WYOMING GOLD DEPOSIT, CENTRAL WESTERN NSW

K.M. Scott,[1] D.I Chalmers,[2] T. Ransted[2] and R Kairaitis[2]

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

[2]*Alkane Exploration Ltd., 96 Parry St., Perth, Western Australia 6000*

LOCATION

The Wyoming Au deposit is 2 km S of the township of Tomingley and 15 km N of Peak Hill (Figure 1; see Chapman, *this volume*) at 32°35'S, 148°13'E; Narromine (SI 55-3) 1: 250 000 map sheet.

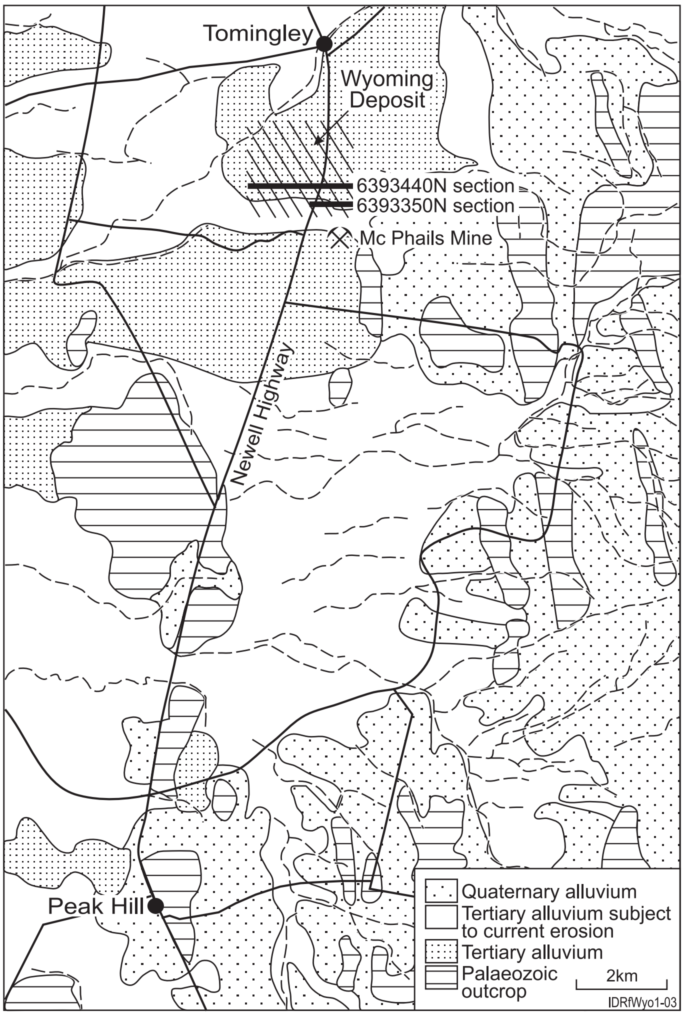

Figure 1 Location map of the Wyoming Deposit, N of Peak Hill, NSW (based on mapping by Sherwin, 1997).

DISCOVERY HISTORY

The Au mineralization in the Tomingley district occurs in a N-striking belt extending 12 km S of Tomingly. It and was worked from 1883 to 1914 and yielded 2.1 t of Au, 97% of which was from the McPhails (Myall United) Mine, 500 m SSE of the Wyoming deposit (Figure 1). Grades averaging 12 g/t were mined (Bowman *et al*., 1982). Thus, in 1997, SIPA Resources International NL and Michelago Resources NL drilled 45 air core holes through transported cover (up to 50 m thick) into weathered bedrock across the projected northern strike extension of the McPhails mineralization. Five holes intersected >1 g/t Au, one (WY29) intersected 16 m at 1.7 g/t Au (Michelago Resources NL, 1997). Changed company priorities meant that these anomalous results were not followed up until 2001, when Alkane Exploration Ltd., in joint venture with Compass Resources NL and Golden Cross Operations Pty. Ltd., conducted further drilling. A programme of 130 air core and reverse circulation drill holes, and one deep diamond drill hole intersected 117 m at 1.5 g/t Au (WY167) and indicated that the best grades were associated with intrusive porphyries. A preliminary resource was defined within the southern portion of the prospect (Wyoming South) in 2002 (Alkane Exploration Ltd., 2002).

PHYSICAL FEATURES AND ENVIRONMENT

The climate is temperate with warm to hot summers and cool to cold winters. The mean annual rainfall of 560 mm is relatively evenly distributed throughout the year as gentle rain in winter and heavy thunderstorms in summer. The average maximum and minimum temperatures are 33°C and 19°C in January and 15°C and 5°C in July. Several days with temperatures greater than 40°C occur during summer and about 5 days with temperatures less than 0°C occur in winter each year. Remnant open woodland (5%) and agricultural crops and pastoral grasses (95%) occur throughout the region.

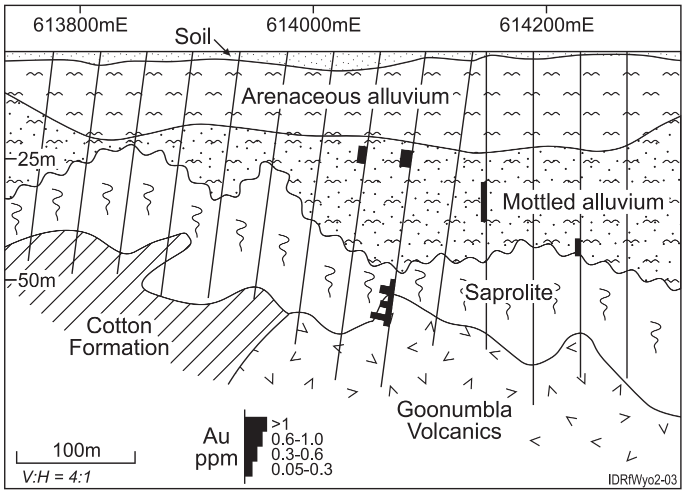

Figure 2 Idealised section along 6393440mN showing significant Au mineralisation (after Cruikshank et al., 1999b).

The Wyoming deposit occurs beneath essentially flat grazing and agricultural land, which drains to the W into the Bogan River. The deposit is covered by loamy soil but patches of gilgai occur to the E and SE. An extensive area of mine dump material from the McPhails Mine, SSE of the Wyoming deposit, had a grade of between 1-2 g/t Au (Bowman *et al*., 1982) and was retreated in the late 1990's.

GEOLOGICAL SETTING

The rocks of the Tomingley area are steep dipping late Ordovician Goonumbla Volcanics in the E overlain by pelitic sediments of the Cotton Formation (Sherwin, 1996) in the W (Figure 2), although recent drilling results are not entirely consistent with this. The volcanics are andesitic phyric lavas and flow breccias with pyroclastic- and volcaniclastic-rich units. These are cut by feldspar porphyry intrusives. At the McPhails Mine, quartz veins that host the mineralization dip steeply E and the volcanic wall rocks are so cleaved and altered that their primary fabrics are almost obliterated (Sherwin, 1996). A recent aeromagnetic survey over the Wyoming deposit area suggests that there may be other intrusive bodies adjacent to the Wyoming feldspar porphyries and the McPhails Mine (Alkane Exploration Ltd., 2002). Continued exploration here suggests that the Tomingly Au deposits are related to an interplay between structures and lithologies rather than related to a single reef system, as originally thought (Bowman *et al*., 1982). At the Wyoming deposit, there is no outcrop and bedrock is obscured by 30-50 m of alluvium.

REGOLITH

Weathering at the Wyoming deposit reaches 70 m but is much shallower to the N. Saprock and saprolite on the intermediate Goonumbla Volcanics are generally about 25 m thick and form an irregular mantle over fresh rock (Figure 2). Saprolite is unconformably overlain by a 15-20 m blanket of mottled alluvium, followed by 10-20 m of more sandy alluvium with lenses of gravel and 1-3 m of loamy soil.

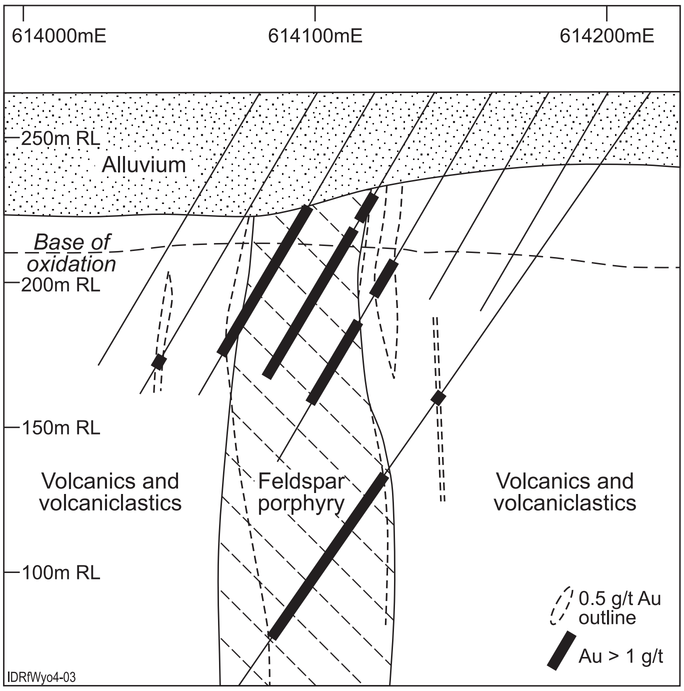

Figure 3 Section along 6393350mN showing the relationship of feldspar porphyry to mineralization (after Alkane Exploration Ltd., Press Release 20/12/01).

The unconformity between residual saprolite and mottled alluvium is shallower on the northern edge of the deposit and also shallows to the S, where the McPhails mineralization outcrops. Thus, the Wyoming mineralization appears to be beneath a palaeovalley.

Dating of similar mottled infill and underlying residual saprolite at Goonumbla indicates that the weathering to saprolite is late Palaeozoic, possibly early-mid Carboniferous, and mottling of the overlying sediments is Tertiary, possibly Miocene (Pillans *et al*., 1999). If similar ages apply here, the unmottled, arenaceous alluvium could be late Tertiary and have a different provenance to the mottled alluvium.

MINERALIZATION

Drilling suggests that potentially economic porphyry-related mineralization extends over a strike of 200 m with three smaller zones in volcaniclastic rocks adjacent to the porphyry (Figure 3). Quartz-sulphide alteration in the porphyry is intense. Gold is free-milling and recoveries of 95% are achieved with standard grinding and cyanide leach. Total sulphide contents are low; the sulphide is mainly discrete, comprising interstitial and intergranular grains and clusters of arsenopyrite. Late quartz-carbonate-albite-arsenopyrite veins are common. Drilling outlined a resource of 1.91 Mt at 1.81 g/t Au, using a 0.5 g/t Au cut off in the southern portion of the prospect (Wyoming South). The mineralization is still open at depth below 165 m and along strike to the SSE towards the McPhails Mine (Alkane Exploration Ltd., 2002).

Although supergene enrichment is reported at the McPhails Mine (Bowman *et al*., 1982), there is no evidence for supergene enrichment or depletion at Wyoming. Economic Au grades generally cease at the saprolite/mottled alluvium interface (Figure 3), but some highly anomalous Au intersections may be found higher in mottled alluvium (Figure 2).

REGOLITH EXPRESSION

The primary mineralization at Wyoming is not sulphide rich, but commonly has 3000 ppm As and 200 ppm Cu in arsenopyrite-rich Au intersections. Weathering of quartz-sulphide assemblages leads to some loss of As and Cu in the residual saprolite (1200 and 140 ppm, respectively), although there is no evidence for Au depletion. Much lower abundances of Au and pathfinder elements occur in the basal 10 m of the mottled saprolite developed in alluvium and such values are generally reduced to background higher in that unit and the overlying arenaceous alluvium. Recent detailed study of the mottled alluvium by Alkane Exploration Ltd did not find significant Au in this transported material. However, Au anomalies have been found in the soil above mineralization (see Table). Detailed evaluation of partial extraction techniques on these soils (Cruikshank *et al*., 1999a) showed that the anomalies defined by the Regoleach, MMI and Enzyme Leach techniques did not perfectly correspond (Figure 4). Copper and As, where determined by these methods, gave unclear results although the Enzyme Leach results were more coherent. Gold determined after an *aqua regia* digest probably is a more cost-effective method than partial extraction (Cruikshank *et al*., 1999b). To understand these soil anomalies better, the soils were sieved into 6 different fractions ranging between –75 μm and >1 mm. Gold was consistently more abundant in the finest fraction, although the 0.5-1 mm fraction from samples along the eastern end of the studied traverse also contained high Au contents (5.8 ppb). Iron also has a bimodal distribution in the coarsest and finest soil fractions but As and Sb, which generally follow Fe, were only concentrated in the coarse soil fraction. Abundant Au and pathfinder elements in mine dump material from the McPhails Mine to the SSE suggests that there may have contamination of the soils by mechanical (aeolian and/or colluvial) dispersion especially when the dumps were being re-treated recently. Thus, the anomalous soil geochemical data may be fortuitous.

Because the transported materials can be distinguished easily from residual saprolite by their higher water content in infrared spectra, interface sampling at the unconformity could have been appropriately used at the deposit.

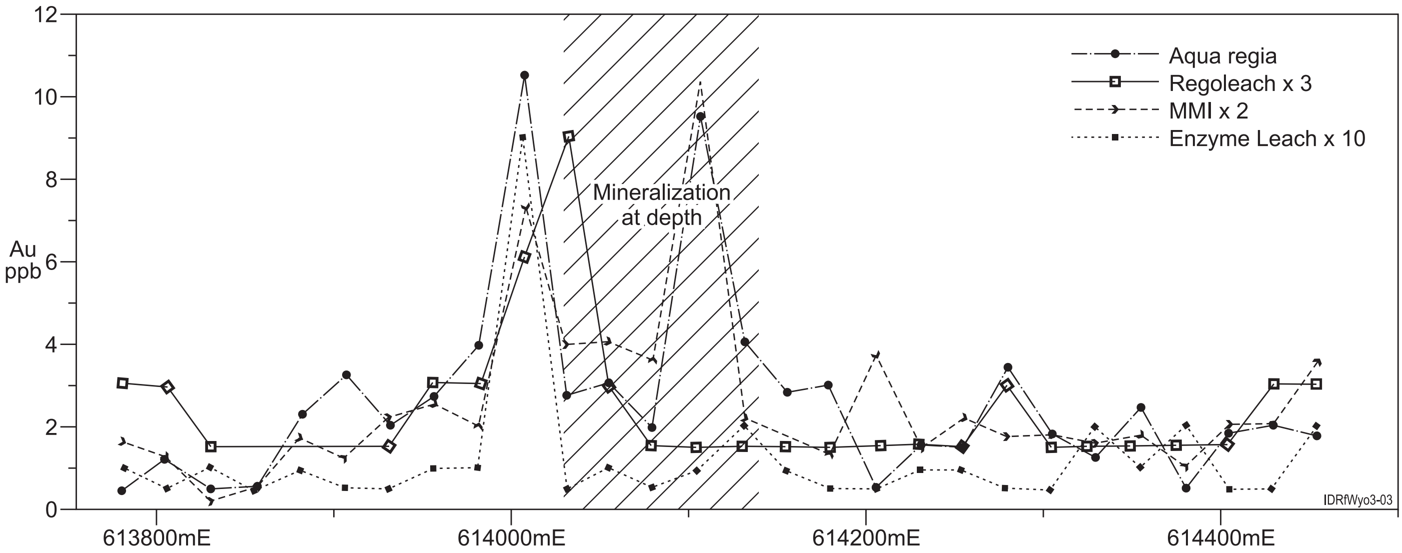

Figure 4 Plots of Au determined on soil after aqua regia digest, Regoleach, MMI and Enzyme Leach on 6393440mN (after Cruikshank et al., 1999b).

ACKNOWLEDGEMENTS

The early work of Ian Baillie (formerly SIPA Resources International NL) and Bruce Cruikshank (formerly AGSO) is gratefully acknowledged.

REFERENCES

Alkane Exploration Ltd., 2002. Announcements. Tomingley Project. 24 May 02. www.alkane.com.au

Bowman, H.N., Richardson, S.J. and Dolanski, J., 1982. Narromine 1:250 000 metallogenic map SI/55-3 – Mine data sheets and metallogenic study. Geological Survey of New South Wales, Sydney. 337 pp.

Chapman, J.R., 2003. Peak Hill Au deposit, Peak Hill, NSW (*this volume*)

Cruikshank, B.I., Baillie, I. and Scott, K.M., 1999a. An evaluation of partial extraction techniques at the Wyoming Cu-Au prospect, Parkes region. Part 1.Comparison of three partial extraction methods in surficial soils. Report 112R, CRC LEME, Perth. 59 pp.

Cruikshank, B.I., Scott, K.M. and Baillie, I., 1999b. An evaluation of partial extraction techniques at the Wyoming Cu-Au prospect, Parkes region. In P.C. Lewis (Editor) Exploration Under Cover '99. Australian Institute of Geoscientists Bulletin 28:43-51.Part 1.

Michelago Resources NL, 1997. Annual Report, Exploring for Australia's Future. St Leonards, Sydney. 36pp.

Pillans, B., Tonui, E. and Idnurm, M., 1999. Paleomagnetic dating of weathered regolith at Northparkes Mine, NSW. In G. Taylor and C. Pain (Editors) New Approaches to an Old Continent, Proceedings of Regolith '98. CRC LEME, Perth. pp.237-242.

Sherwin, L., 1996. Narromine 1:250 000 geological sheet SI/55-3: Explanatory notes. Geological Survey of New South Wales, Sydney. 104 pp.

Sherwin, L., 1997. Narromine 1:250 000 Geological Sheet SI/55-3. Second edition. Geological Survey of New South Wales, Sydney.

SAMPLE MEDIA - SUMMARY TABLE

Sample medium	*Indicator elements*	*Analytical methods*	*Detection limits (ppm)*	*Background (ppm)*	*Maximum anomaly (ppm)*	*Dispersion distance (m)*
Primary rock	As	ICP	1	<1	7200	
	Au	FA (30 g)	0.010	0.006	13.3	
	Cu	ICP	1	45	250	
Saprock/saprolite	As	ICP	1	<1	2200	Minimal
	Au	FA (30 g)	0.010	0.006	2.22	
	Cu	ICP	1	50	240	
Mottled alluvium	As	ICP	1	8	260	10 vertical
	Au	FA (30 g)	0.001	0.006	31	10 vertical
	Cu	ICP	1	25	30	minimal
Soil	As	INAA	1	6	7	100's
	Au	FA (30 g)	0.001	<0.001	10	(mechanical dispersion)

Note: data for weathered material in this table is mainly derived from the earlier SIPA data
ICP analyses followed $HF/HClO_4/HNO_3/HCl$ dissolution.
FA = Fire assay on 30 g aliquot.