Seismologists Study Mining-Induced Earthquakes

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The Bulletin of the Seismological Society of America, the premier scientific journal dedicated to earthquake research, has just published a trio of articles about earthquakes caused by underground coal mining in east-central Utah.
"We've studied how fairly shallow underground coal mining causes earthquakes that, depending on their size, might pose a ground-shaking hazard to nearby surface structures," said Dr. Walter Arabasz, director of the University of Utah Seismograph Stations and one of the principal researchers for the papers.

Dr. Art McGarr, a geophysicist with the U.S. Geological Survey and another of the researchers, added, "Anybody could take our results and apply them to a comparable situation anywhere in the world."

Arabasz, McGarr and others performed their studies in Emery County, Utah, near the Cottonwood coal tract, where underground coal mining is proposed. As planned, mining within the Cottonwood tract could extend to within about 1 kilometer [0.6 miles] of the 58-meter-high [190-foot-tall] earthfill dam at Joes Valley Reservoir. The key question: How close to the dam should future underground mining be allowed?

To help decision-makers answer the question, the scientists monitored earthquakes induced in the neighboring Trail Mountain Mine, a longwall mining operation about 0.5 kilometers [0.3 miles] underground and 3-7 kilometers [1.9 to 4.3 miles] from the dam. They recorded 1,913 earthquakes and developed ground-motion prediction relations based on

distance and earthquake size.

One of the researchers' conclusions is that mining within the Cottonwood tract might cause a maximum earthquake of magnitude 3.9. In 2000, a magnitude 4.2 mining-induced earthquake at the Willow Creek mine about 50 kilometers [31 miles] to the north caused rock falls that temporarily disrupted a highway and a rail line.

The research is the first attempt at ground-motion prediction for low-magnitude, short-distance events related to coal mining, McGarr said.

The three recently published papers are:

-- "Coal Mining Seismicity and Ground-Shaking Hazard: A Case Study in the Trail Mountain Area, Emery County, Utah," by W. J. Arabasz, S. J. Nava, M. K. McCarter, K. L. Pankow, J. C. Pechmann, J. Ake, and A. McGarr;

-- "Development of Ground-Motion Prediction Equations Relevant to Shallow Mining-Induced Seismicity in the Trail Mountain Area, Emery County, Utah," by A. McGarr and J. B. Fletcher; and

-- "Moment Tensor Inversion of Ground Motion from Mining-Induced Earthquakes, Trail Mountain, Utah," by J. B. Fletcher and A. McGarr.

Source: University of Utah