Ground Shaking Teamwork

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The ground vibrated for 29 seconds, almost enough time to transition from a state of wonder to a state of concern.

On a recent crisp fall day, we partnered with Oregon State University and Wallace Technical Blasting to detonate multiple charges in 30- and 80-foot deep holes—essentially, creating a false earthquake—to see how the soil would react.

The largest seismic risk to the Portland International Airport runways is soil liquefaction and settlement. Following an earthquake of significant magnitude, the ground beneath the runways is likely to settle and spread, cracking and breaking the pavement surface and rendering it unusable for airplanes.

It's critical to have an operating airport to bring relief supplies to the region, and to begin the economic recovery following a massive natural disaster. And, without long, flat runways, it's impossible to take off and land aircraft.

The soils that are under the PDX runways consist of a layer of dredge fill, followed by 30 to 50 feet of silt, followed by a deep sand layer. While liquefaction of these types of soils is expected, engineers and academics don't yet understand the degree to which settlement could occur.

Enter Armin Stuedlein, OSU associate professor of geotechnical engineering, and a small team of students who have been planning these tests for nearly three years.

The testing consisted of detonating a series of controlled blasts, one second apart, inducing soil liquefaction, essentially mimicking the results of at least a Magnitude 8.0 earthquake. Preliminary data isn't expected until year's end, with the full results analyzed nearly a year following.

The data collected will inform us, and the geotechnical engineering community at-large, about the seismic performance of the silts and deep sand layers. Armed with this information, we hope to better understand what the airport's runways might look like following a massive earthquake and use the data to guide the design of how to best seismically reinforce the runways.