

**Environmental Geophysical Analysis of Portion of the Muddy  
and Roaring Creek Watersheds, West Virginia**

by

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## **Environmental Geophysical Analysis of Portion of the Muddy and Roaring Creek Watersheds, West Virginia**

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### **Abstract**

This thesis presents a new environmental geophysical analysis derived from airborne and ground measurements of electromagnetics and total magnetic field collected from the Muddy and Roaring Creek watersheds located in northeastern Preston County, West Virginia. This region is referred to as the T&T mine area. In the simplest representation, with respect to subsurface Acid Mine Drainage (AMD) impacted water systems, the subsurface regions can be thought of as containing three pools of AMD contaminated water. The objectives of this project were to determine the location of these subsurface pools, the lateral extent of a contaminated mine pool located at a depth of about 300 feet, and to determine areas of groundwater recharge to the mine pool. Geophysical data analyzed included frequency-domain electromagnetic (EM) conductivity (380, 1400, 6200, 25k and 102k Hz), VLF (VLF1I from Cutler station, VLF2I from Seattle station), and total field magnetics. In order to check the airborne data, ground measurements were collected using EM34 and EM47 instruments. These data were collected for the National Energy Technology Laboratory of the U.S. Department of Energy as part of their active and ongoing environmental geophysical program. Cultural noise was removed from some of the conductivity dataset using ER MAPPER software and applying a variety of

spatial frequency filters. ER MAPPER, ERDAS Imagine, ERDAS Virtual GIS, ESRI Arc/Info, and ESRI ArcView software package were then used to display and interpret the data. The geometry of the high-conductivity pools were imaged using a variety of techniques including Hue Saturation and Intensity (HSI) algorithms and unsupervised classification using ER MAPPER and Arc/Info software. After the pool geometry was determined, a series of geophysical profiles were extracted from the edges of the three pools. I interpret these data as showing the geometry of the mine pools and regions of contrasting groundwater conductivity related to discharge.

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*To my parents and my family*

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