

A New Discovery Frontier for Copper/BHT Deposits in the Thomson Orogen Revealed by Merging Public Research and Precompetitive Data

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With increasing demand for mineral resources, there are two principal avenues to improving Australia's discovery rate: 1) Revitalising brownfields provinces with disruptive geological and targeting ideas; and 2) Applying innovative approaches to the network of research outcomes and precompetitive data to reveal new greenfields frontiers. Experienced mineral explorers will provide the questions and handrails for modern technologies including AI.

The Darling Headwaters offer such new frontiers. A 6Ma drainage reactivation provides a showcase for the 2011 National Geochemical Survey of Australia and the 2023 Heavy Mineral Map of Australia. The pathfinder matrix of mineral suites (including sulphides), geochemistry and mineral hardnesses provides far-seeing target vectoring and proximity measures ranging down to direct targeting. Vectoring with target minerals and metals is a step-change improvement to flagging empirical tactics like potential field targeting. The overlapping pathfinder dispersion fields for multiple catchments in the Darling Headwaters are untangled by careful analysis of different pathfinder suites, geomorphic vergence/history and scant drill geology. This approach delineates a nickel-copper target area with pentlandite chalcopyrite sphalerite lead-ins and a new tin-tungsten belt with cassiterite scheelite galena Sn W Pb lead-ins.

Potential for greenfields copper and Broken Hill Type provinces is also indicated in the Thomson Orogen under the margins of the Eromanga Basin between Thargominda and Cunnamulla. Gahnite chalcopyrite pyrrhotite tongxinite (Cu_2Zn) rhodonite Pb S Hg pathfinders vector into a 300 x 150km source region with potential for Proterozoic basement highs under shallower covered parts of the Eromanga. This region includes metasediment domains, largely interpreted from geophysics by previous researchers, and co-incident gravity and magnetic features consistent with BHT signatures.

The prospective region warrants a collaborative program by government and industry of data acquisition, research and strategic drilling aimed at producing the next generation of discoveries for copper, zinc and other metals as needs evolve.