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Not My Fault: Haywired, the Hayward fault's next 'big one'

Lori Dengler/For the Times-Standard
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I can always count on earthquakes making the news in April. Not because April is more likely for tremors, but because the worst U.S. earthquake happened to fall in this month. The April 18, 1906 earthquake caused major damage not only to its namesake San Francisco, but also to Northern California cities and communities from Monterey Bay to Humboldt County. This April, the U.S. Geological Survey used the occasion to release the second volume in HayWired – a scenario illustrating the impacts of Hayward fault earthquake.

The Hayward fault doesn't get the press of its better-known cousin, the San Andreas. Many maps show the San Andreas as a simple line extending from the Salton Sea to Cape Mendocino marking the boundary between North American and Pacific plates. The real boundary is more complex, breaking into two, three or more fault strands each storing up energy over time and quite capable of producing major earthquakes on its own. In the San Francisco Bay Area, the boundary trifurcates in three main faults: the San Andreas, the Hayward and the Calaveras.

The Hayward fault begins near Mt. Misery about 13 miles SE of San Jose. It skirts the east side of San Jose heading NNW through Fremont, Hayward, Oakland, Berkeley and Richmond, terminating in San Pablo Bay. In October 1868, the southern 20 miles ruptured in an earthquake estimated as M 6.5, killing 30, and damaging structures from Santa Cruz to Contra Costa County. Paleoseismic studies of the fault have identified at least 11 previous earthquakes in the past 2000 years spaced 110 to 220 years apart. The last quake was 150 years ago, which means there's a pretty good chance of another earthquake in the next 50 years.

Whenever a strong earthquake occurs, seismologists, engineers, planners and emergency managers learn a lot about earthquake science and how societies and our built environment respond to the shaking. Learning AFTER a quake occurs is expensive and won't help to lesson impacts BEFORE it happens. Scenarios are away to visualize the likely effects of significant earthquakes to promote planning, preparedness and mitigation to reduce losses and hasten recovery.

The fault has been looked at before. A California Geological Survey Hayward Scenario was published in 1987. But since then, the population has increased from 5 million to over 7 and infrastructure has changed significantly in the information age. The name "HayWired" was chosen for this scenario, not only as a pun on the name of the fault, but to examine how our modern wired society and reliance on electronic telecommunications to manage lifelines like water and utilities will fare during strong shaking.

In the scenario, the epicenter is located near Oakland. The rupture then extends about 25 miles to both the north and south resulting in a magnitude of 7. This is only one possible view the next Hayward earthquake. The epicenter could be farther north or farther south and the rupture could be shorter or possibly longer (more about that below). But the pattern of shaking, particularly areas of strong strongest shaking and liquefaction, should hold for other possibilities.

A quick summary of the findings: East-bay cities are affected both by very strong shaking and fault offset. More than 300 buildings, a BART tunnel, utility and communications, roads and other infrastructure sit directly atop or cross the fault. While structures near the fault are most vulnerable, shaking damage will impact the entire Bay Area and some older steel-frame and reinforced-concrete buildings could be unusable for many months. Shaking will trigger sparks that ignite fires causing additional damage. The upshot? As much as 24% of the buildings in the region could be unsafe to occupy or have restricted use, displacing 400,000 people with losses and repair costs in excess of $110 billion dollars. And there will be casualties, perhaps as many as 800 depending on time of day and 18,000 injuries.

As noted by the USGS, the HayWired scenario is only one possibility, stopping the rupture at the mapped end of the Hayward fault in San Pablo Bay. But although the Hayward may end there, the fault system likely continues, stepping to the east to become the Rogers Creek fault. There are two consequences of a fault jumping or stepping from one strand to another. First, it means rupture could continue along the Rogers Creek fault into Sonoma and Mendocino Counties.

Second, whenever faults like the Hayward step to the right, the step over creates a depression. This is the process that helped to create San Pablo Bay. Vertical motion in an earthquake means the potential for a tsunami. I spent three years with colleagues from USC

looking at the potential tsunami impacts. The good news is that San Pablo Bay is very shallow and a tsunami produced by such a step is likely to be less than two feet.

Media reports about HayWired have emphasized the impacts. The headlines scream words like nightmare, imminent, tectonic time-bomb, long overdue, widespread death and destruction. That is not the point of this scenario or any other. It is intended to drive a realistic discussion of earthquake risks and promote data-driven decision making to lesson hazards.

More about the HayWired Scenario at
http://temblor.net/earthquake-insights/usgs-forecasts-400-fires-20000-people-trapped-in-elevators-400000-homeless-in-east-bay-earthquake-6848/

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