Engineering
UPDATE©

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From Research to Practice

Bright Ideas

Over the past three decades of service, we have come to recognize the different approaches taken by clients to more advanced engineering projects. Engineering projects with challenges, however, are typically synonymous with "more costly" and some clients or managers who are accustomed to routine projects will try to approach a more challenging project with the same approach as they would with a routine project. Challenging or more advanced projects involve many significant variables which can influence key engineering decisions. Such projects benefit from bright ideas to solve the problem rather than conventional ones.

As such, a good manager selects people he can trust and then trusts them; whether in-house staff or consultants. This is exemplified by positive reinforcement by the manager, which in turn improves confidence in those serving the project. This reinforcement can become stressed in the presence of short-sided finances. The manager's or client's trust in the competent staff or consultants can then become compromised and in turn, the judgment of that staff member or consultant can be affected.

The truly good managers "see the forest through the trees" and focus on the big pictures, or in other words, focus on the ultimate cost of the completed project or project savings without risking safety.

In the engineering of a challenging project, our focus is to always use bright ideas to reduce the ultimate project costs to our clients.

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BOREHOLE RADAR USED TO IDENTIFY DEEP COAL PILLARS

This project involved the use of MEA's borehole radar to assess the presence of solid coal barrier pillars in an abandoned mine. These old works were developed during the 1905-1953 time frame and were about 350 ft. deep. A map, which recorded the rooms and pillars, showed the presence of significant coal barriers that were left below the project site.

Upon retreat out of the mine, barrier coal can be second-mined or ("robbed") without being recorded. To assess the presence of the 40 ft. and 100 ft. wide coal barriers noted on the map, ray paths were run longitudinal to the pillars drawn on the map. To provide contrast, ray paths were also taken across areas with entries. The location of the drilled holes and ray paths with the mine map superimposed are shown in Figure 1.

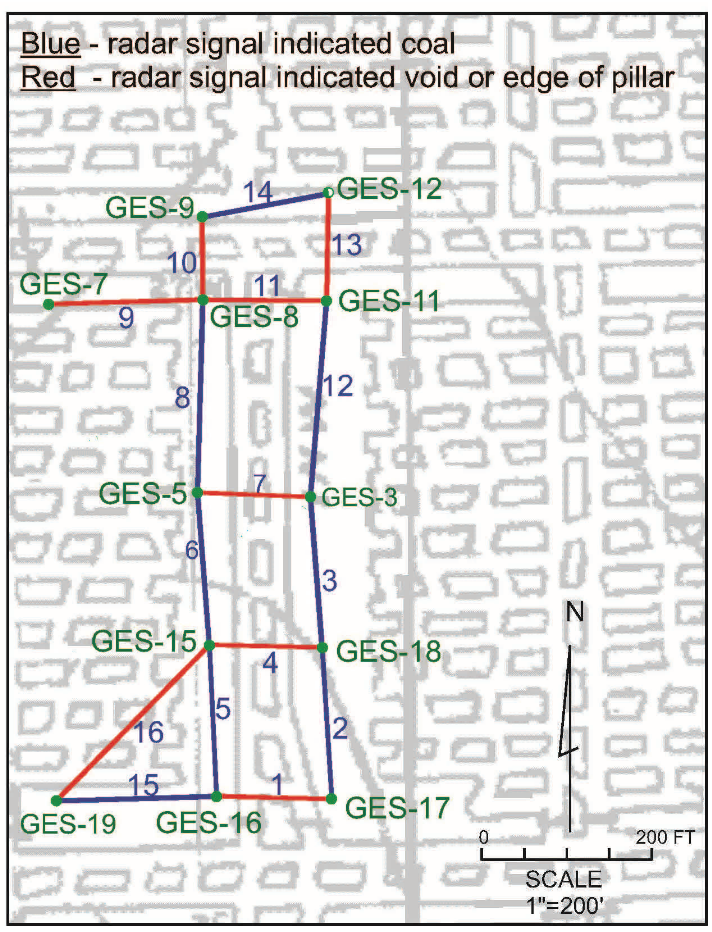

FIGURE 1 LOCATIONS OF DRILL HOLES AND CROSS-HOLE RADAR RAY PATHS SUPERIMPOSED OVER THE MINE MAP

Void detection is accomplished by measuring the strengths of many signals through various ray paths between pairs of boreholes drilled through a coal seam. The attenuation rate

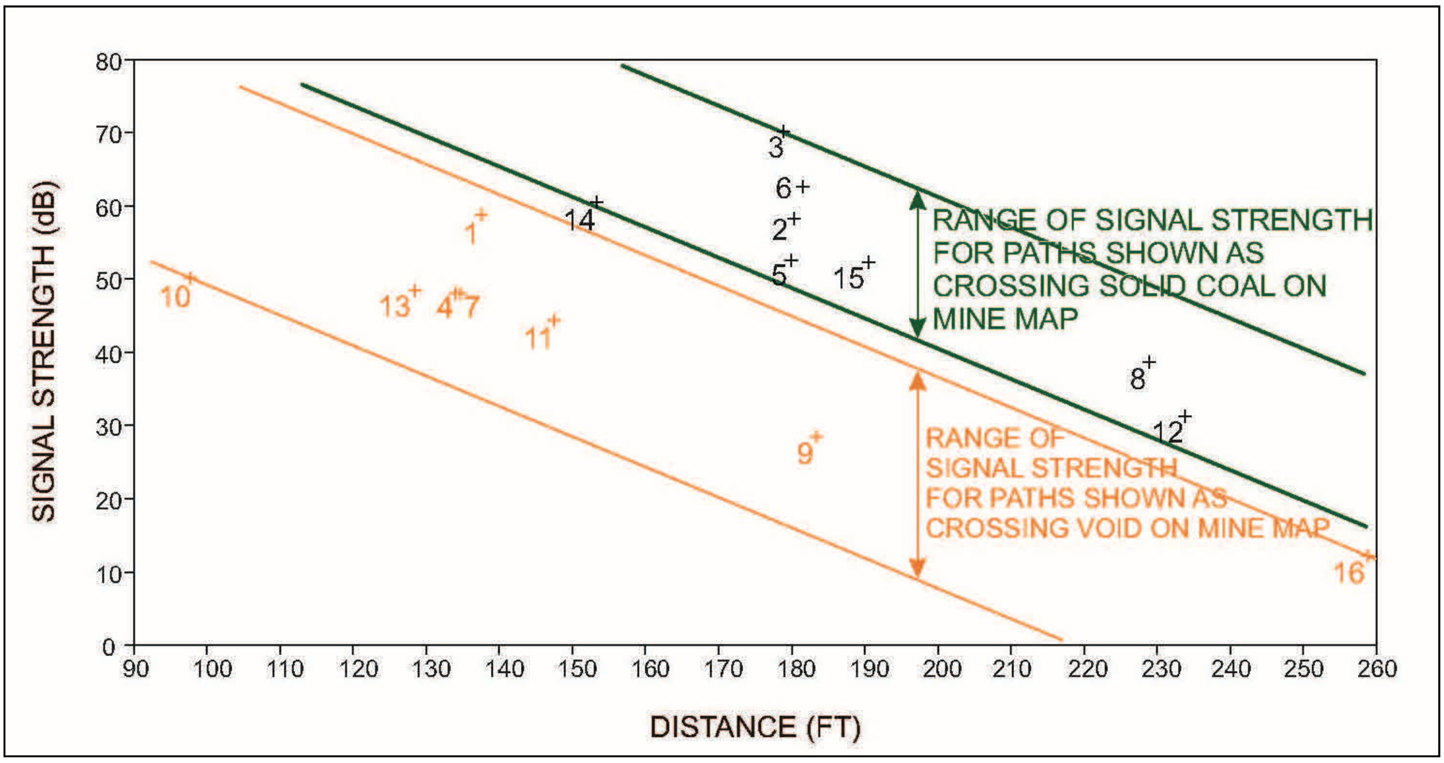

FIGURE 2   PLOT OF RADAR ATTENUATION RATES VERSUS RAY PATH DISTANCE

of solid coal for the area can be established and compared with other measured attenuations to determine which ray paths pass through solid coal and which pass through, or near, mine voids. By using this method, the presence of a void in a ray path can be determined.

A total of 16 ray paths were measured at the project site. In Figure 1, the ray paths marked in blue are those expected to be in solid coal. Those marked in red indicated that voids in the coal were present along the transmissions. The attenuation value versus distance for each pair of boreholes that were measured are plotted in Figure 2. Two green lines are shown bounding the ranges of measurements on ray paths which passed through solid coal according to the mine map. Two orange lines are shown bounding the ranges of measurements on ray paths which passed through voids. As shown in Figure 2, the points corresponding to ray paths which should be through solid coal and the paths which should be through voids fall into two distinct, separate categories. Therefore, the location and accuracy of the mine map as aligned with the borings and ray paths shown in Figure 1 can be considered to be correct (i.e. no robbing of the barrier coal can be assumed).

As a result of the crosshole radar investigation, the mine map was determined to be valid which was further confirmed by later, unrelated drilling. When questions exist about the accuracy of old mine maps, or where no map exists for the project site, crosshole radar can be used to determine the presence of voids or barrier coal. The use of borehole radar surveys provides a fairly reliable geophysical tool for both shallow to deep mine investigations.

Other Engineering UPDATES of Interest:

UPDATE 19: Cross-Hole Radar Used to Locate Mined Out Areas

UPDATE 10: Borehole Radar Determines Soil Coal and Mined-Out Areas

UPDATE 1: Successful Deep Mine Backfilling to Mitigate Mine Subsidence

ABOUT MEA: Marino Engineering Associates, Inc. focuses on engineering research, practice and expert evaluations and is licensed in 24 states in the U.S. Our projects primarily have an emphasis on Geotechnical Engineering, however, we also have significant experience in projects involving transportation, subsidence engineering, laboratory testing, training, and geophysical exploration. Gennaro G. Marino, Ph.D., P.E., D.GE is president and principal engineer of Marino Engineering Associates, Inc., and has been a licensed professional engineer since 1984. To obtain additional information on MEA, one can also visit our website at www.meacorporation.com.

FOR MORE INFORMATION: There is a significant amount of additional information that is available on the above subject. For more information, please contact Dr. Marino at the address listed below.

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