Public Utility District 1 of Thurston County

Hazards Mitigation Plan for

the Thurston Region

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CERTIFIED COPY OF RESOLUTION
ADOPTED AT THE REGULAR MEETING OF THE COMMISSIONERS
OF
PUBLIC UTILITY DISTRICT NO. 1 OF THURSTON COUNTY

The President and Secretary of Public Utility District No. 1 of Thurston County certify that this Resolution was adopted by a majority vote of the Commissioners of Public Utility District No.1 of Thurston County in attendance at the meeting held at the office of the District, Suite 301, 921 Lakeridge Way S.W., Olympia, Washington, 98502 on Someday, November XX, 20XX, and that said Resolution has not been revoked.

RESOLUTION NO. 17-XX

RECITALS

The Public Utility District No. 1 of Thurston County (the District), as a public utility district in the state of Washington and operating in Thurston, Pierce, Lewis, Grays Harbor, and Mason Counties, is vulnerable to the human and economic costs of natural disasters.

The District recognizes the importance of reducing or eliminating those vulnerabilities for the overall good and welfare of the community.

The District has been an active participant in the Natural Hazards Mitigation Planning Workgroup and Task Force, which established a comprehensive, coordinated planning process to eliminate or decrease these vulnerabilities.

District staff have identified, justified and prioritized a number of proposed projects and programs needed to mitigate the vulnerabilities of Thurston PUD to the impacts of disasters.

The proposed projects and programs identified by the District have been incorporated into the 2016 edition of the *Hazards Mitigation Plan for the Thurston Region* that has been prepared and issued for consideration and implementation by the communities of Thurston County.

RESOLUTION

NOW, THEREFORE, THE COMMISSIONERS OF THE DISTRICT DO HEREBY RESOLVE AS FOLLOWS:

Section 1. The District herby accepts, approves, and adopts its designation portion of the 2016 update to the "Natural Hazards Mitigation Plan for the Thurston Region," and affecting the District's operations in Thurston, Pierce, Lewis, Grays Harbor, and Mason Counties.

Section 2. District Staff are requested and instructed to pursue available funding opportunities for implementation of the mitigation initiatives designated therein.

Section 3. The District will, upon receipt of such funding or other necessary resources, seek to implement the proposals contained in its section of the strategy.

Section 4. The District will continue to participate in the updating and expanding of the *Hazards Mitigation Plan for the Thurston Region* as needed and appropriate.

_____

Linda Oosterman
Commissioner and President of
Public Utility District No. 1 of Thurston County

ATTEST:

_____

Russell E. Olsen
Commissioner and Secretary

Community Profile

Public Utilitiy District 1 of Thurston County

(360) 357-8783
www.thurstonpud.org

Background

Who We Are: Public Utility District No. 1 of Thurston County (Thurston PUD) was officially formed in 1938 by a vote of the people. Thurston PUD provides water planning and utility services to the citizens of Thurston County, and also owns and operates water systems in Pierce, Lewis, Grays Harbor, and Mason counties.

Governance: The PUD is governed by three Commissioners, elected by the voters of Thurston County and elected to serve six-year terms. The Commissioners represent the three Commission districts in Thurston County.

Mission

The District is a progressive, innovative service organization dedicated to serving our customer owners and the community. The District strives to provide the highest quality utility service to homes, business, and industry at the most reasonable cost practical.

Service Summary

Total Water Systems	163
Total Customer Connections	4,145
Total People Served	10,362

Group A Systems

Description: Group A water systems have 15 or more service connections or regularly serve 25 or more people 60 or more days per year.

Total Owned Group A Systems	31
Total Managed Group A Systems	12
Total Group A Connections	3,335
Total Group A People Served	8,337

Group B Systems

Description: Group B water systems serve fewer than 15 connections and fewer than 25 people per day.

Total Owned Group B Systems	132
Total Managed Group B Systems	1
Total Group B Connections	810
Total Group B People Served	2,025

Other

Wells	180
Miles of Water Main Pipelines	55
Pump Houses	142

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Thurston PUD Plan Development Process

Hazards Mitigation Plan Development Staff

Thurston PUD's Director of Operations and Compliance, Kim Gubbe and Administrative Assistant, Carrie Bowen attended all the Hazards Mitigation Workgroup meetings.

The Thurston PUD's Hazards Mitigation Committee assisted in the preparation of Thurston PUD's *Hazards Mitigation Plan*. Thurston PUD's Hazards Mitigation Committee is made up of members from the Operation's Team.

Title	Representatives
Director of Operations and Compliance	Kim Gubbe
Administrative Assistant, Project Lead	Carrie Bowen

Hazards Mitigation Plan Development

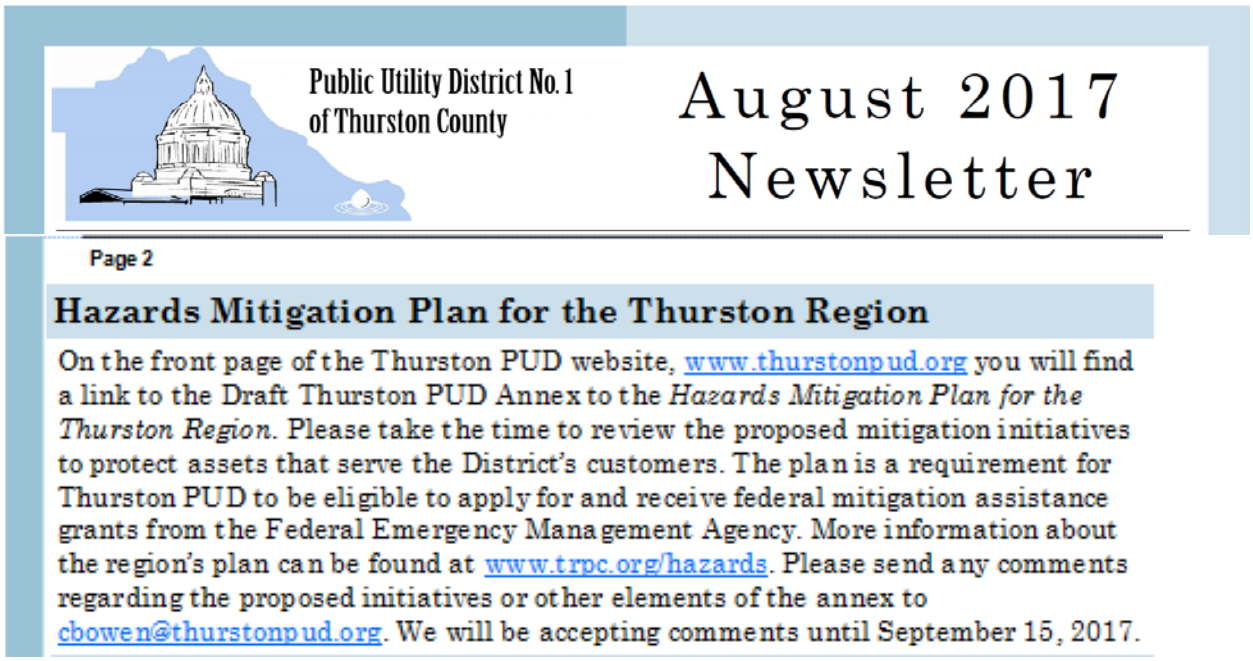
The following activities supported the development and review of Thurston PUD's local hazards mitigation planning process:

Date	Location	Activity	Subject
10/22/15	Thurston PUD	Hazards Mitigation Committee	Briefing on upcoming work to be done on the *Hazards Mitigation Plan*.
6/26/16	Thurston PUD	Commissioner Meeting	Review of the *Hazards Mitigation Plan for the Thurston Region* and TPUD Annex
11/17/16	Thurston PUD	Meeting/ Work session	Thurston PUD Risk Assessment and *Hazards Mitigation Plan*
9/1/17	Thurston PUD	Customer Newsletter	We asked our customers to review our Annex on our website. We also asked them to send in comments regarding the Annex by September 15, 2017.
TBA	Thurston PUD	TPUD Adoption	Adoption of the *Hazards Mitigation Plan for the Thurston Region* and TPUD Annex.

Thurston PUD's Board of Commissioners will review the *Hazards Mitigation Plan* when they review the annual budget. The public is invited to attend all Commissioner Meetings and will be notified in a newsletter when the Hazards Mitigation meeting will take place. Any success or progress we have made on our initiatives will also be noted in the newsletter

Thurston PUD sent a newsletter (Figure 1) to our customers. We asked them to review the Draft Thurston PUD Annex to the *Hazards Mitigation Plan for the Thurston Region* on our website and to send any comments they have regarding the Thurston PUD Annex to KGubbe@thurstonpud.org, by September 15, 2017. When the comment period is over, we will review and note all of the customer's comments and incorporate the comments that will work in our Annex.

Figure 1



Public Utility District No. 1 of Thurston County

August 2017 Newsletter

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Hazards Mitigation Plan for the Thurston Region

On the front page of the Thurston PUD website, www.thurstonpud.org you will find a link to the Draft Thurston PUD Annex to the *Hazards Mitigation Plan for the Thurston Region*. Please take the time to review the proposed mitigation initiatives to protect assets that serve the District's customers. The plan is a requirement for Thurston PUD to be eligible to apply for and receive federal mitigation assistance grants from the Federal Emergency Management Agency. More information about the region's plan can be found at www.trpc.org/hazards. Please send any comments regarding the proposed initiatives or other elements of the annex to cbowen@thurstonpud.org. We will be accepting comments until September 15, 2017.

Mitigation Initiative Prioritization Process

Thurston PUD's Asset Management Plan drives the prioritization of projects and it is reflected in the District's Capital Improvement Plan.

Thurston PUD identified 3 initiatives while creating their *Hazard Mitigation Plan*. They are as follows:

1. TPUD-MH-1 – Create a Customer Communication Process,
2. TPUD-EQ-2 – Tanglewilde-Thompson Place Main Water Line Replacement, and
3. TPUD-MH-3 – Generator Project.

Thurston PUD did a Benefit Cost Review to help prioritize the above initiatives. We looked at the amount of time, customer benefit, expense, and outside funding available. TPUD-MH-1 will take more office time but will be less expensive and can benefit all our customers. TPUD-EQ-2 is very expensive, however this initiative is already in the planning process and will benefit a very large number of customers. TPUD-MH-3 will also be very expensive and is not yet in the planning process. It will also benefit a large number of customers.

Thurston PUD Risk Assessment

Introduction

Chapters 4.0 through 4.6, of the core plan, address the Disaster Mitigation Act risk assessment planning requirements. The Risk Assessment summarizes the hazards and the risks that pose the greatest threat to Thurston PUD. The Risk Assessment includes hazard profiles that describe the hazards, their causes, sources, severity, effects and impacts, probability of occurrence, historical occurrences, geographic extent or delineation, and the portion of the population, assets, and essential facilities potentially exposed to the hazard. The information is presented for general audiences and includes figures, maps, and tables.

Hazard Analysis Definitions

The *Hazards Mitigation Plan for the Thurston Region* uses a subjective risk measurement process based on Thurston County's Hazard Inventory and Vulnerability Assessment (HIVA). This methodology rates elements of each hazard's risk characteristics using the descriptors high, moderate, and low. These descriptors are applied to the hazards' probability of occurrence, vulnerability, and overall risk. The following is an overview of this risk measurement model:

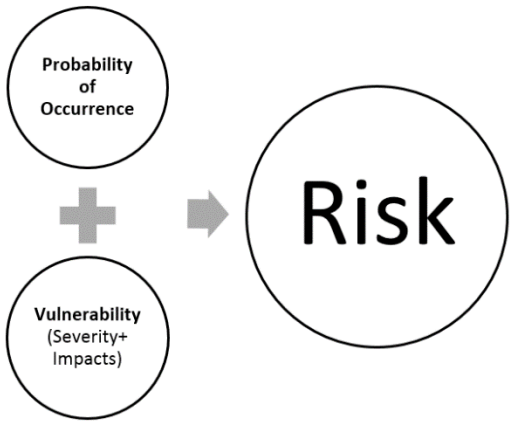
Risk Rating: A description (high, moderate, or low) of the subjective estimate of the combination of any given hazards probability of occurrence and the regions vulnerability to the hazard.

- **High** – There is strong potential for a disaster of major proportions.
- **Moderate** – There is medium potential for a disaster of less than major proportions.
- **Low** – There is little potential for a disaster.

Probability of Occurrence: A description (high, moderate, or low) of the probability of a hazard impacting Thurston County 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: A description (high, moderate, or low) of the potential impact a hazard could have on Thurston PUD. Vulnerability can be expressed as a combination of the severity of a hazards effect and its consequential impacts to the community. It considers the population, property, commerce, infrastructure, and services at risk relative to the entire county.



- **High** – The total population, property, commerce, infrastructure, and services of the county are uniformly exposed to the effects of a hazard of potentially great magnitude. In a worst-case scenario, there could be a disaster of major to catastrophic proportions.
- **Moderate** – The total population, property, commerce, infrastructure, and services of the county are exposed to the effects of a hazard of moderate influence; or the total population, property, commerce, infrastructure, and services of the county 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 county are exposed to the effects of a hazard. In a worst-case scenario, a disaster could be moderate to major, but 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.

Hazard Profiles

The core plan includes detailed profiles of hazards that pose the greatest risk to Thurston PUD water systems in Thurston, Lewis and Pierce Counties. Because the core plan treats the entire county as the planning area, the core plan's risk assessment is the definitive risk assessment for Thurston, Lewis and Pierce Counties. Each hazard profile fulfills all the following criteria:

1. There is a high probability of the natural hazard occurring in Thurston, Lewis and Pierce Counties within the next 25 years,
2. There is the potential for significant damage to buildings and infrastructure; and/or
3. There is the potential for loss of life.

The following hazards meet one or more of the above criteria. Every hazard profile was evaluated and updated during the plan update process.

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 Thurston PUD.

Hazard	Probability of Occurrence	Vulnerability	Risk
Earthquakes	High	Moderate	Moderate
Storms	High	Moderate	Moderate
Flood	Moderate	Low	Low
Landslides	Moderate	Moderate	Moderate
Wildland Fire	High	Moderate	Moderate
Volcanic Events	Low	high	Low

Earthquakes

Severity

The epicenter of an earthquake is the point on the earth's surface directly above the earthquake's focus. The severity of an earthquake is dependent on the amount of energy released from the fault or epicenter. The Richter Magnitude Scale measures the intensity of ground motion. Each whole number increase in magnitude represents a ten-fold increase in measured amplitude, and 31 times more energy released. Three kinds of earthquakes are recognized in the Pacific Northwest: shallow earthquakes have the potential to produce magnitudes mostly less than 3.0 but as high as 7.5, subduction zone earthquakes are considered to be the most destructive with potential magnitudes of 9.0 or greater, and deep earthquakes with recorded magnitudes of 7.5.

Impacts

Impacts of earthquakes can damage water pipe lines, water system pump houses, older concrete reservoirs, and power systems. Road damage can delay restoration and servicing of the water systems. Water systems without backup generators will be unable to provide water to customers should power be disrupted. Water customers may need to boil water before consumption until the water can be tested and determined to be safe.

Probability of Occurrence

History suggests a high probability of occurrence of another damaging earthquake sometime in the next 25 years. The overall probability of occurrence of a damaging earthquake is high.

Historical Occurrences and Impacts to Thurston PUD

There have been 3 large earthquakes since 1949. The one on February 28, 2001, a 6.8 magnitude deep earthquake was centered in the Nisqually Reach northeast of Olympia. It was the second worst earthquake in recent Washington history.

Summary Assessment

Though the example of the 2001 quake is not the largest earthquake event possible in the Puget Sound region, it is conceivable that a similar magnitude earthquake could emanate from a shallow crustal fault which would result in much greater damages. History does suggest a high probability of occurrence of another damaging earthquake sometime in the next 25 years. However, considering Thurston PUD's history of not having any damages to wells, water lines or pump houses our vulnerability to the impact of earthquakes would be moderate, as would the overall risk.

Summary Risk Assessment for Earthquake for Thurston PUD

Probability of Occurrence	Vulnerability	Risk
High	Moderate	Moderate

Storms

Severity

Destructive storms come in several varieties: wind, rain, ice, snow, and any combination. Nearly all destructive local storms occur from October through April when the jet stream is over the U.S. west coast and Pacific low-pressure systems are more frequent. The trajectory of these low pressure systems determines their effect locally. Southerly lows bring heavy rains; northerly lows bring cold air and potential for snow and ice. Winter storms can bring high winds, with speeds above 40 miles per hour causing widespread damage and those above 50 miles per hour causing possible disastrous damage. High winds of short duration can also be destructive though generally not as widespread.

Impacts

1. High winds can bring down trees, telephone and electrical lines, temporarily interrupting power to water system pump houses.
2. Ice storms create treacherous road conditions and often cause downed trees, telephone and electrical lines, temporarily interrupting power to water system pump houses.
3. Each of these, when in combination with any other or if accompanied by freezing temperatures, can exacerbate a storm's impact. High winds, heavy snows and heavy rains often result in increased power outages effecting the safety of drinking water.

Probability of Occurrence

Storms are frequent in Thurston, Lewis and Pierce Counties and history suggests a high probability of wind, rain, ice, snow, and any combination occurring.

Historical Occurrences and Impacts to the Thurston PUD.

The ice and windstorms of December 1996, caused large amounts of debris and damage to powerlines and pump houses.

Summary Assessment

Although examples of the December storms of 1996 and 2008 are not the most severe storm events possible in the Puget Sound region, future occurrences would have similar temporary impacts on Thurston PUD's service area. History does suggest a high probability of occurrence of damaging storms. Impacts of storms would be moderate, as would the overall risk.

Summary Risk Assessment for Storms for Thurston PUD

Probability of Occurrence	Vulnerability	Risk
High	Moderate	Moderate

Floods

Severity

Several factors determine the severity of floods, including rainfall intensity (or other water source) and duration. Four types of flooding occur in Thurston, Lewis and Pierce Counties: river or stream building floods, flash floods, tidal floods, and groundwater flooding.

Impacts

Impacts of flooding on surface water systems would likely be from pump houses getting flooded due to flash and groundwater flooding. Subsequent sanitation problems could arise from contaminated potable water supplies.

Probability of Occurrence

Historically, flooding occurs along one or more of the Thurston, Lewis and Pierce Counties waterways every year, suggesting a high probability of occurrence regionally. However, taking into consideration that Thurston PUD owns 18 water systems in the 100 year flood plain, the probability of occurrence within Thurston PUD's service area is moderate.

Historical Occurrences and Impacts to Thurston PUD

There have been several floods since 1990. During the local flooding events of 1996, the water table rose and wells were contaminated with total coliforms which couldn't be cleaned-up and now must be permanently chlorinated.

Summary Assessment

Although the history of flooding clearly demonstrates a high probability of future occurrence in Thurston, Lewis and Pierce Counties only a few of the District's water systems are in a flood area and, so the probability would be moderate. The likelihood of the wellheads being flooded is low, so our vulnerability is low with and overall rating of low.

Summary Risk Assessment for Flood in Thurston PUD

Probability of Occurrence	Vulnerability	Risk
Moderate	Low	Low

Landslides

Severity

Landslides are movement of rock, soil, or other debris, down a slope. The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Factors such as erosion, unstable slopes, earthquakes, volcanic eruptions, vibrations, increase of load, hydrologic factors, human activity, removal of lateral and underlying support, increase of lateral pressures and regional tilting will affect the severity of a landslide.

Impacts

Possible impacts of landslides would be damaged pump houses, wellheads, smaller reservoirs, the loss of power and the subsequent loss of clean running water. Landslides could also block or erode roadways, which could prevent the District's staff from getting to some of our water systems.

Probability of Occurrence

Landslides tend to occur in isolated, sparsely developed areas threatening individual structures and remote sections of transportation, energy, and communications infrastructure. Thurston PUD owns 21 and manages 2 water systems that would be effected by landslides, therefore landslides would have a low probability of occurrence.

Historical Occurrences and Impacts to Thurston PUD

No significant history of landslide events has impacted Thurston PUD water systems.

Summary Assessment

Thurston PUD has some water systems located in an area with a 40% slope, with no significant history of landslide events. This leads to moderate vulnerability and low overall risk in those areas.

Summary Risk Assessment for Landslide in Thurston PUD

Probability of Occurrence	Vulnerability	Risk
Moderate	Moderate	Moderate

Wildland Fires

Severity

Wildfires can begin unnoticed and spread quickly. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. In Thurston, Lewis and Pierce Counties, wildfires are most likely to occur during the local dry season, mid-May through mid-October, or anytime during prolonged dry periods causing drought or near-drought conditions.

Impacts

Possible impacts of wildland fires on Thurston PUD owned water systems would be the spread of fire near pump houses, plastic reservoirs and powerlines. This could cause water contamination and flow issues for our customers.

Probability of Occurrence

According to FEMA, a low wildland fire risk area might be a developed portion of a city with few native trees and higher urban densities including commercial or industrial development. Thurston PUD owns 33 and manages 6 water systems in the wildland fire interface area, and therefore would have a high probability of occurrence.

Historical Occurrences and Impacts Specific to Thurston PUD

No significant history of wildfire events affected Thurston PUD water systems.

Summary Assessment

Numerous wildland fires will occur over the next 25 years, therefore the hazard received a high probability of occurrence rating. Because Thurston PUD has several water systems located in wildfire hazard areas, the PUD's vulnerability would be moderate with a moderate overall risk.

Summary Risk Assessment for Wildland Fire in Thurston PUD

Probability of Occurrence	Vulnerability	Risk
High	Moderate	Moderate

Volcanic Hazards

Severity

An eruption of Mount Rainier, an intermittently active local volcano, could create mud and debris flows called lahars. Lahars originate on volcano flanks and can surge tens or even hundreds of miles downstream from a volcano. Historically, lahars have been one of the most destructive volcanic hazards.

Impacts

Impacts of an eruption of Mount Rainier and subsequent lahar would be relegated to the Nisqually River valley, impacting nearby water system, disrupting power and destroying pump houses and reservoirs in this area.

Probability of Occurrence

There is evidence (dated to have occurred approximately 300 years ago) that lahars have buried forests near what are now the City of Yelm and the Nisqually Indian Reservation. This indicates a low probability of occurrence.

Historical Occurrences and Impacts Specific to Thurston PUD

The USGS provides the following short history of a major lahar event which originated from Mount Rainier and impacted the Nisqually River valley:

"Less than 2200 years ago, another lahar of similar origin, named the National Lahar, inundated the Nisqually River valley to depths of 10-40 meters (30-120 feet) and flowed all the way to Puget Sound." (R.P. Hoblitt, J.S. Walder, C.L. Driedger, K.M. Scott, P.T. Pringle, and J.W. Vallance, 1998, Volcano Hazards from Mount Rainier, Washington, Revised 1998: U.S. Geological Survey Open- File Report 98-428)

Thurston PUD owns 17 water system in the lahar inundation zone. In the event of a Nisqually Valley or Mt. Adams lahar, nearby roadways would be impacted disrupting or potentially cutting off service to those water systems.

Tephra or ash fall could block proper ventilation in the pump houses and clog air filters on the generators causing them to run poorly or not at all.

Summary Assessment

Due to the possible impact on nearby water systems and subsequent destruction and disruption of service to the water system, vulnerability would be high, but paired with a low probability of occurrence, the overall risk would be low.

Summary Risk Assessment for Volcanic Events in Thurston PUD

Probability of Occurrence	Vulnerability	Risk
Low	high	Low

Insert Maps

The maps will be inserted in the Final Annex.

Thurston PUD Mitigation Initiatives

Mitigation Initiatives – Adopted

The adopted mitigation initiatives are the Thurston PUD's specific actions for mitigating losses and protecting life and property. They were identified during the development of the *Hazards Mitigation Plan for the Thurston Region* looking at all of Thurston PUD's service area in Thurston, Lewis and Pierce Counties. The Thurston PUD development team prepared the initiatives.

Priority	ID Number	Category	Action	Status
1 of 3	TPUD-MH 1	Hazard Preparedness	Create a public education service to offer tips and information to customers for hazard proofing their homes and emergency preparedness information.	New
2 of 3	TPUD-EQ 2	Hazard Damage Reduction	Replace the asbestos cement water main in the Tanglewilde – Thompson Place System to prevent water loss during an earthquake.	New
3 of 3	TPUD-MH 3	Hazard Damage Reduction	Outfit pump houses with generators to maintain service to customers during power outages	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 3 **Status:** New

TPUD-MH 1: Create a public education service to offer tips and information to customers for hazard proofing their homes and emergency preparedness information.

Hazard Addressed: Multi Hazard

Category: Hazard Damage Reduction

Rationale: Thurston PUD customers may experience temporary disruption to services due to hazard events. Public education outreach efforts can assist customers in hazard proofing their home water connections and learn how to become more disaster resilient.

Relates to Plan Goal(s) and Objectives 8A

Implementer: Thurston PUD

Estimated Cost: Unknown

Time Period: Start the Project in 2018

Funding Source: Unknown

Source and Date: N/A

Adopted Plan Number: TPUD-MH 1

Reference Page: N/A

Initiative and Implementation Status: New

Priority: 2 of 3 **Status:** New

TPUD-EQ 2: Replace the asbestos cement water main in the Tanglewilde – Thompson Place System to prevent water loss during an earthquake.

Hazard Addressed: Earthquake Hazard

Category: Hazard Damage Reduction

Rationale: The Tanglewilde – Thompson Place community is in a seismic hazard area and has over 1700 connection with an estimation of 4,460 people. The existing asbestos cement water main is moderately vulnerable for fracture or rupture during an earthquake. Upgrading the water main with steel pipe will reduce its vulnerability to catastrophic failure.

Relates to Plan Goal(s) and Objectives 7A and 7C

Implementer: Thurston PUD

Estimated Cost: Estimated at $17 million

Time Period: Start the Project in 2018

Funding Source: Combination of state or federal grants and locally generated funds

Source and Date: N/A

Adopted Plan Number: TPUD-EQ 2

Reference Page: N/A

Initiative and Implementation Status: New

Priority: 3 of 3 **Status:** New

TPUD-MH 3: Outfit pump houses with generators to maintain service to customers during power outages.

Hazard Addressed: Multi Hazard

Category: Hazard Preparedness

Rationale: Water service is critical for the safety and health of Thurston PUD's customers. Backup generator systems will provide supplemental power to operate the water systems in the event of a power disruption.

Relates to Plan Goal(s) and Objectives: 7A and 7C

Implementer: Thurston PUD Operations

Estimated Cost: The estimated cost for 14 generators installed at an average of $25,000.00 each is $350,000.00

Time Period: 2020 - 2021

Funding Source: Pre-disaster Mitigation Grant and other funding sources

Source and Date: N/A

Adopted Plan Number: TPUD-MH-3

Reference Page: N/A

Initiative and Implementation Status: New