

Poster #21-65

Preliminary Results of 2017 Drilling, Geophysical Logging, Geologic Mapping, and Geochemical Sampling Activities in Redwell Basin, Elk Mountains, Colorado

Andrew Manning^{1*}, Lyndsay Ball¹, Richard Wanty¹, Burke Minsley¹, Jeffrey Mauk¹, and Philip Verplanck¹

¹U.S. Geological Survey, Denver, CO

Contact: amanning@usgs.gov

BER Program: SBR

Project: University Award

Project Website: <https://minerals.usgs.gov/science/metal-transport-characterization-mineralized-mountain-watershed/index.html>

A host of drilling, sampling, and geophysical/geological data collection activities were performed during summer 2017 in Redwell Basin, an alpine tributary of the East River in the Elk Mountains, Colorado. Redwell Basin contains bedrock with extensive sulfide mineralization that produces both natural and mining-related acid-rock drainage. The central objective of our project is to characterize and quantify controls on the flux of water and metals in the basin's bedrock groundwater flow system. Surface geophysical surveys were conducted using multiple methods including transient electromagnetic sounding, electrical resistivity tomography, total-field magnetics, and relative gravity. Resulting subsurface information aided in the siting of wells. Drilling activities included drilling a bedrock borehole high in the watershed to a total depth of 81 m with nearly complete core recovery, open-hole packer testing to determine permeability at different depths, and installing a multi-level monitoring well in the hole with four different screen depths. A full suite of borehole geophysical logs were also recorded using standard tools, plus acoustic televiewer, full wave form sonic, and heat-pulse flowmeter. Sixteen shallow piezometers were installed to depths <2 m in both colluvium and bedrock (using a hand-held core drill) in groundwater discharge zones. About 40 water samples were collected from piezometers, adits, springs, and streams, and analyzed for major ion and trace element chemistry and stable isotopes of water. A subset was also analyzed for Sr isotopes and age tracers (tritium, sulfur hexafluoride, and noble gas isotopes). Rock samples were collected from the drill core and submitted for permeability/porosity, petrophysical, petrographic, X-ray diffraction, and other chemical analyses. Finally, geological data collection included outcrop mapping of hydrothermal alteration and brittle structures, as well as comprehensive logging of stratigraphy, structures, and mineralogy in the drill core. Acquisition of analytical results and data interpretation are ongoing, and preliminary results will be presented at the meeting.