Ore and breccia classification of the 144 Zone gold deposit and its application towards further exploration in the Bare Mountain Range, Nevada*

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The 144 Zone is an oxidized, breccia-hosted, disseminated gold deposit that formed along the contact between the Early Cambrian Carrara Formation limestone and the overlying Bonanza King Formation dolomite within the Bare Mountain range in southern Nevada. Gold mineralization occurs within a breccia body that contains a variety of breccia types. Research goals include classifying clay, oxide, and other minerals as well as breccia types to identify the habits of gold mineralization and the minerals associated with gold. Research was also aimed at determining the paragenesis of Au mineralization and brecciation in the 144 Zone. Underground mapping provided spatial relationships between breccia types, alteration assemblages, and their relationships to structures. Clay minerals and a post-ore oxidation event have made it difficult to identify primary mineral assemblages. However, samples of different breccia types were collected along transects from low/no Au to high grade, and were analyzed using transmitted and reflected light petrography, applied reflectance spectroscopy, secondary electron microscopy, and electron probe microanalysis to characterize mineral assemblages, identify clay and oxide minerals, and locate gold.

Breccias were classified by mineralogy and textures of clasts and their respective matrix to determine different breccia types and mineral assemblages. Cross-cutting relationships observed at both the macroscopic and microscopic scales have led to the identification of two main breccia types. Breccia type 1 (BT1) has clasts composed of dolomite, phengitic-dolomite, and quartz with goethite cemented by a siliceous matrix. Breccia type 2 (BT2) has clasts consisting of dolomite, phengitic-dolomite, and quartz with goethite cemented by a phengite-goethite matrix. Clast and matrix compositions and textures show that both breccia types formed simultaneously and by selective replacement of lower-most Bonanza King dolomite to phengitic dolomite or quartz with minor goethite clasts within either a siliceous-(BT1) and/or phengite-goethite-(BT2) dominated matrix. No single breccia type or alteration assemblage has a preferred association with high gold grades.

Gold is most closely associated with cubic goethite that replaced pyrite, but is also closely related to amorphous goethite. Native gold and electrum are located in pitted zones of goethite and lesser hematite and along the contact of goethite and lesser hematite with quartz. Quartz is typically associated with and encloses oxides and Au. Clay minerals that were identified include relatively common high-temperature phengite with lesser low-temperature kaolinite, montmorillonite, smectite, and phengitic illite. Although phengite is the most abundant clay, it is not consistently spatially associated with gold at the sample scale, though it may be at the deposit scale.

The geologic constraints that characterize gold mineralization in the 144 Zone can be applied to exploration throughout Bare Mountain for additional gold that formed under similar conditions.
This study suggests that an important geological control was the Carrara-Bonanza King contact and the presence of reactive lowermost Bonanza King dolomite. Locating other localities of this contact at fault intersections that could have provided conduits for gold-bearing fluids can provide future drill targets.