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Geology and mineral resources of the Mount Horror Exempt Area

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INTRODUCTION

This report is predominantly a literature review of the geological knowledge, mineral deposits and mineral exploration in the Mount Horror Exempt Area of northeastern Tasmania (fig. 1), with emphasis on the more recent surveys, exploration programmes, and prospectivity.

Lode gold deposits are widespread in western and northern Tasmania, and principally occur in the pre-Carboniferous rocks of the Dundas Trough and Lachlan Fold Belt (fig. 1). The northeastern area is most important, with numerous gold-quartz veins in the turbidite-bearing Mathinna Beds, of Ordovician to Devonian age, in the Lachlan Fold Belt. The greatest concentration of deposits occurs in a belt running through the Mathinna Beds from around Waterhouse, near the north coast, south for about 80 km almost to Fingal (Noldart and Threader, 1965; Bottrill *et al.*, 1992; Bottrill, 1992; Taheri, 1992; Bottrill and Taheri, 1994). Other deposits occur with spatial and possible genetic relationships to granitoid intrusions, and include deposits in the Gladstone, Upper Scamander (Hogans Road or Brilliant Creek) and Lisle-Denison areas (Bottrill *et al.*, 1992).

The Mt Horror area lies in the central part of the above-mentioned belt (the Warrentinna and Forester goldfields) in the Mathinna Beds (fig. 2). The total recorded production from lode gold deposits in the area is only about 105 kg (Table 1) but, as early records are very poor, the actual production would have been much greater. The locations of known deposits are shown in Figure 3.

The Mount Horror Exempt Area area also covers some major alluvial tin deposits in the Ringarooma River and other

drainage systems. These include the Arba, Valley and Briseis deposits. Other mines and prospects in the area were worked for tungsten and other minerals (e.g. the Gorge Creek tungsten prospect).

This report is of an interim nature, timed to coincide with the release of some departmental geophysical data. A more complete report, detailing specific deposits, recent departmental work and other updated data, will be released later in 1994.

REGIONAL GEOLOGY

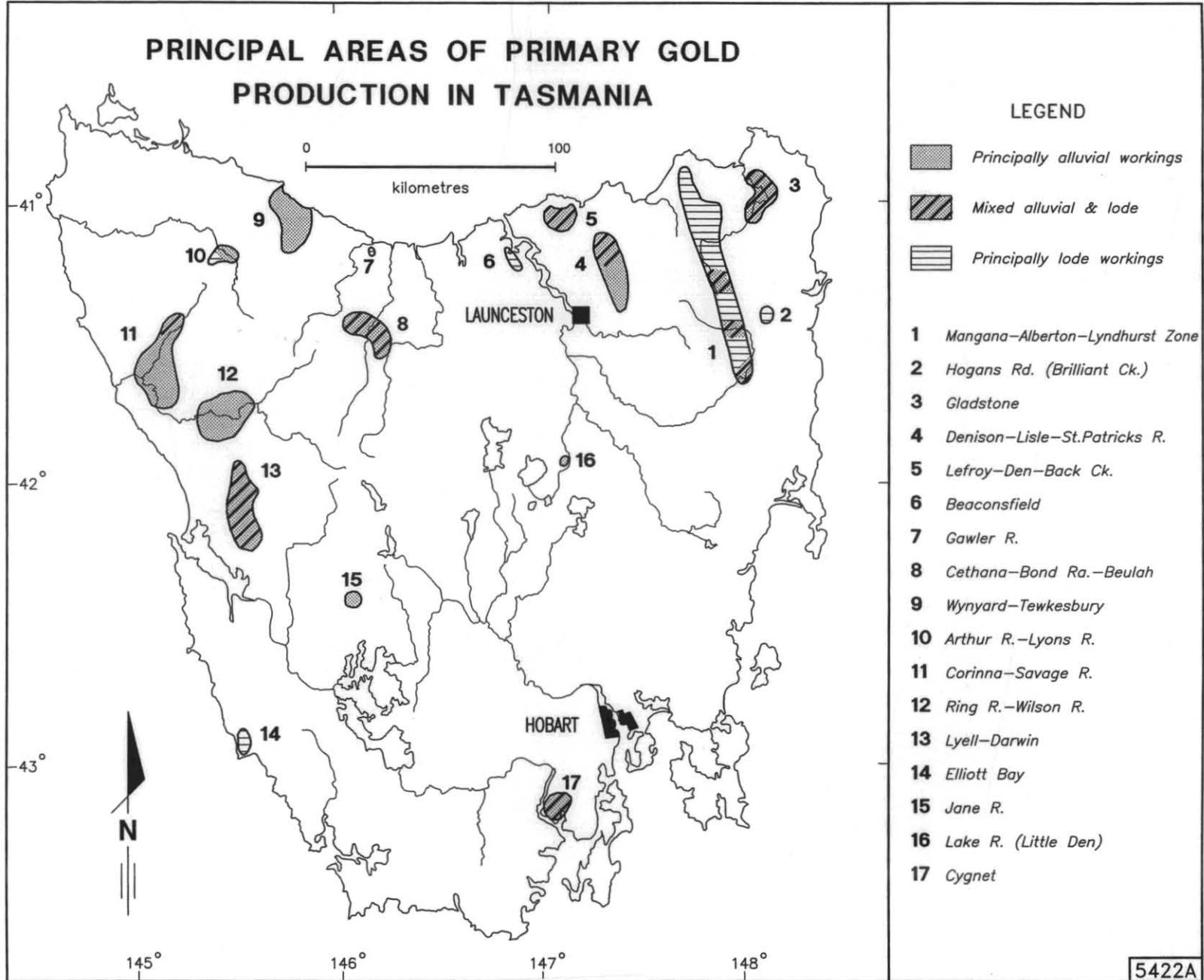
The geology of the Mount Horror area is shown on the Ringarooma 1:50 000 scale geological map sheet (Brown *et al.*, 1977). Much of the following information is summarised from this and McClenaghan *et al.* (1982) (fig. 4).

The oldest rocks exposed in the area are the Mathinna Beds, which are quartzwacke to pelitic turbidite sequences of (?)Ordovician to Early Devonian age, generally classified with the Lachlan Fold Belt. These rocks are intruded and locally contact metamorphosed by granitic to dioritic rocks of the Scottsdale and Blue Tier Batholiths, of probable Upper Devonian to Lower Carboniferous age. The river valleys and flood plains are partly filled with Tertiary to Quaternary sediments and Tertiary basalt.

Mathinna Beds

Although the Mathinna Beds cover much of northeastern Tasmania the geology is relatively poorly known, mainly because of poor outcrop and lack of marker beds. The bedding strikes approximately NNE to NNW in most of the area and the sediments consist of psammite (lithic arenite and

PRINCIPAL AREAS OF PRIMARY GOLD PRODUCTION IN TASMANIA



- LEGEND**
-  Principally alluvial workings
 -  Mixed alluvial & lode
 -  Principally lode workings
- 1 Mangana-Alberton-Lyndhurst Zone
 - 2 Hogans Rd. (Brilliant Ck.)
 - 3 Gladstone
 - 4 Denison-Lisle-St.Patricks R.
 - 5 Lefroy-Den-Back Ck.
 - 6 Beaconsfield
 - 7 Gawler R.
 - 8 Cethana-Bond Ra.-Beulah
 - 9 Wynyard-Tewkesbury
 - 10 Arthur R.-Lyons R.
 - 11 Corinna-Savage R.
 - 12 Ring R.-Wilson R.
 - 13 Lyell-Darwin
 - 14 Elliott Bay
 - 15 Jane R.
 - 16 Lake R. (Little Den)
 - 17 Cygnet

Figure 1
The distribution of gold deposits in Tasmania

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5 cm

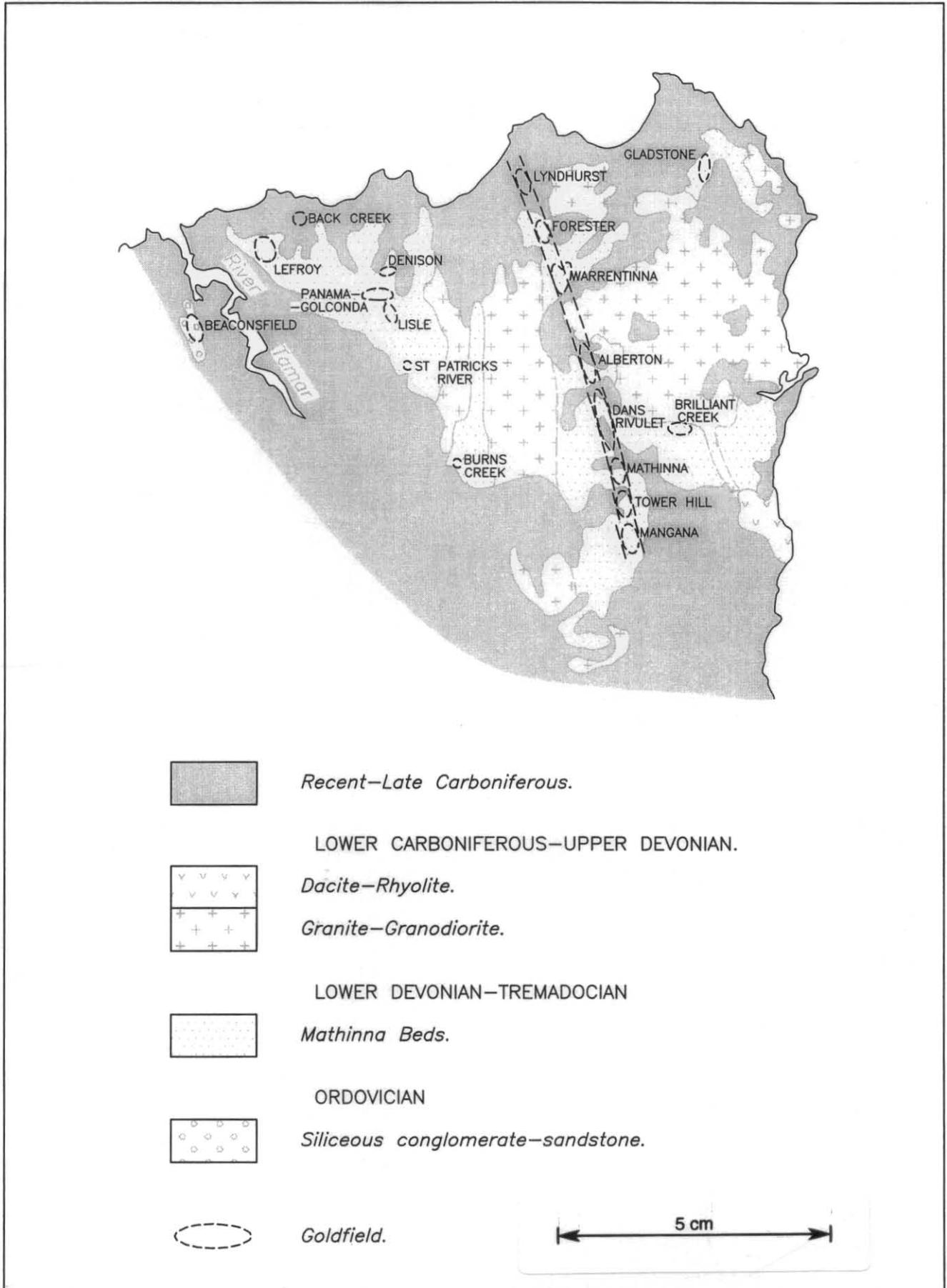


Figure 2

The geology and major goldfields of northeastern Tasmania

quartzite), psammopelite or siltstone, and pelite (phyllite, shale or slate), with local hornfelsing close to granitoid bodies (McClenaghan *et al.*, 1982). M. Roach (unpublished data) considers the sediments to be about 2 to 3 km thick below the 'gold belt'. The folding and syntectonic metamorphism (lower greenschist facies) in the Mathinna Beds is considered to pre-date the intrusion of granitoids (McClenaghan *et al.*, 1982). The major mineralogy is simple, usually quartz and muscovite, with lesser chlorite, albite, graphite, heavy minerals, etc.

The metamorphic aureoles around granitoids are commonly sharply defined, varying from about 800 m to about 5 km in width, depending upon the dip of the contact (McClenaghan *et al.*, 1982). Within these aureoles the sediments are commonly spotty and/or hornfelsed, and may contain biotite, epidote-clinozoisite, andalusite and cordierite, as well as quartz, muscovite and chlorite. Gold mineralisation appears to be associated with some aureoles such as in the Lisle-Golconda and Hogans Road areas (Bottrill *et al.*, 1992), but in general this relationship is not well developed. Tin and/or tungsten veins are also present in some areas. Gold mineralised areas may be variously characterised by enhanced cleavage, silicification or carbonate spotting.

Devonian Granites

In the Exempt Area area the Devonian granitoids have been classified into several categories (Brown *et al.*, 1977). The relevant parts of the Scottsdale Batholith in the west are subdivided into a biotite-hornblende granodiorite (Tuldeena Granodiorite) and various biotite adamellites (including the Mt Stronach Pluton and Russells Road Adamellite). The relevant parts of the Blue Tier Batholith in the east are subdivided into several biotite \pm muscovite alkali-feldspar granites and adamellites (including the Mt Paris Pluton, the Little Mt Horror Granite and the Poimena Adamellite, commonly tin bearing). There are also minor dykes of various porphyries and aplites.

Tertiary

Tertiary sediments are poorly exposed in the area, but are commonly significant tin sources. They consist of non-marine, fluvial, quartz-rich gravel, sand, silt and clay, and the clasts are generally rounded and of granitic or Mathinna Beds derivation. The lowermost parts are often carbonaceous, and may contain coal and marcasite. Sequences may be up to 60 m thick at the Boobyalla River (McClenaghan *et al.* 1982).

Tertiary silcrete and ferricrete are locally important, particularly in the northeast of the area. The ferricrete is thought to be restricted to near the basalt-sediment interface (McClenaghan *et al.* 1982).

Tertiary igneous sequences consist of a lower agglomerate and tuff, with overlying basaltic flows, commonly as valley fill. The rocks vary in composition from basanite to limburgite, olivine nephelinite and alkali olivine basalt, most commonly the last two varieties. Basalts in the area have been dated as early to middle Miocene (McClenaghan *et al.* 1982).

Quaternary

Quaternary deposits in this area consist of river alluvium and talus deposits. Some of the alluvium is tin and/or gold bearing.

STRUCTURE

The structure of the region has not been studied in detail, but major deformation appears to be restricted to the Mathinna Beds. Deformation is probably mostly mid-Devonian in age. Folding mostly strikes about NNW, but is NNE in some areas. Thrusting has been postulated in the northeast, but has not yet been confirmed (Powell and Baillie, 1991). The 'gold belt' is the major structure known in the area.

The 'gold belt' is a poorly-defined zone, about two kilometres wide and with a concentration of gold deposits, running through the Mathinna Beds from around Waterhouse, near the north coast, south for about 80 km almost to Fingal. The structure was probably continuous, but is intruded in places by Devonian granitoid intrusions, and buried in others by later sedimentary deposits, ranging in age from Permian to Recent, and is intruded or partly obscured by Jurassic dolerite. The strike is generally about NNW, but about NW near Mangana, and it may bifurcate (to the NNE) near Warrentinna. The 'gold belt' is characterised by close folding, axial plane shears, strongly cleaved slates, and abundant quartz veining (of several generations). The belt, along with the bedding and major structures, are disrupted by post-granitoid mega-kinking (Goscombe and Findlay, 1989). The structural controls on the veining and gold mineralisation are poorly understood in this area. Other, less well-developed belts, may occur in northeast Tasmania.

MINERALISATION STYLES

The Mount Horror Exempt Area area is moderately to highly mineralised, with thirty-two significant deposits (nineteen gold, eleven tin, one tungsten and one arsenic) known within or in close proximity to the area (Appendix 1, fig. 3 and the departmental MIRLOCH database of mineral deposits).

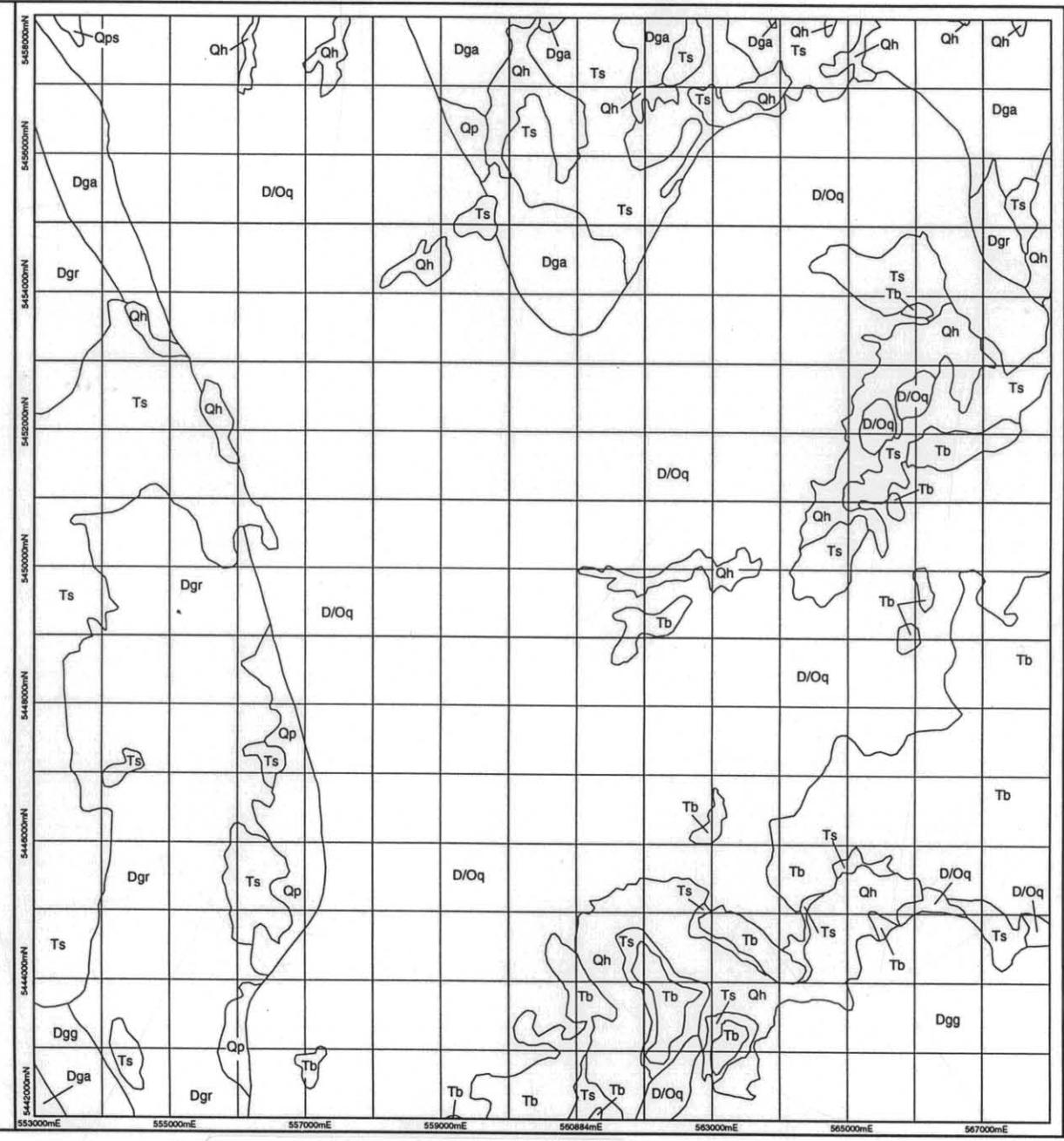
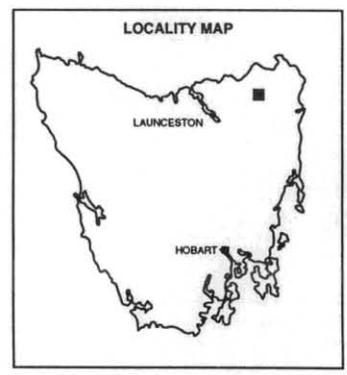
Gold

Lode gold deposits are widespread in northeastern Tasmania, and principally occur in the turbidite-bearing Mathinna Beds, of Ordovician to Devonian age, in the Lachlan Fold Belt. The greatest concentration of deposits occurs in a belt running through the Mathinna Beds from around Waterhouse, near the north coast, south for about 80 km almost to Fingal. The 'gold belt' has been historically subdivided into seven main goldfields; namely the Waterhouse, Forester, Warrentinna, Alberton-Mt Victoria, Dans Rivulet, Mathinna and Mangana fields (Noldart and Threader, 1965).

The primary gold in the Mt Horror Exempt Area (the Forester and Warrentinna goldfields) occurs in quartz-rich veins and breccia within the Mathinna Beds. The gold lodes appear to be closely related to those in other parts of the gold belt, which are described below (summarised from Bottrill *et al.*, 1992).

Figure 4.
Geology of Mt Horror area

- Qh, Qp Quaternary sediments
- Ts Tertiary sediments
- Tb Tertiary basalt
- Dga Devonian adamellite
- Dgg Devonian granite
- Dgr Devonian granodiorite
- D/Oq Mathinna Beds
(Devonian–Ordovician?)
quartzwacke dominant



5 cm

The gold-bearing quartz veins are usually small and, although often very gold-rich (up to 39.5 oz/ton or 1354 g/t; Twelvetrees, 1907), are typically erratic in size and grade. The quartz is usually white and glassy, but where auriferous is dense and milky to blue-grey in colour, with minor sulphides, or iron oxides where weathered. The sulphides include pyrite and arsenopyrite, with lesser chalcopyrite, galena and sphalerite. Minor mica, chlorite and carbonates (ankerite and siderite) may also be present. The veins vary in thickness from a few centimetres to about eight metres, and in length from about seven to 500 metres. The Golden Entrance reef at Mangana may extend to about 2 km, but this has not been proven (McOnie, 1983). The veins are commonly bedding-parallel, striking about 315–345°, and usually dip steeply. Some veins are cross-veins, and some are sub-horizontal. The veins are commonly extensional, in fold limbs and hinges. Some lodes are breccia zones (e.g. Golden Entrance), and these are cemented by cherty to medium-grained quartz. Such re faulted veins have been considered highly prospective (Twelvetrees, 1907).

Fluid inclusion and oxygen isotope studies (Bottrill *et al.*, 1992) indicate deposition of gold from metamorphic fluids, in contrast to the studies of G. Davidson (1988) who identified apparently magmatic fluid-related gold veins in other parts of northeastern Tasmania.

Blake (1939) considered that gold in many Tasmanian goldfields had been upgraded by surface enrichment processes, during leaching of auriferous sulphides and reprecipitation of gold into ferruginous zones. This was the reason given for few mines reaching a depth of more than 30 metres. This has not been proven, and the veins are so erratic in grade it would be difficult to prove. It may have been a convenient explanation for miners who, having found some rich ore on the surface, failed to trace the veins underground. Difficulties in handling sulphide ores may also have resulted in abandonment of prospects on reaching such ores. The situation is different in Western Australia, where gold is enriched in gossan and laterite (Mann, 1984), following much longer periods of weathering than have prevailed in Tasmania. Zeegers and Leduc (1991) note that gold mobilisation usually requires extreme conditions, and much of the dissolved gold is reprecipitated close to the source. In the New Golden Gate mine at Mathinna, the original workings were abandoned at shallow depth, as with most of the early mines in the area, but were later re-opened and reached a final depth of about 600 m, with average grades of 26 g/t (Noldart and Threader, 1965). This suggests a high potential for significant gold reserves at depth below other mines and 'barren' veins.

Gold has been recovered, commonly with tin, from placer deposits in Cainozoic (mostly Tertiary) alluvial sediments in this area, and is most important in the Gellibrand Plains and Trout Creek areas, in the Boobyalla River drainage system.

Tin

Many of the granites and adamellites in northeastern Tasmania are characterised by sporadic tin mineralisation. Most of this tin has been recovered from alluvial and eluvial workings, but many greisen deposits have also been worked (e.g. the Anchor mine). These greisens are small domal bodies, sheets or pipes in the upper surfaces of the alkali

feldspar granites, trapped by older, overlying, unaltered biotite adamellite (Collins, 1989). Small amounts of other minerals are present in economic or sub-economic quantities, including chalcopyrite, bornite, sphalerite, galena, arsenopyrite, molybdenite, wolframite, fluorite, topaz and various silver, uranium and beryllium minerals (Collins, 1989). Granite-related quartz-wolframite-cassiterite \pm sulphide veins also occur within the Mathinna Beds (e.g. Storrs Creek).

No significant primary tin deposits are known in this area, but large amounts of tin have been recovered from the Cainozoic alluvial deposits, e.g. the Ringarooma River valley (Briseis, Valley and Arba), the Boobyalla River (Banca), and smaller deposits in the Trout Creek and Gellibrand Plain areas. Most of the tin in the southern Ringarooma River alluvial deposits has probably been derived from the Devonian Poimena Pluton of the Blue Tier Batholith, particularly in the Mt Paris–George Hill–Bells Hill area. Alluvial tin deposits in the Boobyalla River system have an uncertain source, but are probably also local. Morrison (1989) considered the main deposits in northeastern Tasmania to be late Oligocene braid-plain deposits, with deep leads extending under the Tertiary basalts. There are also post-middle Miocene deposits in the terraces of the present Ringarooma River. Considerable drilling has been undertaken to define channels, with some success (Warin and Appleby, 1965).

Other Commodities

The Gorge Creek tungsten prospect contains copper sulphides, arsenopyrite, wolframite, bismuth minerals and trace gold in small quartz veins of various orientations in tourmalinised hornfels (Herrmann, 1987).

The Mt Horror arsenopyrite prospect contains quartz stringers and breccia in silicified, hornfelsed sandstone. It is anomalous in gold, arsenic, tin and tungsten (Herrmann, 1987).

Monazite and molybdenite occur in the Mt Stronach granite, on the eastern edge of this pluton, but no actual deposits are known in the area and little is known about the styles of mineralisation. Monazite is a common by-product of alluvial tin mining in several areas.

HISTORY AND PRODUCTION

Gold

The Warrentinna goldfield was discovered in the 1880s and most production occurred between 1880 and 1920. The first gold mining in the Forester goldfield was much later, about 1922.

The total recorded production from lode deposits in the area is only 112 kg (Table 1) but, as early records are poor, the actual production could have been much greater. The largest mine in the area was the Golden Mara, which had a recorded production of 104.4 kg of gold at an average grade of 29 g/t. In comparison, the Golden Gate mine, in the Mathinna goldfield to the south, had a recorded production of 7.896 t (253,865 oz) at an average grade of 26 g/t (Noldart and Threader, 1965).

Table 1
Production and grades of gold mines
in the Mt Horror area

Mine	Gold production (kg)	Ore mined (tonnes)	Av. grade (g/t)
Dawn of Peace	0.19	6	31
Golden Mara	104.41	3560	29
Linton	6.94	219	32
Imperial	0.47	20	23
Jordans	0.09		
Total	112.10	3795	

RECENT GEOLOGICAL WORK: THE STATE OF KNOWLEDGE

Geology

The area was mapped at a scale of 1:50 000 by the then Geological Survey of Tasmania (Ringarooma sheet; Brown *et al.*, 1977 and accompanying report by McClenaghan *et al.*, 1982).

Geophysical Coverage

Gravity station coverage is in the regional category, with about one station per square kilometre (Richardson and Leaman, 1987).

Aeromagnetic data for the area was originally derived from flights at a spacing of about 1.5 km and 400 m, and was assessed as regional (Gregory, 1961; Bureau of Mineral Resources Aeromagnetic Survey, 1988).

The area has been reflown by the Department (Richardson, in prep).

An airborne radiometric survey (GRAMS), flown by Geophoto Resources Consultants in about 1969, covered only a small southern part of this area (Rattigan, 1969, 1970), and the data appears to be poorly constrained and recorded (Mortimore, 1974).

A remote sensing survey was flown by Rio Tinto Aust. Exploration in the Arba area (Rattigan, 1957). A regional fracture analysis by Geophoto Resources Consultants in about 1969 covered only a small southern part of this area (Anon, 1979; Thomas, 1970; Rattigan, 1970).

The Utah Development Company undertook an IP survey on EL 6/63 to locate deep leads in the Arba area. The method was only partly successful; the expected response from marcasite in the deep leads was swamped by membrane polarisation of clay minerals and local charging (Warin and Appleby, 1985).

Geochemical Coverage

No systematic regional geochemical surveys have covered all of the area, although Geophoto conducted some poorly recorded studies in the southern part (Rattigan, 1969a, 1970; Mortimore, 1974). Billiton conducted some reconnaissance stream-sediment and rock-chip sampling in the area (Randell, 1991).

Moderately detailed rock-chip surveys (mostly for gold and base metals) have been conducted in and about several mines and prospects by exploration companies (Rayment, 1969; Herrmann, 1987).

Drilling Coverage

Extensive drilling has been undertaken in many tin-mineralised alluvial parts of this area, but many holes are poorly logged or recorded, and many are not recorded on the Department's DORIS database, from which most of the following is summarised.

Two diamond-drill holes (25 and 41 m deep) have been located within the area, both near Williams Hill, to test for gold mineralisation in quartz veins. The results were negative (Poltock, 1992).

Six percussion holes were drilled in the Gorge Creek Tungsten Prospect near Mt Horror in 1969 by Australia Wide Mining (Rayment, 1969).

There are records of another 87 holes bored in the area, probably all in alluvial deposits, and mostly percussion, rotary or cable-tool holes testing for tin-bearing leads. The Department of Mines drilled 21 holes in the Branxholm area in 1931, another nine in 1937, six holes in the southern Boobyalla River valley in 1944, 25 near Winnaleah in 1944, and four at Briseis between 1965 and 1968. Some gave some reasonable tin grades, but none of the results were compiled into reports. Some holes are also poorly located.

Australian Anglo American Prospecting P/L drilled eleven reverse circulation holes in the Gellibrand Plains area in 1981, seven reverse circulation holes at Trout Creek in the same year, three percussion holes at Banca and nineteen in the Arba area in 1981 and 1983. Some low-grade deposits were delineated (Munro, 1982, 1984; Shaw, 1985).

RECENT MINERAL EXPLORATION (1950 -)

The area has been the site of numerous small to medium-sized mining operations, but little extensive or systematic exploration using modern techniques. The principal exploration licences held over the area are summarised below.

SPL 59 — Hall, Relph and Associates P/L, Australia Wide Mining Company

This lease covered the Mt Horror (The Gorge Creek) Tungsten prospect. Alluvial deposits were tested by six percussion drill holes, and some quartz veins containing scheelite, wolframite and gold were mapped and sampled. The results were poor, although small alluvial reserves were delineated (Rayment, 1969).

*SPL 323 —**Rio Tinto Australia Exploration P/L*

Tin-bearing alluvial deposits in the Arba area were tested by auger drilling and remote sensing (photogeology), but results were poor (Rattigan, 1957, 1958).

EL 2/59 — Electrolytic Zinc Company of Australia Ltd

This company flew airborne aeromagnetic surveys over much of the area, but there is no record of any follow up (Hancock, 1959).

EL 6/63 — Utah Development Company

The company undertook some detailed mapping of the geology and tin workings in the Arba-Briseis area. A geophysical survey (IP) indicated the probable position of the deep leads, but drilling (auger, rotary and percussion) indicated the lead to be too deep to be economic (>50 m) (Warin and Appleby, 1965).

EL 6/68 — ACA Howe P/L, Texins Development Pty Ltd, Geophoto Resources Consultants

This lease covered the Arba area, which was tested by channel and pit sampling. Tin reserves were found to be uneconomic (Armstrong, 1971). A regional fracture analysis indicated anomalies at the flanks and noses of anticlinal and stock features, but none were defined in this area (Thomas, 1970). Regional gamma-ray spectrometry and geochemical surveys were also carried out (Rattigan, 1969a, 1969b, 1970). Gold prospects were only briefly considered (Mortimore, 1974). The most promising prospects found were for alluvial tin, but no mining leases were taken up within this area.

EL 19/70 — BMI Mining P/L

This lease covered the Banca area, which was tested by ten percussion and twelve auger holes. These located a deep lead at up to 50 m depth (Williams, 1973).

EL 28/76 — Moruka Tin P/L; Amdex Mining Ltd; Australian Anglo American Prospecting P/L; Triako Mines N/L

This EL was taken out over the southern Ringarooma River area to search for tin. The area was mapped, palaeodrainage patterns studied, and drilling undertaken (churn and reverse circulation). Specific prospects studied included the Arba, Briseis, Valley, Branxholm Creek and Cascade leads. Reserves were found to be too small and/or too deep to be economic, and the licence was dropped, concurrent with the fall in tin price, in 1992 (Guy, 1992).

EL 2/77 — Australian Anglo American Prospecting P/L

This EL covered several tin and gold prospects in the southern Boobyalla River drainage system, including the Banca area, Gellibrand Plains and Trout Creek. Three percussion holes were drilled at Banca, eleven reverse-circulation holes at Gellibrand Plains, and seven reverse-circulation holes at Trout Creek. These holes indicated better prospects for gold than tin, but the results were found to be discouraging for all areas (Munro, 1982, 1984; Shaw, 1985).

EL 5/81 — Australian Anglo American Prospecting P/L; Amdex Mining Ltd

This EL covered the Arba, Gellibrand and Banca areas. A geomorphological study, using satellite imagery, was undertaken to relate drainage to fracture density and trends, using satellite imagery. This proved to be of little use; no other work appears to have been done, prospects were deemed poor, and the licence was dropped due to economic factors (Mellor, 1982a).

EL 6/78 — Amdex Mining Ltd, Kibuka Mines Pty Ltd

The EL covered some of the gold and tin prospects in the Mt Horror, Warrentinna, and Banca areas. Little real work was done but reviews by Morrison (1980) indicated little potential for lode tin and gold, and Bowen (1981) indicated limited tin potential.

EL 17/86 — Goldfields Exploration Pty Ltd

This EL concentrated on the gold prospects in the Forester, Warrentinna and other goldfields. Many of the deposits were sampled and mapped in detail, but there was little encouragement for drilling or mining ventures (Herrmann, 1987).

EL 34/89 — L. Davis

Quartz veins in Mathinna Beds in the Williams Hill area were explored for gold by chip sampling and two shallow diamond-drill holes. Results were very poor (Poltock, 1992).

SUMMARY OF PROSPECTIVITY

The prospects of finding small to medium-sized lode gold mines and alluvial tin mines in this area appear to be good.

The principal style of gold mineralisation in the area is turbidite-hosted, mesothermal, quartz-sulphide-gold veins, very similar to those Phanerozoic deposits of central Victoria, Nova Scotia, Alaska, Wales and many other areas (Nesbitt, 1991). Early gold mining focused on the rich but relatively small veins, while more modern exploration and mining has focused on open-cuttable resources such as disseminated, stockwork and multiple-vein style deposits.

The area, therefore, is highly prospective for gold in rich, small to medium-sized quartz reefs (style 36a of Cox and Singer, 1986), in sheeted veins and stockworks. Gold-bearing stockworks have been described in arenaceous units at the Tower Hill mine south of this area (Morrison, 1990). Sheeted veins are reported at the Alpine mine and other prospects within the Mangana goldfield area. There is a low prospectivity for economic disseminated gold in the Mathinna Beds. Disseminated gold in turbiditic greywacke has been described in very similar settings, with quartz-gold veins, in the Meguma area of Nova Scotia, but is very low in grade (Crocket *et al.*, 1986).

Two medium to large gold mines of the mesothermal vein type have operated as underground workings in Tasmania; the Tasmania mine at Beaconsfield, and the New Golden Gate mine at Mathinna. The Tasmania mine has produced 26.6 t of gold from 1.1 Mt of ore, with reserves of 0.67 Mt of ore grading 24 g/t (Hicks and Sheppy, 1990). The Golden Gate mine produced 7.9 t of gold from 0.3 Mt of ore grading

26 g/t, but reserves are not known (Noldart and Threader, 1965). There appears to be a good potential for locating similar deposits within this area but, unfortunately, most recent exploration has been rather superficial. Only one lode deposit (Williams Hill) has been drilled in the area in the last 50 years, and few systematic geological, geochemical or geophysical surveys have been conducted over the mines in this time, on either a regional or detailed scale.

The area also has good potential for more placer gold and tin deposits, although these have, in general, been better tested than the lode deposits (Mortimore, 1974; Charlton, 1982; Morrison, 1989).

The area requires:

- (1) a detailed structural geological investigation of veining and other structures;
- (2) systematic geochemical sampling (soil, stream sediment and rock chip on a regional and locally detailed scale);
- (3) application of various geophysical techniques (e.g. airborne and ground magnetics);
- (4) petrology and ore genesis studies of mineralisation and host rocks;
- (5) lineament and fracture analysis to identify controlling structures in this and other goldfields.

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[8 April 1994]

APPENDIX 1

Mines and mineral deposits of the Mt Horror Exempt Area

<i>Ref. No.</i>	<i>Name, reference, AMG co-ordinates</i>	<i>Commodity</i>	<i>Co-ord error</i>	<i>Map Sheet</i>	<i>Status</i>	<i>Size</i>	<i>Host rock</i>	<i>Mineral. age</i>	<i>Form</i>	<i>Strike (°)</i>	<i>Explor.</i>
32003	Forest King 557 300 mE, 5 456 200 mN Mineral Chart 3	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32013	Mt Horror 558 100 mE, 5 456 200 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32009	Imperial 558 550 mE, 5 455 550 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32011	Linton 557 250 mE, 5 455 100 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32184	Unnamed 554 000 mE, 5 453 500 mN McClenaghan and Baillie, 1974	Au	3	84154	PEX		DGN	LD		ND	PS
32209	Williams Hill-A 555 700 mE, 5 453 000 mN Poltock, 1991; Poltock, 1992	Au	1	84154	PEX		MAT	LD	VEIN	160	PS GC DR
32210	Williams Hill-B 555 550 mE, 5 452 700 mN Poltock, 1991; Poltock, 1992	Au	1	84154	PEX		MAT	LD	VEIN	160	PS GC DR
32208	Gellibrand Plains 565 500 mE, 5 451 300 mN Mellor, 1982	Au	3	84151	PEX		JCS	TT	PLAC	ND	PS DR
32012	Malabar 558 200 mE, 5 450 500 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32004	Golden Cora 564 700 mE, 5 450 350 mN Mineral Chart 9	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32017	Renown 562 100 mE, 5 448 990 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32010	Kerrison's 565 850 mE, 5 448 400 mN Herrmann, 1987; Morrison, 1980	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32006	Golden Dyke 561 980 mE, 5 447 050 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32002	Derby 561 400 mE, 5 446 650 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32014	North Mara 561 400 mE, 5 446 400 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32008	Golden Mara 561 000 mE, 5 445 700 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32005	Golden Crest 561 200 mE, 5 445 050 mN Herrmann, 1987	Au	2	84145	AMX	ND	MAT	LD	VEIN	ND	PS

<i>Ref. No.</i>	<i>Name and AMG co-ordinates</i>	<i>Commodity</i>	<i>Co-ord error</i>	<i>Map Sheet</i>	<i>Status</i>	<i>Size</i>	<i>Host rock</i>	<i>Mineral. age</i>	<i>Form</i>	<i>Strike (°)</i>	<i>Explor.</i>
32015	Pearce's 560 600 mE, 5 444 850 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32016	Rebel 560 800 mE, 5 444 850 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32007	Golden King 560 700 mE, 5 444 750 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS
32018	Dawn Of Peace 559 700 mE, 5 443 200 mN Herrmann, 1987	Au	2	84154	AMX	ND	MAT	LD	VEIN	ND	PS

Key to MIRLOCH listing abbreviations

CO-ORDINATE ERROR

1	<50 m
2	<100 m
3	<500 m
4	< 1 km
5	>1 km

STATUS

OPM	Operating mine
NOR	Non-operating mine — reserves known
NOX	Non-operating mine — reserves unknown
AMR	Abandoned mine — reserves known
AMX	Abandoned mine — reserves unknown
AMO	Abandoned — mined out
PEX	Prospect — explored
PUN	Prospect — unexplored
MAR	Mineralised area
MOC	Mineral occurrence

SIZE OF DEPOSIT

ND	Not determined
VS	Very small: < 100 tonnes (or cubic metres)
SM	Small: 100 t – 10 000 t
ME	Medium: 10 000 t – 1 000 000 t
LA	Large: 1 000 000 t – 10 000 000 t
VL	Very large: > 10 000 000 t

HOST ROCK

PCS	Precambrian sequences
CSS	Cambrian sedimentary sequences
CIG	Cambrian igneous sequences
MRV	Mount Read Volcanics and correlates
OMS	Owen Conglomerate/Moina Sandstone and correlates
GLE	Gordon Limestone/Eldon Group and correlates
MAT	Mathinna Beds
DGN	Devonian granitoid
PSG	Parameener Supergroup
JCS	Jurassic–Cenozoic sequences

AGE OF MINERALISATION

ND	Not determined
PC	Precambrian
EC	Eocambrian–Early Cambrian
MC	Middle–Late Cambrian
OD	Ordovician–Early Devonian
LD	Late Devonian (granite associated)
PT	Permo-Triassic
JC	Jurassic–Cretaceous
TT	Tertiary
QT	Quaternary

FORM OF DEPOSIT

VMS	Volcanic massive sulphide
STFM	Stratiform
VEIN	Vein (single, sheet, saddle)
STWK	Stockwork
DISS	Disseminated
REPL	Replacement
PIPE	Pipe
PLAC	Placer
RESD	Residual
OTHR	Other (noted in references)

EXPLORATION OF DEPOSIT

NO	Nil or no known exploration
PS	Prospecting
GM	Geological mapping
GC	Geochemical surveys
GP	Geophysical surveys
DR	Drilling

