Development in Understanding of the Tritton-Girilambone Cu District, Lachlan Fold Belt, Australia; Resolving Hydrothermal Mineralisation in Multiply-deformed Rocks.

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ABSTRACT

The Tritton-Girilambone copper (+gold) district hosts the Tritton and Murrawombie mines, completed mines at Larsen's and North-East, and undeveloped deposits at Avoca Tank, Budgery, Budgerygar, and Kurrajong. The total contained copper metal in the combined deposits is more than 750,000t; and exploration prospectivity remains significant.

Host-rocks to copper mineralisation are Ordovician in age and these rocks have been deformed during the Benambran and younger deformation episodes, resulting in complex overprinting relationships. Despite this, a consistent structural history, derived from recognised ductile deformation features, has been established across the Tritton-Girilambone district. Hydrothermal activity, manifest as alteration and sulfide mineralisation, occupies a discrete period within the structural history.

The prospective stratigraphy comprises a package of psammitic rocks enclosed within pelite/schist. Rheological contrast focusses development of discontinuities at contacts, and, in places, these are mineralised where intersected by younger deformation features. Four discrete fold generations and three associated cleavage/foliation fabrics are recognised, with relative timing established through observation of overprinting relationships. Importantly, the oldest cleavage, both pervasive and penetrative and associated with Benambran-age folding; is overprinted by disseminated pyrite in silica-pyrite 'veins' and as layer replacement. Pyrite is therefore introduced during younger deformation and overprinted by chalcopyrite mineralisation in the ductile to brittle transition. Mine-scale distribution of pyrite and chalcopyrite is consistent with structural orientations.

The amount of surface outcrop is poor, and as such, the deposit geology and controls on mineralisation are resolved through geological/structural mapping of underground exposure and solution-focussed campaign logging of diamond-core. Despite other interpretations of volcanic-associated sulfide mineralisation, exploration for these deposits has not been model-centric and relies heavily on associated geophysical (EM, IP, Magnetics) anomalism. A range of mineralisation textures and tenor can occur, with varying geophysical properties. It is therefore critical to utilise multiple geophysical techniques coupled with understanding of the litho-structural architecture to drive discovery.