

PALAEOCHANNEL GOLD DEPOSITS, MOUNT PLEASANT DISTRICT, WESTERN AUSTRALIA

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LOCATION

The Mount Pleasant district is located at 30°32'S 121°15'E, approximately 30 km NW of Kalgoorlie; Kalgoorlie 1:250 000 map sheet (SH51-9).

DISCOVERY HISTORY

Approximately 30% of the 1.9 million ounces of Au recovered from the Mount Pleasant district since the resumption of Au mining in the 1980s has been from numerous palaeochannel deposits, shown in Figure 1. The initial discovery, Centaur Mining and Exploration Ltd's major Lady Bountiful Extended ("LBE") complex, was found by drilling for extensions of the Lady Bountiful primary mineralization in 1983 (Devlin and Crimeen, 1990). Many of the deposits subsequently located owe their discovery to systematic drilling. Soil geochemistry played a part in the discovery of the Rose deposit, found by Black Flag

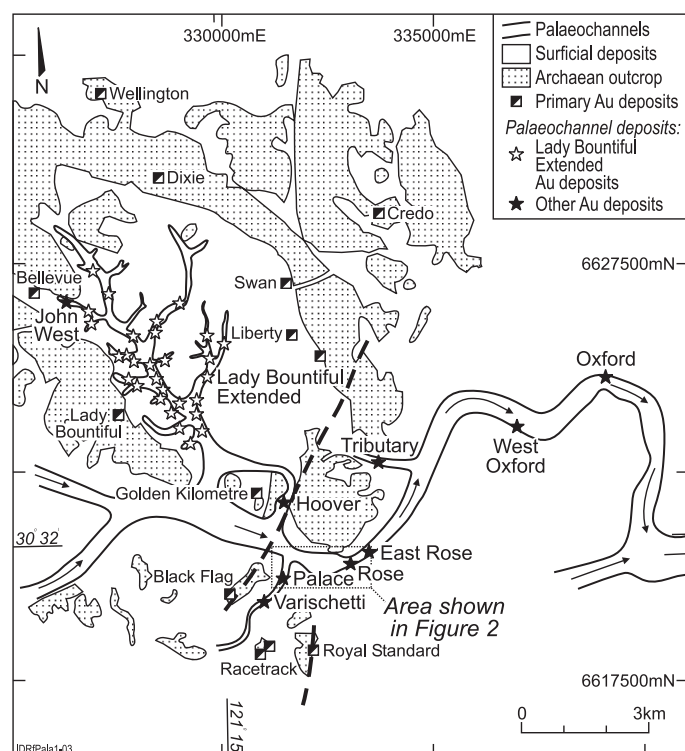


Figure 1. Distribution of primary (square symbols) and palaeochannel (stars) gold mineralization in relation to areas of Archaean outcrop (shaded) and the known palaeochannel system in the Mount Pleasant area. Open stars depict the Lady Bountiful Extended deposits and shaded stars the other palaeochannel deposits.

Consolidated in 1991 and the Palace and Coco deposits, found later by Mining Corporation of Australia Ltd and was used in exploration for additional palaeochannel deposits in the area.

PHYSICAL ENVIRONMENT

The climate is semi-arid with irregular rainfall averaging about 250 mm annually. The deposits occur in low-lying terrain, between a few low hills with outcropping Archaean rocks. The vegetation of the area is typically eucalypt woodland. A major palaeodrainage channel, the Black Flag Palaeochannel, has been followed over some 30 km within the Mount Pleasant area, forming part of a major drainage system which flowed eastwards into the Eucla Basin during the Tertiary (Commander et al., 1991; Gozzard, 1991). This palaeodrainage system has no surface expression, although the present drainage tends to parallel the palaeodrainage system, particularly in the headwaters near basement ridges, that form present-day topographic highs (Figure 1).

GEOLOGICAL SETTING

The Archaean sequence in the Mount Pleasant district consists of ultramafic, mafic and felsic volcanics with interbedded sediments, which have been intruded by mafic and felsic sills and dykes and folded into a granite-cored anticline known as the Mount Pleasant Anticline (Witt, 1993). The area is well endowed with primary lode Au mineralization, which tends to be associated with shear and fault structures trending NNE, ENE and E. Tertiary sediments host the palaeochannel deposits. Sinuous belts of these sediments unconformably overlie the Archaean and reflect the Tertiary drainage system.

REGOLITH

The palaeochannel deposits form depositional landforms. The regolith profile typically consists of thin calcareous loams (about 300 mm), overlying up to 30 m of mottled clays containing distinctive goethitic pisoliths which, in turn, overlie a basal sand horizon up to 10 m thick. The sand is commonly bleached and lenticular in cross section. One or more thin conglomeratic horizons may occur towards the base or lie directly on the Archaean. The column of transported material over the ore is commonly 25-40 m thick.

MINERALIZATION

Some of the numerous occurrences of both primary and palaeochannel Au mineralization in the Mount Pleasant district are shown in Figure 1. The most significant of the primary deposits are the Lady Bountiful (production and reserves as at 1987: 1.7 Mt at 4.2 g/t), Golden Kilometre (production 2.5 Mt at 4.2 g/t) and Racetrack (production 2.4 Mt at 2.9 g/t). The palaeochannel deposits range in size from the John West deposit (20 000 tonnes at 7.87 g/t) to deposits exceeding 1 Mt (e.g., Rose: 1 Mt tonnes at 2.2 g/t Au). They have favourable economics due to shallow depth, flat dips and free digging qualities of ore and overburden. The palaeochannel ore occurs predominantly within the basal sand but, in some cases, (e.g., the Palace zone; Figures 2 and 3) mineralization is almost entirely contained within saprolite below the sand. The deposits tend to be flat-lying and sheet-like to lenticular in cross section. Bonanza grades are not uncommon, particularly in lenses of conglomerate. Although many deposits shown in Figure 1 overlie mafic basement, the LBE complex, comprising some 29 separate deposits and accounting for most of the production, is underlain by granite.

REGOLITH EXPRESSION

The distribution of Au in soils over part of the palaeochannel system is shown in Figure 2. The <2 mm fraction of soils sampled from 100-200 mm depth was analysed by aqua regia digestion and graphite furnace AAS finish. The palaeochannel Au deposits fall within extensive low-order anomalies (>15 ppb Au compared to the regional threshold of about 8 ppb Au). Peak concentrations of 205 and 80 ppb Au were recorded proximal to the Rose and Palace deposits respectively and discontinuous zones with soil concentrations of >30 ppb Au follow the general trend of the palaeochannel mineralization. The spatial correlation between the anomaly contours and the surface projection of the mineralization is less direct than is generally the case for subcropping primary deposits. This is due to the thickness of the transported overburden and the controls on the dispersion process, which are poorly understood at present (Mazzucchelli, 1996). It can be seen from the cross sections in Figures 3A and B, that the top of the ore is buried to depths of 20-26 m, deepening in the northerly or downstream direction. Although full details are not given here, mineralization was also intersected by drilling soil anomalies of the order of 30 ppb in the main Black Flag palaeochannel in the Oxford prospect e.g. 4 m at 3.5 g/t Au from 32 m depth in OXRC60 (339080E; 6624880N).

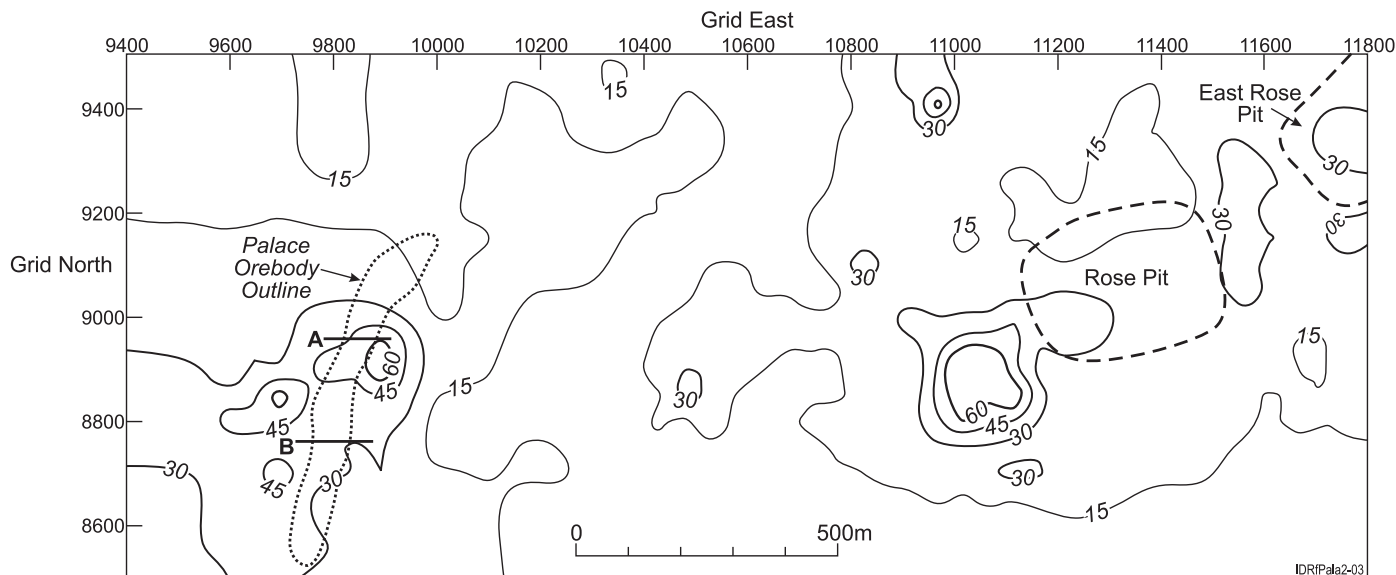


Figure 2. Distribution of gold concentrations in near-surface soils in relation to the surface projection of the Palace palaeochannel deposit and the general location of the Rose and East Rose deposits.

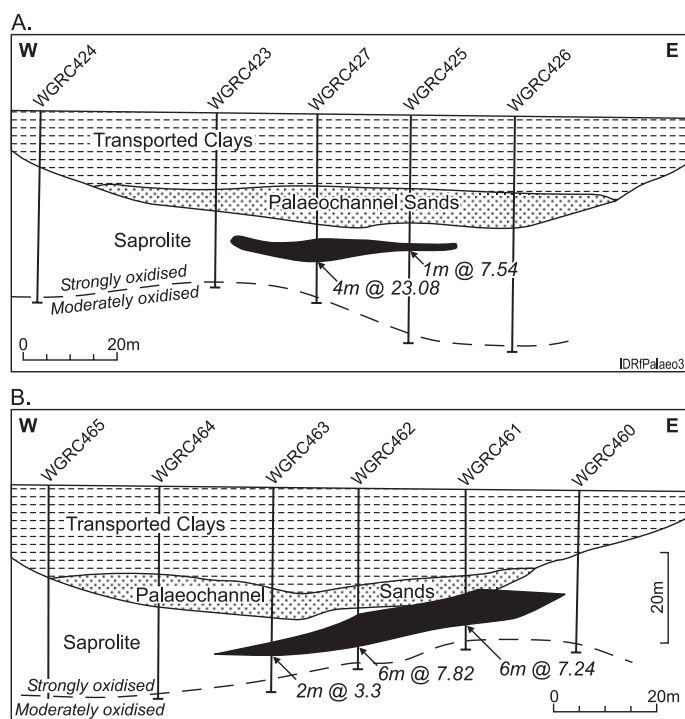


Figure 3. Palace Deposit: A. Cross-section A. B. Cross-section B, See Figure 2.

Gold abundance in groundwater samples collected from mineralized palaeochannels in the Mount Pleasant area range from 49 to 8856 ppt, compared to a regional threshold of 4 ppt (Giblin and Mazzucchelli, 1997). Thus, groundwater is a potentially useful medium to explore for palaeochannel Au deposits and may well be implicated in their genesis and in the development of their related soil anomalies.

REFERENCES

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SAMPLE MEDIA - SUMMARY TABLE

Sample medium	Indicator element	Analytical method	Detection limit	Background	Threshold	Maximum anomaly	Dispersion distance
Soil	Au	AAS-GF	1 ppb	12 ppb	15 ppb	150 ppb	150+ m
Groundwater	Au	INAA	1 ppt	<1 ppt	4 ppt	8856 ppt	?