PANGLO GOLD DEPOSIT, EASTERN GOLDFIELDS, WESTERN AUSTRALIA

K.M. Scott[1] and R.W. Howard[2,3]

[1]CRC LEME c/- CSIRO Exploration and Mining, PO Box 136, North Ryde, NSW 1670

[2]Pancontinental Mining Ltd., Kalgoorlie, Western Australia

[3]Present address: 179 Old Byron Bay Rd, Newrybar, NSW 2479

LOCATION

The Panglo Au Deposit is located 30 km N of Kalgoorlie (Figure 1) at 30°30'S, 121°23'E; Kalgoorlie 1:250 000 map sheet (SH-51-09).

DISCOVERY HISTORY

The Panglo mineralization was found by Pancontinental Mining Ltd. during 1986, following routine soil sampling and drilling through the saprolite adjacent to a palaeochannel. There is no outcrop over the deposit although a barren quartz vein occurs directly above one of the shears that cuts the deposit. Gold in soil calcrete defines the underlying mineralization (Lintern, 2001).

PHYSICAL FEATURES AND ENVIRONMENT

Relief inversion has left palaeochannel gravel to the SW of the deposit (Figure 2) as one of the highest points in the vicinity of Panglo. From here, approximately 4 m above the general surroundings, the surface gently slopes to an ephemeral playa, 0.5 km SE of the deposit. The deposit occurs in an area of salt scalding in a drainage that flows toward the lake. The water table is at <2 m and saline subsurface waters also flow toward the lake (Gray, 1990).

The climate is semi-arid with long, hot, dry summers and short, cool winters. The mean annual rainfall of 270 mm falls mainly in winter, with erratic local summer thunderstorms or rain-bearing depressions. The mean daily maximum and minimum temperatures are 34°C and 18°C in January and 17°C and 5°C in July. Mean annual evaporation is 2600 mm, with evaporation exceeding rainfall for 10 months of the year. The vegetation is remnant, tall eucalypt, open woodland with a saltbush-bluebush understorey on calcareous soils.

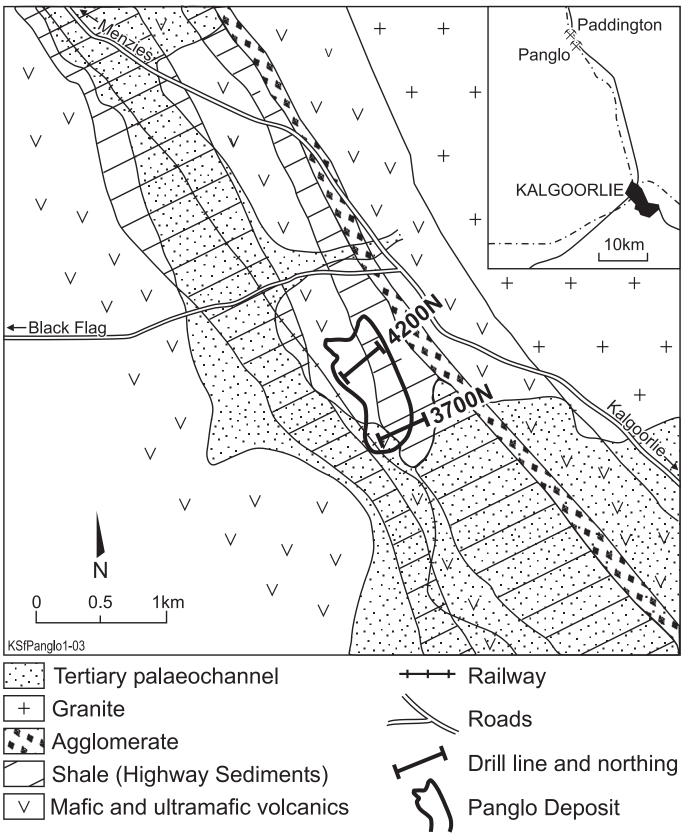

Figure 1. Location and local geology of the Panglo deposit with locations of studied drill lines (after mapping by Pancontinental Mining Ltd).

GEOLOGICAL SETTING

The Panglo gold deposit occurs within the major N-trending Norseman-Wiluna Greenstone Belt (Witt and Swager, 1989). The rocks are Archaean sediments and mafic to ultramafic volcanic rocks that have been regionally metamorphosed to the greenschist facies (Hancock *et al.,* 1990). In the deposit area, rocks dip at 70°W and, because of intense shearing, lithological variations are common over small distances. Palaeochannel sediments of probable Late Eocene age (*cf.* Kern and Commander, 1993) occur near the deposit, especially on its western side (Figure 1).

REGOLITH

In the Panglo district, there are erosional and depositional regimes. Erosional regimes dominate and have subcropping ferruginous and bleached saprolite, derived from Archaean metasediments and metavolcanics, partly covered by a veneer (<0.5 m) of sandy colluvium. The depositional regimes consist of up to 10 m of palaeochannel sediments, dominantly mottled clay overlain by gravel (ferruginous pisoliths, nodules and some lithic fragments) some of which are cemented by calcrete in the top metre. The ground is mantled by a brown, ferruginous lag, of red-brown pisoliths, some coated by carbonates.

Most soils in both erosional and depositional regimes are calcareous in the top 1.5 m (Lintern *et al.,* 1997). However, carbonates tend to be thinner and patchy in the salt scald and absent from the playa.

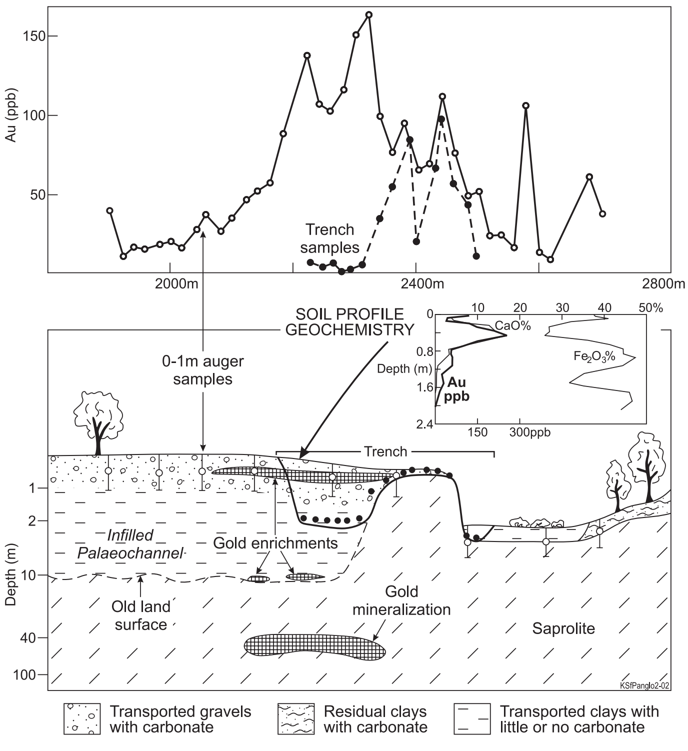

Figure 2. Section 3700mN across the Panglo deposit showing the differing response obtained by sampling shallow, carbonate-rich horizons and relatively deeper carbonate-poor material, the Au, Fe and Ca geochemistry of the soil profile and the relationships between Au anomalies in the saprolite, channel sediments and soil (after Lintern and Scott, 1990).

MINERALIZATION

The mineralization is subparallel to the regional NW strike, in an area 900 x 300 m (Figure 1). It forms several supergene blankets, commonly 2-5 m thick (but some up to 16 m thick), and is overlain by 30-55 m of Au-depleted (Au <50 ppb) saprolite (Figure 3A). The initially defined open-pit mineable reserve at Panglo was 1.5 Mt at 2.7 g/t (Hancock *et al.,* 1990). Small parcels of this oxidized ore were mined and processed at the nearby Paddington mill in 1990-1991. In the underlying fresh rock, up to 2 g/t Au occurs with pyrite and arsenopyrite along sheared mafic-sedimentary rock contacts, but more disseminated sulphides are generally an order of magnitude lower in grade. Deep drilling, in 1997, failed to define an economic fresh-rock resource.

REGOLITH EXPRESSION

Saprolite and saprock

Gold contents are very low (<50 ppb) in the 30-55 m of the saprolite over supergene mineralization. Mineralization in saprolite and saprock at Panglo is associated with elevated Ag, As, Cu, Sn, W and K (Scott and Howard, 2001). Arsenic (>100 ppm) forms a very consistent halo about the deposit (Figure 3B). However, many other element concentrations are influenced by primary lithology. Thus, Cu >100 ppm defines an envelope about the mineralization in the weathered volcanic rocks but not in the thick shale sequence on the E side of the deposit (Figure 3C). Similarly, K is enriched by almost a factor of two in altered and mineralized mafic volcanic rocks (Scott and Howard, 2001). However, this is less obvious in shales, which were already K-rich prior to alteration (Figure 3D). Nevertheless, saprolite derived from shale associated with mineralization contains alunite, formed from weathered pyrite, which is absent in the weathered volcanic rocks (Figure 3E). Paragonite occurs laterally to the mineralization (Figure 3E).

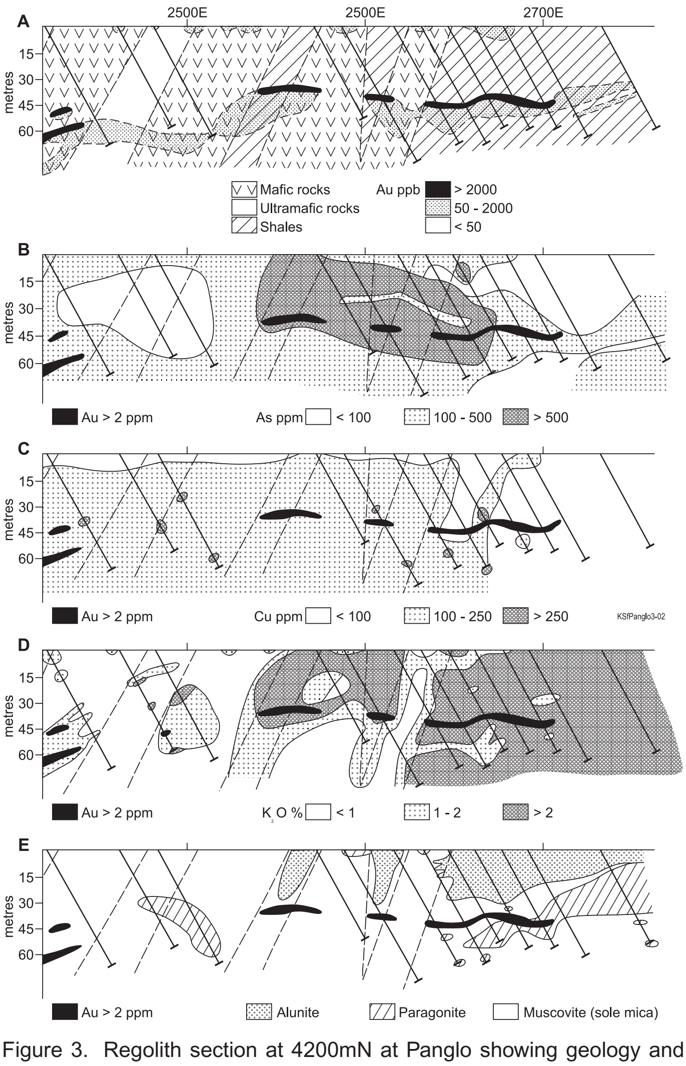

Figure 3. Regolith section at 4200mN at Panglo showing geology and the abundances of Au, As, Cu, K, alunite and micas in the saprolite.

Soil: erosional regimes

There is a strong relationship between Au and alkaline earths in calcareous soils which gives a strong surface expression to mineralization even where Au contents in underlying saprolite are very low. On section 4200N, where soil is derived from saprolite in the salt scald, this correlation is strongest in the top 10-20 cm (Figure 3A). Carbonate development here, however, is thin and patchy and the relationship becomes tenuous with depth. High Au concentrations (>100-500 ppb Au) in the top 4 m occur in non-calcareous materials. They probably represent relict Au particles protected in ferruginous nodules, mottles and quartz which, with further weathering, will supply Au to the carbonates (Lintern and Scott, 1990; Lintern, 2001).

Soil: depositional regimes

Gold and Ca are highly correlated in the ferruginous, gravelly soils over the palaeochannel. On section 3700N, the peak Au concentrations in soil (0-1.0 m, 160 ppb) are directly above the supergene mineralization, which is here overlain by 30 m of leached, Au-poor saprolite and 10 m of barren sediments (Figure 2). The Au in carbonate is chemically very soluble and has been dispersed hydromorphically. The immediate source of Au is equivocal, as there are high Au concentrations at the unconformity, implying either vertical upward dispersion of 10 m, or lateral dispersion from patchily mineralized saprolite outcrops at the E end of the trench, downslope from the peak anomaly (Lintern, 2001).

BIOGEOCHEMISTRY

Three major species, *Atriplex* (saltbush), *Eremophila* (poverty bush) and *Eucalyptus*, grow over the deposit. Gold in *Eremophila* leaves generally correlates with the Au in soils but the other two species do not (Lintern et al., 1997).

HYDROGEOCHEMISTRY

Waters from, and close to, the deposit are saline (averaging 84 000 mg/L total dissolved solids) but are quite variable in their Fe, Al and Mn contents. Such variations and minor element contents, which are closely related to the lithology with which the groundwaters are in contact, are common in groundwaters of the Kalgoorlie region (Gray, 2001). In places, there is up to 3.7 ppb Au in waters from within 200-300 m of mineralization (Gray, 1990).

ACKNOWLEDGEMENTS

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SAMPLE MEDIA - SUMMARY TABLE

Sample medium	Indicator elements	Analytical methods	Detection limits	Background	Maximum anomaly	Dispersion distance
Primary mineralization in shale	Au	INAA	5 ppb	<5 ppb	2000 ppb	-
Supergene mineralization in shale-derived saprock/saprolite	Au Ag As Cu Sn	GFAAS OES XRF ICP OES	10 ppb 0.1 ppm 10 ppm 5 ppm 1 ppm	<10 ppb ppm 60 ppm 10 ppm 2 ppm	3900 ppb 20 ppm 690 ppm 350 ppm 20 ppm	?10m 10 m 30 m 10 m 10 m
Supergene mineralization in mafic volcanic-derived saprock/saprolite	Au As Cu Sn W	GFAAS XRF ICP OES OES	10 ppb 10 ppm 5 ppm 1 ppm 10 ppm	<10 ppb 150 ppm 140 ppm 1 ppm 10 ppm	4600 ppb 2500 ppm 390 ppm 5 ppm 60 ppm	?10m 50 m 50 m <10 m 30 m
Calcrete/carbonate	Au	INAA	2 ppb	10 ppb	120 ppb	<10 m (vertical)
Soil (partially transported)	Au	INAA	2 ppb	10 ppb	250 ppb	100’s m laterally
Vegetation (Eremophila spp.)	Au	GFAAS	1 ppb	1 ppb	59ppb	200m
Groundwater	Au	GFAAS	0.05 ppb	0.05 ppb	3.7 ppb	200-300m

ICP and AAS analysis followed dissolution with HF/HClO4/HNO3 and HCl