The City of Tenino's Annex to the Natural Hazards Mitigation Plan for the Thurston Region

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RESOLUTION NO. 2010-19

A RESOLUTION ADOPTING THE "NATURAL HAZARDS MITIGATION PLAN FOR THE THURSTON REGION" AND "THE CITY OF TENINO'S ANNEX TO THE NATURAL HAZARDS MITIGATION PLAN FOR THE THURSTON REGION."

WHEREAS, the City of Tenino, its residents and property are vulnerable to natural disasters; and

WHEREAS, the City of Tenino City Council realizes the importance of reducing or eliminating vulnerabilities from natural hazard events for the overall good and welfare of the community; and

WHEREAS, the City of Tenino has been an active participant in the Thurston Region Hazards Mitigation Planning Workgroup, which has established a comprehensive, coordinated planning process to eliminate or decrease these vulnerabilities; and

WHEREAS, the City of Tenino staff have identified, justified, and prioritized ten initiatives intended to mitigate the vulnerabilities within the City of Tenino; and

WHEREAS, public input prior to drafting the update to the "Natural Hazards Mitigation Plan for the Thurston Region" was sought at an open house meeting at Tenino Elementary School on June 26, 2008; and

WHEREAS, public input on the final draft "Natural Hazards Mitigation Plan for the Thurston Region" was sought at an open house meeting at the Tenino Quarry House on September 2, 2009; and

WHEREAS, public input for "The City of Tenino's Annex to the Natural Hazards Mitigation Plan for the Thurston Region" was sought at an open house meeting at Tenino City Hall on April 8, 2010; and

WHEREAS, these proposed initiatives have been incorporated into the "City of Tenino's Annex to the Natural Hazards Mitigation Plan" as part of the second edition of the "Natural Hazards Mitigation Plan for the Thurston Region" that has been prepared and issued for consideration and implementation by the jurisdictions and organizations of Thurston County;

NOW THEREFORE, BE IT RESOLVED by the City Council of the City of Tenino, Washington, as follows:

1. City of Tenino hereby approves and adopts the "Natural Hazards Mitigation Plan for the Thurston Region" and "The City of Tenino's Annex to the Natural Hazards Mitigation Plan for the Thurston Region" as its natural hazards mitigation plan and comprehensive flood hazard management plan.

2. City of Tenino staff are requested and instructed to pursue available funding opportunities for implementation of the mitigation initiatives designated by the City.
3. The City of Tenino will, upon receipt of such funding or other necessary resources, seek to implement the proposals contained in its section of mitigation initiatives, and
4. The City of Tenino will continue to participate in the updating and expansion of the "Natural Hazards Mitigation Plan for the Thurston Region" in the years ahead, and
5. The City of Tenino will further seek to encourage the businesses, industries, and community groups operating within Thurston County to also participate in the updating and expansion of the "Natural Hazards Mitigation Plan for the Thurston Region" in the years ahead.

APPROVED by the City Council of Tenino this 27th day of April, 2010.

Kenneth A. Jones, Mayor

ATTEST:

Betty J. Garrison, MMC, CPFA
City Clerk-Treasurer

Approved as to form and for content:

William Hillier, City Attorney

Community Profile
City of Tenino

City info: (360) 264-2368
www.ci.tenino.wa.us

Demographics

Population, 1990		1,292
Population, 2000		1,447
Population, 2008		1,525
Av. Ann. Pop. Growth, 1990-2000		1.1%
Av. Ann. Pop. Growth, 2000-2008		0.7%
Households, 2000		575
Average Household Size, 2000		2.52
Age Structure, 2000:		
19 and under	460	32%
20 - 64	780	54%
65 and over	207	14%
Median Age	34	--
Race and Ethnic Categories, 2000:		
White	1,310	90.5%
Black/African American	12	0.8%
American Indian & Alaska Native	17	1.2%
Asian	45	3.1%
Native Hawaiian & Other Pacific Islander	1	0.0%
Other Race	29	2.0%
Two or More Races	34	2.3%
Hispanic*	55	3.8%

In 1851 Stephen Hodgdon, a Maine native, settled on a site on the old Oregon Trail where it forked north toward Tumwater and east to Yelm Prairie and Fort Nisqually. His farm soon became known as Hodgdon's Station and was a regular stagecoach stop between the Columbia River and Olympia.

In 1872 the railroad reached Hodgdon's farm and a depot was built and named "Tenino," which comes from a Coastal Salish word meaning "a branch in the trail" or "meeting place." The railroad and the opening of the sandstone quarries, beginning in 1888, turned Tenino into a bustling community of 1,000 by the early 1900s. The market for sandstone began to decline in 1912, but its influence is still evident in the town. When Interstate 5 was opened in 1954, Tenino's economy shifted to thermal-electric generation in nearby Hanaford Valley.

Housing

Housing Units, 2000:	
Single-Family	431
Multifamily	96
Manufactured Homes	86
Census Median House Value, 2000	$50,500

Employment and Income

Median Household Income:	
1989 (Census 1990 in 1999 $'s)	$24,962
1999 (Census 2000)	$34,526

Households by Income Category, 1999:		
Less than $14,999	98	17%
$15,000 to $24,999	83	15%
$25,000 to $49,999	202	35%
$50,000 to $74,999	134	23%
$75,000 or more	54	9%

Taxable Retail Sales, 2007	$17,662,391

Total Jobs, 2003:	**1,000**
Manufacturing	<10
Retail	240
Finance/Services	330
Federal, State, & Local Gov't	280
Tribal Gov't & Enterprises	<10
Other	140

Development Activity

Total New Permitted Residential Units, 2007:	
Single-Family	5
Multifamily	0
Manufactured Homes	0
Total	**5**

Subdivision Activity, 2007:	**# Appl.**	**# Lots**
Short Plat	4	11
Long Plat	0	0

Explanation: *Person of Hispanic Origin can be of any race.
Source: TRPC, Profile 2008 (www.trpc.org).

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City of Tenino's Plan Development Process

City of Tenino's Hazard Mitigation Plan Partners

The following individuals served as the City of Tenino's hazard mitigation plan development team:

Department/Title	Representative(s)
Assistant Planner, Plan Lead	Andrew Deffobis
Mayor	Ken Jones
Development Services Director	Ron Kemp
Public Works Director	Dave Dafoe
Associate Planner, TRPC	Paul Brewster
Senior Planner, TRPC	Pete Swenson

Hazard Mitigation Plan Development

The Mayor of Tenino represented the city on the Thurston County Emergency Management Council and oversaw the development of the update to the Natural Hazards Mitigation Plan for the Thurston Region." Andrew Deffobis, Assistant Planner, represented the city at the region's hazard mitigation workgroup meetings and was the lead staff in developing "The City of Tenino's Annex to the Natural Hazards Mitigation Plan for the Thurston Region."

On December 18, 2009, a draft annex was submitted to Thurston Regional Planning Council (TRPC) for review. In January 2010, TRPC submitted the city's annex to the Washington State Emergency Management Division and the Federal Emergency Management Agency (FEMA) for preliminary review. On February 25, 2010 FEMA submitted the results of its review to TRPC. FEMA concluded that the plan met all federal hazard mitigation planning requirements except for one; the city's mitigation strategy did not address continued compliance with the National Flood Insurance Program (NFIP) as required in Section 201.6(c)(3)(ii).

On March 18, 2009, TRPC staff presented the draft annex and the findings of FEMA's review to the City of Tenino Planning Commission. On April 8, 2010, the City of Tenino Planning Commission hosted an open house meeting at City Hall to provide members of the community an opportunity to comment on the draft annex and submit ideas for mitigation actions. A press release of this event was published in the "Tenino Independent" newspaper the week before the event. One member of the public attended the meeting. During the open house meeting, the planning commissioners discussed and considered a range of mitigation actions such as compliance, regulation, flood studies, community outreach, and avoidance that would demonstrate the city's continued compliance with the NFIP as part of its mitigation strategy.

The City of Tenino reviewed the two mitigation initiatives it had adopted in 2003 (MH1 and MH2) and modified them to reflect current needs. Four new initiatives were developed by city staff during the plan update process (EH1, MH3, MH4, and MH5) and four additional flood hazard-related initiatives were identified by the Planning Commission during the final stages of the planning process (FH1, FH2, FH3, FH4).

The following activities summarize the development of the City of Tenino's hazard mitigation planning process.

Date	Location	Activity	Subject
June 25, 2009	TRPC	Meeting with Paul Brewster, Ken Jones and Ron Kemp	Explanation of Hazard Mitigation Planning process and scope of work that Tenino must complete. Review of Tenino's 2003 hazard mitigation plan initiatives. Agreement to begin work on developing Tenino's Annex to the Natural Hazards Mitigation Plan.
August 26, 2009	Tenino City Hall	Meeting with Ken Jones, Dave Dafoe and Ron Kemp	Reviewing draft Hazard Assessment and Mitigation Initiatives; brainstorming
December 18, 2009	TRPC	Annex Review by TRPC	TRPC staff reviews Tenino's Annex to the Natural Hazards Mitigation Plan
February 25, 2010	TRPC	Annex Review by FEMA	FEMA returns plan review results to TRPC
March 18, 2010	Tenino City Hall	Planning Commission Meeting	Planning Commission reviews draft plan FEMA plan review crosswalk
April 8, 2010	Tenino City Hall	Public Open House	Planning Commission invites public to review draft plan and provide input on mitigation activities
April 15, 2010	Tenino City Hall	Planning Commission Meeting	Planning Commission reviews input from open house meeting, prioritizes mitigation activities, and submits recommendation to City Council
April 27, 2010	Tenino City Hall	City Council Meeting	City Council reviews plan, considers Planning Commission Recommendation, and takes action to adopt plan

Mitigation Initiative Prioritization Process

On April 15, 2010, the Planning Commission reviewed all ten hazard mitigation initiatives. The members considered the severity of the hazards addressed, the cost to implement the initiatives, potential funding sources, potential implementation time lines, and the benefits that the initiatives could deliver. In addition, the members considered the social, technical, administrative, political, legal, economic, and environmental implications of implementing the initiatives.

The Planning Commission used a numerical ranking process to prioritize the initiatives. All of the actions were listed on a matrix on a large format poster. On the first round, each member silently ranked the initiatives, from one (highest priority) through ten (lowest priority) on an individual score card. Each member then reported their order and the results were recorded and tabulated on the poster by staff. The initiative with the lowest sum scored the highest priority and the greater the sum, the lower the priority. A discussion of the initial results followed. Each planning commissioner described how they sorted the initiatives and why it was important to them. After the discussion, the individual ranking and reporting process was repeated a second time. The third and final iteration of the ranking was reached by consensus. The results of the prioritization process is shown on page 33.

Tenino Independent Newspaper, Press Release, March 31, 2010

Natural Hazard Mitigation workshop set for Tenino

The Tenino Planning Commission will conduct a workshop on Natural Hazards Mitigation in April, and invites citizens to participate.

The Tenino Planning Commission Open House meeting will be held Thursday, April 8, from 7-9 p.m. in the Council Chambers at Tenino City Hall, for the purpose of brainstorming ideas to increase Tenino's resilience to natural hazards.

Tenino is not immune to the effects of natural hazards such as earthquakes, severe winter storms, flooding, fires, landslides, and volcanic ash fall. The December 2008 snow storm and freezing temperatures brought traffic to a standstill for several days. Past windstorms have toppled trees that crushed roofs and severed power lines disrupting city residents' and businesses' power during extended periods with sub-freezing temperatures. Heavy rains and melting snow have caused episodic flooding of Scatter Creek or high groundwater flooding in neighborhoods around the City.

There is some relief. Communities that develop and adopt plans to help them understand their vulnerabilities and prioritize actions to mitigate the effects of hazards are eligible for federal grants to fund their disaster resilience projects. The grants, administered by the Federal Emergency Management Agency (FEMA), can be used to retrofit aging foundations, replace older windows with storm windows, elevate flood prone structures above flood levels, replace undersized storm drains or culverts, or purchase properties that experience repetitive flood losses.

For the past two years, the City of Tenino has partnered with Thurston County, cities, fire districts school districts, and other entities to update the "Natural Hazards Mitigation Plan for the Thurston Region." The region-wide plan was approved by FEMA last November, and the City of Tenino and other jurisdictions are completing their local portions of the plan this spring.

The City of Tenino Planning Commission will listen to ideas of residents, business owners, and other concerned community members about actions that can break the disaster cycle and make Tenino a safer place to live, work, and play in. the Commission will consider the community's input and incorporate validated proposals into action items that will include responsibilities, cost estimates, and a timeline for completion. The City Council will review and consider the plan for adoption in the coming months.

For more information, contact Paul Brewster, Thurston Regional Planning Council, at (360) 956-7575.

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City of Tenino Risk Assessment

Introduction

The risk assessment provides information about the hazards that threaten Tenino. This information provides the factual basis to identify and support a strategy that can effectively mitigate the effects of the hazards that threaten this jurisdiction's safety and challenge its ability to perform essential functions.

The content and structure of this plan's risk assessment was developed using the Federal Emergency Management Agency's (FEMA) 2008 "Local Multi-Hazard Mitigation Planning Guidance." Table 1 shows the Disaster Mitigation Act (DMA) Risk Assessment Planning Requirements that must be met in order for this plan to receive a "satisfactory" score. Each of these planning requirements is met through the information contained in both the regional risk assessment and in this local annex.

Table 1: Disaster Mitigation Act Risk Assessment Planning Requirements

DMA Section	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 …
§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.
§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.
§201.6(c)(2)(ii):	[The risk assessment in all] plans approved after October 1, 2008 **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.
§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 areas …
§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 …
§201.6(c)(2)(ii)(C):	[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.
§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.

In general the Federal DMA planning requirements with the words "**shall**" and "**must**" indicate that the item is mandatory and must be included in the plan, otherwise it will not be approved by FEMA. Regulations with the word "**should**" indicate that the item is strongly recommended to be included in the plan, but its absence will not cause FEMA to disapprove the plan.

Hazard Analysis Definitions

The adjective descriptors (High, Moderate, and Low) for each hazard's probability of occurrence, vulnerability, and risk rating are consistent with the terms used in the regional assessment.

The following terms are used in this plan to analyze and summarize the risk of the hazards that threaten this jurisdiction:

Risk Rating:

An adjective description (High, Moderate, or Low) of the overall threat posed by a hazard is assessed for the next 25 years. Risk is the subjective estimate of the combination of any given hazard's probability of occurrence and vulnerability.

- High: There is strong potential for a disaster of major proportions during the next 25 years; or History suggests the occurrence of multiple disasters of moderate proportions during the next 25 years.
- Moderate: There is medium potential for a disaster of less than major proportions during the next 25 years.
- Low: There is little potential for a disaster during the next 25 years.

Probability of Occurrence:

An adjective description (High, Medium, or Low) of the probability of a hazard impacting the jurisdiction within the next 25 years.

- High: There is great likelihood that a hazardous event will occur within the next 25 years.
- Moderate: There is medium likelihood that a hazardous event will occur within the next 25 years.
- Low: There is little likelihood that a hazardous event will occur within the next 25 years.

Vulnerability:

Vulnerability can be expressed as combination of the severity of a natural hazard's effect and its consequential impacts to the community. An adjective description (High, Medium, or Low) of the potential impact a hazard could have on the community. It considers the population, property, commerce, infrastructure and services at risk relative to the entire jurisdiction.

- High: The total population, property, commerce, infrastructure and services of the community are uniformly exposed to the effects of a hazard of potentially great magnitude. In a worse case scenario, there could be a disaster of major to catastrophic proportions.
- Moderate: The total population, property, commerce, infrastructure, and services of the community are exposed to the effects of a hazard of moderate influence; or The total population, property, commerce, infrastructure, and services of the community are exposed to the effects of a hazard of moderate influence, but not all to the same degree; or An important segment of population, property, commerce, infrastructure and services of the community

are exposed to the effects of a hazard. In a worse case scenario there could be a disaster of moderate to major, though not catastrophic, proportions.

- Low: A limited area or segment of population, property, commerce, infrastructure, or service is exposed to the effects of a hazard. In a worse case scenario, there could be a disaster of minor to moderate proportions.

Summary Risk Assessment

Based on the regional risk assessment and the local risk assessment in the subsequent section, the following hazards pose the greatest threat to Tenino:

Hazard	Probability of Occurrence	Vulnerability	Risk
Earthquake	High	Moderate	High
Storm	High	High	High
Flood	High	Moderate	Moderate
Landslide	High	Low	Moderate
Wildland Fire	High	Moderate	Moderate
Volcanic Event	Low	Moderate	Low

Local Risk Assessment

A comprehensive risk assessment of the major natural hazards that threaten Tenino was developed for this plan through the regional risk assessment process described in Chapter 4.0. The regional risk assessment and its hazard profiles serve as the foundation for this jurisdiction's risk assessment. A list of all of the potential natural hazards that could impact this jurisdiction is located in Chapter 4. Chapter 4 includes six natural hazard profiles for earthquake, storm, flood, landslide, wildland fire, and volcanic events. Each profile defines the hazard and describes its effects, severity, impacts, probability of occurrence, and historical occurrences. The regional profiles describe this jurisdiction's local vulnerabilities in terms of the portion of the jurisdictions land base or service area, population, employment, dwelling units, jurisdiction-owned assets, and critical facilities that are within each hazard zone.

This section of the plan provides additional details or explains differences where this jurisdiction's risks for each hazard vary from the risks facing the entire planning area. Maps of the hazards that affect Tenino are scaled to local boundaries and are included in this section.

Earthquake

Severity

A profile of earthquakes is provided in Section 4.1 of the Regional Risk Assessment. Tenino is susceptible to both liquefaction and ground shaking from earthquakes. According to the Washington State Department of Natural Resources (DNR) Liquefaction Map, the majority of Tenino's area is classified as having a "very low" liquefaction risk, or is found on bedrock, which is not susceptible to liquefaction. Some land adjacent to and including Scatter Creek in the north part of the city is rated as having a "moderate to high" liquefaction risk. According to DNR, most of Tenino is situated upon Class C soils, which amplify the shaking effects of earthquake events. The extent of liquefaction susceptibility is illustrated on the City of Tenino Liquefaction Hazards Map.

Impacts

Same as described in Section 4.1 of the Regional Risk Assessment. See Table 2 for information on population, structures and assets that are at risk of earthquake in Tenino.

Table 2. Description of population, land, employment and assets at risk of earthquakes in Tenino

		Earthquake Hazard Area				
	Total Acres	In Hazard Area	% In Hazard Area			
City	924	58	6%			
UGA[1]	65	0	1%			
Total	989	59	6%			
	2006 Population Estimate			2030 Population Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	1,525	85	6%	3,110	225	7%
UGA	20	0	0%	475	0	0%
Total	1,545	85	6%	3,585	225	6%

	2006 Dwelling Estimate			2030 Dwelling Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	700	40	6%	1,320	95	7%
UGA	5	0	0%	195	0	0%
Total	705	40	6%	1,515	95	6%

	2006 Employment Estimate			2030 Employment Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	810	45	6%	2,100	95	5%
UGA	35	0	0%	45	0	0%
Total	845	45	5%	2,145	95	4%

	Residential			Commercial/Industrial			Government/Institutional		
	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area
City	75	5	7%	17	0	0%	42	10	24%
UGA	1	0	0%	0	0	0%	0	0	0%
Total	76	5	7%	17	0	0%	42	10	24%

Probability of Occurrence

Same as described in Section 4.1 of the Regional Risk Assessment.

Historical Occurrences and Impacts Specific to this Jurisdiction

February 2001, Federal Disaster 1361: Nisqually Earthquake
No city buildings were impacted, but some private buildings sustained damage. Bricks shook loose from some buildings in the city, and fireplaces and foundations were cracked.

Summary Assessment

History suggests that the probability of a damaging earthquake event occurring in the next 25 to 30 years is high. Some of Tenino's land area is within earthquake hazard areas, and the city also has an older housing stock and many historical sandstone buildings which are vulnerable to earthquakes. There is a high risk of Tenino being impacted by an earthquake event in the future.

Summary Risk Assessment for Earthquake in Tenino

Probability of Occurrence	Vulnerability	Risk
High	Moderate	High

Storm

Severity

Same as described in Section 4.2 of the Regional Risk Assessment. The severity of storms experienced by Tenino is similar to that experienced by the rest of Thurston County.

Wind is the biggest hazard faced by Tenino. The effect or wind on Tenino is amplified by the city's proximity to a large prairie to the west. As wind crosses the prairie, there is little to block its progress, so it is not deflected or slowed. As it enters Tenino, local topography causes the wind to be funneled directly through the city.

Impacts

The city may be impacted by wind, heavy rains, freezing rain, snow, tornadoes, hail and lightning. One storm event may consist of one or more of the above. For instance, hail and lightning are often associated with tornadoes, and heavy wind may accompany a rain or snowstorm.

Wind, snow and ice may cause power outages in Tenino, which depending on their severity, may take days to restore. These types of impacts may also cause trees to topple, which can damage property and cause the death or injury of people or animals. Snow and ice may make roads impassable, and create difficulty in emergency response. Rain or snowmelt may cause riverine or localized flooding.

The occurrence of power outages in Tenino may be mitigated by the city's electrical connections with outside regions. Tenino is fed by at least four power grids. Additionally, the city is attempting to be moved up on the priority list of power restoration due to its new sewer system, which is operated by electrical power.

Probability of Occurrence

Same as described in Section 4.2 of the Regional Risk Assessment.

Historical Occurrences and Impacts Specific to this Jurisdiction

January 2009, Federal Disaster 1817: Severe Winter Storm, Flooding
Moderate flooding occurred in the Huston Street area. The street was flooded, and water entered some houses. McDuff Road had to be closed.

December 2008, Federal Disaster 1825: Severe Winter Storm, Near Record Snow

Citizens had difficulty navigating city streets. The City had to borrow plowing equipment from a private citizen, as City plows were ineffective in clearing snow and ice.

December 2006, Hanukkah Eve Storm: Federal Disaster 1682

Some areas of the city lost electrical power during this windstorm.

January 2005, Windstorm

Strong winds caused some damage to residences, including trees falling onto and through roofs.

December 1996 & February 1997, Federal Disaster 1159

The city was impacted by snow and then ice. This caused downed trees and power outages. In some parts of the city, power was not restored for a week.

January 1993, Federal Disaster 981: Inaugural Day Storm

Trees were felled in City Park, power was disrupted and some homes lost roofs.

Summary Assessment

Storm events have a high probability of occurrence throughout Thurston County. Like many other areas of the county, Tenino is vulnerable to the impacts of storms. Due to these factors, a high risk rating has been assigned.

Summary Risk Assessment for Storm in Tenino

Probability of Occurrence	Vulnerability	Risk
High	High	High

Flood

Severity

Same as described in Section 4.3 of the Regional Risk Assessment. Severity of flooding events is influenced by the amount and type of precipitation, pre-existing conditions of the ground (saturated from previous rain, covered with snow, or frozen) and human modification of the landscape (development and logging practices). Flood zones are illustrated by the City of Tenino Flood Hazards map.

Impacts

Tenino is not impacted by tidal flooding. Riverine, groundwater and urban flooding may all occur, however. The 100-year floodplain surrounds Scatter Creek to varying extent as the creek winds its way through city limits. There are also some areas of Tenino within the 500-year floodplain, including residential areas. Also within city limits are several areas at risk for high groundwater flooding, including along Scatter Creek through the center of town and along the northern city limits, as well as isolated areas throughout the portion of the city west of Scatter Creek.

A listing of Tenino's population, structures and assets at risk of flooding is found in Table 3(a-e).

Table 3. Description of population, land, employment and assets at risk of flooding in Tenino

		100 Year SFHA		500 Year SFHA		High Groundwater		All Flood Zones	
	Total Acres	In Hazard Area	% In Hazard Area	In Hazard Area	% In Hazard Area	In Hazard Area	% In Hazard Area	In Hazard Area	% In Hazard Area
City	924	31	3%	10	1%	79	9%	100	11%
UGA[1]	65	7	11%	0	0%	0	0%	7	11%
Total	989	38	4%	10	1%	79	8%	107	11%
	2006 Population Estimate			2030 Population Forecast					
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area			
City	1,525	30	2%	3,110	165	5%			
UGA	20	5	25%	475	5	1%			
Total	1,545	35	2%	3,585	170	5%			

	2006 Dwelling Estimate			2030 Dwelling Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	700	15	2%	1,320	70	5%
UGA	5	0	0%	195	0	0%
Total	705	15	2%	1,515	70	5%

	2006 Employment Estimate			2030 Employment Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	810	0	0%	2,100	65	3%
UGA	35	0	0%	45	0	0%
Total	845	0	0%	2,145	65	3%

	Residential			Commercial/Industrial			Government/Institutional		
	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area
City	75	1	1%	17	0	0%	42	1	3%
UGA	1	0	10%	0	0	0%	0	0	0%
Total	76	1	2%	17	0	0%	42	1	3%

Source: Thurston Regional Planning Council Population Forecast, 2007; Thurston County Assessor's Office; Local Jurisdictions.
Explanations: Numbers may not add due to rounding.
[1]UGA - Urban Growth Area. Unincorporated area designated to be annexed into city limits over 20 years time to accommodate urban growth.

Probability of Occurrence

Same as described in the Regional Risk Assessment.

Historical Occurrences and Impacts Specific to this Jurisdiction

There is a specific pattern to groundwater flooding in areas of Tenino. Water that comes down from hills surrounding the southern edge of the city will cause flooding in the Huston Street area, to the west, approximately 24 hours after the water enters the ground at the bottom of the hill.

January 2009, Federal Disaster 1817

Groundwater surfaced in the vicinity of a trailer park on Garfield Avenue. Scatter Creek caused flooding in backyards of residences along Old Military Road. Flooding is also known in the neighborhood at the south end of Huston Street.

December 2007, Federal Disaster 1734

Localized flooding occurred.

1990, Flooding

Morningside Drive was washed away in the vicinity of the railroad trestle, preventing residents from accessing downtown Tenino by car. City water mains were also exposed by the flood.

Summary Assessment

Flooding events have a high probability of occurrence in Tenino. Several areas of town have flooded in the past, to varying degrees of severity, resulting in a moderate vulnerability rating. The nature of past flood events and their impacts in Tenino results in a moderate risk assessment.

Summary Risk Assessment for Flood in Tenino

Probability of Occurrence	Vulnerability	Risk
High	Moderate	Moderate

Landslide

Severity

Same as described in Chapter 4.4 of the Regional Risk Assessment. Tenino has some areas of steep slopes above its City Park and also in the western portion of the city. Steep slopes (> 40%) also exist along roads that connect the city to Bucoda, Rainier and Tumwater, including SR 507 and Old Highway 99. Locations of steep slopes are shown on the City of Tenino Steep Slopes map.

Impacts

Travel by Tenino residents and emergency personnel could be impacted by landslides along the major routes out of town, including SR 507 toward Bucoda and Rainier and Old Highway 99 in the direction of Tumwater.

Table 4 shows information on population, structures and assets at risk of landslides in Tenino.

Table 4. Description of land, population, employment and assets at risk of landslide in Tenino

	Landslide Hazard Area		
	Total Acres	In Hazard Area	% In Hazard Area
City	924	24	3%
UGA[1]	65	3	5%
Total	989	27	3%

	2006 Population Estimate			2030 Population Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	1,525	10	1%	3,110	1,009	32%
UGA	20	5	25%	475	409	86%
Total	1,545	15	1%	3,585	1,418	40%

	2006 Dwelling Estimate			2030 Dwelling Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	700	5	1%	1,320	415	31%
UGA	5	0	0%	195	170	87%
Total	705	5	1%	1,515	585	39%

	2006 Employment Estimate			2030 Employment Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	810	0	0%	2,100	310	15%
UGA	35	0	0%	45	5	11%
Total	845	0	0%	2,145	315	15%

	Residential			Commercial/Industrial			Government/Institutional		
	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area
City	75	1	1%	17	0	0%	42	1	3%
UGA	1	0	21%	0	0	0%	0	0	0%
Total	76	1	1%	17	0	0%	42	1	3%

Source: Thurston Regional Planning Council Population Forecast, 2007.
Explanations: Numbers may not add due to rounding.
1UGA - Urban Growth Area. Unincorporated area designated to be annexed into city limits over 20 years time to accommodate urban growth.

Probability of Occurrence

Same as in the Regional Risk Assessment.

Historical Occurrences and Impacts Specific to this Jurisdiction

None of note.

Summary Assessment

Landslides have a high probability of occurrence throughout the Thurston region. Some land area and residents of Tenino are found within landslide hazard areas. The major threat from landslides is in transportation routes to outside areas being cut off by a landslide event. Routes to the west of the city are less vulnerable. A low vulnerability rating has been assigned. Overall, landslides pose a moderate risk to Tenino.

Summary Risk Assessment for Landslide in Tenino

Probability of Occurrence	Vulnerability	Risk
High	Low	Moderate

Wildland Fire

Severity

Same as described in Section 4.5 of the Regional Risk Assessment. Severity will vary depending on the size of the fire and the population and value of structures at risk. According to a determination by the Washington State Department of Natural Resources, a large High Fire Risk Area abuts Tenino to the south. Wildfires in this area may pose a threat to Tenino and its residents. Wildland fires may leave previously wooded and vegetated hillsides vulnerable to erosion and landslides. The City of Tenino Wildfire Hazard Areas map shows the location of at risk areas.

Impacts

Wildfires that are not contained may threaten property and cause injury and death when those at risk do not quickly evacuate. This may include people recreating in wild areas, or those who live or work on the Wildland Urban Interface. Wildfires can destroy large areas of forest, killing wildlife and reducing viable habitat.

See Table 5(a-e) for information on population, structures and assets that are at risk of wildland fire in Tenino.

Table 5. Population, land, employment and assets at risk of wildland fire in Tenino

		Wildland Urban Interface Fire Hazard	
	Total Acres	In Hazard Area	% In Hazard Area
City	924	14	2%
UGA[1]	65	46	71%
Total	989	60	6%

	2006 Population Estimate			2030 Population Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	1,525	5	0%	3,110	40	1%
UGA	20	5	25%	475	430	91%
Total	1,545	10	1%	3,585	470	13%

	2006 Employment Estimate			2030 Employment Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	810	0	0%	2,100	0	0%
UGA	35	0	0%	45	5	11%
Total	845	0	0%	2,145	5	0%

	2006 Dwelling Estimate			2030 Dwelling Forecast		
	Total	In Hazard Area	% in Hazard Area	Total	In Hazard Area	% in Hazard Area
City	700	0	0%	1,320	15	1%
UGA	5	0	0%	195	175	90%
Total	705	0	0%	1,515	190	13%

	Residential			Commercial/Industrial			Government/Institutional		
	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area	Total (mil. $)	In Hazard Area	% in Hazard Area
City	$75	$0	1%	$17	$0	0%	$42	$0	1%
UGA	$1	$0	22%	$0	$0	0%	$0	$0	0%
Total	$76	$1	1%	$17	$0	0%	$42	$0	1%

Source: Thurston Regional Planning Council Population Forecast, 2007; Thurston County Assessor's Office; Local Jurisdictions.
Explanations: Numbers may not add due to rounding.
[1]UGA - Urban Growth Area. Unincorporated area designated to be annexed into city limits over 20 years time to accommodate urban growth.

Probability of Occurrence

The probability of small fires (smaller than two acres in size) occurring in Tenino is high. The probability of larger fires occurring is low.

Historical Occurrences and Impacts Specific to this Jurisdiction

Between 1972 and 2007, there have been two fires within Tenino city limits, and four in the vicinity of the city. All of these fires were less than two acres in size.

Summary Assessment

Wildland fires have a high probability of occurrence throughout the Thurston Region. Tenino abuts a large wooded area that is considered to be at high risk for wildland fire, and has been assigned

a moderate vulnerability rating. The city is partially surrounded by, and also includes within its boundaries, wooded areas that could catch fire. A moderate risk rating has been assigned to the city.

Summary Risk Assessment for Wildland Fire in Tenino

Probability of Occurrence	Vulnerability	Risk
High	Moderate	Moderate

Volcanic Hazards

Severity

Same as described in Section 4.6 of the Regional Risk Assessment.

Impacts

Tenino could be impacted by ash fall from a volcanic eruption. Ash accumulation presents difficult driving conditions, including reduced visibility. This could result in injury or death as a result of traffic accidents. Inhalation of ash particles could pose a threat to people with respiratory illnesses, though avoiding exposure would mitigate this threat. Ash can cause damage to agricultural crops as well as mechanical outdoor ventilation, heating and air conditioning systems. Significant rooftop accumulation could lead to structural failures. Wet ash can cause slippery roads, increased threat of structural failures, and power outages.

Probability of Occurrence

For ash fall, same as described in Section 4.6 of the Regional Risk Assessment. A volcanic lahar is not likely to impact Tenino.

Historical Occurrences and Impacts Specific to this Jurisdiction

May 1980, Federal Disaster 623: Mt. St. Helens Eruption

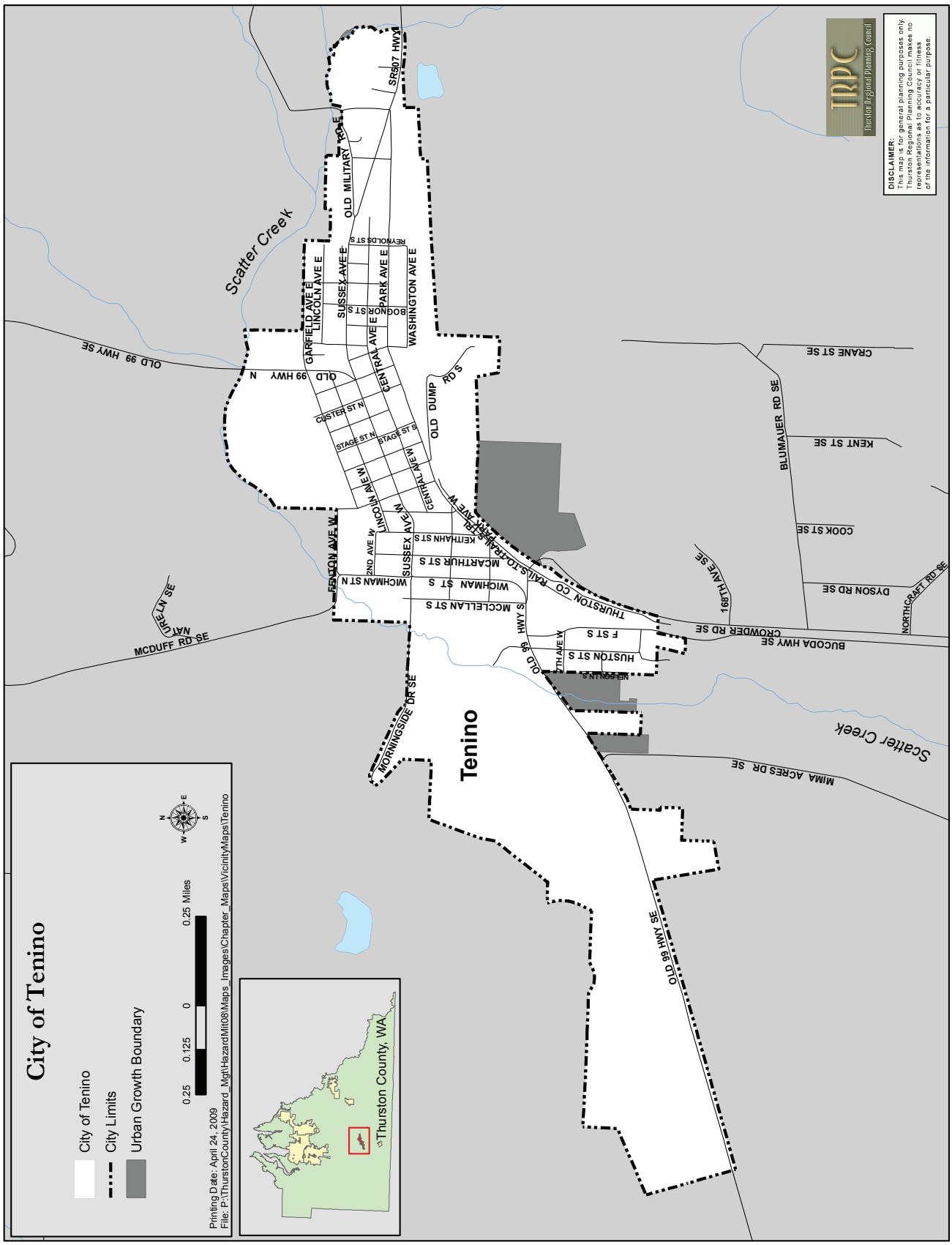
The city received a dusting of ash, which was only a minor nuisance.

Summary Assessment

Volcanic events have a low probability of occurrence. Historical events demonstrate a moderate vulnerability to the threats of volcanic events, though a major eruption could impact the city depending on the specific conditions of the event. Impacts would likely be limited to ash fall. A low risk rating has been assigned.

Summary Risk Assessment for Volcanic Events in Tenino

Probability of Occurrence	Vulnerability	Risk
Low	Moderate	Low


Tenino
City of Tenino
City of Tenino
City Limits
Urban Growth Boundary
0.25 0.125 0 0.25 Miles
Printing Date: April 24, 2009
File: P:\ThurstonCounty\Hazard_Mgt\HazardMit08\Maps_Images\Chapter_Maps\VicinityMaps\Tenino
Thurston County, WA
Scatter Creek
SR507 HWY
OLD MILITARY RD E
REYNOLDS ST S
SUSSEX AVE E
PARK AVE E
BOGNOR ST S
WASHINGTON AVE E
GARFIELD AVE E
LINCOLN AVE E
CENTRAL AVE E
OLD 99 HWY N
OLD 99 HWY SE
CUSTER ST N
STAGE ST N
STAGE ST S
OLD DUMP RD S
LINCOLN AVE W
CENTRAL AVE W
KEITHAN ST S
SUSSEX AVE W
2ND AVE W
FENTON AVE W
MCARTHUR ST S
WICHMAN ST N
WICHMAN ST S
MCCLELLAN ST S
THURSTON CO RAIL TO TRAIL
OLD 99 HWY S
F ST S
HUSTON ST S
7TH AVE W
NELSON LN S
MORNINGSIDE DR SE
MCDUFF RD SE
NATURE LN SE
OLD 99 SE HWY
MIMA ACRES DR SE
CRANE ST SE
BLUMAUER RD SE
KENT ST SE
COOK ST SE
DYSON RD SE
NORTHCRAFT RD SE
BUCODA HWY SE
CROWDER RD SE
184TH AVE SE
TRPC
Thurston Regional Planning Council
DISCLAIMER:
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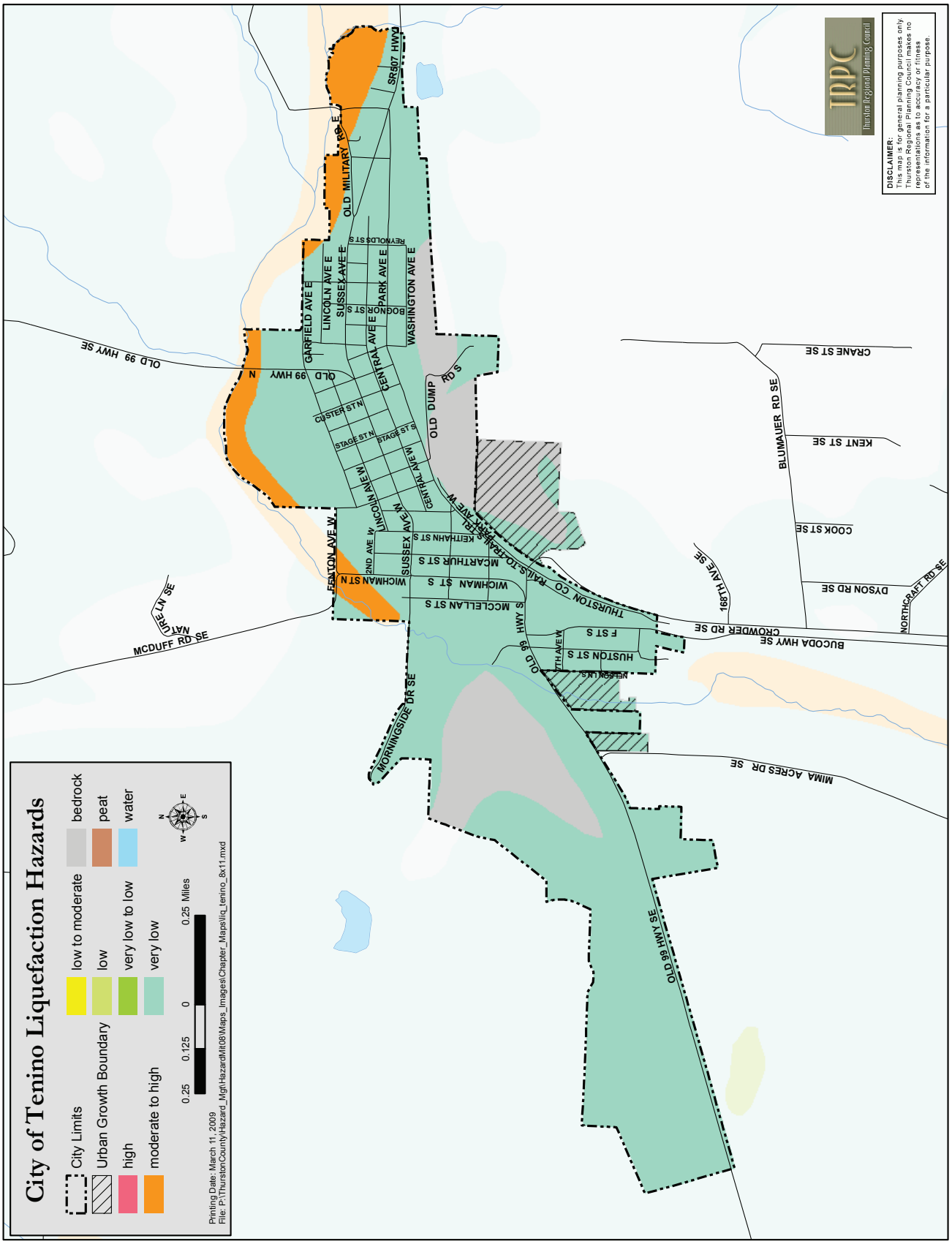
City of Tenino Liquefaction Hazards
City Limits
Urban Growth Boundary
high
moderate to high
low to moderate
low
very low to low
very low
bedrock
peat
water
0.25 0.125 0 0.25 Miles
Printing Date: March 11, 2009
File: P:\ThurstonCounty\Hazard_Mgt\HazardMit08\Maps_Images\Chapter_Maps\liq_tenino_8x11.mxd
TRPC
Thurston Regional Planning Council
DISCLAIMER:
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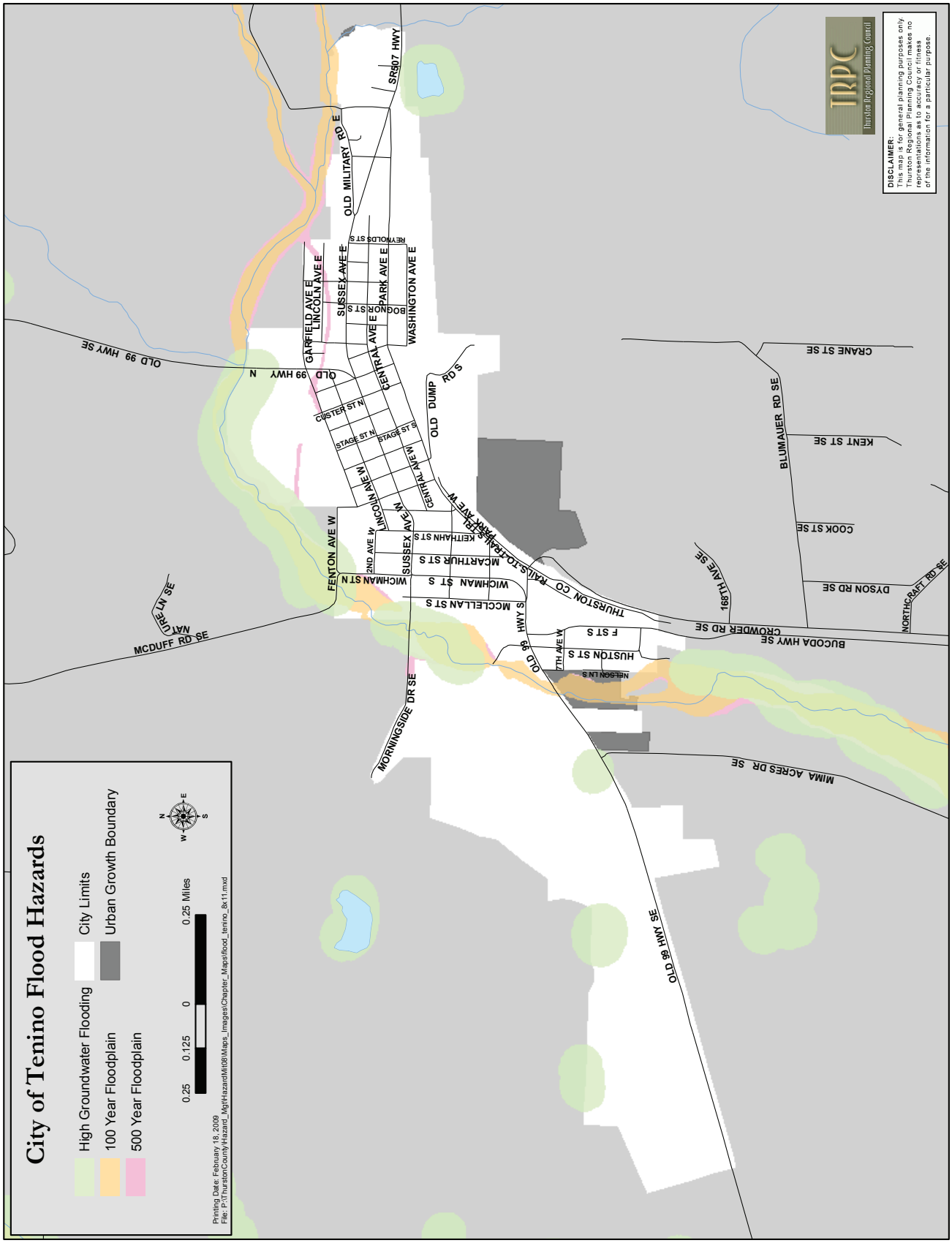
SR507 HWY
OLD MILITARY RD E
REYNOLDS ST S
GARFIELD AVE E
LINCOLN AVE E
SUSSEX AVE E
BOGNOR ST S
PARK AVE E
WASHINGTON AVE E
CENTRAL AVE E
OLD 99 HWY SE
OLD 99 HWY N
CUSTER ST N
STAGE ST N
STAGE ST S
OLD DUMP RD S
CRANE ST SE
BLUMAUER RD SE
KENT ST SE
COOK ST SE
DYSON RD SE
NORTHCRAFT RD SE
CROWDER RD SE
BUCODA HWY SE
191ST AVE SE
CENTRAL AVE W
LINCOLN AVE W
SUSSEX AVE W
FENTON AVE W
2ND AVE W
KEITHAHN ST S
MCARTHUR ST S
WICHMAN ST S
WICHMAN ST N
MCCLELLAN ST S
THURSTON CO RAILS TO TRAILS
S HWY 99
OLD 99
F ST S
HUSTON ST S
NETSON LN S
7TH AVE W
MORNINGSIDE DR SE
MIMA ACRES DR SE
OLD 99 HWY SE
MCDUFF RD SE
NAT GRE LN SE


City of Tenino Flood Hazards
High Groundwater Flooding
100 Year Floodplain
500 Year Floodplain
City Limits
Urban Growth Boundary
0.25 0.125 0 0.25 Miles
Printing Date: February 18, 2009
File: P:\Thurston County\Hazard_Mgt\HazardMit08\Maps_Images\Chapter_Maps\flood_tenino_8x11.mxd
TRPC
Thurston Regional Planning Council
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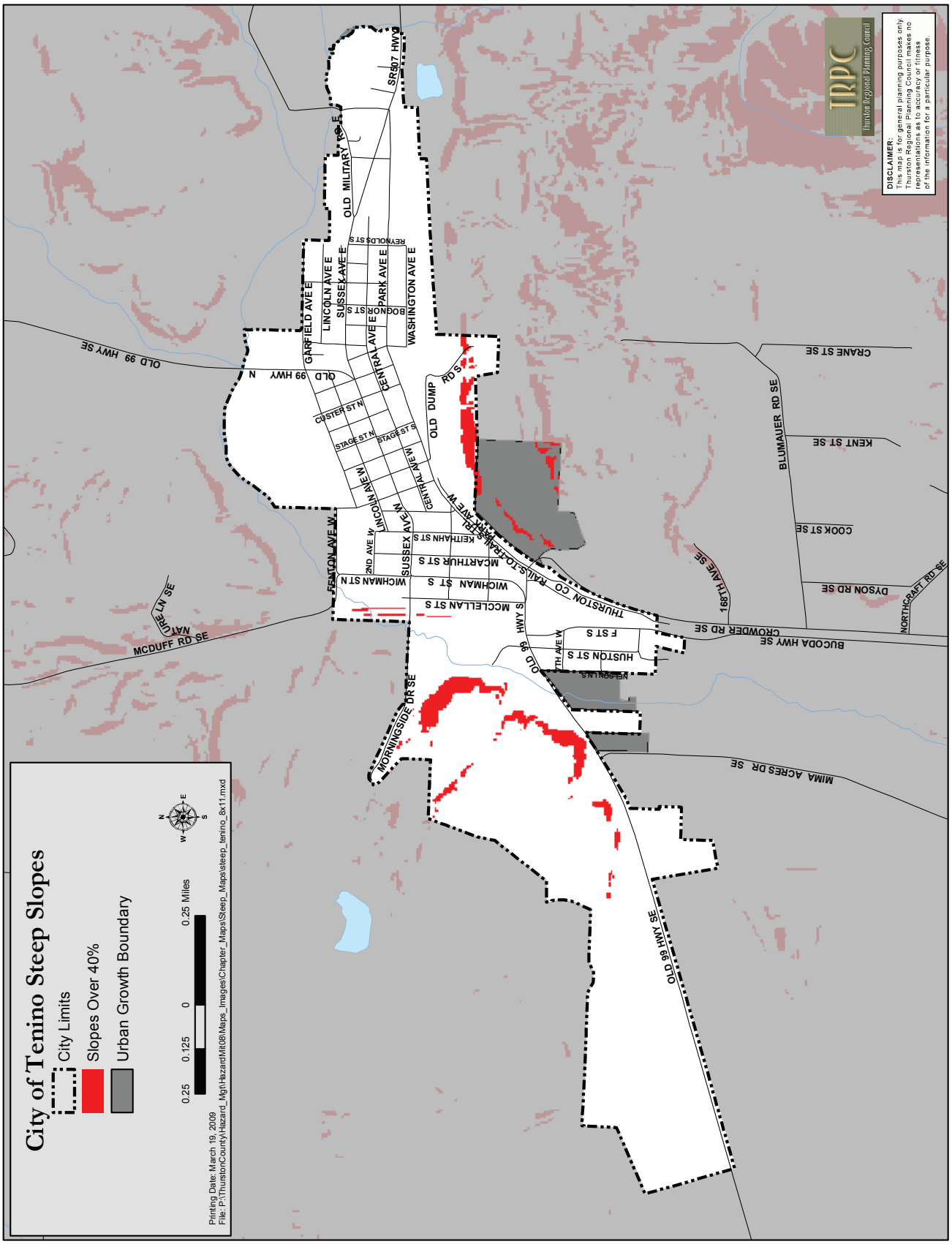
OLD 99 HWY SE
OLD 99 HWY N
SR507 HWY
OLD MILITARY RD E
GARFIELD AVE E
LINCOLN AVE E
SUSSEX AVE E
PARK AVE E
CENTRAL AVE E
WASHINGTON AVE E
REYNOLDS ST S
BOGNOR ST S
CUSTER ST N
STAGE ST N
STAGE ST S
OLD DUMP RD S
CENTRAL AVE W
LINCOLN AVE W
SUSSEX AVE W
2ND AVE W
KEITHAHN ST S
MCARTHUR ST S
WICHMAN ST N
WICHMAN ST S
MCCLELLAN ST S
FENTON AVE W
MCDUFF RD SE
NATURE TRAILS PARK AVE W
THURSTON CO TRAILS TO TRAILS
OLD 99 S
7TH AVE W
HUSTON ST S
F ST S
NELSON LN S
MORNINGSIDE DR SE
OLD 99 HWY SE
MIMA ACRES DR SE
BUCODA HWY SE
CROWDER RD SE
THURSTON CO
168TH AVE SE
DYSON RD SE
COOK ST SE
KENT ST SE
BLUMAUER RD SE
CRANE ST SE
NORTHCRAFT RD SE


City of Tenino Steep Slopes
City Limits
Slopes Over 40%
Urban Growth Boundary
0.25 0.125 0 0.25 Miles
Printing Date: March 19, 2009
File: P:\ThurstonCounty\Hazard_Mgt\HazardMit08\Maps_Images\Chapter_Maps\Steep_Maps\steep_tenino_8x11.mxd
DISCLAIMER:
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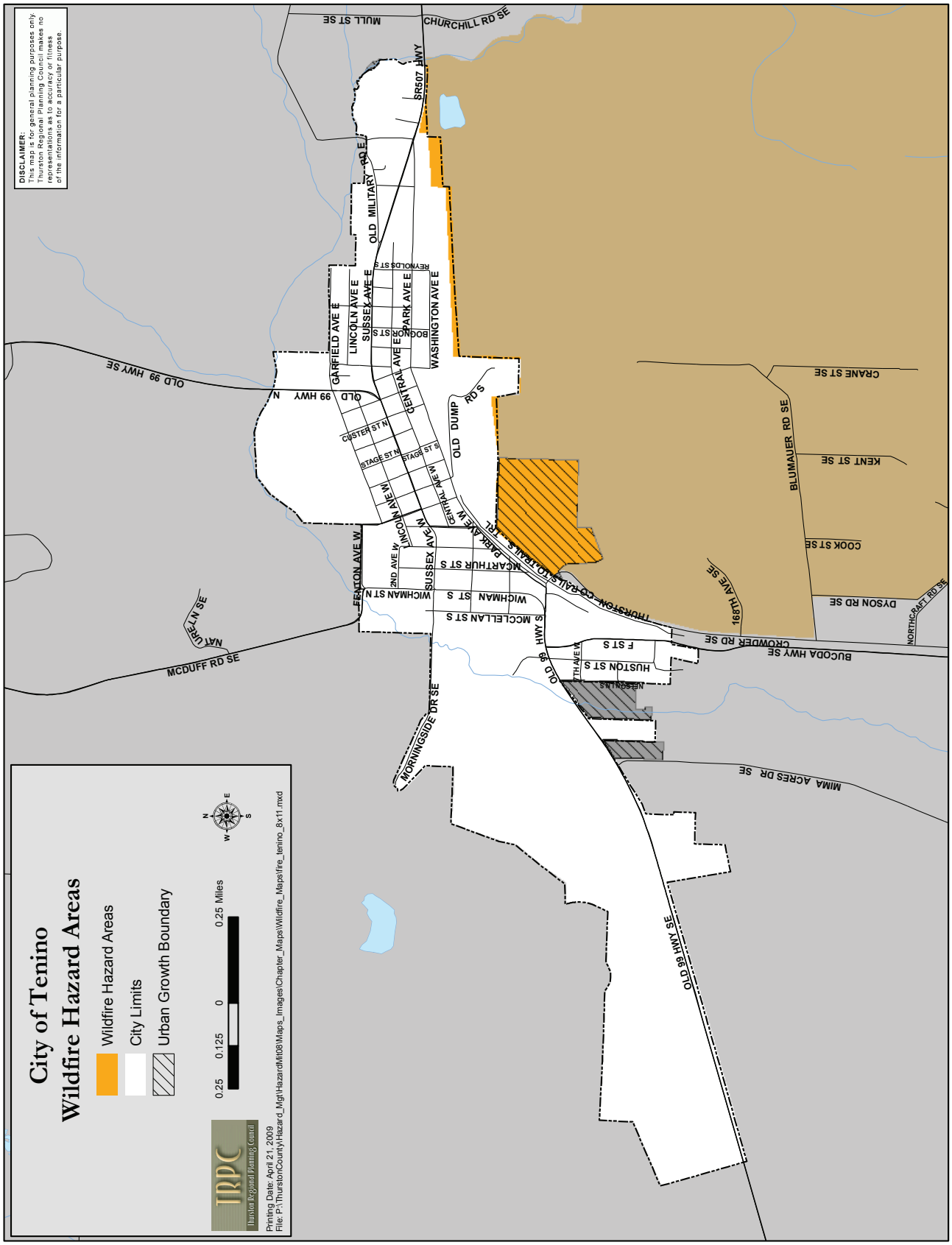
TRPC
Thurston Regional Planning Council
SR 507 HWY
OLD MILITARY RD E
REYNOLDS ST S
GARFIELD AVE E
LINCOLN AVE E
SUSSEX AVE E
PARK AVE E
BOONE ST S
WASHINGTON AVE E
CENTRAL AVE E
OLD 99 HWY SE
OLD 99 HWY N
CUSTER ST N
STAGE ST N
STAGE ST S
OLD DUMP RD S
CENTRAL AVE W
LINCOLN AVE W
SUSSEX AVE W
2ND AVE W
KEITHAHN ST S
MCARTHUR ST S
WICHMAN ST S
WICHMAN ST N
MCCLELLAN ST S
FENTON AVE W
NATIONAL LN SE
MCDUFF RD SE
THURSTON CO FAIRGROUNDS
THURSTON CO FAIRGROUNDS
S 1ST AVE W
S HWY 99
OLD 99
F ST S
HUSTON ST S
NELSON LN S
MORNINGSIDE DR SE
OLD HWY 99 SE
MIMA ACRES DR SE
CRANE ST SE
BLUMAUER RD SE
KENT ST SE
COOK ST SE
DYSON RD SE
168TH AVE SE
BUCODA HWY SE
CROWDER RD SE
NORTHCRAFT RD SE


DISCLAIMER:
This map is for general planning purposes only. Thurston Regional Planning Council makes no representations as to accuracy or fitness of the information for a particular purpose.
City of Tenino
Wildfire Hazard Areas
Wildfire Hazard Areas
City Limits
Urban Growth Boundary
0.25 0.125 0 0.25 Miles
Printing Date: April 21, 2009
File: P:\ThurstonCounty\Hazard_Mgt\HazardMit08\Maps_Images\Chapter_Maps\Wildfire_Maps\fire_tenino_8x11.mxd
Thurston Regional Planning Council
MULL ST SE
CHURCHILL RD SE
SR507 HWY
OLD MILITARY RD E
REYNOLDS ST S
GARFIELD AVE E
LINCOLN AVE E
SUSSEX AVE E
PARK AVE E
WASHINGTON AVE E
BOGUE ST S
CENTRAL AVE E
OLD 99 HWY SE
OLD 99 HWY N
CUSTER ST N
STAGE ST N
STAGE ST S
OLD DUMP RD S
CRANE ST SE
BLUMAUER RD SE
KENT ST SE
COOK ST SE
DYSON RD SE
NORTHCRAFT RD SE
CROWDER RD SE
BUCODA HWY SE
168TH AVE SE
THURSTON CO RAILS TO TRAILS TRL
CENTRAL AVE W
PARK AVE W
LINCOLN AVE W
SUSSEX AVE W
2ND AVE W
MCARTHUR ST S
WICHMAN ST S
WICHMAN ST N
MCCLELLAN ST S
FENTON AVE W
NAT TURF LN SE
MCDUFF RD SE
HWY 99
OLD 99
F ST S
HUSTON ST S
NE 5TH AVE
MORNINGSIDE DR SE
MIMA ACRES DR SE
OLD 99 HWY SE

City of Tenino Mitigation Initiatives

Current Mitigation Initiatives consist of actions that have not yet begun or require additional work. They consist of new initiatives identified by the City of Tenino during the plan update process. They also consist of existing initiatives that were carried over from the first edition of this plan and modified from their original form to reflect present needs.

Priority	I.D. Number	Category	Action	Status
1 of 10	TEN-MH 3	Critical Facilities Replacement/Retrofit	Retrofit Tenino High School for generator hookup capability.	New
2 of 10	TEN-MH 1	Critical Facilities Replacement/Retrofit	Purchase and install a 20KW generator at the Tenino Police Building.	Modified
3 of 10	TEN-FH 1	Public Information	Flood Hazard Education and Community Outreach	New
4 of 10	TEN-FH 2	Data Collection and Mapping	Scatter Creek Stream Gage Installation and Data Monitoring	New
5 of 10	TEN-FH 4	Data Collection and Mapping	Flood Hazard Analysis and Project Prioritization	New
6 of 10	TEN-FH 3	Data Collection and Mapping	Flood Hazard Mitigation Review of City Ordinances and Best Practice Amendments	New
7 of 10	TEN-MH 2	Critical Facilities Replacement/Retrofit	Retrofit the Tenino City Fire Hall building and set up an alternate disaster command center.	Modified
8 of 10	TEN-MH 5	Hazard Preparedness	Construct third well and redundant reservoir above City Park.	New
9 of 10	TEN-MH 4	Hazard Preparedness	Purchase a 26 foot semi-trailer and stock it with emergency supplies to be used in hazard response.	New
10 of 10	TEN-EH 1	Data Collection and Mapping	Fund engineer study of potential seismic retrofits for historical buildings.	New

Hazard Category Codes are as follows: EH=Earthquake Hazard; FH=Flood Hazard; LH=Landslide Hazard; MH=Multi Hazard; SH=Storm Hazard; WH=Wildland Fire Hazard; and VH=Volcanic Hazard.

Priority: 1 of 10 Status: New

Hazard Addressed: Multi Hazard
Category: Critical Facilities Replacement / Retrofit

TEN-MH 3: Retrofit Tenino High School for generator hookup capability.

Rationale: Tenino High School is an emergency evacuation shelter for residents of Tenino. During an emergency, response personnel will report to the school. At this time, there is no source of reserve power for the school. The city owns a 100 kW trailer-mounted generator, but the school's electrical system will need to be configured to allow the generator to be hooked up during a power outage.

Relates to Plan Goal(s) and Objectives: 3A, 3B, 3E

Implementer: City of Tenino – Public Works; Tenino School District

Estimated Cost: $5,000

Time Period: 2013

Funding Source: Grant funds

Source and Date: New Initiative

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This is a new initiative.

Priority: 2 of 10 Status: Existing

Hazard Addressed: Multi Hazard
Category: Critical Facilities Replacement / Retrofit

TEN-MH 1: Purchase and install a 20KW generator at the Tenino Police Building.

Rationale: Having a self sufficient command center during disasters is imperative to disaster management. An independent power source is needed in case electrical service is disrupted. Provisions would be made for three days fuel storage at the site. The generator itself should be trailer mounted to facilitate use by all City departments.

Relates to Plan Goal(s) and Objectives: 4D

Implementer: City of Tenino – Police Department and Public Works

Estimated Cost: $25,000

Time Period: 2010-2012

Funding Source: Grant and/or City Funds

Source and Date: Natural Hazard Mitigation Plan for the Thurston Region (2003)

Adopted Plan Number: TEN-MH 1

Reference Page: V-103

Initiative and Implementation Status: This item is still a priority but has not yet been completed due to lack of funding.

Priority: 3 of 10 Status: New

Hazard Addressed: Flood Hazard
Category: Public Information

TEN-FH 01: Flood Hazard Education and Community Outreach

Rationale: Some neighborhoods within Tenino city limits are vulnerable to riverine flooding from Scatter Creek and high groundwater flooding when seasonal precipitation exceeds normal high levels. In order to prepare residents for potential flood hazards, the City will distribute an annual fall newsletter with the water bill to educate residents about the risks of flooding, steps that can be taken to prevent losses, and inform residents about the National Flood Insurance Program and enrollment procedures.

Relates to Plan Goal(s) and Objectives: 1E, 8A,B

Implementer: City of Tenino Community Development Department

Estimated Cost: $1,000 per year

Time Period: Ongoing

Funding Source: General Fund

Source and Date: New Initiative for 2010

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This initiative will begin in Fall 2010. City staff, planning commission, and council members will review the effectiveness of the program and adjust as necessary each year.

Priority: 4 of 10 Status: New

Hazard Addressed: Flood Hazard
Category: Data Collection and Mapping

TEN-FH 02: Scatter Creek Stream Gage Installation and Data Monitoring

Rationale: Scatter Creek flows seasonally through Tenino City Limits. There is very little data available on the timing and flow rates of the upper portion of the creek that runs through city limits. Through a partnership with Thurston County, the City of Tenino will install and monitor a staff gage near the northern city limits Old Highway 99 Bridge (or suitable location). City and county staff will coordinate efforts to seek a suitable location for the installation of a permanent automatic data recording stream gage. Stream gage data combined with a nearby precipitation station can be analyzed to better understand the hydrological conditions that can lead to flooding in this portion of the Chehalis River Basin.

Relates to Plan Goal(s) and Objectives: 1A, 2F,2H

Implementer: City of Tenino Community Development Department and Thurston County Water and Waste Managment

Estimated Cost: $500 Install Staff Gage, $2,000 to locate and install stream gage installation

Time Period: 2010 Staff Gage Installation, 2010-2015 permanent gauge

Funding Source: Describe the source of revenue that will be used to finance the initiative. If a carry-over initiative, consider a new funding source, if appropriate.

Source and Date: New Initiative for 2010

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This is a new initiative. City staff will coordinate with Thurston County to install the staff gage. City staff will monitor the gage on a routine basis to record stream levels.

Priority: 5 of 10 Status: New

Hazard Addressed: Flood Hazard
Category: Data Collection and Mapping

TEN-FH 04: Flood Hazard Analysis and Project Prioritization

Rationale: The City of Tenino has experienced adverse riverine (Scatter Creek), high groundwater, and on occasion urban or stormwater flooding conditions. The city will conduct a downstream analysis to evaluate the factors and conditions that cause the most severe flood conditions within city limits and develop a prioritized list of projects that will prevent future flooding or mitigate future losses. This task would likely run concurrently with TEN-FH 02 and TEN-FH 03. Projects may include stormwater drainage system retrofits or replacements, elevation or relocation of critical infrastructure, or habitat enhancements to Scatter Creek to restore natural functions and increase floodwater conveyance.

Relates to Plan Goal(s) and Objectives: 1B, 2F, 4C, 5A, 6A, 7A,B

Implementer: City of Tenino Community Development and Public Works Departments.

Estimated Cost: $10,000

Time Period: 2010-2015

Funding Source: Grants and General Fund

Source and Date: New Initiative for 2010

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This is a new initiative.

Priority: 6 of 10 Status: New

Hazard Addressed: Flood Hazard
Category: Data Collection and Mapping

TEN-FH 03: Flood Hazard Mitigation Review of City Ordinances and Best Practice Amendments

Rationale: The City of Tenino has experienced adverse riverine (Scatter Creek), high groundwater, and on occasion urban or stormwater flood conditions. The city will review its current critical areas ordinance, zoning ordinances, development ordinances, and building codes to determine if they inadvertently contribute to flood problems within and outside of city limits. The city will amend ordinances as necessary to incorporate best community practices that will avoid flood conditions resulting from future development, both within and outside of city limits.

Relates to Plan Goal(s) and Objectives: 6A,B,C,D

Implementer: City of Tenino Community Development and Public Works Departments.

Estimated Cost: $2,500

Time Period: 2010-2015

Funding Source: Grants and General Fund

Source and Date: New Initiative for 2010

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This is a new initiative.

Priority: 7 of 10 Status: Existing

Hazard Addressed: Multi Hazard
Category: Critical Facilities Replacement / Retrofit

TEN-MH 2: Retrofit the Tenino City Fire Hall building and set up an alternate disaster command center.

Rationale: Having a backup command center is necessary if the primary center is rendered inoperable. Based on the close proximity to active rail lines the Police/City Hall building may be rendered uninhabitable by toxic spills so an alternate command center for disaster management is needed. The fire station did sustain minor damage during the Nisqually earthquake so some retrofitting is needed. Very little communications equipment would be required as the fire station is equipped as an emergency center as normal procedure.

Relates to Plan Goal(s) and Objectives: 3B

Implementer: City of Tenino – Fire Department and Public Works

Estimated Cost: $100,000

Time Period: 2015

Funding Source: Grant Funds

Source and Date: Natural Hazard Mitigation Plan for the Thurston Region (2003)

Adopted Plan Number: TEN-MH 2

Reference Page: V-105

Initiative and Implementation Status: A generator that can power the entire building has been installed. A better communications system is still needed, as well as a chemical shower and command central computers.

Priority: 8 of 10 Status: New

Hazard Addressed: Multi Hazard
Category: Hazard Preparedness

TEN-MH 5: Construct third well and redundant reservoir above City Park.

Rationale: The City's water reservoirs are currently situated on Lemon Hill. Should a hazard event damage the reservoirs, or the transmission lines that connect water service to the city, Tenino's citizens could be without water for an extended period of time. An additional reservoir which serves the city from the opposite side reduces this risk.

Relates to Plan Goal(s) and Objectives: 3C, 4C, 7B

Implementer: City of Tenino – Public Works

Estimated Cost: $750,000-$1,000,000

Time Period: 2015-2018

Funding Source: Grant and City Funds

Source and Date: New Initiative

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This is a new initiative.

Priority: 9 of 10 Status: New

Hazard Addressed: Multi Hazard
Category: Hazard Preparedness

TEN-MH 4: Purchase a 26 foot semi-trailer and stock it with emergency supplies to be used in hazard response.

Rationale: Stocking supplies before a disaster shortens response time in the hours and days after the event. Storing them in a trailer ensures that the supplies can be moved directly to where they are needed most. At the city's discretion, the supplies could be distributed outside of Tenino, should a major hazard event strike any adjacent communities.

Relates to Plan Goal(s) and Objectives: 4D

Implementer: City of Tenino – Public Works

Estimated Cost: $10,000

Time Period: 2010-2012

Funding Source: Grant and/or City Funds

Source and Date: New Initiative

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This is a new initiative.

Priority: 10 of 10 Status: New

Hazard Addressed: Earthquake Hazard
Category: Data Collection and Mapping

TEN-EH 1: Fund engineer study of potential seismic retrofits for historical buildings.

Rationale: Tenino's older sandstone buildings are vulnerable to earthquake damage. Some of these buildings make up the City's Historic District, though sandstone buildings exist in other parts of town. They are important in terms of tourist revenue and the city's sense of history.

Relates to Plan Goal(s) and Objectives: 2A, 5E, 6G

Implementer: City of Tenino – Building Department

Estimated Cost: $50,000

Time Period: 2010-2015

Funding Source: Grants

Source and Date: New Initiative

Adopted Plan Number: N/A

Reference Page: N/A

Initiative and Implementation Status: This is a new initiative

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City of Tenino Implementation of the National Flood Insurance Program

Introduction

All Local Mitigation Plans approved by FEMA after October 1, 2008 **must** describe each jurisdiction's participation in the NFIP and **must** identify, analyze and prioritize actions related to continued compliance with the NFIP. Basic compliance NFIP actions could include, but are not limited to:

- Adoption and enforcement of floodplain management requirements, including regulating all and substantially improved construction in Special Flood Hazard Areas (SFHAs);
- Floodplain identification and mapping, including any local requests for map updates, if needed; or
- Description of community assistance and monitoring activities.

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

National Flood Insurance Program Participation

Summary of National Flood Insurance Program Premiums, Policies, and Claims

Community	Total Premium	Number of Policies V Zone	A Zone	Total	Total Coverage	Total Claims Since 1978	Total Paid Since 1978	Repetitive Losses	Severe Losses
Bucoda	$55,051	0	64	74	$10,033,700	42	$249,262	0	0
Lacey	$4,652	0	0	14	$3,871,000	3	$8,088	0	0
Olympia	$90,555	0	31	82	$25,265,400	16	$347,006	0	0
Rainier	$326	0	0	1	$280,000	0	$0	0	0
Tenino	$1,327	0	0	4	$633,700	7	$105,233	0	0
Tumwater	$2,707	0	0	6	$1,482,000	2	$12,515	0	0
Yelm	$17,617	0	11	28	$7,313,400	2	$7,603	0	0
Thurston County	$316,352	3	281	663	$141,785,400	215	$3,389,280	10	0
County Total :	$488,587	3	387	872	$190,664,600	287	$4,118,987	10	0

Source: FEMA NFIP Insurance Report, Washington, May 5, 2009.

The City of Tenino has participated in the NFIP since 1975. There are four policies within the city, with coverage totaling $633,700. Since 1978, seven claims have been filed with payments totaling $105,233. There are no repetitive loss properties in Tenino. The last community assistance visit was conducted in August 2008. There were no unresolved issues from the last visit.

The City of Tenino will continue to participate in the NFIP.

Flood Plans, Ordinances, and Regulations

18D.70.030 Flood Hazard Area Review Procedures.

A. General Requirements.

2. The Department will complete a review of the Flood Hazard Area maps, and other source documents, for any development proposal to determine whether the proposed project area for a regulated activity falls within a potential flood hazard area. When there is a conflict between the elevations and the mapped 100- or 500-year floodplain or floodway boundaries, the elevations shall govern.

3. When the Department's maps or sources indicate that the proposed project area for a regulated activity is or may be located within a potential flood hazard area, the Department shall require a flood boundary verification survey as outlined in Section C below, and may require a flood study as outlined in Section D below, a deep and/or fast flowing water analysis as outlined in Section E. below, and/or a zero-rise analysis as outlined in Section F below, except for coastal flood hazard areas which shall not be required to submit a flood study, deep and/or fast flowing water analysis, or a zero-rise analysis.

4. Any proposed development located within a flood hazard area shall comply with the flood hazard area standards set forth in Section 18D.70.040.

5. A FEMA Letter of Map Amendment (LOMA) or Letter of Map Revision (LOMR) shall not be submitted to FEMA until review and approval has been granted by the Department. The City shall not recognize any LOMA or LOMR as an amendment to the Department's Flood Hazard maps unless the Department has granted prior approval.

C. Flood Boundary Verification Survey.

1. A flood boundary verification survey that delineates the horizontal and vertical limits of the base flood elevation shall be submitted to the Department when the Department's maps or sources indicate that the proposed project area for a regulated activity is located within a potential flood hazard area.

    a. Where a base flood elevation has not been determined, a flood study shall be required pursuant to Subsection D below.

b. A base flood elevation that has been established through a detailed flood study accepted by the Department may be used in lieu of conducting a flood study.

c. The base flood elevation for a natural watercourse shall be established at the five-foot topographic elevation line above the ordinary high water mark.

2. The requirement to submit a flood boundary verification survey may be waived at the Department's discretion, when the Department can determine, using contour elevations, base flood data, orthophotos, and parcel data, that the extent of the regulated activity is clearly above the base flood elevation.

3. The flood boundary verification survey shall be prepared, signed, and dated by a registered land surveyor or professional engineer.

4. The Department shall review the flood boundary verification survey to determine if the proposed development is located within a flood hazard area.

D. Flood Study.

1. A flood study shall be conducted when the Department's maps or sources indicate that the proposed project area for a regulated activity is, or may be located within, a potential flood hazard area where base flood elevation data is not available through the Flood Insurance Study or other authoritative sources, or when an established base flood elevation is contested. A full engineering analysis to determine the base flood elevation shall be required by the Department. Base flood elevations shall be determined using the detailed methods established in 18D.70.050 Appendix A. The Department may approve alternative methods.

2. The flood study shall be prepared, signed, and dated by a professional engineer.

3. Once the Department has reviewed and approved the flood study, the applicant shall be required to provide a flood boundary verification survey, utilizing the newly established base flood elevation, as outlined in Subsection C above.

E. Deep and/or Fast Flowing Water Analysis.

1. When the Department determines that a proposed project area for a regulated activity is located within a flood hazard area, a deep and/or fast flowing water analysis based on Figure 18D.70-9 and 18D.70.050 Appendix A shall be required to determine the floodway limits.

2. The floodway limits and flood fringe limits identified in the deep and/or fast flowing water analysis shall be depicted on the flood boundary verification survey, as outlined in Subsection C above.

3. The deep and/or fast flowing water analysis shall be prepared, signed, and dated by a professional engineer.

F. Zero-Rise Analysis.

1. When the Department determines that a proposed project area for a regulated activity is located within a flood hazard area, a zero-rise analysis shall be required to determine that no increase in base flood elevation, displacement of flood volume, or flow conveyance reduction will occur as a result of the development.

2. The zero-rise analysis shall be conducted utilizing HEC-RAS modeling methodology (Hydrologic Engineering Center – River Analysis System) or by other alternative methodologies approved by the City (see 18D.70.050 Appendix A). The analysis shall show that no rise (0.01 foot or less) has occurred as a result of the proposed development. The proposed development may need to be reduced or specially engineered (such as utilizing piers or pilings) to achieve zero-rise.

3. The zero-rise analysis shall be prepared, signed and dated by a professional engineer.

18D.70.040 Flood Hazard Area Standards

C. Flood Fringe Areas.

6. Structures. Single-family, two-family, multi-family, mobile/manufactured homes, commercial, industrial, etc., except for critical facilities as set forth in Section 18D.70.040 C5 above, shall be allowed subject to the following standards:

    a. New construction, additions affixed to the side of an existing structure, and substantial improvement of any structure with a crawlspace shall have the lowest floor elevated a minimum of two feet above base flood elevation (see Figure 18D.70-14).

    b. New construction, additions affixed to the side of an existing structure, and substantial improvement of any structure elevated by piers or pilings shall have the bottom of the lowest horizontal structural member elevated a minimum of two feet above the base flood elevation and must be designed by a professional structural engineer. Electrical, heating, ventilation, plumbing, air-conditioning equipment, and other service facilities and associated ductwork shall be elevated a minimum of two feet above base flood elevation, however, the Department may approve a lesser minimum distance above base flood elevation provided that the systems are designed to prevent floodwater from entering or accumulating within the components (see Figure 18D.70-15). Areas below the lowest horizontal structural member shall not be enclosed and shall remain free of obstructions.

Wetlands

18D.30.030 Wetland Review Procedures.

A. General Requirements.

1. The City's Critical Areas Wetland map provides an indication of where potential wetlands are located within the City. The actual presence or location of a potential wetland that has not been mapped, but may be present on or adjacent to a site shall be determined using the procedures and criteria established in this Chapter.

2. The Department will complete a review of the City's Critical Areas Wetland map and other source documents for any proposed regulated activity to determine whether the project area for a proposed single-family dwelling unit or site for all other proposed regulated activities is located within a potential wetland. Identification of a potential wetland may also occur as a result of field investigations conducted by Department staff.

3. When Department maps, sources, or field investigations indicate that a potential wetland is located within the project area for a proposed single-family dwelling or within the site for all other proposed regulated activities, the Department shall require a site evaluation (field investigation) to determine whether or not a regulated wetland is present and if so, the relative location in relation to the proposed project area or site. The findings of the site evaluation shall be documented as outlined in 18D.30.030B and C below.

4. If Department staff completes the site evaluation and determines that no regulated wetlands are present, then wetland review will be considered complete.

5. All site evaluations shall include a proposed categorization of the wetland in accordance with the guidelines set forth in Section 18D.30.020 B and a calculation of the standard wetland buffer as set forth in Section 18D.30.060.

Ordinances 710 & 731 – Adoption of current Development Standards, including Critical Areas Ordinance, SEPA, Comprehensive Plan

Resolution 2003-06 – Adoption of 2003 edition of the Natural Hazards Mitigation Plan for the Thurston Region

Member of Thurston County Emergency Team

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

December 17, 2009

Mr. Andrew Deffobis, Assistant Planner
Thurston Regional Planning Council
2424 Heritage Court SW, Suite A
Olympia, WA 98502

RE: National Flood Insurance Program (NFIP) Status

Dear Mr. Deffobis:

This letter certifies that the City of Tenino is a participating member in good standing in the National Flood Insurance Program (NFIP) with an approved flood damage prevention ordinance found in Section 18D.70 for the Tenino Municipal Code.

The City of Tenino joined the NFIP on February 18, 1975. The NFIP identification number is 530302. There are no unresolved issues from the last community assistance visit, which was conducted on August 22, 2008.

If you need further documentation, please call me at (360) 407-7253 and I will be glad to provide you with any other information you may need.

Sincerely,

Kevin Farrell

Kevin B. Farrell
Floodplain Management Specialist - SWRO
Shorelands and Environmental Assistance Program

Cc. Dan Sokol, Ecology