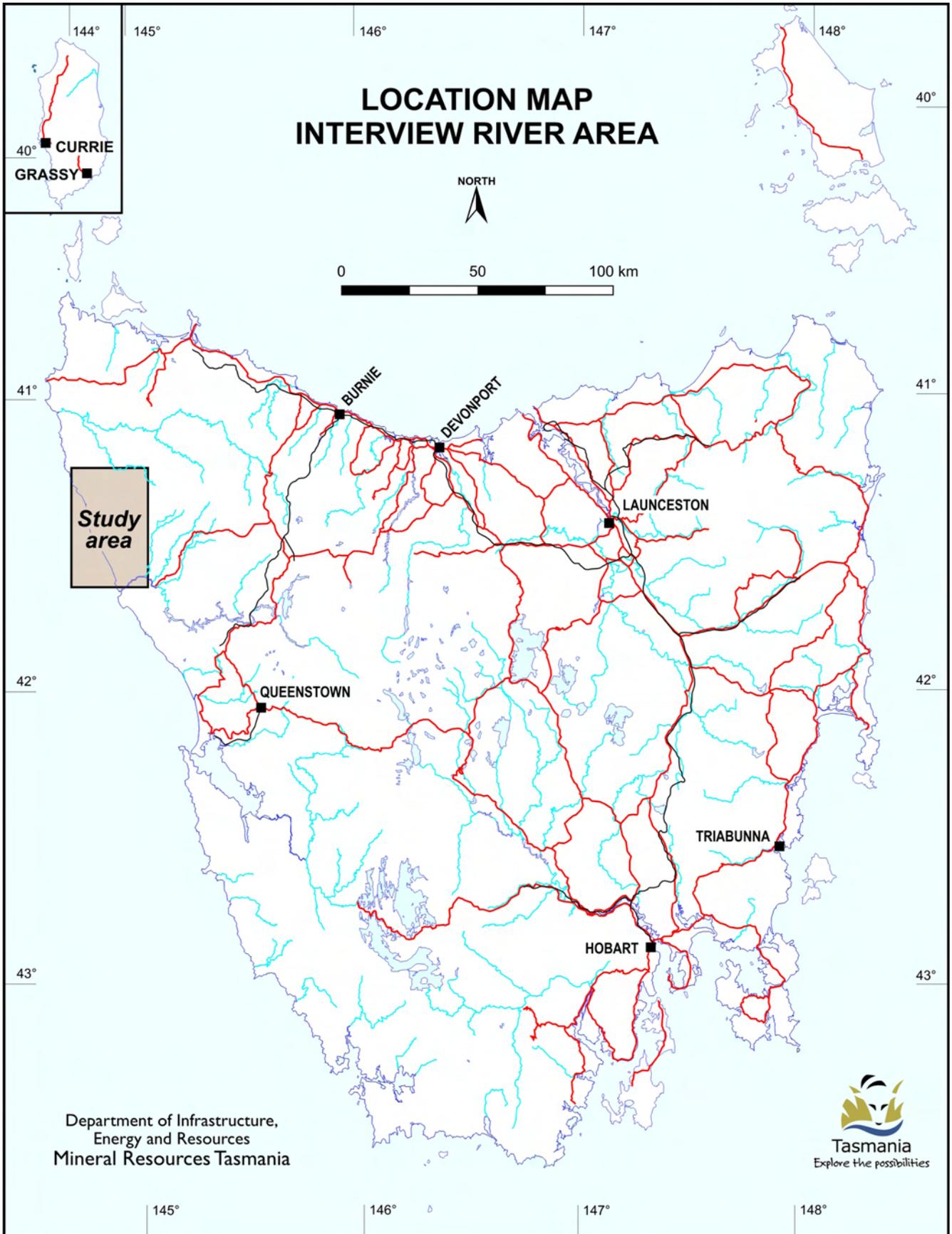


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A ground-truthing survey in the Interview River area, northwest Tasmania

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Abstract

A ground-truthing survey was conducted in the Interview River area, in northwest Tasmania, to identify any relationships between aeromagnetic anomalies and mineralisation. The survey found granite-related Sn-W, and sediment-hosted Cu and Pb (REE, Th and U) vein deposits, and confirmed that some of the mineralisation is associated with strong aeromagnetic anomalies, but the depth and origin of the anomalies are not known. Only small magnetic units were discovered.

Introduction

A three-day, helicopter-assisted, ground-truthing survey was conducted as part of the Western Tasmania Regional Mapping Program in the Interview River area, northwest Tasmania, from 21 to 23 February 2003. The aims of this field work were to evaluate:

- The nature of the copper deposits associated with high aeromagnetic anomalies occurring along the southern third of the NNW-trending Balfour copper belt (extending from Heemskirk Road through Balfour to the Interview River) (fig. 1, 2, 3);
- Any similarities between the general structural, stratigraphic and mineralogical features of these copper deposits to those occurring along the northern part of the Balfour copper belt;
- Any relationships between copper (occurring on magnetic highs) and nearby W-Sn (occurring on magnetic lows) deposits (fig. 2, 3, 4);
- The nature and size of a very poorly-known lead-zinc deposit occurring on a very strong aeromagnetic anomaly, west of the copper deposits (fig. 2, 3);
- The magnetic characteristics of the rocks hosting the copper and other mineralisation, and their relationship to those at Balfour and Temma (Bottrill and Taheri, 2003).
- Any geological, mineralogical or geochemical evidence for a shallow granite underlying, influencing and/or generating the deposits.

Three copper prospects, two tin-tungsten prospects and one silver-lead prospect were visited (fig. 4). The structural and stratigraphic settings were determined, magnetic susceptibilities of the ore and associated host rocks were measured, and samples were taken for analysis and petrological studies.

All coordinates quoted in this report are based on the 1966 Australian Geodetic Datum (AGD66) and are AMG co-ordinates in Zone 55.

Geology and mineralisation

The geology of the area is dominated by the Proterozoic Rocky Cape Group, locally intruded by some narrow, altered mafic dykes (fig. 4). Other rocks include the Devonian Interview Granite, Tertiary basalt and sedimentary rocks, and Quaternary sediments.

The Proterozoic rocks mainly consist of the folded Lagoon River Quartzite and Interview River Siltstone. These rocks

are structurally complex, mostly showing a regional N-S to NNE-SSW-trending strike, sub-parallel to the Arthur Lineament. According to Cromer (1989) "some Precambrian beds contain disseminated magnetite which produces magnetic anomalies". This was not verified for the sedimentary rocks in this area by this study, but magnetite is present in magnetic siltstone north of Balfour (Taheri and Bottrill, 2004).

The Interview Granite is a large, elongated body, intruding the Proterozoic rocks along the coastline to the west. It is covered by a thick horizon of soil in most places. Based on gravity interpretation (Leaman, 1988), the top of the granite gradually deepens to the east and there is a possibility of a sub-surface extension to the Heemskirk Granite to the south (fig. 1).

There are basically three different mineral deposit types within the area; tungsten-tin, copper, and silver-lead. These are briefly described below.

Tungsten and tin

These deposits are located in a belt approximately 2.5 km from the coast and are entirely hosted by the Interview Granite (fig. 4). They occur as veins varying in width from 100 to 400 mm with local high-grade tungsten mineralisation over a possible strike length of 2500 m (Cromer, 1989). Mineralogically, the deposits consist of quartz-pyrite-wolframite, tourmaline, muscovite, and arsenopyrite with minor cassiterite and scheelite. The high-grade sections are normally less than 400 mm wide, but are very rich in tungsten, containing up to 27% WO₃. Based on drilling programs, it has been estimated that a total of 1.6 million tonnes of ore containing 1.4% WO₃ is present in the area (Brink, 1985). The deposits were only visited very briefly in this study (Kennys and Cooneys workings). The base metal sulphide contents are very low.

Copper

These deposits, like those in the Balfour belt (Bottrill and Taheri, 2003; Taheri and Bottrill, 2004), are hosted on a regional scale by the Interview Siltstone, which mainly consists of laminated siltstone and minor quartzite. The deposits occur as brecciated veins along east-west trending, fracture or shear zones within the siltstone. Structurally, the lodes appear to have been formed along weak zones in kick bands, as in the Balfour belt.

The main prospect is the Copper Reward mine, but mapping by Gouge (1982) identified other mineralised lodes (quartz veins containing pyrite and chalcopyrite) within the area (fig. 5). These lodes show similar strikes and dips to those

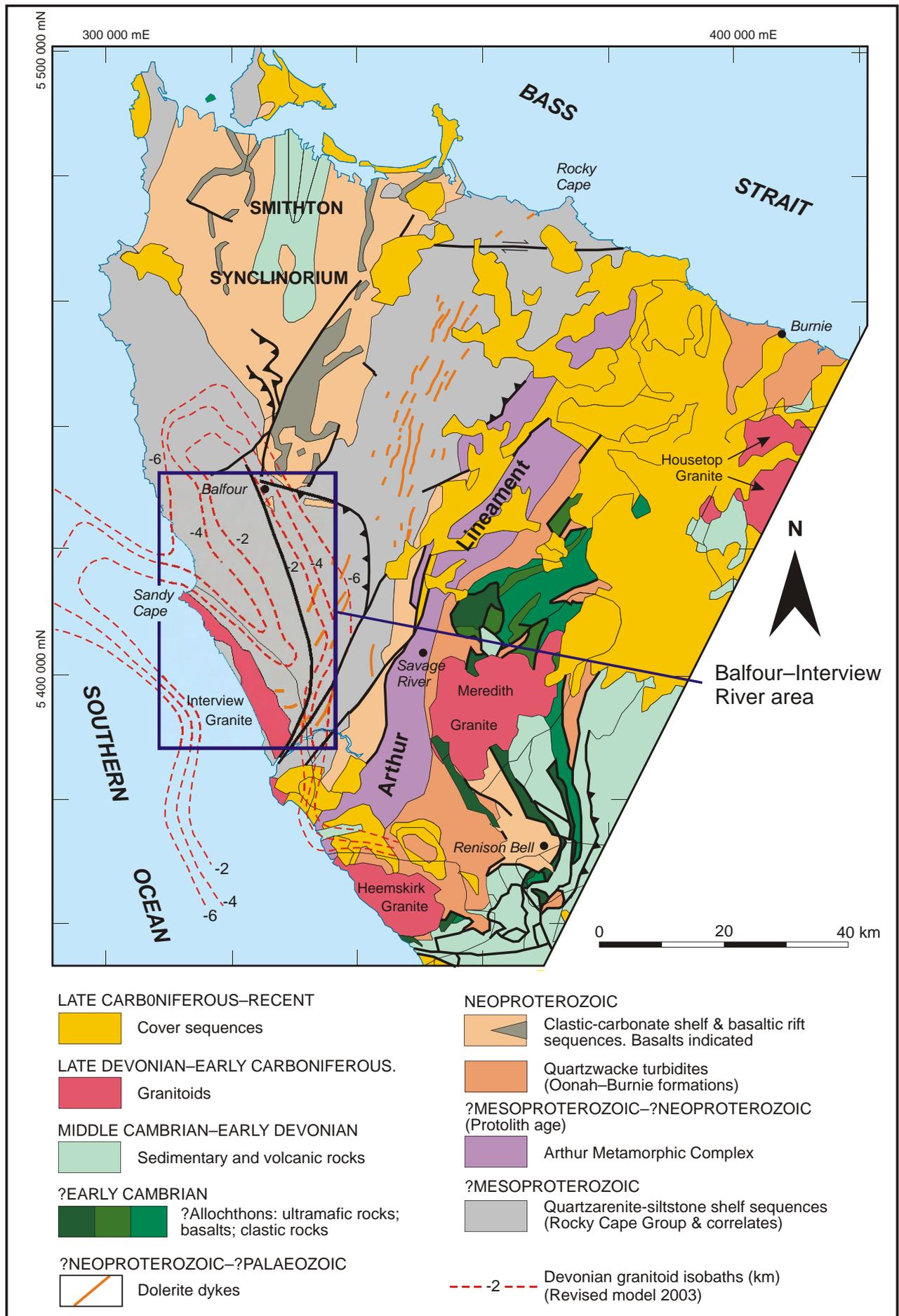


Figure 1

Regional geology, structure and granite contours in the Balfour-Interview River area (from Taheri and Bottrill, 2004).

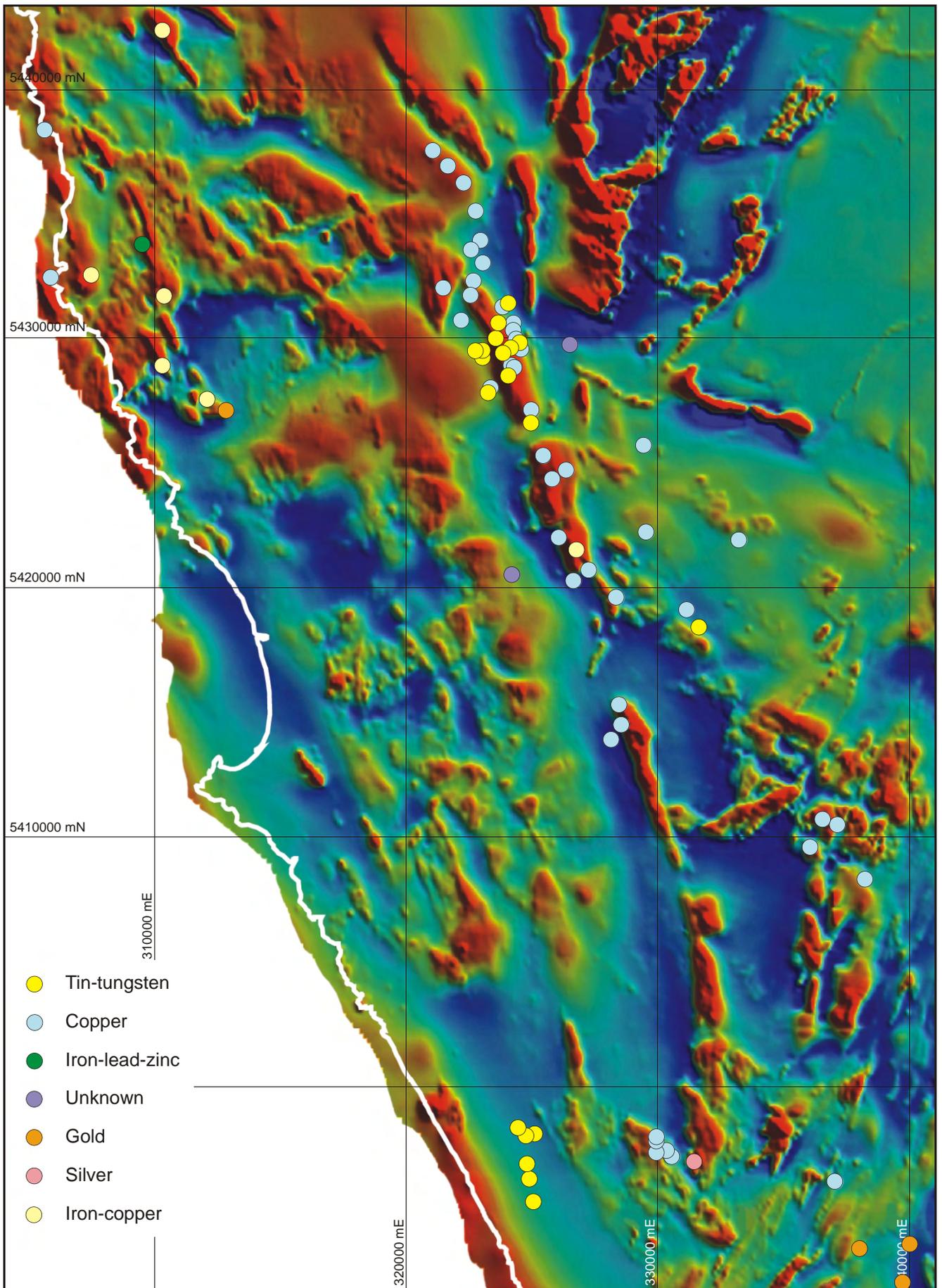


Figure 2

Total aeromagnetic image, showing location of mineral deposits, Balfour-Interview River area (from Taheri and Bottrill, 2004).

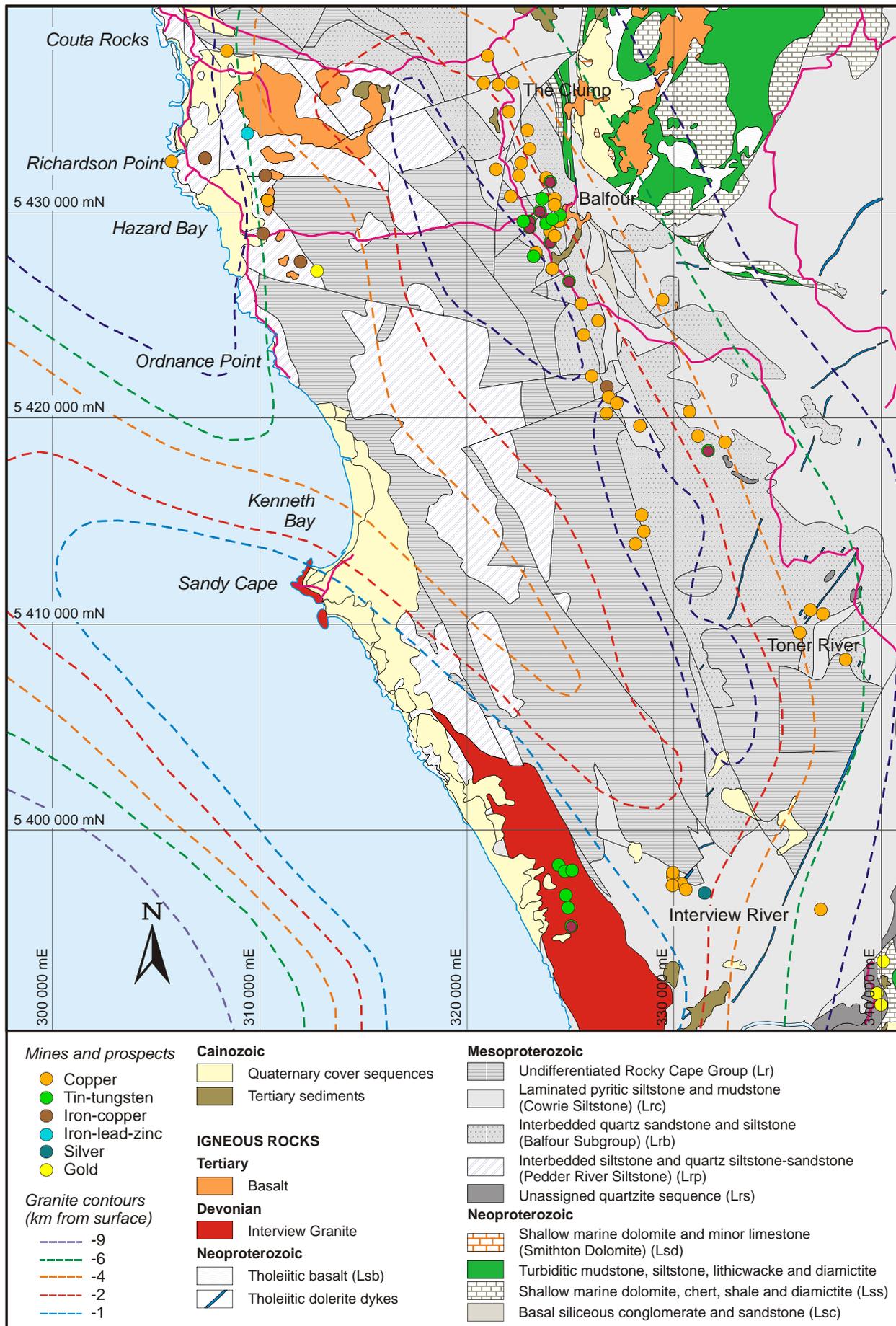


Figure 3

Locations of deposits located along the Balfour Copper Belt and Interview River field, showing geology, structure and granite contours (from Taheri and Bottrill, 2004).

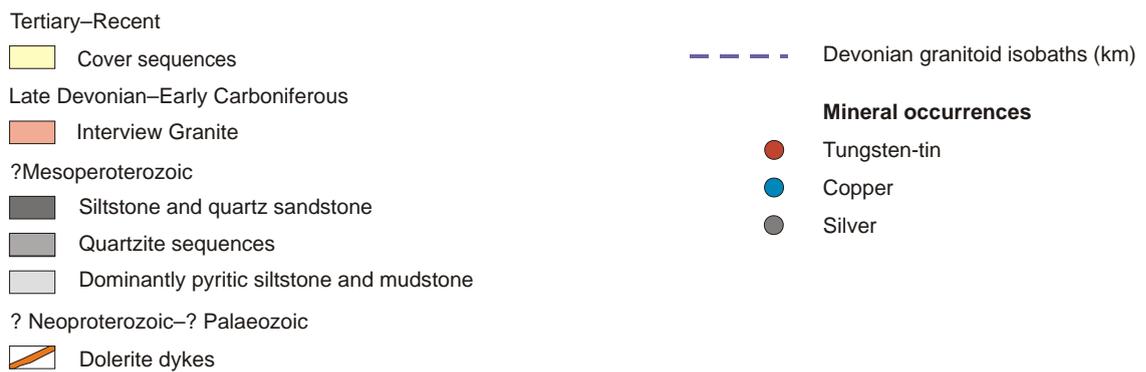
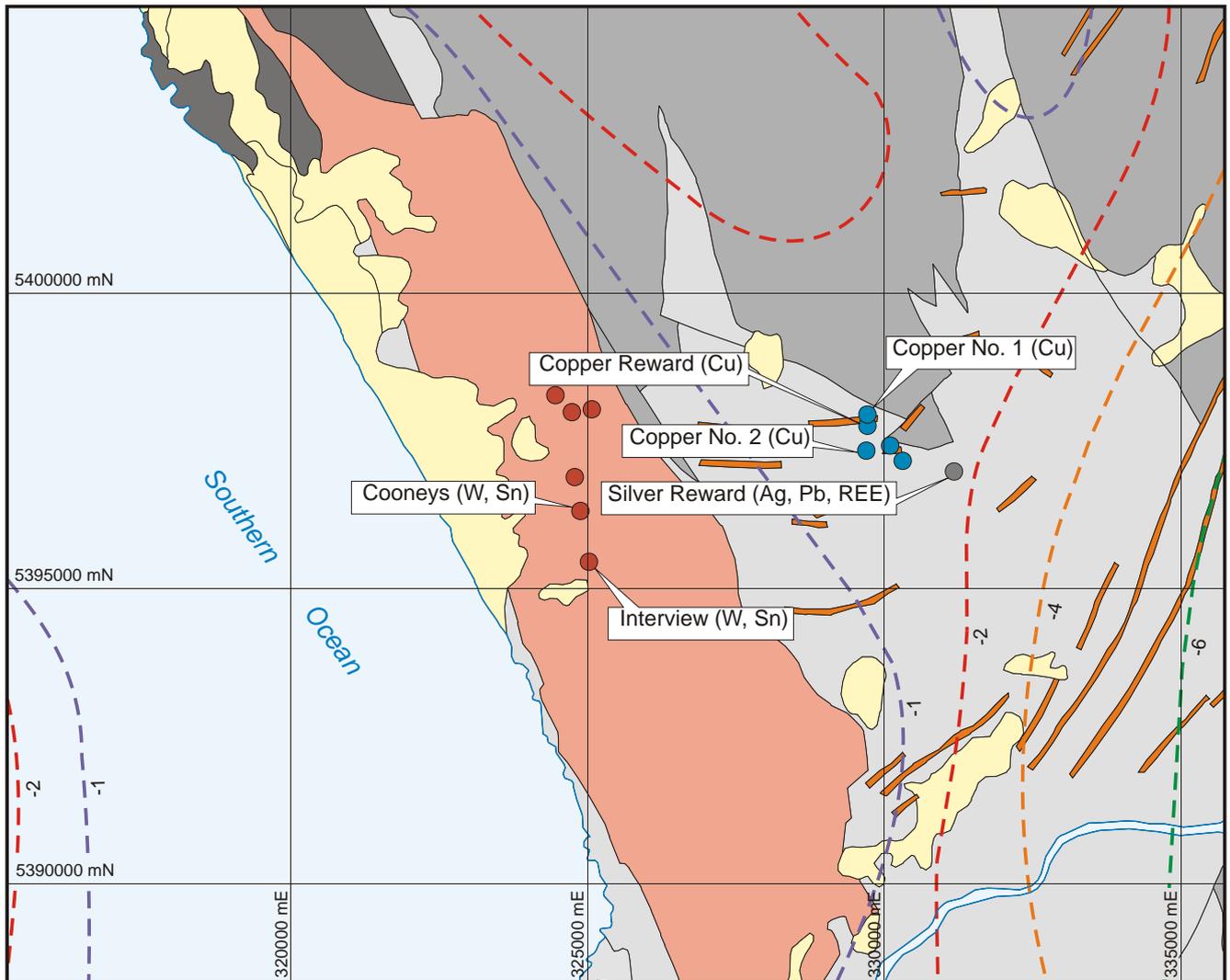


Figure 4

Simplified geology of the Interview River area showing associated mineral deposits and granite contours.

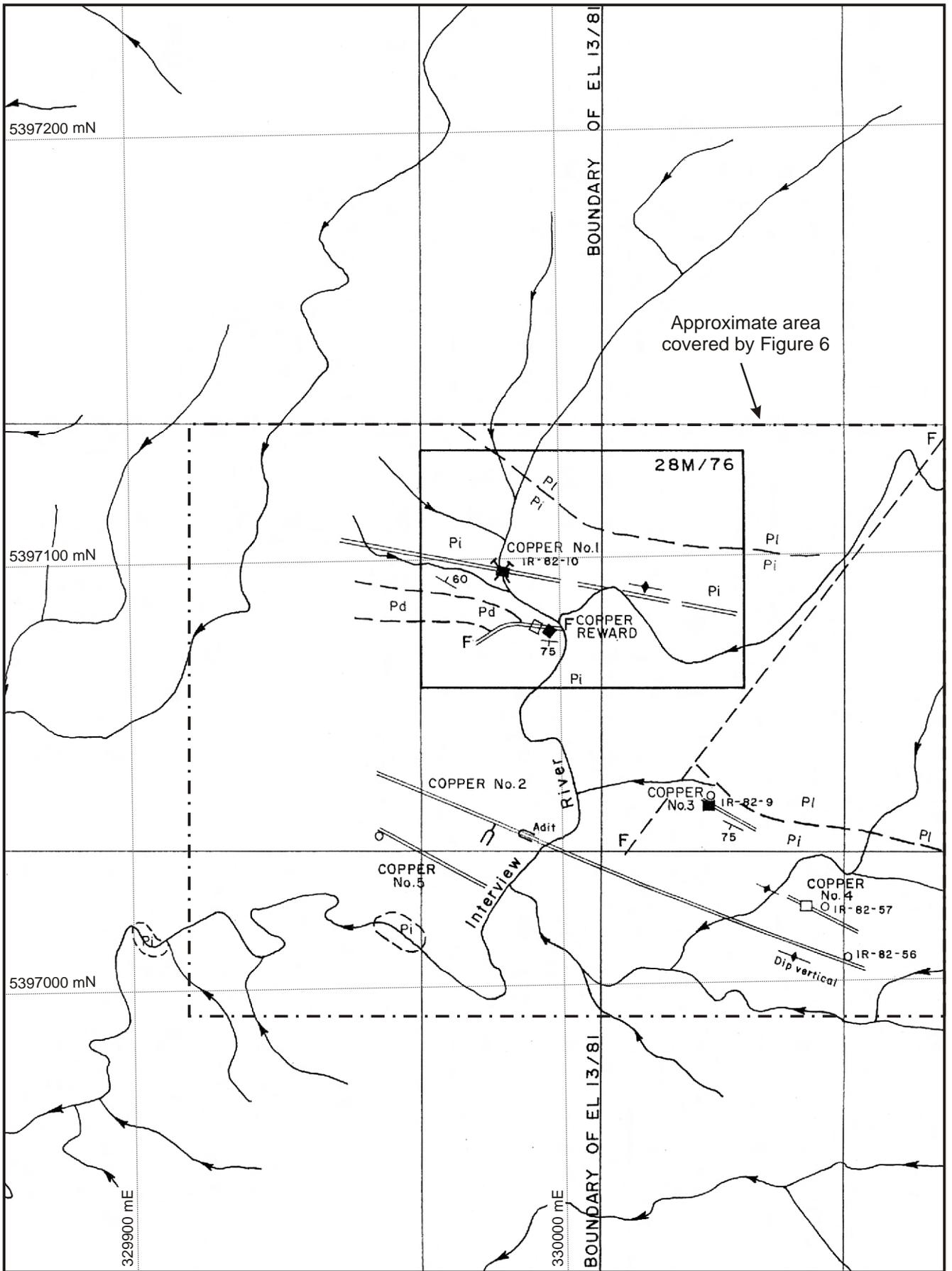


Figure 5

Sketch map of the major copper deposits, showing the general trends of the individual lodes, Interview River area (from Gouge, 1982). 100 m grid. Approximate co-ordinates in AGD66.

observed at the Copper Reward prospect (i.e. $\sim 300^\circ$ and 80°S respectively). Because of rough terrain and lack of time, only the Copper Reward and Copper No. 1 and 2 lodes (fig. 5, 6) were located in the field. The three deposits visited are described below.

Copper Reward (Elliotts Reward)

This prospect (also known as the Elliotts Reward prospect) is the main copper deposit in the area (fig. 5, 6, 7; Plates 3–6). The mineralisation here consists of a 300 mm wide, brecciated lode, occurring at the contact between a laminated siltstone (hanging wall) and a nearly one metre wide, altered dolerite dyke (footwall, fig. 7). The lode strikes about 290°T and dips 80° to the south, with the variation in dip of the country rock to either side suggesting it may be in a small kink zone. The rock is heavily brecciated and contains small fragments of veined country rocks.

Gouge (1982) inspected the old Reward shaft which was sunk on the lode (now water filled: 329 990 mE; 5 397 820 mN; Plate 3–6). This showed that the lode width is up to about 600 mm at a depth of six metres. A representative sample from the bottom of the shaft contained 10.5% copper. The lode has also been intersected in an inclined shaft, located about 16 m to the west of the Reward shaft, at a depth of about three metres (Gouge,

1982). Further west, the surface expression of the lode structure is only characterised by the contact between the dolerite dyke and the siltstone, with no indication of mineralisation. The lode can also be traced east to the bed of the Interview River, beyond which it is probably covered by alluvial flats on the eastern bank of the river.

The shafts were inaccessible at the time of our inspection and our studies were conducted on dump samples and outcrops of the lode in the river.

The lode is a weakly siliceous, sulphidic breccia. The main sulphide is chalcopyrite, which is medium grained and varies from an infiltration, intergranular or cement texture to quite massive (close to 90% in patches). It is almost unaltered (except for minor limonite and trace covellite). The chalcopyrite contains small quartz and siderite blebs, plus bands, stringers and patches of pyrrhotite, now mostly altered to a fine-grained mixture of pyrite and marcasite. Apparently early-formed, semi-massive pyrite + quartz clasts also occur in the vein. Some relatively unaltered pyrrhotite occurs as laths in quartz veins, in part associated with chalcopyrite (now partly replaced by covellite). The quartz veinlets (in clasts) also contain traces of muscovite, chlorite, albite, green-brown biotite and allanite (Appendix 1).

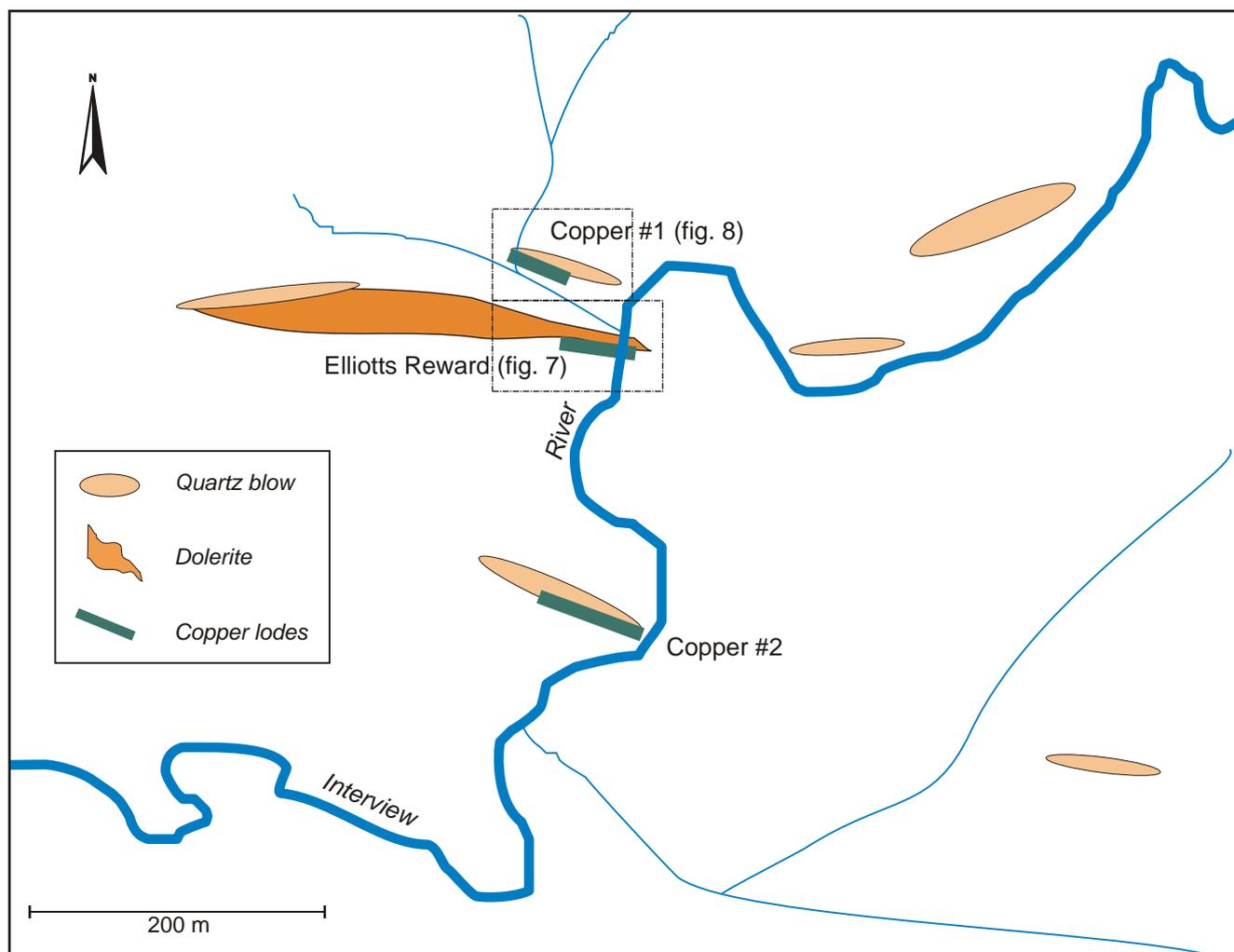


Figure 6

Sketch map of the major copper deposits in the Interview River area, showing the general trends of the individual lodes, veins and dolerite.

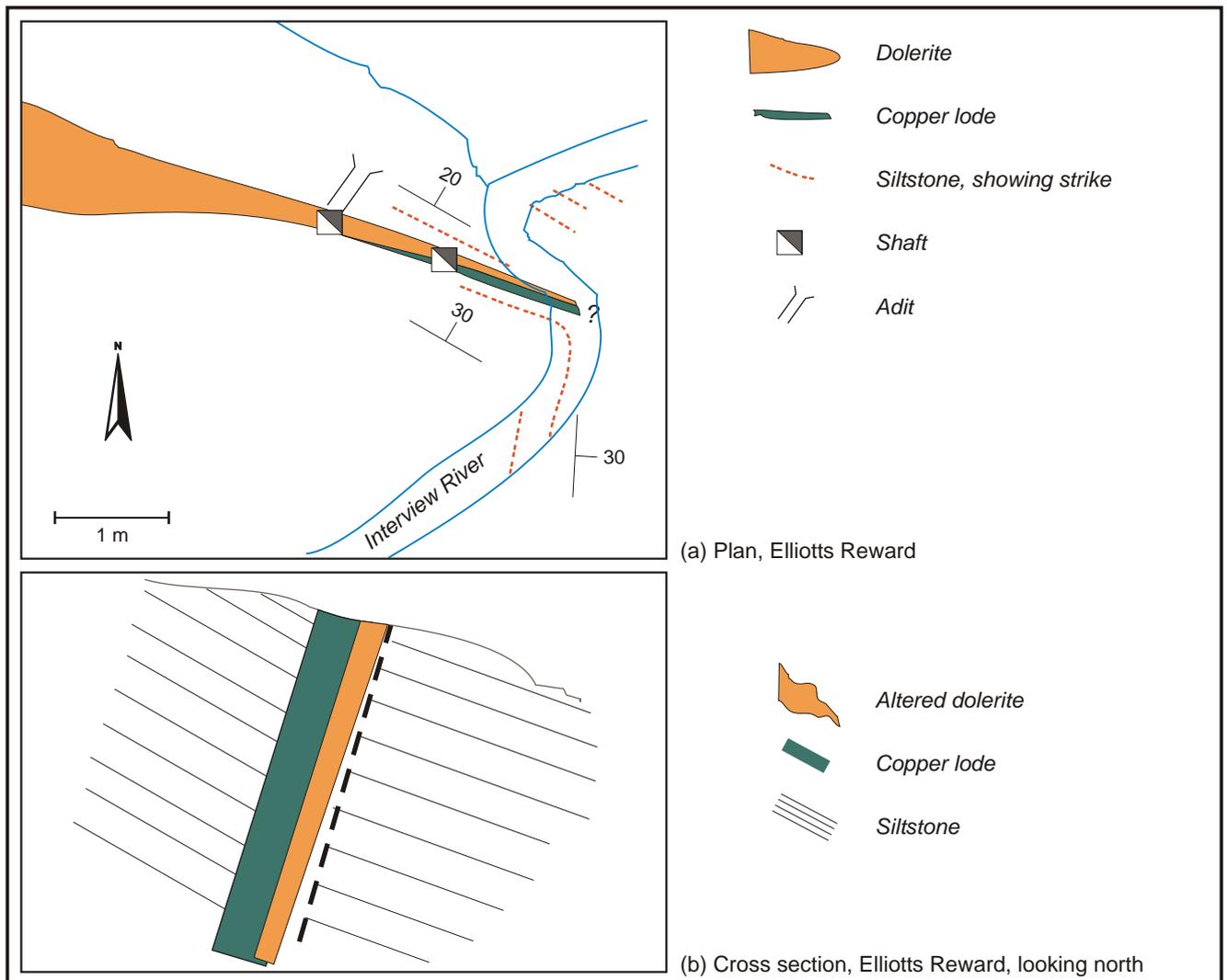


Figure 7

Sketch map of the Elliotts Reward copper deposit (see Figure 6 for location). Note the change in the strike of the bedding for the hanging and foot walls.

The breccia nature of the lode means that it cannot be presumed that all lode constituents have the same origin; some may be from the immediate wall rocks, and some from much deeper. The quartz is largely recrystallised and granular, but some is fibrous in the pyrite-rich clasts, suggesting it is pre-metamorphic or syn-metamorphic. Lithic clasts in the breccia are mostly chalcopryite or quartz-hosted and are fine-grained aggregates of quartz, chlorite, muscovite and leucoxene. These largely resemble siltstone but the locally high leucoxene content may indicate that some may be altered (silicified) dolerite.

The dolerite dyke is less than a metre wide near the river, but widens to more than ten metres about 200 m to the west, where it is much coarser (gabbroic) and more foliated in texture. At the mine site it is altered (presumably hydrothermally, during mineralisation?) and is composed mostly of chlorite and sericite, with some relict albitised plagioclase, and ~5% iron-titanium oxides (ilmenite and/or Ti-magnetite?) now mostly altered to leucoxene (sample C108534). There are numerous small rounded quartz blebs (~5%, vesicles?), mostly containing splashes of chalcopryite (~1% of the rock). The dolerite is quite fine-grained (<1 mm) and non-porphyrific. There is some weak

lamination defined by grain size variation, but no obvious metamorphic foliation. The dolerite adjacent to the lode was only identified after petrological studies were undertaken. This may indicate that dolerite dykes may also be associated with other copper deposits along the belt, but have not yet been recognised in the field.

The presence of allanite in quartz clasts suggests that these formed in underlying rocks, perhaps granites, skarns or relatively high-grade metamorphic rocks (not otherwise preserved in the lode).

The pyrrhotite and siderite in the lode indicate a significant mineralogical difference from the Balfour lodes, which mostly contain only quartz, chalcopryite, pyrite and dolomite (Taheri and Bottrill, 2004). There is no detectable tourmaline, cassiterite, wolframite or any other minerals indicative of granitic fluids, and other sources of fluids, including metamorphic fluid, may be responsible for the formation of the copper lodes in the Interview River area. Hydrothermal fluids of metamorphic origin were considered to be the most likely fluids for the formation of copper deposits in the Balfour and Toner River areas (Taheri and Bottrill, 2004) but granitic fluids are suggested by the presence of allanite.

Copper No. 1 Lode

This lode (329 857 mE; 5 397 899 mN) is about two metres wide, and consists of a massive white to pale grey quartz/quartzite lode with disseminated pyrite, plus a narrow (~500 mm) zone with quartz-chalcopyrite-slate breccia veining (similar to Copper Reward) along the southern contact with laminated siltstone (fig. 8; Plate 7). The northern contact appears to grade into silicified siltstone(?). It is exposed over a length of about one kilometre striking 310°T and dipping vertically. There is a five metre long trench cutting across the lode, and another along the southern side of the lode, following the chalcopyrite-rich vein (Plate 7).

Copper No. 2 Lode

Vein No. 2 (329 926 mE; 5 397 294 mN; fig. 6) consists mainly of massive white to medium grey quartz with disseminated pyrite; minor chalcopyrite has also been reported but not was seen. Polished sections indicate coarse-grained magnetite, pyrite and hematite (<0.5 mm). Two short adits have been driven along the strike of the vein (313° Mag.) with the vein in both adits shown to be very low in copper content. The lode in the upper adit is accessible but highly leached and honeycombed. The lower adit is flooded. No copper mineralisation was seen at either site.

Summary and interpretation of copper deposits

Our field observations, and the limited available information, indicate that only the Copper Reward prospect contains ore grades of any economic significance. According to Gouge (1982) the other veins, although continuous for several hundred metres, contain only traces of chalcopyrite (although the Copper # 1 lode is locally Cu rich).

The full strike length of the Copper Reward vein is unknown, especially the eastern extension of the vein which is covered by alluvial flats and may require diamond drilling, geochemical and geophysical surveys for full delineation.

Based on studies carried out along the Balfour copper belt (Bottrill and Taheri, 2003; Taheri and Bottrill, 2004), there are some basic similarities between the copper deposits in the Interview River area and those located along the belt to the north. Some of these features are summarised below.

- The copper deposits exhibit a relatively simple mineralogy mainly consisting of quartz, chalcopyrite and pyrite.
- The observed mineralogy of these copper deposits is distinctly different to the W-Sn deposits to the west, which contain abundant tourmaline, wolframite, cassiterite and muscovite, and are only locally rich in base metal sulphides.
- Structurally all the copper deposits occur along zones of weakness such as kink bands, pre-existing faults and shear zones, and perhaps axial planes of folds. The copper mineralisation commonly occurs as thin, rich veins on the selvages to massive, barren quartz blows.
- Pyrite appears to be paragenetically an earlier phase than chalcopyrite and commonly occurs as mylonitised clasts and stringers in chalcopyrite. This early-formed pyrite may be of different origin to the chalcopyrite.
- The lodes have been intensively affected by different phases of brecciation. Clasts of pyrite and the country rocks may thus form as clasts in the brecciated lodes.
- There is no sign of granitic influence on the copper lodes.

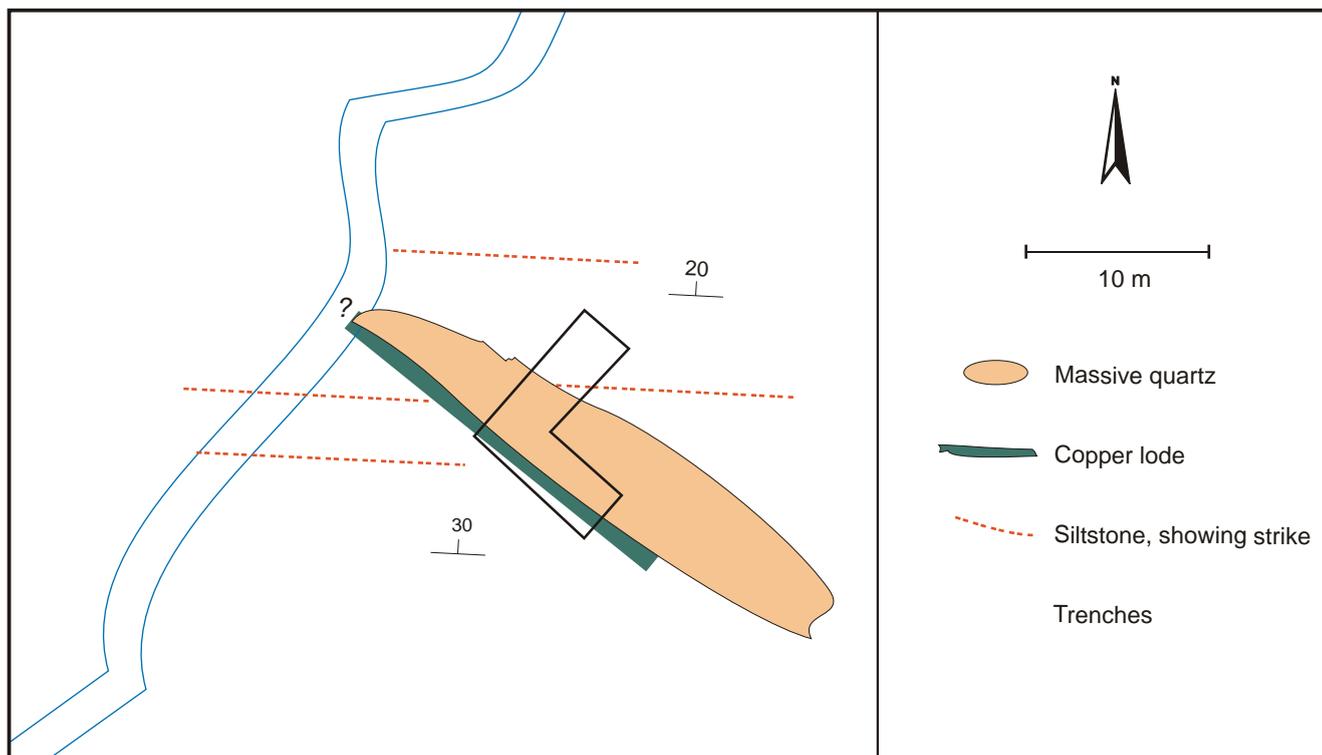


Figure 8

Sketch map of the Copper No. 1 lode, Interview River area.

- All copper lodes are associated with high aeromagnetic anomalies. The source and depth of the anomalies are not fully understood.

Differences include:

- Dolerite has not been found associated with the Balfour lodes although it has been recorded at Toner River (Ward, 1911). It may have been overlooked if fine grained and altered (Taheri and Bottrill, 2004).
- The Interview River lodes trend nearly east-west while the Balfour lodes trend nearly north-south.
- Minor pyrrhotite occurs at Copper Reward but has not been observed in the copper deposits along the Balfour belt. Pyrrhotite may also have originally been present in those deposits but it may have been altered and/or weathered to pyrite, marcasite and limonite. Textures indicative of its former presence may be revealed by further work.
- The presence of siderite and magnetite at Interview River, which have not been noted in the Balfour belt, but which occur in the Temma deposits.

There are many other strong aeromagnetic anomalies to the north of the Interview River that may be associated with significant copper deposits. Recent work by John Everard has noted some pyritic and cupriferous rocks in the area (Appendix 1; Everard, 2005), but insufficient ground-truthing and other fieldwork have been undertaken to determine the form and grade of this mineralisation.

Lead-zinc

There is only one known lead-zinc deposit (Silver Reward anomaly) within the area (331 586 mE; 5 396 846 mN, fig. 4). This prospect is small and could only be located at a second attempt through the help of a helicopter. Based on surface expression, the lode is small and only appears to be about 600 mm wide and a couple of metres long with an unknown depth. The workings include a small open cut (a few metres in diameter) and a shaft sunk on the vein which is currently filled with water (Plates 8–11). No additional work appears to have been undertaken since the original prospecting work. Although the lead and zinc grades of the vein are very high, the extent of the vein (vertically and along the strike) is not known. No similar deposits have been recorded within the area, and the economic significance of this type of deposit within the area is unknown. No reports are known to have been written on this prospect.

Host rocks

The lode is hosted by laminated siltstone similar to that at the Copper Reward, but is close to the contact with a more massive quartzitic unit to the north. The siltstone consists mostly of silt to fine sand-sized quartz and muscovite, with minor ilmenite (~5%), and traces of tourmaline (~2%), altered biotite and zircon. The vein strikes 140° and dips steeply north, nearly concordant with the host rocks.

The Lode

The lode is a 600–700 mm wide, highly mineralised breccia vein or possibly a hydrothermal breccia pipe (Plates 10, 11). The main sulphide mineral is galena, which occurs as

disseminated to massive (90%) patches in a quartz-siderite-chlorite-siltstone breccia. The galena is coarse grained and shows an infiltration, intergranular or cement texture in the breccia, or rarely exhibits bladed forms. Other sulphide minerals include minor patches of pyrite (<5%, mostly in siltstone clasts), traces of chalcopyrite and traces of fine-grained pyrite/marcasite aggregates after pyrrhotite (mostly as inclusions in galena). No sphalerite or silver minerals were detected. The sulphide minerals are almost unaltered, except for supergene limonite (goethite and lepidocrocite) and trace sulphur. The breccia contains abundant coarse-grained quartz and siderite blebs, the quartz showing a mosaic recrystallised texture indicating it is pre-deformational. Traces of chlorite, muscovite and biotite occur in the quartz.

Rare earth-rich phosphate mineralisation (Th, U) is locally disseminated in some chloritic selvages between the siltstone and siderite (Bottrill *et al.*, in prep.).

Geochemistry

A preliminary geochemical investigation included the analysis of eight samples from mineralised and host rocks (Appendix 2). The analyses of the copper lodes are very similar to those in the Balfour area (Taheri and Bottrill, 2004); basically low in base metals except for copper, and minor cobalt and nickel. The lead lode shows low base metals except for lead, and minor copper and trace cobalt and bismuth. Zinc is surprisingly low. Silver is locally high in the Pb-rich samples (up to 680 g/t). Both ore samples from Silver Reward are anomalous in gold, containing 0.2 and 0.9 g/t Au.

Rare earth, uranium and thorium analyses on the samples collected are not particularly high, despite some samples being locally rich in monazite, xenotime, and uranium and thorium minerals. This is due to the erratic and poorly understood distribution of these minerals (Bottrill *et al.*, in prep.).

Interpretation

The ore appears to have been emplaced (largely tectonically?) in a silicified breccia zone near the contact of a Proterozoic siltstone and quartzite. There may be a genetic relationship with the copper lodes (the lead lode contains minor copper), but the proportions of most minerals are quite different, and no galena was detected in the copper lodes. Only trace tourmaline was observed (in the siltstone host rock) and no cassiterite, wolframite or any other minerals indicative of granitic fluids were identified in the vein. Trace chlorite, biotite (associated with recrystallised quartz) and REE minerals may have been formed in country rocks at deeper levels and may have been transported to higher levels through explosive hydrothermal brecciation in a breccia pipe and/or tectonic activities.

The Silver Reward prospect is associated with a very strong aeromagnetic anomaly occurring along the copper belt from north of Balfour to the Interview River (fig. 2). The source and nature of the anomaly are not known, but may relate to the ilmenite disseminated in the siltstone (see above).

There is a high potential for the occurrence of more high grade, vein-type lead-zinc deposits similar to that which occurs at Silver Reward as there has been no systematic work in this area. Company reports (e.g. Cromer, 1989) also report elevated gold, zinc, lead and molybdenum from stream sediment samples throughout the area. The potential for rare earths and uranium is unknown, but worthy of further investigation.

Magnetic susceptibility

A hand-held magnetometer unit was used to measure the magnetic susceptibilities of the rocks in the vicinity of the copper and silver-lead deposits. These deposits, like those at Balfour, are characterised by significant aeromagnetic anomalies within the area. The readings vary considerably; the values are in SI units and are summarised (maximum, minimum and average) in Table I. Full sample details and locations are given in Appendix I.

In general, magnetic susceptibility (MS) data indicate that:

- the MS values are relatively higher in the ore zones than in siltstone away from the ores;
- the dolerite dyke is distinctly higher in MS than are most ore zones and the country rocks; and
- magnetite is the source for the uncommonly high values measured on a mineralised sample (C108536) from the Copper No. 2 prospect.

Potential for further work

Future work should include:

- Detailed magnetic susceptibility surveys and petrological investigations of the copper deposits and their immediate host rocks along the whole Balfour copper belt. This is to investigate:
 - (a) the possible occurrence of magnetite and pyrrhotite in other copper lodes, and
 - (b) the possible association of Precambrian dolerite with other copper lodes.

This is particularly important at Toner River, where dolerite dykes appear to be in close association with the copper lodes. Insufficient attention was given to the search for dolerite dykes in our visits to the Toner River prospect area and other deposits around Balfour and Temma.

- There are numerous aeromagnetic anomalies with sharp boundaries in the Temma area, some of which are associated with magnetite in lodes (e.g. Strickland mine). A small ground-truthing project is needed to examine the magnetic nature of this district and to investigate the magnetic nature of anomalous areas not associated with magnetite-bearing deposits.
- There are at least four copper prospects in the Norfolk Range, near the middle of the Balfour–Interview River copper belt, which are unusual in having no association with high aeromagnetic anomalies. There is very little information on the nature of the copper mineralisation in these deposits, and whether they have a different nature and origin to the other copper deposits along the copper belt.
- Little is known about the Ag-Pb mineralisation identified in this area, and it may be worthy of follow-up work.

Summary/discussion

The copper deposits in the Interview River area, as with most other copper deposits occurring along the Balfour copper belt, are associated with strong aeromagnetic anomalies, but the depth and origin of the anomalies are not known. Based on recent quantitative geophysical modelling in the southern end of the Balfour copper belt (Line 5a, Webster, 2002; fig. 9, 10), the source of the high magnetic anomaly in this area is very close to the surface, being less than a few hundreds of metres. The gravity lows from 326 500 mE to 329 000 mE and 330 500 mE to 333 000 mE are interpreted to be related to outcropping granites at shallow depths (fig. 10). The magnetic high at 329 000 mE (fig. 10) has also been interpreted to be an altered

Table I
Magnetic susceptibility measurements of various samples.

Sample No.	Locality	Lithology	Magnetic susceptibility		10 ⁻³ SI
			Average	Minimum	Maximum
C108529	Copper Reward	ore	0.12	0.07	0.18
C108531	West of Copper Reward	dolerite	0.7	0.5	0.9
C108532	Copper # 1	ore	0.16	0.08	0.24
C108534	Copper Reward	dolerite	0.6	0.4	1
C108535	Copper Reward	ore	0.5	0.4	0.6
C108537	Copper # 2	ore	38.6	0.04	119
C108538	Silver Reward	ore	0.26	0.13	0.36
C108541	Silver Reward	siltstone	0.2	0.1	0.3
C108542	Silver Reward	ore	0.43	0.34	0.52
C108543	Silver Reward	ore	0.07	0.05	0.09
C108544	Silver Reward	siltstone	0.42	0.32	0.51
<i>Samples from North of Interview River, collected by J. Everard</i>					
R011668	Mt Norfolk	?	0.45	0.28	0.32
R011672	Lagoon River	?	1.54	1.02	2.06
R011673	Lagoon River	?	0.09	0.05	0.13

Proterozoic quartzite unit which is in contact with a very shallow granitic body to the east. Recent ground truthing carried out by J. Everard (pers. comm.) failed to identify any granitic outcrops or Devonian hydrothermal signatures within the area. Also, according to Taheri and Bottrill (2004), the rocks hosting the copper deposits along the belt, which are commonly associated with high magnetic anomalies, lack Devonian granite-related hydrothermal alteration signatures. Considering the field observations, the proposed geophysical modelling for the area becomes highly speculative. The interpreted granite may be older in age (Cambrian, Precambrian) and rocks containing disseminated magnetite and/or pyrrhotite may be the source for the anomaly, without granite-related fluids being necessarily involved.

The Interview River deposits are mineralogically and structurally similar to those occurring along the Balfour copper belt to the north, but are distinctly different mineralogically to the nearby W-Sn deposits.

The Silver Reward prospect is also associated with a strong aeromagnetic anomaly and is mineralogically different to both the copper and W-Sn deposits within the area. The area has not been systematically explored for Pb-Zn deposits or rare earth minerals and requires further investigation, as there could be potential for high-grade vein type lead-zinc-rare earth deposits.

Magnetic susceptibilities of the rocks in the lode zones vary widely, but are generally low, ranging from <0.1 to $>1 \times 10^{-3}$ SI units. These values increase from siltstone to ore zones, with dolerite dykes having the highest values. The unusually high readings from mineralised samples at the Copper No. 2 prospect is due to magnetite but the Copper Reward deposit contains minor pyrrhotite; the other copper deposits may have originally contained pyrrhotite but this may have already been altered to pyrite-marcasite-limonite.

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[31 May 2011]

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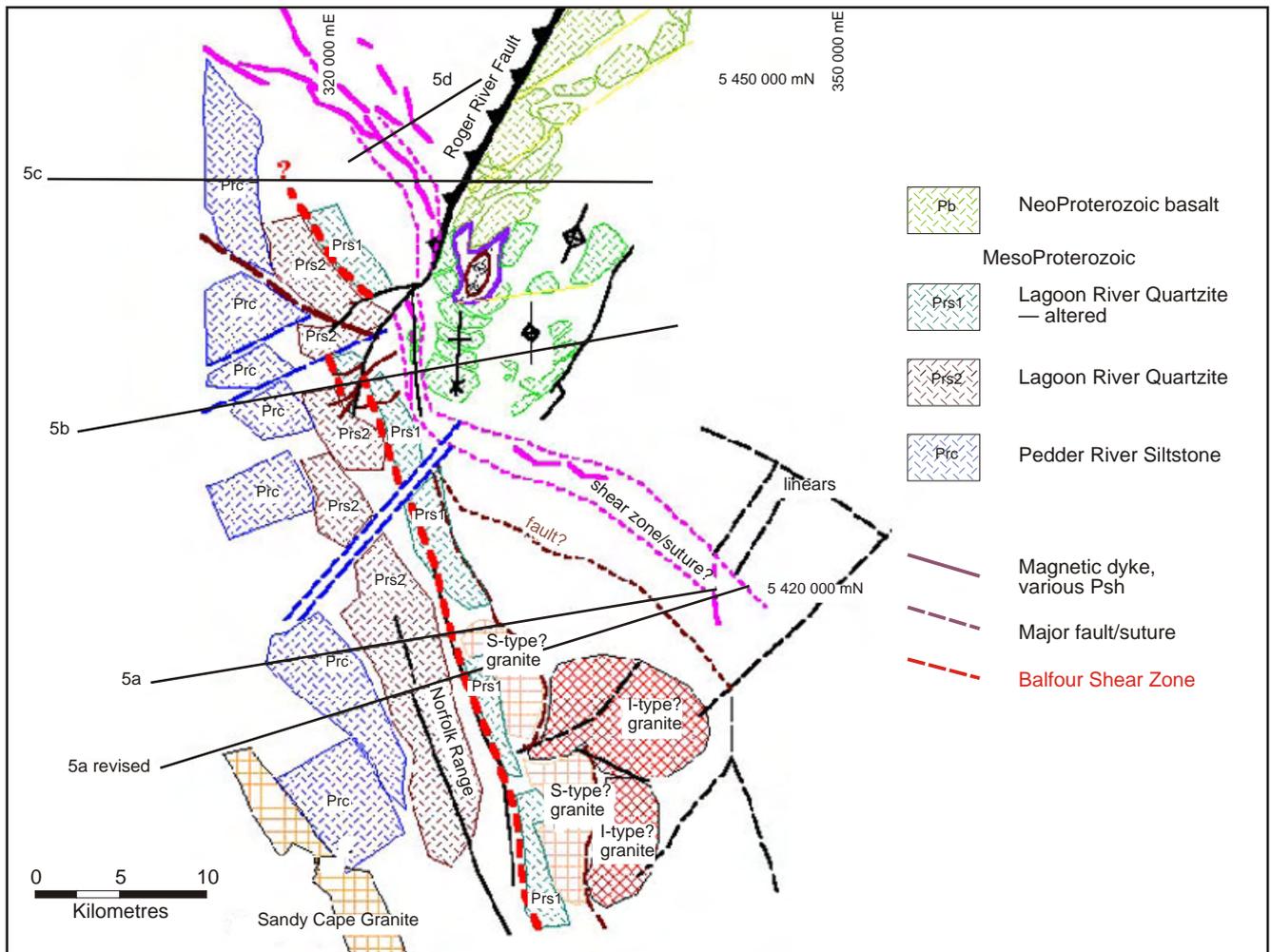


Figure 9. Geology of the Balfour district interpreted from geophysical data (from Webster 2002).

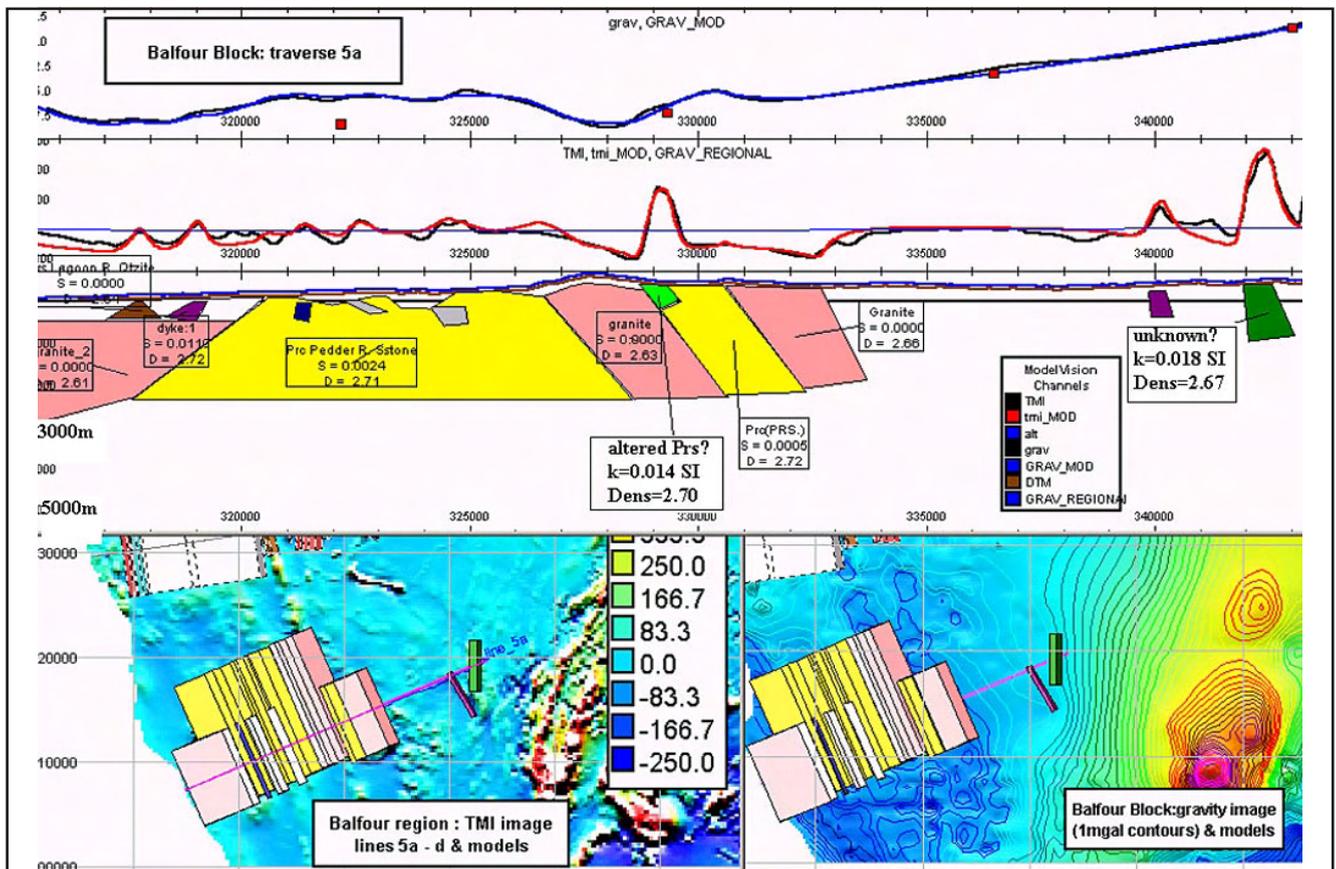


Figure 10. Total Magnetic Image, traverse 5a and model results, Balfour district, Interview River area (from Webster 2002).

Plates



Plate 1

General view of Interview River area, showing typical vegetation.



Plate 2

Interview River area, showing the general topography and vegetation.



Plate 3

Copper Reward shaft, now filled with water.



Plate 4
Copper Reward shaft.



Plate 5
Copper Reward shaft.

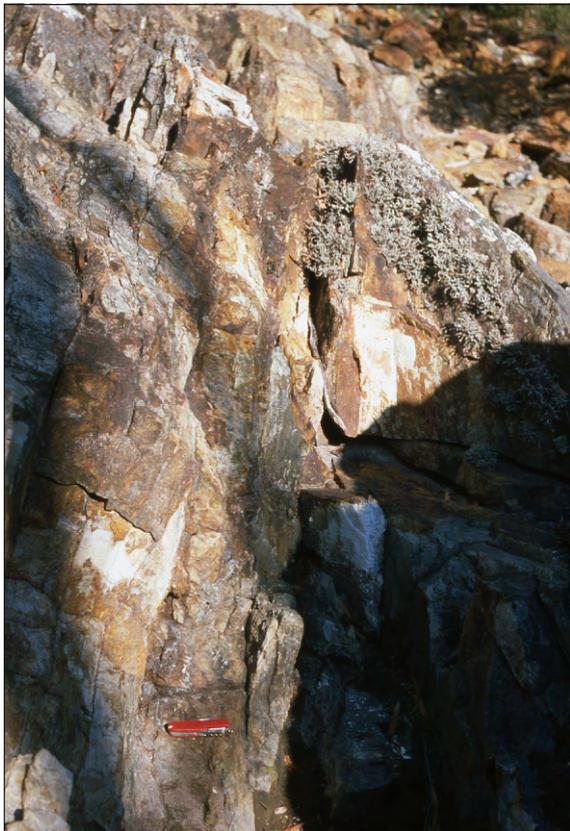


Plate 6
Copper Reward lode, showing the brecciated nature of the lode.

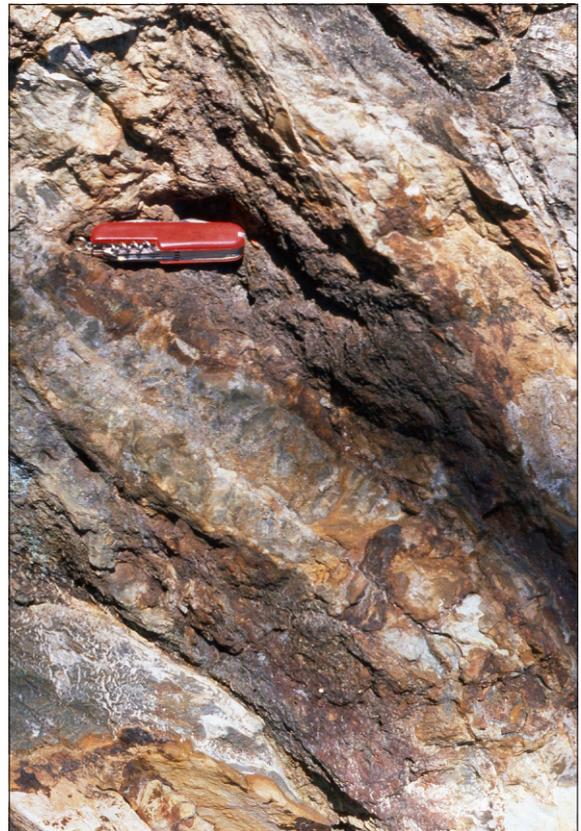


Plate 7
Copper No. 1 prospect showing the massive (barren) quartz in contact with the copper lode.



Plate 8

Silver Reward dump, showing the general topography and vegetation within the area.



Plate 9

Silver Reward Shaft, now filled with water.

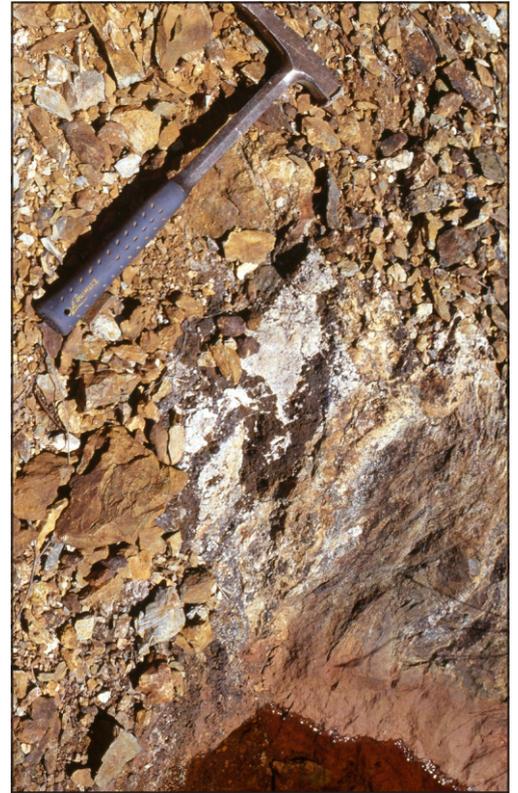


Plate 10

Lode in Silver Reward Prospect, characterised by being highly brecciated, weathered, and lead and silver-rich.



Plate 11

Lode in Silver Reward Prospect, characterised by being highly brecciated, weathered, and lead and silver-rich.

APPENDIX I

Sample details

Reg. No.	Locality	AMG mE	AMG mN	Site type	Lithology	Minerals	Treatments	Structure
C108523	Kennys	324400	5398400	dump	ore	tur, qtz		
C108524	Kennys	324400	5398400	dump	ore	tur, py, cpy, greisenised		
C108525	Kennys	324400	5398400	dump	ore	tur, qtz		
C108526	Kennys	324400	5398400	dump	ore	qtz		
C108527	Kennys	324400	5398400	dump	ore	w, qtz		
C108528	Elliotts Reward	329990	5397820	dump	ore	cpy	CA, PT	
C108529	Elliotts Reward	329990	5397820	dump	ore	cpy, py	CA, PT	80/190
C108530	Elliotts Reward	329990	5397820	dump	ore	py		
C108531	W of Elliotts Reward	329945	5397775	float	dolerite			
C108532	Copper #1	329857	5397899	outcrop	ore	cpy, qtz, brx		90/140
C108533	Copper #1	329857	5397899	outcrop	fault gouge	py		20/135
C108534	Copper Reward	329990	5397820	outcrop	dolerite	chl, ser, fgnd	CA, PT	30/000
C108535	Copper Reward	329990	5397820	dump	ore	qtz, dol?, brx	XR	
C108536	Copper #2	329800	5397300	dump	ore	qtz, py		
C108537	Copper #2	329878	5397340	underground	ore	qtz, lim		90/000
C108538	Silver Reward	331586	5396846	dump	ore	gn, sl, brx	CA	
C108539	Cooneys	324901	5396291	dump	ore	tur, qtz		
C108542	Silver Reward	331586	5396846	dump	ore	gn, qtz, brx	PT	
C108543	Silver Reward	331586	5396846	dump	ore	gn, sl, mass	CA, PT, XR	
C108544	Silver Reward	331586	5396846	outcrop	siltstone	chl?, sl, brx	PT, XR	20/050
<i>Samples from North of Interview River, collected by J. Everard</i>								
R011668	Mt Norfolk	329860	5410530	float	quartzite	lim, vein	PT	
R011672	Lagoon River	330870	5410080	outcrop	breccia	py, qtz, chl	PT	60
R011673	Lagoon River	331070	5409720	outcrop	breccia	py, qtz, chl	PT	150

Minerals: chl – chlorite; cpy – chalcopyrite; dol – dolerite; gn – galena; lim – limonite; py – pyrite; qtz – quartz; ser – sericite; sl – sphalerite; tur – tourmaline; w – wolframite;

Texture: brx – breccia; fgnd – fine grained; lami – laminated; mass – massive

Treatment: CA – chemical analysis; PT – polished thin section; XR – X-ray diffraction

APPENDIX 2

Geochemistry

Base metal analyses (XRF*, MRT)

Sample No.	Lab. No.	Sample type	Location	Co ppm	As ppm	Bi ppm	Ga ppm	Zn ppm	W ppm	Cu ppm	Ni ppm	Sn ppm	Pb ppm
C108528	20030069	ore	Elliotts Reward	125	<20	<5	<5	(<5)	-	115000	130	12	26
C108529	20030070	ore	Elliotts Reward	22	<20	<5	11	(<5)	-	11000	29	<9	<10
C108534	20030071	dolerite	Elliotts Reward	<8	<20	<5	20	<5	<10	52	6	<9	<10
C108534	20030071b	dolerite	Elliotts Reward	<8	<20	<5	21	<5	<10	51	6	<9	<10
C108538	20030072	ore	Silver Reward	29	(<20)	-	-	36	(<10)	110	8	<9	82000
C108541	20030073	siltstone	Silver Reward	<8	<20	<5	16	<5	<10	6	<5	<9	330
C108541	20030073b	siltstone	Silver Reward	<8	<20	<5	16	<5	<10	5	<5	<9	330
C108543	20030074	ore	Silver Reward	18	(<20)	-	-	16	(<10)	60	<5	<9	114000

Other elements (XRF*, MRT)

Sample No.	S %	Ag g/t	Au g/t	Nd ppm	Ce ppm	La ppm	Ba ppm	Th ppm	Sr ppm	U ppm	Rb ppm	Y ppm	Zr ppm	Nb ppm	Mo ppm	Cr ppm	V ppm	Sc ppm
C108528	20.5	55	<0.05	<20	<28	<20	86	15	<5	<10	<5	19	5	<3	<5	82	7	<9
C108528	20.5	55	<0.05	<20	<28	<20	86	15	<5	<10	<5	19	5	<3	<5	82	7	<9
C108534	0	0.6	<0.05	<20	53	24	320	15	6	<10	210	54	390	18	<5	88	68	15
C108534	0	0.6	<0.05	20	49	23	310	16	5	<10	210	53	380	18	<5	88	71	15
C108538	2.1	210	0.1	<20	-	<20	68	-	<5	<10	25	-	94	<3	<5	83	20	<9
C108541	0.1	0.4	<0.05	24	75	26	290	<10	<5	<10	130	27	190	6	<5	91	55	<9
C108541	0.1	0.4	<0.05	26	78	27	290	<10	<5	<10	130	28	190	6	<5	87	53	<9
C108543	5.7	680	0.9	<20	-	<20	<23	-	<5	<10	<5	-	54	<3	<5	30	6	<9

ICP-MS analyses (SGS Aust.)

Elements Units	As ppm	Bi ppm	Ga ppm	W ppm	La ppm	Th ppm	U ppm	Y ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm
C108528	<1	5.7	1.4	1.5	2.2	0.75	0.25	3	3.7	0.6	2.7	1.7	0.26	1.6	0.18	1	0.13	0.3	<0.05	0.3	<0.1
C108529	4	3.3	10.5	2.8	15.2	4.7	0.99	8.6	29.5	3.5	14.5	4.3	0.76	3.5	0.38	2.1	0.36	0.9	0.13	1	0.1
C108534	<1	0.1	21.6	4.3	17.6	10.6	3.75	9.5	37.1	4.5	17.9	3.3	0.56	2.5	0.3	1.9	0.39	1.4	0.23	1.9	0.3
C108538	80	9.5	9.3	1.6	7.9	3.65	0.68	3.15	16.8	2.05	8.8	2.3	0.53	1.3	0.12	0.7	0.12	0.4	0.07	0.6	<0.1
C108543	14	7.8	3.3	0.4	6.5	2.15	0.45	1.15	13.8	1.66	6.9	1.3	0.32	0.6	0.06	0.3	<0.05	0.2	<0.05	0.2	<0.1

* Cells from ore samples with no values indicate the concentrations are possibly erroneous. This is due to interference effect caused by very high Pb and/or Cu content and the values were not included.