

Subsurface Mapping Using Complementary Selective Extractions and Biogeochemistry at the I-10 Skarn/Porphyry and the Sol Porphyry Deposits, South-central, Arizona

J. Robert Clark¹, Gregory T. Hill², and Kenneth A. Lovstrom³

¹Enzyme-ACTLABS, LLC, 7778 Lewis St., Arvada, CO 80005, USA

²3dG, LLC, 785 Andrew Lane, Reno, NV 89511, USA

³Consulting Geochemist, 1770 E. Ganymede Drive, Tucson, AZ 85737, USA

An ongoing geochemical study is employing selective extractions on *B*-horizon soils and biogeochemistry at the buried I-10 copper skarn and underlying porphyry and the Sol porphyry in semi-arid southern Arizona. Enzyme LeachSM (EL) and TerraSolSM (TS) data, and ashed mesquite data reveal diagnostic signatures indicative of buried ore-grade Cu and Mo mineralization and pre- and post-mineral structures. The I-10 deposit is covered by 80 meters of barren alluvium in the north and 200 meters in the south. A small porphyry stock is located 400 meters below the southern end of the skarn. At Sol the depth to the leached cap varies from 80 meters to 300 meters. *B*-horizon soil samples were collected on grids over both mineral deposits, and mesquite twigs were collected where plants were available.

Enzyme LeachSM disrupts amorphous oxide coatings on soil grains by dissolving the MnO₂ component. TerraSolSM selectively dissolves all of the amorphous coatings and much of the limonite. As a result, trapped trace elements are released into the leach solutions. Patterns produced by EL and TS for the same element are often dissimilar, adding valuable information for the interpretation of subsurface geology. Mesquite, a phreatophyte, develops deep root systems in search of ground water, and where extant, is an effective sample media in semi-arid regions. Mesquite anomalies often reflect hydromorphic dispersion by ground water.

A three-dimensional view into the subsurface at I-10 is provided by contrasting patterns between EL and TS. Shallow features and hydrothermal plumbing show up best in the TS patterns. The underlying porphyry and an intersecting N-S structure, shown in the EL patterns, appear to have fed hydrothermal fluids into the overlying skarn. Mesquite is an effective regional exploration sample media at I-10.

Enzyme LeachSM and mesquite produce inverse patterns over around Sol. A strong horseshoe-shaped halo around the buried Cu/Mo porphyry is evident in the EL patterns. Trace element for trace element, anomalous mesquite values occur in the EL central low over the porphyry. Similar positive/negative pattern relationships are seen over a small mineralized zone near the edge of the grid. Since the mesquite patterns are ostensibly related to groundwater enrichments in metals, the EL patterns are not related to any hydromorphic transport mechanism, such as seismic pumping. The EL patterns also show subsurface faults.