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# Chapter 5

# Discovery and Geology of the Cannington Ag-Pb-Zn Deposit, Mount Isa Eastern Succession, Australia: Development and Application of an Exploration Model for Broken Hill-Type Deposits

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**Abstract**

The Cannington deposit is located in the Eastern Succession of the Paleoproterozoic to Mesoproterozoic Mount Isa inlier, and was discovered by BHP in 1990 as result of drill testing of an aeromagnetic target below 60 m of Recent and Cretaceous cover. The deposit is hosted by amphibolite facies migmatitic quartzofeldspathic gneiss sequences and displays Broken Hill-type affinities. A feasibility study carried out between 1993 and 1995 defined a total resource of 43.8 million metric tones (Mt) grading 11.6 percent lead, 4.4 percent zinc, and 538 ppm silver. Underground mining commenced in 1997, and with an annual production of 2.0 Mt, the Cannington mine is currently the world's largest single producer of silver with an annual output of over 30 Moz.

The discovery of the Cannington deposit represented the culmination of six years of integrated and systematic exploration of the Mount Isa Eastern Succession by BHP for Broken Hill-type massive sulfide deposits. Exploration was based on concepts and a model developed in the Broken Hill block, New South Wales, involving new data releases in the early 1980s. A critical component of the exploration model was an empirical understanding of the relationship of regional marker horizons and Broken Hill-type deposits to lithostratigraphy. The model was applied to systematic evaluation of permissive terrains Australia-wide, and identified the Soldiers Cap Group in the eastern Mount Isa inlier as rating a top priority. Initial exploration was based on extrapolation of known prospects and associated lithostratigraphy, using high-quality regional aeromagnetic data, into areas of Cretaceous cover.

Economic ore lenses at Cannington are associated with diverse assemblages of Fe-Mn-Ca-F–rich gangue minerals including hedenbergite, pyroxmangite, magnetite, olivine, garnet, and fluorite. The deposit is strongly zoned with silver-lead–dominant and zinc-dominant ore lenses that exhibit a crude strata-bound distribution. Mineralization types display complex and extended paragenesis involving amphibolite facies metamorphism, extensive postpeak metamorphic hydrothermal overprints, and multiple brittle-ductile structural events. The Cannington deposit shares many similarities with the Broken Hill Main lode and is an important new world-class example of a Broken Hill-type deposit. However, the extent and effects of postpeak metamorphic hydrothermal overprints at Cannington appear to be more significant compared to other documented examples of Broken Hill-type deposits.

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