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New study shows massive earthquake could cause Anderson Dam to fail

By Paul Rogers
Mercury News
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The risk is small, but the largest dam in Santa Clara County could collapse in a major earthquake, according to a new study.

A 6.6 magnitude quake centered directly at Anderson Reservoir near Morgan Hill, or a 7.2 quake centered one mile away, could cause the reservoir's 240-foot-high earthen dam to fail, an engineering report that the Santa Clara Valley Water District released Monday found.

In the worst case, a complete failure of Anderson Dam could send a wall of water 35 feet high into downtown Morgan Hill within 14 minutes, and eight feet deep into San Jose within three hours, under state emergency scenarios.

On Monday water district officials alerted neighboring towns of the report, though district

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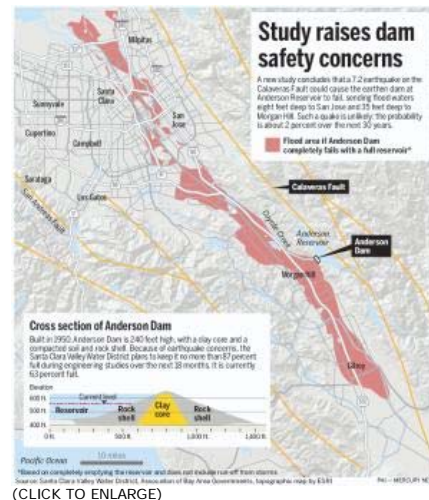
The largest dam in Santa Clara County, at Anderson Reservoir, could collapse... (Patrick Tehan)

officials emphasized that the dam is safe. But they said they will not allow its water level to come within 30 feet of the top — leaving the reservoir no more than 87 percent full — for at least 18 months while more detailed engineering studies are done.

The reservoir is currently 63 percent full.

"Although this is a preliminary study, we are taking it very seriously," said Susan Siravo, a spokeswoman for the Santa Clara Valley Water District.

"We want to be open and transparent with the public. And we want to proceed with a comprehensive study to ensure the safety of the dam for generations to come."



Based in San Jose, the water district provides drinking water to 1.8 million people in Santa Clara County.

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The district's customers will not have water service interrupted, and boating at the reservoir won't be affected.

Anderson Dam was built in 1950. It holds 90,000 acre-feet of water when full, more than the other nine reservoirs in the county combined. The dam sits east of Highway 101, along the Calaveras Fault, which runs from Hollister to Milpitas.

Anderson came through the Loma Prieta Earthquake of 1989 without harm and, similarly, made it through the 1984 Morgan Hill quake, a 6.2 on the Calaveras Fault, with only minor cracking to the asphalt road on its crest.

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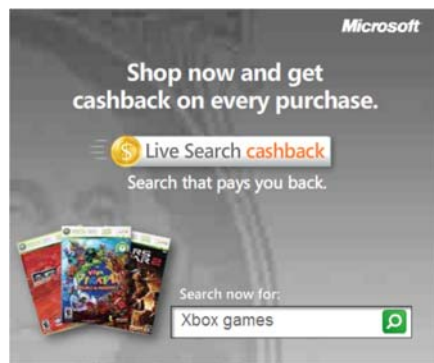
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But a report prepared Dec. 17 for the district by AMEC Geomatrix, an Oakland engineering firm, found in one of 13 test borings that the dam's foundation contains sand and gravel, which could liquefy in a big quake. Most of the foundation was scraped down to bedrock when the dam was built.

"The dam was designed to address earthquakes," said Dave Hook, an engineering unit manager for dam safety with the water district. "They were aware of the faults, but it wasn't designed for today's maximum credible earthquake."

In a worst-case scenario, the dam would almost certainly not all collapse at once, like a concrete structure might, but rather if completely full, could slump and begin to erode away from the top, giving people a day or so to evacuate, Hook said.

How likely is a massive quake on that fault that could

threaten the dam's integrity?

In recorded history, there have been no 6.6 or larger magnitude quakes on the Calaveras Fault. But one isn't impossible.

In 2003, the U.S. Geological Survey concluded that there is an 11 percent probability of a quake of 6.7 or larger on the Calaveras Fault in the next 30 years, and a 2 percent probability of a 7.0 or larger quake on the fault over the same time.

"If the Calaveras Fault ruptured across multiple segments, you could get an earthquake up to 7.2," said David Oppenheimer, a USGS seismologist in Menlo Park. "I don't think that's likely to occur, but you can't rule it out entirely."

The largest earthquake recorded on the Calaveras Fault was a 6.5 in 1911.

Most recently, on Oct. 30, 2007, a 5.6 quake occurred on the Calaveras Fault about five miles north of Alum Rock Park in San Jose. Shaking was felt from Santa Rosa to King City. Damage was minor — mostly broken windows — although librarians at San Jose's Dr. Martin Luther King Jr. main library had to reshelve 300,000 books that were thrown to the floor.

The next step is for the water district's board to fund further studies. Jim Fiedler, the water district's chief operating officer for water utility enterprise, said to ensure speed, he will recommend the board approve at its next meeting Jan. 13 a no-bid contract with the same firm that did the preliminary study for a more exhaustive investigation that will include additional borings and computer models.

That could cost roughly \$3.7 million, he estimated.

If retrofitting were needed, the district probably would not need to tear down the dam, Hook said. It could drain the reservoir and make it wider and stronger with more rocks and earth, a project it conducted in 1985 at Stevens Creek Reservoir.

On Monday, the district sent notice of the new findings to city managers and county leaders in surrounding communities.

Morgan Hill City Manager Ed Tewes said his community has known for years it was living in the shadow of a 240-foot tall dam.

"As we do our emergency planning and worst case scenarios, our largest risk has always been consideration of a failure of the dam," Tewes said. "We will be very interested in this study."

Contact Paul Rogers at progers@mercurynews.com or (408) 920-5045.

Biggest quakes on the Calaveras Fault

--On Oct. 30, 2007, a 5.6 quake occurred on the Calaveras Fault about 5 miles north of Alum Rock Park. Shaking was felt from Santa Rosa to King City. Damage was minor -- mostly broken windows -- although librarians at San Jose's Dr. Martin Luther King Jr. main library had to reshelve 300,000 books that were thrown to the floor.

-- On April 24, 1984, a 6.2 quake occurred on the Calaveras Fault, causing \$7.5 million in damage and injuring 21 people in Morgan Hill, with most damage occurring in the Jackson Oaks subdivision east of Morgan Hill. The earthquake was felt from Bakersfield to Sacramento.

-- On July 1, 1911, a 6.5 quake on the Calaveras Fault destroyed chimneys and cracked brick walls in Gilroy, Los Gatos, Morgan Hill, San Jose, Santa Clara, and other nearby towns. One three-story brick building at Lick Observatory was damaged so severely it had to be rebuilt, and shaking was felt as far away as Reno.

-- On June 20, 1897, a 6.3 quake on the Calaveras Fault destroyed numerous brick buildings in the Gilroy area. Chimneys and walls fell in Hollister and Salinas.

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