HILL 800 Au-Cu MINERALIZATION, EASTERN VICTORIA

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LOCATION

The Hill 800 Cu-Au mineralization is 2.4 km N of Wrens Flat (Figure 1), 18 km ESE of Jamieson and 145 km ENE of Melbourne in central eastern Victoria at 146°22'31"E, 37°19'34"S; Warburton 1:250 000 map sheet (SJ 55-06).

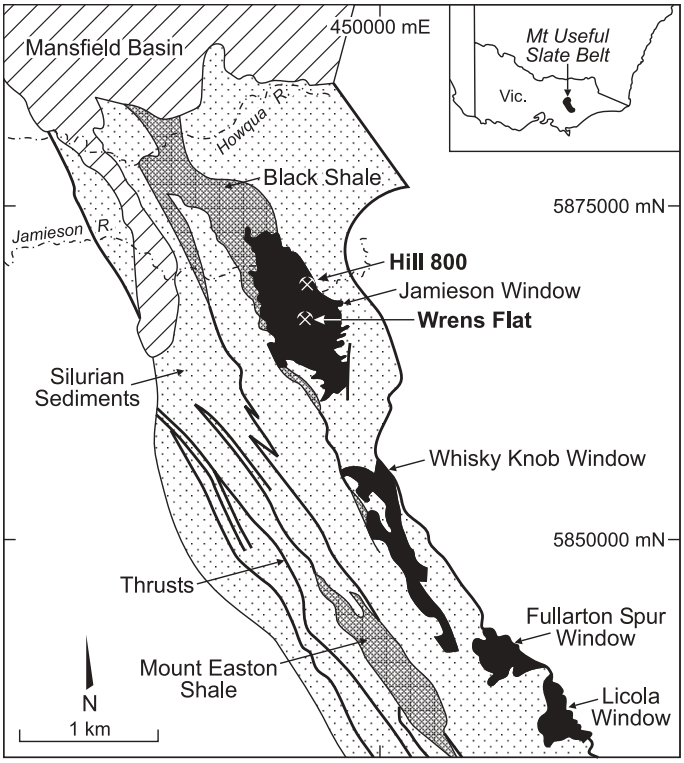

Figure 1. Location map showing Cambrian windows in the Mt Useful Slate Belt, Eastern Victoria (after Cherry, 1998).

DISCOVERY HISTORY

Although identified as having potential for Au mineralization in the 1890s, the region received little notice until, almost a century later, Anglo American, BHP and other companies commenced exploration during the 1980s. Using Geological Survey of Victoria airborne magnetic and radiometric data, New Holland Mining NL discovered the prominent, Au-bearing gossans on Hill 800 in 1994. They sampled coincident magnetic and radiometric anomalies and identified zones of strong alteration at the northern end of a narrow ridge, 1.5 km N of Wrens Flat on the Jamieson River. Follow-up geochemical surveys elsewhere on the tenements discovered additional anomalies. These were all in an area of poor bedrock exposure with no known mineralization, except for weak anomalies about 6 km to the S in the Rhyolite Creek area (Raetz and Parrington, 1988).

PHYSICAL FEATURES AND ENVIRONMENT

The area lies at the crest of a narrow ridge within heavily forested and mountainous country. The site is at about 840 m AHD with steep slopes to the Jamieson River (520 AHD), less than 1 km away (Figure 2). The average annual rainfall is about 1000 mm and average minimum and maximum temperatures for summer are 12-23ºC (January) and for winter are 4-11°C (July).

Vegetation on Hill 800 consists mainly of messmate (*Eucalyptus obliqua*) and mountain ash (*E. regnans*) with canopy heights of over 30 m. A thick under-storey of ferns, wattles and other wet temperate shrubs render parts of the slopes impassable. The prospect is within unreserved forest, less than two km outside of the Alpine National Park, and has been logged in the past.

GEOLOGICAL SETTING

Hill 800 lies within the Palaeozoic Mount Useful Slate Belt, a complexly

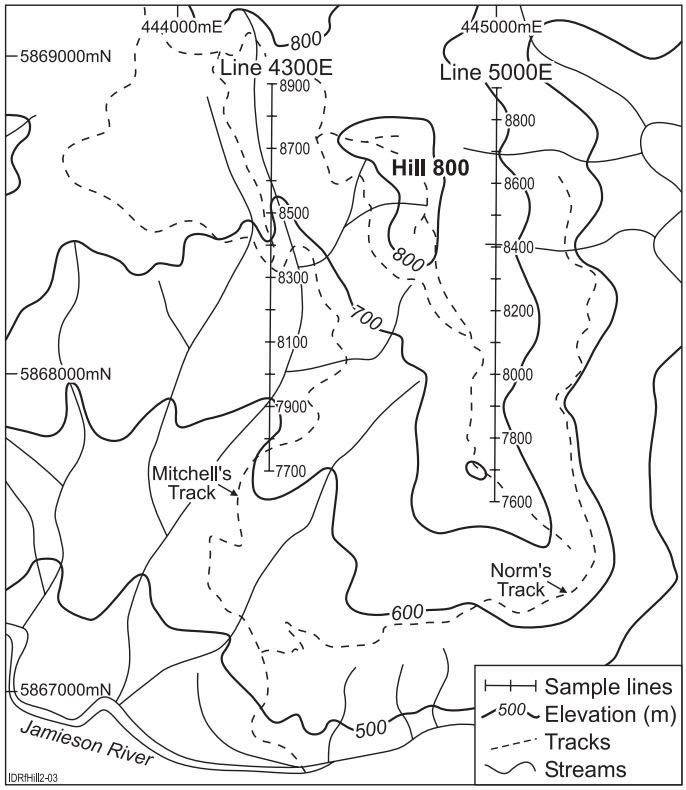

Figure 2. Location of sample lines 5000mE and 4300mE.

folded and faulted belt in the S portion of the Mount Wellington Fault Zone, one of the most deformed areas of the Lachlan Fold Belt in Victoria (Gray, 1988). The Mount Useful Slate Belt represents an imbricate thrust terrane where fault-bounded slices contain Cambrian, Ordovician and Silurian rocks. Four separate structural windows expose the Cambrian geology, which is thought to be linked at depth below the overthrust units (Vandenberg *et al.,* 1995).

The northernmost Jamieson Window exposes about 38 km^2 of the Barkly River Volcanics, volcaniclastic units interbedded with intermediate to felsic volcanic flows and intrusives. The main rock types include siltstone, sandstone, breccia (autobreccia and debris flows), andesite, dacite and rhyolite lavas, dykes and stocks. Vandenberg *et. al.,* (1995) define several rock formations and provide detailed rock and structural descriptions of the Slate Belt. Recent appraisals of the Jamieson Window volcanics and the mineralization at Hill 800 are by Turner (1996), Cherry (1998, 1999) and Morey (2000).

The rocks have been regionally metamorphosed to the greenschist facies, with dominant alteration to chlorite, patchy epidote and quartz. In zones of weak to strong mineralization, along faults and near over-thrust packages, there has been intense sericite alteration and the rocks are strongly cleaved. Locally, prehnite and pumpellyite are developed and there are zones of intense epidote and silica alteration.

REGOLITH

Hill 800 has been uplifted, ferruginized and weathered since the beginning of the Mesozoic. Remnants of a palaeoplain with Oligocene Older Volcanics and sub-basaltic sediments form local ridge tops next to steep, deeply incised valleys as much as 600 m deep. The combination of high rainfall with steep slopes has rapidly removed unconsolidated material, particularly weathered and altered volcanic rocks. A relatively thin residual soil mantles much of the area; many slopes are scree, loosely anchored by vegetation. The soil is rich in organic material (plant roots and charcoal). Much of the soil comprises clasts of quartz and lithic fragments >4 mm in size. The depth to fresh rock is 3-40 m. However, outcrops stand several metres above ground in zones of intense silicification.

MINERALIZATION

Alteration

The main alteration minerals include sericite, pyrite and silica. They form zones around a 20-40 m wide central core of dominant sericite. Paragonite (Na-rich mica) is associated with the highest Au grades. The central core is surrounded by a zone a few hundred metres wide of K-rich sericite (muscovite) and chlorite with less silica and pyrite (Figure 3). Within this zone, the ore minerals are more Cu-rich and Au-poor. This zone grades outwards into the regional metamorphic assemblage. Pyrite is disseminated throughout most of the deposit, but some massive pyrite lenses have been intersected in drilling, with thicknesses up to about 2 m. An early, disseminated, fine-grained and barren pyrite, which is common throughout the area and extends hundreds of metres from the deposit, is overprinted by a more confined later disseminated to massive pyrite, which is intimately associated with Au mineralization.

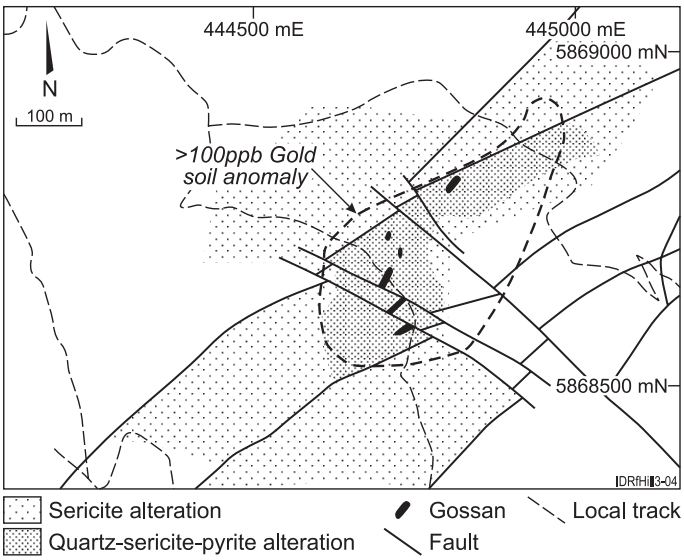

Figure 3. Hill 800 geological map showing the relationship of gossan, alteration zones, faults and geochemical anomaly. (Modified from Cherry, 1999).

Primary mineralization

Drilling defined a broad envelope, up to 100 m wide, with Au grades >0.2 g/t, and significant higher-grade zones of 10-20 m widths and grades >2 g/t Au. The highest grades in drill intersections within fresh rock include 122 g/t Au (visible in core) and 2.27% Cu over 1 m. Other intersections in fresh rock include 26 m at 4.73 g/t Au, 18 m at 5.06 g/t Au, 24 m at 1.5 g/t Au and 30 m at 0.9 g/t Au.

Chalcopyrite occurs as blebs and veins up to 25 mm wide in drill core and percussion drill chips. Minor bornite and chalcocite have been noted in a few drill samples, generally associated with chalcopyrite. One chalcopyrite vein was continuous along the drill core, extending for almost 10 m (containing 6 m at 0.9% Cu and 0.74 g/t Au). Solid chalcopyrite veins have feathery edges where the sulphide envelops gangue minerals or is squeezed between them. In places, fine-grained disseminated chalcopyrite occurs with disseminated pyrite. In polished section, the massive chalcopyrite veins are free of inclusions, except for a trace of pyrite. Patches and masses of anhedral chalcopyrite occur in a few places away from the veins, generally in a quartz-sericite-chlorite intergrowth with disseminated pyrite.

Oxide mineralization

In oxidized ore, one drill intersection averaged 4.09 g/t Au over 35 m, another intersected 13 m at 10.9 g/t (including 3 m at 38.8 g/t). SEM studies indicate that Au particles in the gossans are almost entirely enclosed by Fe oxides and are <10 µm in size (S. McKnight pers. comm. 1999). Copper oxides, sulphates and carbonates have not been recognized in any outcrop or drill sample on the Hill 800 prospect.

REGOLITH EXPRESSION

Silica and Fe oxide-rich gossans express the mineralization at surface. They vary from massive silica to a fine network of silica veinlets filled with Fe oxides to massive Fe oxides. The gossans contain up to 30 g/t Au and the surrounding soils have up to 6240 ppb Au. A central soil anomaly (100 x 200 m) with Au >500 ppb surrounds the gossan outcrop. Soil sampling defined an area of almost 5 ha with Au >100 ppb in a local background of <10 ppb. This soil anomaly has a teardrop shape with a NE orientation and a maximum length of about 450 m (Figure 1). Other element concentrations are summarized in Table 3.

Significantly, the soil of the central area (>500 ppb) is strongly depleted in Cu, with many samples <100 ppm Cu, whereas outside the 500 ppb Au anomaly, Cu varies from 150 to 400 ppm up to 300 m from the mineralization. This reflects the primary zonation. In contrast, Pb correlates well with Au in soil. Arsenic is elevated near the Au mineralization (up to 180 ppm), but is spotty and unreliable as a pathfinder. Limited orientation programs indicated spotty distributions of As, Ag, Co, Mo, Sb, Se, Te and Zn, within a broad alteration halo indicated by anomalous Fe, K, Mn, Na and S (Scott, 2001).

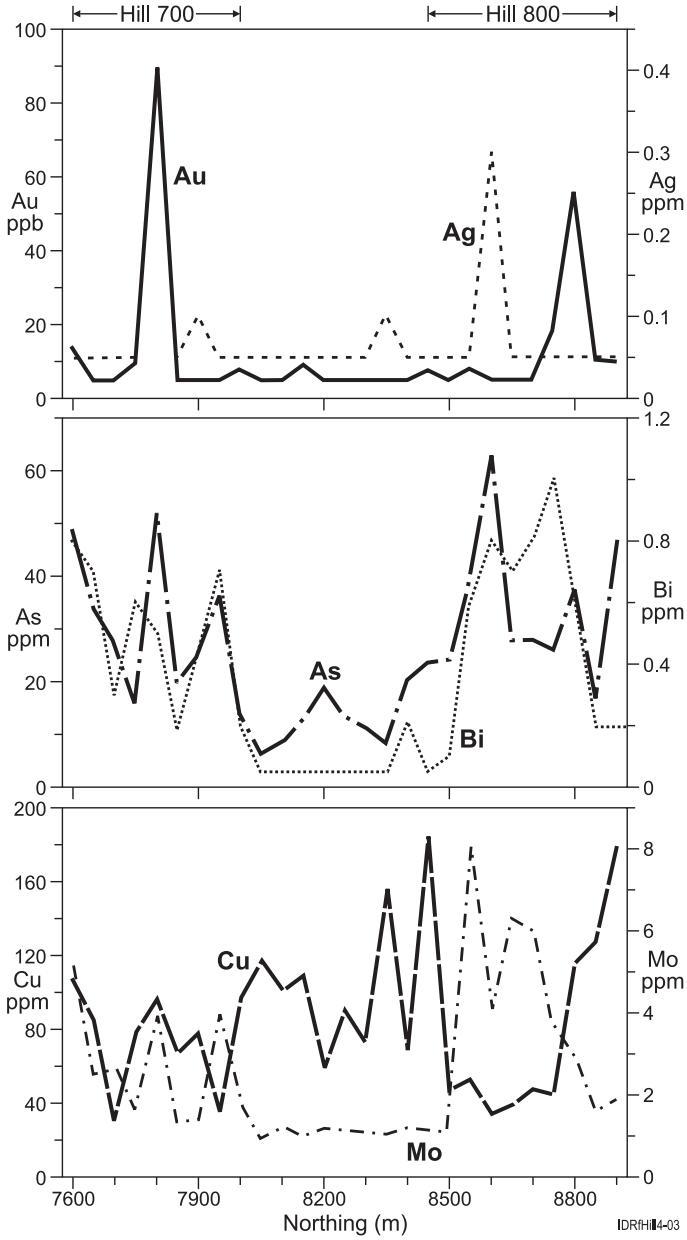

Figure 4. Elemental abundances (Au, Ag, As, Bi, Mo and Cu) on the 5000E line - Coarse fraction (modified from Scott, 2001).

Although high K in the regional radiometric data attracted exploration to this area, the centre of Au mineralization is associated with high Na and low K. The mineralization is, however, surrounded by a high K zone that extends many hundreds of metres beyond the mineralization. The distributions of Na and K reflect those of paragonite and muscovite. However, elsewhere, this inverse relationship is overprinted by the regional greenschist (chlorite-epidote) metamorphic alteration.

Due to the amount of scree on slopes, many samples contain quartz and lithic fragments >4 mm in size. For want of a field standard, all early

sampling was sieved to <2 mm before assay. However, in a study by Scott (2001), eight size fractions (from 4 mm to 63 μm) of the soils were analysed and the coarser (2-4 mm) fractions were found to be the most practical sampling media. Silver, As, Bi, Mo, Pb, Sb, and Te were found associated with the Au anomaly at Hill 800 (Figure 4).

The Hill 700 anomaly, about 800 m S, has a generally similar Au-Cu-Zn soil geochemical signature to Hill 800 (Figure 4). No surface gossans were recognized, but several tors of silica are possible indications that there could be mineralization. However, drilling failed to locate any primary mineralization and the sericite-altered volcanic rocks lacked the intensity of alteration and the pyrite content of Hill 800.

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TABLE 1
SAMPLE MEDIA - SUMMARY TABLE

Sample medium	*Indicator elements*	*Analytical methods*	*Detection limits (ppm)*	*Background (ppm)*	*Threshold (ppm)*	*Maximum anomaly (ppm)*	*Dispersion distance (m)*
Primary mineralization - quartz-sericite-pyrite core	Au	PM205	0.001	0.03		20	<<10 m
	Cu	ICPAES	5			<2000	
	Pb		5			2100	
	As		5			2520	
Primary mineralization – Cu veins	Au	PM205	0.001			122	<100 mm
	Cu	ICPAES	5			22700	
	Pb		5			<300	
	As		5			<100	
Supergene Au mineralization	Au	PM205	0.001		0.08	75	10-30 m
	Cu	ICPAES	5		200	739	
	Pb		5		75	1000	
	As		5		100	1960	
Soil	Au	PM205	0.001	0.001	0.08	6.24	150 m
	Cu	ICPAES	5		200	992	
	Pb		5		50	775	
	As		5		40	289	
Gossan	Au	PM205	0.001			30.3	
	Cu	ICPAES	5			637	10-30 m
	Pb		5			593	
	As		5			2590	
Regional average	Au	PM205	0.001	0.01		0.31	
	Cu	ICPAES	5	134		1310	
	Pb		5	28		513	
	Zn		5	85		1140	
	As		5	44		2840	
	Ba		10	653		3250	
	Mo		5	7		80	
	Co		5	24		376	

Cu, Zn, Pb, As, Co, Mo, Mn, Ba and Ag analysis by ICP AES analysis after $HF/HNO_3/HClO_4/HCl$ digestion.

Au by AAS/graphite furnace after aqua regia digestion of 50 g aliquot.