ABSTRACT

There are tens of thousands of inactive or abandoned mine features in 274 mining districts in New Mexico (NM) (including coal, uranium, metals, and industrial minerals districts) with about 15,000 abandoned legacy mine features varying from shallow prospect pits to deep mine shafts in the state. There is a need to classify these wastes or "abandoned deposits" to understand their composition, properly estimates the quantity and evaluate the potential economic value. Since most of the earlier operations and exploitation was focused on heavy metals, it would be good to now turn our attention to examine these wastes for potential critical minerals. Hence this project seeks to (1) characterize and estimate the critical mineral endowment of mine wastes in these mining districts in New Mexico (Copper Flat at Hillsboro, Black Hawk in Burro Mountains, and Carlisle-Center mines in Steeple Rock district) and (2) "beta-test" USGS procedures and provide feedback. Potential critical minerals at these deposits include As, Bi, Te, Zn, Co, Ni, Mg, Mn, and fluorite.

It is necessary to perform paste pH test and particle size analysis on samples collected since these factors collected from the waste rock piles ranged from 3.66 to 5.67 and are mostly indicative of fine-grained for reclamation. The benefits of this project are to ensure prospects for critical minerals in the New Mexico state are not lost to urbanization, settlement or other land use. This project would ensure that there are data and potential critical minerals can help pay for reclamation and clean up these sites.

INTRODUCTION

Critical minerals are those that are essential to the nation's economic and national security. The majority of our electronic equipment, such as smartphones, laptops, computer chips, wind turbines, hybrid and electric cars, etc., depend on these rare earth elements (REE) and other critical minerals. This coupled with the anticipated rise in demand for critical minerals and the potential shortage of production capacity from China and other nations has made it necessary to examine and evaluate the NM mine wastes for its critical mineral and future mining potential. The NM-Mines Database lists more than 9,000 mines, of which more than 7,000 are inactive or abandoned. While the actual mineral production was typically for precious and base metals rather than critical minerals, the majority of these mines have existed mine wastes that were generated during mineral production and may have potential for critical minerals. As a result, any essential minerals discovered in a mineral deposit would also be present in the mine wastes (mine waste dumps, tailings, etc.). Although the main focus of this project is the critical mineral endowment of mine wastes, we also intend to assess the stability of the mine features and their typical environmental characteristics of the mine wastes (acid base accounting, pH, leaching tests, etc.). Considering that these assessments are necessary to ensure a safe working environment during mining, reclamation, and/or waste processing.

THE STUDY AREA

The district's core is dominated by a dike and breccia pipe, and latite (calc-alkaline) intrusions. These dikes extend outward from it. Quartz veins with Cu, Ag, Au, and Ag disseminations make up the Copper Flat porphyry copper deposit. More of the latter dikes are found in the same area that make up the Copper Flat porphyry.

METHODS

• The use of sampling techniques developed by USGS staff, the BLM (Bureau of Land Management), 2014; USGS, and EPA.
• Preparation of a Site Health and Safety Plan (SHAS).
• Geologic mapping (USGS), sampling of waste and rock piles.
• Laboratory studies; Geochemistry, Petrography, Electron Microprobe analysis, XRD
• The use of geochemical and geotechnical data to determine potential of acid production within the wastes, estimation of the volumes and tonnages of waste and rock piles.
• Particle size analysis.

None of the samples have a potential to generate acid drainage though some samples were slightly acidic when a paste pH test was done.

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This study also uses earlier data collected by Nicholas G. Harrison, Marcus E. Silva and Navid Mojtabai.

FUTURE WORK

• More samples to be collected, analyzed and archived from mine waste rock piles in the two mining districts.
• Samples to be analyzed for S and C concentration to determine acid drainage potential of the waste rock piles at Steeple Rock district, NM and confirm earlier results and provide insights on the geochemistry of the waste rock in the Copper Flat mine.
• Geochemistry on different particle fractions would be analyzed.