# Consolidated Geological Characterisation of the Massive Sulfide Rosebery Deposit and Implications for Exploration in the District

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The Rosebery deposit is a polymetallic volcanic-hosted massive sulfide system. The deposit consists of a series of moderately east dipping lenses between the Rosebery fault (footwall) and Mt Black fault (hanging-wall). Footwall stratigraphy comprises massive rhyolitic to dacitic lavas and breccias, feldspar-quartz porphyritic sills, pumiceous volcaniclastics, and sandstones. The deposit is hosted within tuffaceous sandstones and siltstones that are conformably overlain by intercalated lenses of black-gray mudstone, feldspar-quartz-phyric to lithic volcaniclastic sequences. A three-dimensional model of Rosebery was built to assist in targeting new sulfide lenses within the system. The model integrated UG and near-mine mapping, structural relogging, and the interpretation of multi-element geochemistry and SWIR mineralogy.

About 9,800 4 acid digest ICP-MS/AES analyses and 80,000 SWIR measurements were collected throughout the Rosebery system. Major element ratios combined with SWIR mineralogy were used to map relative proportions of sericite, chlorite, potassium feldspar, carbonate, and pyrite. Together with pathfinder element distribution patterns, the estimated mineralogy was used to define the zoning and geometry of the alteration system.

The sulfide lenses are entrained within a high-strain, ductile shear zone that is bounded by the Rosebery and Mt Black fault. Heterogeneous strain partitioning across the deposit resulted in the development of narrow, discrete ductile shear zones and transposition, flattening and attenuation of the host stratigraphy and massive sulfide lenses. This resulted in the development of asymmetric, rootless to isoclinal folds, with the lower limbs truncated by shears. The hanging-wall black shale, the massive sulfide lenses, and the footwall phyllosilicate alteration zones preferentially took up ductile deformation. These more ductile lithologies were thickened in asymmetric fold hinges and attenuated on the limbs. Transposition shifted the massive sulfide bodies up dip and to the north relative to the position of the footwall alteration that was associated with the sulphide mineralization. Similarly, transposition shifted the hanging-wall shale up and north. Consequently, the plunge of the ore shoots is controlled by the fold-hinge geometry. Transposition accounts for the apparent thin, stratiform geometry of the footwall alteration; in fact, the real alteration is not in the structural footwall of the sulfide bodies, but rather down the plunge of the foliation.

The key elements in the targeting model are defining the bounding shears between structurally stacked parts of the deposit, defining the thickened volumes of footwall alteration, massive sulfide, and hanging-wall shale in the asymmetric hook fold hinges, and plotting bedding-cleavage intersections to predict the plunge of ore shoots.