

Multi-Scale Characterisation of Intrusion-Related Gold Systems in NE Queensland: Insights from the Ravenswood Deposit

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North-east Queensland hosts multiple gold deposits produced by late Palaeozoic intrusion-related gold systems (IRGS), including the Ravenswood, Mt Leyshon, and Kidston deposits. The Geological Survey of Queensland (GSQ) implemented an integrated, multi-scale approach to characterise mineralisation signatures and alteration footprints of IRGS in the region, using the Ravenswood camp as a key case study area. This approach involves consistent and systematic characterisation of individual gold deposits and their camps, combining continuous hyperspectral (HyLogger) and XRF (Minalyzer) drill core scanning, comprehensive bulk geochemistry and multiple micro-analytical techniques. Bulk macro-scale methods allow identification of overall mineralisation and alteration signatures, as well as delineation of alteration zoning, while micro-analytical tools document micro-scale mineral phase relationships and textures. GSQ employed micro-XRF (M4 TORNADO PLUS) and TESCAN TIMA microanalysis, which successfully identified free gold and electrum within quartz – pyrite – galena ± chalcopyrite assemblages. High-resolution elemental mapping (≤60 µm) also highlighted distinct Au–Pb–Bi correlations. In addition, this study documented systematic alteration of dioritic host rocks to muscovite-chlorite assemblages, locally overprinted by biotite, reflecting evolving hydrothermal conditions. This integrated approach addresses the geochemical, mineralogical, and metallurgical complexities at Ravenswood — a common challenge in Queensland's IRGS — and offers a transferable framework for exploration targeting in analogous mineral systems across the region.