Sequim Comprehensive Emergency Management Plan

Hazard-Specific Annexes

Annex A – Earthquakes

Earthquakes - definition

Earthquakes are the sudden, violent shaking of the ground caused by an abrupt shift along a fracture in the earth, known as a fault. The earth's crust is divided into eight major plates and numerous smaller plates. The plates are constantly moving and when they create enough friction, release stress, which in turn can create significant earthquakes.

History

Washington State has many large and small faults with most being located within the Puget Sound basin or coastal areas. Hundreds of small earthquakes are recorded each year within the state. The most recent large earthquake was the 2001 Nisqually earthquake that occurred 11 miles north of the city of Olympia.

There are multiple major fault lines that are in or near Sequim and Clallam County with the potential to create powerful earthquakes.

• The Boundary/Lake Creek and Sadie Creek faults cross below the ground surface just south of Port Angeles and Sequim. These can produce quakes in the 7.0 range. These quakes can last 30 to 90 seconds and cause serious damage because their epicenters are directly below the county's population centers. This quake should not result in a tsunami. Mutual aid should be available within days.

• The Southern Whidbey Island Fault crosses Admiralty Inlet between Port Townsend and Whidbey Island. It has the potential to generate strong earthquakes more than 6.5 on the Richter scale**. Historically, shaking has been less than one minute. Underwater land movement may generate less than 10-foot tsunamis in Puget Sound, Admiralty Inlet and the eastern Strait of Juan de Fuca. It has the potential to cause large amounts of damage in Sequim, Port Angeles and eastern Clallam County because of the area's close proximity to the epicenter. Mutual aid should be available within hours.

• The Seattle Fault bisects the Kitsap Peninsula across the Puget Sound through Seattle into the Cascade Mountains near Issaquah. It has the potential to generate strong earthquakes of more than 6.5 on the Richter scale. Historically, shaking has been less than one minute. Underwater land movement may generate tsunamis in Puget Sound, Admiralty Inlet and the eastern Strait of Juan de Fuca. Quakes on this fault have caused light to moderate damage to the eastern county because the area is more distant from the epicenter. Mutual aid should be available immediately. No tsunami for Sequim or Clallam County is expected.

In summary, the primary ways these earthquakes damage our community are:

• Moderate to strong ground shaking

• Liquefaction
• Landslides
• Tsunamis
• Aftershocks

Short-term disruption of highways, power, water, sewer, communications, and waste treatment may inconvenience people for several days. Transportation should be restored within days. Supply chain disruption should not last long.

Sequim Emergency Management must plan for:

• Transportation disruptions
• Limited need for mass care
• Overloaded healthcare systems
• Disturbance of community services (schools and government closures)
• Failure of wireless/internet structure
• Fuel shortages
• Damage or closure of food and pharmaceutical outlets
• Debris removal
• Competing demands for relief and recovery resources
• General public communications disturbance and extreme anxiety (mental health)

Response:

When responding to an earthquake, emergency personnel will prioritize the following:

• Life safety
• Property protection
• Restoration of government
• Protection of the environment
• Preservation of the economy

Cascadia Subduction Zone Earthquake

The Cascadia Subduction Zone Earthquake (CSZE) is a recurring catastrophic earthquake that periodically strikes the Pacific Northwest. The Cascadia Subduction Zone is a 600-mile-long fault that is located about 130 miles west of the Pacific Coast. This fault has the potential to create earthquakes similar in strength and damage to that of the 2011 Tohoku event which was registered at 9.0 and caused tsunamis as high as 130 feet. An earthquake of this strength generally causes more than 3-5 minutes of violent shaking followed by numerous powerful aftershocks. The primary ways these earthquakes can cause damage is from:

• Violent ground shaking
• Subsidence
• Landslides
• Liquefaction
• Tsunamis

This major earthquake is well documented and will dwarf all other earthquakes in the Pacific Northwest. The CSZE happened 42 times in the past 10,000 years with an average interval of 238 years. The last CSZE occurred around 9 PM on January 26th, 1700. Native American oral histories describe the event, but no written record is available. Japanese records show Japan felt the effects a few hours later when tsunami waves took lives and destroyed property.

The CSZE is expected to be magnitude 9.0 or larger with shaking lasting up to 5 minutes. All areas of Sequim and Clallam County will be affected. Alluvial soils (liquefaction zones) will magnify and may prolong shaking. Unreinforced masonry buildings, bridges and engineered culvert fills are not expected to survive.

The Olympic Peninsula between the Pacific Coast and Port Angeles is expected to subside (sink) up to six feet during the first three minutes of the quake. The Department of Natural Resources predicts 40-foot tsunamis along the coast and 30-foot tsunamis in the Strait of Juan de Fuca. Landslide prone areas along highway 101 are expected to slide in multiple locations. There may be landslides on the coastal bluffs from the Elwha River to Jamestown.

Long-term disruption of highways, power, water, sewer, telephone, and waste treatment can result in the danger of exposure, disease and starvation to survivors. Washington National Guard studies predict supply lines to Sequim and the county may be severed for up to a month or longer. This will necessitate delivery of aid and supplies by air or ship.

Delivery of aid to the peninsula will be complicated by near complete destruction of the Pacific Northwest supply distribution system. All counties west of the Cascade summit between northern California and British Columbia will be damaged. The United States government will mobilize to supply the 8 million people in the region.

Sequim Emergency Management must plan for:

- Extensive transportation disruptions
- Fuel shortages
- Extensive need for mass care and sheltering
- Overloaded healthcare systems
- Mass fatality management
- Debris removal and management
- Disturbance of community services (schools and government closures)
- Failure of wireless/internet structure
- Damage or closure of food and pharmaceutical outlets
- Competing demands for relief and recovery resources
- General public communications disturbance and behavioral health issues resulting from increased emotional stressors.
- A disruption in the Olympic Peninsula economy
- An extended recovery phase that may take years or decades.

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Annex B – Tsunamis

Tsunamis - Definition

Tsunamis are waves, or a series of waves, generated in a body of water by sudden underwater earth movements caused by earthquakes, landslides, or volcanoes. Tsunamis can travel at speeds up to 500 mph and may cause waves as high as 100 feet when they make landfall. The speed with which a tsunami strikes, and the height of inundation, make it incredibly important for those in the path to evacuate to high ground immediately.

History

The tsunami history of the Olympic Peninsula during the last 100 years is quite small.

• Marjorie Daniels reports a 25-foot wave swept into lower Port Townsend in the winter of 1866 in her book "Remember When…"

• The 1964 Good Friday Alaskan earthquake was observed along the Clallam County Pacific and Strait of Juan de Fuca coast. It destroyed the Copalis Crossing Bridge in Grays Harbor County.

• Tsunamis from the 2011 Tohoku Megaquake in Japan were observed at the Lyre River and the Port Angeles Boathaven. Water level deviations of 4-feet with currents of up 4 knots were observed at the entrance to the marina.

Longer-term tsunami history has found evidence of giant tsunamis at Discovery Bay, Neah Bay and Copalis in Grays Harbor. These events have occurred 42 times in the past 10,000 years with an average interval of 238 years. Inundation may rise as high as 40- feet above tide stage. The last giant tsunami occurred on January 26, 1700. Native American oral history confirms the event occurred but cannot provide a specific date.

A major coastal tsunami will heavily impact all of Clallam County, the Olympic Peninsula and all the Pacific Northwest. The City Water Reclamation Facility is within a recognized tsunami hazard zone.

Sequim Emergency Management must plan for:

• Extensive transportation disruptions
• Fuel shortages
• Extensive need for mass care and sheltering
• Overloaded healthcare systems
• Mass fatality management
• Debris removal and management
• Disturbance of community services (schools and government closures)
• Failure of wireless/internet structure

• Damage or closure of food and pharmaceutical outlets
• Competing demands for relief and recovery resources
• General public communications disturbance and behavioral health issues resulting from increased emotional stressors.
• A disruption in the Olympic Peninsula economy
• An extended recovery phase that may take years or decades.

Response

The County has multiple AHAB sirens at key coastal locations. These sirens will only be effective when a far-reaching tsunami approaches Washington. The sirens are not expected to survive events that generate near tsunamis.

A general evacuation of inundation zones is the top priority. The minimum safe height is 50 feet above water level at the time the warning is received, a landslide into a lake is observed or the earth starts shaking.

When a far tsunami warning is received, the following actions should take place:

- Activate ECC
- Notify key personnel and agency
- Implement emergency communications plan
- Begin coordinated planning for evacuation and search and rescue operations
- Establish traffic control points
- Begin evacuation of hazard areas
- Establish staging areas near the hazard area for mutual aid resources
- Monitor conditions for indications of degree of threat
- Request declaration of emergency (City Council)
- Scale up staffing as necessary
- Remain operational until the alert is cancelled or as long as necessary
- Coordinate SAR operation as needed by operational area
- Sustain operations or demobilize as appropriate

In the event of a near tsunami, treat per Earthquake response.

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Annex C – Landslides

Landslides - Definition

A Landslide is the sliding movement of masses of loosened rock and soil down a hillside or slope. Landslide causes depend on the rock type, precipitation, seismic shaking, land development and zoning practices, soil composition, moisture, and slope steepness.

History

Landslides in populated neighborhoods are seldom a threat in Sequim. More serious hazards occur along Highway 101. Areas of Clallam County are more susceptible to landslides on several highways. These slides will interrupt traffic east and west of Sequim for days. Landslides along the transportation corridors could have local impacts even if the landslide is not near our jurisdiction.

Sequim Emergency Management must plan for:

- Transportation and/or supply chain disruptions
- Need for sheltering or other population support measures
- Debris removal and management
- A disruption in the Olympic Peninsula economy

Response

- Maintain situational awareness such as understanding recent weather that has occurred.
- Monitor rainfall totals and/or strength of winds, weather pattern
- Conduct a threat analysis:
  - Road conditions
  - Rainfall last 24/48 hours
  - Soil saturation
- Recommended action:
  - Activate EOC
  - Establish communications with surrounding jurisdictions.
  - Consider requesting Declaration of Emergency if severity warrants.
- Local fire districts, sheriff's office, state, and Olympic National Park resources can be tasked to check on conditions and assist with emergency activities
- Conduct SAR operations as necessary.
- Evacuate areas surrounding incident site.
- Staff ECC as needed.
- Begin damage information collection process.
- Change status of ECC as necessary

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Annex D – Flooding

Flooding - Definitions

River building floods are caused by heavy, prolonged rain, melting snow, or both. Heavy rains over prolonged periods of time are the most common cause of flooding which is rare in Sequim but occurs often within Clallam County. Runoff from melting snow and ice in the Olympic Mountains can add to these floods, especially in the spring.

Tidal floods are not an issue within the Sequim city limits but will impact the surrounding area of the County. These can occur when high tides, strong winds, heavy swells, and low atmospheric pressure all combine and create flooding in coastal areas.

Flash Floods are caused by the rapid rise of water in small rivers or streams that move quickly downhill. These are usually caused by brief, intense rainfall from thunderstorms or failure of a blocked culvert.

History shows river building floods commonly occur along the Dungeness River that would impact Sequim. Other rivers in the County may be affected. Major storms can produce short-term flooding on side streams. Salmon recovery and land trust programs along with past mitigation programs have relocated most threatened housing and infrastructure out of the flood zones.

Flash flooding has occurred along Bell Creek in Sequim. Mitigation programs have reduced the threat of recurrence.

Understanding these rivers and the hazards they pose is important when conducting response actions.

PENCOM is the designated local warning point. They will advise Sequim if a flood bulletin is received.

Sequim Emergency Management must plan for:

- Damage to homes, schools, businesses, government facilities and critical infrastructure
- Delays in emergency responses
- Disruption of utilities
- Debris removal and management

Response

- Maintain situational awareness such as understanding recent weather.
- Check weather and flood bulletins (Advisory, Watch, or Warning).
- Check rainfall last 24/48 hours and soil saturation.
- Recommend public warning action as necessary.
- Activate the EOC and establish communications with Operational Areas at risk.
- Conduct damage assessments.

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Annex E – Severe Weather

Severe Weather

Severe weather encompasses a wide variety of atmospheric hazards that range in impacts.

Severe weather can be:

- Heavy precipitation (pineapple express rain, snow and/or ice)
- Damaging winds
- High/low temperature events
- Thunderstorms & lightning
- Drought

Windstorms have a high probability of occurring every year between October and April. Damaging winds are considered storms with sustained winds of 50 mph or gusts of 65 mph or higher. Of all the hazards that can occur in Sequim, damaging winds happen most often and usually cause the most damage.

Impacts and effects of these storms may include:

- Loss of life
- Damage to homes, schools, businesses, government facilities and critical infrastructure
- Delays in emergency responses
- Disruption of utilities
- Government, school and business closures
- Debris removal and management

Sequim occasionally experiences severe winter storms creating damage. Severe weather throughout the Olympic peninsula has caused landslides, flooding, snow, and wind damage. This weather will impact Sequim, costing millions of dollars to homes and businesses. Road closures will affect the supply chain via Highway 101.

Recent severe snowstorms show that emergency services need to plan to assist oxygen dependent and dialysis patients as well as provide temporary shelter and emergency device charging facilities for stranded travelers.

Severe weather is an annual threat to Sequim. Wind, snow, ice and rainstorms often disrupt transportation, electrical power, phone service, and the internet for hours to days. These events also disrupt emergency responses from fire, EMS and law enforcement.

National Weather Service Guidelines:

HIGH WIND ADVISORY/OUTLOOK – Events that are not life threatening but may cause limited power outages or other inconvenience. Sustained winds of 30 to 39 mph or gusts of 45 to 57 mph

HIGH WIND WATCH – Conditions are favorable for the HIGH WINDS in the next 48 hours but are not yet certain.

HIGH WIND WARNING – A potentially life-threatening HIGH WIND event is occurring or is about to occur. Winds are or will be at the WARNING level or above the HIGH WIND WARNING threshold: Sustained winds of 40 MPH with gusts to 58 MPH or higher.

Sequim Emergency Management must plan for:

- Downed trees and tree branches.
- Closed roads - trees or other debris in the roadway; tree/power line entanglement.
- Power outages - short term specific sites; long term system-wide damage.
- Telephone outages - conventional and cellular; line damage; tower damage; overload.
- System outages - internet service providers; data transfer systems; communications.
- Property damage - homes and businesses; impacts from any of the above.
- Debris removal and debris management.

Response Activities:

- Maintain 24/7 Situational awareness.
- Ramp up staffing as needed.
- Advise City staff and Departments to execute storm checklists. (refueling chain saws, staff call back, etc.)
- Monitor storm activities and track damage reports.
- Provide the public with information.

Post incident recovery:

- Initiate private/public property damage assessments.
- Provide public and private damage data to CCEM.
- Modify or enhance EOC staffing to transition from response to recovery operations.
- Coordinate with partner agencies to prioritize restoration of services and debris disposal.
- Sequim EOC will coordinate with CCEM in organizing and executing short-term and long-term recovery.

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Annex F– Wildland Fires

Wildland Fires – Urban Interface

Wildland urban interface fires, forest or wildland fires are the uncontrolled destruction of forested lands and wildlands (range) by fire caused by natural or human-made events. Forest and wildland fires occur primarily in undeveloped areas. Interface fires are fires that occur in developed forests and wildlands, only partially cleared, and occupied by structural development. When weather conditions are dry and fuels are abundant, rapidly spreading fires can cause significant loss of life and property.

The Olympic Peninsula has a long history of wildland fires over the past thousand years. While Sequim is not located immediately adjacent to forest lands, the threat of fire still exists. It is grass and wind that can produce rapidly expanding grass/range fires that have resulted in the greatest loss of life and property. Grass (range) fires occur in light fuels: grasses, small bushes, and the like. These fuels go through a seasonal cycle: greening up during the wetter seasons, then drying out. The wetter the rainy season, the greater the fuel load. Once a fire is started, either natural or human caused, winds will provide huge amounts of oxygen for the fire and rapidly push it forward, moving hot embers and superheated air ahead of the flame front, often with catastrophic results.

The Olympic Peninsula fire season usually runs from mid-May through October. Any prolonged period without significant precipitation presents a potentially dangerous situation, particularly if strong, dry, east winds prevail. The probability of a forest fire or an interface fire in any one location depends on fuel conditions, topography, the time of the year, weather conditions, and if there is human activity such as debris burning, camping, etc. In addition, narrow access roads can interfere with fire suppression efforts.

Several activities can be undertaken that will reduce the actual numbers and resulting loss from fires. These include:

- Forest fire education and enforcement programs must be emphasized to include early reporting of fires.
- Effective early fire detection and emergency communication systems are essential.
- Effective early warning systems are essential to notify local inhabitants near the area of the fire.
- Develop an evacuation plan detailing primary and alternate escape routes.
- Encourage Fire-safe development such as; remove burnable fuel around structures, use of fire resistant roofing materials, adequate two-way routes and turnaround areas for emergency vehicles, adequate water supplies.
- Development of local ordinances to control human caused fires.
- Road closures should be increased during peak fire periods to reduce access to fire prone areas.
- Enforcement of “no-burn” periods.

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Annex G – Power Outage

Power Outage

A power outage is when the electrical power goes out. Planned or unexpected, it can last for hours, days or longer. Lighting, refrigeration, water, air conditioning, the internet and medical equipment will not work. An extended power outage could impact local public communications, access to resources such as fuel, and an inability to provide consistent heat or air conditioning in severe weather, for example.

Clallam PUD #1 has the responsibility for stabilization and recovery from power outages. This region is at risk of regional impacts to our electrical supply. Most incidents of power outages in our area are of short duration, however the public should prepare for the potential of longer-term outages.

Before a power outage:

- Register electric life-sustaining and medical equipment with your utility company.
- Consider an emergency backup generator located outside the house.
- Keep a preparedness kit to include flashlights, light sticks, a battery powered radio and extra batteries.
- Landline telephones are good because cell phones will not work without power.
- Have a safe alternate heat source and fuel supply. Never burn charcoal or use a generator indoors.
- If you have an electric garage door opener, know how to open it without power.

During a power outage:

- Lights and electrical appliances should be turned off or unplugged. Leave one lamp on to know when the power is restored. Wait 15 minutes after the power is restored before turning on other appliances.
- Unplug computers and other sensitive equipment to protect them from possible surges when the power is restored.
- Keep freezers and refrigerators closed to maintain temperature.
- Never use gas ovens, gas ranges, barbecues or portable or propane heaters for indoor heating.
- Only use generators outdoors and away from windows.
- Conserve water, especially if a well is the source of water.
- Use flashlights and lights sticks for lighting – candles are dangerous.
- Using a kerosene heater, gas lantern or stove inside the house can be dangerous. Always maintain proper ventilation to avoid the buildup of toxic fumes and be sure to have a carbon monoxide detector.
- Follow boil water guidance

- Stay away from downed power lines and sagging trees with broken limbs.

After a power outage:

- Avoid downed or damaged power lines and poles.
- Avoid flooded areas that may have contact with downed or damaged power lines.
- Be aware of carbon monoxide poisoning.

Sequim Emergency Management must plan for:

- A prolonged power outage will have impacts to life and safety.
- Lack of power will create challenges to provide consistent heat or air conditioning and sufficient sanitation/hygiene in shelter or other mass care facilities.
- People with health issues, disabilities and people with access and functional needs may be at higher risk.
- The availability or shortage of redundant, accessible, and diverse communications will affect response and recovery operations.
- Local businesses and organizations have limited generator capability.
- A portion of the population have access and functional needs and are power dependent on medical equipment, devices and services outside hospital settings and must be supported during outages.
- Extremely hot or cold weather conditions will greatly increase the number of survivors unable to shelter at home during a prolonged outage
- Critical health care facilities, sites such as hospitals, may have difficulty maintaining sufficient temporary emergency power and will face stress from a surge in care needs and potential degradation of services
- Public and private sector organizations impacted by long-term power outages will require the activation of continuity plans to sustain essential functions and provide critical services to the affected population, and to ensure continuity of government at all levels
- Fuel will need to be prioritized for distribution and use based on requirements, such as the number of available generators, number of Critical Infrastructure facilities requiring fuel or generators, and fuel consumption rates.
- Even with adequate fuel stocks, distribution and delivery shortfalls may still limit the ability to maintain emergency response.

Response Activities:

- Maintain situational awareness.
- Activate the Emergency Coordination Center to coordinate activities with local partners, resource providers, and organizations if length of outage warrants.
- Coordinate public messaging with local PUD, Fire District 3 and Clallam EOC utilizing radio stations with emergency back up generators.