

## 1985/47. The potential for the discovery of economic mineral resources in south-western Tasmania

G.R. Green

*Abstract*

South-western Tasmania, comprising the South-West Conservation Area and the World Heritage Area, has considerable potential for the discovery of economically exploitable mineral resources. The area has been divided into a number of districts of varying prospectivity, namely:

- (i) Very highly prospective areas, in which known mineral deposits and/or geological associations suggest that modern exploration techniques, properly applied, could have a reasonable chance of discovering an orebody.
- (ii) Highly prospective areas, in which rock associations known to host orebodies elsewhere occur and/or in which there is a high, but untested, potential for the occurrence of specialised non-metallic commodities.
- (iii) Prospective areas in which a number of factors, chiefly the thickness of overburden, act as a disincentive for intensive mineral exploration and development.

In the areas of very high prospectivity, known mineralisation and rock assemblages suggest that the following types of ore deposit might exist in south-western Tasmania:

- (i) Volcanic-associated massive sulphide deposits of zinc, lead, silver, copper and gold and related disseminated precious metal mineralisation.
- (ii) Carbonate-replacement deposits of tin and tungsten.
- (iii) Carbonate-hosted lead-zinc-silver deposits.
- (iv) Silica deposits of high purity.
- (v) Ultramafic-related deposits of platinoids and chromite.

In the areas of high prospectivity there is considerable potential for:

- (i) Base metal vein and shale-hosted deposits (chiefly of copper, lead, zinc and silver).
- (ii) Gold deposits of unknown type.
- (iii) Tin and tungsten deposits at depths presently not exploitable economically.
- (iv) Silica deposits.

In addition, there is potential for the discovery of coal, petroleum and oil shale in the region.

The inaccessibility, uncertainty of a discoverer being able

exploit a discovered resource, and the lack of an adequate geological data base are major factors deterring mineral exploration and development in much of the region.

Future geological mapping and regional geochemical and geophysical research programmes, together with local detailed exploration, will enable considerable refinement of the zones of prospectivity suggested in this report and should lead to the establishment of mines in the region.

### INTRODUCTION

Central-western and north-western Tasmania constitute one of the most intensively mineralised regions of the world and mining in the region is and will continue to be, a keystone of the State's economy.

Although the same cannot be said of the South-West Conservation Area and the World Heritage Area (collectively referred to as South-western Tasmania in this report), over 100 mineral deposits and prospects are known. Much of the area is of very high prospectivity for the occurrence of ore deposits, but little mining is currently being carried out. Green et al. (1982) suggested that this was not necessarily due to a lack of mineralisation in the region, but was more probably related to a number of factors including:

- (1) Remoteness and difficulty of terrain and climate.
- (2) Lack of adequate communications.
- (3) Lack of the intensive prospecting and mineral exploration activity that have taken place in western Tasmania for over a century.
- (4) The relative paucity of a detailed geological mapping base.
- (5) Uncertainty by industry of the right to mine discovered deposits.

Important criteria for the assessment of prospectivity include:

- (1) Distribution of known mineralisation
- (2) Ranking of areas on the basis of the consideration of well known genetic models of various types of mineralisation in terms of:
  - (a) rock associations
  - (b) structural information
  - (c) geophysical data and their interpretation

Three main categories of mineral prospectivity have been assigned:

- (1) Areas of very high prospectivity, comprising known mineral fields and zones in which the rock associations and other factors suggest that modern, detailed exploration could have a reasonable chance of discovering an orebody.
- (2) Areas of high prospectivity, comprising rock associations known to host metallic mineral deposits and/or offering high,

but untested potential for specialised non-metallic commodities, principally silica.

- (3) Prospective areas in which a significant thickness of overburden acts as a disincentive for mineral exploration for metals, given present day technology and economic factors, and in which there is no knowledge of non-metallic commodities (fuels or industrial minerals) existing on a possibly exploitable scale.

This report briefly discusses the geological environment of significant deposits of metallic and non-metallic commodities in Tasmania. A subdivision of South-western Tasmania into zones of varying prospectivity for the present and future discovery of economically extractable mineral resources is then given. Obviously the boundaries of the zones will change with further geological investigations in the region.

IMPORTANT METAL ASSOCIATIONS

Three major and a number of minor metallogenic epochs are known in Tasmania:

MAJOR METALLOGENIC EVENTS

*Late Precambrian*

Massive iron ore (magnetite-pyrite) is associated with metabasalt-sedimentary sequences (Coleman, 1976). The type example of this style of deposit is Savage River. Correlates of the rock sequences associated with the Savage River mineralisation do not occur in south-western Tasmania and the potential for this type of mineralisation is considered minimal.

*Cambrian*

Massive and disseminated copper-gold and copper-lead-zinc-silver-gold-cadmium orebodies are associated with a 10-15 km wide meridional zone of volcanic rocks, the Mt Read Volcanics, which extends from the Que River area in the north to Elliott Bay in the south. Within this belt is a concentration of disseminated Cu-Au-Ag mineralisation to the south of the Henty Fault Zone, for example, the majority of deposits in the Jukes-Darwin (White, 1975) and Mt Lyell fields (Reid, 1976; Walshe and Solomon, 1981), whereas to the north are the massive Cu-Pb-Zn-Ag-Au deposits of Rosebery (Brathwaite, 1974; Green et al., 1981), Hercules (Burton, 1976), Que River (Webster and Skey, 1979; Wallace and Green, 1982) and Hellyer (Sise and Jack, 1984). Solomon (1981) related this pattern to either a deeper level of erosion in the south due to north-plunging Late Cambrian folds, or to the southern areas being more emergent at the time of mineralisation. Neither of these explanations bears close scrutiny. For example, at Mt Lyell, the minor banded Pb-Zn rich ore at Tasman and Crown Lyell Extended has similarity to the Rosebery deposit, but the more important exhalative Mt Lyell (Blow) orebody was a cupriferous massive pyrite deposit, poor in lead and zinc (Markham, 1968; Walshe and Solomon, 1981). Further, the massive sulphide deposits at Mt Lyell bear testimony to the fact that a suitable submarine environment for the accumulation of exhalative mineral deposits occurred at the time of ore deposition. The assumption implicit in Solomon (1981) that there was a single major episode of massive sulphide mineralisation is also open to question. Rather, it would appear that different types of Cambrian ore deposits are associated with different facies of volcanism within the Mt Read Volcanics. For

example, the Rosebery and Hercules deposits are associated with thick rhyolitic ignimbrite sequences, the Rosebery sulphide ore showing conspicuous primary banding, and along-layer metal and sulphur isotope zonation (Green *et al.*, 1981). The Que River and Hellyer deposits are contained within a volcanic sequence dominated by andesite lavas and the Que River deposit lacks the prominent banding and layer-parallel metal zonation present at Rosebery (Wallace and Green, 1982) and apparently has a more restricted range of sulphur isotope ratios (Whitford *et al.*, 1983). The above arguments might suggest that differences in local geological conditions (for example, mineralisation might be related to different, not necessarily contemporaneous, volcanic centres), could be the cause of the varying styles of sulphide deposits within the Mt Read Volcanics. The present lack of understanding of the reasons for the apparent regional zonation of metal ratios in the deposits and the more local strong differences in ore styles would suggest that no single area within the Mt Read Volcanics can be presently regarded as being unprospective for polymetallic massive sulphide mineralisation.

In addition to the well known massive sulphide and disseminated copper deposits, the Mt Read Volcanics and flanking volcano-sedimentary sequences offer potential for precious metal deposits of epithermal and Hemlo-like styles. The recent discoveries of disseminated silver mineralisation at Howard's Anomaly by Goldfields Exploration (Komysan, 1981) and sulphide-poor disseminated gold mineralisation in the Elliott Bay area by Geopeko (Large and Herrmann, 1984) bear testimony to the potential for further finds. As barite is a common associate of the sulphide ores, the discovery of commercial barite deposits is also highly possible.

#### *Late Devonian to Early Carboniferous*

Vein and massive replacement deposits of a wide variety of metals occur in rocks of Late Precambrian to Devonian age. The ore deposits of Devonian age which are presently being actively mined are all tin and tungsten producers and the mineralisation is believed to be dominantly related to fluids exsolved from crystallising granite magmas (*e.g.* Groves *et al.*, 1972; Large, 1971; Solomon, 1981; Patterson *et al.*, 1981; Collins, 1981; Kwak and Askins, 1981; Kwak and Tan, 1981). These deposits include a wide variety of types, the most important of which are the carbonate replacement tin deposits (*e.g.* Renison, Cleveland and Mt Bischoff, Queen Hill); tungsten-skarn deposits (*e.g.* King Island and Kara); tin-skarn deposits (*e.g.* St Dizier); tin-tungsten vein deposits (*e.g.* Shepherd and Murphy, Oakleigh Creek) and endogranitic greisen deposits (*e.g.* Federation). Some of the tin-tungsten deposits have significant quantities of bismuth (*e.g.* Shepherd and Murphy) and potentially important associated non-metallic commodities include fluorite and beryl.

The tin and tungsten deposits tend to be associated with haloes of silver-lead-zinc veins and replacement deposits, some of which have been important producers in the past (*e.g.* Magnet, numerous mines in the Zeehan district). Within this halo there may be an inner zone of copper mineralisation (*e.g.* at Scamander - Groves, 1972; and at Balfour - Ward, 1911), and copper may be an important associate of tin or tungsten mineralisation (*e.g.* at Cleveland - Collins, 1981).

From the metallogenic map (fig. 1), it is clear that most major tin and tungsten deposits occur in close proximity to outcrops of Devonian granite and this association is strengthened when the probable subsurface distribution of granite is taken into account. By modelling regional and detailed gravity data, Leaman *et al.* (1980) produced a map showing the

inferred contours of the upper surface of granite at depths of one, four, and nine kilometres below sea level. All major tin and tungsten deposits and most of the fringing lead-zinc-silver vein deposits lie within the four kilometre BSL granite depth contour (isobath). A few Pb-Zn-Ag veins lie outside this isobath, but these occur adjacent to major north or WNW-trending faults. Examples include the Queensberry Mine (Green, 1985) and Espie's Prospect (No. 14, fig. 3), which occur near the Linda Fault Zone of Solomon (1962). Similarly a number of antimony and copper prospects occur near mapped faults of similar trend in the Port Davey area. These prospects may suggest that tin and/or tungsten deposits occur in these areas at depths presently inaccessible for both technical and economic reasons.

Of more immediate interest for mineral exploration are areas which offer the greatest potential to host either scheelite skarn deposits or cassiterite-pyrrhotite replacement deposits of limestone or dolomite. These styles of mineralisation provide ore deposits of world stature within the state and are most likely to occur in terrains in which both carbonate rocks (of Precambrian, Cambrian, Ordovician or Early Devonian age) are known to occur within the four kilometre granite isobath.

Gold deposits of supposed Devonian age tend to occur in separate zones from the more common tin-tungsten-copper-lead-zinc-silver association. Some gold deposits in north-eastern Tasmania are spatially associated with granodiorite intrusions (e.g. Lisle-Golconda; Klomfínský and Groves, 1970), but other major deposits such as Beaconsfield and the Mangana-Mathinna-Waterhouse line of deposits are not obviously associated with granitoid rocks and may have been formed during Silurian or Devonian regional metamorphism.

The widespread occurrence of alluvial gold and particular occurrences such as Jane River suggest there is potential for lode gold deposits in south-western Tasmania but much work is needed on regional mapping and metallogenic studies in the region, and in genetic studies of Tasmanian gold deposits in general.

*MINOR METALLOGENIC EVENTS*

*Cambrian*

Minor copper-nickel, chromium and asbestos deposits are associated with Cambrian gabbroic and ultramafic rocks (e.g. Heazlewood, Ni; Cuni, Ni-Cu; Serpentine Hill, asbestos). Asbestos deposits within the SWCA have been prospected by B.H.P. at Noddy Creek (No. 46, fig. 3). More important historically are the alluvial osmiridium deposits which are shed from, and are closely associated spatially with, the ultramafic rocks (e.g. Adamsfield, No. 30, fig. 3).

*Ordovician*

Some zinc-lead-silver deposits associated with the Gordon Limestone were formerly classified with the Devonian deposits (see above) but are now believed to have formed soon after deposition of their limestone host rocks in the Ordovician. Important orebodies of this type occur in Eire and the best known Tasmanian example is the Oceana mine near Zeehan which was a significant producer between 1887 and 1960. Sub-economic reserves of four million tonnes of 2% Zn, 8% Pb and 80 g/t Ag have been established at Oceana (Legge et al., 1984). The recognition of an Ordovician mineralising event suggests that Ordovician limestones remote from centres of Devonian

mineralisation might be prospective for zinc-lead-silver orebodies.

*Cretaceous*

Minor gold mineralisation is associated with Cretaceous syenite intrusions near Cygnet. Syenite is not known to occur in south-western Tasmania and the potential for this type of deposit in the region would appear to be minor.

NON-METALLIC RESOURCES

The distribution of the potentially important non-metallic commodities is shown in Figure 2.

*Silica*

High quality silica deposits are known to exist within the SWCA. At present the potential of silica deposits at Glovers Bluff (No. 32, fig. 3) to provide the raw material for a silicon metal industry at Electrona is being investigated. In addition, Comalco holds mining leases for silica at Cape Sorell (No. 33, fig. 3) but the deposits are undeveloped. Both the metamorphosed and the comparatively unmetamorphosed sandstone-mudstone sequences of the Precambrian (fig. 1) have high potential for containing units with very high purity silica deposits.

*Carbonate rocks*

Two main carbonate-bearing sequences occur within the region. Precambrian dolomitic rocks of the Jane Dolomite and correlates occur within the World Heritage Area in the Loddon Range and in the Maxwell and Jane River areas. Within the South West Conservation Area, dolomite occurs near Tim Shea, Mt Mueller, in the Weld and Huon River valleys and at Hastings Caves.

Ordovician limestone of the Gordon Group is widespread and occurs in the upper and lower Gordon, Florentine, Giblin, Olga, Franklin, D'Entrecasteaux, Picton, Andrew and Nelson River valleys and at a number of other localities. In addition, Devonian limestone crops out at Point Hibbs and in the lower Gordon River.

*Coal and lignite*

Coal occurs in siltstone units of Permian age near Lake Will, Mt Thetis and Mt Pelion East. Triassic coal occurs at South Cape.

Tertiary lignite occurrences in Macquarie Harbour were mined early last century to provide fuel for the convict settlement, but these are unlikely to be of importance under present economic conditions.

*Petroleum*

The colour of conodont microfossils provides an indication of the thermal maturation of hydrocarbons in rock sequences and has been compared to other more widely used techniques (e.g. vitrinite reflectance). Preliminary studies of the colour indices of conodonts in Tasmanian Ordovician and Devonian limestones by Burrett (1984) suggest that Ordovician-Devonian limestone and siliciclastic sequences in southern, south-western and central Tasmania could have had a temperature-time history consistent with oil generation and preservation.

*Oil shale*

The Broken Hill Proprietary Company discovered bands of low oil-yielding siltstone (maximum oil yield of seven litres/tonne) in a correlate of the Woody Island Siltstone in the Styx River area just outside the South West Conservation Area (Anon., 1981). Oil shale is a commodity of little economic importance at present, but there is potential for further minor discoveries in the region.

MINERAL DISTRICTS OF SOUTH-WESTERN TASMANIA  
- VERY HIGHLY PROSPECTIVE AREAS

PRECAMBRIAN ROCKS

*Cape Sorell district*

Work by Comalco Limited has established the existence of high grade orthoquartzite containing 99.4% SiO<sub>2</sub> and a mining lease is held over the deposit (A.H. White pers. comm.; in Summons, 1981).

*Glovers Bluff district*

Reserves of 15.4 million tonnes of 98.0% SiO<sub>2</sub> have been defined in the Glovers Bluff area (Summons, 1981).

*Twelvetrees Range district*

Within the dominantly metasedimentary rocks of the Tyennan region are a number of bodies of metamorphosed mafic igneous rocks. Of interest is the close spatial association of amphibolite with thin units of hematitic iron formation which have been mapped in the Holley Road area in the Huntley and Pedder Quadrangles (Brown et al., 1982; Turner et al., 1985; M.P. McClenaghan, pers. comm.). The mineralogy of the ironstones (quartz, hematite, white mica, albite, blue amphibole; M.P. McClenaghan, pers. comm.) is similar to that of iron formations which overlie, and occur as an extensive halo at the horizon of, massive polymetallic sulphide deposits of Tertiary age in Japan (e.g. Kalageropolous and Scott, 1983). Similar iron formations occur at breaks in the volcanic stratigraphy in the Noranda area, Quebec but these Archaean iron formations are pyritic rather than hematitic. Of more importance is the fact that these rocks similarly mark horizons of exhalative mineralisation and have been traced laterally into massive sulphide ore (e.g. Sangster, 1972).

On this basis it is suggested that the Twelvetrees Range district might offer potential for volcanic-associated massive sulphide mineralisation (which would be older than but analogous to the Rosebery and Que River orebodies). The suggestion is based on nothing more than analogy of rock associations with other volcanic-hosted ore deposits and is therefore pre-emptive and speculative.

*Arthur - Davey district*

Mining of alluvial cassiterite deposits supports the only permanent settlement in far south-western Tasmania. Apart from the alluvial tin fields at Melaleuca Inlet, Ray River and Cox Bight, vein style tin-tungsten-molybdenum mineralisation occurs at Cox Bight. Copper and antimony vein deposits occur in a zone trending WNW from Melaleuca Inlet (fig. 2). Most of the known mineral occurrences occur in the more readily accessible shoreline and buttongrass plain areas and it is apparent that the hinterland

has been more poorly prospected. Therefore, a zone of very high prospectivity, the Arthur-Davey district, has been arbitrarily defined to lie within the one kilometre BSL granite isobath generally and to be limited by the four kilometre BSL granite isobath in the area WNW of Melaleuca Inlet.

*Fury - Granite Tor district*

Similar to the Arthur-Davey district discussed above, the Fury-Granite Tor district offers potential for Devonian granite-related mineralisation, and the recently mined Oakleigh Creek tungsten deposit lies just to the east of the World Heritage Area. Numerous Sn, W-Sn, Cu, Mo, and Pb-Ag vein deposits are known within the district which has been only superficially prospected. There remains a very high prospectivity for further discoveries, particularly of blind deposits, in the district.

CAMBRIAN ROCKS

*Elliott Bay - D'Aguilar district*

The Cambrian felsic volcanic rocks of the Elliott Bay area contain small massive sulphide deposits of the Rosebery type (Large and Wilson, 1982), disseminated sulphide deposits adjacent to major fault zones (Large and Wilson, 1982) and a stratabound zone of disseminated gold mineralisation in a lithic tuff unit (Large and Herrmann, 1984). These recent discoveries establish the potential of this district, especially since much of the area has only received broadly based exploration.

*Hibbs - Mainwaring district*

Numerous disseminated and vein-style copper deposits occur in the Cambrian sedimentary and mafic volcanic rocks in the Hibbs - Mainwaring district, and potential exists for the discovery of Cyprus-type Cu-Au rich massive sulphide deposits. Alluvial gold has been found at Christmas Cove and in the Mainwaring and Urquhart Rivers. B.H.P. carried out an intensive investigation of chrysotile asbestos deposits in a serpentinite belt trending NNE from Point Hibbs (Close, 1972; McGregor, 1972).

*Jukes - Darwin district*

The Jukes - Darwin district contains a wide variety of disseminated and vein-type Cu-Ag-Au deposits associated with altered rhyolites (Hills, 1914). In addition, there are a number of small alluvial and vein gold deposits. The area is being actively explored.

*West Coast Range*

This area contains an abundance and variety of mineralisation types including Devonian vein-type Pb-Ag and Sn deposits in the Sterling Valley area and Cambrian disseminated Cu and massive Pb-Zn-Ag-Au at Red Hills (Reid and Meares, 1981). The area remains a focus of active exploration, and the widespread mineral occurrences suggest that there is much potential for the discovery of blind orebodies in the district.

CAMBRIAN - DEVONIAN ROCKS

*New River district*

The New River district is underlain by Cambrian sedimentary rocks and serpentinite, Cambro-Ordovician siliciclastic rocks and Ordovician

9/20

limestone. Limestone and alluvial iridosmine are known. In addition, studies of conodonts in the limestone suggest a temperature history consistent with the maturation of petroleum (Burrett, 1984). Potential also exists for carbonate-hosted Pb-Zn-Ag mineralisation.

#### *Upper Gordon - Adamsfield district*

The district is noted most for the Adamsfield alluvial osmiridium field, but a strongly faulted and varied suite of late Precambrian and Cambrian to Devonian sedimentary rocks and Cambrian serpentinite and pyroxenite are present. Potential for ultramafic-hosted platinoid, chromite and asbestos exists, and limestone and dolomite occur. The eastern part of the district lies within the four kilometre granite isobath and untested potential for carbonate-replacement tin and tungsten deposits as well as limestone-hosted lead-zinc-silver exists. The old Mt Mueller copper prospect, silica deposits at Wings Lookout, and alluvial gold occurrences just outside the district add to its potential.

#### *Mt Strahan district*

The Mt Strahan district is underlain by sedimentary rocks of Cambrian to Devonian age. There are limestone deposits in the area and potential exists for vein-style and sediment-hosted Ag-Pb-Zn deposits.

#### *Giblin, Gordon - Lower Gordon - Olga, Adam Range and Lower Picton districts*

These districts are underlain by Ordovician limestone and siliclastic rocks. Potential exists for the occurrence of carbonate-hosted lead-zinc-silver deposits. In addition the Gordon - Lower Gordon - Olga and Adam Range districts are prospective for black shale-hosted base metal mineralisation. The Lower Picton district may also be prospective for petroleum (Burrett, 1984).

### HIGHLY PROSPECTIVE AREAS

#### PRECAMBRIAN ROCKS

##### *Tyennan district*

Alluvial and authigenic gold has been prospected in the Jane River area (Jennings, 1974). Minor lead-zinc and copper vein mineralisation occurs in the Raglan Range and Mt Arrowsmith. Dolomite is widespread.

##### *Canning district*

Potential for Sn, W and base metal vein mineralisation exists.

#### SILURO - DEVONIAN ROCKS

##### *South Eldon district*

The area is underlain by Devonian mudstone. Euxinic basin-associated Pb-Zn-Ag could occur in the area.

### REFERENCES

ANON. 1981. Exploration Licence 37/79 Styx River, Tasmania. Report for the six months ended 1 November 1981. Rep.B.H.P. Exploration Department (T.C.R. 81-1657) [Unpubl.].

- BRATHWAITE, R.L. 1974. The geology and origin of the Rosebery ore deposit, Tasmania. *Econ.Geol.* 69:1086-1101.
- BROWN, A.V.; McCLENAGHAN, M.P.; TURNER, N.J.; BAILLIE, P.W.; McCLENAGHAN, J.; LENNOX, P.G.; WILLIAMS, P.R. 1982. Geological atlas 1:50 000 series. Sheet 73 (8112N). Huntley. *Department of Mines, Tasmania.*
- BURTON, C.C.J. 1976. Hercules and Farrell orebodies, Rosebery district. *Monogr.Ser.australas.Inst.Min.Metall.* 5:626-628.
- BURRETT, C.F. 1984. Early Devonian deformation and metamorphism of conodonts in Western Tasmania - economic, theoretical and nomenclatural implications, in BAILLIE, P.W.; COLLINS, P.L.F. (eds.). *Mineral Exploration and Tectonic Processes in Tasmania.* 14-17. Geological Society of Australia (Tasmania Division) : Hobart.
- COLEMAN, R.J. 1976. The Savage River magnetite deposits. *Monogr.Ser.australas.Inst.Min.Metall.* 5:598-604.
- COLLINS, P.L.F. 1981. The geology and genesis of the Cleveland tin deposit, Western Tasmania : Fluid inclusion and stable isotope studies. *Econ.Geol.* 76:365-392.
- COLLINS, P.L.F.; WILLIAMS, E. *in press.* Metallogeny and tectonic development in the Tasman Fold Belt System in Tasmania. *Ore Geology Reviews.*
- CLOSE, R.J. 1972. *The geology and economic potential of the Hibbs ultramafic belt in the Noddy Creek area of South West Tasmania.* Fellowship Diploma Thesis, Royal Melbourne Institute of Technology (TCR 72-889).
- GREEN, G.R. 1985. Metallic minerals, in BAILLIE, P.W.; CORBETT, K.D. Geological atlas 1:50 000 series. Sheet 57 (7913N). Strahan. 63-70. *Explan.Rep.geol.Surv.Tasm.*
- GREEN, G.R.; JENNINGS, D.J.; COLLINS, P.L.F.; CORBETT, K.D.; THREADER, V.M.; BACON, C.A. 1982. *Submission to Senate Select Committee South West Tasmania.* [unpubl.].
- GREEN, G.R.; SOLOMON, M.; WALSH, J.L. 1981. The formation of the volcanic-hosted massive sulfide ore deposit at Rosebery, Tasmania. *Econ.Geol.* 76:304-338.
- GROVES, D.I. 1972. The zoned mineral deposits of the Scamander - St Helens district. *Bull.geol.Surv.Tasm.* 53.
- GROVES, D.I.; MARTIN, E.L.; MURCHIE, H.; WELLINGTON, H.K. 1972. A century of tin mining at Mount Bischoff, 1871-1971. *Bull.geol.Surv.Tasm.* 54.
- HILLS, C.L. 1914. The Jukes - Darwin Mining Field. *Bull.geol.Surv.Tasm.* 16.
- JENNINGS, D.J. 1974. Visit to Warnes Lookout, Jane River area. *Tech.Rep.Dep.Mines Tasm.* 17:13-16.
- KALAGEROPOULOS, S.I.; SCOTT, S.D. 1983. Mineralogy and geochemistry of tuffaceous exhalites (tetsusekiei) of the Fukazawa Mine, Hokuroku District, Japan. *Econ.Geol.Monograph.* 5:412-432.

KLOMINSKY, J.; GROVES, D.I. 1970. The contrast in granitic rock types associated with tin and gold mineralisation in Tasmania. *Proc. australas.Inst.Min.Metall.* 234:71-77.

KOMYSHAN, P. 1981. Howard's Anomaly, in MEARES, R.M.D.; HUTTON, M.J.; KOMYSHAN, P. Exploration Licence 9/66 Tasmania, Annual Report 1980-81 *Unpubl.Rep.The Mount Lyell Mining and Railway Company Limited.* (TCR 81-1660).

KWAK, T.A.P.; ASKINS, P.W. 1981. Geology and genesis of the F-Sn-W(-Be-Zn) skarn (wrigglite) at Moina, Tasmania. *Econ.Geol.* 76:439-467.

KWAK, T.A.P.; TAN, T.H. 1981. The geochemistry of zoning in skarn minerals at the King Island (Dolphin) mine. *Econ.Geol.* 76:468-497.

LARGE, R.R. 1971. Metasomatism and scheelite mineralization at Bold Head, King Island. *Proc.australas.Inst.Min.Metall.* 238:31-45.

LARGE, R.R.; WILSON, P.A. 1982. Geology and exploration of the southern part of the Mount Read Volcanics, Elliott Bay, in GREEN, D.C. (ed.). *Geology, mineralisation, exploration : Western Tasmania. A symposium in honour of the late K.O. Reid, Queenstown, November 1982.* 9-10. Geological Society of Australia (Tasmanian Division) : Hobart.

LARGE, R.R.; HERRMANN, W. 1984. Gold in the Mount Read Volcanics at Elliott Bay, in BAILLIE, P.W.; COLLINS, P.L.F. (eds). *Mineral exploration and tectonic processes in Tasmania.* 37. Geological Society of Australia (Tasmanian Division) : Hobart.

LEAMAN, D.E.; RICHARDSON, R.G.; SHIRLEY, J.E. 1980. Tasmania - the gravity field and its interpretation. *Unpubl.Rep.Dep.Mines Tasm.* 1980/36.

LEGGE, P.J.; HASLAM, C.O.; TAYLOR, S. 1984. Lead-zinc-silver exploration and development in Australia. *Proc.australas.Inst.Min.Metall.* 289:119-135.

MARKHAM, N.L. 1968. Some genetic aspects of the Mt Lyell mineralisation. *Miner.Deposita.* 3:199-221.

MCGREGOR, P.W. 1972. Exploration for chrysotile asbestos Pad 2 to Hibbs Lagoon E.L. 13/65, S.W. Tasmania. *Unpubl.Rep.B.H.P.Exploration Dep.* (TCR 72-862).

PATTERSON, D.J.; OHMOTO, H.; SOLOMON, M. 1981. Geologic setting and genesis of cassiterite-sulfide mineralization at Renison Bell, western Tasmania. *Econ.Geol.* 76:393-438.

REID, K.O. 1976. Mount Lyell copper deposits. *Monogr.Ser.australas.Inst.Min.Metall.* 5:604-619.

REID, K.O.; MEARES, R.M.D. 1981. Exploration for volcanic-hosted sulfide deposits in Western Tasmania. *Econ.Geol.* 76:350-364.

SANGSTER, D.F. 1972. Precambrian volcanogenic massive sulphide deposits in Canada : a review. *Pap.geol.Surv.Canada.* 72-22.

SISE, J.R.; JACK, D.J. 1984. Exploration case history of the Hellyer deposit, in BAILLIE, P.W.; COLLINS, P.L.F. (eds). *Mineral exploration and tectonic processes in Tasmania.* 48-49. Geological Society of Australia (Tasmanian Division) : Hobart.

12/20

- SOLOMON, M. 1962. The tectonic history of Tasmania, in SPRY, A.H.; BANKS, M.R. (eds). The geology of Tasmania. *J.geol.Soc.Aust.* 9(2):311-339.
- SOLOMON, M. 1981. An introduction to the geology and metallic ore deposits of Tasmania. *Econ.Geol.* 76:194-208.
- SUMMONS, T.G. 1981. Silica in Tasmania. *Unpubl.Rep.Dep.Mines Tasm.* 1981/12.
- TURNER, N.J.; CALVER, C.R.; McCLENAGHAN, M.P.; McCLENAGHAN, J.; BROWN, A.V.; LENNOX, P.G. 1985. Geological atlas 1:50 000 series. Sheet 80 (8112S). Pedder. *Department of Mines, Tasmania.*
- WALLACE, D.B.; GREEN, G.R. 1982. Que River Mine and aspects of the Mount Read Volcanics in the Pieman River area, in GREEN, D.C. (ed.). *Geology, mineralisation, exploration : Western Tasmania. A symposium in honour of the late K.O. Reid, Queenstown, November 1982.* 52-66. Geological Society of Australia (Tasmanian Division) : Hobart.
- WALSHE, J.L.; SOLOMON, M. 1981. An investigation into the environment of formation of the volcanic-hosted Mt Lyell copper deposits using geology, mineralogy, stable isotopes, and a six-component chlorite solid solution model. *Econ.Geol.* 76:246-284.
- WARD, L.K. 1911. The Mount Balfour mining field. *Bull.geol.Surv.Tasm.* 10.
- WEBSTER, S.S.; SKEY, E.H. 1979. Geophysical and geochemical case history of the Que River deposit, Tasmania, Australia. *Econ.Geol.Rep.geol. Surv.Canada.* 31:697-720.
- WHITE, N.C. 1975. *Cambrian volcanism and mineralization in South-West Tasmania.* Ph.D. thesis, University of Tasmania : Hobart.
- WHITFORD, D.J.; SUN, S.-S.; GULSON, B.L.; CRAVEN, S.J.; PORRITT, P.M. 1983. Petrological and geochemical studies at Que River. *CSIRO Mineralogy Research Rev.* 1983:13-15.

[15 August 1985]

15/20

Table 1. MAIN MINERAL DEPOSITS AND PROSPECTS IN SOUTH-WESTERN TASMANIA

No.*	Deposit name	Commodities	Deposit type
1.	Mt Remus	Mo, V, Co	Pyritic veins
2.	Bluff River	Sn	Skarn
3.	Hartnett	W, Sn	Quartz veins
4.		Sn, Cu	Skarn(?)
5.	Brooks	W	Quartz-sulphide veins
6.	Sterling Valley	Sn	Veins
7.		Ti	Alluvial
8.		Sb	Pyritic veins
9.	Melaleuca	Sn	Alluvial - several deposits
10.	Cox Bight	Sn, W, Mo	Alluvial Sn - several deposits; Vein W, Sn, Mo
11.	Ray River	Sn	Alluvial
12.		Cu	Veins
13.	Bubs Hill	Pb, Zn	Disseminated
14.	Espie's Prospect	Pb, Zn	Veins
15.	Lake Selina	Pyrite	Disseminated
16.	Lake Dora	Cu	Veins and disseminated
17.		Pb, Zn	Veins
18.	Mt Mueller	Cu	Veins
19.	Pender's Prospect	Cu	Veins
20.	Voyager 19	Pb, Zn, Ag	Massive sulphide
21.		Pyrite	Disseminated
22.		Pb, Ag	Vein
23.		Pb, Zn, Ag	Disseminated
24.		Cu	Disseminated
25.	Birthday Bay	Cu	Veins
26.	Double Cove	Cu	Veins
27.	Mt Arrowsmith Area	Cu	Veins
28.	Jukes-Darwin Area	Cu, Au, Ag	Numerous disseminated and vein deposits
29.	Sterling Valley	Pb, Zn, Ag	Vein
30.	Adamsfield	Os-Ir, Cr	Alluvial
31.	Precipitous Bluff	Limestone	Sedimentary
32.	Glovers Bluff	Silica	Sedimentary
33.	Cape Sorell	Silica	Sedimentary
34.	Wings Lookout	Silica	Sedimentary
35.	Bathurst Channel	Gold	Alluvial
36.	Christmas Cove	Gold	Alluvial
37.	Urquhart River	Gold	Alluvial
38.	Mainwaring River	Gold	Alluvial
39.	Jane River	Gold/cinnabar	Alluvial(?)
40.	Mt Pelion West	Coal	Sedimentary
41.	Barn Bluff	Coal	Sedimentary
42.	South Cape	Coal	Sedimentary
43.	Lettes Bay	Lignite(?)	Sedimentary
44.	Farm Cove	Lignite	Sedimentary
45.	Coal Head	Lignite	Sedimentary
46.	Asbestos Point - Hibbs River	Asbestos	Veins in serpentinite
47.	Iron Creek - Neilson River	Hematite, pyrite gold(?)	Veins
48.	Andrew River	Pb-Zn-Ag	Carbonate-hosted
49.	Holley Road	Banded ironstone	Sedimentary(?)

19/20

Table 1 (continued).

No.*	Deposit name	Commodities	Deposit type
50.	Red Hills	Cu-Pb-Zn-Ag-Au	Massive and disseminated sulphide
51.	King River Delta	Pyrite (Cu, Co)	Alluvial

\* Deposit numbers refer to Figure 3.

Table 2. LIST OF MINERAL DISTRICTS

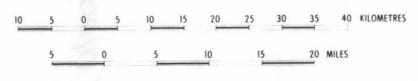
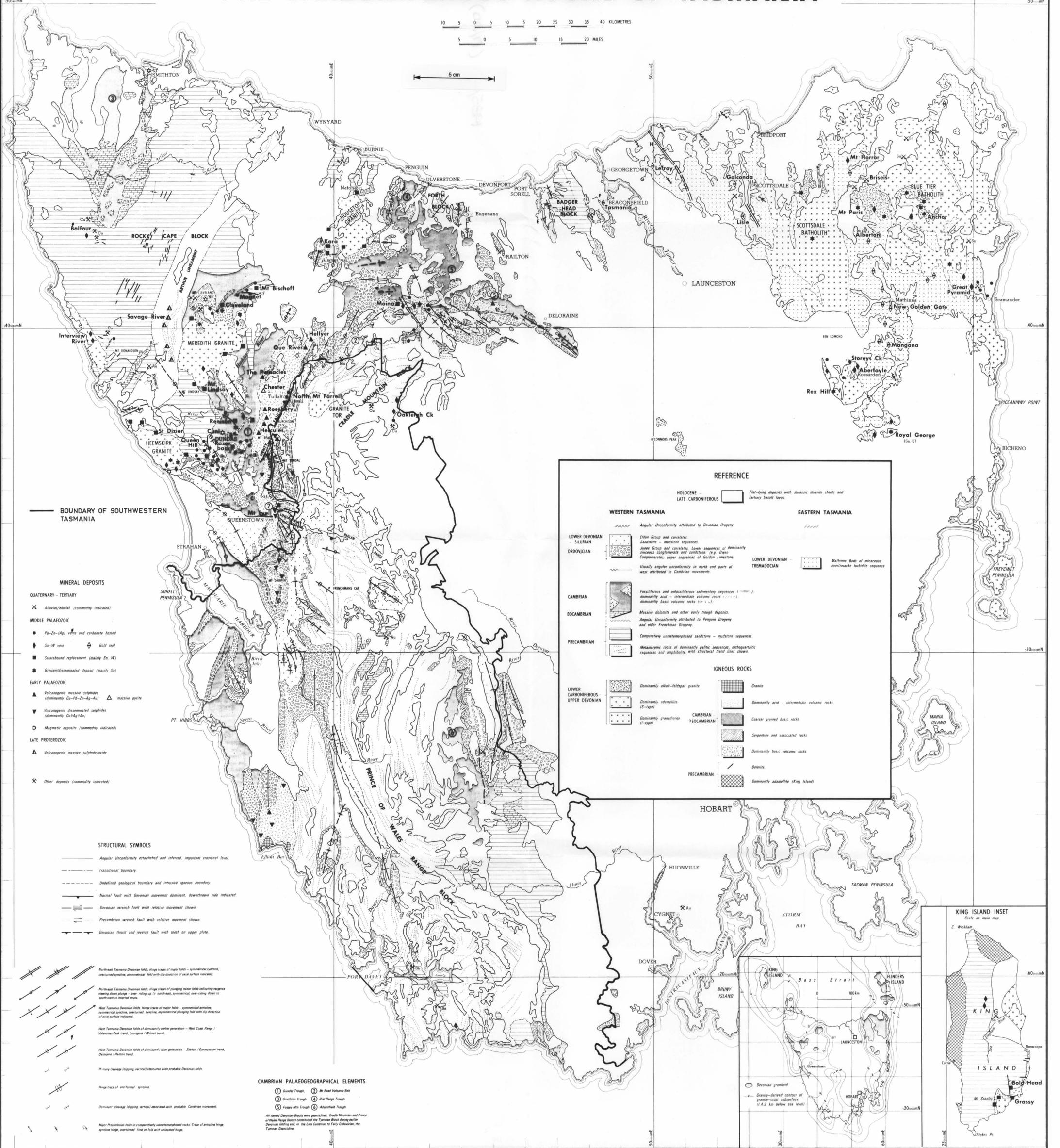
Main age of host rocks	District	Commodity(ies)	Status of knowledge
<i>VERY HIGHLY PROSPECTIVE AREAS</i>			
Precambrian	Cape Sorell	Silica	Established resource
	Glovers Bluff	Silica	Established resource
	Twelvetrees Range	Volcanogenic Cu-Zn-Au-Ag	Speculative model-based, very little exploration
	Arthur - Davey	Granite-related Sn-W-Cu-Au-Mo- Sb-Ag-Pb-Zn	Alluvial Sn being mined; Sb-Cu-Au-Mo veins known, very little exploration or mapping in hinterland
	Fury-Granite Tor	Granite-related Sn-W-Cu-Pb-Ag	Cu, Mo, Pb vein mineralisa- tion known. Only pre- liminary exploration carried out.
Cambrian	Elliott Bay - D'Aguilar Range	Volcanic-hosted: massive Cu-Pb-Zn- Ag-Au, dissemi- nated Au.	Number of prospects identified; only a small proportion of area intensively explored.
	Hibbs - Mainwaring	Ni, Cr, asbestos in ultramafic rocks. Volcano- genic & sedi- mentary hosted Cu-Au-Ag	Asbestos, copper pros- pects known. Most of area not intensively explored.
	Jukes - Darwin	Cu-Au-Ag (Pb-Zn) volcanogenic; disseminated Au.	Long known mineral district; some of area intensively explored.
	West Coast Range	Volcanic-hosted: massive Cu-zinc- lead-silver-gold; disseminated Au. Granite-related Ag-Pb, Sn-W vein deposits.	Intensive exploration continuing.
Cambrian - Devonian	New River	Alluvial Os-Ir; limestone, petroleum	Very little exploration done.
	Upper Gordon - Adamsfield	Limestone; carbonate-hosted Zn-Pb-Ag; alluvial & ultramafic-hosted Os-Ir, Cr, Ni; granite-related Sn-W, Ag-Pb. Petroleum.	Very little modern exploration. Old alluvial mining centre at Adamsfield.
	Mt Strahan	Limestone; sediment hosted Pb-Zn-Ag. Vein & dissemi- nated Au.	Little intensive exploration.

16/20

Table 2. (continued)

Main age of host rocks	District	Commodity(ies)	Status of knowledge
Ordovician	Giblin	Limestone, carbonate Pb-Zn-Ag.	Very little exploration.
	Governor - Lower Gordon - Olga	Limestone, shale or carbonate-hosted Pb-Zn-Ag.	Very little exploration; evidence of Pb-Zn mineralisation of this style recently discovered by P.W. Baillie (pers. comm.) near Darwin.
	Adam Range	Limestone; shale or carbonate-hosted Pb-Zn-Ag.	Very little exploration.
	Lower Picton	Limestone, petroleum, carbonate-hosted lead-zinc.	Very little exploration.
<i>HIGHLY PROSPECTIVE AREAS</i>			
Precambrian	Tyennan	Gold (Jane River). Dolomite, carbonate-hosted Pb-Zn-Ag; tin-tungsten, copper and Pb-Zn-Ag veins; silica.	Very little intensive exploration.
	Canning	Copper, silver-lead-zinc veins, silica.	Very little exploration.
Siluro- Devonian	South Eldon	Shale-hosted Pb-Zn-Ag.	Current exploration

# METALLOGENIC AND STRUCTURAL MAP OF PRE-CARBONIFEROUS ROCKS OF TASMANIA



BOUNDARY OF SOUTHWESTERN TASMANIA

MINERAL DEPOSITS

- QUATERNARY - TERTIARY
  - Alluvial/fluvial (commodity indicated)
- MIDDLE PALAEOZOIC
  - Pb-Zn-Ag veins and carbonate hosted
  - Su-W vein
  - Stratobound replacement (mainly Su, W)
  - Greens/dissiminated deposit (mainly Su)
- EARLY PALAEOZOIC
  - Volcanogenic massive sulphides (dominantly Cu-Pb-Zn-Ag-Au)
  - Volcanogenic disseminated sulphides (dominantly Cu-Pb-Zn-Au)
  - Magmatic deposits (commodity indicated)
- LATE PROTEROZOIC
  - Volcanogenic massive sulphide/oxide
  - Other deposits (commodity indicated)

STRUCTURAL SYMBOLS

- Angular Unconformity established and inferred, important erosional level
- Transitional boundary
- Undefined geological boundary and intrusive igneous boundary
- Normal fault with Devonian movement dominant, downthrown side indicated
- Devonian wrench fault with relative movement shown
- Precambrian wrench fault with relative movement shown
- Devonian thrust and reverse fault with teeth on upper plate

- North-east Tasmania Devonian folds, hinge traces of major folds - symmetrical, overturned, asymmetrical, fold with dip direction of axial surface indicated
- North-east Tasmania Devonian folds, hinge traces of plunging minor folds indicating segment plunging down-plunge - over-riding up to north-east, symmetrical, over-riding down to south-west in inverted strata
- West Tasmania Devonian folds, hinge traces of major folds - symmetrical, overturned, asymmetrical, plunging fold with dip direction of axial surface indicated
- West Tasmania Devonian folds of dominantly earlier generation - West Coast Range / Valerius Peak trend, Longene / Winton trend
- West Tasmania Devonian folds of dominantly later generation - Zeehan / Gormanston trend, Deloraine / Raibon trend
- Primary cleavage (slipping, vertical) associated with probable Devonian folds
- Hinge trace of antiformal syncline
- Dominant cleavage (slipping, vertical) associated with probable Cambrian movement
- Major Precambrian folds in comparatively unmetamorphosed rocks: Trace of anticline hinge, syncline hinge, overthrust: line of fold with unobscured hinge

CAMBRIAN PALAEOGEOGRAPHICAL ELEMENTS

- 1 Dundee Trough
- 2 Mt Read Volcanic Belt
- 3 Smithton Trough
- 4 Dial Range Trough
- 5 Fanny Mts Trough
- 6 Adamsfield Trough

All named Devonian Blocks were granitophic. Cradle Mountain and Price of Wales Range Blocks constituted the Tasman Block during earlier Devonian folding and, in the Late Cambrian to Early Ordovician, the Tasman Orogen.

**REFERENCE**

HOLOCENE - LATE CARBONIFEROUS: Flat-lying deposits with Jurassic dolerite sheets and Tertiary basalt lavas.

**WESTERN TASMANIA**

- LOWER DEVONIAN - SILURIAN: Angular Unconformity attributed to Devonian Orogeny
- ORDOVICIAN: Eidon Group and correlates; Sandstone - mudstone sequences; June Group and correlates; Lower sequences of dominantly siliceous conglomerates and sandstone (e.g. Owen Conglomerate); upper sequences of Gordon Limestone
- CAMBRIAN: Usually angular unconformity in north and parts of west attributed to Cambrian movements
- EOCAMBRIAN: Fossiliferous and unfossiliferous sedimentary sequences (dominantly acid - intermediate volcanic rocks); dominantly basic volcanic rocks
- PRECAMBRIAN: Massive dolomite and other early trough deposits; Angular Unconformity attributed to Penguin Orogeny and older Frenchman Orogeny; Comparatively unmetamorphosed sandstone - mudstone sequences; Metamorphic rocks of dominantly pelitic sequences, orthoquartzitic sequences and amphibolites with structural trend lines shown

**EASTERN TASMANIA**

- LOWER DEVONIAN - TREMADOCIAN: Mathinna Beds of micaceous quartzwacke turbidite sequence

**IGNEOUS ROCKS**

- LOWER CARBONIFEROUS - UPPER DEVONIAN: Dominantly alkali-feldspar granite; Dominantly adamellite (S-type); Dominantly granodiorite (I-type)
- CAMBRIAN - EOCAMBRIAN: Granite; Dominantly acid - intermediate volcanic rocks; Coarser grained basic rocks; Serpentine and associated rocks; Dominantly basic volcanic rocks; Dolerite
- PRECAMBRIAN: Dominantly adamellite (King Island)

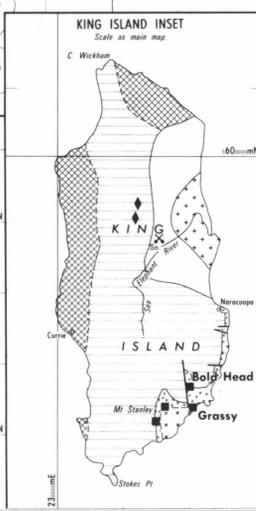
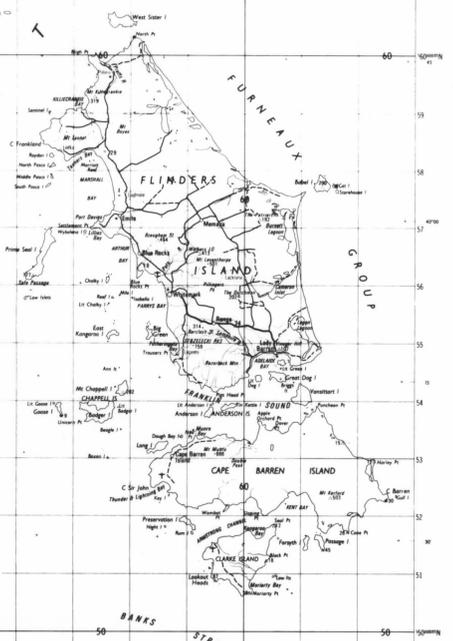
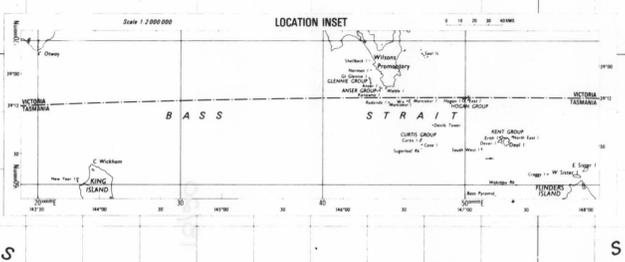
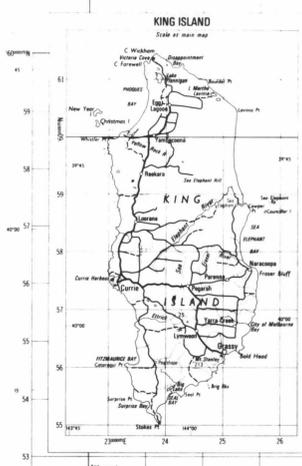
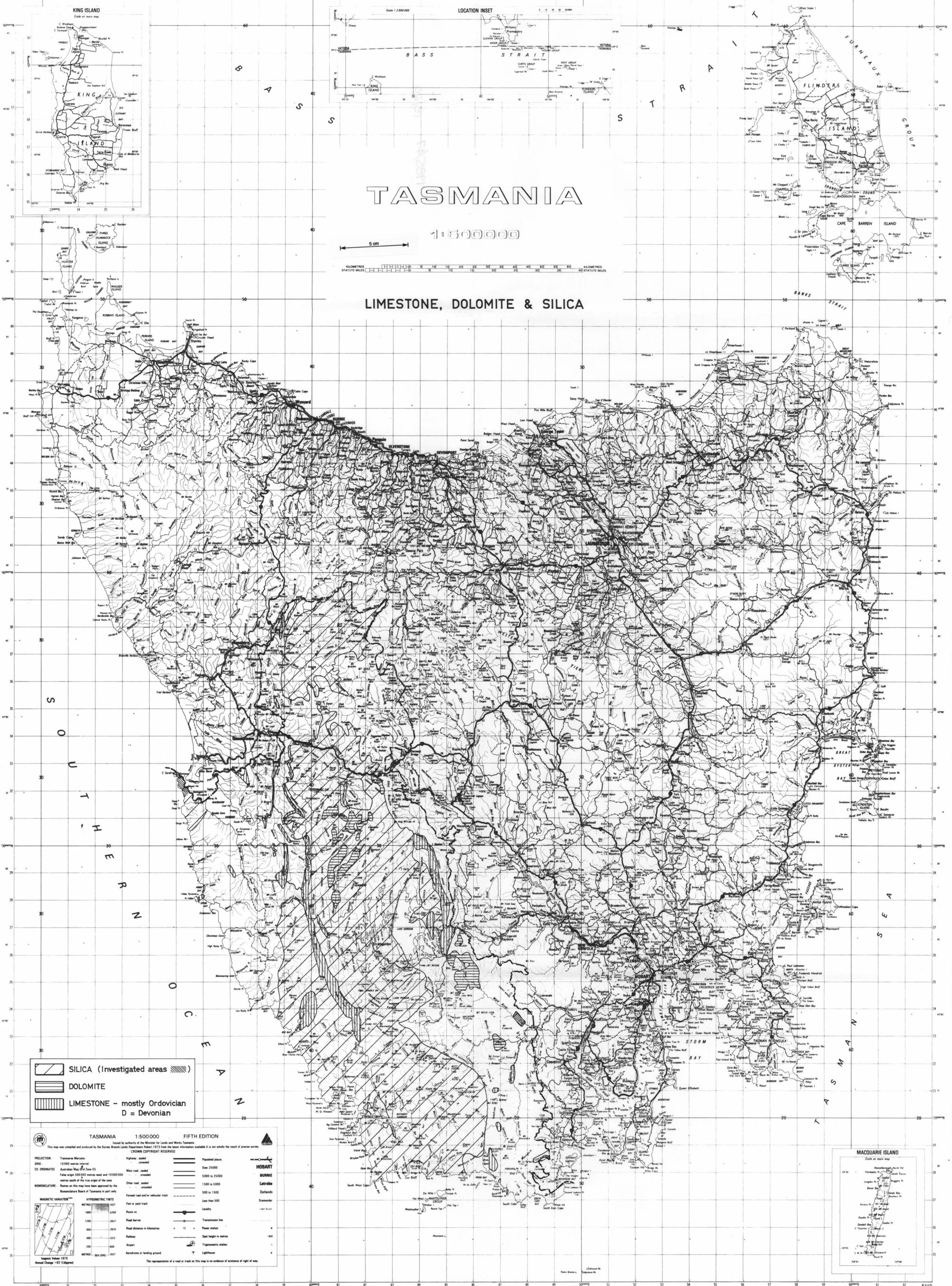


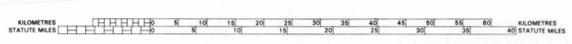
Fig.1



# TASMANIA

1:500000

5 cm



## LIMESTONE, DOLOMITE & SILICA

- SILICA (Investigated areas)
- DOLOMITE
- LIMESTONE - mostly Ordovician  
D = Devonian

**TASMANIA 1:500000 FIFTH EDITION**

This map was compiled and produced by the Survey Branch Land Department, Hobart, 1973 from the latest information available. It is not wholly the result of precise survey.

**PROJECTION:** Transverse Mercator  
**GRID:** 10 000 metres interval  
**CO-ORDINATES:** Australian Map Grid Zone 55  
 False origin 500 000 metres west and 10 000 000 metres south of the true origin of the zone.  
**NOMENCLATURE:** Names on this map have been approved by the Nomenclature Board of Tasmania in part only.

**MAGNETIC VARIATION:** See separate sheet.

**HYPSOMETRIC TINTS:**

1800	2527
1200	2827
800	2927
400	3232
200	466

**Legend:**

- Highway, sealed
- Main road, sealed
- Other road, sealed
- Formed road and/or vehicular track
- Foot or pack track
- Road barrier
- Road distance in kilometres
- Railway
- Airport
- Aerodrome or landing ground
- Populated places
- Over 25 000
- 5 000 to 25 000
- 1 500 to 5 000
- 500 to 1 500
- Less than 500
- Locality
- Transmission line
- Power station
- Spot height in metres
- Trigonometric station
- Lighthouse

**Legend:**

- HOBART
- BURNIE
- Launceston
- Darlington
- Scamander
- Launceston

The representation of a road or track on this map is no evidence of existence of right of way.

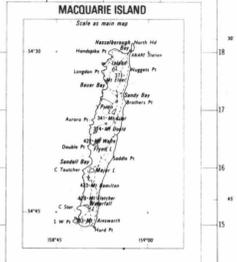


Fig.2

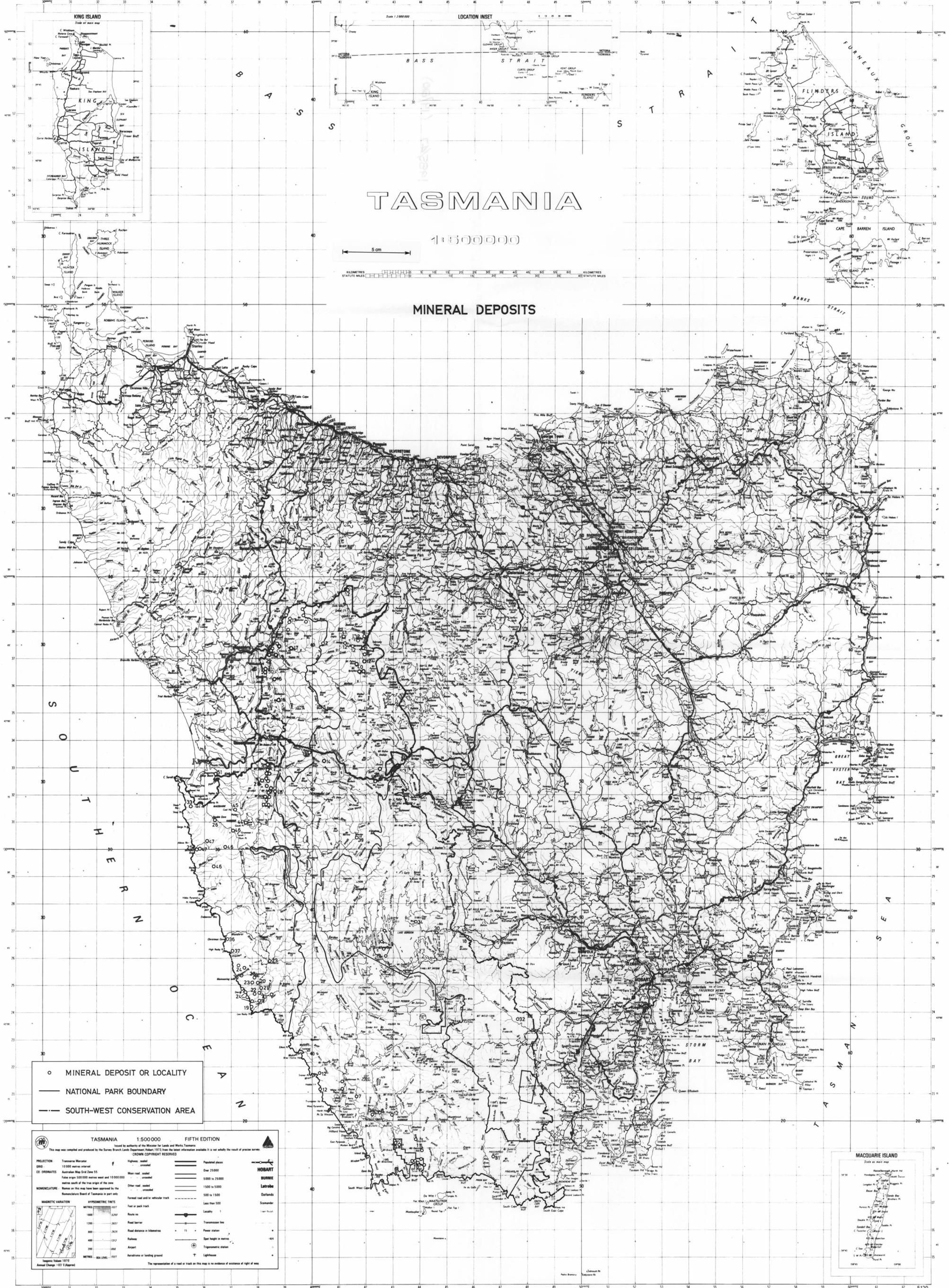
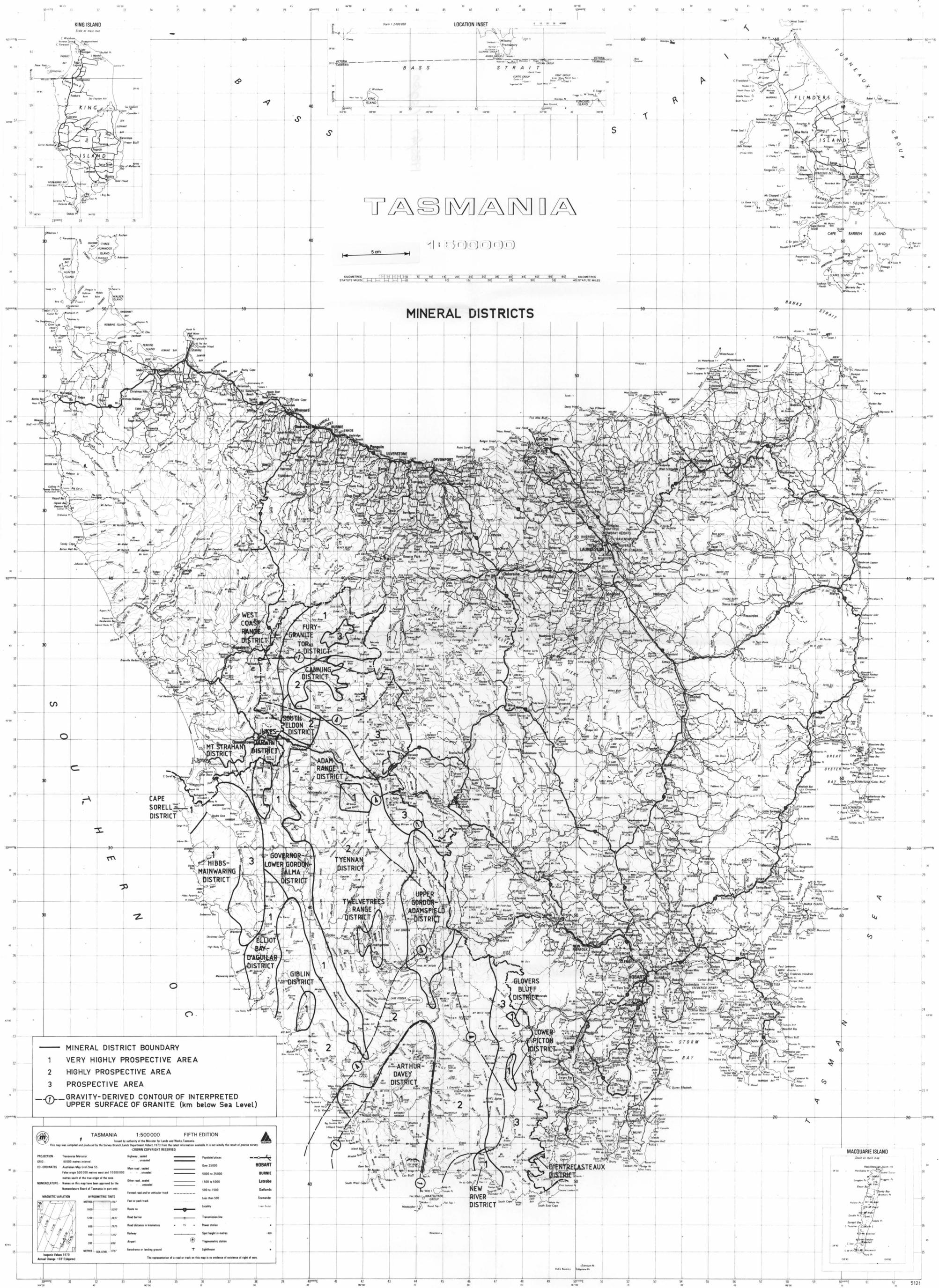


Fig.3



# TASMANIA

## MINERAL DISTRICTS

1:500000

5 cm

KILOMETRES STATUTE MILES

- MINERAL DISTRICT BOUNDARY
- 1 VERY HIGHLY PROSPECTIVE AREA
- 2 HIGHLY PROSPECTIVE AREA
- 3 PROSPECTIVE AREA
- ① GRAVITY-DERIVED CONTOUR OF INTERPRETED UPPER SURFACE OF GRANITE (km below Sea Level)

**TASMANIA 1:500000 FIFTH EDITION**

This map was compiled and produced by the Survey Branch, Lands Department, Hobart, 1972. From the latest information available it is not wholly the result of precise survey. CROWN COPYRIGHT RESERVED.

<p><b>PROJECTION</b> Transverse Mercator</p> <p><b>DATUM</b> 1958 datum (vertical)</p> <p><b>CO. ORIGINATES</b> Australian Map Grid Zone 55</p> <p>Falses origin 500 000 metres west and 10 000 000 metres south of the true origin of the zone</p> <p><b>NOMENCLATURE</b> Names on this map have been approved by the Nomenclature Board of Tasmania in part only.</p> <p><b>MAGNETIC VARIATION</b></p> <p><b>HYPSONETIC TINTS</b></p> <p>1800 5250</p> <p>1200 3825</p> <p>800 2625</p> <p>400 1750</p> <p>200 850</p> <p>METRES SEA LEVEL 777</p>	<p>Highways sealed/unsealed</p> <p>Main road sealed/unsealed</p> <p>Other road sealed/unsealed</p> <p>Foot or pack track</p> <p>Road barrier</p> <p>Road distance in kilometres</p> <p>Railway</p> <p>Airport</p> <p>Aerodrome or landing ground</p>	<p>Populated places</p> <p>Over 25 000</p> <p>5 000 to 25 000</p> <p>1 500 to 5 000</p> <p>500 to 1 500</p> <p>Less than 500</p> <p>Locality</p> <p>Transmission line</p> <p>Power station</p> <p>Spot height in metres</p> <p>Trigonometric station</p> <p>Lighthouse</p>	<p><b>HOBART</b></p> <p><b>BURNIE</b></p> <p><b>LATROBE</b></p> <p>Outfalls</p> <p>Scamander</p>
--	--	--	--

The representation of a road on this map is no evidence of existence of right of way.

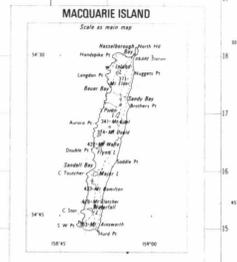


Fig. 4