Thurston County Fire Protection Districts 2 and 4 (SE Thurston Fire and EMS) Annex to the Natural Hazards Mitigation Plan for the Thurston Region

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S. E. THURSTON FIRE & EMS

RESOLUTION NO. 2009-J04

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF S.E. THURSTON FIRE & EMS – (YELM FIRE DISTRICT #2 & THURSTON COUNTY FIRE DISTRICT #4 - RAINIER)

WHEREAS, S.E. Thurston Fire & EMS (Yelm & Rainier), its residents and property are vulnerable to natural disasters: and

WHEREAS, S.E. Thurston Fire & EMS (Yelm & Rainier) Joint Board of Fire Commissioners realizes the importance of reducing or eliminating those vulnerabilities for the overall good and welfare of the community: and

WHEREAS, S.E. Thurston Fire & EMS (Yelm & Rainier) has been an active participant in the Hazard Mitigation Planning Workgroup, which has established a comprehensive, coordinated planning process to eliminate or decrease these vulnerabilities: and

WHEREAS, S.E. Thurston Fire & EMS (Yelm & Rainier) staff have identified, justified and prioritized one initiative intended to mitigate the vulnerabilities within S.E. Thurston Fire and EMS: and

WHEREAS, this proposed initiative and associated projects have been incorporated into 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 HEREBY RESOLVED by the Board of Commissioners for S.E. Thurston Fire & EMS (Yelm & Rainier), as follows:

1. S.E. Thurston Fire and EMS hereby approves and adopts the "Natural Hazards Mitigation Plan for the Thurston Region" as its natural hazards mitigation plan and comprehensive flood hazard management plan.

2. S.E. Thurston Fire and EMS staff are requested and instructed to pursue available funding opportunities for implementation of the mitigation initiative designated by S.E. Thurston Fire and EMS.

3. S.E. Thurston Fire and EMS will, upon receipt of such funding or other necessary resources, seek to implement the proposals contained in its section of the mitigation initiative.

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4. S.E. Thurston Fire and EMS will continue to participate in the updating and expansion of the "Natural Hazards Mitigation Plan for the Thurston Region" in the years to come.

5. S.E. Thurston Fire and EMS 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 at a regular meeting of the S.E. Thurston Fire & EMS Board of Commissioners on this ___3rd_____ day of ___December_____, 2009

Attest:

Rita Hutchesson
District Secretary

Commissioner Orval French

Kathleen Devin
Commissioner Kathleen Devin

Commissioner Steven Slater

Robert L Johnson
Commissioner Robert Johnson

Commissioner Stewart Kunkel

Commissioner Jonathan Sprouffske

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Community Profile
S.E. Thurston Fire and EMS

(360)458-2799
www.sethurstonfire-ems.com

Background

S.E. Thurston Fire & EMS was formed in 2001 as a consolidation of two previously all-volunteer fire departments. The Yelm Fire Department and the Rainier Fire Department began sharing resources to help lessen the burden. The department provides fire suppression, emergency medical services, and public education to the citizens of the City of Rainier, the City of Yelm, and the surrounding unincorporated area.

Governance: S.E. Thurston Fire & EMS is governed by a board of six fire commissioners operating under an Intergovernmental Agreement. Commissioners must reside in the district and they are elected by district voters to serve six year terms.

Demographics

Service Area Limits (sq mi.)[1]:	130
Service Area Population	19,390
Dwelling Units	7,810

Thurston County Population by Race (2000)[2]:	
White Alone	86%
Black/African American	2%
American Indian & Alaska Native	2%
Asian	4%
Hispanic or Latino	5%
Other	2%

Mission
S.E. Thurston Fire & EMS will provide professional, caring volunteer and full time responders to all manner of emergencies. We will strive to effectively utilize all available resources as provided by our community. We will train our responders to safely meet increasing call volumes and to fulfill the public need for education and prevention. We will respond with compassion and integrity, with respect and support for citizens in their time of need.

Vision
S.E. Thurston Fire & EMS will be the model community leader in providing emergency response and training to meet the fire, rescue, and emergency medical service needs of our citizens.

Major Lands Within the District
Fort Lewis Military Reservation
Private Commercial Timberlands

Service / Operations

Service Summary

Stations	**Duty Positions**
Station #21 Yelm Station	3
Station #22 Lawrence Lake Station	0
Station #24 Rainier Station	2
Station #25 McIntosh Station	0
Station #26 Vail Station	0

Apparatus	**Quantity**
Engine	4
Tender	2
Brush Truck	2
Aid Unit	2
Command Vehicle	4
Maintenance	2
Other	2

Staff[3]	**Number**
Career/Full-Time	25
Part-Time	1
Volunteer Firefighter/EMTs	10

Financial

Assets (2008)[4]:	
Valuation of Infrastructure	$3,235,305
Valuation of Apparatus and Contents	$4,395,825
Total Assets	**$7,631,130**

Yelm FD tax collection	$1,429,512
Rainier FD tax collection	$714,886
City of Yelm contract for service	$445,990
Grants, etc.	$640,155
Total Revenue	**$3,230,543**

Expenses	
Legislative Services	$73,068
Fire Administration	$723,850
Fire Suppresion-Salaries & Benefits	$1,692,712
Fire Suppresion-M & O	$241,578
Fire Control-Prevention & Public Relations	$17,375
Fire Control-Training	$35,974
Fire Control-Facilities	$79,127
Capital Expenses	$239,524
Total Expenses	**$3,103,208**

Sources:
[1]Thurston Regional Planning Council
[2]U.S. Bureau of the Census; data is for the entire County
[3]This figure includes firefighter/EMTs (18), chiefs (3), administrative (2) & maintenance staff (2). 1 PT receptionist.
[4]S.E. Thurston Fire and EMS

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Thurston County Fire Districts 2 and 4 (SE Thurston Fire and EMS, Yelm and Rainier) Plan Development Process

Hazard Mitigation Plan Workgroup

The following individuals served as SE Thurston Fire and EMS's hazards mitigation planning development workgroup:

Department/Title	Representative(s)
Fire Chief	Rita Hutcheson
Deputy Chief	Mark King
Fire Commissioner	Kathleen Devin
Office Manager	Kris Kelly

Hazard Mitigation Plan Development

The following activities supported the development of the District's local hazard mitigation planning process:

Date	Location	Activity	Subject
April 2009	Yelm Fire Station	Work Group Meeting	2003 Plan review & Plan Development
May 13, 2009	Yelm Fire Station	Meeting with DC King	Risk Assessment
May 26, 2009	Yelm Fire Station	Work Group Meeting	Risk Assessment
June 10, 2009	Yelm Fire Station	Meeting with DC King	Mitigation Initiative
July 10, 2009	Yelm Fire Station	Meeting with DC King	AARA Grant preparation
July 24, 2009	Yelm Fire Station	Meeting with DC King	Community Profile completion
August 4, 2009	Yelm Fire Station	Work Group Meeting	Review of draft plan to date
August 7, 2009	Yelm Public Safety Building	Meeting with Police Chief, Todd Stancil	Plan Development

Mitigation Initiative Prioritization Process

South East Fire and EMS's highest priority project is the completion of the seismic retrofit of its headquarters station. See the mitigation initiative for more information.

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Thurston County Fire Districts 2 and 4 (SE Thurston Fire and EMS, Yelm and Rainier) Risk Assessment

Introduction

The risk assessment provides information about the hazards that threaten S. E. Thurston Fire & EMS. 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)(::)(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:

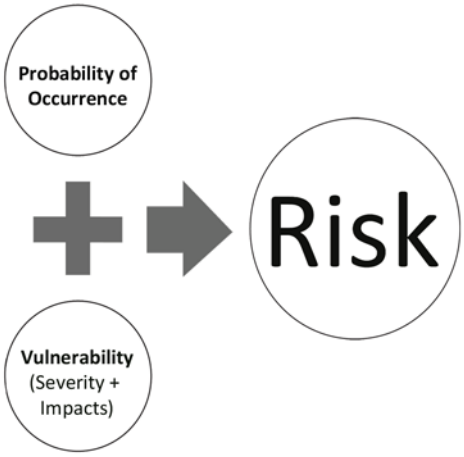


Figure 1: Risk is a subjective estimate of the combination of a hazard's probability of occurrence and a community's vulnerability.

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 worst 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 worst 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 S. E. Thurston Fire & EMS.

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

Local Risk Assessment

A comprehensive risk assessment of the major natural hazards that threaten S. E. Thurston Fire & EMS 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 S. E. Thurston Fire & EMS are scaled to local boundaries and are included in this section.

Earthquake

Severity

Current accepted measurement of earthquake intensity is the Richter Magnitude Scale, which expresses peak ground acceleration as a measure of ground movement. Severity is dependent upon the source of the quake. There are three major types: 1) crustal (shallow) in faults along the North American plate, 2) subduction zone along the Juan de Fuca and North American plates, and 3) deep in the Juan de Fuca plate. The most current and proximate earthquake in 2001 centered near the Nisqually River Delta. This was a deep type measuring 6.8 on the Richter Scale.

Impacts

Based on an independent assessment of natural hazards by S.E. Thurston Fire & EMS, the relative risk for earthquakes indicates an area impact exceeding 75% with few fatalities but the potential for numerous injuries and potential for major damage and/or to buildings. Depending on the severity of the earthquake, there is potential for damage to roadways and bridges, creating challenges in maneuverability of emergency vehicles in some areas of the district.

Probability of Occurrence

Past events suggest a destructive event occurs about every 26 years. Therefore, the probability of occurrence of a damaging earthquake is “high”.

Historical Occurrences and Impacts Specific to this Jurisdiction

At 10:54 a.m. on February 28, 2001 a magnitude 6.8 earthquake produced strong ground shaking across Washington State. The epicenter was located near Anderson Island, approximately 11 miles north of Olympia near the Nisqually River Delta. The focus was located nearly 33 miles underground. The depth of the earthquake minimized the intensity of the shaking and limited the impact to the built environment. Thurston County was among the hardest hit counties in the State, with the most damage in Olympia and Tumwater. The main fire station, built in 1952, within Rainier sustained reportable damage to the structure. State Hazard Mitigation grant funds were approved to replace the facility. The fire districts operated under disaster conditions for approximately 48 hours, providing assessment and response services throughout the districts. There were no reported injuries or deaths. Damage within the districts was minor.

Summary Assessment

History suggests a high probability of occurrence of another damaging earthquake within the next 25 years. The 2001 Nisqually earthquake is not the largest event possible in the Puget Sound area. It is conceivable a similar or greater magnitude earthquake could occur from a shallow crustal fault, resulting in much greater structural damage and potential for injuries and deaths.

Summary Risk Assessment for Earthquake in S. E. Thurston Fire & EMS

Probability of Occurrence	Vulnerability	Risk
High	High	High

Storm

Severity

A severe storm is a meteorological event generated by atmospheric conditions. The most destructive storms in western Washington occur from October through April delivering sustained high speed directional winds and higher than normal levels of precipitation. Severe weather events are the most frequent source of natural disasters for S.E. Thurston Fire & EMS and the surrounding communities. Between 1962 and 2009, 19 of 23 Presidential Disaster Declarations for Thurston County were attributed to damage resulting from the effects of winter storms, principally damage from flooding and/or high ground water, high winds, freezing rain, black ice, and heavy snow.

Impacts

These storms cause significant property damage, power loss, and disruption of services within S.E. Thurston Fire & EMS since much of the area is rural and heavily forested. Winter storms are deadly because sustained sub-freezing temperatures pose significant operational problems for transportation and emergency response. They also greatly increase the risk of hypothermia for elderly, low income and homeless populations, or much larger populations when electrical power is disrupted. Thunderstorms also occur in S.E. Thurston Fire & EMS. These storms deliver hail, lightning, and tornados to the region, but thunderstorm events are much less common, shorter lasting, and the impacts and damages are much more isolated than winter storms. High winds weaken standing trees and structures that are weighted with snow or ice. Tall columnar trees and their massive branches act like giant hammers and sever electrical transmission lines, crush vehicles, damage homes and buildings, and block transportation routes. Falling tree limbs and other flying debris can injure or cause the death of people and animals. Widespread power outages can take several days to restore. The total mass of downed debris on the transportation network impedes the response capabilities of emergency personnel and utility crews. When power outages occur simultaneously with heavy stormwater flows, public works crews may struggle to provide auxiliary power to sewer lift stations to prevent backups or flooding within the City of Yelm.

People without power may lack backup home heating systems and may suffer from hypothermia if temperatures persist below freezing levels. Out of desperation, some people may resort to heating their homes with BBQ grills unaware of the risks of carbon monoxide poisoning. The risk of home fires increases county-wide as people use candles to light their homes or start wood fires in stoves or fireplaces that are structurally faulty or have excessively dirty or blocked chimneys. Individuals with home powered life support systems, such as oxygen respirators or suction equipment, may be at risk of health complications if backup power systems are not available. Low income populations are particularly impacted by loss of food due to spoilage from lack of refrigeration.

Probability of Occurrence

Storms, primarily in the winter months, are an annual occurrence within S. E. Thurston Fire & EMS. It is anticipated this will not change in the future and will continue to cause damage and injuries requiring fire department services.

Historical Occurrences and Impacts Specific to this Jurisdiction

As stated above storms occur annually within S. E. Thurston Fire & EMS. There has been significant flooding along the banks of the Nisqually and Deschutes Rivers that cause damage and on occasion life threatening situations related to high water. The primary impacts are safe transportation of responding emergency vehicles, accessibility for member to district facilities, and power outages.

Summary Assessment

The high recurrence rate of Pacific Northwest storms, the record of historical damage and the repetitive response and recovery costs associated with these destructive events make the county and S. E. Thurston Fire & EMS highly vulnerable to storm events. At least 18 notable Pacific Northwest cyclones have impacted the Thurston Region in the last 25 years, thus probability of occurrence is high.

Summary Risk Assessment for Storm in S. E. Thurston Fire & EMS

Probability of Occurrence	Vulnerability	Risk
High	High	High

Flood

Severity

A flood is a temporary condition in which a normally dry area of land or infrastructure is inundated by excess standing or flowing water. Floods can occur during any season and at any time. Four types of flooding occur in Thurston County and are addressed individually in this hazard profile: riverine flooding (is the effect of excess flow and volume of water exceeding a river channel's normal capacity to contain the water), groundwater flooding (high water table and excessive rain), tidal flooding (high tide combined with low atmosheric pressure, excessive run-off and/or strong northerly winds), and urban flooding (when stormwater runoff exceeds the capacity of natural or infrastructural drainage systems). S. E. Thurston Fire & EMS is primarily at risk of flooding by all methods except tidal flooding. Both the Nisqually and Dechutes Rivers run through several locations within our response area. Most Pacific Northwest flooding occurs from November through March.

Impacts

River floods kill people in the United States every year. People caught unprepared and isolated by swift moving or flash flood waters can die from drowning, hypothermia, or trauma. Past flood events have revealed lapses in some flood victims judgment regarding the speed, extent, and severity of floods requiring intervention from the fire department to rescue them from rising water and or to assist in preventing damage to property. Major and moderate flooding frequently inundates low lying roads within S. E. Thurston Fire & EMS resulting in transportation disruptions that make it difficult for emergency vehicles. As flood waters recede, woody debris and other objects left behind can pose hazards to bridge structures and culverts. Electric, gas, water, and communication utilities are also subject to damage and disruption.

Probability of Occurrence

Based on the history of the last 41 years (1968 to 2009), the Chehalis, Deschutes, and Skookumchuck Rivers are likely to experience a major flood about every 4 to 4.5 years. The Nisqually River has an estimated 12.2 percent chance of major flooding a year, or about one major flood event every eight years. On average, a major flood event occurs on at least one major river about every two and one-third years within the county (major flood events occurred during fifteen of the last 42 years). Overall, this data clearly indicates that the probability of occurrence of major flood events in the Thurston Region is high.

Historical Occurrences and Impacts Specific to this Jurisdiction

S. E. Thurston Fire & EMS has experienced frequent episodes of flooding, primarily from the Deschutes River and Yelm Creek. The primary impact to the department has been difficulty accessing emergency calls due to water over roadways, assisting with sand bagging efforts, power outages, and debris in roadways. Less frequent episodes of rescues have occurred in the past.

Summary Assessment

Although the vulnerability is moderate, the frequency of flooding, the potential for simultaneous flooding events, plus the historical record of recurrent flooding and cumulative costs, all lead to the assignment of a high risk rating.

Summary Risk Assessment for Flood in S. E. Thurston Fire & EMS

Probability of Occurrence	Vulnerability	Risk
High	Moderate	Moderate

Landslide

Severity

Landslides are the movement of rock, soil, or other debris, down a slope. They develop when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry" which can travel at avalanche speeds, growing in size as it picks up trees, rocks, and other materials along the way. Gravity acting on an overly steep slope is the primary cause of a landslide. Landslides can be initiated by heavy rain or snow, fires, earthquakes, volcanoes, and various human activities that modify the environment. S. E. Thurston Fire & EMS has 83,420 acres with 7,138 acres or 9% within the hazard area.

Impacts

The impacts of landslide hazards in Thurston County are numerous. Landslides can injure or kill people caught in the path of rapid moving earth. S. E. Thurston Fire & EMS has had minimal impact from landslides.

Probability of Occurrence

Historically, the incidences of landslides are concurrent with winter storms, flooding, and earthquakes. The majority of landslides in the region are triggered by heavy precipitation.

Historical Occurrences and Impacts Specific to this Jurisdiction

On February 8, 1996 Nisqually River flooding and groundwater under heavy pressure from near record rains caused a 70 feet deep, 50 feet long, by 40 feet wide landslide. Nearly 100 dump trucks worth of material disappeared into the river in the Nisqually Pines neighborhood on Thuja Avenue west of Yelm. Although no homes were destroyed, the landslide threatened area residences. Thurston County declared seven homes unsafe for occupancy. Following the December 1996 and March 1997 rain storms, a slide south of the City of Rainier threatened a section of the Northwest Pipeline and the disruption of natural gas distribution. A 26 inch diameter line was shut down, but gas was diverted to a 30 inch line.

Summary Assessment

Landslides in S. E. Thurston Fire & EMS tend to occur infrequently with minimal overall impact to the area.

Summary Risk Assessment for Landslide in S. E. Thurston Fire & EMS

Probability of Occurrence	Vulnerability	Risk
Moderate	Low	Low

Wildland Fire

Severity

A wildland fire, also known as a wildfire, can damage or destroy open space and natural resource lands. Although wildland fires can be ignited by natural means such as lightning, they are more frequently the result of ignition due to poor judgment or a lack of understanding of fire hazard potential, such as residential debris burns left unattended. As the region's population grows and the potential for drought from warmer, drier, and longer lasting summers (due to the effects of climate change), the risk for hazardous wildland fires is likely to increase. The wildland fire hazard is unique from other hazards in Thurston County in that: a) It is the most frequent occurring hazard; approximately 71 wildland fires start per year, b) It can be prevented; over 99 percent of fires are started due to poor human judgment or accidental ignition, and c) It is the only hazard that can be actively contained or suppressed in real time. Indeed, ecologists, foresters, and other natural resource land managers view wildland fires as a natural process necessary to sustain the health of forest, woodland, or grassland ecosystems. Nevertheless, when a fire threatens managed natural resources, property, and human life, the natural process transforms to a hazard.

The severity of a wildland fire depends upon the extremity of the factors listed above, the extent of the fire, the size of the population, the value of structures that are at risk, and the ability of firefighters to effectively mobilize and suppress the fire. The number, size, and severity of wildfires has decreased within S. E. Thurston Fire & EMS over the past few years due to the implementation of a County-wide burn ban during the Summer months.

Impacts

The impacts of a wildland fire varies depending upon the size and location of the fire. The heat from intense wind driven flames can destroy virtually any combustible material in its path. People caught off guard by a rapidly spreading fire could suffer burn injuries or other non-burn injuries trying to escape a fire, or possibly be killed. Physical damages include loss of valuable timber, wildlife habitat, and recreational areas such as trails, parks, and campground facilities. Buildings and their contents, utility lines, and parked vehicles are also destroyed. Power and communication disruptions can occur, even in areas unaffected by fires, if major transmission lines are damaged or destroyed. The loss of vegetation on steep slopes increases the risk for mudslides or landslides during the fall and winter months. Stream and creek channels could fill with sediment and debris increasing flood risks. Firefighting requires significant local resources and often assistance from DNR. A wildfire can tie up firefighters for hours, making them unavailable for additional alarms. Firefighting is strenuous work and extended firefights can result in fatigue and equipment wear.

Temporary disruptions to transportation networks can occur during the suppression and recovery stages. Local area residents may need to seek detour routes. Some local area residents may not be able to reach their homes until local authorities indicate it is safe to reopen restricted areas.

Probability of Occurrence

The documented record of wildland fires in Thurston County suggests that approximately 97 percent of future fires will be five acres or less. The region can expect at least one fire exceeding 100 acres over the next 25 years. A warmer and drier future climate may create more suitable conditions for more frequent or larger fires. There is a "high" probability of reoccurrence both in the County and in S. E. Thurston Fire & EMS.

Historical Occurrences and Impacts Specific to this Jurisdiction

S. E. Thurston Fire & EMS has experienced several threatening wildfires over the years requiring assistance from DNR and other fire districts. Since 2000, a significant fire occurred within Nisqually Pines housing area threatening multiple homes, another on Burnett Road threatening a home, several along the Yelm/Tenino Trail causing traffic disruption along Highway 507, and multiple smaller fires.

Summary Assessment

Numerous wildland fires will reoccur over the next 25 years, therefore this hazard receives a high probability of occurrence rating. A moderate vulnerability rating is assigned because even small fires have the potential to impact multiple properties with devastating results in a very short period of time particularly in the Lake Lawrence and Nisqually Pines areas. Finally, the subjective estimate of the probability of occurrence and vulnerability threat are combined to classify the wildland fire hazard as a moderate risk.

Summary Risk Assessment for Wildland Fire in S. E. Thurston Fire & EMS

Probability of Occurrence	Vulnerability	Risk
High	Moderate	Moderate

Volcanic Hazards

Severity

There are five major Cascade volcanoes in Washington State: Mount Baker, Glacier Peak, Mount Rainier, Mount St. Helens, and Mount Adams. In the last 4,000 years, 11 Cascade volcanoes have erupted an estimated 100 times; a rate of two events per century. The last major eruption was Mount St. Helens on May 18, 1980.

Two of the most active and hazardous volcanoes in the United States, Mount Rainier, and Mount St. Helens, are located only 22 and 39 miles, respectively, from the southeast corner of Thurston County near Alder Lake. An explosive eruption could create an ash plume that could conceivably deposit ash all across Thurston County. A volcanic event could trigger large debris and mudflows, known as a lahar. A lahar could originate on the flanks of the mountain and flow downhill and create a path of destruction and inundation all the way to the Puget Sound via the Nisqually River Valley.

Impacts

Ash fall of a quarter inch or more will reduce motorists' visibility and disrupt nearly every mode of transportation. Wet ash could create hazardous driving conditions and result in traffic injuries or fatalities. Aircraft is especially vulnerable as ash may disable engines and completely obscure pilots' visibility. Inhalation of ash particles could cause respiratory irritation and pose more serious problems for people with asthma or other respiratory diseases, but this could be mitigated by simply avoiding exposure. Ash can destroy agricultural crops, contaminate surface water sources, clog drainage and sewer systems, and inhibit or destroy mechanical systems such as outdoor heating, ventilation, and air conditioning systems. Ash fall of just a few inches in depth could exceed the load capacity of some building rooftops and lead to structural failure. Failure could occur with lower depths if ash absorbed subsequent precipitation. Wet ash has been known to cause power lines to short out. Clean up and recovery would likely be the greatest cost to both the public and private sector.

Based on the Case 1 lahar scenario, properties along the Nisqually River Valley are the most susceptible to lahar inundation. Following the Nisqually River southeast to northwest, the following general vicinities and communities along the Nisqually River may be most affected under this scenario: properties north east of Bald Hills Rd in the vicinity of Cook Rd SE and Dan Cook St SE, McKenna Elementary School (Pierce County) Yelm Community School District, Nisqually Care Center, properties between the Nisqually River and the Yelm Urban Growth Area Boundary in the vicinity of Bridge St SE and Flume Rd SE, properties northeast of Yelm in the north east section of the Nisqually Pines residential community in the vicinity of Port Orford Blvd SE , Heather Ln SE, and Briar St SE, and the City of Centralia Power Plant off Mud Run Road (eight employees and family members live on site).

Probability of Occurrence

The United States Geological Survey reports that Mount Rainier has only produced moderate quantities of ash in past eruptions. The eruption of Mount St. Helens in 1980 did deposit a scant layer of ash in Thurston County, but the fallout did not pose a significant hazard to the region. Thurston County winds prevail from the south and west, therefore ash is more likely to fall on the east side of the Cascades than the west side.

A Case 1 lahar is estimated to have a recurrence interval of approximately every 500 to 1,000 years. The probability of a Case 1 Lahar is low.

Historical Occurrences and Impacts Specific to this Jurisdiction

The historical occurrences of Lahars have been classified by size. The largest lahar, historically represented by the Osceola mudflow, is designated a Case M Lahar for a maximum lahar event. Scientists offer this scenario as "low probability and high consequence," with the implication that the risk may be unacceptable at even very small probabilities. There is no geologic record of a Case M Lahar affecting Thurston County. A Case 1 lahar originating from Mount Rainier is considered by scientists to be the most appropriate planning case scenario for hazard mitigation planning. The risk of this lahar type exceeds that of all smaller but more frequent flows. In addition, the risk is increased by a potential to occur without a major volcanic eruption, which may not afford downstream populations an early warning. A noneruptive event could be initiated by non-magmatic seismic activity, by steam eruptions, or just by gravity in places where a failure plane has been lubricated by clay and hydrothermal fluids.

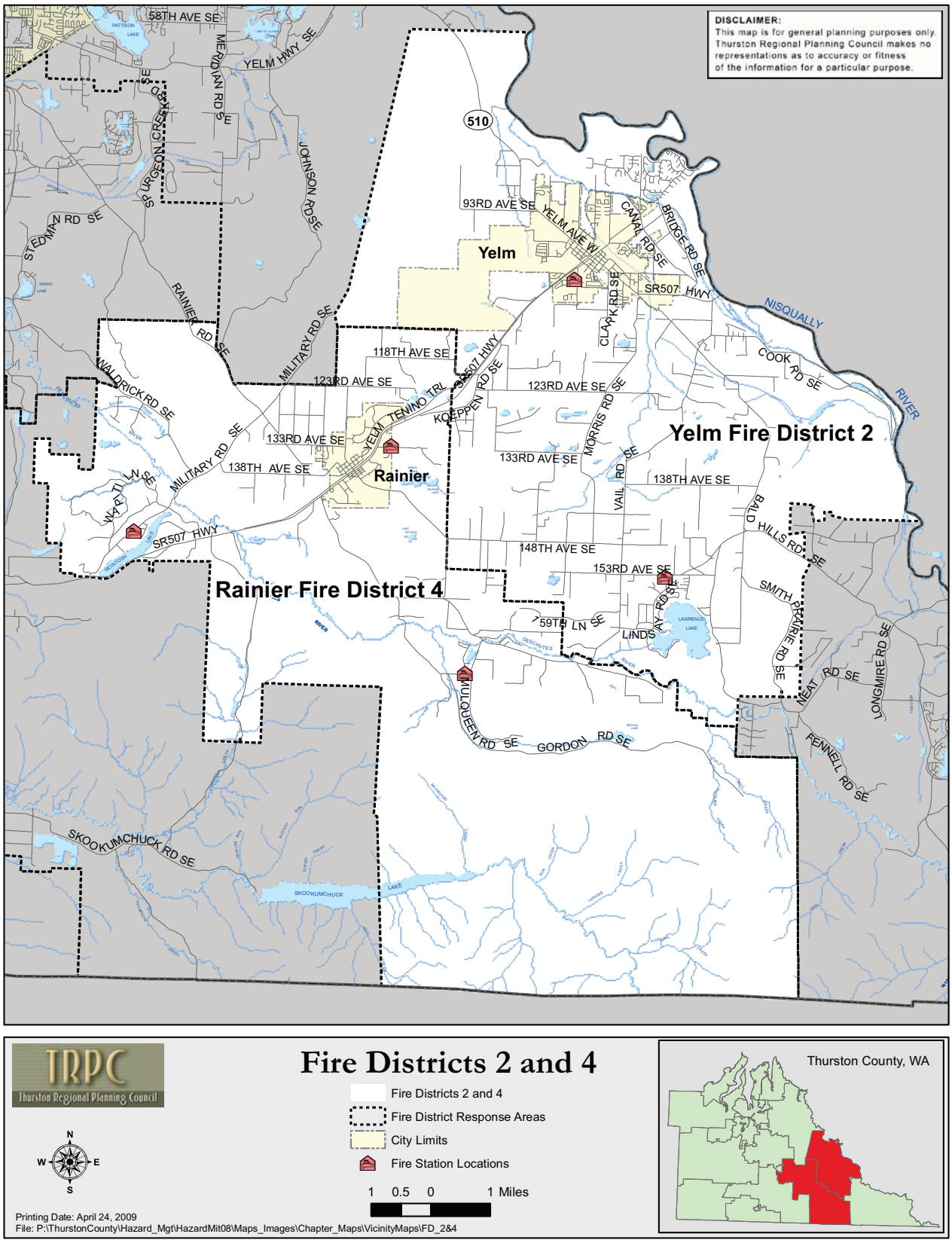
Summary Assessment

Under certain wind conditions a tephra fall could adversely affect the entire county. The effects would not pose immediate life threatening conditions to the population, but the clean up and recovery costs could be significant. Therefore the region is moderately vulnerable to a tephra fall. The probability of ash deposition is very low, so overall the risk of ash fall to S. E. Thurston Fire & EMS is low.

A lahar could pose immediate danger to the residents and employees that live and work in the lahar hazard zone. Although no lahar warning system exists for the upper Nisqually River valley, the Tacoma Power Alder and La Grande Dam warning system could notify appropriate authorities to initiate evacuation efforts for downstream residents. Thurston County Emergency Management could notify area residents and businesses with its flood warning system and local emergency personnel could be deployed to assist people to evacuate to higher ground.

Summary Risk Assessment for Volcanic Events in S. E. Thurston Fire & EMS

Probability of Occurrence	Vulnerability	Risk
Low	Moderate	Moderate


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.
Yelm
Rainier
Yelm Fire District 2
Rainier Fire District 4
58TH AVE SE
YELM HWY SE
MERIDIAN RD SE
SURGEON CREEK RD SE
JOHNSON RD SE
STEDMAN RD SE
RAINIER RD SE
MILITARY RD SE
WALDRICK RD SE
510
93RD AVE SE
YELM AVE W
CANAL RD SE
BRIDGE RD SE
SR507 HWY
NISQUALLY
RIVER
CLARK RD SE
COOK RD SE
118TH AVE SE
123RD AVE SE
YELM TENINO TRL
KOEPPEN RD SE
MORRIS RD SE
133RD AVE SE
138TH AVE SE
VAIL RD SE
BALD HILLS RD SE
148TH AVE SE
153RD AVE SE
SMITH PRAIRIE RD SE
59TH LN SE
LINDS
NEAT RD SE
LONGMIRE RD SE
MULQUEEN RD SE
GORDON RD SE
FENNELL RD SE
SKOOKUMCHUCK RD SE
SKOOKUMCHUCK LAKE
TRPC
Thurston Regional Planning Council
Fire Districts 2 and 4
Fire Districts 2 and 4
Fire District Response Areas
City Limits
Fire Station Locations
1 0.5 0 1 Miles
N
W
E
S
Thurston County, WA
Printing Date: April 24, 2009
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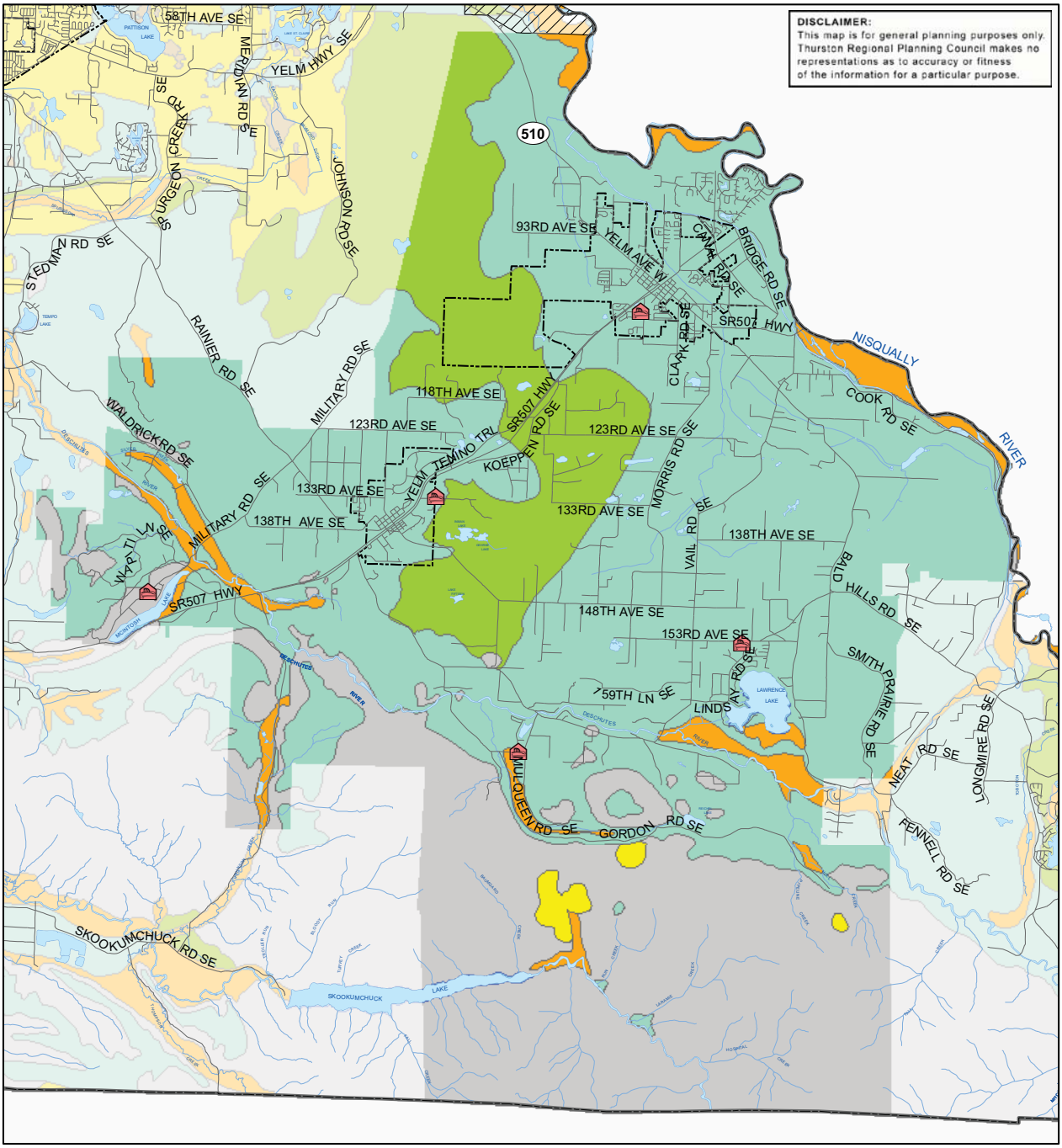

Fire Districts 2 and 4
Liquefaction Hazards

N
W E
S

County Boundary
City Limits
Nisqually Indian Reservation
Fire Station Locations

high
moderate to high
low to moderate

low
very low to low
very low

bedrock
peat
water

TRPC
Thurston Regional Planning Council

1 0.5 0 1 Miles

Printing Date: February 10, 2009
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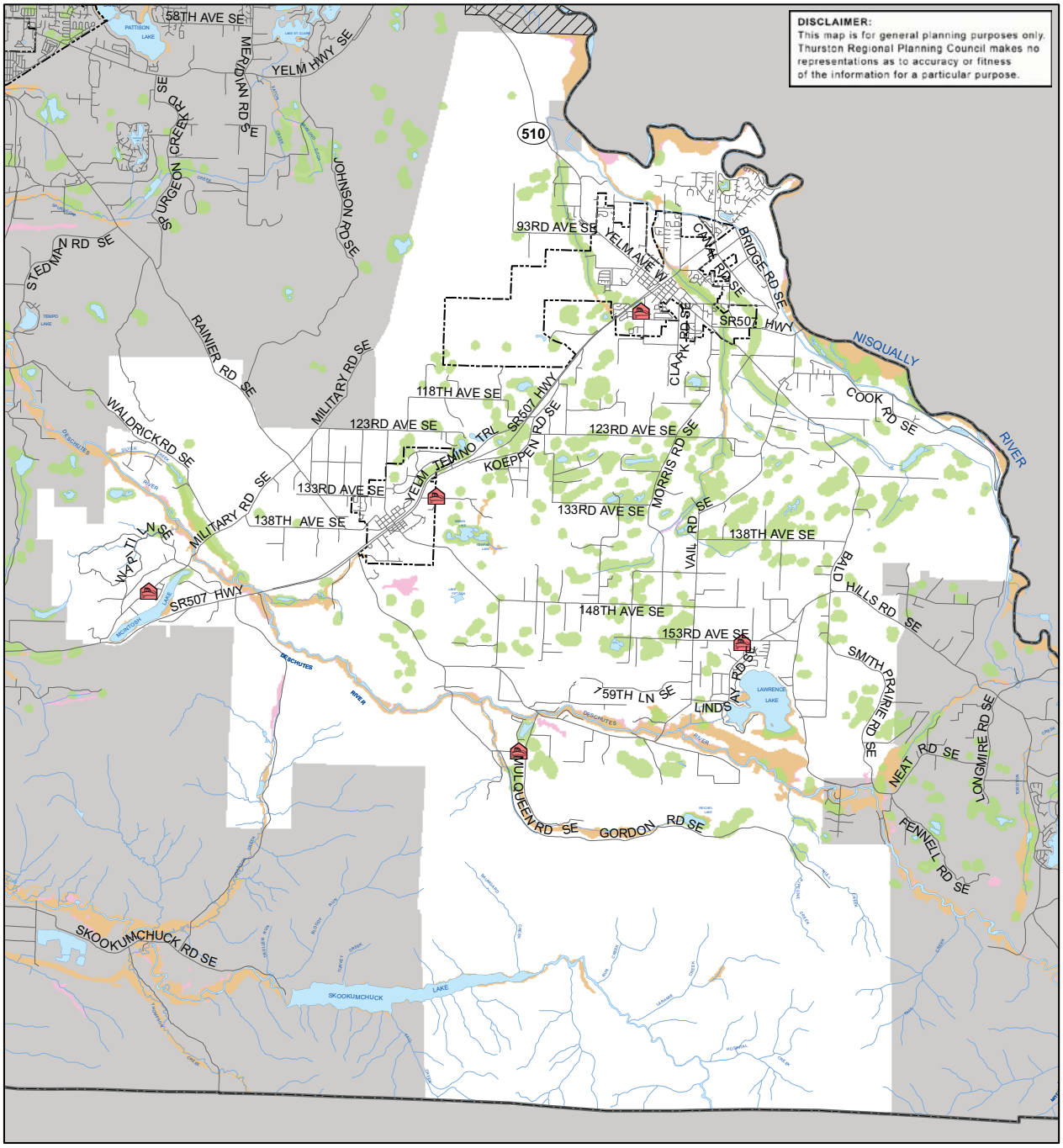

Fire Districts 2 and 4
Flood Hazards

N
W E
S

High Groundwater Flooding
100 Year Floodplain
500 Year Floodplain
County Boundary
Fire District Boundary
City Limits
Nisqually Indian Reservation
Fire Station Locations

TRPC
Thurston Regional Planning Council

1 0.5 0 1 Miles

Printing Date: February 10, 2009
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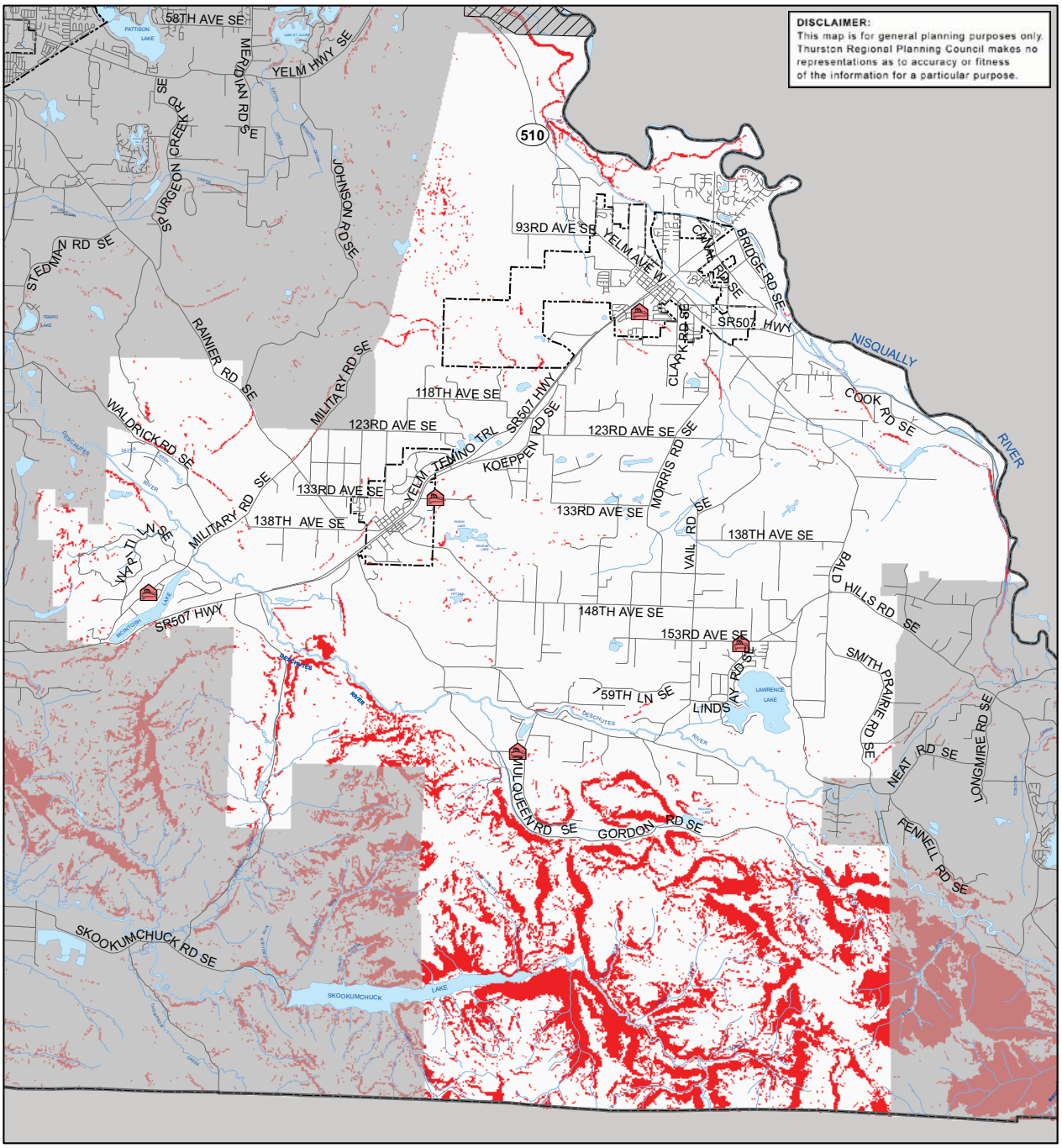

Fire Districts 2 and 4
Steep Slopes

N
W E
S

Slopes Over 40%
Fire Station Locations
City Limits
Nisqually Indian Reservation
County Boundary

TRPC
Thurston Regional Planning Council

1 0.5 0 1 Miles

Printing Date: March 18, 2009
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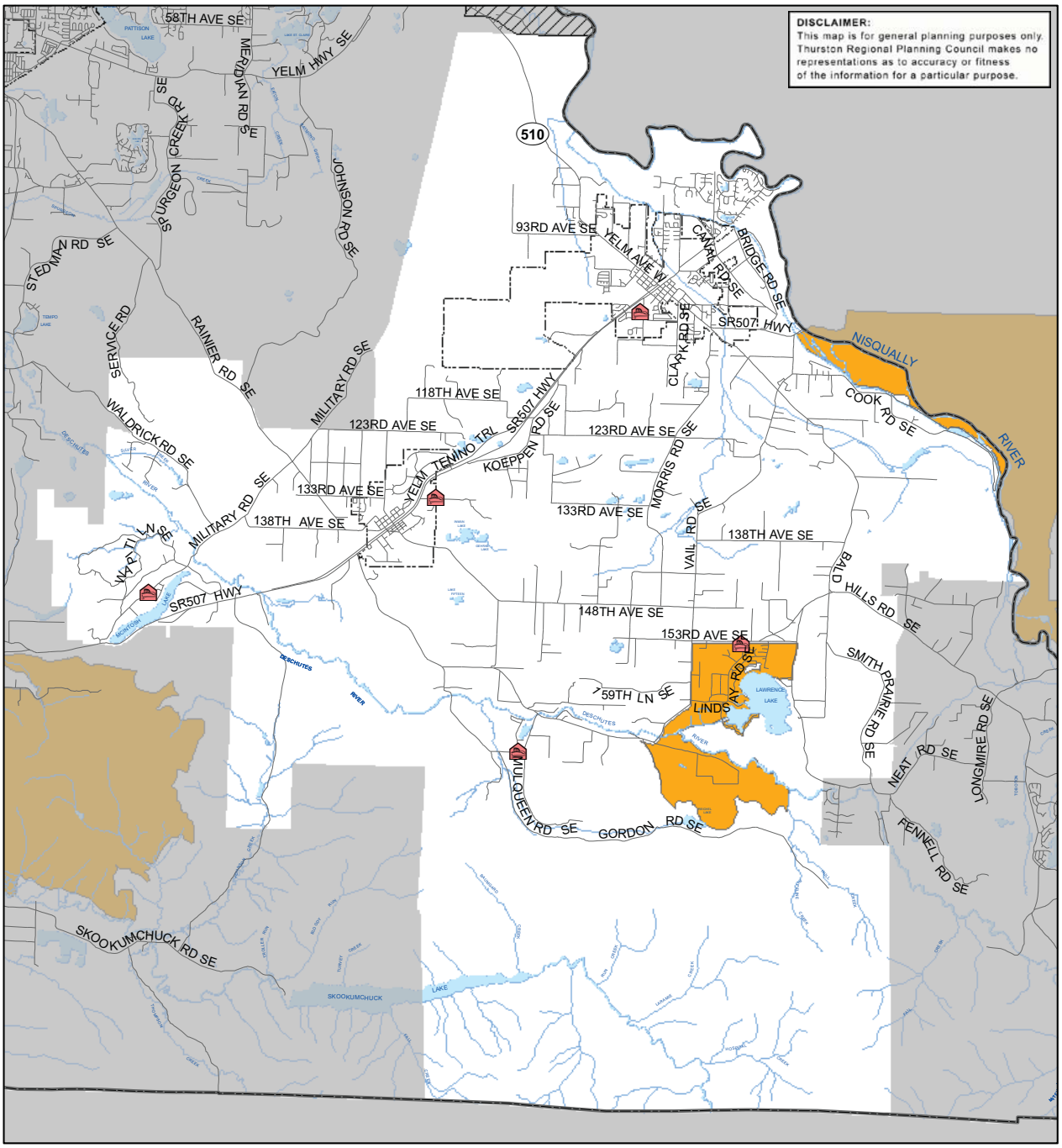

Fire Districts 2 and 4
Wildfire Hazard Areas

N W E S

Wildfire Hazard Areas
Fire Station Locations
County Boundary
City Limits
Nisqually Indian Reservation

TRPC Thurston Regional Planning Council

1 0.5 0 1 Miles

Printing Date: February 10, 2009
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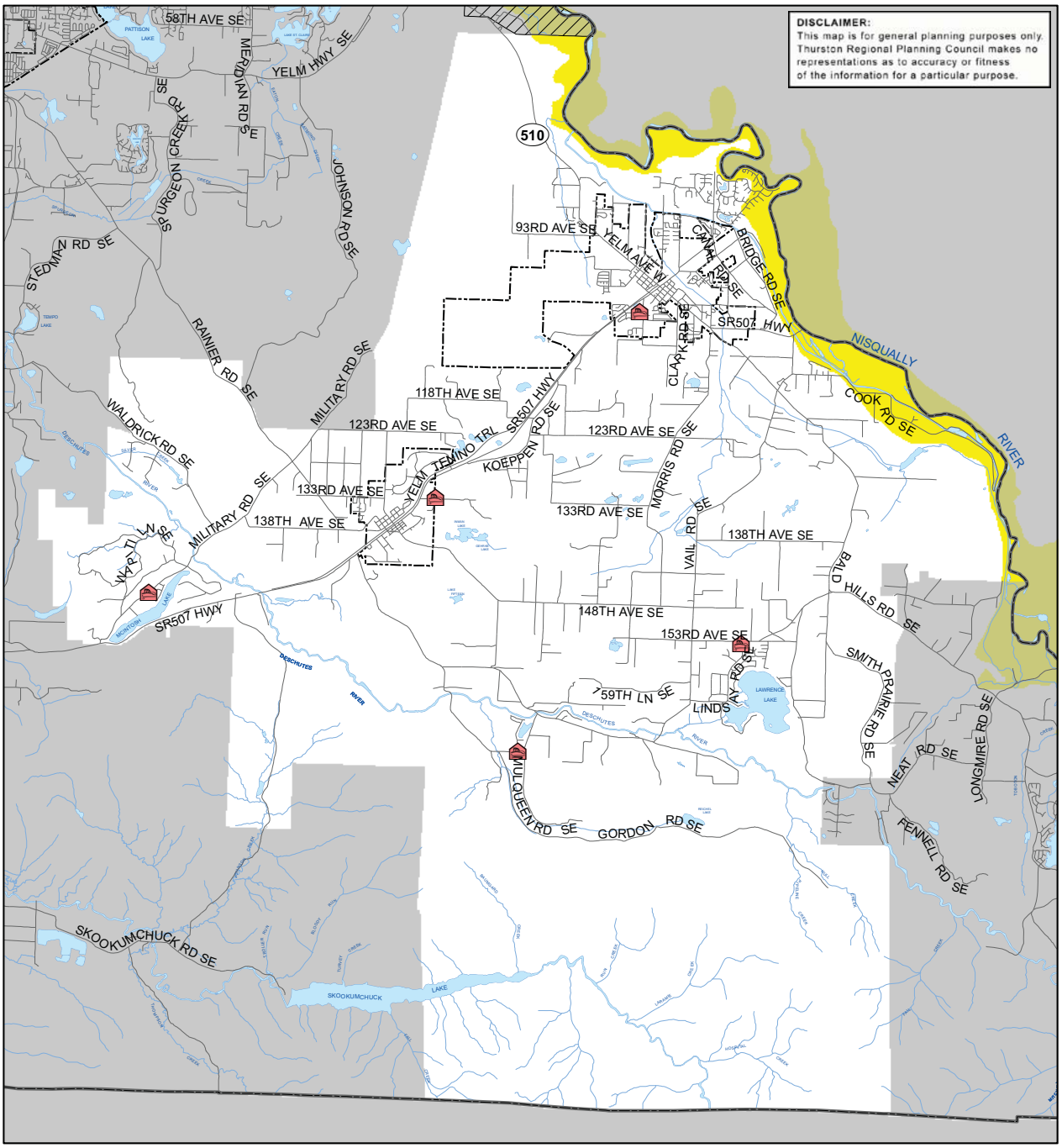

Fire Districts 2 and 4
Case I Lahar Inundation Zone

N
W E
S

Case I Lahar Boundary
Fire Station Locations
City Limits
Nisqually Indian Reservation
County Boundary

TRPC
Thurston Regional Planning Council

1 0.5 0 1 Miles

Printing Date: March 25, 2009
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Thurston County Fire Districts 2 and 4 (SE Thurston Fire and EMS, Yelm and Rainier) Mitigation Initiatives

Current Adopted Mitigation Initiatives

S.E. Thurston Fire & EMS (Yelm & Rainier) updated its mitigation initiative during the regional plan update process. No new initiatives were identified.

Priority	I.D. Number	Category	Action	Status
1 of 1	TCFD2&4-EH 1	Critical Facilities Replacement/Retrofit	Replace Headquarters Station 41 (now 24) with a seismically safe structure	Existing

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 1 Status: Existing

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

TCFD 2&4-EH 1: Replace Headquarters Station 41 (now Station 24) with a seismically safe structure.

Rationale: The fire station is identified as a critical facility within the fire district response area. The City of Rainier and surrounding unincorporated area is the second highest response area and has the second highest risk rating within S.E. Thurston Fire & EMS. This station is the second staffed fire station.

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

Implementer: S.E. Thurston Fire & EMS (Yelm & Rainier)

Estimated Cost: Phase 1--$600,000; Phase 2--$3,200,000.

Time Period: 2004--2006. Phase 1 was completed in July 2005. Phase 2 2009--2015.

Funding Source: Phase 1 Washington State & FEMA Mitigation Grant Funds were used. Phase 2 Potential AARA Grant or future Bond Initiative.

Source and Date: Natural Hazards Mitigation Plan, Thurston County.

Adopted Plan Number: TCFD4-EH 1

Reference Page: V-211

Initiative and Implementation Status: Phase 1 has been complete. Phase 1 includes a state of the art fire apparatus bay providing space for an engine, water tender, and a brush or aid unit. It also included a storage area and an office/communication room, 1 restroom, a shower, and a decontamination area. Phase 2 will include sleeping quarters, fitness area, day room, kitchen, administrative offices, classroom, and a hose drying tower. A grant application has been submitted for funding through the Assistance to Firefighters Fire Station Construction Grant Program. If awarded, phase 2 will begin immediately. If the grant is not awarded, the department Capital Facilities Plan will be update to include Phase 2 in a future Bond Initiative.