AML Project: Inventory and Characterization of Inactive/Abandoned Mine Land Features in New Mexico

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Abstract

The New Mexico Bureau of Geology and Mineral Resources (NMBGMR) and Mineral Engineering Department at New Mexico Tech are conducting research on legacy mine features in New Mexico. The objective of our research is to develop a better procedure to inventory and characterize inactive or abandoned mine features in the state. This project will inventory mine features in three mining districts in New Mexico: the Jicarilla Mountains District in Lincoln County and the North Magdalena and Rosedale Districts in Socorro County. Samples are collected to determine whole-rock geochemistry, mineralogical, physical, and engineering properties, acid-base accounting, hydrologic conditions, particle size analyses, soil classification, and hazard ranking. Past pH is used as a proxy for pH in leachate that might enter the water system after passing through mine waste piles. This allows us to determine if there is any potential for acid mine drainage. On several occasions water has been found in shafts, pits, and springs in mined areas. Once found, water is sampled in the field and tested for trace metals, stable isotopes, and general chemistry. By testing water found in and around mine features, we can assess whether AML features are influencing the watershed in which they are found. This allows us to prioritize which sites need remediation. These mine features are being mapped, evaluated for future mineral-resource potential, and evaluated for slope stability. The results of this research will help the AML and other organizations better understand and remediate our state’s legacy mining issues.

Project Goals and Procedures

Abandoned Mine Lands (AML): Lands that were mined and left unattended where no individual or company has reclamation responsibility. These may consist of excavations, either walled in or sealed, that have been deserted and where further mining is not intended. Also called inactive, legacy, and orphaned mines.

A water sampling procedure can be used to establish the potential for acid mine drainage (AMD) in mining districts and at sites within those districts and to help assess the specific geochemical processes that may contribute to AMD. These processes may include metal partitioning in mine waste, electron microprobe and XRD are used to classify mineralogy within samples and detect the presence of gold, followed by laboratory testing for gold. Samples are tested for whole rock geochemistry, mineralogical, stable isotopes, and particle size analyses.

Waste Pile

In conjunction with the Aquifer Mapping Program (AMP) we have collected water samples from select areas in the Rosedale Mining District.

• Water has been collected from 3 locations: the Rabb Mine, at a spring in Big Rosa Canyon, and downstream of a waste rock pile from the creek sourced from that spring.
• Samples are being tested for general chemistry, trace metals, and stable isotopes.
• Trace metals samples were filtered and acidified prior to lab analysis and all samples were kept cold after collection.
• Results are pending, so we have not drawn any conclusions at the time of this presentation though our results will hopefully help us understand how geology and different mining techniques affect water quality.

Water Sampling

Jicarilla District:
• The Jicarilla District does, at some sites, contain sufficient pyrite to be potentially acid generating.
• Quantitative analyses of some samples indicate arsenic (As) percentages between 0.22-5%. Pitted textures observed in microprobe analyses are consistent with arsenic being leached from pyrite.

Rosedale District:
• It appears that sites in the Rosedale district do not contain pyrite based on current data and thus do not pose an environmental threat via AMD. We are still assessing geochemical results that may show otherwise; however, it is unlikely due to the nature of the geologic setting.
• Water samples from Rosedale have only shown high pH and Al levels, but more data is required from the surrounding watershed to draw any conclusions.

North Magdalena:
• We have only recently begun work on N. Magdalena, however what we have seen so far has been sites of copper production.
• N. Magdalena is known to have had vanadium, gold, silver, and other commodity production, so further fieldwork will reveal whether or not there is an environmental risk from these sites.

Preliminary Conclusions

Selected References & Acknowledgements

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Keywords: Abandoned Mine Lands (AML), inactive, geochemistry, acid-base accounting, hydrologic conditions, particle size analyses, soil classification, hazard ranking, water sampling, electron microprobe, XRD, New Mexico.

North Magdalena (shaft)

Rosedale (Big Rosa Canyon)

Rosedale (Bell Mine AML)