TRINGADEE ZINC ANOMALY, NE QUEENSLAND

C. Phang

CRC LEME, CSIRO Exploration and Mining,P.O. Box 1130, Bentley, WA 6102

LOCATION

The Tringadee Zn anomaly is about 120 km S of Cloncurry and 12 km W of Cannington Mine at 21º52'30"S, 140º47'57"E; Duchess 1:250 000 map sheet (SF54-06), Selwyn 1:100 000 map sheet (7054).

DISCOVERY HISTORY

Aberfoyle Resources Ltd found the Tringadee Zn anomaly in 1992 by drilling aeromagnetic anomalies through the Mesozoic sedimentary cover. A widespread Zn anomaly (Figure 1), up to 1000 ppm, occurs in white to brown claystone in the Mesozoic cover which is confined to a N-striking palaeovalley. Drilling data indicate that the Tringadee anomaly is separated from the Cannington Pb-Zn-Ag deposit by a palaeohigh.

PHYSICAL ENVIRONMENT

The Tringadee Zn anomaly lies beneath a pediment developed from hills of Mesozoic sediments and is covered with a polymictic lag of goethite- and Mn-rich lithic fragments and Fe-stained brecciated, silicified saprolite. The climate is tropical, semi-arid, with an annual average rainfall of 375 mm and minimum and maximum temperatures of 24-37ºC in January and 9-24ºC in July. The vegetation is mainly spinifex and sparse, low trees and shrubs. Pockets of dense to open scrubby turpentine bush (*Acacia lysiphloia*) are common, with eucalypts growing along watercourses.

GEOLOGICAL SETTING

The Tringadee Zn anomaly is underlain by rocks of the Eastern Succession of the Proterozoic Mt Isa Block. These basement rocks are covered by 20-30 m of variably eroded and weathered Mesozoic sediments, largely siltstones, with poorly sorted and commonly cross-bedded, basal sandstones and conglomerates. Regionally, the Mesozoic rocks form the margin of the Eromanga Basin and thin to the N. Proterozoic granitoids, minor calc-silicates, amphibolites and some metasediments outcrop towards the W (Figure 1).

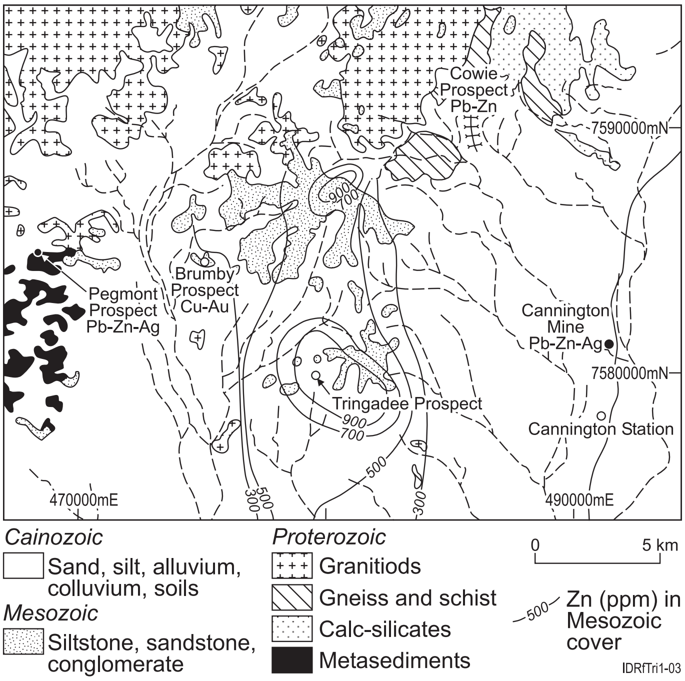

Figure 1. Simplified geological map of the Tringadee Prospect (Zn contours from Aberfoyle Resources Ltd).

REGOLITH

Tringadee lies beneath pediments developed on the flanks of Mesozoic claystone mesas (Figure 2). The Mesozoic rocks are weathered to saprolite or, at least, to saprock and the mesas are capped by patchy remnants of laterite (Phang *et al.,* 1997). Much of the upper part of the Mesozoic has been silicified to porcellanite, commonly brecciated and cut by conchoidal fractures that have formed the loci for Fe accumulation. The mesas have a local relief of <30 m and are deeply incised by gullies that expose soft, pale, grey-brown, smectitic claystone saprolite. Some mesas have been further eroded to isolated, low, conical hills or buttes. In some places, exposure of sub-horizontal goethite- Mn oxide-rich bands in the saprolite has formed low knolls or a step-like microrelief. Manganese oxides from the surface were dated by $^{40}Ar/^{39}Ar$ (Vasconcelos, 1998) as late Miocene (12 Ma). Similar ages were obtained from manganiferous materials from the Cowie and Pegmont prospects (Figure 1).

Where the cover is shallow (20 m), the Proterozoic basement rocks are weathered to saprolite (Robertson *et al.,* 1997). Where the cover is substantial (80 m), they have been only slightly weathered to saprock in the pre-Cretaceous (Robertson and Li Shu, this volume).

The surrounding depositional plains have extensive smectitic black soils with gilgai microrelief, caused by shrinking and swelling of clay. These soils are commonly 1-2 m thick and are developed on recent colluvium-alluvium on weathered Mesozoic and Proterozoic rocks.

MINERALIZATION

No primary basement-related mineralization has been identified in the Proterozoic granites beneath the extensive Zn anomaly in the Mesozoic sediments. The Tringadee Zn anomaly appears to be associated with accumulated Fe and Mn oxides in ferruginous bands within the weathered Mesozoic sediments and the source of the Zn is thought to be external, lateral and distal.

REGOLITH EXPRESSION

A RAB drill intersection at Tringadee (ROTR156 at 479500mE, 7580000mN) containing >1000 ppm Zn was investigated as part of a more detailed study (Phang *et al.,* 1997) to determine the source of the Zn anomaly. Colluvial-alluvial plains, near low mounds of Fe- and Mn-stained Mesozoic sediments, surround this site. A schematic regolith profile of ROTR156 shows the dispersion of Zn and related elements (Figure 3).

Analyses of different size fractions of the intersection in ROTR156 showed that the median concentration of Zn, Cu, Pb, As and Sb were similar in the >2000 µm and the 710-2000 µm fractions, but with very variable abundances of Fe_2O_3 (2-60%), Al_2O_3 (6-20%) and SiO_2

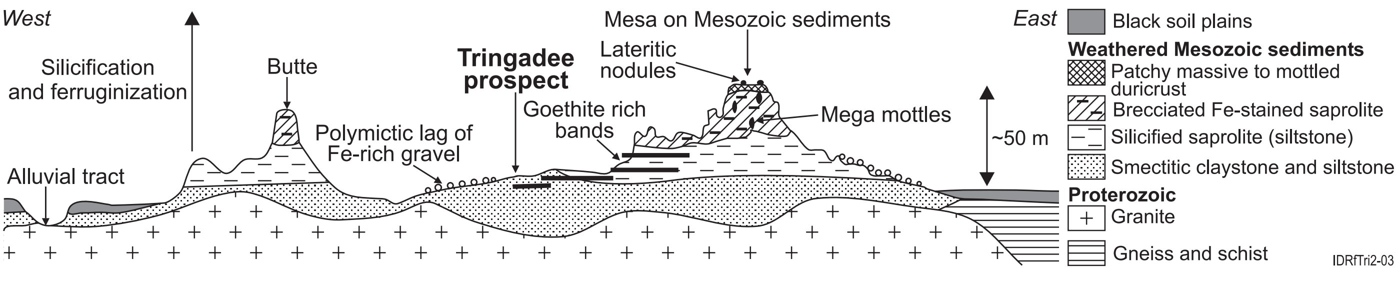

Figure 2. Regolith model of the Tringadee Prospect.

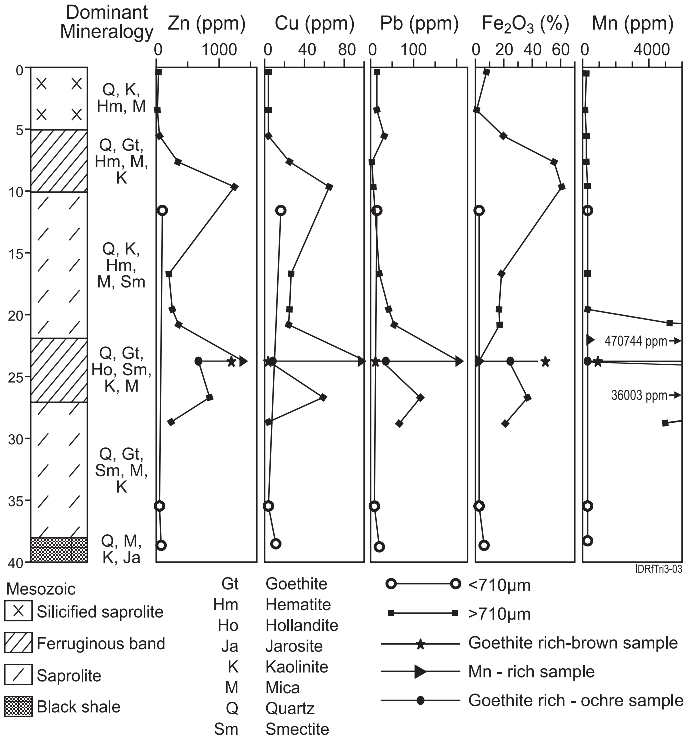

Figure 3. Regolith profile for RAB ROTR156 showing dominant mineralogy and distributions of Zn, Cu and Pb with Fe and Mn.

(22-70%). For most of the remainder of the samples, the >710 µm fraction was analysed; however, in about 20% of the samples this was insufficient, so that the <710 µm fraction, which is dominated by quartz and kaolinite, was used instead. Samples at various depths within a profile were selected for analysis based on colour (reds and browns). For ferruginous bands in the saprolite, the >710 µm fraction was hand separated into Mn-rich and Fe-rich materials.

Zinc is relatively enriched in sub-surface ferruginous bands at depths of 5-10 and 20-25 m, where the concentration of Fe_2O_3 reaches 60%. The 20-25 m interval contains goethite with dendritic overgrowths of hollandite. The Zn content of the ferruginous bands is 1300-2000 ppm compared to <200 ppm in the pale, clay-rich, Fe-poor materials. Copper is also enriched, to a maximum of 170 ppm. Lead concentrations are low in both fine and coarse fractions but reach 200 ppm in two Mn-rich samples. The As contents vary from 1-50 ppm, with the high concentrations associated with Fe-rich samples. Goethite and hollandite are the most probable hosts for Zn, Cu and possibly Pb thought to have been mobilized by weathering.

These data and RAB geochemical data supplied by Aberfoyle Resources Ltd indicate the Zn anomaly in the Mesozoic sediments is associated with accumulated Fe and Mn oxides. Zinc appears to be more closely associated with Fe than with Mn, but where both Fe and Mn contents are high, Zn concentrations exceed 1000 ppm. However, low contents of Pb, which is less mobile, suggest a distal source (the only high Pb is associated with about 40% Mn). The Tringadee area is thought to have been low in the landscape before, during and after deposition of the Mesozoic sediments. Although contemporaneous accumulation of metals with the sediments is possible, it is more probable that it occurred during diagenesis or weathering. Iron, Mn and Zn were derived from external sources, migrating laterally along permeable layers, precipitating at redox fronts within the sedimentary pile. The Fe and Mn oxides precipitated to form the ferruginous bands and scavenged Zn. It is concluded that there is no proximal relationship between Zn anomalies in the sedimentary cover and any base metal mineralization in the basement. The sources of Cu, Pb and As are, as yet, undetermined.

REFERENCES

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SAMPLE MEDIA - SUMMARY TABLE

Sample medium	*Indicator elements*	*Analytical methods*	*Detection limits (ppm)*	*Background (ppm)*	*Threshold (ppm)*	*Maximum anomaly (ppm)*	*Dispersion distance (m)*
Lateritic duricrust	Zn	XRF	5	60	-	-	-
	Cu	XRF	10	25	-	-	-
	Pb	XRF	5	235	-	-	-
Loose Nodules	Zn	XRF	5	40	-	-	-
	Cu	XRF	10	15	-	-	-
	Pb	XRF	5	55	-	-	-
Silicified saprolite	Zn	XRF	5	20	-	-	-
	Cu	XRF	10	<10	-	-	-
	Pb	XRF	5	30	-	-	-
Goethite rich bands	Zn	XRF	5	150	700	2000	5 Km
	Cu	XRF	10	60	-	170	-
	Pb	XRF	5	10	-	200	-
Black soils	Zn	XRF	5	70	-	-	-
	Cu	XRF	10	20	-	-	-
	Pb	XRF	5	20	-	-	-