LP3 Pb-Zn MINERALIZATION, COBAR DISTRICT, NSW

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LOCATION

The mineralization at LP3 is approximately 35 km SW of Cobar and 1.5 km NNW of the McKinnons Gold Mine (Figure 1) at 31°46'12"S, 145°40'53"E; Cobar 1:250 000 (SH55-14) and Wrightville 1:100 000 (8034) map sheets.

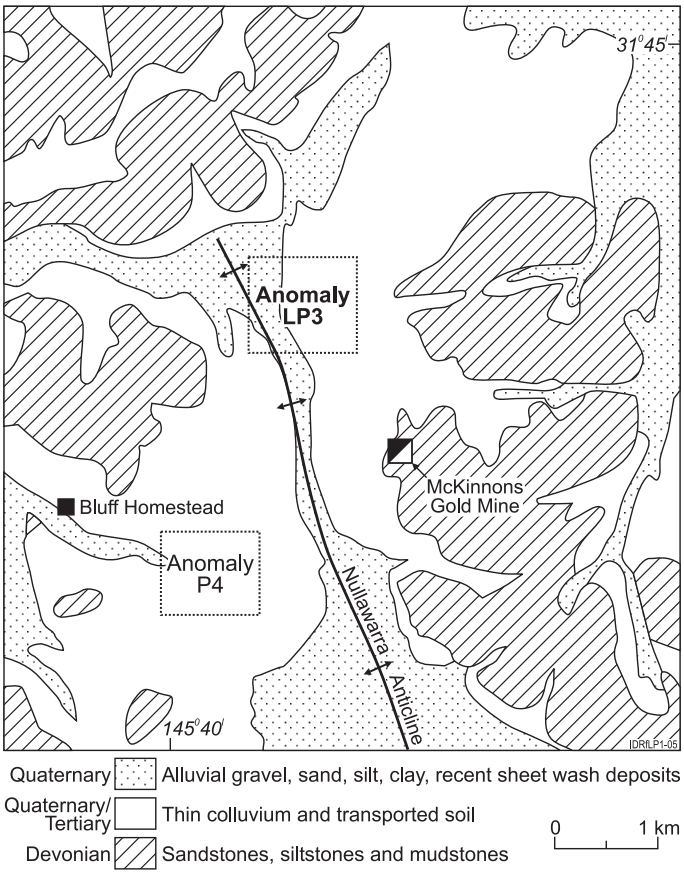

Figure 1. Location map and geology around the LP3 and P4 anomalies, slowing the McKinnons Gold Mine (after Glen, 1987).

DISCOVERY HISTORY

Geopeko identified structurally-hosted Pb-Zn pyrite mineralization associated with an Induced Polarization anomaly trending NNW (330°) from the McKinnons Gold Mine. Between 1989 and 1991, this was tested by RAB drilling and diamond drilling (Schmidt, 1991). The continuity of the mineralization was only recognized following a reconnaissance partial leach soil geochemical survey by Burdekin Resources NL in 1995 (Johnston, 1995, 1996). This covered >1000 km^2 along the western margin of the Cobar Trough, centred on the McKinnons Gold Mine and led to the discovery of Anomaly P4 (Rutherford and Salt, this volume), a Au-As-Sb-pyrite show, Goldwing, a small sub-economic disseminated Au-pyrite resource, and other anomalies.

PHYSICAL FEATURES AND ENVIRONMENT

The region is dominated by low undulating hills, dissected by broad alluvial flats with a relief of about 20 m on a base of about 200 m ASL. The prospect is flat, with a relief of 3-4 m. Vegetation is open and dominated by an *Acacia-Eremophila* association with ironwood, wilga, mulga, and emu bush; cypress pine (*Callitris spp*.) is common in drainages. The climate is semi-arid and has both summer and winter rainfall averaging about 330 mm per annum. Evaporation varies from 320 mm in January to about 50 mm in July. Mean daily temperature ranges are 20-34°C in January and 4-16°C in July.

GEOLOGICAL SETTING

LP3 occurs within the same structural corridor as the McKinnons Gold Mine (Figure 1) and along strike from low-grade base metal mineralization at that mine site. RAB drilling suggests mineralization is fault-hosted within and at the margins of fault bound blocks of massive Devonian Lerida Limestone of the Amphitheatre Group that extends from just N of McKinnons for at least 2 km N. Fine to medium grained sandstone, mudstone and fossiliferous calcareous units of the Amphitheatre Group, such as in the McKinnons open pit, are associated with the limestone. The irregular depth of intersection of the upper surface of the limestone (Figure 2) and abundant Fe-Mn oxides at the contact suggest development of a karst surface in the Tertiary. This was followed by burial by 10-40 m of gravel and silt during the Late Tertiary and Quaternary. However, faulting could also account for the depth variation. Rhyolitic volcanic rocks occur within the Devonian limestone a few kilometres to the N.

REGOLITH

There is no outcrop around LP3 and the mineralization is located partially beneath a recent catchment, capped by Quaternary sheet wash, alluvial sand, silt and clay. Float, mostly rounded gravel clasts, is rare. Regionally, red earths, calcareous red earths and lithosols dominate. These soils are probably not residual but developed on sediments derived from erosion of a Cretaceous ferruginous profile and from aeolian action (Leah, 1996). On the western side of the anomaly, Quaternary deposits, within a recent catchment, cover older Tertiary-Quaternary valley fill. This valley fill reaches 20-40 m in thickness over the central and southern parts of the anomaly and consists of quartz gravel, clay, fine to medium sand and sandy clay. Locally, sheet wash extends northward from the slightly elevated McKinnons area on to the southern parts of LP3.

The present drainage sediments form a veneer over Devonian basement and Tertiary alluvial materials and do not reflect the buried pre-Quaternary drainage. The axis of the earlier drainage lies S and E of the current position.

The Cretaceous weathered profile has a thick zone of pallid saprolite which, in some places, has been partly or totally eroded during the Tertiary. This indicates a strongly dissected terrain prior to infill during the late Tertiary and Quaternary. Boundaries between soil, transported cover and weathered bedrock are difficult to distinguish in RAB cuttings due to high clay contents, but quartz gravel indicates alluvial cover. Calcrete commonly occurs at 5-8 m and reflects underlying limestone (Salt, 1996; Salt and Donnelly, 1996; Johnston, 1996).

A dark brown to black Fe-Mn-rich horizon (Figure 2), rich in Zn, extends

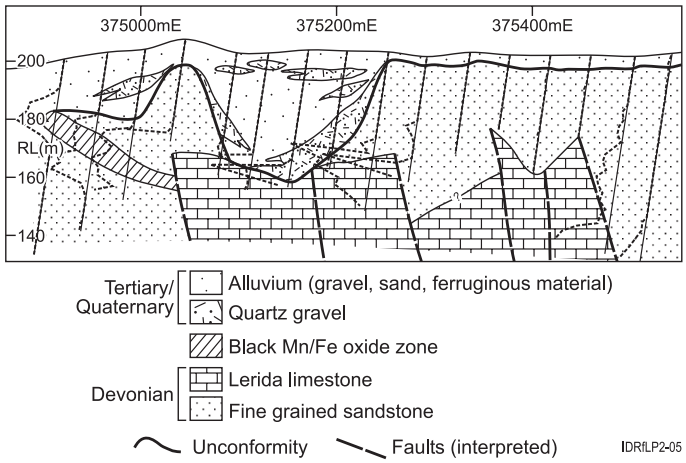

Figure 2. Geological and Zn geochemical section across Anomaly LP3 on oblique traverse centred at 375213E 6483689N.

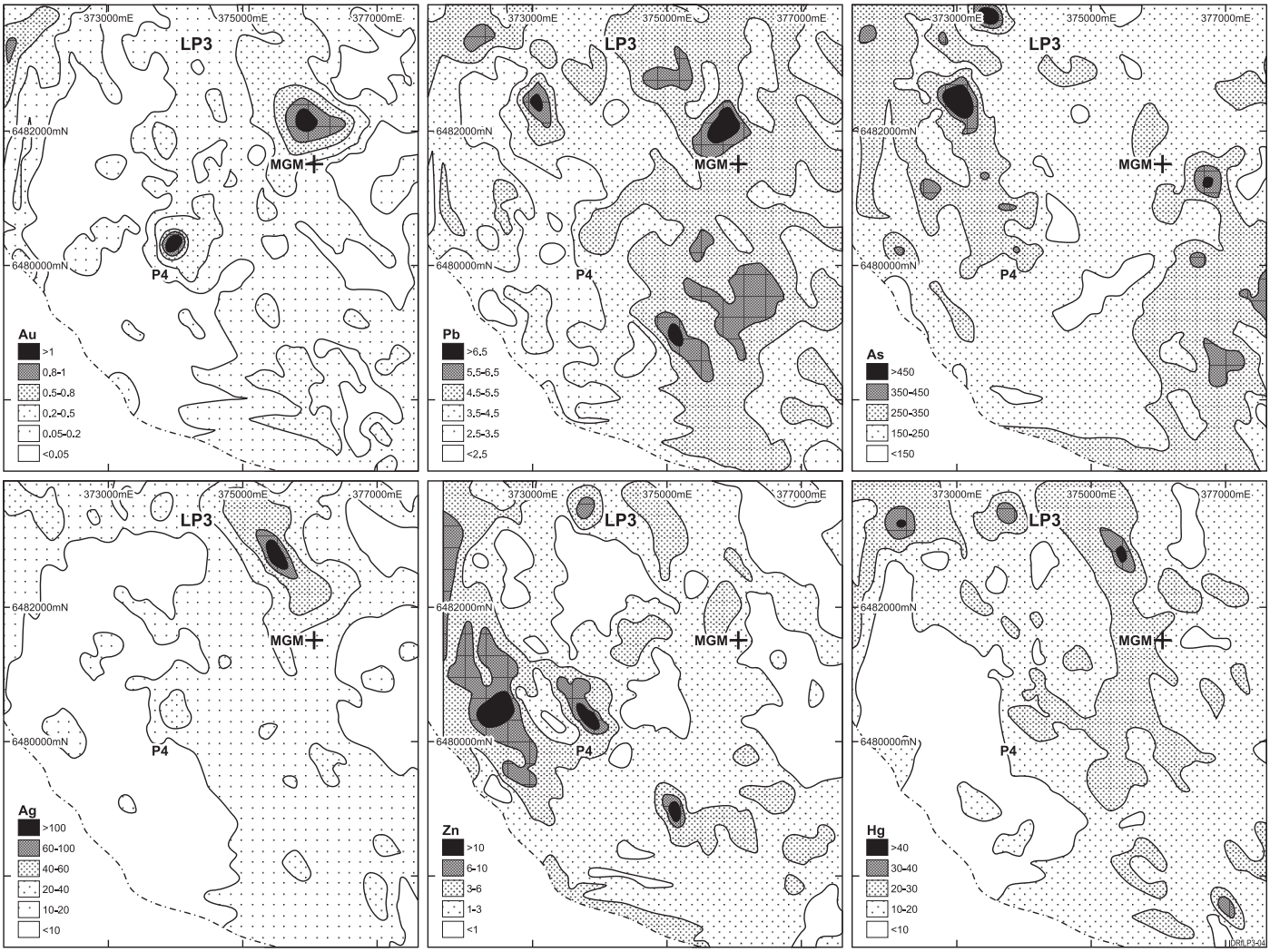

Figure 3. Partial leach (dilute HCl) geochemistry of the <75 µm soil fraction of Au (ppb), Pb (ppm), As (ppb), Ag (ppb), Zn (ppm) and Hg (ppb) of the area in Figure 1. Also shown are the P4 mineralization (P4) and the McKinnons Gold Mine (MGM).

away from the fault-bounded blocks. Lead is anomalous adjacent to the limestone contact and within the limestone unit. Distinctive brown redox boundaries in the saprock are anomalous in Pb, Zn and Au.

MINERALIZATION

The RAB drilling did not reach primary mineralization. The mineralization is thought to be similar to that in the McKinnons pit, where minor galena, sphalerite, and traces of chalcopyrite, arsenopyrite and Au occur within a broad, silicified shear. Shear-hosted disseminated pyrite causes a well-defined IP anomaly beneath the McKinnons Au mineralization and extends NNW to LP3 where pyrite is the only sulphide in saprock. There are at least three, possibly four, mineralized fault or shear zones, two along the boundaries of the limestone blocks and one or more within faulted limestone within a 600 m wide interval over 1000 m of strike (Figure 2). Mineralization beneath the limestone is untested but base metal mineralization at McKinnons suggest that the host structures may be 2-3 m wide within a pyritized envelope with a steep easterly dip (80-85°) and this is consistent with RAB drilling across LP3.

REGOLITH EXPRESSION

The anomaly at LP3 is best defined by partial leach (dilute HCl) Ag geochemistry of soil. Silver forms a broad 2000 m long anomaly, trending NNW from the McKinnon's deposit, with a maximum of 230 ppb (Figure 3). Mercury, Mn and, to a lesser extent, Co, Mo, Cu and Zn are also anomalous (Figure 3). The strong Ag anomaly was originally thought, by Burdekin Resources, to be derived from the McKinnon's deposit (Johnston, 1995, 1996; Rugless and Elliot, 1995; Bywater *et al.*, 1996). It now appears more likely that the anomalies reflect mineralization at depth, beneath 20-40 m of cover. The most compelling reason is the difference between element concentrations at the McKinnons deposit and Anomaly LP3. However, Ag appears to mark the continuity of the mineralized structure between Anomaly LP3 and McKinnons (Figure 3). The dispersion of base metals, such as Zn (Figure 3), into the cover has been strongly inhibited by the alkaline environment of the limestone and calcareous sandstones in the sequence at LP3 but not at McKinnons. Elements such as Ag, Hg, Mo, (and possibly also locally Co, Mn, Bi, Au) may by quite soluble in these environments as thiosulphate complexes (from weathering of pyrite in the presence of a carbonate buffer), hydroxy-species or oxy-anions and disperse through the profile. Thus Ag, Hg and Mo become useful pathfinders in environments of high pH, rather than the base metals, which have very limited dispersions in such circumstances. Concentrations of these elements in the soils are very low, requiring ICP-MS analysis of the partial leach solutions (Rutherford, 2000, 2004). Most of these elements are below detection for routine 'total' analysis. Pisoliths are rare or absent over most of the area and none have been analysed.

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SAMPLE MEDIA - SUMMARY TABLE

Sample medium	Indicator elements	Analytical method	Detection limit (ppm)	Background (ppm)	Maximum anomaly (ppm)
Soil	Au		0.00004	0.0001	0.0004-0.00088
	Cu		0.2	2-4	5-6
	Pb		0.1	3-4	5-6
	Zn		0.1	1-3	8
	As		0.05	0.1-0.2	0.25
	Sb	ICP-MS[1]	0.0005	0.01-0.015	0.025-0.035
	Ag		0.001	0.015-0.030	0.23
	Mo			0.040-0.060	0.12
	Co			1-2	4-5
	Hg			0.01-0.02	0.04-0.087
Saprolite	Au		0.001	0-0.002	0.12
	Cu		1	5-15	601
	Pb		1	8-15	7430
	Zn	ICP-AES	1	15-30	14900
	Ag		0.1	0-0.2	5.2
	As		1	2-4	156
	Sb		2	0-2	114

[1]After a partial leach of a 4 g aliquot with dilute HCl (cold extraction in 40%HCl with intermittent agitation over four hours prior to dilution before analysis).