AIRBORNE GEOPHYSICAL SURVEY FOR MAPPING ACID MINE DRAINAGE[1]

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Abstract: A wide range of environmental studies and mapping can be enhanced with helicopter and ground geophysical methods. While drill results can be definitive about the depth and type of stratigraphy, water content and subsurface contamination, they usually represent conditions at only one small location. Airborne geophysical data are less definitive, but cover a large area completely, mapping conductivity in three dimensions quickly and inexpensively. Once data are acquired, drilling can be targeted on the target zones picked from the geophysics, and only a few drill holes are needed to give some ground truth to the resistivity data. This allows a more accurate quantitative assessment of the target depth, thickness and total volume over the entire survey area. Fugro's HEM data have been used as to assess sites, plan remediation and monitor the status of sub surface contamination.

Additional Key Words: resistivity, ground water, ARD, fracture zone, water table, conductivity

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Mapping Acid Rock Drainage

The U.S Department of Energy (DOE) has tested and accepted Fugro's HEM system as a valuable tool for characterizing abandoned coal mines and assessing water tables. The DOE has employed Fugro systems to map the extent and impact of ARD in Pennsylvania, Ohio, Virginia, West Virginia and California and the Powder River Basin of Wyoming. Western Research Institute, a private company previously operated as a DOE laboratory, recently contracted Fugro to acquire data over an operating mine in Tennessee in advance of applying bioremediation technologies.

A partial list of completed helicopter projects includes:

- The U.S. Department of Energy (U.S. DOE) surveyed several northeastern states to identify mining related fracture zones and other features. These included old wells and mine shafts, as well as water-loss zones in creeks and streams and ground water discharge locations. In addition to providing information to assist in curtailing ARD, the data allow mining industry officials to locate and avoid natural fracture zones.
- In August 2000, Fugro conducted an airborne survey at the Sulphur Bank Mine in Lake County, California for the U.S. DOE. The airborne survey mapped geological structure as well as lithology to identify natural conduits for the movement of groundwater. From the data the clients were able to improve the knowledge base associated with drainage, water/contaminant sources and pathways through fracture systems.
- A Fugro survey was employed by Komex International, Ltd. to characterize an oil pumping facility in the Canadian Arctic. Airborne magnetic and EM data were gathered over land and water to detect and map wellheads, buried pipelines subsurface salt water, permafrost, oil plumes and assorted equipment. The pipelines showed clearly in the EM data and the magnetic data found the wellheads, the dumps and the pipelines.

Data courtesy of the U.S. Department of Energy

National Energy Technology Laboratory, Pittsburgh, PA.