



Emergency Water for Hospitals

Preparing for Cascadia

Photo: Portland Water Bureau



Loss of water can result from weather events and accidents as well as earthquakes. By preparing for Cascadia, administrators make their hospitals more resilient.

In this fact sheet:

- **How to make sure your hospital has enough water to function after a Cascadia quake**
- **What hospital leaders in Oregon need to know to plan for a water outage**
- **Resources and tips to help you develop a resilient water system**

Will Your Hospital Have Water after a Cascadia Quake?

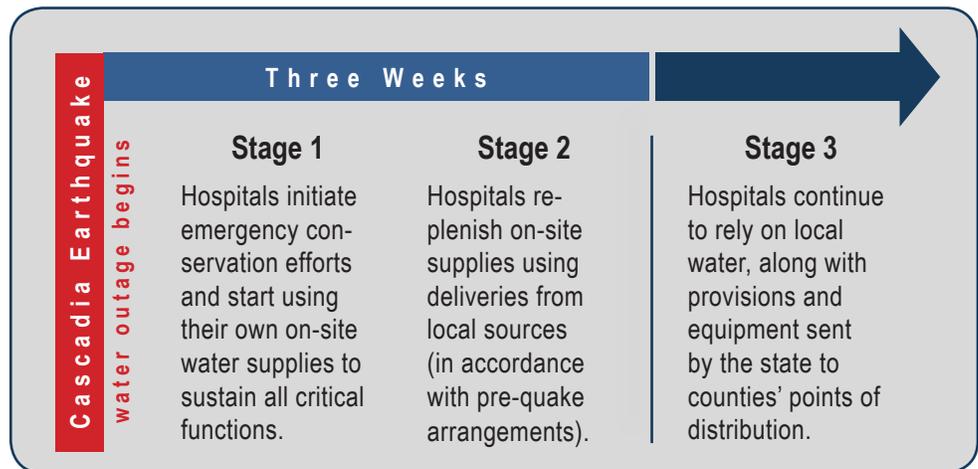
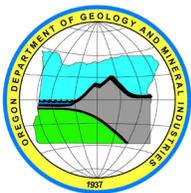
Hospitals across western Oregon can expect a major Cascadia earthquake to cause widespread damage to water and wastewater systems, resulting in loss of service for extended periods. Moreover, because the earthquake will extensively damage other critical infrastructure, including transportation networks, hospitals should plan to be cut off from all but local, seismically prepared emergency response services. This isolation will last longest on the coast, where the shaking will be most severe and tsunami waves will devastate low-lying coastal areas. Hospitals must prepare to function after the earthquake using only their own on-site and local emergency water supplies. The quality and quantity of this water must be sufficient to provide an uninterrupted supply that meets all of the hospital's needs.

What Will Hospitals Face When Cascadia Breaks?

Currently, the Oregon Health Authority (OHA) requires hospitals to have enough emergency water for 96 hours and only for sheltering purposes. This isn't enough to keep hospitals going during the lengthy outage caused by Cascadia. Hospitals must work now with their water districts and other local partners to develop an emergency water supply that supports both sheltering and operations, and that can be sustained with local resources alone until the state is able to deliver emergency water provisions and purification equipment—up to three weeks after the earthquake. Hospitals should also prepare to manage their own wastewater, such as with tanks and backup water, possibly for many months.

Turn the page to learn more....

Oregon's coastal hospitals must prepare to rely on local emergency water supplies and equipment for up to three weeks following a Cascadia earthquake. After that, the state will start to assist with water needs.



Strategy for Post-Earthquake Emergency Water at Oregon Hospitals

Hospital leaders can improve the resilience of their hospitals by envisioning their post-earthquake emergency water strategy in three stages and by taking steps now to meet the demands of each stage.

TO PREPARE FOR:	LOCAL/REGIONAL HOSPITAL LEADERS SHOULD:
<p>Stage 1 The hospital responds to the loss of normal water supplies by following the procedures in its emergency water supply plan (EWSP), including making use of on-site emergency water supplies and taking steps to conserve water.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Develop and routinely evaluate an emergency water supply plan (EWSP). <input type="checkbox"/> Design or retrofit the hospital's water system to withstand a major Cascadia earthquake. <input type="checkbox"/> Develop an earthquake-ready emergency water supply and delivery system that is sufficient for both sheltering and critical functions.
<p>Stage 2 The hospital replenishes its on-site emergency water supplies by transporting water from other local sources, following the pre-disaster arrangements made with the hospital's water supplier, county emergency managers, and other local partners.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Work now with city and county emergency managers, the local water district, and other local partners to identify emergency water supplies and develop a plan for testing water, purifying contaminated water if needed, and delivering water to the hospital. <input type="checkbox"/> Install an external plumbing (emergency water) connection so that trucks can deliver water to the facility.
<p>Stage 3 The hospital continues to replenish its water supplies locally; it may use water purification equipment and provisions delivered by the state to county-designated community points of distribution (CPODs). (County emergency managers arrange for use and distribution according to predetermined priorities.)</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Work now with the county emergency manager to identify the nearest community point of distribution (CPOD), communicate the hospital's needs, and verify that the hospital will receive priority when water purification equipment and other emergency water provisions are available.

To learn more about how you can prepare your hospital for each stage, keep reading this fact sheet and consult the *Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities* by the Centers for Disease Control and Prevention and the American Water Works Association.



Will Backup Systems Work after a Quake?

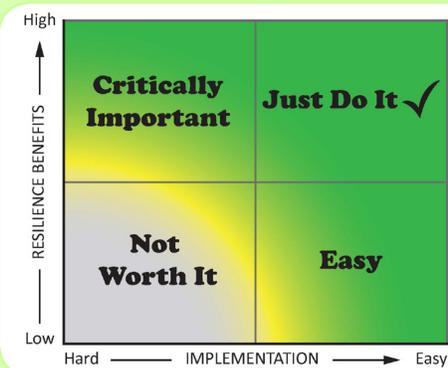
New hospital buildings should be built above current code standards so they're designed to function after an earthquake. When designing an emergency water supply system for an existing building, consider not only the components needed to make it work—such as booster pumps and shut-off valves—but also how to protect all parts of the system from damage during an earthquake.

For example, hospitals must install exterior plumbing connections to receive water from trucks. Design these and other plumbing components to resist earthquake damage. Also, remove or secure falling hazards, such as parapets and cladding, as these may damage connections during an earthquake or block access to them.

RESILIENCE CHECKLIST

Developing a resilient water system starts with understanding the plumbing, including where to find the valves and outlets that control the flow of water and flush the system. Earthquake-ready hospitals should have:

- Two or more separate water lines (feeds) connecting the hospital to the water district's system.
- An external plumbing connection for emergency water deliveries.
- An earthquake-resistant fire-sprinkler system.
- Shut-off valves in strategic locations.
- Equipment and components that are seismically designed and—when available—seismically certified.
- Earthquake-resistant water pipes throughout the hospital and from the water source to the hospital.
- Flexible connections, such as between buildings.
- Portable water-purification kits.
- A seismically designed delivery system, if relying on on-site emergency water sources, such as a well.
- Seismically designed tanks (AWWA D100) with flexible connections, if relying on large-capacity on-site storage.



Upgrading Existing Hospitals

Upgrading a hospital's systems can be both effective and easier when done step by step:

1. Assess your system's vulnerabilities.
2. Prioritize mitigation based on ease of implementation and highest resilience benefits.
3. Plan and upgrade incrementally.

The Oregon Seismic Rehabilitation Grant Program offers grants of up to \$2.5 million to help mitigate seismic vulnerabilities in hospitals.

How Much Water Does Your Hospital Need?

Audit your water-usage and create an emergency water supply plan (EWSP). To learn how, see the CDC's *Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities*.

Start by assessing how your system is used and works normally:

- How much water does the hospital use? For what purposes?
- What type of water (sterile, potable, or non-potable) is needed for each purpose?
- What uses are critical?
- How does the hospital control water and its uses during a shortage?
- Where does the water come from and how does the plumbing system, including wastewater, work?
- Is emergency power needed—and is it available—to maintain water pressure or otherwise run the system and pumps?

Identify Your Hospital's Emergency Water Sources

Work with your water district and local emergency planners to identify on-site and local sources of water (such as groundwater wells) and to determine how water will be tested for quality and purified. Verify that the quantity is adequate to meet the hospital's needs; then estimate how long supplies will last.

A hospital's emergency water supply may include multiple sources, such as water stored inside the building in containers (as shown at right), large on-site tanks, groundwater wells, and surface water. (Photo: DOGAMI)



Is Your Hospital Ready to Receive Emergency Water?

- Identify sources of tanker trucks to carry potable water; ask the county emergency manager and transportation engineers about likely routes.
- Arrange for necessary equipment, such as hoses, generators, pumps, and fuel.
- Regularly test water stored on-site in tanks; develop a plan with the water district to treat contaminated water and test water deliveries.
- Verify that you have what's needed (such as connections, valves, and backflow-prevention devices) to receive water from trucks. Know how to close connections to the main water supply to prepare the plumbing for delivery of emergency water.

How Resilient Is the Local Water Supply?

Resilience requires robust local water systems, which is why Oregon law requires water districts serving hospitals in western Oregon to assess seismic vulnerabilities and plan mitigation.

Hospitals should work with local water districts to ensure that the part of the system that serves the hospital is a top priority for mitigation, if needed. The district may install seismic shut-off valves, replace rigid connections with flexible connections and brittle pipes with earthquake-resistant pipes, or buy equipment, including seismically certified generators. Programs such as the Safe Drinking Water Revolving Loan Fund offer loans and grants to support the seismic mitigation work of water districts. (To learn more, consult the Infrastructure Finance Authority of the Oregon Business Development Department or the Oregon Office of Emergency Management.)

Hospitals should also ask if the local water district is part of OR-WARN: the Oregon Water/Wastewater Agency Response Network (www.orwarn.org).

What about Wastewater?

Hospitals must prepare to deal with wastewater during a post-Cascadia water outage. Discuss options with the local wastewater utility and review the hospital's plumbing diagrams to decide how to:

- Collect and dispose of (or store) wastewater for at least three weeks.
- Power the wastewater system (if power is required).
- Repair, clean out, and unclog pipes.

If the hospital will adopt special procedures during the crisis, be sure to train personnel and adequately stock whatever supplies will be needed, such as waste bags and disinfection tools.

Additional Resources

Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities (2012). CDC and American Water Works Association: www.cdc.gov/healthywater/pdf/emergency/emergency-water-supply-planning-guide.pdf

[FEMA 577](#) *Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds* (2007).

Emergency Power for Coastal Hospitals: Preparing for Cascadia (CREW Fact Sheet #10).

Oregon

Oregon Coastal Hospitals Preparing for Cascadia (DOGAMI Open-File Report 0-18-03), [see especially Appendix A: Technical Resources List for Hospitals]: www.oregongeology.org/pubs/ofr/O-18-03_report.pdf

Oregon Hospital and Water System Earthquake Risk Evaluation Pilot Study (DOGAMI Open-File Report 0-17-01, [see especially Appendix A: References for Water Facilities]: www.oregongeology.org/pubs/ofr/O-17-01.pdf

Oregon Seismic Rehabilitation Grant Program: www.orinfrastructure.org/Infrastructure-Programs/Seismic-Rehab/

Oregon Health Authority (OHA) Prepare for Earthquakes website: <http://public.health.oregon.gov/Preparedness/Prepare/Pages/PrepareForEarthquake.aspx>