

Evergreen Basin Seismic Imaging Study

In a collaborative effort between the U.S. Geological Survey and the Santa Clara Valley Water District, this study will provide subsurface images or “pictures” that will increase the knowledge and information on earthquake occurrence, earthquake ground shaking, and water supply. These are important issues facing the rapidly growing Santa Clara Valley. The subsurface pictures resulting from this study will help determine which faults are moving and how they move, an essential step in assessing earthquake hazards. The results of this study will also help explain why different parts of the city shake more strongly than others, work that could lead to improved forecasts of future ground shaking during earthquakes. Faults also significantly impact the occurrence and movement of ground water, so the position and geometry of faults in the Evergreen basin will also be used to improve the resolution of the basin hydrologic model. An improved hydrologic model will allow better management of the water supply.

During June 2002, a group of scientists from the U.S. Geological Survey, using an echo-sounding method is collecting data over the Evergreen sedimentary basin within the San Jose Array (see map below left) to help understand ground shaking during earthquakes and the flow of groundwater. We use the echoes to create a picture of the subsurface that shows the depth and thickness of deposits (see example profile below right). This figure shows the depth of rock and soil layers refracting and reflecting the sound waves back to the surface. By measuring the speed of sound through the ground and analyzing the echoes, we get an idea of the strength of the ground and its potential to amplify earthquake ground motion.

The San Jose dense seismic array (see map below) is composed of 41 K2 strong-motion seismographs deployed in northeastern San Jose, California to evaluate the effects of a deep sedimentary basin and shallow sedimentary deposits on earthquake ground motions. This urban array is located near the eastern edge of the Santa Clara Valley and spans the Evergreen sedimentary basin. The stations are approximately equally spaced 1 km (0.62 miles) apart. The array is designed to investigate the spatial variation of earthquake ground motions and how this variation is related to the three-dimensional geologic structure of the area. Funding to install this array came from the Pacific Gas and Electric Company.

