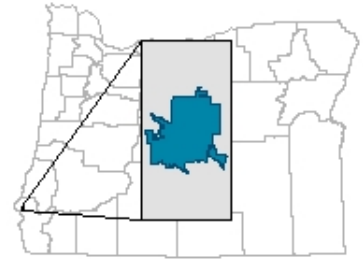




Port Orford, OR

The Department of Geology and Mineral Industries (DOGAMI) has completed a tsunami damage assessment for a local Cascadia Subduction Zone earthquake and tsunami event in Port Orford, OR. The major results are presented below along with suggested action items to increase resilience in the community. This study was designed so that public decisions might be made with the best science available.

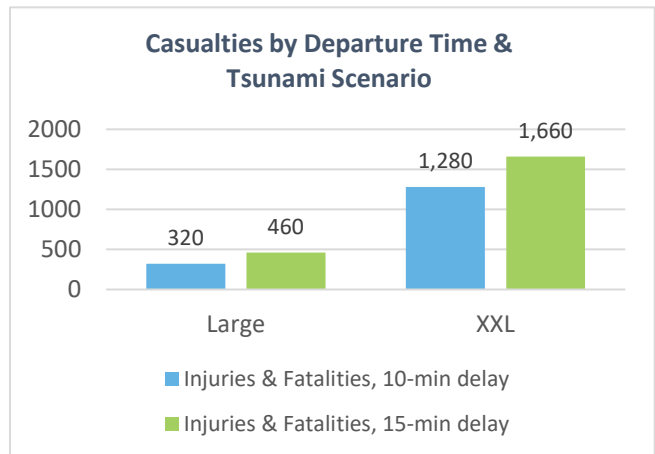


Casualty Estimates (Injuries + Fatalities)

The first tsunami wave arrives in Port Orford **17 minutes** from the start of earthquake shaking. The wave arrival time is extremely fast in this location and is important for assessing the community’s ability to quickly evacuate, which directly affects the potential for fatalities.

The results presented here are for a summer weekend at 2 AM, which represents a peak number (all possible beds occupied). Results also include the City’s Urban Growth Boundary, which includes the neighborhoods north of Garrison Lake and the Hubbard Creek areas outside the Port Orford city limits in the southeast.

Assuming a 10-minute departure time and average walking speed of 3 miles per hour, only 40% of the Port Orford summer population located within the XXL tsunami zone (temporary + permanent) is expected to survive. Departure time is the length of earthquake shaking (3-5 min.) plus milling time before someone starts evacuating. Fatalities increase as departure time increases (i.e., longer milling time) and decrease as the speed of travel increases.



Longer evacuation delays can significantly increase the number of injuries and fatalities. Fewer people are impacted by a Large tsunami scenario than the XXL scenario.

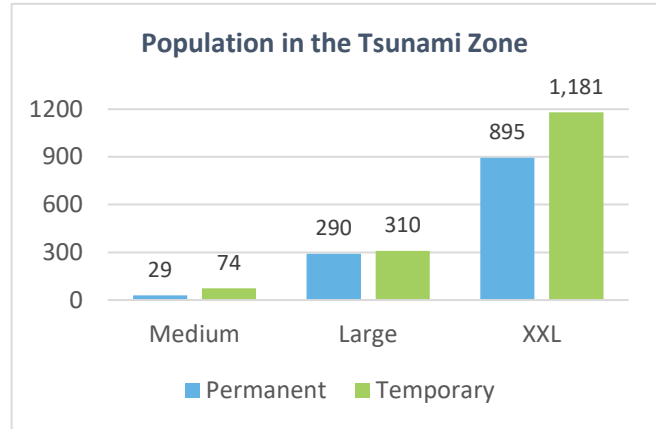
The size of the earthquake and resulting tsunami are also significant to survivability in Port Orford (see graph). A Medium or Large tsunami result in a much smaller inundation zone and therefore less casualties. A Large tsunami event represents 95% of the expected inundation from a CSZ earthquake. (See tsunami inundation maps at www.oregonsunami.org.)

Population in the Tsunami Zone

Almost the entire community of Port Orford is directly impacted by the XXL tsunami. High ground is located in the northern and eastern hills and on Port Orford Head. People located in the tsunami zone will have to quickly evacuate to safety following an earthquake. Effective evacuation, and hence survivability, can become more difficult with additional risk factors, such as visitors, older or younger individuals, or those with mobility challenges.

- Almost all of Port Orford’s permanent residents live in the XXL tsunami zone; 37% are aged 65 years or older. About 32% of the city’s permanent population lives in the Large tsunami zone.

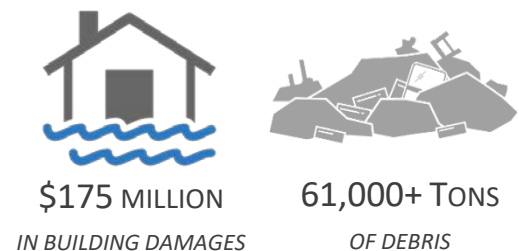
- About 40% of the local population has a self-reported disability, with about 28% reporting an ambulatory disability. These individuals may need significant help evacuating from the tsunami zone.
- Most of the permanent population within the tsunami zone occupies single-family (62%) or manufactured homes (17%). Foundations of manufactured homes may fail in an earthquake, hindering timely evacuation.
- About 73% of the temporary visitor population occupies single-family vacation homes. A challenge of such a dispersed temporary population is ensuring every vacation home contains site-specific earthquake and tsunami information.
- About 60% of the jobs in the Port Orford UGB are located within the tsunami zone.
- Temporary residents could increase the local population within the tsunami zone by ~2.3 times in the summer.



The greatest challenge facing the Port Orford community is that the tsunami (regardless of size) strikes the area so quickly (~17 minutes) after the start of earthquake shaking. Assuming a 10-minute delay to allow people to collect their belongings and evacuate from a building, actual evacuation time is reduced to about 7 minutes. **The faster people can evacuate, the greater the chances of survival.**

Building Damage & Debris Estimates

Within the XXL tsunami zone, combined earthquake and tsunami building repair costs are estimated to be ~\$175 million (which includes over 800 buildings), with the bulk of the cost attributed to the destruction caused by the tsunami. The costs to repair buildings and infrastructure located outside the tsunami zone that are also damaged by the earthquake are **not** included in this estimate.



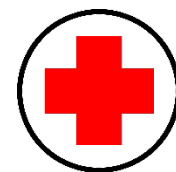
The weight of debris generated by the destruction of the buildings in the tsunami zone is estimated to be ~61,000 tons, which is a minimum estimate (excludes content in the buildings, vehicles, and other forms of debris).

Sheltering Needs

Permanent and temporary residents who successfully evacuate out of the tsunami zone will require short- to medium-term shelter. For an XXL tsunami event, the displaced population in Port Orford could range from ~375 (mid-winter) to ~850 people (peak summer). These numbers reflect only those displaced from the tsunami zone; there may be additional sheltering needs for those whose homes have been damaged or destroyed by the earthquake event outside of the tsunami zone. A lesser magnitude tsunami event will result in fewer sheltering needs (~150-290 for a Large tsunami).

Data Source:

Open File Report O-20-03, *Analysis of earthquake and tsunami impacts for people and structures inside the tsunami zone for five Oregon coastal communities: Gearhart, Rockaway Beach, Lincoln City, Newport, and Port Orford*, DOGAMI: www.oregongeology.org/pubs/ofr/p-O-20-03.htm.



375 – 850 PEOPLE
IN NEED OF SHELTER

Instill a Culture of Preparedness.

Through adaptation planning, communities can be better prepared to face natural disasters.

Action Items:

- **CONDUCT COMMUNITY EVACUATION DRILLS** – All neighborhoods in Port Orford should review evacuation maps, walk evacuation routes, and conduct tsunami evacuation drills.
- **EDUCATE** – Loss of life can be minimized if individuals evacuate as soon as possible after the earthquake and travel on foot as fast as possible to safety. Tsunami evacuation map distribution, signage, and roadway paint are education tools that are highly effective if used widely.
 - Locally specific evacuation maps can now be generated for any location via the online tsunami evacuation portal: <http://nvs.nanoos.org/TsunamiEvac>. Or the smartphone application: NVS Tsunami Evacuation.
- **PREPARE COMMUNITY RESOURCES**, such as disaster supply caches and mass sheltering plans. OEM and DOGAMI have a newly released community disaster cache [planning guide](#) with resources to get groups started.
- **ENCOURAGE THE PURCHASE OF FLOOD INSURANCE TO COVER TSUNAMI LOSSES** – Most of the buildings (~900) in Port Orford are in the XXL tsunami zone but **not** in a designated FEMA flood zone. The voluntary purchase of flood insurance is available to all building owners through the National Flood Insurance Program, which covers building loss due to a tsunami. Standard homeowner’s insurance does not cover flood, tsunami, or earthquake damage. Find out more: www.fema.gov/flood-insurance.
- **IMPLEMENT EVACUATION IMPROVEMENTS**, focused to the challenges of the community, such as:
 - Increase the density of tsunami evacuation signage so that signs can be easily viewed and read.
 - Encourage residents of manufactured homes to store crowbars and sledgehammers near doors or windows to address compromised egress. Such homes may slip off their foundations during an earthquake, hindering timely evacuation out of the tsunami zone.
 - Evaluate major engineering projects to improve resilience. Consider vertical evacuation structures within the city, such as at Buffington Memorial Park or near Garrison Lake, which could save hundreds of lives.
 - Seismic retrofits of the bridges at Highway 101 and Arizona St provide a minimal benefit to evacuation success, however, are important for post-disaster response and recovery and should be considered.
- **ADVANCE LOCAL PLANNING**
 - Relocate critical and essential buildings if they are within the tsunami zone.
 - Adopt zoning restrictions or building standards for certain types of new development in the most hazardous areas in alignment with the community’s risk tolerance.
 - Develop a plan for how to manage earthquake and tsunami debris after a disaster event.
- **DEVELOP MUTUAL AID AGREEMENTS** with other jurisdictions or organizations to provide additional resources for the community during disaster events. Coastal hospitals will need to prepare for a surge in injuries that could exceed existing capacity.
- **KNOW WHAT RESOURCES ARE AVAILABLE** – Federal and state agencies have grant funds available for risk reduction activities (e.g., FEMA’s Hazard Mitigation Grant Program, NOAA’s Coastal Management Program).

