		<a href="mailto:ckmiller@opusnet.com">ckmiller@opusnet.com</a>
<b>Rainier</b>				
City Administrator	Lars Gare	503-556-7301		<a href="mailto:lgare@cityofrainier.com">lgare@cityofrainier.com</a>
<b>Scappoose</b>				
City Manager	Jon Hanken	503-543-8404		<a href="mailto:jonhanken@ci.scappoose.or.us">jonhanken@ci.scappoose.or.us</a>
<b>St. Helens</b>				
Community Development Dir.	Skip Baker	503-397-6272		<a href="mailto:skip@ci.st-helens.or.us">skip@ci.st-helens.or.us</a>
Police Chief	Steve Salle	503-397-3333	503-318-1075	<a href="mailto:steves@ci.st-helens.or.us">steves@ci.st-helens.or.us</a>
<b>Vernonia</b>				
Grants Administrator	Jessie Jones	503-989-7244		<a href="mailto:Jesse.Vernonia@gmail.com">Jesse.Vernonia@gmail.com</a>

## COLUMBIA COUNTY

		Primary Phone	Cell Phone	Email
<b>Columbia County</b>				
Commissioner	Tony Hyde	503-397-4322	503-312-4456	<a href="mailto:tony.hyde@co.columbia.or.us">tony.hyde@co.columbia.or.us</a>
Land Development Services	Todd Dugdale	503-366-7207	503-369-1713	<a href="mailto:todd.dugdale@co.columbia.or.us">todd.dugdale@co.columbia.or.us</a>
County Roads	Lonny Welter	503-366-3963		<a href="mailto:lonny.welter@co.columbia.or.us">lonny.welter@co.columbia.or.us</a>
Col Co Emergency Recovery	Bill Haack	503-367-7221		<a href="mailto:haackb@co.columbia.or.us">haackb@co.columbia.or.us</a>
<b>C R F &amp; R</b>				
Board Chair	Diane Dillard	503-397-9203	503-396-7067	<a href="mailto:dillardd@crfr.com">dillardd@crfr.com</a>
			503-397-2990	
	Terry Grice			<a href="mailto:gricet@crfr.com">gricet@crfr.com</a>
<b>C911CD</b>				
	Lee Knowlton	503-397-7255 x 2222	503-369-1967	<a href="mailto:lknowlton@columbia911.com">lknowlton@columbia911.com</a>
<b>Boise Inc</b>				
Communications Manager	Diane Dillard	503-397-9203	503-396-7067	<a href="mailto:dianedillard@boisepaper.com">dianedillard@boisepaper.com</a>
<b>Mist-Birkenfeld F &amp; R</b>				
Fire Chief	Dave Crawford	503-755-2710	503-791-4628	<a href="mailto:Crawford_df@yahoo.com">Crawford_df@yahoo.com</a>
<b>Scappoose R F D</b>				
Fire Chief	Mike Greisen	503-543-3114		<a href="mailto:mgreisen@srfd.us">mgreisen@srfd.us</a>
<b>ColCo EM</b>				
Director	Vicki Harguth	503-366-3905	503-784-4262	<a href="mailto:vicki.harguth@co.columbia.or.us">vicki.harguth@co.columbia.or.us</a>
	Frank Hupp	503-366-3927	503-201-7495	<a href="mailto:frank.hupp@co.columbia.or.us">frank.hupp@co.columbia.or.us</a>
<b>State OEM</b>				
	Dennis Sigrist	503-378-2911		<a href="mailto:dsigrist@oem.state.or.us">dsigrist@oem.state.or.us</a>
<b>FEMA</b>				
Mitigation Planning Manager	Kristen Meyers	425-487-4543		<a href="mailto:kristen.meyers@dhs.gov">kristen.meyers@dhs.gov</a>
<b>URS</b>				
Technical Services Group Manager	Laura Young	907-562-3366	907-261-9704	<a href="mailto:laura_young@urscorp.com">laura_young@urscorp.com</a>
Invironmental Planner	April Brehm	907-562-3366	907-261-9743	<a href="mailto:april_brehm@urscorp.com">april_brehm@urscorp.com</a>
Graduate Urban Planner	David Ghosh	510-893-3600	510-874-3127	<a href="mailto:david_hqosh@urscorp.com">david_hqosh@urscorp.com</a>

	<p><b>COLUMBIA COUNTY MULTI- JURISDICTIONAL MULTI-HAZARD MITIGATION PLAN</b></p>
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|  | <p><b><i>Planning Assistance Team</i></b></p>  |
|  | <ul style="list-style-type: none"> <li>■ Kristen Meyers, FEMA Region X</li> <li>■ Dennis Sigrist, Oregon OES</li> <li>■ Laura Young, URS Consultant</li> <li>■ April Brehm, URS Consultant</li> <li>■ David Ghosh, URS Consultant</li> </ul> |

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|  | <p><b><i>What Is Hazard Mitigation Planning?</i></b></p>   |
|  | <p>Process to identify policies, activities and tools to implement mitigation actions</p> <ul style="list-style-type: none"> <li>- Strengthen and enforce codes and ordinances prohibiting development in hazard-prone areas</li> <li>- Educate residents and businesses about development in hazard-prone areas</li> <li>- Improve flood control structures</li> <li>- Relocate, elevate or flood proof flood-prone structures</li> </ul> |

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|  | <p><b><i>What is Needed from each Jurisdiction?</i></b></p>  |
|  | <ul style="list-style-type: none"> <li>■ Active Participation</li> <li>■ Engagement through the Process</li> <li>■ Advocacy / Enthusiasm for the Process</li> <li>■ Understanding</li> </ul> |

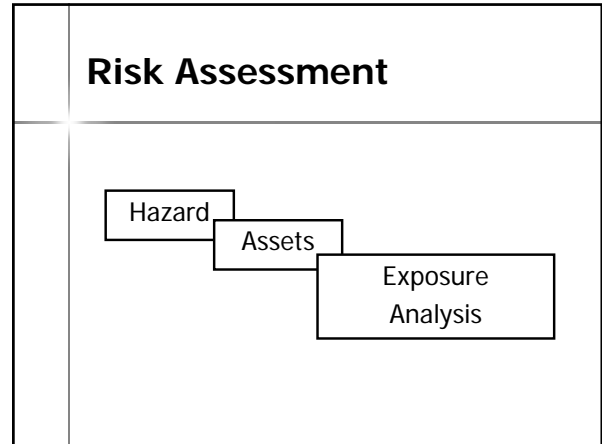
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|  | <p><b><i>Why Do We Need A Plan?</i></b></p>  |
|  | <ul style="list-style-type: none"> <li>■ Community Benefits             <ul style="list-style-type: none"> <li>- Hazard Awareness &amp; Community Safety</li> <li>- Avoid Development in Hazard-Prone Areas</li> <li>- Develop / Improve Ordinances and Enforcement</li> <li>- Eligibility for Mitigation Project Funding</li> </ul> </li> <li>■ State Benefits             <ul style="list-style-type: none"> <li>- Data to Support Enhanced Mitigation Planning Efforts</li> </ul> </li> </ul> |

- |  |   |
|--|---|
|  | <p><b><i>The Planning Process</i></b></p>   |
|  | <ul style="list-style-type: none"> <li>■ Hazard Identification</li> <li>■ Risk Assessment</li> <li>■ Planning Goals</li> <li>■ Mitigation Programs, Actions, and Projects</li> <li>■ A Resolution from the Community Adopting the Plan</li> </ul> |





Types of Critical Facilities (from Columbia County HMP)	
Emergency Services	Fire Stations
	Police Stations
	Ambulance Services
	Emergency Operations Center
	Emergency Shelters
Medical Facilities	Hospitals & Urgent Care Facilities
	Other Medical Facilities
Special Needs Populations	Elderly Housing
	Schools (K-12)
	Schools (Higher Education)
	Jails
	Telecommunications
Utilities	Electric Power
	Natural Gas
	Water
	Wastewater
	Dams
Transportation Systems	Roadways
	Air, Rail, and Water Transport
HAZMAT Facilities	



## Risk Assessment

The results of the risk assessment are summarized in the exposure analysis (example).

Hazard	Population at Risk	Residential Structures				Critical Facilities				Total		
		Number	Structure Value	Contents Value	Value	Number	Structure Value	Contents Value	Value	Structure Value	Contents Value	
Explosion	VOC/PCB Contaminated Equipment	43	17	\$ 2,218,800	\$ 1,109,400	\$ 3,328,200	13	\$ 94,227,226	\$ 226,474,020	\$ 320,701,246	\$ 131,355,180	\$ 2,274,796,226
		Emergency	1,400	2,000	\$ 120,400,000	\$93,200,000	\$213,600,000	94	\$ 176,904,107	\$ 241,220,610	\$ 418,124,717	\$ 305,204,107
Flood	Older Residential	25	10	\$ 3,200,000	\$ 432,000	\$ 3,632,000	32	\$ 29,198,875	\$ 38,791,620	\$ 67,990,495	\$ 30,502,875	\$ 98,493,370
		New Residential	0	0	-	-	-	0	30,000	\$ 45,000	\$ 75,000	\$ 30,000
Severe Weather	Occupancy	1,400	1,000	\$ 120,400,000	\$93,200,000	\$213,600,000	94	\$ 176,904,107	\$ 241,220,610	\$ 418,124,717	\$ 305,204,107	\$ 1,611,729,812
		Other Occupancy	63	20	\$ 2,200,000	\$ 1,100,000	\$ 3,300,000	20	\$ 157,013,066	\$ 37,797,220	\$ 194,810,286	\$ 78,207,220
Volcanic	Occupancy	1,400	1,000	\$ 120,400,000	\$93,200,000	\$213,600,000	94	\$ 176,904,107	\$ 241,220,610	\$ 418,124,717	\$ 305,204,107	\$ 1,611,729,812
		Wildland Fire	2,200	900	\$ 118,952,200	\$57,476,100	\$176,428,300	0	\$ 86,713,262	\$ 103,763,568	\$ 190,476,830	\$ 185,960,268

## Mitigation Strategy

Based on the results of the Risk Assessment:

- Establish Goals
- Identify Projects
- Prioritize

- ## Next Steps
- Gather Data from Worksheets
  - Present Results of the Risk Assessment
  - Prepare Mitigation Strategy
  - Finalize Plan/Community Review
  - Submit the Plan for Oregon OEM and FEMA Review
  - Adopt the Plan

## Contractor Contact Information

Laura Young or April Brehm, URS  
 800-909-6787 or 907-562-3366  
 (laura\_young@urscorp.com or april\_brehm@urscorp.com)

# COLUMBIA COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

April 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the Columbia County Multi-Jurisdictional Hazard Mitigation Plan Update. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the Columbia County Website at <http://www.co.columbia.or.us/>.*

The Federal Emergency Management Agency (FEMA) is providing technical assistance to your community to facilitate the update of a natural hazards mitigation plan. The plan will identify hazards, such as flood, severe weather, and earthquake. The plan will also identify the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process will be documented as part of the project. The purpose of the project is to ensure that each incorporated city in the county is eligible for mitigation project funding in the event of a declared disaster.

## What is Hazard Mitigation?

Across the United States, natural and man-made/technological disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Oregon are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

## Why do we need a Hazard Mitigation Plan?

The purpose of hazard mitigation planning is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short- and long-term activities to reduce the hazards; reduce exposure to hazards; or reduce the effects of hazards. Mitigation could include better preparation, response, and recovery measures. Examples of hazard mitigation activities include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

## Why is it important to update the plan?

FEMA requires that hazard mitigation plans be updated at least every five years. FEMA recommends an update after a major disaster. The period following a disaster provides a unique opportunity to evaluate hazard exposure and existing mitigation activities. Columbia County adopted a FEMA-approved Hazard Mitigation Plan in January 2005. As a result of the federally declared disaster in December 2007, FEMA is recommending and providing funding for technical assistance to each of the incorporated cities to prepare a local plan. This local plan will be annexed into the forthcoming updated Columbia County Multi-Jurisdictional Hazard Mitigation Plan.

## The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.



# CITY OF ST. HELENS

## HAZARD MITIGATION PLAN

May 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the City of St. Helens Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the City of St. Helens Website at <http://www.ci.st-helens.or.us/>.*

The Federal Emergency Management Agency (FEMA) is providing technical assistance to your community to facilitate the preparation of a natural hazards mitigation plan. The plan will identify hazards, such as flood, severe weather, and earth quake. The plan will also identify the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process will be documented as part of the project. The purpose of the project is to ensure that each incorporated city in the county is eligible for mitigation project funding in the event of a declared disaster.

### *What is Hazard Mitigation?*

Across the United States, natural and man-made/technological disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Oregon are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

### *Why do we need a Hazard Mitigation Plan?*

The purpose of hazard mitigation planning is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short- and long-term activities to reduce the hazards; reduce exposure to hazards; or reduce the effects of hazards. Mitigation could include better preparation, response, and recovery measures. Examples of hazard mitigation activities include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

### *The Planning Process*

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.

### *We need your help!*

We are currently in the very beginning stages of preparing the plan, and are requesting your input at this time to identify the natural and man-made/technological hazards that occur in the City of St. Helens.



# ST. HELENS HAZARD MITIGATION PLAN

April 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the St. Helens Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the City of St. Helens Website at <http://www.ci.st-helens.or.us/>.*

The Federal Emergency Management Agency (FEMA) is providing technical assistance to your community to facilitate the preparation of a natural hazards mitigation plan. The plan will identify hazards, such as flood, severe weather, and earthquake. The plan will also identify the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process will be documented as part of the project. The purpose of the project is to ensure that each incorporated city in the county is eligible for mitigation project funding in the event of a declared disaster.

## What is Hazard Mitigation?

Across the United States, natural and man-made/technological disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Oregon are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

## Why do we need a Hazard Mitigation Plan?

The purpose of hazard mitigation planning is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short- and long-term activities to reduce the hazards; reduce exposure to hazards; or reduce the effects of hazards. Mitigation could include better preparation, response, and recovery measures. Examples of hazard mitigation activities include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

## The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.

## We need your help!

We are currently in the very beginning stages of preparing the plan, and are requesting your input at this time to identify the natural and man-made/technological hazards that occur in St. Helens.





# SCAPPOOSE HAZARD MITIGATION PLAN

April 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the Scappoose Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the City of Scappoose Website at <http://www.ci.scappoose.or.us/>.*

The Federal Emergency Management Agency (FEMA) is providing technical assistance to your community to facilitate the preparation of a natural hazards mitigation plan. The plan will identify hazards, such as flood, severe weather, and earthquake. The plan will also identify the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process will be documented as part of the project. The purpose of the project is to ensure that each incorporated city in the county is eligible for mitigation project funding in the event of a declared disaster.

## What is Hazard Mitigation?

Across the United States, natural and man-made/technological disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Oregon are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

## Why do we need a Hazard Mitigation Plan?

The purpose of hazard mitigation planning is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short- and long-term activities to reduce the hazards; reduce exposure to hazards; or reduce the effects of hazards. Mitigation could include better preparation, response, and recovery measures. Examples of hazard mitigation activities include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

## The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.

## We need your help!

We are currently in the very beginning stages of preparing the plan, and are requesting your input at this time to identify the natural and man-made/technological hazards that occur in Scappoose.



# RAINIER HAZARD MITIGATION PLAN

April 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the Rainier Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the City of Rainier Website at <http://www.cityofrainier.com/>.*

The Federal Emergency Management Agency (FEMA) is providing technical assistance to your community to facilitate the preparation of a natural hazards mitigation plan. The plan will identify hazards, such as flood, severe weather, and earthquake. The plan will also identify the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process will be documented as part of the project. The purpose of the project is to ensure that each incorporated city in the county is eligible for mitigation project funding in the event of a declared disaster.

## What is Hazard Mitigation?

Across the United States, natural and man-made/technological disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Oregon are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

## Why do we need a Hazard Mitigation Plan?

The purpose of hazard mitigation planning is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short- and long-term activities to reduce the hazards; reduce exposure to hazards; or reduce the effects of hazards. Mitigation could include better preparation, response, and recovery measures. Examples of hazard mitigation activities include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

## The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.

## We need your help!

We are currently in the very beginning stages of preparing the plan, and are requesting your input at this time to identify the natural and man-made/technological hazards that occur in Rainier.



# COLUMBIA CITY HAZARD MITIGATION PLAN

April 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the Columbia City Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the Columbia City Website at <http://www.columbia-city.org/>.*

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A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

## The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

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- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.

## We need your help!

We are currently in the very beginning stages of preparing the plan, and are requesting your input at this time to identify the natural and man-made hazards that occur in Columbia City.





# CLATSKANIE HAZARD MITIGATION PLAN

April 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the Clatskanie Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the City of Clatskanie Website at <http://www.clatskanie.com/>.*

The Federal Emergency Management Agency (FEMA) is providing technical assistance to your community to facilitate the preparation of a natural hazards mitigation plan. The plan will identify hazards, such as flood, severe weather, and earthquake. The plan will also identify the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process will be documented as part of the project. The purpose of the project is to ensure that each incorporated city in the county is eligible for mitigation project funding in the event of a declared disaster.

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Across the United States, natural and man-made/technological disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Oregon are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

## Why do we need a Hazard Mitigation Plan?

The purpose of hazard mitigation planning is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short- and long-term activities to reduce the hazards; reduce exposure to hazards; or reduce the effects of hazards. Mitigation could include better preparation, response, and recovery measures. Examples of hazard mitigation activities include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

## The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.

## We need your help!

We are currently in the very beginning stages of preparing the plan, and are requesting your input at this time to identify the natural and man-made/technological hazards that occur in Clatskanie.





# VERNONIA HAZARD MITIGATION PLAN

April 2008

First Edition

*This newsletter is the first in a series of newsletters regarding the preparation of the Vernonia Hazard Mitigation Plan Update. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This and subsequent newsletters can be found on the City of Vernonia Website at <http://www.vernonia-or.gov/>.*

The Federal Emergency Management Agency (FEMA) is providing technical assistance to your community to facilitate the update of a natural hazards mitigation plan. The plan will identify hazards, such as flood, severe weather, and earthquake. The plan will also identify the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process will be documented as part of the project. The purpose of the project is to ensure that each incorporated city in the county is eligible for mitigation project funding in the event of a declared disaster.

## What is Hazard Mitigation?

Across the United States, natural and man-made/technological disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Oregon are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

## Why do we need a Hazard Mitigation Plan?

The purpose of hazard mitigation planning is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short- and long-term activities to reduce the hazards; reduce exposure to hazards; or reduce the effects of hazards. Mitigation could include better preparation, response, and recovery measures. Examples of hazard mitigation activities include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

A community is eligible to receive grant money for mitigation programs by preparing a FEMA-approved Hazard Mitigation Plan.

## Why is it important to update the plan?

FEMA requires that hazard mitigation plans be updated at least every five years. FEMA recommends an update after a major disaster. The period following a disaster provides a unique opportunity to evaluate hazard exposure and existing mitigation activities. Vernonia adopted a FEMA-approved Hazard Mitigation Plan in 2006. As a result of the federally declared disaster in December 2007, FEMA is recommending and providing funding for technical assistance to each of the incorporated cities to prepare a local plan. This local plan will be annexed into the forthcoming updated Columbia County Multi-Jurisdictional Hazard Mitigation Plan.

## The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: <http://www.fema.gov/fima/ifrs.shtm>.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan.



Subject: PRESS RELEASE - COLUMBIA COUNTY - PRESS RELEASE

For Immediate Release  
Friday, July 18, 2008

Please contact Frank Hupp or Vicki Harguth in Columbia County Emergency Management with any questions at 503-366-3930.

Columbia County Sets Meeting Date for Public Input and Review of Draft of the Hazard Mitigation Plan

The Federal Emergency Management Agency (FEMA) is providing technical assistance to Columbia County to facilitate the update of our existing natural hazards mitigation plan to a multi-jurisdictional hazard mitigation plan. The following jurisdictions have designated steering committees, completed the hazard screening process, and gathered data to analyze the risk associated with the hazards affecting the people and property in the following jurisdictions: Columbia County, St. Helens, Columbia City, Scappoose, Clatskanie, Rainier, Prescott, and the Vernonia.

All interested parties are encouraged to attend one of the three informational sessions presenting the results of the risk assessment. This opportunity for public participation is designed to describe: the planning process to date; natural and technological hazards identified to occur in your community; people and property at risk from each hazard; goals your community wants to achieve; and mitigation actions or projects your community can implement to reduce or mitigate the risks associated with the hazards.

Date: Wednesday, August 13, 2008

Location: Emergency Communications 911 District Office  
58611 McNulty Way  
St. Helens, OR 97051

Times: 10:00 am, 2:00 pm or 6:00 pm







	<p><b>COLUMBIA COUNTY MULTI- JURISDICTIONAL MULTI-HAZARD MITIGATION PLAN</b></p>
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|  | <p><b><i>Planning Assistance Team</i></b></p>  |
|  | <ul style="list-style-type: none"> <li>■ Kristen Meyers, FEMA Region X</li> <li>■ Dennis Sigrist, Oregon OES</li> <li>■ Laura Young, URS Consultant</li> <li>■ April Brehm, URS Consultant</li> <li>■ David Ghosh, URS Consultant</li> </ul> |

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|  | <p><b><i>What Is Hazard Mitigation Planning?</i></b></p>   |
|  | <p>Process to identify policies, activities and tools to implement mitigation actions</p> <ul style="list-style-type: none"> <li>- Strengthen and enforce codes and ordinances prohibiting development in hazard-prone areas</li> <li>- Educate residents and businesses about development in hazard-prone areas</li> <li>- Improve flood control structures</li> <li>- Relocate, elevate or flood proof flood-prone structures</li> </ul> |

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|  | <p><b><i>What is Needed from each Jurisdiction?</i></b></p>  |
|  | <ul style="list-style-type: none"> <li>■ Active Participation</li> <li>■ Engagement through the Process</li> <li>■ Advocacy / Enthusiasm for the Process</li> <li>■ Understanding</li> </ul> |

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|  | <p><b><i>Why Do We Need A Plan?</i></b></p>  |
|  | <ul style="list-style-type: none"> <li>■ Community Benefits             <ul style="list-style-type: none"> <li>- Hazard Awareness &amp; Community Safety</li> <li>- Avoid Development in Hazard-Prone Areas</li> <li>- Develop / Improve Ordinances and Enforcement</li> <li>- Eligibility for Mitigation Project Funding</li> </ul> </li> <li>■ State Benefits             <ul style="list-style-type: none"> <li>- Data to Support Enhanced Mitigation Planning Efforts</li> </ul> </li> </ul> |

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|--|---|
|  | <p><b><i>The Planning Process</i></b></p>   |
|  | <ul style="list-style-type: none"> <li>■ Hazard Identification</li> <li>■ Risk Assessment</li> <li>■ Planning Goals</li> <li>■ Mitigation Programs, Actions, and Projects</li> <li>■ A Resolution from the Community Adopting the Plan</li> </ul> |

<b>Public Participation</b>
<ul style="list-style-type: none"> <li>Minimum Requirements</li> <li>Newsletters</li> <li>Websites</li> <li>PSAs/Press Releases</li> <li>Workshops</li> </ul>

<b>Columbia County Jurisdictions</b>
<ul style="list-style-type: none"> <li>■ St. Helens</li> <li>■ Columbia City</li> <li>■ Scappoose</li> <li>■ Clatskanie</li> <li>■ Rainier</li> <li>■ Prescott</li> <li>■ (Vernonia) already completed HMP Process</li> </ul>

<b>Hazard Identification</b>	HAZARD WORKSHEET			
	Hazard	State of Oregon Plan	Columbia County Plan	Jurisdiction
Natural Hazards	Avalanche			
	Coastal Erosion	X		
	Droughts	X		
	Dust Storms	X		
	Earthquake	X	X	
	El Niño/La Niña	X		
	Expansive Soils			
	Flood	X	X	
	Landslide/Debris Flow	X	X	
	Tsunami	X		
	Volcano Hazards	X	X	
	Wind Storms	X		
	Winter Storms	X	X	
	Wildland/Urban Interface Fire	X	X	
	Dam Failure			
Man-Made / Technological Hazards	Disruption of Utility and Transportation Systems		X	
	HAZMAT Incidents		X	
	Terrorism		X	

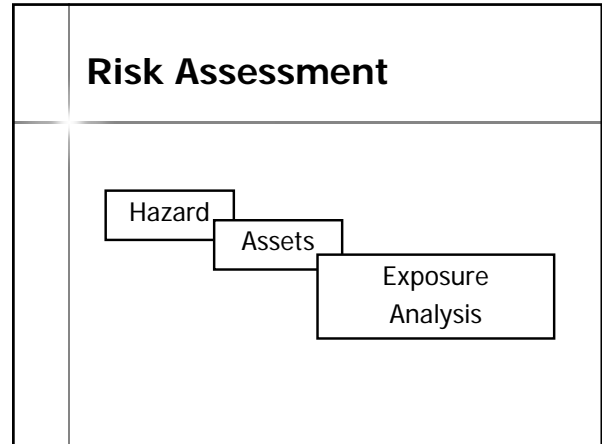
<b>Risk Assessment</b>
<p>Hazards Profile</p> <ul style="list-style-type: none"> <li>– General Description</li> <li>– History of Events</li> <li>– Location (Maps, GIS, etc.)</li> <li>– Probability</li> <li>– Extent</li> <li>– Impact</li> </ul>

<b>Risk Assessment</b>
<p>Critical facilities are local facilities that provide essential products and services to the general public</p> <ul style="list-style-type: none"> <li>■ Bridges</li> <li>■ Care</li> <li>■ Community</li> <li>■ Dams</li> <li>■ Educational</li> <li>■ Emergency Response</li> <li>■ Government</li> <li>■ Ground &amp; Air</li> <li>■ Highways</li> <li>■ Railroads</li> <li>■ Utilities</li> </ul>

<b>Risk Assessment</b>
<p>Community Assets (Existing and Future)</p> <ul style="list-style-type: none"> <li>– Critical Facilities <ul style="list-style-type: none"> <li>■ Location</li> <li>■ Estimated Value</li> <li>■ Resident Population (e.g. assisted living facility)</li> </ul> </li> <li>– Residential and Non-Residential Buildings <ul style="list-style-type: none"> <li>■ Location</li> <li>■ Estimated Value</li> <li>■ Population</li> </ul> </li> </ul>



Types of Critical Facilities (from Columbia County HMP)	
Emergency Services	Fire Stations
	Police Stations
	Ambulance Services
	Emergency Operations Center
	Emergency Shelters
Medical Facilities	Hospitals & Urgent Care Facilities
	Other Medical Facilities
Special Needs Populations	Elderly Housing
	Schools (K-12)
	Schools (Higher Education)
	Jails
	Telecommunications
Utilities	Electric Power
	Natural Gas
	Water
	Wastewater
	Dams
Transportation Systems	Roadways
	Air, Rail, and Water Transport
HAZMAT Facilities	



## Risk Assessment

The results of the risk assessment are summarized in the exposure analysis (example).

Hazard	Population at Risk	Residential Structures				Critical Facilities				Total	
		Number	Structure Value	Contents Value	Value	Number	Structure Value	Contents Value	Value	Structure Value	Contents Value
Explosion	43	17	\$ 2,218,800	\$ 1,118,400	\$ 3,337,200	15	\$ 94,227,200	\$ 226,474,000	\$ 320,701,200	\$ 96,444,000	\$ 133,355,100
			\$ 130,400,000	\$ 65,200,000	\$ 195,600,000	94	\$ 176,904,100	\$ 246,220,600	\$ 423,124,700	\$ 304,438,100	\$ 611,779,800
Flood	25	10	\$ 3,300,000	\$ 402,000	\$ 3,702,000	32	\$ 29,198,875	\$ 38,791,600	\$ 67,990,475	\$ 20,353,600	\$ 48,486,100
			\$ 0	\$ 0	\$ 0	1	\$ 30,000	\$ 45,000	\$ 75,000	\$ 30,000	\$ 45,000
Severe Weather	2,492	1,000	\$ 135,400,000	\$ 65,200,000	\$ 200,600,000	94	\$ 176,904,100	\$ 246,220,600	\$ 423,124,700	\$ 304,438,100	\$ 611,779,800
			High	63	25	\$ 3,300,000	\$ 402,000	\$ 3,702,000	22	\$ 22,013,000	\$ 29,197,200
Wildfire	2,492	1,000	\$ 135,400,000	\$ 65,200,000	\$ 200,600,000	94	\$ 176,904,100	\$ 246,220,600	\$ 423,124,700	\$ 304,438,100	\$ 611,779,800
			Medium Fire	2,268	948	\$ 118,463,200	\$ 57,701,600	\$ 176,164,800	9	\$ 82,713,262	\$ 107,984,900

## Mitigation Strategy

Based on the results of the Risk Assessment:

- Establish Goals
- Identify Projects
- Prioritize

- ## Next Steps
- Gather Data from Worksheets
  - Present Results of the Risk Assessment
  - Prepare Mitigation Strategy
  - Finalize Plan/Community Review
  - Submit the Plan for Oregon OEM and FEMA Review
  - Adopt the Plan

## Contractor Contact Information

Laura Young or April Brehm, URS  
 800-909-6787 or 907-562-3366  
 (laura\_young@urscorp.com or april\_brehm@urscorp.com)

## Columbia County 08/13/08 Public Meeting Q&A Summary

- Several participants shared the general concern their community would be committed to fulfilling identified goals and completing listed action items.
- Participants were not clear as to the state, county, and jurisdictional planning requirements.
- Participants were confused how a State Standard Plan compared to an Enhanced State Plan. Few participants believed they could receive greater funding if they completed an Enhanced Plan for their community.
- Participants questioned how critical facilities were identified and why did they differ between hazards.
- Participant questioned if infrastructure value considered the consequences for closing or not be able to use a facility due to hazard impact.
- Participants were unclear the detail level requirements for developing a mitigation strategy. For example, did the strategy need to include all details for elevating a structure?
- Vernonia resident stated that road cross-sectional analysis needs to be accomplished for several flood impact areas. New communities are being built which change the floodplain/floodway, but no one is doing anything about it. These new developments are bringing in fill, changing the landscape and exacerbating downstream flood hazard effects. This impact needs to be reflected in the plan.
- Meeting facilitators requested that all communities identify all critical facilities they rely upon no matter who owns the facility. This will ensure we have completely identified all critical facilities for each jurisdiction. Facilities having repeatedly identified impacts will raise a “red flag” alerting all responsible entities that this facility needs to receive mitigation actions.
- Participants inquired whether combined damages were identified in the plan and their interrelationship explained.
- Participants inquired whether all data used to develop the risk assessment will be released.
- *Security sensitive data will not be released.*
- Columbia County 911 center identified a few good mitigation goals and projects that can be added to the applicable sections.
- State SHMO comments:
  - On 10/01/08, FEMA will require that all mitigation grant applicants will need to have a FEMA approved, community adopted Hazard Mitigation Plan before being eligible for federal mitigation grants.
  - This planning effort is a good tool to use to identify potential projects for future development and funding.
  - Jurisdictions identifying potential hazardous conditions affecting a County infrastructure (i.e. highway), may be assisting other communities using the same infrastructure.
  - This planning process should be used to identify hazard “buffer zones.” For example, clear cut areas should be designed to reduce road closure due to highway tree or mud-flow closure problems.

**Appendix N**  
**Benefit–Cost Analysis Fact Sheet**



***Benefit-Cost Analysis Fact Sheet***

Hazard mitigation projects are specifically aimed at reducing or eliminating future damages. Although hazard mitigation projects may sometimes be implemented in conjunction with the repair of damages from a declared disaster, the focus of hazard mitigation projects is on strengthening, elevating, relocating, or otherwise improving buildings, infrastructure, or other facilities to enhance their ability to withstand the damaging impacts of future disasters. In some cases, hazard mitigation projects may also include training or public-education programs if such programs can be demonstrated to reduce future expected damages.

A Benefit-Cost Analysis (BCA) provides an estimate of the “benefits” and “costs” of a proposed hazard mitigation project. The benefits considered are avoided future damages and losses that are expected to accrue as a result of the mitigation project. In other words, benefits are the reduction in expected future damages and losses (i.e., the difference in expected future damages before and after the mitigation project). The costs considered are those necessary to implement the specific mitigation project under evaluation. Costs are generally well determined for specific projects for which engineering design studies have been completed. Benefits, however, must be estimated probabilistically because they depend on the improved performance of the building or facility in future hazard events, the timing and severity of which must be estimated probabilistically.

***All Benefit-Costs must be:***

- Credible and well documented
- Prepared in accordance with accepted BCA practices
- Cost-effective ( $BCR \geq 1.0$ )

***General Data Requirements:***

- All data entries (other than Federal Emergency Management Agency [FEMA] standard or default values) MUST be documented in the application.
- Data MUST be from a credible source.
- Provide complete copies of reports and engineering analyses.
- Detailed cost estimate.
- Identify the hazard (flood, wind, seismic, etc.).
- Discuss how the proposed measure will mitigate against future damages.
- Document the Project Useful Life.
- Document the proposed Level of Protection.
- The Very Limited Data (VLD) BCA module cannot be used to support cost-effectiveness (screening purposes only).
- Alternative BCA software MUST be approved in writing by FEMA HQ and the Region prior to submittal of the application.

***Damage and Benefit Data***

- Well documented for each damage event.
- Include estimated frequency and method of determination per damage event.
- Data used in place of FEMA standard or default values MUST be documented and justified.
- The Level of Protection MUST be documented and readily apparent.
- When using the Limited Data (LD) BCA module, users cannot extrapolate data for higher frequency events for unknown lower frequency events.

***Building Data***

- Should include FEMA Elevation Certificates for elevation projects or projects using First Floor Elevations (FFE).
- Include data for building type (tax records or photos).
- Contents claims that exceed 30 percent of building replacement value (BRV) MUST be fully documented.
- Method for determining BRVs MUST be documented. BRVs based on tax records MUST include the multiplier from the County Tax Assessor.
- Identify the amount of damage that will result in demolition of the structure (FEMA standard is 50 percent of pre-damage structure value).
- Include the site location (i.e., miles inland) for the Hurricane module.

***Use Correct Occupancy Data***

- Design occupancy for Hurricane shelter portion of Tornado module.
- Average occupancy per hour for the Tornado shelter portion of the Tornado module.
- Average occupancy for Seismic modules.

***Questions to Be Answered***

- Has the level of risk been identified?
- Are all hazards identified?
- Is the BCA fully documented and accompanied by technical support data?
- Will residual risk occur after the mitigation project is implemented?

***Common Shortcomings***

- Incomplete documentation.
- Inconsistencies among data in the application, BCA module runs, and the technical support data.
- Lack of technical support data.
- Lack of a detailed cost estimate.
- Use of discount rate other than FEMA-required amount of 7 percent.

## Appendix N Benefit–Cost Analysis Fact Sheet

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- Overriding FEMA default values without providing documentation and justification.
- Lack of information on building type, size, number of stories, and value.
- Lack of documentation and credibility for FFEs.
- Use of incorrect Project Useful Life (not every mitigation measure = 100 years).

**Appendix N**  
**Benefit–Cost Analysis Fact Sheet**

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## **Appendix 0**

Plan Maintenance Documents

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**Local Mitigation Plan Review Crosswalk:** Monitoring, Evaluating, and Updating the Plan (Element A)  
**Tribal Mitigation Plan Review Crosswalk:** Monitoring, Evaluating, and Updating the Plan (Element A)

<b>HMP Progress Report</b>			
<b>Progress Report Period From (date):</b>		<b>To (date):</b>	
<b>Plan Title:</b>			
<b>Description of Plan:</b>			
<b>Implementing Agency:</b>			
<b>Contact Name:</b>			
<b>Contact E-mail and Number:</b>			
<b>Summary of Progress of HMP for this Reporting Period</b>			
<b>1. Did any hazard / disaster events occur during this report period? If so, list events.</b>			
<b>2. Did anyone from the public comment on the plan during this reporting period? If so, list the comments.</b>			
<b>3. Were any mitigation projects identified in the HMP implemented during this reporting period?</b>			

**4. What obstacles, problems, or delays did any current or ongoing mitigation projects encounter, if any? How were the problems resolved?**

**Local Mitigation Plan Review Crosswalk: Monitoring, Evaluating, and Updating the Plan (Elements B & C)**  
**Tribal Mitigation Plan Review Crosswalk: Monitoring, Evaluating, and Updating the Plan (Elements B & C)**

Annual Review Questionnaire				
Project Title	Questions	Yes	No	Comments
<b>PLANNING PROCESS</b>	Are there internal or external organizations and agencies that have been invaluable to the planning process or to mitigation action?			
	Are there procedures (e.g., meeting announcements, plan updates) that can be done differently or more efficiently?			
	Has the Planning Team undertaken any public outreach activities regarding the HMP or a mitigation project?			
<b>HAZARD ANALYSIS</b>	Has the natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this HMP and should be?			
	Are additional maps or new hazard studies available? If so, what are they and what have they revealed?			
<b>VULNERABILITY ANALYSIS</b>	Do any new critical facilities or infrastructure need to be added to the asset lists?			

	Have there been changes in development trends that could create additional risks?			
<b>CAPABILITY ASSESSMENT</b>	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning?			
<b>MITIGATION STRATEGY</b>	Should new mitigation actions be added to the Implementation Strategy/Plan?			
	Are the mitigation actions listed in a community's Implementation Strategy/Plan appropriate for available resources?			

**Local Mitigation Plan Review Crosswalk:** Not required (may be used for internal reporting)

**Tribal Mitigation Plan Review Crosswalk:** Reviewing Progress (Elements A & B)

<b>Mitigation Project Progress Report</b>			
<b>Progress Report Period From (date):</b>		<b>To (date):</b>	
<b>Project Title and Project ID:</b>			
<b>Description of Project:</b>			
<b>Implementing Agency:</b>			
<b>Contact Name:</b>			
<b>Contact E-mail and Number:</b>			
<b>Grant/Finance Administrator:</b>			
<b>Total Project Cost:</b>			
<b>Anticipated Cost Overrun/Underrun:</b>			
<b>Date of Project Approval:</b>			
<b>Project Start Date:</b>			
<b>Anticipated Completion Date:</b>			

<b>Summary of Progress of Project for this Reporting Period</b>
<b>1. What was accomplished during this reporting period?</b>
<b>2. What obstacles, problems, or delays did the project encounter, if any? How were the problems resolved?</b>