



Project No: 07195	Rose Breccia Pipe Project , Seligman, Arizona
Total Cost:	\$69,300
Project Focus	Evaluation of Collapse Structures Associated with Breccia Pipe Formation

**DESCRIPTION:** Zonge Geosciences, Inc, (Zonge) performed a 3D seismic reflection survey at the Rose Breccia Pipe project, located near Seligman, Arizona. Breccia pipes are collapse features that extend in a near vertical fashion for nearly 1,500 vertical feet. Often the surface expression of a breccia pipe is a sinkhole or series of sinkholes at the surface which can be greater than 300 feet across. The Rose Pipe is a famous pipe due to both its surface expression and very rich uranium deposit where the breccia pipe intersects the Hermit Shale Formation at approximately 1100 feet below ground surface. Historically, the only way to investigate these collapse structures is with drilling due to their near-vertical nature, as well as the broken-up character of the rock formations. For the first time, a high-resolution 3D seismic reflection survey was used to evaluate a breccia pipe structure and volume of material at the Hermit Shale level. The mineral-rights owners initiated the geophysical investigation.

**METHOD:** The geophysical method used was 3D seismic reflection. Both archeological and biological surveys were required due to the sensitive nature of the site, within 20 miles of the south edge of the Grand Canyon. A ¼ by ¼ mile survey grid was established with GPS for a 40 by 40 foot source/receiver 3D seismic grid (see Figure 1). The field work consisted of laying out 240-channels using a Seistronix EX-6 seismograph (capable of recording over 300 channels). Shot points were placed at every half-station, and outside the receiver network by one station. The Digipulse 1180 source truck was used throughout the project (*inset photo*). The weight-drop source produces ~90,000 ft/lbs of energy per shot and less than 3 blows per shot point were needed.



**RESULT:** The 3D reflection results were demonstrably better than any exploration method used previously for determining the verticality, continuity and existence of a mineralized zone at a depth for breccia pipes along the south rim of the Grand Canyon. The survey successfully imaged formations to approximately 1,100 feet below ground surface. The Bureau of Indian Affairs, BLM and Nat. Park Service were all pleased with the non-destructive nature of the seismic reflection method on sensitive grounds and Zonge’s adherence to state and Federal regulations. The size, shape and extent of the pipe at the mineralized zone were presented in 2D and 3D views (Figures 2 and 3, respectively). Two startling results were obtained: 1) at the depth of interest - the Hermit Shale contact, the Rose Pipe was narrower than anticipated; and, 2) the Rose Pipe actually has two ‘pipes’ but only one is manifested at the ground surface as a collapse feature. This survey resulted in the projection of locations for additional drilling and sampling for assay purposes, and also to generate additional exploration funds due to the increased reserves projected from an additional ‘pipe’ present at depth.

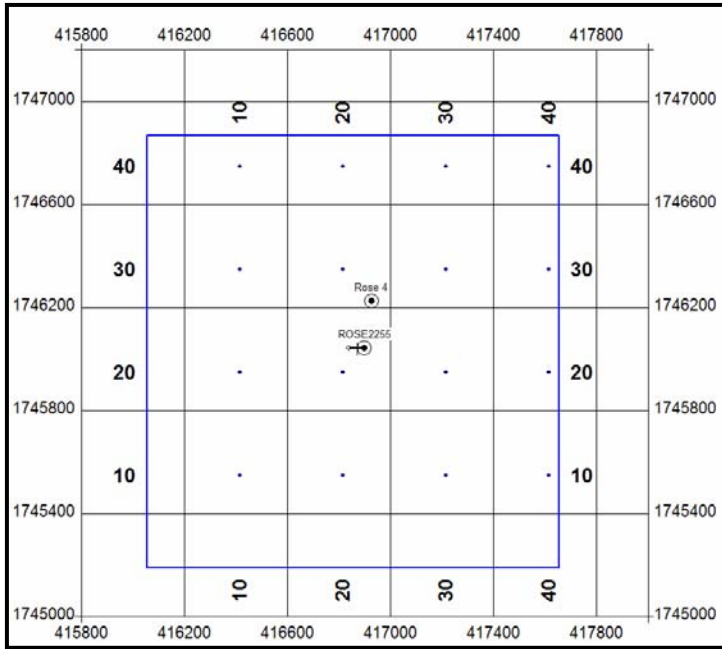


Figure 1. 3D seismic grid map at the Rose Pipe project, Arizona. Two drill holes used to explore the Rose Pipe are shown (Rose 4 and Rose 2255).

Figure 2. 2D seismic reflection section of the Rose Pipe. 2D Data reveal that the surface expression of the pipe is much wider than the pipe at depth; however, there is a second 'branch' off the pipe at the depth of uranium mineralization, which was not known prior to the seismic survey.

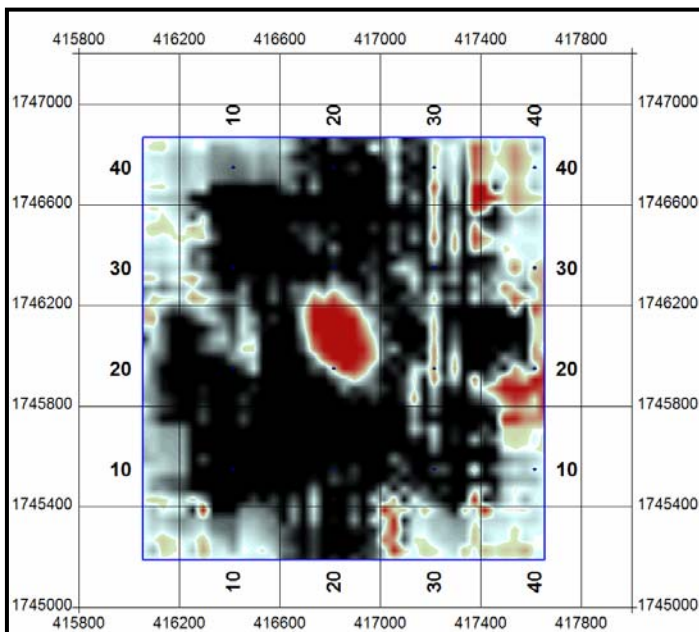
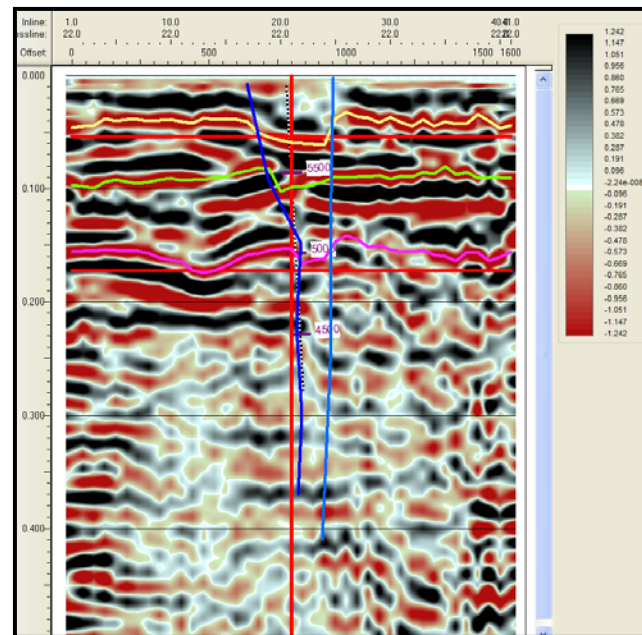


Figure 3. 3D map view (looking in plan) onto the low-reflectance breccia pipe materials at the depth of mineralization. This image represents a 'time slice' which at 0.09 seconds, or approximately elevation 5,500 feet (AMSL). This depth is the zone of interest for uranium mineralization. These 3D depth (or time) slices had never been obtained for breccia pipe structures prior to this project.