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Collection of X-Ray Fluorescence Analyses of Reverse Circulation Drill Chips as a Tool in Geological and Alteration Modeling at the Castle Mountain Gold Deposit, California

Erik R. Tharalson[1, 2], Will Joseph[2], Oscar Vazquez[2], Wiley Skewes[2], Owen Nicholls[2], Thomas Monecke[1], Annelie Lundström[3], Egill Ö. Sigurpálsson[3]
1. Center for Advanced Subsurface Earth Resource Models, Colorado School of Mines, Golden, CO, USA, 2. Equinox Gold Corp, Henderson, NV, USA, 3. Minalyze AB, Sävedalen, Sweden

Castle Mountain is a Miocene-aged, disseminated-style, low-sulfidation epithermal gold deposit located in southern California. The deposit currently hosts reserves of 4.17 million ounces of gold at an average grade of 0.51 g/t gold. Mining operations resumed in 2020 after a 16-year hiatus. Phase 1 of mining is expected to produce approximately 25,000 ounces of gold per year for five years from backfill material, while phase 2 average annual production from bedrock will be approximately 200,000 ounces of gold over 14 years.

The host rocks include coherent lavas and volcaniclastic rocks that are intermediate and felsic in composition. Alteration associated with the mineralization has primarily resulted in increases of Si and K while areas outboard of the main mineralization show less significant compositional changes. The large deposit area, wide host rock variability, and inconsistency between multiple generations of logging geologists have proven to be significant challenges to building a meaningful 3D alteration model based solely on visual logging.

To refine the existing geology and alteration models, 8,205 meters of reverse circulation drill chips were analyzed using an automated X-ray fluorescence (XRF) scanner manufactured by Minalyze AB. The instrument enabled rapid (i.e., 60 s per chip compartment) collection of geochemical data that can be integrated into the geology and alteration models for the Castle Mountain deposit.

To date, results show that the coherent volcanic rocks in the deposit area are easily identified using immobile element ratios (e.g., Ti/Zr). Alteration zoning as defined by variations in the K/Al ratio show that more intensely altered rocks occur in proximity to the higher-grade areas of the deposit and contain the highest average gold grade. These initial results show that routine, rapid XRF analyses on reverse circulation dill chips can be pivotal to interpreting and modeling the large alteration zones around disseminated-style low-sulfidation epithermal deposits.