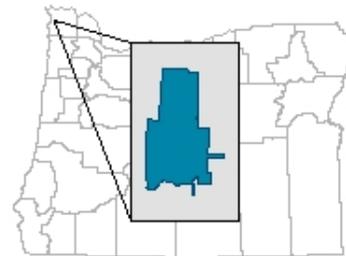


Gearhart, OR



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 Gearhart, 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, most detailed science available.

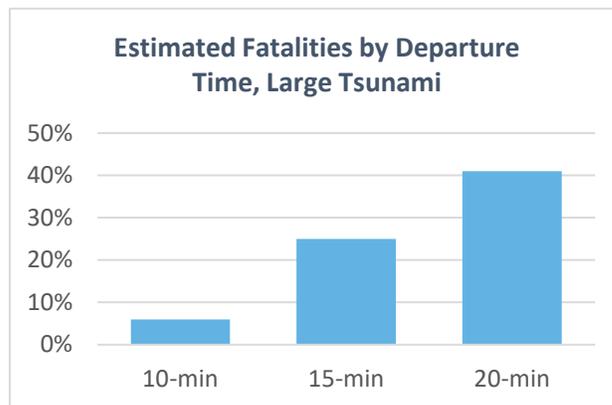
Casualty Estimates (Injuries + Fatalities)

The first tsunami wave arrives in Gearhart **33 minutes** from the start of earthquake shaking. The wave arrival time is important for assessing a community’s ability to quickly evacuate, which directly affects the potential for fatalities.

In Gearhart, the size of the earthquake and resulting tsunami are significant to survivability. The City of Gearhart has determined that planning community evacuation from an XXL tsunami is not feasible due to the substantial distances required to travel to reach high ground along the eastern foothills. For this reason, the city has communicated to its residents that in the event of a major earthquake, people should evacuate to the “islands” located in the north and northwest of the city that are outside of the **Large** tsunami zone.

Thus, results shown here are for a Large tsunami scenario and a summer weekend at 2 AM, which represents a peak number (all possible beds occupied).

Assuming a 10-minute departure time and average walking speed of 3 miles per hour, 94% of the Gearhart summer population (temporary + permanent) is expected to survive in a Large tsunami scenario. Departure time is the length of earthquake shaking (3-5 min.) plus milling time before someone starts evacuating. Evacuation delays could increase the number of fatalities significantly, as shown in the graph. For comparison, in an XXL tsunami, survivability drops down to only 5% of the summer population.



Longer evacuation delays can significantly increase the percent of the population that could be killed by a tsunami.

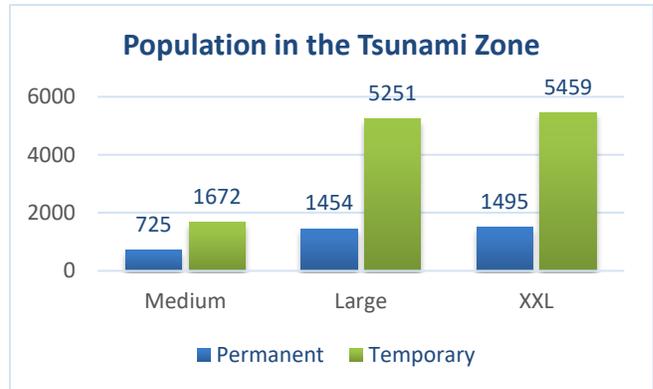
Population & Assets in the Tsunami Zone

The entire city of Gearhart is inundated by the XXL tsunami; however, a few discrete areas of high ground are outside of the Large tsunami inundation zone. The City has chosen to use the Large tsunami scenario for evacuation planning purposes. A Large tsunami event represents 95% of the expected inundation from a CSZ earthquake. (See tsunami inundation maps at www.oregontsunami.org.)

People located within the tsunami zone will have to quickly evacuate to safety following an earthquake. Effective evacuation, and hence survivability, can become more difficult when additional risk factors are involved such as visitors, older or younger individuals, or those with mobility challenges.

- 99% of Gearhart’s permanent residents live in the XXL tsunami zone; 29% are aged 65 years or older.
- Temporary residents could increase the local population within the XXL tsunami zone by 4.6% in the summer.

- Temporarily occupied households make up 57% of the residential households in the XXL tsunami zone.
- There is a big increase in affected populations from the Medium to Large tsunami scenario, due to the broad, low-lying geography of the city.
- 81 businesses are located in the **Large** tsunami scenario.
- Most of the population (permanent + temporary) occupies single-family dwellings.

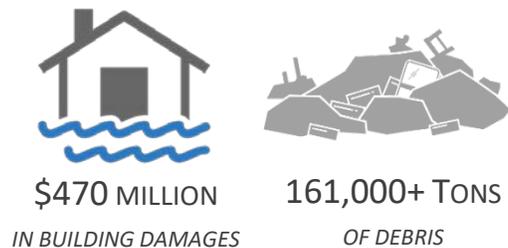


Temporary population = those occupying vacation rentals & second homes. Temporary population estimates are based on a summer weekend scenario.

Most of the people in Gearhart should evacuate to the “Large Islands” in the north and northwestern portions of Gearhart. In some cases, this may mean evacuating towards the ocean, which may be counterintuitive for some. Evacuation to the east is the best option for those people who reside immediately adjacent to Highway 101 and to its east.

Building Damage & Debris Estimates

Within the XXL tsunami zone, combined earthquake and tsunami building repair costs are estimated to be ~\$470 million (which includes over 1,600 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 ~161,000 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 (which may mean several weeks to months after a tsunami). For a Large tsunami event, the displaced population in Gearhart could range from ~1,406 (mid-winter) to ~6,600 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. In addition, extensive development exists north of Gearhart in the Large tsunami zone, including the unincorporated Surf Pines neighborhood. Displaced people in those locations will also temporarily need food and shelter.



1,460 – 6,600 PEOPLE
IN NEED OF SHELTER

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. More resources at: www.oregontsunami.org.

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 Gearhart 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.
 - About 85% of visitors to Gearhart spend the night in single-family vacation or second homes. Focus education to second homeowners and vacation home renters.
 - 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 in Gearhart are located in the Large 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.
 - Evaluate major engineering projects to improve resilience, such as vertical evacuation structures within the city or a seismic retrofit for the bridge over Neawanna Creek.
 - Direct evacuation of people east of Highway 101 towards the eastern highlands.
- **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. Look to OEM and FEMA for resources to get started.
- **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).

