MRPA_06

MINERAL RESOURCE POTENTIAL ASSESSMENTS OF THE VALE OF BELVOIR–REYNOLDS FALLS–GRANITE TOR AREA

OCTOBER 1990

DEPARTMENT OF RESOURCES AND ENERGY
DIVISION OF MINES AND MINERAL RESOURCES

CONTENTS

LIST OF FIGURES

INTRODUCTION AND METHODOLOGY

At the request of the Mining Forum, the mineral resource potential of the Vale of Belvoir-Reynolds Falls-Granite Tor area of western Tasmania has been assessed (Fig. 1).

Consistent with the definitions and philosophy advanced in a previous document 'Contrasting Approaches to Mineral Resource Potential' the evaluation has involved appraisal of the adequacy of the existing geoscientific data base as well as its content.

The results of past exploration in the area are summarised from OPEN FILE reports held by the Division of Mines. Some comments are made about this work, but there has been little attempt to synthesise or reinterpret the data. Exploration of currently held licences over the last five years is held by the Division on CLOSED FILE and remains confidential to the companies concerned.

The report separates the information into sections on 'DATA' and 'ASSESSMENT'. The latter section applies known mineral deposit models to the geologic information to a definition of zones of mineral deposit potential (Fig. 2).

DEFINITIONS

A previous report by the Division entitled "Contrasting Approaches to the Assessment of Mineral Resource Potential" adopted preferred definitions of the various classes - high, moderate, low and unknown. These definitions are restated below. It is necessary to restate that these categories are a product of both the current knowledge of the geology of the area and ore genetic models. As such they are likely to change dramatically with future work and with different commodities required to meet the future needs of humanity.

A HIGH MINERAL RESOURCE POTENTIAL exists where the geological characteristics favourable for resource accumulation are known to be present, or where enough of these features are present to support the relevant genetic model and where there is evidence that mineralisation, not necessarily of economic size or grade, has taken place.

A MODERATE MINERAL RESOURCE POTENTIAL exists where the geological data suggest that the factors favourable for formation of a class of deposit are present or can be reasonably inferred, or where the geological features of the area show a reasonable degree of fit with those of the deposit class considered. There need not be evidence of mineralisation in the area.

A LOW MINERAL RESOURCE POTENTIAL exists where the geological conditions suggest that mineral concentrations are unlikely and that the relevant genetic model cannot be supported. As noted by Taylor and Steven (1983), this requires an element of positive knowledge.

A category of UNKNOWN MINERAL RESOURCE POTENTIAL is used in situations where either the geoscientific data base is inadequate to assess the likelihood of the resource accumulation, or the relevant deposit models are so poorly understood that a reasonable assessment cannot be made. This definition is not to be equated with low mineral resource potential, but takes into account a high degree of uncertainty or incompleteness in the available information.

1. SUMMARY

A review of the mineral resource potential of the Vale of Belvoir-Reynolds Falls-Granite Tor area of western Tasmania indicates that there is considerable scope for the future discovery of economically viable metallic mineral deposits of a wide range of commodities including tin, tungsten, copper, lead, zinc, silver and gold traditionally produced in Tasmania as well as others such as bismuth, arsenic, cobalt and vanadium which have not achieved prominence in the past.

The potential for non-metallic commodities is virtually untested.

There is an insufficient geoscientific database on which to make an informed estimate of resource potential over much of the area. Suggestions for further work are appended. This work should be carried out and adequate provision be allowed for follow-up exploration before any final decision on land use of the area is made.

Stratigraphic and structural drill holes in the area would considerably enhance the confidence level of future assessments.

Fig. 1 **AREAS OF ASSESSMENT**
VALE OF BELVOIR - REYNOLDS FALLS - GRANITE TOR

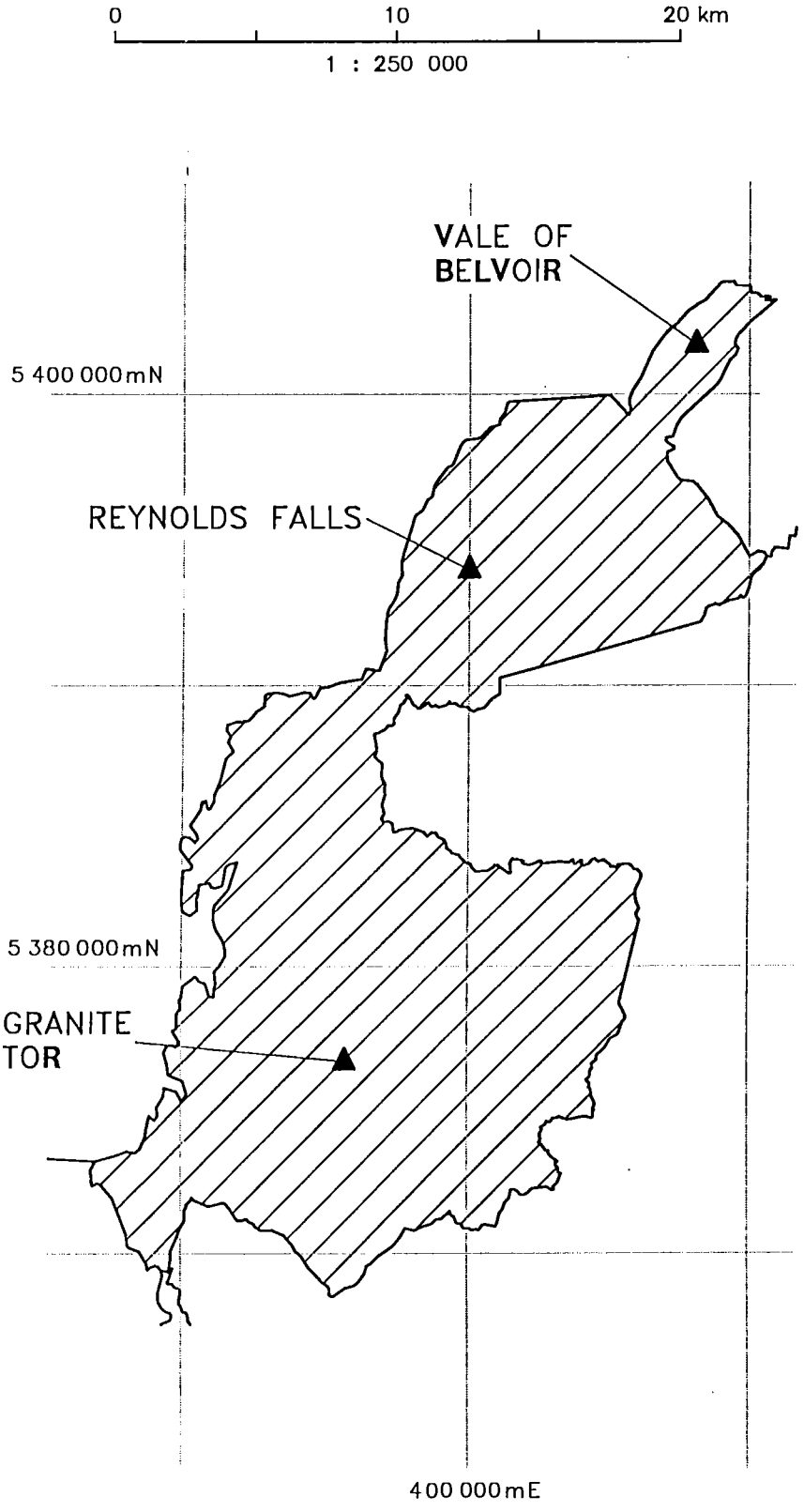


Fig. 2 **PRELIMINARY MINERAL RESOUCE POTENTIAL VALE OF BELVOIR - REYNOLDS FALLS - GRANITE TOR**

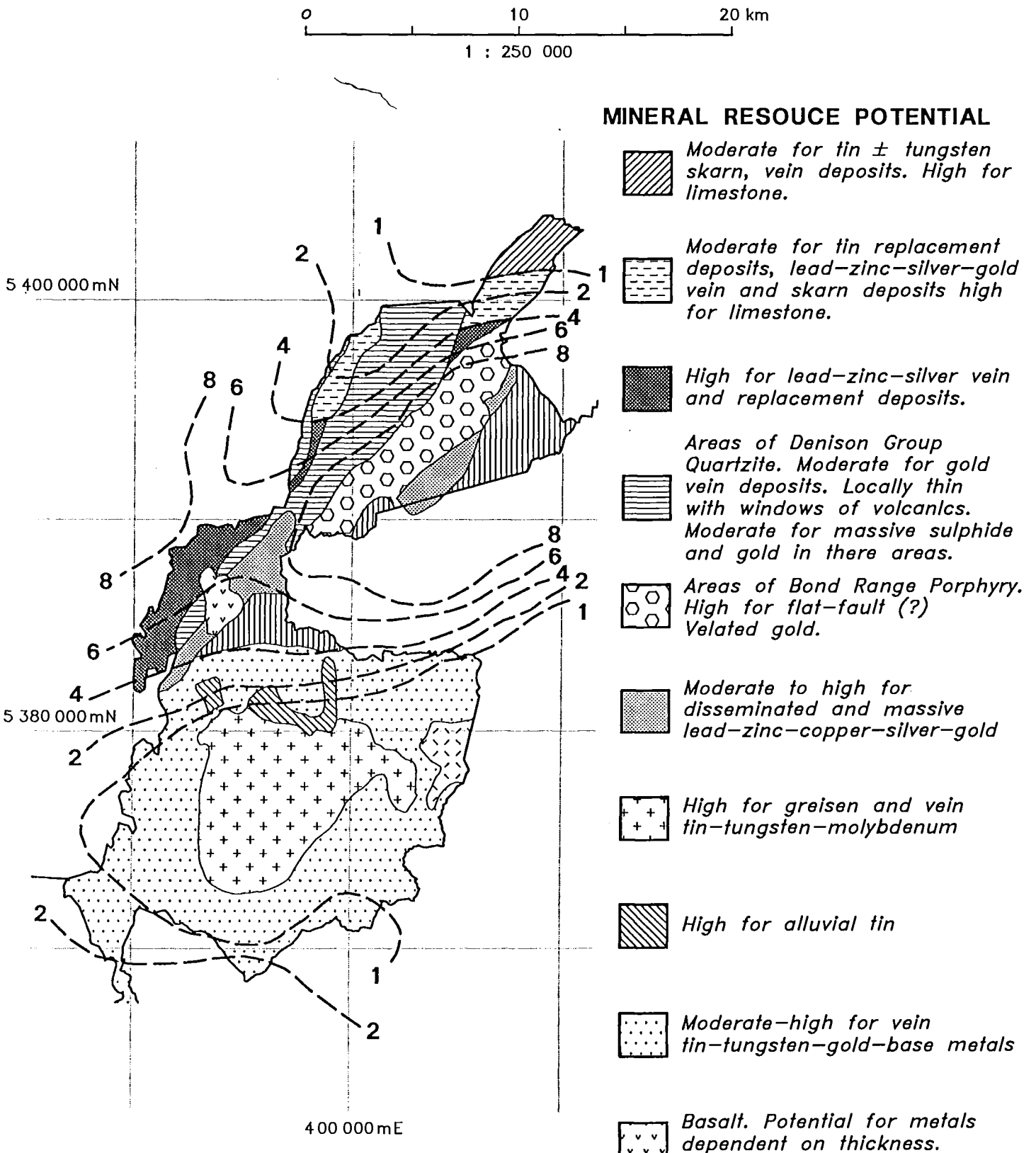
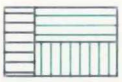


FIG.3 LEGEND - 1:500,000 TASMANIA, GEOLOGY

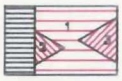
HOLOCENE
PLEISTOCENE



Alluvium, sand, gravel and talus.
Till, fluvioglacial, periglacial, and associated deposits.

Erosional surface.

TERTIARY



Non-marine sequences (1); marine limestone (2); basalt and related igneous rock types (3).

Low angle unconformity.

TRIASSIC
PERMIAN
UPPER CARBONIFEROUS

Fluvio-lacustrine sequences of sandstone, siltstone, mudstone (1) with carbonaceous sequences indicated (2). Fresh water sequence with some coal measures. — UPPER PARMEENER SUPER GROUP

Upper glacio-marine sequence of pebbly mudstone, pebbly sandstone and limestone. Fresh water sequence with some coal measures.

Lower glacio-marine sequence of pebbly mudstone, pebbly sandstone, minor limestone, Tasmanite oil shale and basal tillite. — LOWER

WESTERN TASMANIA

UPPER-MIDDLE DEVONIAN

Terrestrial cavern fillings (grid ref. 442 436) — EUGENANA BEDS

Unconformity attributed to the Tabberabberan Orogeny.

LOWER-DEVONIAN SILURIAN
ORDOVICIAN

Quartzite, sandstone, siltstone, and shale; Devonian limestone-siltstone (1) — ELDON GROUP & CORRELATES; SPERO BAY GROUP

Limestone sequence with siltstone in some areas.

Siliceous conglomerate, shallow water quartzose sandstone & siltstone. — JUNEE GROUP AND CORRELATES

CAMBRIAN

Middle-Upper Cambrian fossiliferous usually greywacke turbidite sequences (1); acid with intermediate volcanic and associated rocks dominant (2), basic-intermediate volcanic and associated rocks dominant (3); probably Cambrian unfossiliferous usually greywacke turbidite sequences (4); probably Cambrian unfossiliferous orthoquartzite sequence (5).

INCLUDING DUNDAS GROUP (fossiliferous); MT READ VOLCANICS AND OTHER FORMATIONS

Usually unconformity attributed to Cambrian movements; occasionally unconformity e.g. parts of western Tasmania

PRECAMBRIAN

Comparatively unmetamorphosed sequences. Orthoquartzite-mudstone sequences (1); quartzwacke turbidite successions (2); dolomite (3); basalt lava (4).

Metamorphic rocks of dominantly metaquartzite and pelitic sequences, amphibolite indicated (1).

EASTERN TASMANIA

Unconformity attributed to the Tabberabberan Orogeny.

LOWER DEVONIAN TREMADOCIAN-CAMBRIAN(?)

Micaceous quartzwacke turbidite sequences dominant (1); mudstone sequences dominant (2). — MATHINNA BEDS

IGNEOUS ROCKS

TERTIARY

Basalt and related rock types.

CRETACEOUS

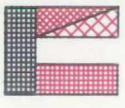
Syenite.

Appinite.

JURASSIC

Dolerite and related rock types.

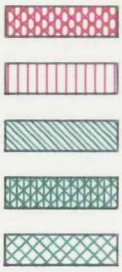
LOWER CARBONIFEROUS-(?)-DEVONIAN



Dominantly adamellite-granite; biotite hypersthene-adamellite porphyry (1).

Dominantly granodiorite.

CAMBRIAN



Granitic rocks.

Coarser grained basic rocks

Serpentinite, peridotite and associated rocks.

Acid with intermediate volcanic and assoc. rocks.

Basic-intermediate volcanic and associated rocks.

PRECAMBRIAN

Granite.

Dolerite.

FIG.4 GEOLOGY - CENTRAL WESTERN TASMANIA

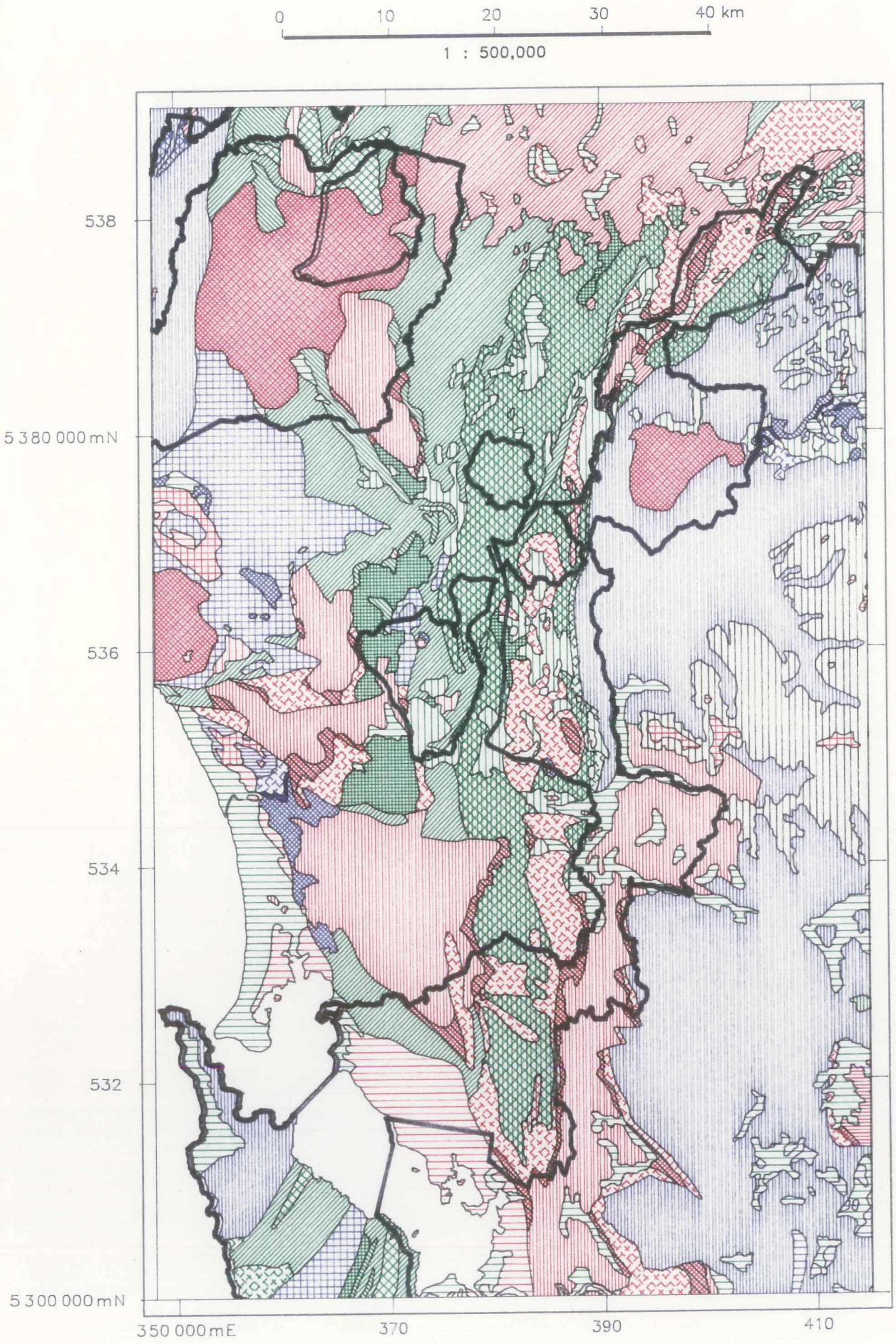


Fig. 5 CONFIDENCE LEVELS OF GEOLOGICAL MAPPING
AREAS MINERAL RESOURCES ASSESSMENT
VALE OF BELVOIR - REYNOLDS FALLS - GRANITE TOR

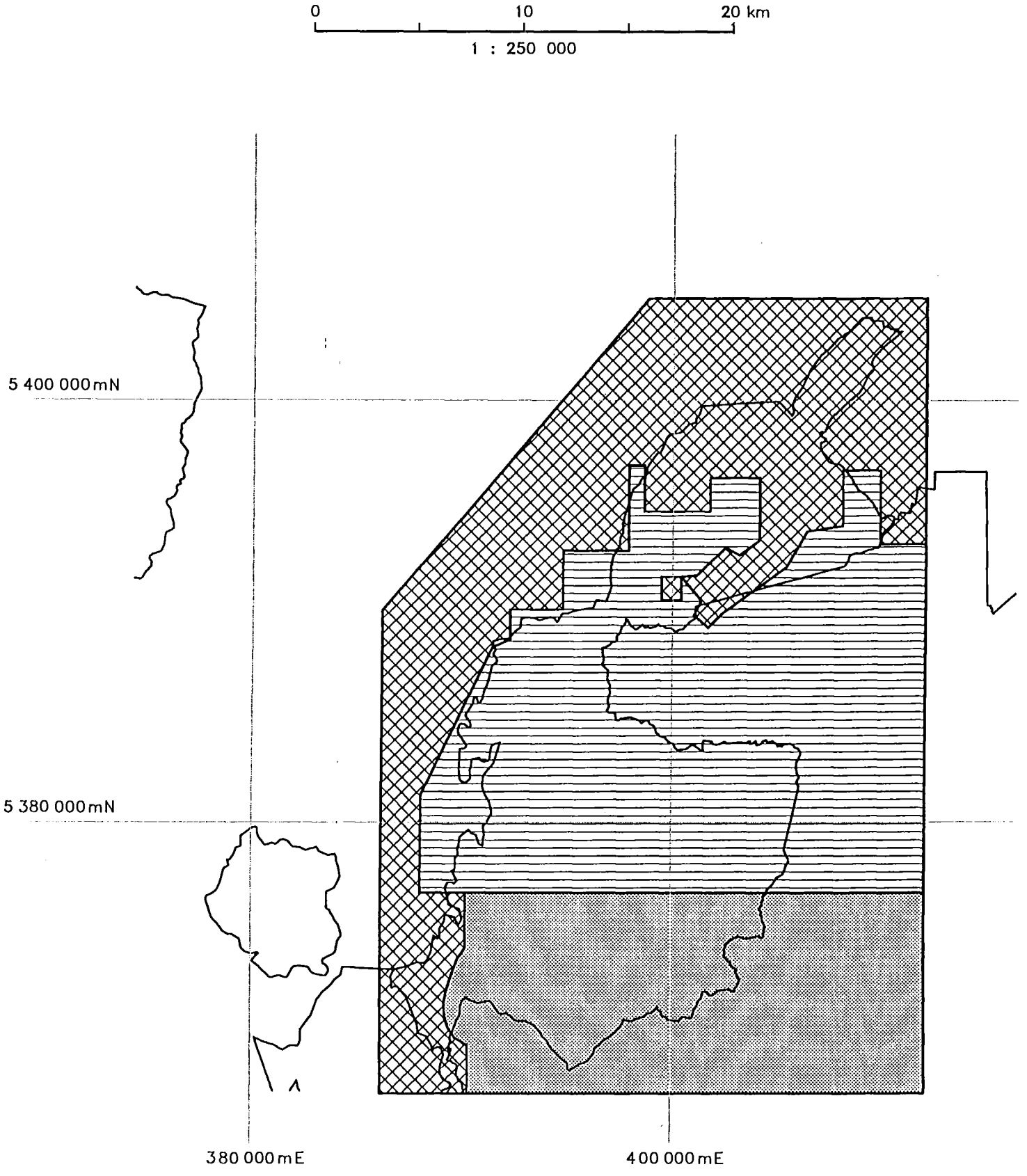
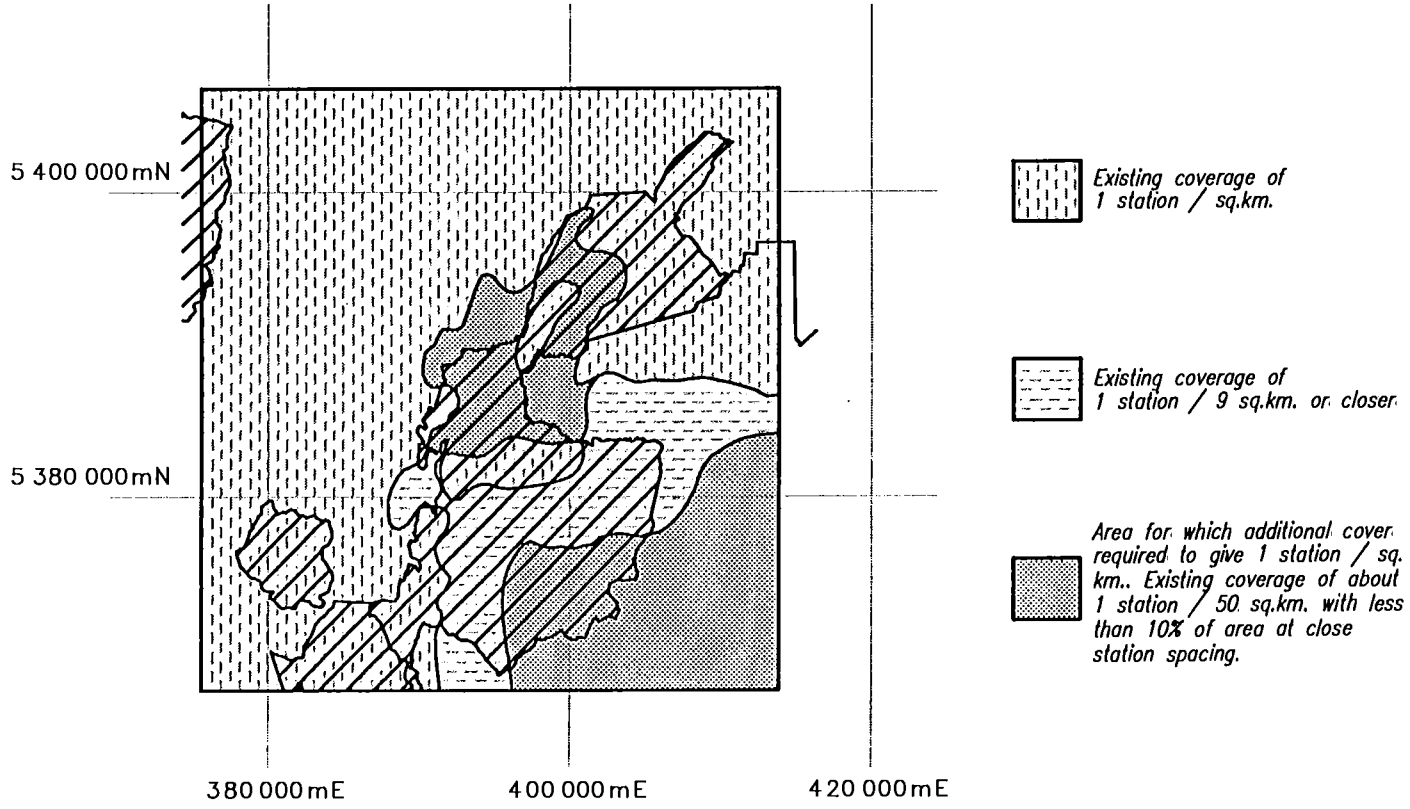


Fig. 6 GEOPHYSICAL COVERAGE (EXISTING AND REQUIRED).
AREAS OF MINERAL RESOURCE ASSESSMENT
VALE OF BELVOIR - REYNOLDS FALLS - GRANITE TOR

0 10 20 30 40 km

1 : 500 000

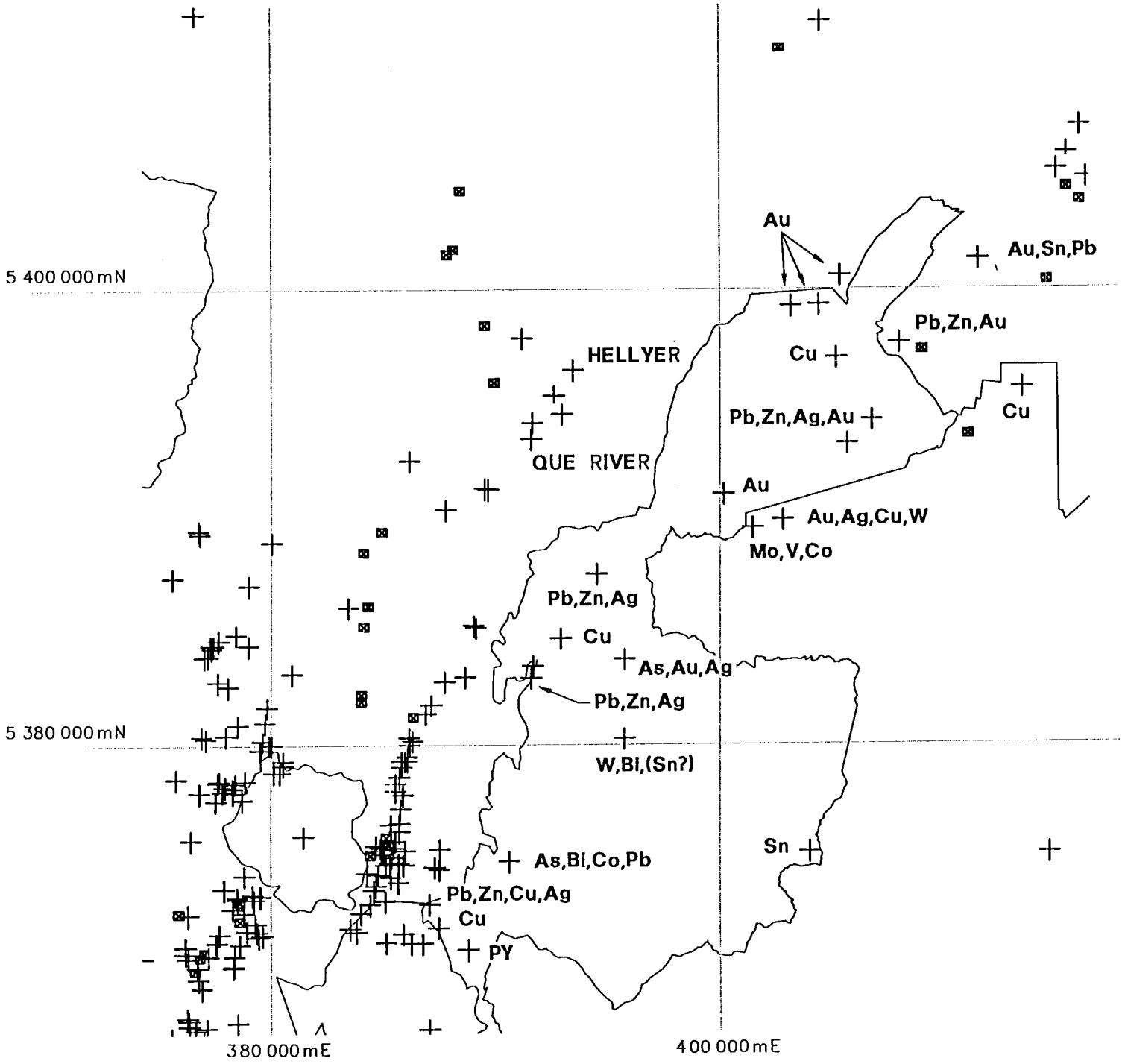
A) GRAVITY



B) AEROMAGNETICS

Fig. 7 **MINERAL OCCURRENCES**
VALE OF BELVOIR - REYNOLDS FALLS - GRANITE TOR

0 10 20 km
1 : 250 000



CROSSES (+) : MINERAL OCCURRENCE

Au	:	*Gold*	**As**	:	*Arsenic*
Pb	:	*Lead*	**Bi**	:	*Bismuth*
Zn	:	*Zinc*	**Mo**	:	*Tungsten*
Ag	:	*Silver*	**V**	:	*Vanadium*
Cu	:	*Copper*	**py**	:	*Pyrite*
			Co	:	*Cobalt*

SQUARES (▣) : CONSTRUCTION MATERIALS

DATA

Geological Maps

Barton, C.M., et *al.*, 1966. Mackintosh. 1 Mile Geol.Map.Ser. 8014-N. Dep.Mines Tasm.

Corbett, K.D., and McNeill, A.W., 1988. Geological Compilation Map of the Mount Read Volcanics and Associated Rocks: Hellyer to South Darwin Peak. 1:100 000 Mount Read Volcanics Project Map 6. Dep.Mines Tasm.

Corbett, K.D., and McNeill, A.W., 1986. Geology of Rosebery-Mt Block area. 1:25 000 Mount Read Volcanics Project Map 2. Dep.Mines Tasm.

Corbett, K.D., and Brown, A.V., 1975. Queenstown. 1:250 000 Map SK55-5. Dep.Mines Tasm.

Komyshan, P., 1986. Geology of the Mt Charter-Hellyer area. 1:25 000 Mount Read Volcanics Project Map 1.

McNeill, A.W., 1987. Geology of the Mt Murchison area. 1:25 000 Mount Read Volcanics Map 8. Dep.Mines Tasm.

Pemberton, J., and Vicary, M.J., 1988. Geology of the Mt Cattley-Mt Tor area. 1:25 000 Mount Read Volcanics Map 8. Dep.Mines Tasm.

Vicary, M.J., and Pemberton, J., 1988. Geology of the Back Peak-Cradle Mountain Link Road area. 1:25 000 Mount Read Volcanics Project Map 7. Dep.Mines Tasm.

Williams, E., and Turner, N.J., 1973. Burnie. 1:250 000 Map SK55-3. Dep.Mines Tasm.

The northern part of the area has been covered by recent 1:25 000 published Mount Read Volcanic Project mapping. The central portion has been covered by 1:63 600 scale mapping published in 1966, but the southern portion has only been compiled on 1:250 000 scale, published in 1975, and is based on interpretation of aerial photographs by Corbett and Brown (1975). Some useful observations have been made by exploration geologists, but no systematic mapping, apart from further air photo interpretation, has been done (see Fig. 5).

(b) Geological Summary

The oldest rocks in the area are Precambrian quartzite and phyllite of the Tyennan region which crop out in the eastern part of the area. These are flanked to the west and are overlain unconformably by Cambrian sedimentary rocks in the Back Peak area which are derived from a mixed source comprising

the Precambrian basement and Cambrian volcanic rocks. These rocks are correlates of the Sticht Range Beds of the Tyndall Range. These rocks are overlain by a mixed volcanic-sedimentary succession of the Back Peak Beds. A major quartz-feldspar-biotite-hornblende porphyry, the Bond Range Porphyry intrudes the Cambrian sequence and is part of a discontinuous belt of similar porphyries which occupies the eastern flank of the Mount Read Volcanics from Elliott Bay to Lorinna. Windows of quartz-bearing volcanics and volcaniclastic sandstone occur discontinuously in the Black Bluff Range-Mt Beecroft area. These rocks are probably correlates of the Tyndall Group as are similar rocks further south which occur on the shores of Lake Mackintosh.

The Mount Read Volcanics are succeeded by quartzose, and minor volcaniclastic, sandstone and conglomerate of the Denison Group. These rocks are relatively thin in the Black Bluff Range-Mt Beecroft area as evidenced by the windows of Cambrian volcanics mentioned previously but the area south of Mt Beecroft encompassing Reynolds Falls and Ten Mile Creek has not been remapped in detail. The Denison Group rocks on the western shore of Lake Mackintosh have been recently mapped at a satisfactory scale. Ordovician Gordon Limestone occurs in the Vale of Belvoir, and the limestone and succeeding rocks, correlates of the Eldon Group, occur in the White Hawk Creek-south Mt Cripps area.

A small area of Parmeener Group sedimentary rocks is mapped W of Mt Inglis. Tertiary basalt crops out in the Vale of Belvoir and the headwaters of White Hawk Creek. Quaternary glacial, fluvioglacial, fluvial and scree deposits are widespread.

(c) Geophysical coverage

- Richardson, R.G., and Leaman, D.E. 1987. Tasgrav - the Tasmanian gravity data base. Unpub.Rep.Dep.Mines Tasm. 1987/02.
- Bureau of Mineral Resources aeromagnetic survey, Tasmania 1985.
- Tasmanian Dept. of Mines aeromagnetic survey, Western Tasmania 1981.
- Tasmanian Dept. of Mines aeromagnetic survey, Devonport area 1985.
- Various company magnetic and electromagnetic surveys (see references section (e)).

The gravity and aeromagnetic coverage is shown in Fig. 6. Aeromagnetic data from the Tasmanian Department of Mines western Tasmanian and Devonport surveys is at a line spacing of 500 m with a nominal terrain clearance of 150 m. Local areas have been covered in more detail in company surveys.

Much of the area requires further gravity coverage.

(d) Mineralisation

References

Green, G.R. and Bamford, A.L., 1986a. Tullah. Mount Read Volcanics Project 1:50 000 Mineral Deposits Map Series 80.

Green, G.R. and Bamford, A.L., 1986b. Rosebery. Mount Read Volcanics Project 1:50 000.

Pemberton, J., Vicary, M.J. and Corbett, K.D., in press. Geology of the Cradle Mountain Link Road-Mount Tor area. Mount Read Volcanics Proj.Geol.Rep.4. Dep.Mines Tasm.

MIRLOCH: Div.Mines Tasm. data base.

Perusal of the literature has resulted in some refinement of the position of deposits listed in MIRLOCH and has provided additional areas of mineralisation (Table 1).

Table 1: Deposits in or near Vale of Belvoir-Granite Tor area

No.	Location	Name	Commodities	Comment
44018	391650 E, 5383700 N	White Hawk	Pb, Zn, Cu, Ag	veins
44049	391600 E, 5383000 N	Symmon's and Lynches	Pb, Zn, Cu, Ag	veins, disseminated
44312	395700 E, 5383800 N	Romulus East	As, Au, Ag, Bi	vein
44313	394400 E, 5387400 N	Ray's Prospect	Pb, Zn, Ag	disseminated
44320	401500 E, 5389600 N	Mt Remus	Mo, V, Co	vein
44315	395700 E, 5380300 N	Granite Tor	W, Bi, (Sn?)	veinlets
44317	403100 E, 5399280 N	Mayday Creek	Au	placer
44322	413300 E, 5395700 N	Welcome Home	Cu	vein
44328	404300 E, 5399350 N		Au	
44329	402740 E, 5389970 N	Anio Creek	Au	
	402600 E, 5389600 N	Anomaly 13 (Anio Ck)	Au, Cu, Ag, W	mineralised breccia
44331	406600 E, 5394300 N	Carter's Prospect	Pb, Zn, Ag, Au	veins, breccia
44332	405600 E, 5393300 N	Heap of Rocks	Pb, Zn, Ag	veins
44333	407900 E, 5397700 N	Speeler Creek	Pb, Zn, Ag	disseminated
44334	400000 E, 5391650 N	Ten Mile Creek	Au	stockwork
51319	390600 E, 5374900 N	Innes' Prospect	As, Bi, Co. Pb	vein
51081	387040 E, 5373040 N	Foy's Lode	Pb, Zn, Cu, Ag	vein
51095	387440 E, 5372040 N	Kittson's Workings	Cu, Ag, Bi, Zn	vein
	404000 E, 5375000 N	Bluff River	Sn	greisen, placer, (skarn?)
	405100 E, 5397050 N	Prover 8	Cu, magnetite	disseminated
	389890 E, 5369840 N		pyrite	veins
	392500 E, 5384800 N		Cu	

Key: Pb: lead, Zn: zinc, Cu: copper, Ag: silver, Au: gold, Bi: bismuth, Mo: molybdenum, V: vanadium, Co: cobalt, W: tungsten, Sn: tin, As: arsenic.

(e) Exploration History

Vale of Belvoir

The area has been held under Exploration Licences 12/65 by Pickands Mather International, 7/68 by Tasminex NL, 10/74 by Union Oil, with subsequent exploration under a farm out agreement by Geopeko, 41/83 by RGC and 47/87 by Billiton.

Most attention during these programmes was directed towards exploration of the Mount Read Volcanics in the surrounding areas and the Gordon Limestone in the Vale of Belvoir has received scant attention. Some 28 stream sediment samples have been analysed from the area: 21 by Pickands Mather, two by Union Oil, two by Billiton and two by Geopeko. Most reported low base metal values (< 20 g/t) but three samples collected by Pickands Mather around 406 500 m E, 5 400 300 m N had Zn values of 100 g/t and Pb values in the range 50-90 g/t, with relatively high assays for Cu, Co and Ni.

Two samples analysed by Billiton around 408 200 m E, 5 401 500 m N also had relatively high Pb (82 and 32 g/t); As (14 and 13 g/t) and Ba (115 and 105 g/t) contents.

The former group of anomalies is in an area underlain by Gordon Limestone and fluvioglacial gravels.

These anomalies are significant given the generally poor dispersion trains of Cu, Pb and Zn stream sediment results in areas with peaty soils, but derivation of the anomalies from the fluvioglacial deposits is a possibility.

Geopeko flew a DIGHEM II helicopter-borne EM (magnetics survey in 1980. EM/magnetic anomalies were interpreted to be due to Tertiary basalt.

References

Corbett, E.B., 1975. Preliminary geological report - Bond Range area, northern Tasmania. EL 10/74 - Black Bluff. Unpub.Report, Union Oil Development Corp. (TCR 75-1098).

Pemberton, J., 1981. Progress report on EL 10/74 Black Bluff, Tasmania, February 1980 to June 1981. Unpub.Rep. Geopeko Ltd. (TCR 81-1581).

Pemberton, J., 1983. Relinquishment report on part of EL 10/74 Black Bluff. Unpub.Rep. Geopeko Ltd. (TCR 83-1895).

Randell, J.P., 1988. EL 47/87 - Bond Range, Tasmania. First and final report. Unpub.Rep. Billiton Aust. (TCR 88-2898).

Roberts, P.A., 1984. EL 41/83, Lake Lea area, Annual Report 1983-84. Gold Fields Exploration Pty Ltd Rep. (TCR 84-2310).

Roberts, P.A., 1985. EL 41/83, western 56 sq.km., relinquishment report. Unpub.Rep. Gold Fields Exploration Pty Ltd. (TCR 85-2506).

Smith, H.D., 1968. Bond Peak area, geology and stream sediment sampling survey. Unpub.Rep. Pickands Mather and Co. Internat. (TCR 68-509).

Reynolds Falls area

EL 2/70

Exploration commenced in the area around Carters Prospect with soil and rock chip geochemistry defining disseminated galena-pyrite mineralisation over an area of about 150 by 150 metres. Krummei (1970) concluded that the mineralisation was stratiform but had been reconcentrated along NW trending faults and breccias. Follow up gridding and soil sampling showed that the anomalies extended over a 5.4 km NE trending zone in a narrow belt of volcanic rocks between an intrusive porphyry and Precambrian metasediments (Varley, 1971). A wide spaced stream sediment survey from Anio Creek in the south to Mackintosh Creek in the west was carried out at this time but samples were analysed for copper, lead and zinc only. In 1972 a helicopter borne aeromagnetic/EM survey identified four conductors in the area, but the survey was largely restricted to the Cambrian rocks (Slade and Webster, 1972). Follow up of one of these anomalies revealed a minor copper-lead-zinc soil anomaly and a limonite-stained schist breccia but the EM response was interpreted to be probably caused by graphitic schist. At this time the stream sediment survey was extended to include the Ordovician rocks in the Southwell River, Mackintosh Creek and tributaries. Although low order anomalies were identified

in the Vale River near its confluence with Etchell Creek and in a southward flowing tributary of Mackintosh Creek near 396 500 m E, 5 390 800 m N it was considered that the Ordovician and Silurian rocks were of limited potential (Krummei, 1972) and the licence was subsequently reduced to cover mainly the Cambrian rocks.

Further follow up of the airborne EM anomaly over the Precambrian rocks by ground EM confirmed the conductor which was noted to be coincident with a copper-lead-silver soil geochemical anomaly. The graphitic schist model did not explain why there is a magnetic anomaly in the area and a comprehensive geochemical sampling programme was recommended (Skey, 1973). Follow up of the other airborne EM anomalies revealed they were probably caused by Tertiary basalt (Skey, 1974).

Follow up I.P. surveys were done over four lines covering two of the Paringa lead soil geochemical anomalies and revealed weak anomalies coincident with the geochemistry. Reconnaissance drilling was recommended (Skey, 1975). Trenching of the anomalous areas was followed up with petrology and rock chip geochemistry with lead values to 2400 g/t reported. It was concluded that the source of the anomalies was disseminated sulphides in fissures, but that a source in glacial scree might partly be responsible (Young, 1978).

Exploration was continued from 1979 by Geopeko under a joint venture agreement with Aberfoyle. Geological mapping, and stream sediment geochemistry with analyses for copper, lead, zinc, iron, tin, tungsten and gold (small proportion of samples only) was carried out. Minor anomalous gold was reported from streams draining the porphyry and base metal anomalism mainly was found in areas draining the Cambrian volcanic and sedimentary rocks east of the porphyry. Anomalous tin values to 425 g/t were recorded from Fleece Creek and a tributary to the south which drain an area south of Carter's Prospect and values up to 165 g/t were recorded from the lower reaches of Tumbling Creek in an area draining Cambrian porphyry and Ordovician sandstone (Herrmann, 1980).

Detailed geological mapping C horizon soil geochemistry over the Heap of Rocks (Prover 1) prospect was followed up by diamond drilling of one 156 m diamond drill hole under the peak lead soil anomaly. Twenty three metres of 0.14% lead, 0.14% zinc and 2.5 g/t silver were assayed from an interval of minor veinlet pyrite-base metal sulphide mineralisation in siliceous siltstone and zinc mineralisation including 4 m of 0.6% Zn occurred further down the hole in a brecciated lava containing quartz-chlorite-sulphide veinlets (Herrmann, 1984).

A helicopter borne EM-magnetic (Dighem II) survey was flown over the area in 1979. Follow up of most of the anomalies was disappointing, one was due to basalt, another could not be located on the ground and a third was just west of Carter's Prospect. Neither of the more significant mineralised zones (Carter's and Speeler Creek Prospects) were detected by the survey. A magnetic anomaly east of the Vale River (Prover 8) was found to be related to hematite-maghetite veins, with up to 1600 g/t copper, in tuffs stratigraphically above the major quartz-feldspar-biotite porphyry (Herrmann, 1984).

Cyprus Minerals then joint ventured into the licence as operators. An EM-77 electromagnetic survey was run over 7 loops covering the Heap of Rocks, Carter's and Speelers Creek Prospects. Weak responses occurred over the three prospect areas and four drill holes were proposed to test the anomalies (Jones, 1985). Follow up geochemistry showed a promising gold zone at Speeler Creek (Jones, 1986) but this was downgraded by re-assay and was assumed to be due to laboratory error (Jones, 1987). One of the four holes was drilled at the Speeler Creek Prospect, outside the CEG nominated area with a 3 metre zone of 785 g/t Cu, 2600 g/t Pb, 260 g/t Zn and 2.5 g/t Ag in a vuggy siliceous zone in fine tuff. A downhole EM survey failed to detect any significant off hole conductor and the area was relinquished (Jones, 1987).

References

Herrmann, W., 1980. Progress report on Mackintosh East, part of EL 2/70, Tasmania, December 1978 to December 1979. Unpub.Rep. Geopeko Ltd. (TCR 80-1473).

Herrmann, W., 1984. Final report on exploration in areas to be relinquished from the eastern part of EL 2/70: Mackintosh East Unpub.Rep. Geopeko Ltd. (TCR 84-2304).

Jones, P.A., 1985. Progress report, December 1984 to November 1985, Mackintosh East, Exploration Licence 2/70 Tasmania. Unpub.Rep. Cyprus Minerals Aust.Co. (TCR 85-2515).

Jones, P.A., 1986. Progress report, December 1985 to June 1986, Mackintosh East, Exploration Licence 2/70, Tasmania. Unpub.Rep. Cyprus Minerals Aust.Co. (TCR 86-2553).

Jones, P.A., 1987. Progress report six months to November 1986, Mackintosh East. Exploration Licence 2/70 Tasmania. Unpub.Rep. Cyprus Minerals Aust.Co. (TCR 87-2637).

Krummei, G., 1970. Progress report on the Back Peak Prospect, Mackintosh area, Tasmania. Unpub.Rep. Aberfoyle Management Pty Ltd. (TCR 70-630).

Krummei, G., 1972. Progress report on the Mackintosh area, EL 2/70, Tasmania 1971-72. Unpub.Rep. Aberfoyle Management Pty Ltd (TCR 72-881).

Skey, E.H., 1973. EL 2/70 Mackintosh River area, Tasmania. January-February 1973. Unpub.Rep. Cominco Exploration Pty Ltd. (TCR 73-931).

Skey, E.H., 1974. EL 2/70 Mackintosh River. Unpub.Rep. Cominco Exploration Pty Ltd (TCR 74-1020).

Skey, E.H., 1975. Progress report Mackintosh River, Exploration Licence 2/70 for six months ended June 30, 1975. Unpub.Rep. Cominco Exploration Pty Ltd (TCR 75-1125).

Slade, J. and Webster, S.S., 1972. Report on the combined helicopter magnetic and electromagnetic survey in the Mackintosh River area, Tasmania. Unpub.Rep. McPhar Geophysics Pty ltd (TCR 72-863).

Varley, R.J., 1971. Report on the Mackintosh area, Tasmania, 1970-71. Unpub.Rep. Aberfoyle Management Pty Ltd (TCR 71-737).

Young, C.H., 1978. Annual Report, Exploration Licence 2/70 Mackintosh, Tasmania for 12 months ending June 1, 1978. Unpub.Rep. Abminco NL (TCR 78-1277).

EL 14/74

EL 14/74 was held over Carter's Prospect. Comstaff Pty Ltd carried out gridding, geological mapping and ground magnetics, self potential and Crone EM surveys over the grid. In addition 135 A horizon soil samples were analysed for copper, lead, zinc, molybdenum and barium and 19 rock samples were analysed for the above metals and silver. Best assays in the gossan were 0.18% copper, 9.2% lead, 1.15% zinc, 880 g/t molybdenum, 1050 g/t barium and 80 g/t silver. It was concluded that the mineralisation occurred as gash veins in Precambrian host rocks. Although the mineralisation itself was concluded to have little potential, its presence enhanced the prospectivity of the Cambrian rocks to the west. Tourmaline was noted in one vein (Rugless, 1976).

Reference

- Rugless, C.S., 1976. Final report on Fury Plains Prospect, Exploration Licence 14/74. Unpub.Rep. Comstaff Pty Ltd (TCR 76-1165).

EL 46/80

EL 46/80 was taken up over Precambrian rocks in the Heap of Rocks area to explore for tin and tungsten. Anomalies generated by the Dighem II survey were followed up with limited stream sediment geochemistry which revealed low order tin and tungsten anomalies (Heithersay, 1982). A panned concentrate stream sediment survey, and limited ground magnetics and C-horizon soil sampling were carried out. Two panned concentrated tungsten anomalies of 160 and 170 g/t were defined in Fleece Creek just upstream from Carter's Prospect (Pemberton and Sumpton, 1983).

References

- Heithersay, P., 1982. Progress Report on Heap of Rocks EL 46/80 Tasmania. Unpub.Rep. Geopeko Ltd (TCR 82-1881).

- Pemberton, J. and Sumpton, J.D.H., 1984. Progress report on Heap of Rocks EL 46/80 Tasmania. Unpub.Rep. 46/80 Tasmania. Unpub.Rep Geopeko Ltd (TCR 84-2117.

ELs 24/84 and 106/87

Both of these licences are currently operated by Aberfoyle Resources Ltd. Parts within the area have been relinquished, but the only work carried out was limited geological traversing. No samples were analysed (Henham, 1989; McNeil, 1990).

References

Henham, R.J., 1989. Exploration Licence 24/84, Mt Romulus, Tasmania. Report on exploration in areas to be relinquished, 25th November, 1989. Unpub.Rep. Aberfoyle Resources Ltd (TCR 89-3050).

McNeill, A.W., 1990. Lake Mackintosh, Exploration Licence 106/87, Tasmania. Report on exploration of areas to be relinquished. Unpub.Rep. Aberfoyle Resources Ltd (TCR 90-3073).

EL 89/87

This licence was taken out by CRA Exploration but all effective work was done by Aberfoyle under a joint venture agreement. The Ten Mile Creek Grid of the adjacent EL 24/84 was extended to the NE to examine the continuation of stockwork and vein hematite-gold mineralisation in the Bond Range Porphyry. Fifty C horizon soil samples were analysed for copper, lead, arsenic, zinc, gold, silver and iron. Weak to moderate copper anomalies (to 535 g/t were detected. Minor gold anomalies (to 0.068 g/t) are associated with chloritic alteration. It was concluded that hematite stockworks are surrounded by hematite-chlorite alteration anomalous in copper and zinc and, to a lesser extent, gold. Conventional and bulk cyanide leach stream sediment samples were collected from the SE drainages of the Vale River between Ten Mile and Tumbling Creeks. One anomalous sample was related to the hematite-chlorite stockwork.

Three additional stream sediment samples and one bulk leach sample were collected in the area near the Cradle Mountain Link Road. Two nearby samples assayed 130 g/t Pb, 205 g/t Zn and 1250 g/t Ba and 200 g/t Pb and 155 g/t Zn but 'were not considered anomalous'.

It was concluded that there had been insufficient testing of the possibility of hematite-gold stockwork mineralisation in the Cradle Mt Link Road-Vale of Belvoir area.

Reference

Henham, R.J., 1989. Exploration Licence 89/87, Back Peak, Tasmania. Report on Exploration Activity 12 months to 10th April, 1989. Unpub.Rep. Aberfoyle Resources Ltd (TCR 89-2971).

EL 90/87

EL 90/87 was taken out by Billiton Australia to explore the Back Peak Beds between Mt Remus and the Speeler Ck Prospect. Stream sediment geochemistry (including bulk cyanide leach sampling for gold) was carried out. Most anomalies could be related to the known prospects, but some possibly related to the contact between the Back Peak beds and the Bond Range porphyry were not followed up. Additional soil sampling was carried out over the Carter's and Heap of Rocks Prospects to confirm previous anomalies and a 166 m hole was drilled at the Speeler Creek Prospect over an EM and soil geochemical anomaly defined by Cyprus. Minor disseminated zinc-lead mineralisation with peak values of 0.23% lead, 0.21% zinc over 1.2 metres. Downhole EM surveying failed to detect an off hole conductor (Randell, 1988 and personal communication). Field work to explore the contact between the volcanics and the Denison Group sedimentary rocks was considered, but was not carried out and the licence was relinquished (Randell, 1989).

References

Randell, J.P., 1988. EL 90/87 - Back Peak, Exploration progress report for the 12 month period ending 29th January 1989. Unpub.Rep. Billiton Aust. (TCR88-2890).

Randell, J.P., 1989. EL 90/87 - Back Peak, Relinquishment Report. Unpub.Rep. Billiton Aust. (TCR89-3041).

Granite Tor area

EL 5/74

Following the discovery of the Que River orebody, Cominco Exploration Pty Ltd (now Aberfoyle) took out this licence over the central relinquished strip of EL 2/70. An airborne magnetic/E.M. survey was flown over the area and a broad anomaly west of Backwater Creek was regarded as due to a lithological response (Webster, 1975). Some stream sediment geochemical anomalies generated by Paringa in the Backwater Creek-Romulus Pup-Fury River area were followed up with geological mapping and stream sediment geochemistry. One anomalous sample had relatively high copper, lead, zinc and tungsten values (near 496 900 m E, 5 386 000 m N) but samples 50 m either side were not anomalous and the anomaly was regarded to be insignificant (Rabone, 1975). The area was subsequently relinquished.

References

Rabone, G., 1975. Progress report for year ending May 30, 1975. Exploration Licence 5/74, Mayday Creek Tasmania. Unpub.Rep.Cominco Exploration Pty Ltd (TCR 75-1091).

Webster, S.S., 1975. Airborne geophysical survey of an area within EL 2/70, Mackintosh, EL 15/73, Hatfield, EL 5/74 Mayday. Unpub.Rep.Cominco Exploration Pty Ltd (TCR 75-1134).

EL 17/74

CRA Exploration applied soil geochemical exploration on 500 m spaced grid lines in this area underlain by Cambrian volcanic and intrusive rocks in the Brougham and Sophia River valleys. Marginally elevated lead values were reported in a tuff unit in a few places, but were not considered worthy of follow up and the area was relinquished (Porter, 1976). Samples were analysed for lead, zinc, copper and silver only.

Reference

Porter, T.M., 1976. EL 17/74 Mt Romulus, North West Tasmania. Final Report. Unpub.Rep.CRA Exploration Pty Ltd (TCR 76-1158).

EL 2/78

The area was taken out by Alcoa Australia with the primary objectives of exploring for quartz vein, greisen, carbonate replacement and skarn tin-tungsten deposits in the Granite Tor granite pluton and surrounding rocks. An aeromagnetic/radiometric survey was flown with 200 to 400 metre line spacing and some 26 anomalies were identified (Speijers, 1978). Follow up work involved water analysis for fluorine, stream sediment geochemistry, rock chip geochemistry of the granite and petrography of the granite and adjacent calc-silicate rocks (Speijers, 1979a). Subsequent work involved detailed mineralogical study of 286 heavy mineral concentrates combined with chemical analyses for a broad suite of elements, more water analyses for fluorine and photogeology (Speinjers, 1979b). Further photogeology and stream sediment sampling was carried out and grids were established over the Bluff River tin deposit and the Brougham River area east of Mt Swallow. Results from the Bluff River area showed that greisen mineralisation was more extensive than previously known and a number of skarn units were delineated. In the Mount Swallow area areas of anomalous tungsten, zinc and lead soil geochemistry were defined near the margins of the granite. Further work in both areas was recommended (Speijers, 1980). Shell then entered into a joint venture agreement with Alcoa and a major change in exploration emphasis resulted. A helicopter-borne magnetic/E.M. survey was flown over the western portion of the licence, in areas mainly of Cambrian rocks, and 19 anomalies were followed up by gridding, ground E.M. (mainly VLF, some GENIE), ground magnetics and soil, rock and stream sediment geochemistry. Most anomalies were found to be related to lithological causes. In addition outcropping lead mineralisation was discovered during stream sediment sampling (Ray's Prospect) (Speijers, 1982). In 1983 the eastern part of the area was relinquished without completion of the sampling in the Bluff River and Mt Swallow grid areas (Smyth, 1983a). Detailed follow up of some of the Dighem anomalies focussed on a number of areas. These included the Romulus East Prospect (quartz-pyrite-arsenopyrite veins with elevated arsenic, lead, silver, bismuth and mercury values), Backwater Creek where anomalous tin and tungsten values were regarded as being due to glacial sediments derived from the granite, the NE shore of Lake Mackintosh, where chlorite-pyrite veins were located, as was lead-zinc anomalism in limestone and Ray's Prospect. Most prospects were downgraded but drilling was recommended at two prospects and geophysics (EM and gravity) was

mooted at a further four locations (Smyth, 1983b). The final phase of exploration involved rock chip sampling in the Lower Brougham valley and further stream sediment surveys in the Anio Creek-Mt Remus area, Fury River-Backwater Creek and west of Mt Swallow. Gold anomalies were reported from Ten Mile Creek and Mt Swallow and tin and tungsten values were reported from all areas, but were believed to be due to transported granite. The areas of anomalous gold were not thought to represent major mineralisation and the area was relinquished (Smyth, 1984).

References

Smyth, W.D., 1983a. EL 2/78 - Granite Tor. Relinquishment report. Unpub.Rep. Shell Co. of Aust. Ltd (TCR 83-2020).

Smyth, W.D., 1983b. EL 2/78 - Granite Tor, annual report on retained area for the period June, 1982 to June, 1983. Unpub.Rep. Shell Co. of Aust. Ltd. (TCR 83-2033).

Smyth, W.D., 1984. EL 2/78 - Granite Tor. Final report on the area. Unpub.Rep. Shell Co. of Aust. Ltd. (TCR 84-2094).

Speijers, D.C., 1978. Report on EL 2/78, Granite Tor area, Tasmania. Unpub.Rep. Alcoa of Aust. Ltd. (TCR 78-1308).

Speijers, D.C., 1979a. Report on exploration of EL 2/78 during 1978-79 field season. Unpub.Rep. Alcoa of Aust. Ltd. (TCR 79-1349).

Speijers, D.C., 1979b. Report on exploration of EL 2/78 during winter, 1979. Unpub.Rep. Alcoa of Aust. Ltd. (TCR 79-1400).

Speijers, D.C., 1980. Report on exploration of EL 2/78 during 1980. Unpub.Rep. Alcoa of Aust. Ltd. (TCR 80-1490).

EL 42/83

Geopeko took up the relinquished eastern block of EL 2/78, but shortly afterwards the company began withdrawing from exploration in Tasmania. No work was done on the licence.

ASSESSMENT

(a) Quality of data

Some 80% of the area has been mapped at scale sufficiently detailed for preliminary mineral resource potential assessment (1:63 600 or better), but only about 25% has been mapped recently enough to allow confident preliminary assessment.

The southeastern 20% of the area, despite some useful scattered observations made during the tenure of Exploration Licence 2/78, has never been systematically mapped (Fig. 5).

Gravity coverage is patchy. It requires upgrading in the Granite Tor area and part of the Reynolds Falls area. Aeromagnetic data are adequate, but further work is required to link the various surveys.

A number of aerial E.M. surveys have been flown. The Granite Tor area and the belt of post-Cambrian rocks between the areas of Mount Read Volcanics outcrop in the Sophia River-Reynolds Falls area deserve further attention.

Numerous geochemical surveys have been done. Most of these have been limited in elements analysed, and deficient compared with current techniques.

Exploration programmes in the area have not been supported by sufficient drilling. Only one drill hole at the Heap of Rocks Prospect has been sufficiently documented. An earlier hole at Carter's Prospect has not been logged, analysed or surveyed. In general, recommendations to drill have not been supported by management decisions in exploration programmes and there has been no stratigraphic or structural drilling carried out.

This paucity of data extends to the understanding of known mineral deposits in the area. For example, Krummei (1970) suggested that mineralisation near Carter's Prospect was originally stratiform but higher concentrations were localised in later WNW faults in the Devonian. Rugless (1976) reported tourmaline in a vein from the area reinforcing the interpretation of Devonian mineralisation. Pemberton et al. (in press) summarised the data and concluded

that Cambrian mineralisation may have been remobilised into Devonian faults during Devonian granite emplacement despite the interpretation of Leaman and Richardson (1989) that granite lies at a depth of more than 8 km near Carter's Prospect. On the other hand, Herrmann (1984) implied that the mineralisation might be related to emplacement of the Bond Range Porphyry in the Cambrian. The unusual metallogenic association at the Mt Remus prospect, and its interpreted remoteness from Devonian granite supports an alternative, novel suggestion. Mo, V and Co are elements known to be concentrated in black shales together with base and noble metals (e.g. Vine and Tourtelot, 1970; various papers in Geological Society of America Abstracts, v. 22, pp. A11-A13, 1990). The occurrence of prospects within the Precambrian rocks, Cambrian Sticht Range Beds correlates and the Back Beds is consistent with initial metal concentrations in Precambrian black shales with later reconcentration during porphyry intrusion and Devonian faulting. Devonian granite emplacement may have played no significant role in the mineralisation history.

Such thoughts are pre-emptive and speculative, but emphasise the gaps in knowledge of the geological history of the area. A clear conclusion is that much more work is required to enable a reasoned estimate of the mineral resource potential of the area. Further petrographic, isotopic and ore genetic studies are required, in addition to the basic geological, geophysical and geochemical mapping currently lacking.

One particular item impacts strongly on the resource potential of the area. The position of the strongly mineralised Henty Fault Zone has not been established north of Mount Cripps. Although it has been suggested by Pemberton et *al.* (in press) that it lies underneath basalt to the west of the study area, it remains possible that the fault lies beneath Quaternary alluvium and Tertiary basalt along the upper reaches of Mackintosh Creek.

In summary, mineral exploration has been extensive, but somewhat superficial. This is shown by the emphasis on airborne geophysical surveys and stream sediment geochemistry despite the potentially masking and confusing effects of post-mineralisation rocks such as Tertiary basalt and Pleistocene glacigene sediments. In a number of cases promising anomalies have been incompletely delineated, but programmes were aborted due to changes in metal prices. A good case in point is the work on tin-tungsten mineralisation carried out by Alcoa on EL 2/78.

References

Leaman, D.E., and Richardson, R.G., 1989. The granites of west and north-west Tasmania - a geophysical interpretation. Bull.geol.Surv.Tasm. 66.

Pemberton, J., Vicary, M.J., and Corbett, K.D., in press. Geology of the Cradle Mountain Link Road-Mt Tor area. Mount Read Volcanics Project Geol.Rep. 4. Dep.Mines Tasm.

Vine, J.D., and Tourtelot, E.B., 1970. Geochemistry of black shale deposits - a summary. Economic Geology, 65, 253-272.

(b) Preliminary listing of possible resource models

Metallic Resources

Reference: Cox, D.P. and Singer, D.A., eds, 1986: Mineral Deposit Models. U.S. Geol.Surv.Bull. 1693.

Refer to Fig. 2. Model numbers refer to Cox and Singer (1986).

14a Tungsten skarn in limestone (Vale of Belvoir, possibly Granite Tor)

14b Tin skarn (Vale of Belvoir, possibly Granite Tor)

14c Replacement tin (in limestone, Vale of Belvoir, possibly Granite Tor)

15a Tungsten vein (Granite Tor area, Vale of Belvoir)

15b Tin vein (Granite Tor area, Vale of Belvoir)

15c Tin greisen (Granite Tor)

16 Climax molybdenum (Granite Tor)

18c Zinc-lead skarn (Vale of Belvoir)

19a Polymetallic replacement (Vale of Belvoir)

19b Replacement manganese (Vale of Belvoir)

20b Tin-polymetallic veins (Granite Tor, Vale of Belvoir)

21b Porphyry molybdenum (Granite Tor)

22c Polymetallic veins (Granite Tor, Vale of Belvoir, Cambrian and Precambrian rocks)

25a Hot spring gold-silver (Mount Read Volcanics)

25b Crude epithermal veins (Mount Read Volcanics)

25c Comstock epithermal veins (Mount Read Volcanics)

25d Sado epithermal veins (Mount Read Volcanics)

25e Epithermal quartz-alunite gold (Mount Read Volcanics)

26a Carbonate-hosted gold (Vale of Belvoir, Lake Mackintosh)

28a Kuroko massive sulphide (Tyndall Group, Back Peak Beds)

30a Sandstone-hosted lead-zinc (Eldon Group)

30b Sediment-hosted copper (Gordon Limestone)

31a Sedimentary exhalative zinc-lead (Gordon Limestone)

31b Bedded barite (Gordon Limestone)

32b Appalachian zinc (Gordon Limestone)

32c Kipushi copper-lead-zinc (Gordon Limestone)

36a Low-sulphide gold-quartz veins (All Precambrian and Palaeozoic)

37b Gold on flat faults (Bond Range Porphyry, Denison Group)

39a Placer (and palaeoplacer) gold (Quaternary sediments, Denison Group)

39e Alluvial placer tin (Parmeener and Quaternary sediments, Granite Tor)

Black shale related molybdenum-vanadium-gold (Precambrian)

Non-metallic resources

Coal in Parmeener Supergroup

Oil shale in Parmeener Supergroup

Limestone, dolomite in Gordon Limestone

Petroleum in hidden thrust slices

Construction materials

Silica in Precambrian rocks

Zeolites in Tertiary basalt

Barite in Mount Read Volcanics

CURRENT MINERAL RESOURCE POTENTIAL

Metallic mineral resources

The potential for many of the deposit classes listed above is poorly known to unknown because of inadequacies in the geological mapping coverage, lack of analyses for relevant elements and poorly constrained models.

14a, 14b, 14c	Moderate, confidence level poor
15a	Moderate
15b, 15c	High
16	Low to moderate
18c, 19a, 19b	Moderate, confidence level poor
20b	High in Granite Tor area, moderate, confidence level poor in Vale of Belvoir
21b	Moderate, confidence level poor
22c	High in Granite Tor area
25a - e	Unknown
26a	Unknown
28a	Moderate (in Mount Read Volcanics, exclusive of Bind Range Porphyry)
30a	High
30b	Unknown
31a	High in Gordon Limestone
31b	Unknown in Gordon Limestone
32b	High in Gordon Limestone
32c	Unknown in Gordon Limestone
36a	High in Denison Group, Mount Read Volcanics
37b	High in Bond Range Porphyry, moderate in Denison Group
39a	High in Vale of Belvoir-Reynolds Falls area
39e	High around Granite Tor
Black shale-related Mo-V-Co-Au	High in Precambrian phyllite, confidence level low

Non-metallic resources

Coal, oil shale	Moderate to unknown in Parmeener Supergroup
Limestone, dolomite	High in Gordon Limestone, inadequate assays
Petroleum	Unknown
Silica in Precambrian	Unknown, no known assays. Potentially high.
Zeolites in basalt	Unknown. Interesting occurrences in nearby areas
Barite in Mount Read Volcanics	Moderate
Construction Materials	Locally high

FUTURE MINERAL RESOURCE POTENTIAL

Largely as above. A resurgence in tin and tungsten prices would result in further exploration in the Lake Lea and Granite Tor areas.

Shifts in commodity prices could result in exploration for commodities such as lithium, beryllium and rare earth elements in the Granite Tor area.

Before any decision involving exclusive reservation of the area for nature preservation, further geological, geochemical, geophysical and ore genetic work should be carried out in the area and time provided for follow up exploration.

Past exploration in the area has been hindered by the remoteness of the area and the logistical difficulties and expense of performing the work. Notwithstanding these problems, strict environmental standards should be applied to future exploration and mine development.

The potential for the discovery and development of economic mineral resources in the area warrants such an approach.

APPENDIX 1

ASSESSMENT AND COSTINGS OF ADDITIONAL

GEOLOGICAL MAPPING AND GEOPHYSICAL PROGRAMMES

GEOLOGICAL MAPPING PROGRAMS

Estimated costs of geological mapping programmes have been prepared.

The costs have been arrived at in the following way:

1. Costs are based on $300/skm which is the standard geological survey cost for 1:50 000 scale mapping including field work, laboratory work and map productions.

2. The costs for each area are those required to update the geological mapping at the 1:50 000 scale believed to be sufficient for preliminary assessment of these areas. As far as costs are concerned, traverse mapping has been treated at the same rate as 1:50 000 scale mapping as the location and definition of basement rocks enclosed in dolerite or Parmeener Group rocks is required.

Area of mapping required = 283 skm.

Cost = $85,000

GEOPHYSICAL COVERAGE - EXISTING AND REQUIRED

The existing coverage of geophysical data is shown in Fig. 6. It is considered that the aeromagnetic data are adequate. Upgrading the gravity coverage to one station per skm within the area and to a distance of 5 km to the east and to a density of one station per 9 skm from 5 to 40 km to the east would require an additional 453 stations. At a cost of $195 per station, allowing for the remoteness and topography of the area, would require $88,300. Coverage of the area to the north is adequate and further coverage required to the south and west will be addressed in companion volumes of this series.