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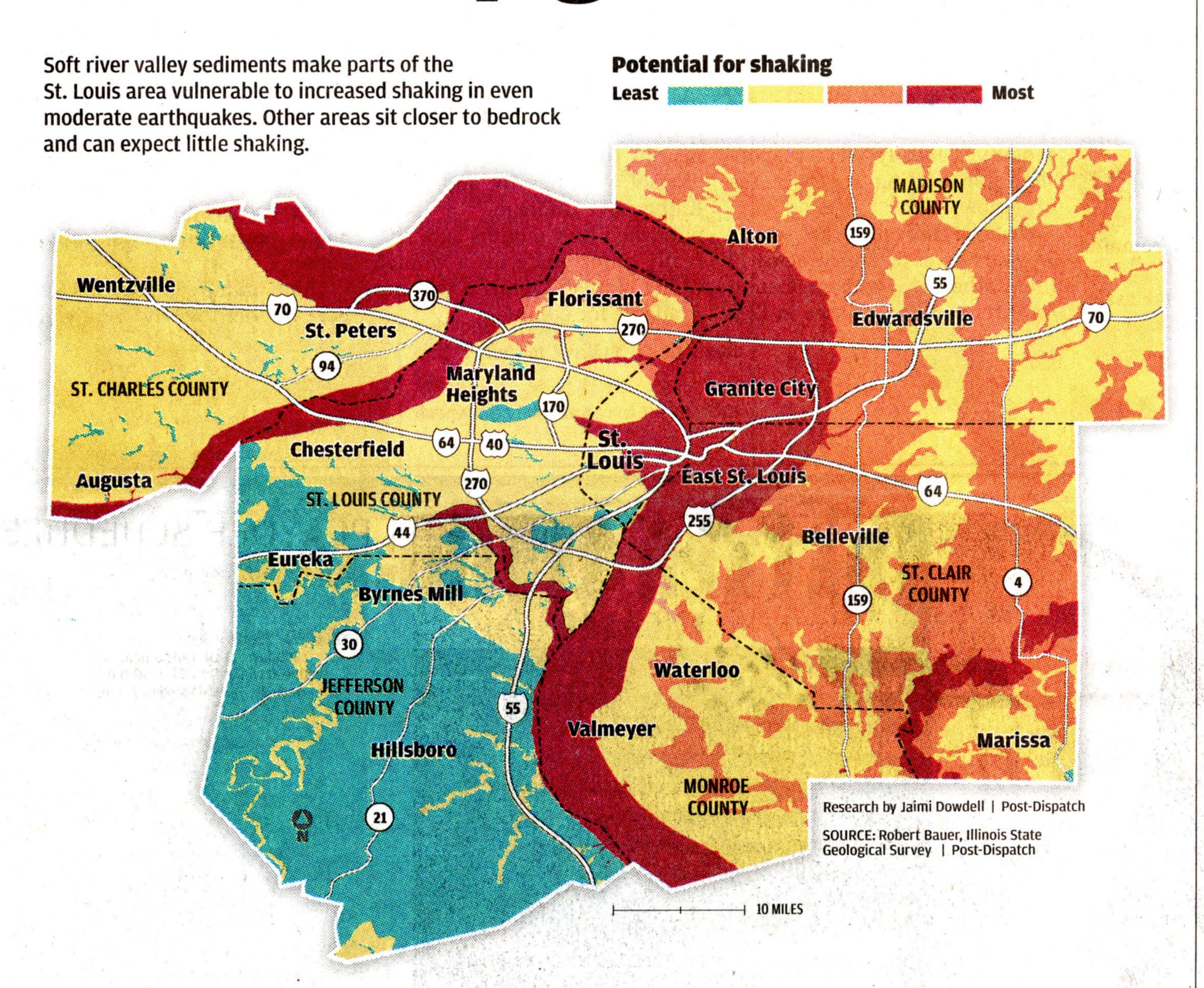
Is your home on shaky ground?

Where you build has everything to do with whether you'll get shaken a little or a lot in a quake.

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PREPARING FOR A NEW MADRID QUAKE

Is your home on shaky ground?



Portions of the region lie atop soft soils that can amplify earthquake waves.

By Eric Hand ST. LOUIS POST-DISPATCH

When talking about building for earthquakes, J. David Rogers likes to paraphrase Fred Flintstone.

"Bedrock is the place to be," says the University of Missouri at Rolla engineer. "Where you build has everything to do with how much you get shaken."

Nowhere is that more true than the

St. Louis region, which has both bedrock bluffs and squishy river valley soils. According to new simulations from Rogers, soft soils in St. Louis can amplify earthquake waves by as much as a factor of 10 — perhaps more than any other place in the world.

That has Rogers worried about the safety of tall buildings and bridges, which he thinks are inadequately designed.

Other geologists say Rogers' work PLEASE SEE QUAKE | D7

reinforces the need for better mapping of the subsurface, which in St. Louis can vary drastically, changing from bedrock to soil over short distances.

Last week marked the 100th anniversary of the 1906 San Francisco earthquake, a magnitude 7.8 quake that remains the deadliest in U.S. history, killing 3,000. Geologists say

QUAKE | FROM D1

Soft soils pose greater quake danger

three New Madrid Seismic Zone earthquakes in the winter of 1811-1812 were just as big.

Rogers recalled discussing the next "Big One," major quakes that ness of the soil layer, dangerous in masonry or brick homes could tend to recur every 500 years, resonances can also occur, like a expect cracks and toppled chimwith the Missouri Department of car rattling and shaking at a cer- neys, as occurred in the 1968 Transportation.

come back in 300 years?' I saw at news and bad news. The good The bad news is for those who That's the one that's overdue."

The U.S. Geological Survey esthe next 50 years.

a magnitude 6 quake, amplified to the 1811-1812 shockwaves, it suf- and downtown St. Louis also are by soil conditions, can have big fered little to no damage. effects. The amplification effect happens suddenly, when shock- owners today have little to worry bridge sites — one in Maryland waves cross from hard rock to about, especially if they live in Heights, one in Hermann, Mo. soft soils. Depending on the thick- wood-frame homes. Those living showed more amplification than

Amplification

Amplification, or increased shaking, occurs when seismic waves cross into thick layers of soft soil. Area river Waves valleys have some amplify in softer soil of the biggest Bedrock amplification Earthquake factors in the world, because soft, Soft soil – waves---new sediments sit atop bedrock hundreds of millions of years old.

SOURCE: J. David Rogers, University of Missouri at Rolla | Post-Dispatch

tain speed.

"They said, 'Why don't you For St. Louis, there's good Southern Illinois. tion.

Rogers said average home-

magnitude 5.5 earthquake in

that point I'm not going to sell an news is that most of St. Louis and live near the Mississippi and Mis-1811-1812 maximum event to these St. Louis County sit on bedrock souri rivers, where hundreds of guys," he said. "What they're fac- or less than 40 feet of soil — not feet of gelatin-like soil lie directly ing is the magnitude 6 event. enough to cause much amplifica- above some of the oldest, toughest bedrock in North America — Rogers cites the example of creating the perfect recipe for timates that there is a 25 percent Ste. Genevieve, a French settle- amplification. The largest vulnerparticularly vulnerable.

Rogers' simulations at two in the famous 1985 Mexico City earthquake. That quake occurred hundreds of miles away, near the Pacific coast, but shockwaves amplified in an ancient, muddy lake bed under the city. The quake killed more than 10,000.

St. Louis University seismologist Robert Herrmann agreed that underlying soil conditions are wondered if amplification factors of 10 were a bit much. He said St. Louis will have to wait for an actual earthquake to see how accurate Rogers' models are.

through the Earth's crust. A pro- pletion. gram calculates the amplification ehand@post-dispatch.com | 314-340-8250 as the shockwaves shoot to the surface though layers of rock and soil. He modeled only two STLtoday.com/links Learn

data is tough.

He describes the results in papers that will be peer reviewed in two earthquake engineering journals. He'll present the information Thursday in a talk at the Engineers' Club of St. Louis.

He hopes transportation engineers will pay attention, because he expects a magnitude 6.5 quake — big, but not the Big One — to disable bridges. Many piers under the main spans of bridges are anchored to bedrock, but piers under the approaches often rest on deep piles that float in river mud.

Rogers fears the bridge approaches would collapse in an earthquake. He also worries about pipelines, railroads and other infrastructure.

"It's not going to take a huge quake to shut all that down and create a panic attack," he said.

A new soil amplification map would help engineering design and emergency planning. The authors of the Illinois and Missouri to 40 percent chance of an earth- ment on the Mississippi River able areas lie east of the Missis- portions of a regional map, creatquake magnitude 6 or greater in that relocated to bedrock bluffs in sippi River, covering both East St. ed in the mid-1990s, say it needs 1785. Even though St. Genevieve Louis and Granite City. Parts of to be refined. The map relies on And Rogers is finding that even lay 50 miles closer than St. Louis Chesterfield, Maryland Heights generalizations and spotty borehole data.

> "There's not a lot of detail in the maps," said Robert Bauer, an engineering geologist with the Illinois State Geological Survey.

> For example, the museum below the Gateway Arch is built in bedrock 25 feet below the surface. Less than a half-mile away, just south of Busch Stadium, bedrock is more than 80 feet down. Yet on the existing map, both spots lie in the same vulnerable soil category.

Dave Hoffman, a former Missouri geologist with the Department of Natural Resources who very important in St. Louis, but mapped the Missouri side, says he wants the map to be redone.

That is the goal of a St. Louis urban hazard mapping project announced two years ago by the U.S. Geological Survey. But the Rogers' models use computer project — a collaboration beprograms in which artificial tween many cash-strapped earthquake signatures are sent groups — is still years from com-

sites because getting deep soil more about the New Madrid fault.