Camp Creek Porphyry Alteration Mineralogy and Geochemistry: Exploring for Blind Copper Mineralization in Northern British Columbia, Canada

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Camp Creek is a Late Cretaceous calc-alkalic Cu-Au-(Mo) porphyry deposit, located within the Stikine terrane in northern British Columbia, Canada. Late Triassic mafic volcanic and clastic sedimentary rocks of the Stuhini Group host numerous Late Cretaceous granodiorite to monzonite stocks and dykes. This research aims to characterize the mineralogy, composition, timing, and shape of various porphyry units at Camp Creek, and to link these features to mineralization. Drilling programs by Brixton Metals have discovered Cu-Au-(Mo) mineralization approximately 400m below the surface. Multiple phases of porphyry units have previously been classified at Camp Creek based on detailed trace element analysis, particularly Zr, Ti, and Sc. In this study, host rock and alteration types were characterized by petrography, SWIR, microXRF element mapping, and whole-rock geochemistry. U-Pb zircon dating of the porphyry phases and post-mineral dykes has constrained temporal relationships. Mineralization is typically hosted within porphyry X (PX), a hornblende-quartz-biotite-plagioclase porphyry, dated (U-Pb zircon) at 86.60 ± 0.36 Ma, cut by A-type quartz-vein stockwork, occurring together with K-silicate and biotite alteration. In addition to PX, several other texturally similar porphyry bodies occur within the deposit. Both PZ and PY have apparent sill-like geometry, with PZ being a shallow, relatively unmineralized porphyry phase that transitions to PY with increasing depth, correlating with increased grade and quartz veining density. However, the contact relationships of these porphyries are obscured by intense alteration. SWIR data indicates a vertical zonation of alteration from pyrophyllite, transitioning into illite, then muscovite and ending with K-silicate dominant minerals with depth. Sericite type generally transitions from white to pale green and then dark green with depth. Initial observations indicate multiple generations of biotite-altered volcanic rocks proximal to the PX stock. The results of this study will identify key vectors to locate buried mineralization in porphyry copper deposits, enhancing regional exploration approaches.