

Hayward Fault Fact Sheet

The Hayward Fault is considered one of the most dangerous in the world because scientists believe it is due for a large earthquake and because it runs under a densely populated area of California. The California Geological Survey was among the organizations contributing to the Uniform California Earthquake Rupture Forecast, Version 2, released in April 2008. That report stated that there's a 31 percent chance the Hayward Fault will produce a magnitude 6.7 or greater earthquake in the next three decades.

Where is the fault?

The fault runs parallel to and east of the San Andreas Fault. It extends from San Jose about 74 miles northward along the base of the East Bay Hills to San Pablo Bay. Communities on or near the fault include San Jose, Oakland, Fremont, Richmond, Berkeley, Hayward, San Leandro, San Lorenzo, El Cerrito, Emeryville, Kensington and Milpitas. Among other sites, the fault runs directly under the now-abandoned old city hall in downtown Hayward, the University of California-Berkeley football stadium, the Mira Vista Golf Course near Berkeley, Lake Temescal, Contra Costa College, and Port Pinole Shoreline Regional Park.

The 1868 earthquake

The three decades mentioned earlier may be an optimistic time span. By digging trenches across the fault, scientists have determined that the last five earthquakes large enough to cause damage have occurred about every 140 years (the "recurrence rate"). That means the Hayward Fault may be due.

The biggest earthquake on the fault in recorded history was an estimated magnitude 7 at 7:53 a.m. October 21, 1868. The fault moved northward from the Warm Springs area of Fremont possibly as far as Berkeley. The maximum horizontal displacement was about six feet. It was known as "the Great San Francisco earthquake" until 1906, damaging almost every building in Hayward and doing significant damage in San Francisco, in Fremont, San Jose, San Leandro and elsewhere. Cracks appeared in walls as far away as Napa, Santa Rosa, and Hollister. At a time when the greater Bay Area had a population of only about a quarter-million and infrastructure was minimal, damage was estimated at \$350,000 in 1868 dollars. Thirty people perished in the quake, including five in San Francisco.

Other quakes of note

Earthquakes estimated at magnitude 5.9 occurred on the Hayward Fault in 1864 and 1870, and a magnitude 5.6 event struck in 1889. In October 2007, a magnitude 5.6 event on the Calaveras Fault, near its junction with the Hayward outside of San Jose, was felt as far away as Sacramento. It caused minimal damage.

In March 2008, the 1868 Hayward Earthquake Alliance and Risk Management Solutions estimated that a repeat of the 1868 earthquake would impact more than five million people – leaving 100,000 or more homeless -- and cause \$165 billion in damage to residential and commercial properties. Much of the damage would be uninsured. And that figure does not include potential post-quake fire losses, damage to infrastructure, or the disruption of business. The California Geological Survey's 1987 Earthquake Planning Scenario for a Magnitude 7.5 Earthquake on the Hayward Fault in San Francisco Bay Area anticipated 1,500 to 4,500 deaths, depending on the time of occurrence, and three times that number of nonfatal casualties.

While a significant amount of structural retrofitting work has been done in the Bay Area, the Hayward Fault runs under numerous lifelines, such as freeways, the Hetch Hetchy Aqueduct, and Bay Area Rapid Transit tracks. A sizable earthquake could cut off water supplies – not only for drinking, but also for fighting fires -- to nearly half the Bay Area. The aforementioned CGS scenario noted that eight large (99 beds or more) acute care hospitals in Alameda and Contra Costa counties are within a mile of the fault. More than a thousand roads (including the trans-bay bridges) could be closed for

significant amounts of time. Liquefaction could render local airports and port facilities useless. Secondary hazards such as landslides and wildfires are possible.

How large an earthquake can the fault produce?

A fault's length is related to the maximum strength of an earthquake it can produce. The Hayward Fault is thought capable of generating a magnitude 7.5 quake. However, many scientists believe that the Hayward Fault is connected to the Calaveras Fault to the south, the Rodgers Creek Fault to the north and to the Maacama Fault still farther north. If that is the case, the longer fault system could produce larger temblors.

Fault creep

Aside from size and reputation, a major difference between the Hayward and San Andreas faults is "aseismic creep". The San Andreas Fault is locked in many places; much of its energy is released in the form of earthquakes. However, creep occurs in spots along the Hayward Fault. The ground consistently moves a few millimeters each year, pulling apart sidewalks, pipelines and other structures that sit astride the fault. UC Berkeley's Memorial Stadium was built in 1923. Since then, creep has caused the two sides of the stadium to be offset more than a foot, requiring retrofitting with expansion joints. Creep accounts for a small part of the total motion that takes place on a fault over geologic time; earthquakes account for the rest.

The [California Geological Survey](#) role

Two CGS programs establish regulatory zones in seismically active areas to protect lives and property. The Alquist-Priolo program is designed to ensure that structures for human habitation are not built atop surface traces of active faults (in most cases, a 50-foot setback is required). There are 12 Alquist-Priolo zone maps covering the Hayward Fault. The Seismic Hazard Mapping Program addresses the secondary earthquake hazards of liquefaction (the inability of water-saturated, heavily shaken soil to support structures) and landslides. Zones of Required Investigation are created in areas prone to liquefaction and landslides. Before large-scale construction can take place within these zones, local government must obtain site-specific geologic investigations, and mitigation steps may be required. Real estate disclosure is required when property within a zone is sold. For more information on these programs. CGS also reviews geologic site reports of new and retrofitted schools and hospitals.

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