

Earthquake simulator gives model levee a big shake

Mike Taugher, Bay Area News Group, 8-30-11

SHERMAN ISLAND -- A model levee wobbled and tossed as if it were on a giant waterbed but held up nearly intact during a series of simulated earthquakes Monday.

The tests were meant to investigate a deep concern among water suppliers around the state -- that an earthquake in or near the East Bay could cause massive flooding in the Delta and foul water supplies.

But a series of simulations on a 6-foot-high levee appeared to show that the soupy foundations that stirred such concern are surprisingly resilient. The experiment was believed to be the first time field tests have been done to determine how levees on peat soil fare during earthquakes.

"The news is good, although I certainly wouldn't give an all-clear," said Jonathan Stewart, a professor of civil and environmental engineering at UCLA. "It could have been that this thing could have plunged into the ground. That wouldn't have been a shocker to anybody out here."

In test after test, the model levee, built to perform like many of the 1,100 miles of levees that separate Delta channels and islands, held up.

A 3-ton ground-shaker shook the levee as hard as if it had been on San Francisco Bay during the 1989 Loma Prieta earthquake. Then it shook with the force of a magnitude 7.0 rupture directly atop the Hayward Fault.

Each time, the result was the same -- visible waves rolled along the ground, work trucks bounced on their springs and squeaked and the levee tossed about and eventually settled back into place.

It only sank about a quarter-inch on its foundation.

The peat foundations of Delta levees have received attention in recent years because of the possibility that earthquakes could turn them to mush and cause wholesale levee failures and floods.

If that were to happen during a dry season, it could draw brackish water into massive water intakes near Tracy that serve much of the Bay Area and the rest of the state, potentially for a long time.

The biggest worry is in the western Delta, which is closest to Bay Area earthquake faults and has the deepest peat. A levee failure there could draw more salty water toward pumps than other parts of the Delta.

That threat is a big reason why many water agencies support a \$13 billion plan to build tunnels to deliver Sacramento River water beneath the Delta.

Monday's results may cast doubt on the conclusion that the levees are highly vulnerable to earthquakes, but researchers cautioned more work is needed.

The ground in the western Delta is like a 3-foot-thick mat of felt floating atop about 30 feet of black goo, said Bob Nigbor, manager of UCLA's Network for Earthquake Engineering Simulation.

"We were half expecting this thing to settle down noticeably," Nigbor said. "Our results could very well show that peat is stronger than we thought. The fact that it can move this much and not tear is pretty amazing."

Levee engineers in the Delta have long argued the earthquake threat in the Delta might be manageable without resorting to tunnels.

There is about \$500 million in voter-approved bond funds available for levee repair and upgrading in the Delta, said Gilbert Cosio of MBK Engineering, which helps maintain and repair about one-third of the Delta's levees for landowners.

"By 2016, when the bond money is gone, these levees are going to look a lot different," Cosio said.

Monday's test was the highlight of a four-year, \$375,000 study funded by the National Science Foundation.

The study is meant only to provide information about how the peat foundation would perform in an earthquake.

Unlike the Delta's key levees, the model levee was dry because it did not have water pushing against one side of it and the water table beneath it was low.

And researchers said the levee could still sink somewhat in the coming days.

Stewart, whose father Farrel "Bud" Stewart was city manager of Concord from 1960 to 1986, said he pursued the study because he thought there was insufficient information about the nature of the earthquake threat in the Delta.

"I felt this was one of the more important problems in the state," he said. "I wasn't satisfied. We really don't know anything about this peat."