Searching for civil war era bomb shelters using shallow seismic methods

*Steven D. Sloan, U.S. Army Engineer Research & Development Center, Vicksburg, MS*

*Cooper S. Cearley, U.S. Army Engineer Research & Development Center, Vicksburg, MS*

*Allison R. Scates, U.S. Army Engineer Research & Development Center, Vicksburg, MS*

*William H. Weber, Millsaps College, Jackson, MS*

*Daniel Z. Feigenbaum, U.S. Army Engineer Research & Development Center, Vicksburg, MS*

*Robert H. Stevens, U.S. Army Engineer Research & Development Center, Vicksburg, MS*

The city of Vicksburg, Mississippi, sitting 30 m higher than the surrounding Delta on loess bluffs overlooking the Mississippi River, was the site of an 18-month long series of battles during the American Civil War in 1862 to 1863. As a crucial junction of river and rail traffic and supply lines, the Confederate army intended to keep it and the Union army had plans to take it. Caught in the middle was the local civilian population, who resorted to digging “caves” or bomb shelters into the loess bluffs to avoid artillery strikes. Time has reclaimed many of the caves in and around Vicksburg, but the fate of one well-documented and photographed cave in particular (and perhaps the last one) remained unknown. As a service to the National Park Service, geophysicists from the U.S. Army Engineer Research & Development Center conducted geophysical surveys over the cave property in an effort to determine if the void still existed, potentially leading to its preservation and restoration as part of the Vicksburg National Military Park.

Seismic data were collected at the site and processed using a variety of methods including refraction tomography, backscatter analysis of surface waves, and diffraction enhancement; however, no void-related signatures of interest were identified that warranted further interrogation. Additional seismic data were collected over a similar feature also within the local loess as a follow-on effort to ensure that the seismic detection methods used were applicable and capable of detecting a void of similar size. Body-wave diffraction enhancement and backscatter analysis of surface waves techniques were successful in detecting a similar void in the same geology. Although it did not help in finding the original cave of interest, the results of the follow-on test case did increase confidence in our interpretation and the methods used. This presentation will discuss near-surface seismic data acquisition and processing techniques, combined with a little Civil War history.

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