POLICE CREEK GOLD DEPOSIT, DRUMMOND BASIN, NE QUEENSLAND

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LOCATION

The Police Creek Au deposit is located 6 km NE of Mount Coolon and 210 km SE of Charters Towers (Figure 1) at 21°21'30"S, 147°23'20"E; Mount Coolon (SF 55-07) 1: 250 000 map sheet.

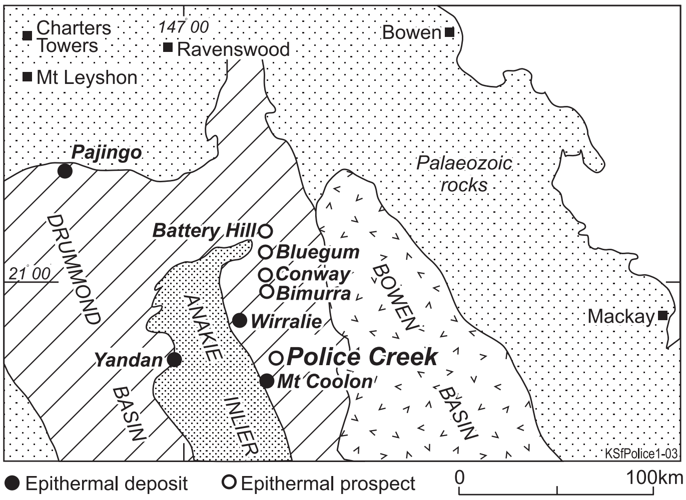

Figure 1. Regional; setting of epithermal Au deposits, Drummond Basin, Queensland (after Scott, 1995).

DISCOVERY HISTORY

Epithermal vein Au mineralization was discovered at Mt Coolon in 1913 and worked from 1914 to 1939, to produce 197 500 oz of Au (Malone, 1969). Although the Police Creek deposit is only 8 km to the NE, Au was not identified at that time by prospectors using panning, as the Au at Police Creek is very fine grained. It was only found by modern exploration methods during the 1990's. High grade epithermal Au mineralization was discovered at Pajingo by Battle Mountain (Australia) Inc in 1984 (Cornwell and Treddinnik, 1995) and at Wirralie in 1986 by Austamax Resources Limited (subsequently Australian Consolidated Minerals Limited (ACM)) (Fellows and Hammond, 1990). This rekindled interest in exploration in the Drummond Basin, S and SE of Charters Towers (Figure 1). These deposits cropped out as small windows in areas of Tertiary cover and provided the incentive to explore under this cover.

In 1990, ACM followed up a regional Au stream sediment anomaly with detailed -80 mesh (<180 μm) soil sampling on a 50 m sampling grid to define a 1200 x 600 m anomalous Au zone at Police Creek. Subsequent drilling intersected narrow, high-grade mineralization within a broad, low-grade zone in the bedrock. This mineralization was initially considered to be beneath 30 m of transported clay. In 1992, Ross Mining NL acquired the prospect, dug some costeans, relogged the drill holes and concluded that the cover sequence was generally only 2-3 m thick. Further drilling led to an inferred resource of 1 Mt at 2 g/t Au (Register of Australian Mining, 1995).

PHYSICAL FEATURES AND ENVIRONMENT

The climate is tropical with hot, wet summers and mild, dry winters, although frosts are common. The mean annual rainfall of 670 mm falls mainly during December-February. The mean daily maximum and minimum temperatures are 35°C and 21°C in December and 23°C and 7°C in July. The vegetation of the district is eucalypt woodland and grassland. The Police Creek deposit occurs on a pediment at the base of an incised plateau at an elevation of about 250 m. It occurs adjacent to Police Creek, within the catchment of Rosetta Creek which is, in turn, a tributary of the perennial Suttor River (Malone, 1969). Low-order streams normally only flow after heavy rain, although there is a dam on Police Creek 5 km downstream from the deposit.

GEOLOGICAL SETTING

The Devonian-Carboniferous sedimentary and volcanic rocks of the Drummond Basin are divided into two N-trending belts by the highly metamorphosed Lower Palaeozoic fine-grained rocks of the Anakie Inlier (Figure 1). In the Police Creek area, 6 km NE of Mount Coolon and in the eastern portion of the Drummond Basin, quartz latite ignimbrites of the Carboniferous Silver Hills Volcanics host primary gold mineralization. These rocks contain 5-10% quartz phenocrysts and are stratigraphically equivalent to the Bimurra Volcanics, 50 km to the N (Hutton *et al.,* 1991). During the Palaeocene, these rocks were overlain by about 10 m of sandstone (Suttor Formation). The Suttor Formation is stratigraphically equivalent to the Southern Cross Formation in the Charters Towers area (Henderson and Nind, 1994; Henderson, 1996).

REGOLITH

During the mid to late Tertiary, lateritization affected the whole Drummond Basin (Wells *et al.,* 1989). Surface ferruginization occurred in the Suttor Formation and saprolite was developed in the underlying Silver Hills Volcanics. Subsequently, the weathered profile has been incised 15-20 m, exposing the mottled and clay zones of the volcanics prior to being covered by alluvium. The alluvium has been mottled and ferruginous nodules have formed. Several metres of quartz-rich colluvium also occur in the region, but this colluvium is generally poorly represented over the deposit. Recent incision of the alluvium and colluvium by Quaternary streams was followed by several periods of fluvial deposition. Very thin colluvial outwash sands occur at the base of the scarps.

At Police Creek, the alluvium is about 10 m below the top of the Suttor Formation and about 2 m above the current streams (Figure 2). Near the deposit, Silver Hills Volcanics outcrop either as silicified ridges about 5 m above the general level of the alluvium or as very low exposures surrounded by abundant float. Soils around these areas of outcrop and float are largely residual. Residual soils also occur at the base of the Suttor Formation scarp (Figure 2).

MINERALIZATION

The Police Creek mineralization occurs as discrete zones of i) quartz-pyrite±marcasite breccia up to 10 m wide and ii) narrow quartz-carbonate veins within iii) pervasive silica-pyrite alteration in the ignimbrites of the Silver Hills Volcanics. These mineralization types reach 3, 10 and 0.5 g/t Au respectively. The silica-pyrite alteration is surrounded by successive zones of illite and chlorite-carbonate, typical

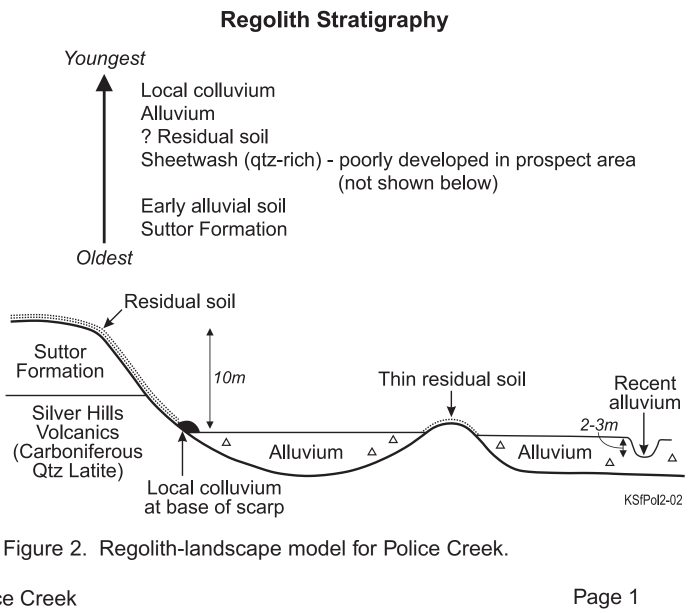

Figure 2. Regolith-landscape model for Police Creek.

of epithermal mineralization (*e.g.*, Hayba *et al*., 1986). No obvious base metal sulphides are developed with the alteration. The mineralization generally occurs below 30 m depth, *i.e.,* below the zone of complete oxidation of the sulphides. Above that depth, Au is severely depleted to <0.1 g/t Au in the saprolite (Figure 3), except where it is protected by quartz. In the underlying saprock, supergene Au enrichment reaches 1 g/t. The pervasive mineralization occurs in a zone, 1200 x 600 m, directly below the soil anomaly.

REGOLITH EXPRESSION

Within the Silver Hills Volcanics there are three distinctive assemblages that are variably affected by weathering. Highly mineralized assemblages of illite-adularia-kaolinite contain arsenical pyrite (up to 7.3% As, 2.3% Sb and 0.4% Hg) and weather to illite, kaolinite, jarosite and Fe oxides. In less mineralized types, calcite is readily weathered, chlorite weathers to kaolinite but adularia and illite are retained. Areas

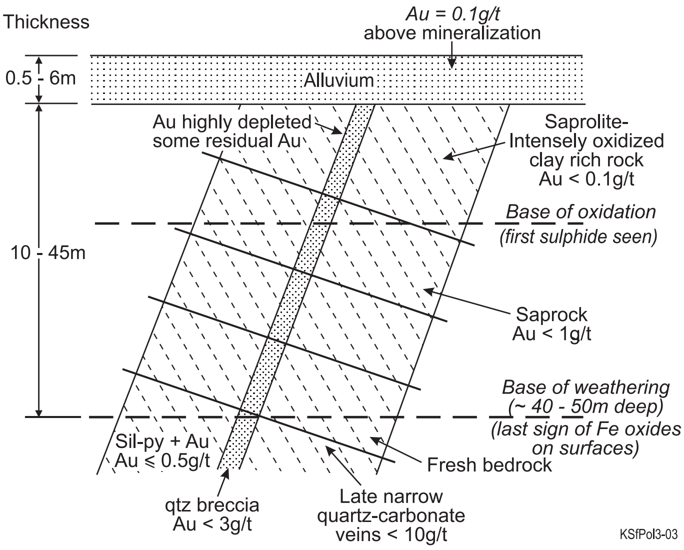

Figure 3. Schematic profile through weathered mineralization, Police Creek.

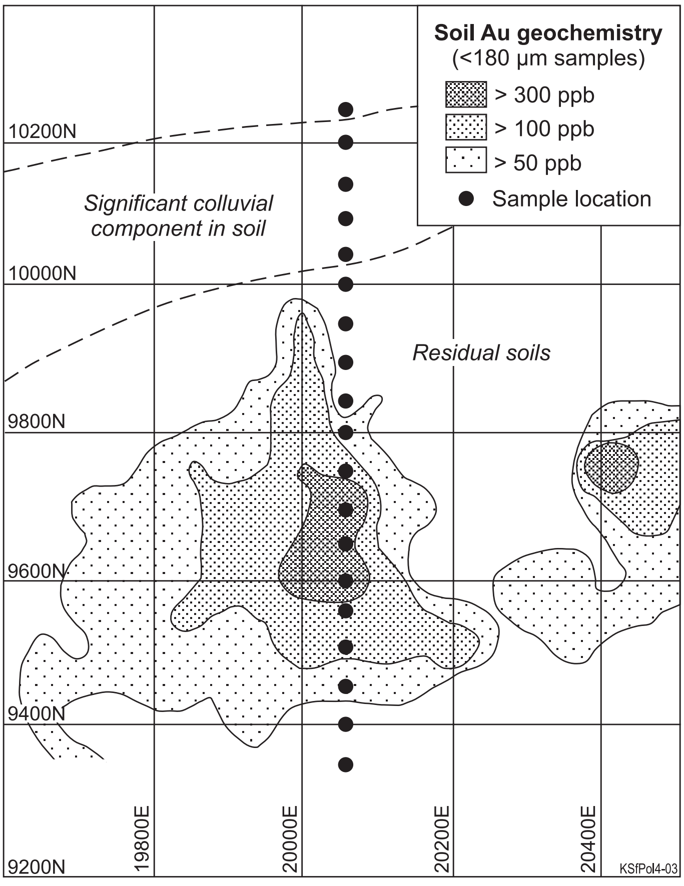

Figure 4. Plan of the ACM <180 µm Au in soil anomaly; sample locations refer to transect in Figure 5.

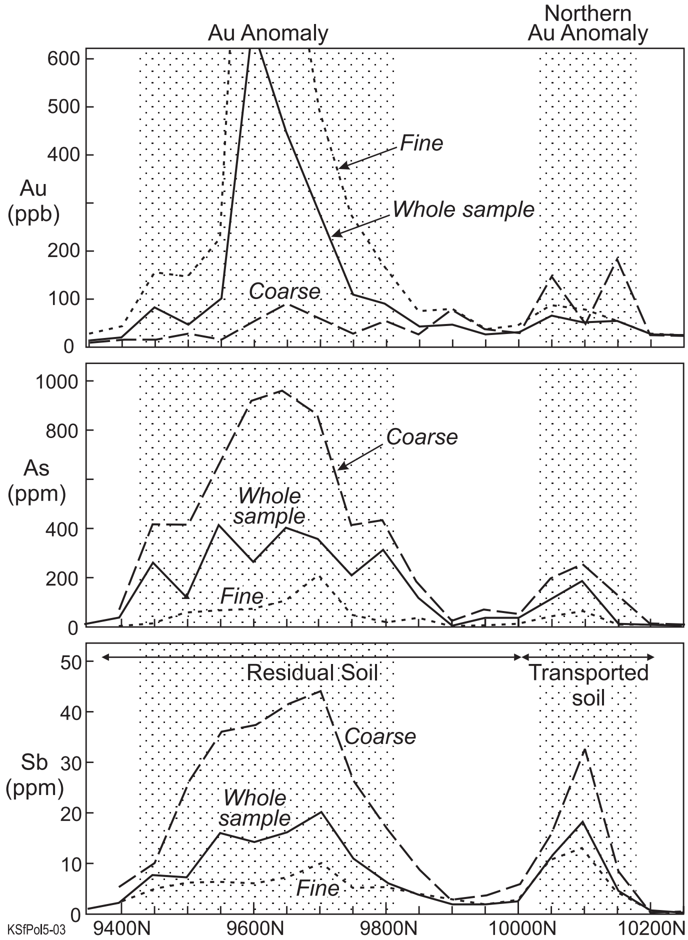

Figure 5. Distributions of Au, As and Sb in the fine (<75 µm), coarse (<180 µm) fractions and whole soil along traverse 20050E (see Figure 4 for location of traverse).

of argillic alteration contain dickite and pyrophyllite, with dickite being retained in outcrop. These mineralogical and consequent geochemical variations in feldspar and phyllosilicate abundances could be measured by PIMA and radiometric surveys of outcrop and shallow drill spoil to pick out altered areas (Scott, 1997). The saprolite is generally strongly depleted in Au, As and Sb during weathering, although some supergene enrichment in Au occurs at the base of weathering at about 40-55 m.

Although the soil over the deposit has a variable colluvial-alluvial component, ACM outlined a 1200 x 600 m zone with Au >50 ppb, in the <180 µm soil fraction (Figure 4). They also found anomalous Ag, As, Cu and Sb abundances irregularly distributed within the Au-anomalous zone. Detailed work by Scott (1995) indicated that the Au anomaly in the clay-rich <75 µm soil fraction is broader and has a greater contrast than the coarser <180 µm fraction or whole soil sample (Figure 5). Arsenic >200 ppm and Sb >10 ppm anomalies in the coarse (>2 mm) ferruginous soil fraction are generally more restricted (Figure 5). This is because the coarse fraction of these residual soils comprises both neo-formed Fe concretions, which incorporate As and Sb during pedogenic processes, and mechanically reworked fragments of mineralized residual material. However, these fractions also located another, smaller, northern anomaly within thin (<0.2 m) soil with a significant colluvial component overlying saprolite north of 10050 mN (Figure 5). This anomaly was not obvious in the original survey (Figure 4) where no account was taken of the transported component in the soil.

ACKNOWLEDGEMENT

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SAMPLE MEDIA - SUMMARY TABLE

Sample medium	*Indicator elements*	*Analytical methods*	*Detection limits (ppm)*	*Background (ppm)*	*Maximum anomaly (ppm)*	*Dispersion distance (m)*
Primary mineralization	Au	INAA	0.005	<0.005	1.1	<300
	As	INAA	1	60	1400	<300
	Sb	INAA	0.2	6	75	300
Saprolite	Au	INAA	0.005	<0.005	0.400	<300
	As	INAA	1	20	740	<300
	Sb	INAA	0.2	2	25	300
Soil fine fraction <75 µm	Au	INAA	0.005	0.006	0.11	50
	As	INAA	1	3	200	50
	Sb	INAA	0.2	1	7	50
Soil coarse fraction >2 mm	Au	INAA	0.005	<0.005	0.110	100
	As	INAA	1	30	1000	100
	Sb	INAA	0.2	1	29	100