

Ground Water Mapping in Underground Mining Operations: A Minimally Invasive Approach

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The complex interactions between mines and their surrounding groundwater systems do not end at mine closure or even with the completion of reclamation. Mine-impacted water, such as acid rock drainage, complicates reclamation efforts and has far-reaching consequences. A fundamental challenge associated with many reclamation projects is that groundwater systems are both intricate and unseen, facts which impede the effort to predict, monitor and treat mine-affected water. A clear understanding of subsurface water regimes can make the difference between reclamation success and failure.

This paper will examine a minimally invasive water mapping procedure that has proven effective in mining operations in North and South America. This procedure, which uses Audio Frequency Domain Magnetics (AFDM), begins by charging the groundwater with a low voltage, low amperage, high frequency electrical current. As the current moves through the groundwater it emits a magnetic field whose size, shape, and magnitude are characteristic of the aqueous system (Biot-Savart Law). This field is then read at the surface by a specially tuned receiver. When run through a series of corrective filters—to be explained in this paper—the data thus generated can be used to create both two-dimensional maps and three-dimensional models that indicate the location and attributes of the water network, including potential flow paths.

Armed with such knowledge, reclamation efforts can be focused on the most likely sites of water contact and contamination. These maps can effectively aid both the prevention and remediation of problematic groundwater.

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