PACIFIC-NEVADA MINING PTY LTD

ACN 008 486 717

NORTH-WEST TASMANIA - AUSTRALIA

AN EXPLORATION OPPORTUNITY FOR GOLD, COPPER AND DIAMONDS

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1997

Executive Summary

THE OPPORTUNITY

- Exploration within one of the world's spectacularly endowed mineral provinces. Targets include Proterozoic gold, Proterozoic copper-gold pipes, Proterozoic stratiform copper and Early Permian(?) diamond-bearing pipes.

- An innovative exploration opportunity for diamond-bearing pipes based on the interpretation of state-wide gravity data. It recognises a subtle pattern of late Paleozoic horst and graben structures superimposed on a Precambrian craton. Alluvial diamonds have been taken from the area.

- A solid exploration opportunity for gold and copper built on a paradigm-shift that recognises the significance of Proterozoic rocks in Tasmania.

- Sixteen exploration licences in five blocks for a total area of approximately 4,000 square kilometres are held by Pacific-Nevada Pty. Ltd. Areas were chosen on the basis of prospectively rather than what was available at the time of acquisition.

- At least one target, Roger River, will be ready to drill with only minimal additional data input. This is a Proterozoic iron-formation hosted gold, copper-gold pipe and stratiform copper play. Other targets will be at the drill-ready stage with minimal additional effort.

- The entire region is covered by an exceptional technical data set compiled by Mineral Resources Tasmania. The magnetic data set for north-west Tasmania was only widely released in June 1997.

THE EXPLORATION AND MINING ENVIRONMENT IN TASMANIA

- Supportive State government.

- Supportive State Mines Department - Minerals Resources Tasmania.

- An outstanding data base with new magnetic and gravity data made available for the exploration community by Mineral Resources Tasmania.

- No Native Title concerns at this time.

- There is a legally sound framework in place to accommodate mining alongside the stringent environmental laws in this environmental sensitive State. Consider the Henty example.

- Exploration and mining infrastructure is in place.

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1. Introduction

Pacific-Nevada Pty Ltd has acquired approximately 4,000 square kilometres of prime exploration property in Tasmania (Figures 1 & 2). The acquisition in April, by Morritt Holdings Pty Ltd (vended to Pacific-Nevada in October, 1997) and in June 1997 by Pacific-Nevada, was timely. The region had just been the subject of a major phase of data acquisition by the Tasmanian government. The magnetic component of this data set was only widely released in June 1997.

State and Federal laws have been implemented to support the explorer and to minimise the adverse impact of the political decisions of the 1980's. The Tasmanian government has worked diligently to court the Australian exploration and mining community back to Tasmania whilst retaining the States environmentally sound values.

The Tasmanian government, through Mineral Resources Tasmania (MRT), prepared an exploration document for release in June 1997; "Mineral exploration opportunities in Tasmania - A summary of opportunities for mineral exploration and mineral resource development in Tasmania". This release coincided with a promotional tour in Western Australia, South Australia, Victoria and New South Wales in June 1997.

2. The Exploration Opportunity

In the late 1890's Corinna was the site of one of Australia's first gold rushes. With the discovery of tin at Mt Bischoff in 1871 and gold & copper at Mt. Level in 1883, a flourishing mining industry developed. These discoveries produced enormous wealth for Tasmania and for their respective companies. It also precipitated the floating of an unprecedented number of companies on the London stock exchange. The exploration that followed produced a number of other deposits including the massive magnetite ore body at Savage River, zinc, lead and silver at Rosebery and Hellyer, and a tin ore body at Rension.

The alluvial goldfield at Corinna produced more than just alluvial gold. Firstly, although not documented in the historical record, the source of that alluvial gold was discovered in the immediate vicinity within the iron-rich Proterozoic rocks. A significant underground operation resulted. These workings were uncovered in 1996 by the exploration effort associated with the Corinna JV between Titan Resources NL and Goldstream Mining NL[1]. Secondly, alluvial diamonds were gleaned from the same alluvial effort that produced the gold in 1894 (Twelvertrees, 1918 & Anonymous, 1914 - refer to Appendix 2 for transcripts). No source for these diamonds has ever been located.

The legacy of this extraordinary exploration effort can be seen in the number of truly world class ore deposits focused into a tiny area of the earth's crust that is north-west Tasmania (Figures 3 & 6). There are few areas on the earth's crust that can boast such

[1] Morritt introduced the Corinna JV partners to this area, picked up the ground on their behalf and designed and implemented the exploration program that is currently under way.

an accumulation of diverse and profitable ore bodies. The Goldfields of Western Australia and the Carlin Trend of Nevada in the USA are two gold-only areas that compare to the north-west of Tasmania.

The on-going exploration of this region in the last 20 years has, for a variety of reasons, focused into a very narrow geological domain - the Paleozoic Mt Read Volcanics. This exploration has been driven by an extraordinarily restricted exploration philosophy that focused all attention into the Mt Read Volcanics of the Dundas Element (Figure 3). The Corinna Goldfield (Figure 6) located in Proterozoic rocks to the west of Palaeozoic Dundas Element rocks, is a case in point. The alluvial gold taken from this site is generally considered to have been derived from the Paleozoic Dundas Element - the Mt. Read Volcanics. - that host a variety of massive sulphide ore bodies. In fact the gold is derived from the Proterozoic Bowrie Formation which also hosts the Savage River magnetite deposit. This area is currently being explored by a joint venture between two Perth-based junior explorers'. In other parts of Australia and indeed in other parts of the world, rocks of Proterozoic age and similar geological make-up host ore bodies such as Homestake in Lead, south Dakota, USA (160 Mt @ 8 g/t gold), at Raposos in the Quadrilatero Ferrifero in Mines Gerias State in Brazil (20 Mt (?) @ 10 g/t gold), and at Selwyn in Queensland (4.6 Mt @ 5.2 g/t gold & 2.05% copper) and ore bodies such as Warrego (1.48M ounces of gold & 174,000 t of copper form 6.9 Mt of ore) and Nobles Nob (over 1M ounces of gold from 2 Mt of ore) in the Tennant Creek Goldfield in the Northern Territory.

Clearly north-west Tasmania has the necessary geological ingredients to host world-class ore bodies. Until now, the overwhelming focus of exploration and discovery has taken place within the Paleozoic Mt. Read Volcanics. The Paleozoic rocks have historically produced lucrative opportunities, yet the subjacent rocks of the Proterozoic have largely been ignored. A compelling paradigm-shift lies in the recognition that these subjacent rocks of the Proterozoic offer the opportunity to make the next major discovery in Tasmania. This paradigm-shift necessitates a revision in the way in which technical data is interpreted. The available geological, magnetic and gravity data sets have therefore been re-interpreted. This has been undertaken in light of the recognition of the significance of three primary crustal breaks, other structures of regional significance and the multiple phases of mineralisation that occurred from the Proterozoic through to the Tertiary. This reinterpretation identifies the major deformation events, the types of associated structures and their likely stress fields (Figure 5) as well as the associated mineralisation (Figure 6). For example, the Mt Read Volcanics and its range of massive sulphide bodies are interpreted to have been emplaced into the south-western limb of a Cambrian graben, the triple-point for which would have been located just north of Devonport (Figure 3). Also, interpretation of the gravity data has enabled the recognition of a series of horst-and-graben structures to be identified that were active in the Early Permian(?) - prior to the rifting associated with the separation of Australia an Antarctica (Figure 7). The horst blocks uplift and expose some of the prospective Proterozoic rocks as well as younger mineralised systems such as the Early Permian(?) Cygnet Goldfield south of Hobart, Tasmania. The edges of these structures cut across recognised rock boundaries and cut into otherwise little-deformed parts of the Proterozoic rock sequence - the ideal site for intrusions that could host diamonds. Perhaps the source of alluvial diamonds taken from the Corinna Goldfield in north-western Tasmania will now be determined.

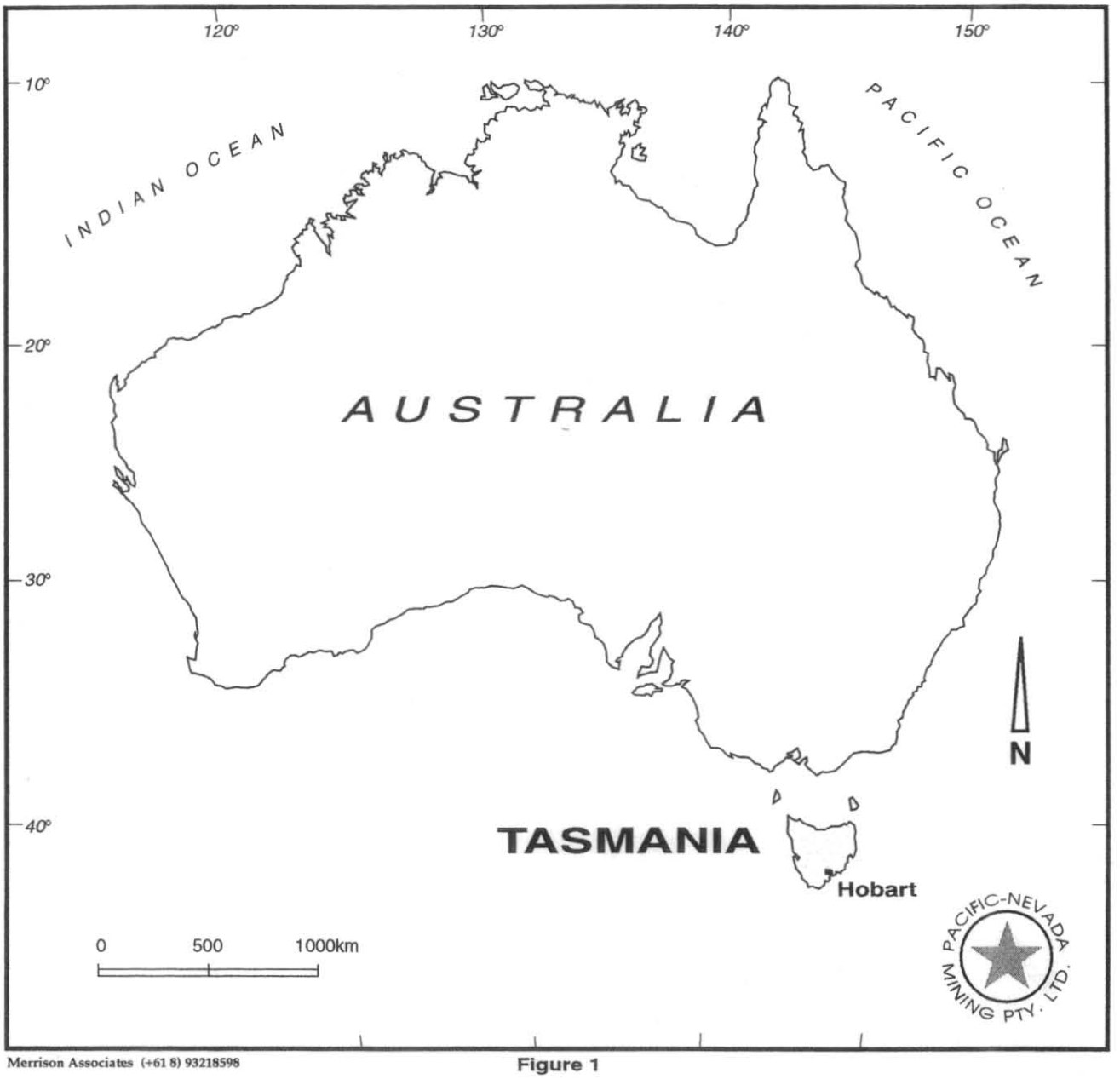
This proprietary interpretive data set provides the basis for strategic exploration in north-west Tasmania.

The detailed knowledge of the rock types, their distribution and the types of mineralisation each can host, will facilitate rapid and accurate exploration. Targets include Proterozoic iron-formation hosted gold such as that which occurs at Homestake at Lead in South Dakota; Proterozoic iron-formation hosted gold-copper pipes that occur at Selwyn in Queensland; Proterozoic copper-gold shoots that occur in the Tnnant Creek district of the Northern Territory; Proterozoic stratiform copper that occurs in the Keewanaw Peninsula of Michigan in the USA; and Early Permian (?) diamond-bearing pipes. Encouragement for the successful drill-testing of these targets comes from the occurrence of primary gold and copper, including native copper in these Proterozoic rocks, and from alluvial gold, copper sulphides and diamonds recovered from local streams.

Targets for early drill testing have already been identified. The Roger River Proterozoic gold and Proterozoic stratiform copper target require the acquisition and interpretation of airborne EM and the detailed interpretation of existing magnetics and gravity to determine drill hole placement (Figures 9,10 & 11).

Morritt has made the critical paradigm-shift from the historical exploration focus on the Palaeozoic Dundas Element rocks (the Mt Reed Volcanics) to a new exploration focus on the Proterozoic Rocky Cape Element rocks of north-west Tasmania. Additionally, the recognition of the normal and listric faults associated with the edges of Early Permian(?) horst blocks that cut Precambrian Shield provides a focus for locating the source of locally derived diamonds.

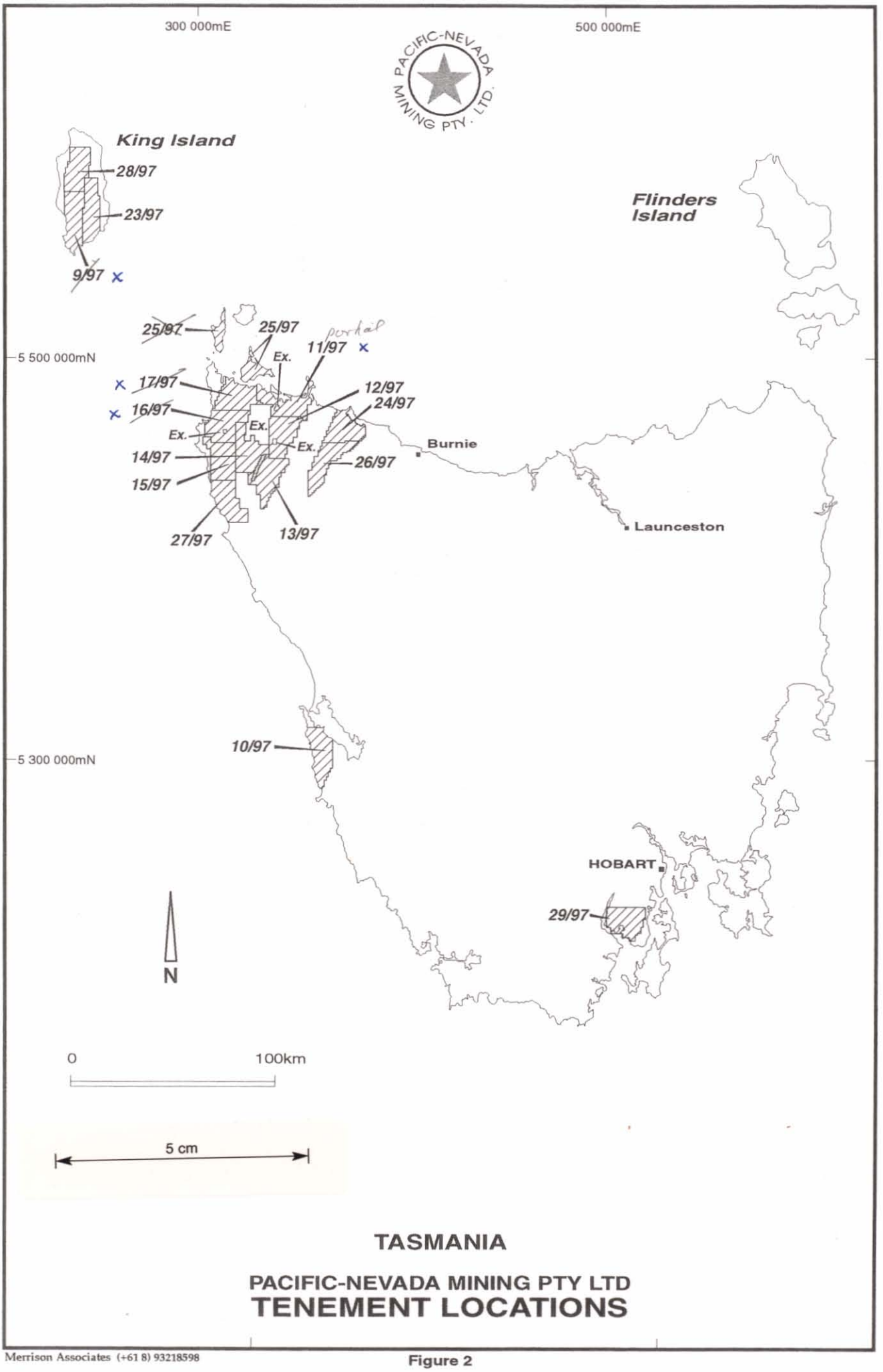
Approximately half of the exploration licences occur within areas subjected to Strategic Prospectively Zone (SPZ) legislation or within farmland that is the subject of more standard legislation pertaining to exploration and mining (Figure 3). The State Regional Forestry Agreement (RFA) process was completed in early November with the signing of the binding agreement by the State and Federal governments.



Merrison Associates (+61 8) 93218598

Figure 1

5 cm



TASMANIA

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TENEMENT LOCATIONS

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Figure 2

3. The Geology Behind the Exploration Opportunity

The geological thesis has been developed to provide a technical edge for exploration and discovery. Although some technical justification is provided it is not the aim of this document to present more than the principle elements of this thesis and to present the technical paradigm-shift required to understand the exploration opportunities. The geology of Tasmania is well documented with a wealth of reference material provided by MRT. Refer to that data source for background material.

This thesis is about exploration and discovery of major gold and copper ore bodies. The diamond opportunity is a bonus.

There are several demonstrable factors that delineate this thesis:

1. The exploration effort is to focus on a piece of the earth's crust that demonstrably hosts the world class ore bodies of Mt Lyell (Cu, Au,) Rosebery (Zn, Pb, Ag, Au, Cu), Rension (Sn), Hellyer (Zn, Pb, Ag, Au, Cu), Mt Bischoff (Sn), and King Island (W) (Figure 6). The resources at Savage River (Fe) and at Beaconsfield (Au) are also significant deposits.

2. The Proterozoic rocks under licence are of the kind that are known to host very large gold and copper ore bodies. Unlike the Archaean of, for example, Western Australia, the Proterozoic iron-formation hosted gold ore bodies are consistently of high grade, averaging 8-10g/t worldwide, and also consistently of large tonnage. Although smaller in size the Selwyn -style and the Tennent Creek-style ore bodies are of generally high grade - a reasonable trade-off.

3. Interpretation of the magnetic and gravity data bases has revealed five primary north-west to south-east orientated crustal features that have been demonstrably reactivated through time and have been the focus for mineralisation (Figures 3 & 6). They have been assigned the term "focal structure" (FS) by Morritt who has named them the Macquarie Harbour FS, the Savage River FS, the King Island Fs, the Devonport FS and the Launceston FS for ease of reference (Figure 3). Five of the six world-class ore bodies fall along these structures. The sixth falls within one of the two corridors formed by the three adjoining structures. The Savage River magnetite deposits occurs on the Savage River FS (Figure 6).

4. Zones of structural extension have been a focus for mineralisation throughout geological time. The Dundas Element consists of volcanic and sub-volcanic rocks and associated volcanogenic massive sulphide (VMS) deposits within a Middle Cambrian graben (Figures 3 & 8). The Proterozoic platform succession hosts a series of deformational belts of which the AMC is the only one recognised to-date. These are interpreted by Morritt to be former zones of extensions. The Smithton Zone, Montagu Zone and Mary Hall Zone have been recognised as being similar to the AMC and have been named for the first time in this document (Figures 3,8 & 10). These zones are cross-cut by the King Island FS and by the Savage River FS. Early

Permian(?) extension, also reported for the first time, may be associated with diamond-bearing kimberlite in the north-west of the State (Figures 7, 8, 10 & 11).

THE PARADIGM-SHIFT

Recognition that the world-class ore bodies of north-western Tasmania are almost certainly <u>not</u> restricted to the Late Cambrian volcanic rocks of the Dundas Element (exemplified in the Mt. Read Volcanics), but are controlled by the intersection of three focal structures and suitable host rocks (Figure 3) such as occurs in the Proterozoic Rocky Cape Element. Further, that the alluvial diamonds found in the north-west are probably related to diamond-bearing intrusions along Early Permian(?) horst-block margins that cut the Precambrian rocks.

The summary plans, sections and stress field information presented in this document, including the nature of deformational events and the associated principle stress field σ_1, are base entirely on the interpretation of the following data:

- The 1:250,000 scale four-map set titled "Geology of Tasmania" published by the Tasmanian Geological Survey (MRT) in 1996.

- Composite total magnetic intensity (TMI) imagery generated by Tasmania Development and Resources (MRT) in conjunction with AGSO in 1996 and presented at 1:250,000 scale. The imagery utilised was limited by the coastal boundary. An A4 version of the TMI image presented in the June 1997 information release by the MRT revealed off shore between the Tasmanian mainland and King Island.

- The time-space diagram for Tasmania (Proterozoic - Cainozoic). An NGMA TASGO project from MRT and AGSO compiled by D.B. Seymour and C.R. Calver in 1995.

The interpretation by Morritt is based on standard geological and geophysical principles. It draws on an understanding of the following areas of geological science in addition to basic geological principles:

- ore body development,
- regional tectonics and structure,
- techtono-stratigraphic environments,
- depositional environments, and
- time-space diagrams.

Occam's Razor, a principle of the economy of hypothesis, is widely used. It is the lynch-pin of the geological interpretation and enables understanding where confusion may otherwise prevail. For example, the Tasmanian Geological Survey (MRT) divides the Proterozoic sedimentary succession into the King Island and Rocky Cape elements to the west of the Palaeozoic Dundas Element and into the Tyennan and Adamsfield-Jubliee elements to the east of the Dundas Element. As the rocks of the Palaeozoic Dundas Element are interpreted to occur in a graben, there is every reason to link the Proterozoic

sediments on each side of this graben. Using Occam's Razor all the Proterozoic sedimentary elements have been assigned to the rocky cape Element (Figures 3, 4 & 8). Variation on each side of the Palaeozoic graben is assigned to depositional variation, differences in strain, and possibly to differences in pressure/temperature conditions.

The TMI image, in conjunction with the geological map and the time-stratigraphic diagram, provided the key data for this interpretation. The gravity data provided confirmation of the key through-going structures.

MAJOR STRATIGRAPHIC DIVISIONS

NEO-PROTEROZOIC ROCKY CAPE ELEMENT

The redefined Rocky Cape element which, for the purposes of this review, includes the King Island, Tyennan and Adamsfield-Jubliee elements (Seymour & Claver 1995), consists of continental shelf-associated rocks from turbidite successions of mudstone, siltstone and minor carbonates to volcaniclastic-to-mafic volcanic rocks. It extends westward from the Devonport FS.

The metamorphic grade ranges upward through greenschist facies and into amphibolite facies.

The AMC is noted to be a distinct geological environment within the Rocky Cape Element. However, the TMI imagery has revealed that the AMC is far more extensive than indicated on the published geological map. Figure 10 & 11 present the data for North-West Tasmania. There appears to be a doubling of the width of the AMC to the north of the Savage River neck-point. Furthermore, similar zones to the AMC have been identified to the north-west within the Rocky Cape Element. These have been named the Smithton Zone and the Montagu Zone. The Smithton Zone is terminated to the south by the Savage River FS at Balfour. The Montagu Zone pinches-down to the south before it reaches the Savage River FS. The TMI imagery suggest an alignment of strata along the Savage River FS. King Island hosts the Mary Hall Zone. This zone has rotated counter-clockwise from the north-north-east orientation observed for the AMC to it northerly orientation.

Extending south form the Savage River FS and west of the AMC is a package of rocks with a distinctive magnetic signature. A similar magnetic signature is present sough of the King Island FS and east of the Dundas Element. These rocks are considered to represent a distinct sub-facies of the Rocky Cape Element. The rocks have a generally low magnetic signature, but have distinctive highly magnetic horizons. The nature of these magnetic horizons is not, as yet, full understood. Several are known to be magnetic pyrrhotite horizons. However others may occur in response to magnetite-rich horizons associated with mafic rocks and/or iron- formation.

MIDDLE-LATE CAMBRIAN DUNDAS ELEMENT

Superimposed on the Rocky Cape Element package are Middle-Late Cambrian sedimentary, volcano-sedimentary and volcanic rocks of the Dundas Element. These rocks are predominantly of felsic-to-intermediate origin. They sweep in an arc north-north-eastward from Macquarie Harbour to Burnie and then south-eastward through Launceston where the rock package diminishes into the Devonport FS and into the Launceston FS (Figure 3). These Dundas Element rocks are interpreted to have been deposited into a Middle Cambrian graben (Figures 3 & 8).

The metamorphic grade is low.

CAMBRO-DEVONIAN NORTH-EAST TASMANIA ELEMENT

To the east of the Devonport FS is the North-east Tasmania Element - intrusive rocks covered by a thin veil of Cambro-Devonian shelf sediments - and extension of those occurring in south-eastern Australia and associated with the Lachlan Fold Belt (Figure 3). The extent of the intrusive belt is clearly identified in the gravity imagery extending east from a meridional structural break (Figure 7).

Siluro-Devonian restricted basin sediments superimposed on rocks of the Dundas Element have been deformed into a series of *en-echelon* basins along with strata of the Dundas Element and strata of the Rocky Cape Element. Rocks in these basins include siltstone, shales, limestones and carbonates.

The metamorphic grade of these rocks is generally low.

LATE DEVONIAN-to-EARLY CARBONIFEROUS INTRUSIVES

Granitic rocks dominate this intrusive phase of the development of western Tasmania. Variations include allkali-feldspar granite through to adamellites and associated dykes.

These western intrusive are clearly delineated in the gravity imagery. Their limits are identified in Figure 7.

JURASSIC-to-TERTIARY VOLCANICS AND SEDIMENTS

The Jurassic is dominated by dolerite and related igneous rocks.

The Tertiary is dominated by basalt and related pyroclastic rocks. Subaerial volcano-sedimentary and sedimentary rocks are also present. Rocks of the Jurassic and Tertiary are restricted to the eastern two thirds of Tasmania (Figure 3).

The metamorphic grade is very low.

These rocks are associated with the separation of Australia and Antarctica.

MAJOR STRUCTURAL ELEMENTS

D_n ARCHAEAN FOCAL STRUCTURES

The following five north-west to south-east orientate linear zones form the principal crustal breaks or "focal structures" (FS) that dominate the structural setting of the State:

1. Macquarie Harbour FS,
2. Savage River FS,
3. King Island FS,
4. Devoport FS, and the
5. Launceston FS.

The deformational effect, or strain, that each focal structure has on the host rocks varies from seemingly nil to significant. The Macquarie Harbour FS offsets the AMC at least 50 strike kilometres to the south-east (Figure 3). This is based on the interpretation of the geological map that the AMC continues south of Strahan. The age of this particular structural offset associated with the Macquarie Harbour FS is interpreted to be post-AMC, but probably pre-Dundas Element. This anomaly occurs because the eastern margin of the Dundas Element, as defined by the Mt. Read Volcanics, is apparently unaffected by the Macquarie Harbour FS. Proterozoic dyke swarms between the AMC and the Smithton Zone appear to be truncated by the Savage River FS. The Smithton Zone is truncated by the Savage River FS (Figures 10 & 11). More importantly, the intersection of focal structures with tectono-stratigraphic units such as the AMC and the Smithton Zone form neck-points along these units.

The Tasmania Gold Mine (Beaconsfield) and other associated quartz-reef associated gold mineralisation, such as occurs in association with the Lefroy Gold Mine, occur within the Launceston FS. The quartz reefs lie along the Launceston FS in a series of *en-echelon* and steeply north-dipping latitudinal reefs. This geometry is indicative of a phase of brittle deformation associated with the late dextral shear along the Launcestion FS.

The focal structures are of primary crustal origin. They are subjacent to the mappable rock units. They may or may not impact on the geometry of these mappable rocks units. They do coincide with tectonically thinned zones such as is observed along the Smithton Zone at Roger River and along the AMC at Savage River.

No principle stress field σ_1 is noted for the focal structures. As they are the first recognisable strain they have been assigned to the first deformation D_n (Figure 5).

Each of the six world class ore bodies in Tasmania occurs in association with focal structures (Figure 6). The Savage River iron ore body occurs on the Savage River FS. Even the Tasmania gold ore body occurs in association with a focal structure - the Launceston FS.

D_{n+1} EARLY CAMBRIAN SHORTENING (OVERTHRUST and / or DETACHMENT) STRUCTURES

The presence of obducted ophiolites implies a thrust element D_{n+1}. This deformational phase was not recognised from the geophysical and geological data set. It was taken from the time space diagram.

Focal structures are likely to have been reactivated during this thrust event and will have been the site of strike-slip and/or transform displacement.

The principle stress field σ_1 is not established for this D_{n+1} deformational event.

D_{n+2} MIDDLE CAMBRIAN EXTENSION (HORST & GRABEN)

A major rift environment including aulacogen and triple-junction dominate the Middle and Late Cabrian structural setting of Tasmania. The volcanic and sedimentary rocks of the Dundas Element were deposited into these Middle Cambrian extensional basins. The geometry of the western rift which adjoins the AMC and the aulacogen penetrating south-eastward along the Devonport FS predicates a triple-junction just offshore from, and to the north-north-east of, Burnie (Figure 3).

The principle stress field σ_1 is orientated N-S for this D_{n+2} Middle Cambrian phase of deformation (Figure 5).

Another possible structural scenario is that the Devonport FS and the Launceston FS represent portions of a bifurcated subduction zone under which the western rift succession has been partially subducted. This represents a completed Wilson Cycle. In this alternative scenario the principle D_{n+2} stress field σ_1 will have rotated, possibly in a clockwise direction through a quadrant, during the rift, close and subduction phases of the completed Wilson Cycle.

D_{n+3} DEVONIAN SHORTENING (FOLDING) AND STRIKE-SLIP FAULTING

Folded strata of the AMC and the Smithton Zone have sub-vertical to steeply east-dipping axial surfaces. This is indicative of a north-west transport direction for the shorting. Differential movement has been taken up along the focal structures. At least 70 kilometres of strike-slip offset is observed along the Macquaire Harbour FS in the vicinity of Macquarie Harbour (Figure 6).

The Devonian deformatinal event identified by Seymour and Calver (1995) is the most likely to have accounted for the final geometry observed in the rock structure. It is here assigned to D_{n+2}. This D_{n+3} event could by superimposed on the Early Cambrian D_{n+1} event but the contribution to the final strain observed in the rocks is not quantified.

The Devonian D_{n+3} event is demonstrated to have a north-western transport direction and therefore a σ_1 orientated north-west.

An *en-echelon* array of Cambro-Devonian restricted marine sedimentary basins, each with open fold axes orientated north-west, partially overlies the western Dundas Element. These reflect dextral shear along the edges of the graben into which the Dundas Element volcanic and sedimentary rocks have been deposited. This dextral shear with a σ_1 orientated north-north-east, has probably been absorbed along pre-existing normal fault and listric normal fault structures associated with the Middle Cambrian D_{n+2} extension. Without any other recognised deformational event that could have produced the shear it is inferred that this north-north-east direction for σ_1 is the final direction for the Devonian D_{n+3} event which commenced with σ_1 being orientate north-westward.

D_{n+4} EARLY PERMIAN (?) EXTENSION (HORST & GRABEN)

The gravity data for Tasmania reveals a series of horst and graben blocks not previously recognised (Figure 7). This is indicative of widespread, albeit subtle, post-Devonian extension. Clearly this is not an extension of the same or even similar amplitude as that observed in the namesake area of western USA.

The most likely time frame for the horst-and-graben development is the Early Permian(?) which is understood to be associated with a phase of "warping" (Seymour & Calver 1995). Perhaps this "warping" is the result of a proto-rift phase during the separation of Australia from Antarctica?

The normal and/or inferred historic faults are associated with the horst/graben block edges and are clearly defined on the gravity imagery. These faults cut across the sediments of the Dundas Trough as well as across otherwise little-deformed Proterozoic rocks - for example, north of Roger River (Figure 7, Figure 8 & Figures, 9, 10, 11, 12 & 13).

The orientation of σ_1 is ambiguous. A best guess is for a meridional σ_1 (Figure 5).

D_{n+5} CRETACEOUS EXTENSION (BREAKUP OF AUSTRALIA AND ANTARCTICA)

The separation of Australia from Antarctica resulted in widespread latitudinal extension. The σ_1 orientation was meridional.

MINERALISING EVENTS

Six phases of mineralisation are recognised in Tasmania. Listed from the oldest to the youngest these are:

1. **Au-Fe-Cu**	NEO-PROTEROZOIC
2. **Ni**	EARLY CAMBRIAN
3. **Cu-Pb-Zn-Au**	LATE CAMBRIAN
4. **Au-Cu**	CAMBRO-DEVONIAN

5. **Sn, W+Pb, Zn, Ag, Bi**	LATE DEVONIAN - EARLY CARBONIFEROUS
6. **Au-Cu & Diamonds**	EARLY PERMIAN(?)

The Neo-Proterozoic and the Early Permian(?) are considered in this report as they are central to the exploration effort in Tasmania. The other significant mineralising events are discussed in detail by other authors. Refer to MRT publications.

Targets identified to date:

- Roger River - Proterozoic gold-copper lode and/or sulphide-gold pipe targets (Figures 10, 11, 12 & 13).
- Roger River - Proterozoic stratiform copper target (Figures 10, 11, 12 & 13).
- Remaining gravity anomalies between the Smithton Zone and the Montagu Zone (the probable site of massive sulphides) (Figures 12 & 13).
- The magnetic anomaly (identified by MRT) in carbonates between Balfour and the Rober River Target - a Late Devonian - Early Carboniferous Mt-Pb-Zn+Au skarn (Figures 10 & 11).
- The discrete magnetic anomalies associated with gold-in-iron formation south of Strathan - a Proterozoic iron formation hosted gold target, and
- Permian extensional fault-related diamond bearing pipes (Figures 7, 12 & 13).

Au-Cu-Fe NEO-PROTEROZOIC

Gold, copper and magnetite mineralisation occurs in Proterozoic rocks in north-western Tasmania.

The Corinna Goldfield

The Corinna alluvial goldfield is the site of one of Australia's first gold rushes. Recent work has revealed that primary gold was extracted form the area in addition to the alluvial gold. In fact, the alluvial gold taken from the area is demonstrably associated with the iron-rich rocks of the Bowry Formation - hence the interest in the Proterozoic iron-formation hosted gold analogy. Associated copper anomalism, particularly near the Pieman River suggests that some of the gold may be droved from copper-gold shoots in association with iron-rich parts of the Bowry Formation - hence the Sewlyn and the possible Tennant Creek association.

The Smithton Zone native copper

Similarities between the Proterozoic Keewanaw Peninsula Michigan copper-iron-gold belt and the Proterozoic of north-western Tasmania are striking. The occurrence of native copper in the basalt and associated interflow sediments has

been known since before the white settlement of North America. The native copper was fashioned into implements by the Indians and Keewanaw copper was traded as far as present day Russia.

The Keewanaw hosts a massive Proterozoic stratiform copper deposit. Nerby at Marquette are the soft and hard iron ores that were used by Henry Ford for his first automobiles.

Contact has been made with Michigan Technological University at Houghton in the Upper Peninsula of Michigan in order to further advance the understanding of the two regions. It turns out that the professional staff at this institution used Proterozoic of north-western Tasmania as an analogy for the Keewanaw as far back as the early 1970's.

The Savage River magnetite

This extensive Proterozoic magnetite deposit occurs within the Bowry Formation at a distinct pinch-down of the AMC. The Savage River FS cuts through this site. Gold is recorded from the site and from small occurrences in the immediate vicinity. The Specimen Creek reef produced high grade gold from quartz lodes and from haematite/carbonate veins immediately north of and along the strike from the Savage River magnetite deposit.

The targets thus far are as follows:

- There are three very distinct gravity anomalies flanking the King Island FS at the point where it intersects a distinct pinch-down of mafic volcanic rocks in the Smithton Zone (Figures 10 & 11). This is the Roger River target. The pinch-down itself is an ideal Proterozoic copper target as well as an ideal Proterozoic lode gold/iron formation hosted gold play. The three bull's eye gravity anomalies (Figures 10 & 11) are likely to be associated with massive sulphides.

- Several other bull's eye gravity anomalies occur in the area that extends west to the Montagu Zone. These are also likely massive sulphide bodies. The possibility is that these are also associated with gold and copper.

- A cluster of the gravity bull's eyes occurs immediately north of Balfour.

- Located in a Proterozoic carbonate sequence immediately west of the mafic rock succession between Balfour and the Roger River Target is a discrete magnetic anomaly. This has been interpreted by MRT to be a skarn, hopefully with associated massive copper and/or zinc and/or lead sulphides. The most likely candidate is a Late Devonian-to-Early Carboniferous Mt-Pb-Zn+Au skarn.

- Within the southern extension of the AMC to the south of Strahan is a continuation of the magnetite-bearing Bowry Formation. Gold attached to haematite has been recovered from the local stream. Recently acquired airborne magnetic data reveals several discrete magnetic anomalies as well as cross-cutting structures. This is a Proterozoic iron formation hosted gold target.

Au-Cu & Diamonds EARLY PERMIAN(?)

Two Early Permian(?) targets have emerged from the analysis of the data. The first is a diamond play related to the horst-and-graben development in north-west Tasmania (Figure 7). The second is related to an Early Permian(?) gold-copper porphyry exposed in the Axis Horst. This ground is held by Pacific-Nevada but is included for information.

The diamond opportunity in North-West Tasmania

Salient features:

- Alluvial diamonds have been found (Twelvertrees, 1917) but the source of these diamonds has been elusive.
- The north-west is covered by a platformal sequence of Proterozoic sediments portions of which are significantly deformed within belts such as the AMC, the Smithton Zone and the Montagu Zone (Figure 10).
- Early Permian(?) normal and historic faults (Figures 7 & 8) cut this sequence.

The edges of these formal faults are likely target horizons for kimberlite pipes. Careful analysis of the magnetics and perhaps even the gravity data, may reveal likely targets for exploration.

The Cygnet Goldfield, a possible gold-copper porphyry

This historic goldfield is located south of Hobart in the south-eastern part of the State (Figure 6). Production from the alluvial field is recorded at 100kg. The Cygnet Goldfield is bounded by the Savage River FS and the Macquarie FS (Figures 6 & 14). It is within the Axis Horst (Figure 7). Its location within these horst is the likely reason these porphyritic host rocks have been exposed through erosion. Mineralisation, including gold with minor copper, lead, zinc and arsenic, occurs within a Cretaceous syenite and in Permian rocks. These rocks are faulted and altered with alteration assemblages including quartz, carbonate, clay, limonite, jarosite and haematite. Gold grades within these altered rocks is generally low but values up to 24 g/t gold have been recorded.

The Cygnet Goldfield is a likely gold-copper porphyry exploration play.

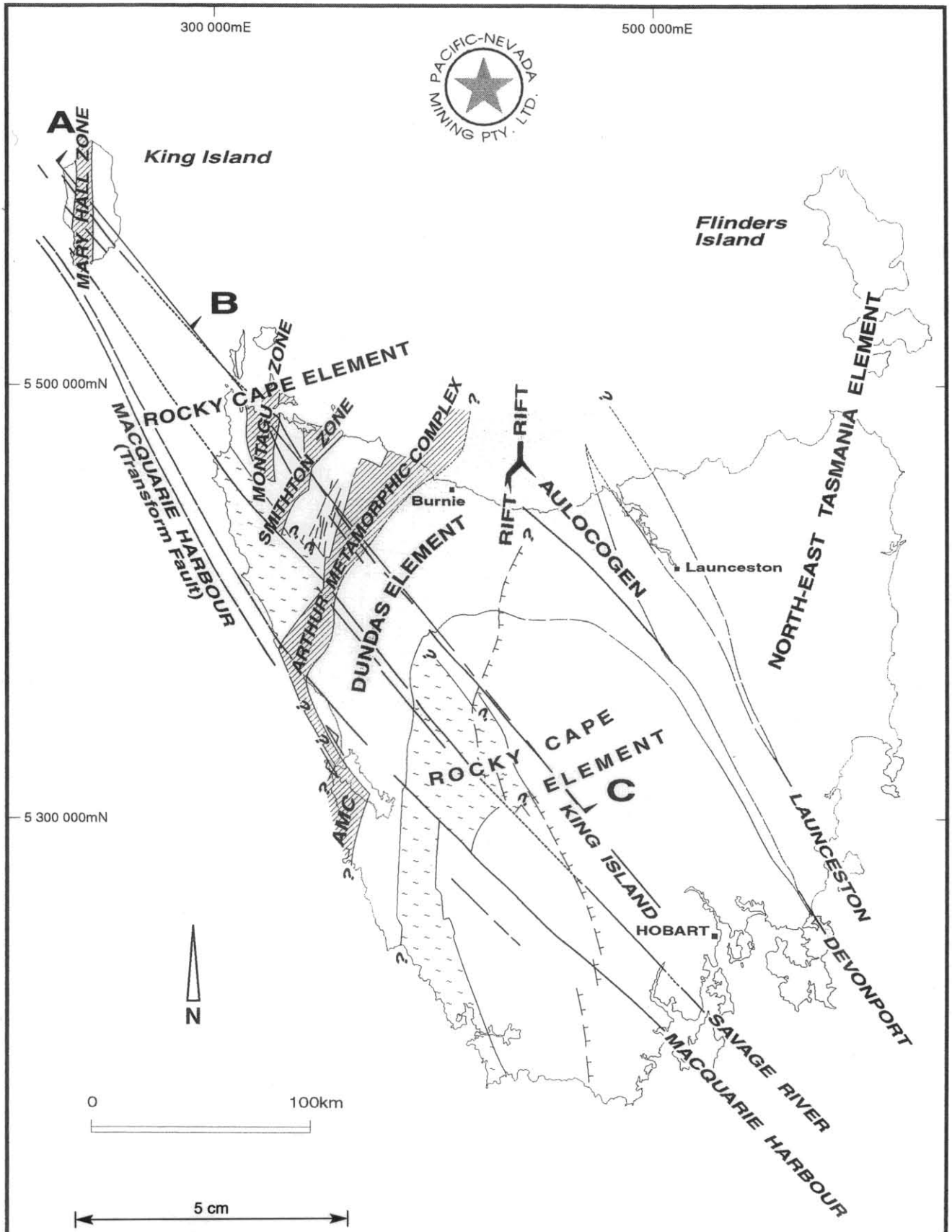
Table 1. Summary of north-western Tasmanian mines and their production.

MINE	MINED/ CURRENT RESERVE	INDICATED RESOURCE	COMMODITY	COMMENTS
Mount Lyell	113Mt @ 1.21% 7.0 g/t 0.4 g/t	10 Mt @ 1.95% 3.0 g/t 0.95 g/t	copper silver gold	**world class ore body** Remaining global resource 203 Mt @ 0.82% copper
Rosebery	18.4 Mt @ 14.8% 150 g/t 4.6 % 2.7 g/t	8 Mt @ 10.4% 109 g/t 3.5% 2.8 g/t	zinc silver lead gold	**world class ore body**
Hellyer	8.4 Mt @ 13% 165 g/t 6.9%	12% 140 g/t 5.9%	zinc silver lead	**world class ore body**
Hercules	3.1 Mt @ 17.6 % 3.2 176 g/t 5.6% 2.9 g/t	2.71% 127 g/t 2.9% 2.3 g/t	zinc silver lead gold	
Renison	14.7 Mt @ 1.22%	12 Mt @ 1.52%	tin	**world class ore body**
Mt Bischoff	10.3 Mt @ 1.13%	4.73 Mt @ 0.62%	tin	**world class ore body**
King Island			tungsten	**world class ore body**
Tasmania Mine (Beaconsfield)	930,000 t @ 23 g/t	230,000 t @ 6.4 g/t	gold	1 Mt of 30 g/t gold has been mined Equivalent global resource is also 1 Mt @ 30 g/t
Henty	506,000 t @ 27 g/t	23,000 t @ 35.4 g/t	gold	
Savage River		440 Mt @ 45%	magnetite	open-cut ore body

United States Geological Survey definition of a world class ore body "[an] economic deposit containing the top 10% by mass of a given metal".

Two interesting minerals industries statistics for Tasmania are that:

- the gross value of the output in 1994-1995 was in excess of $1 Billion; and that is
- accounted for 43% of exports.



TASMANIA

MAJOR STRUCTURAL & STRATIGRAPHIC ELEMENTS INTERPRETED FROM MAGNETICS, GRAVITY & AVAILABLE GEOLOGY

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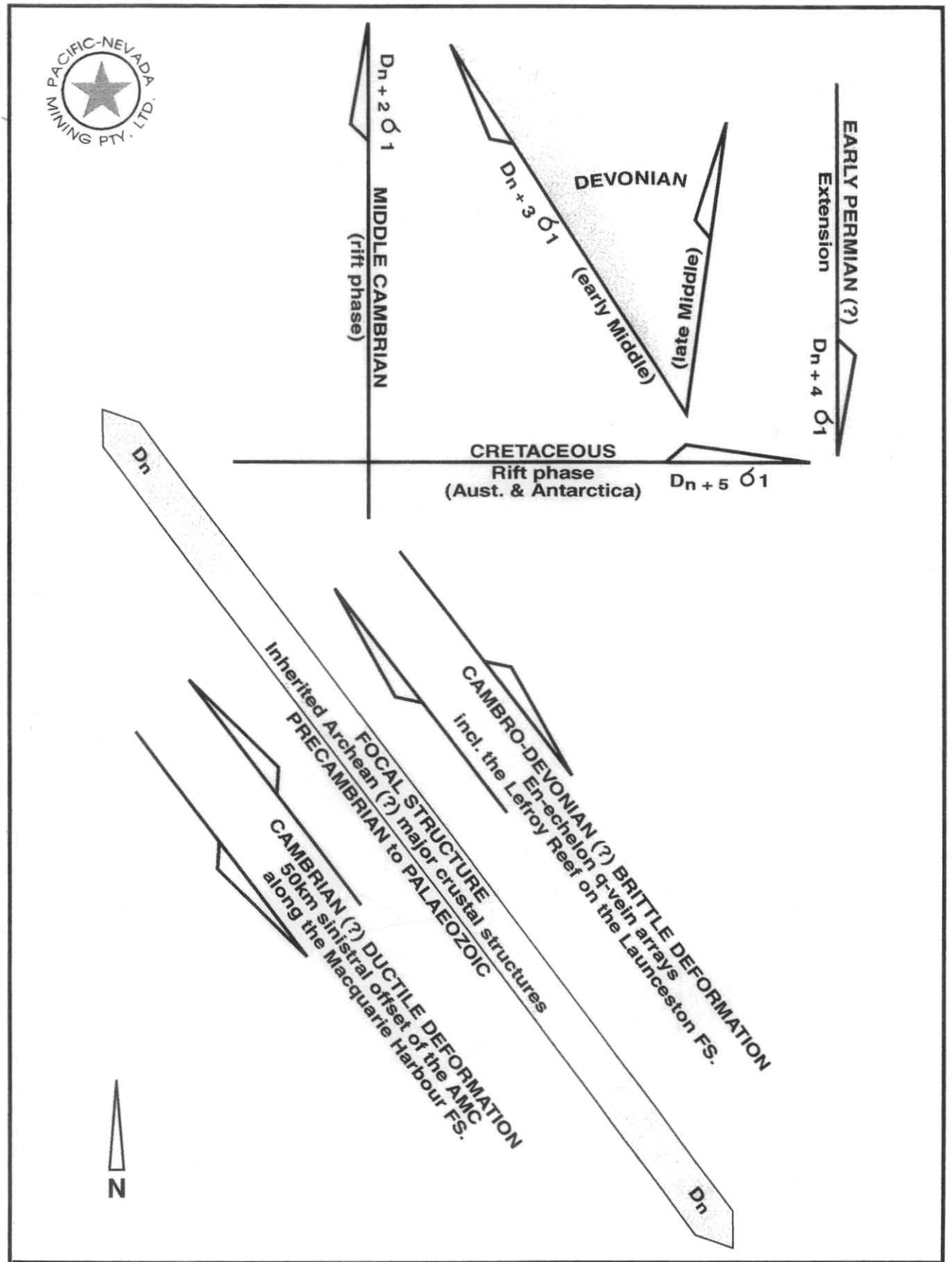
Figure 3

PACIFIC-NEVADA MINING PTY. LTD.

TERTIARY		Volcanic rocks and subaerial sediments (E of line)
CRETACEOUS		D_{n+5} N-S extension
EARLY PERMIAN (?)	Au, Cu, dia	D_{n+4} E-W extension ? Rebound horst & graben development ?
LATE DEVONIAN EARLY CARBON-IFEROUS	Sn, W, B, Pb, Ag, Zn	Granite intrusions
DEVONIAN		D_{n+3} NW structural shortening to NNE strike-slip development
CAMBRO-DEVONIAN	Au, Cu	Lachlan Fold Belt
LATE CAMBRIAN	Cu, Pb, Zn, Au	Dundas Element
MIDDLE CAMBRIAN		D_{n+2} E - W extension — dykes
EARLY CAMBRIAN	Ni	D_{n+1} ophiolite enplacement (overthrust - orientation not known)
NEO-PROTEROZOIC	Au, Fe, Cu	Little deformed Folded Tightly folded and overthrust — Rocky Cape Group (shelf sediments)
ARCHAEAN		D_n Focal structures - major crustal breaks

LEGEND

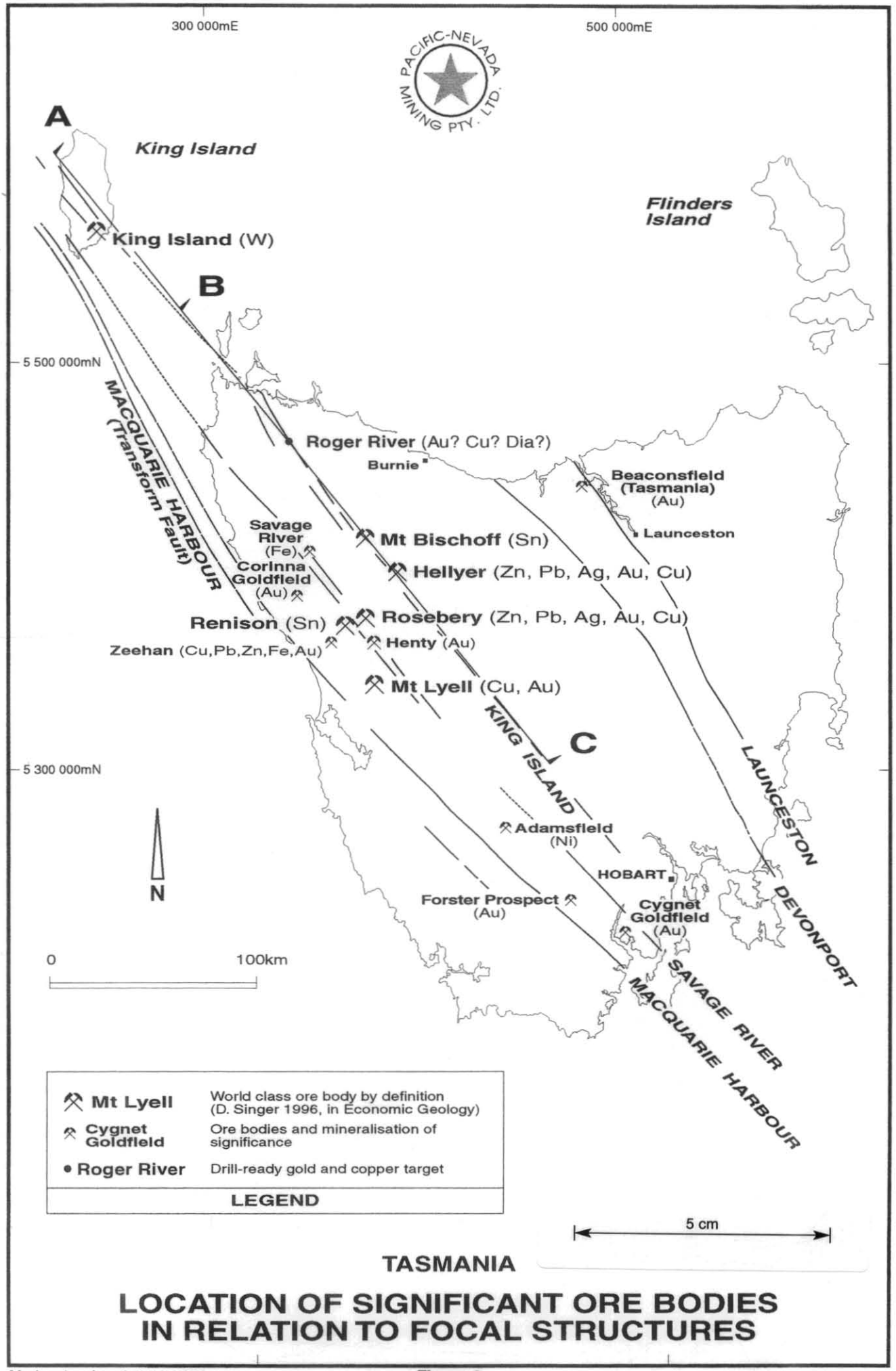
Figure 4



MAJOR STRESS FIELDS - NEOPROTEROZOIC to CRETACEOUS

σ 1 for the EARLY CAMBRIAN overthrust (detachment) not indicated

Figure 5



TASMANIA

LOCATION OF SIGNIFICANT ORE BODIES IN RELATION TO FOCAL STRUCTURES

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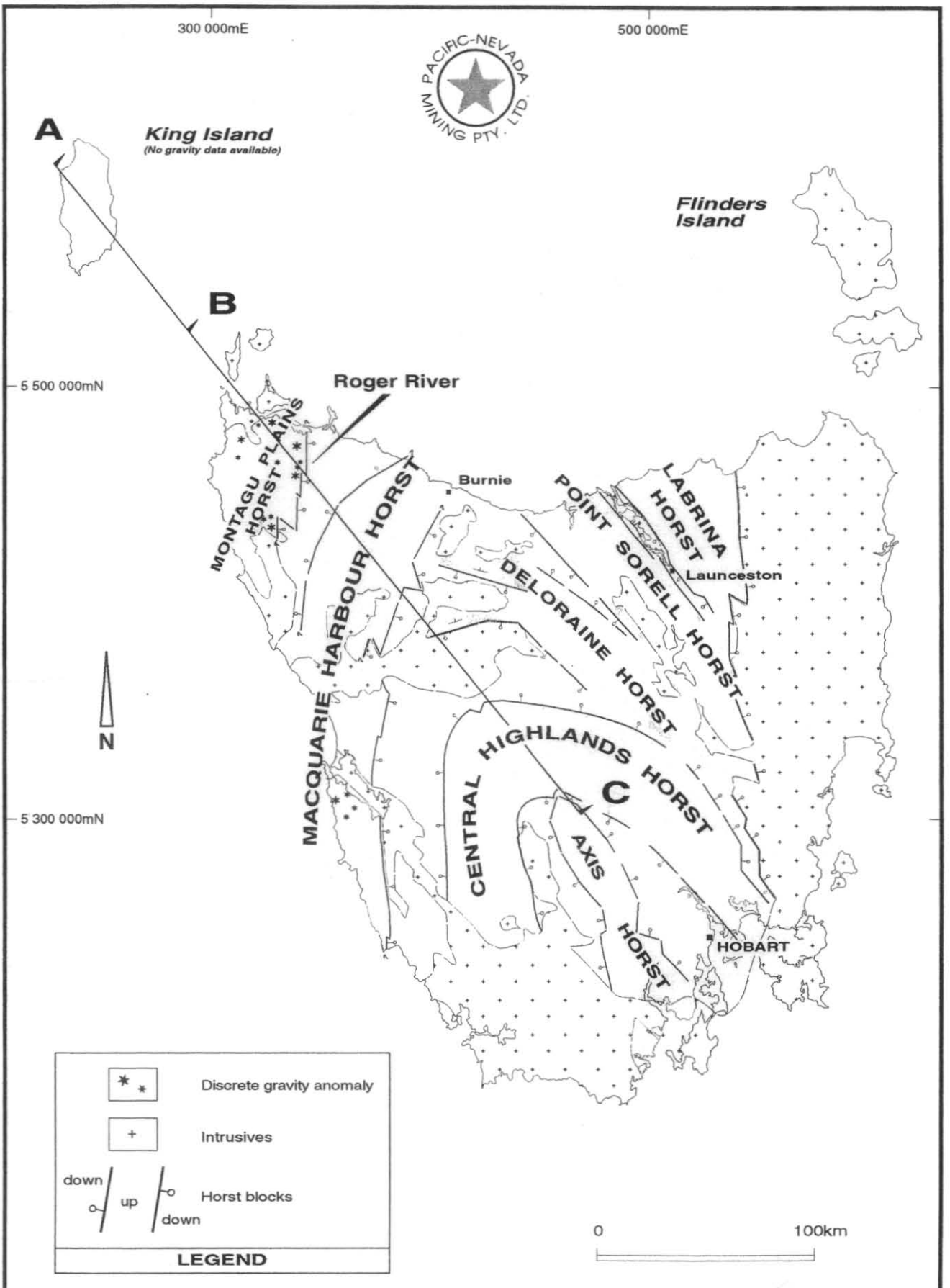
Figure 6



EARLY PERMIAN (?) CRUSTAL GEOMETRY
(MAJOR CONCEALED INTRUSIONS ALSO INDICATED)

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Figure 7

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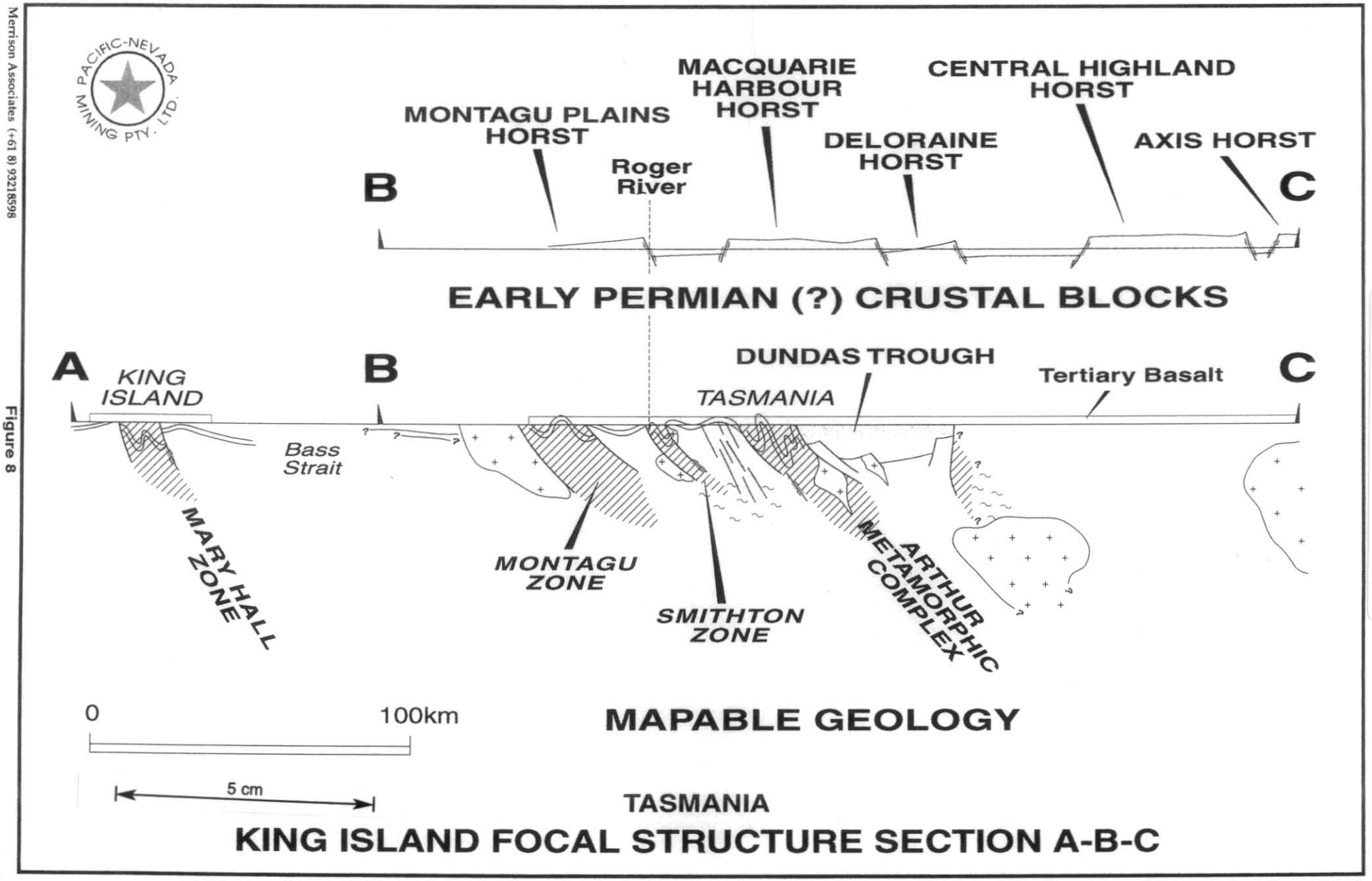

Figure 8

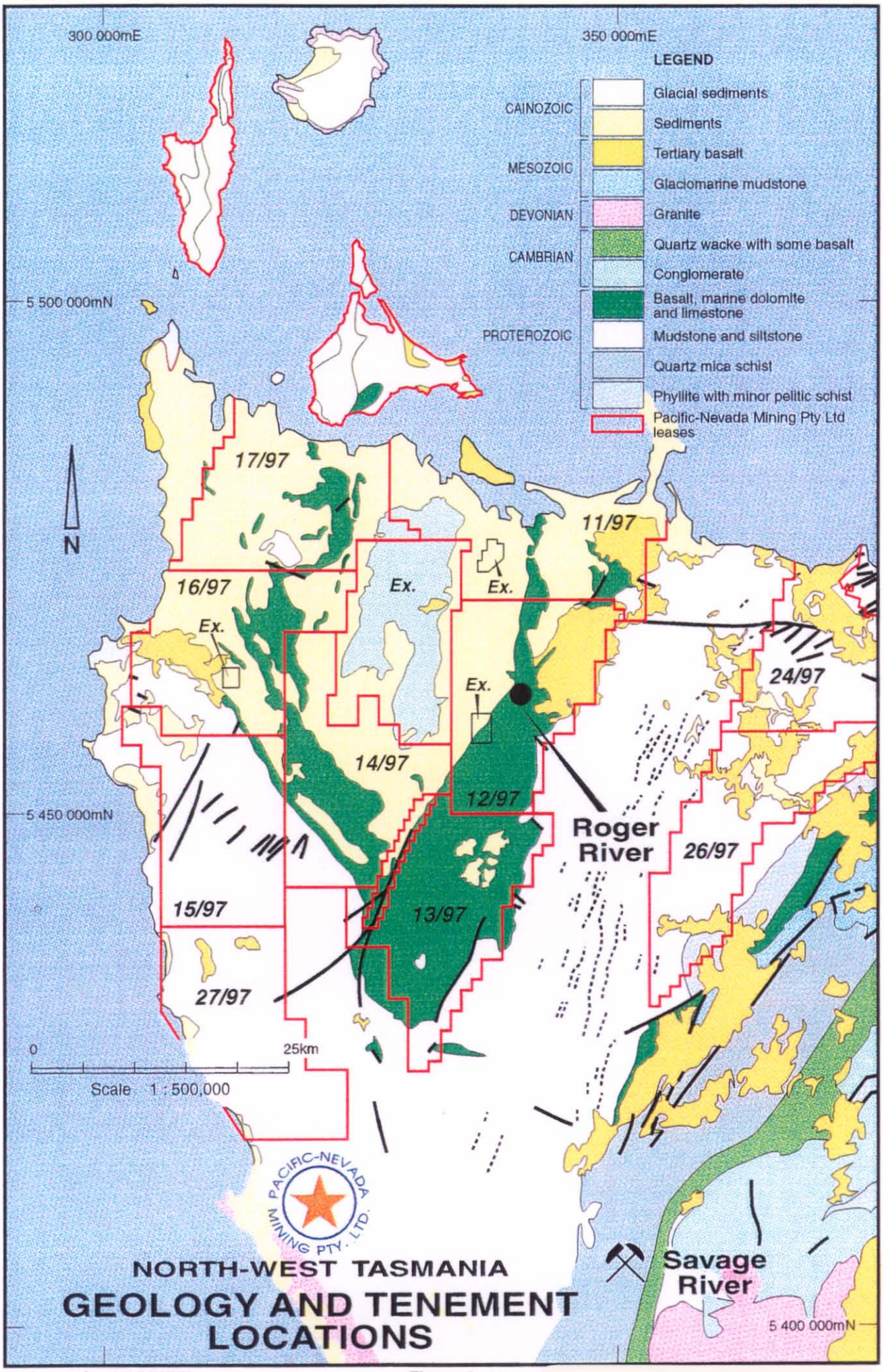

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Figure 9

5 cm

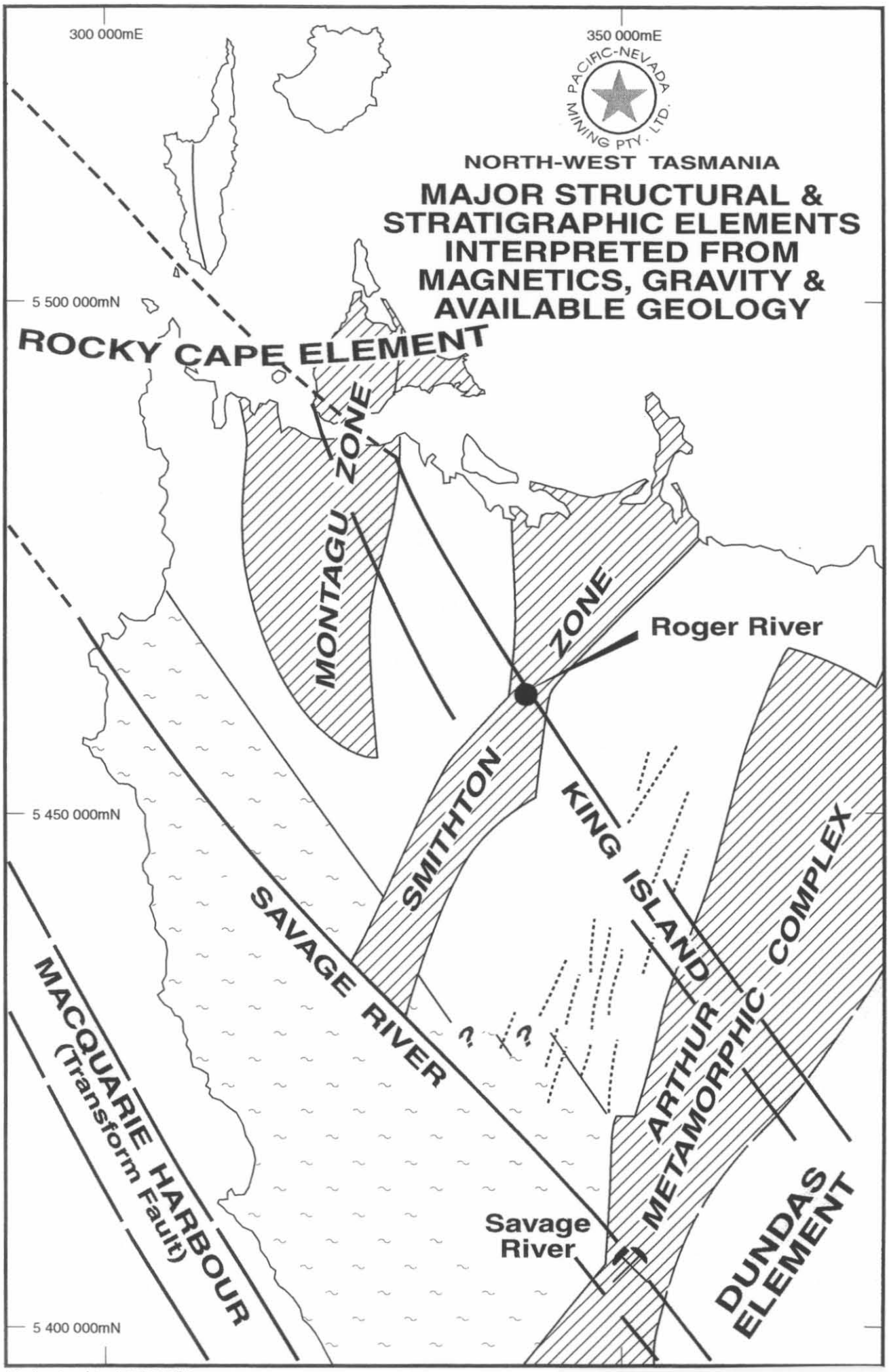

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Figure 10

5 cm

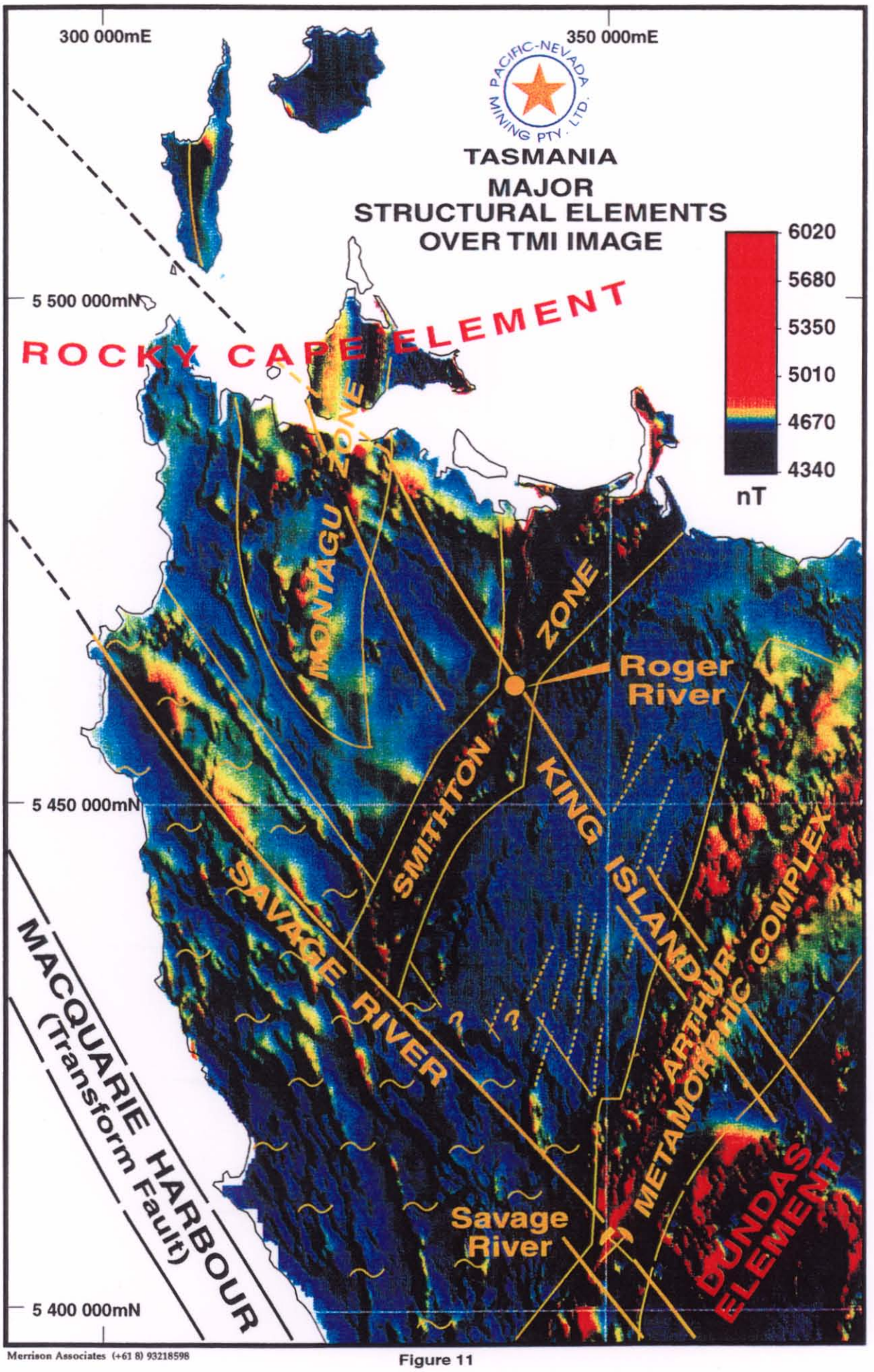

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Figure 11

5 cm

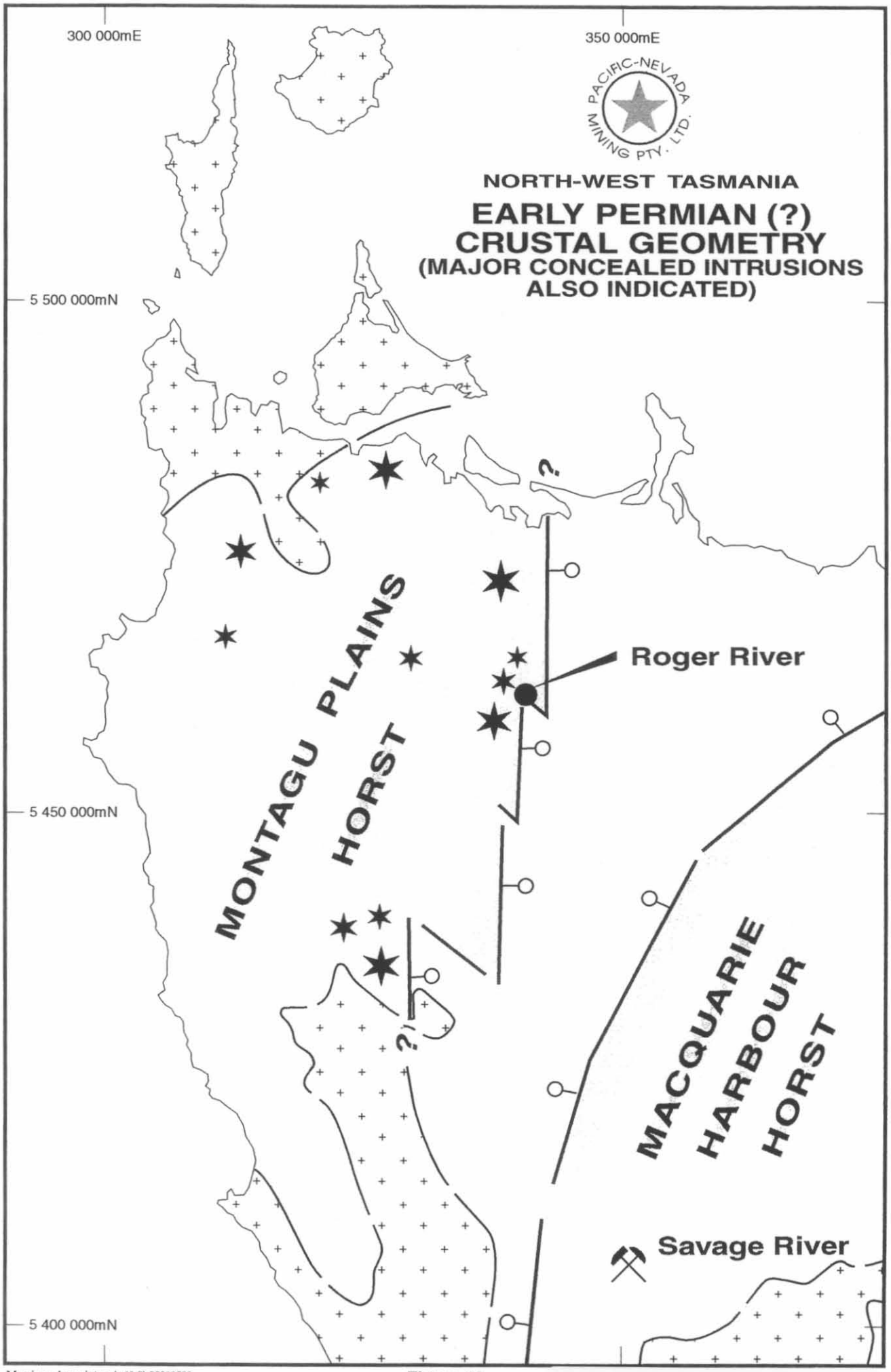

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Figure 12

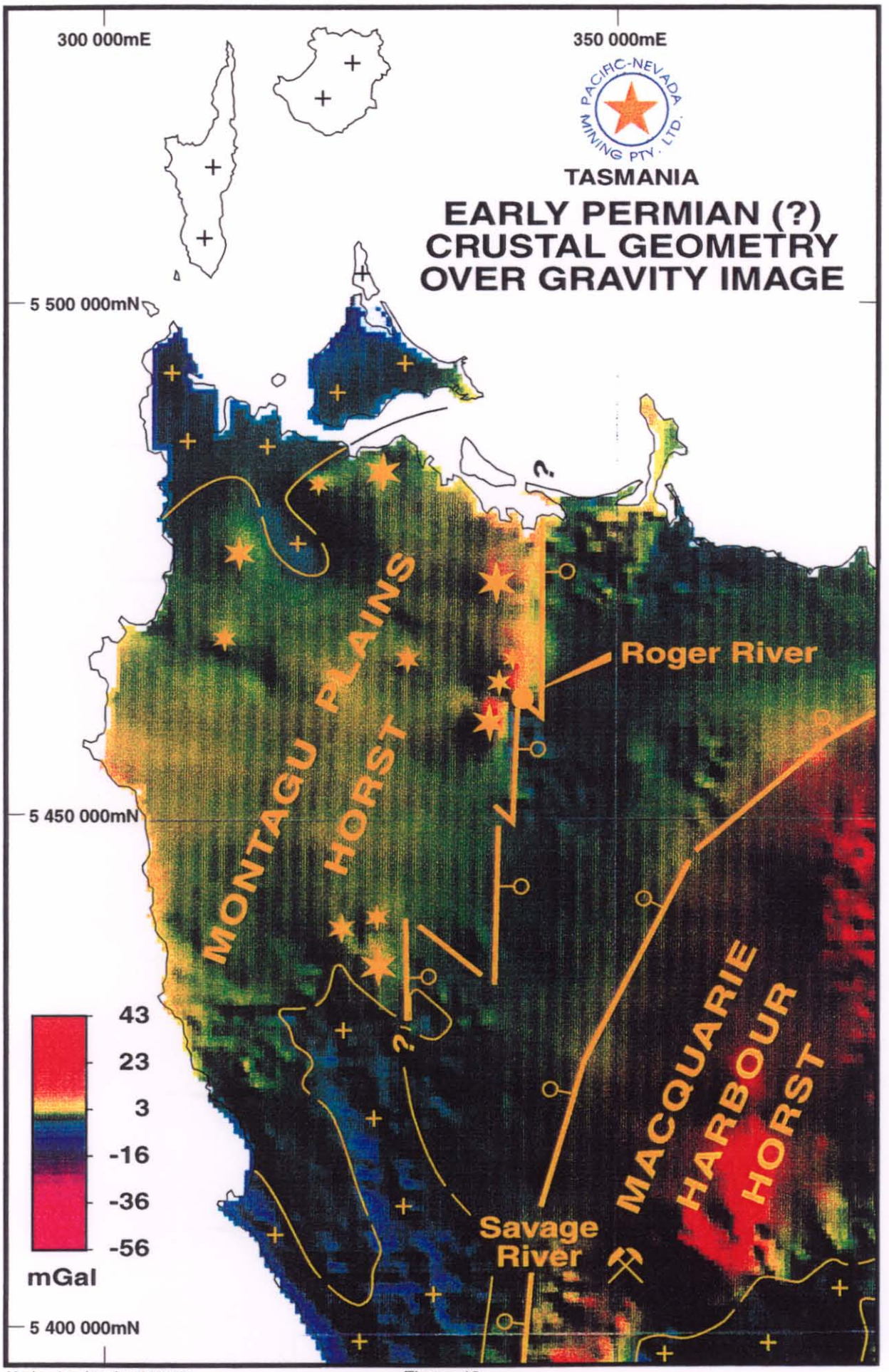

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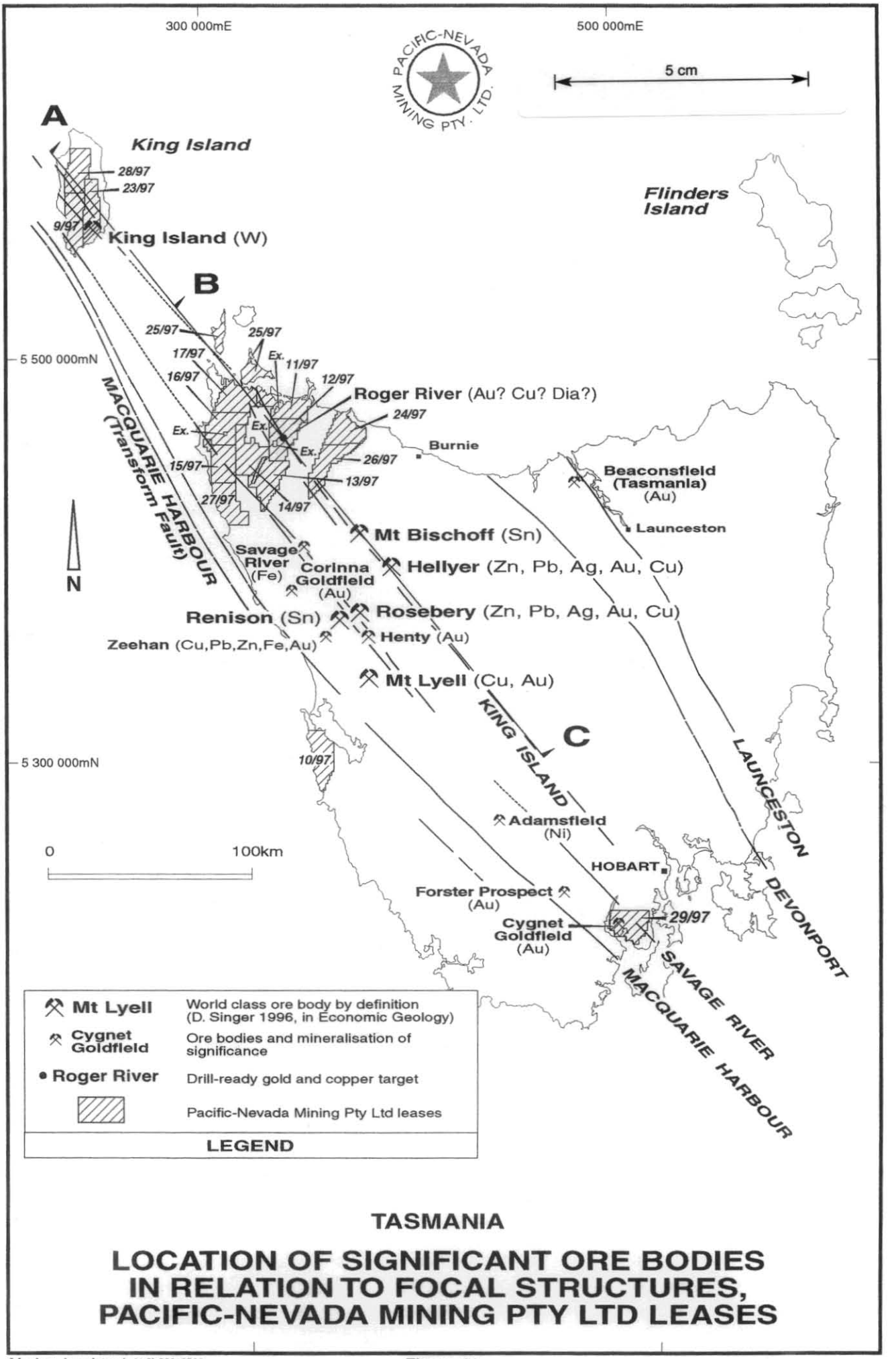
Figure 13

5 cm



TASMANIA

LOCATION OF SIGNIFICANT ORE BODIES IN RELATION TO FOCAL STRUCTURES, PACIFIC-NEVADA MINING PTY LTD LEASES

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Figure 14

4. Native Title

Native Title is not considered to be a significant impediment to exploration and mining in the state of Tasmania. As of mid July 1997, only three Native Title claims had been lodged in the State. The first over south-eastern Tasmania was immediately rejected by the Native Title Tribunal. The other two are associated with south-western coastline and some Bass Strait islands. No claims have been made in areas considered prospective to exploration.

5. Land Classification and Tenure

Land classification in Tasmania, as specified by State and Federal Acts of Parliament, clearly defines the scope for, and limits to, land access and utilisation by the explorer and miner.

There are six major Acts of Parliament under which Crown Land may be reserved:

- Native parks and Wildlife Act 1970,
- Aboriginal Relics Act 1975,
- Crown Lands Act 1976.
- Forestry Act 1920,
- Public Land (Administration and Forests) Act 1991 and
- Mining Act 1929 (including the Mining - Strategic Prospectively Zones - Act 1992).

Additional categories of land not covered by these Acts include private property and Commonwealth lands. Exploration and mining licences can be taken out over the former, but not on the latter.

These Acts have enable exploration and mining to proceed with a security of tenure equal to that of any other state in Australia. The 1992 Strategic Prospectively Zones (SPZ) amendment to the Mining Act (1929) provides the explorer with an additional guarantee of tenure beyond that seen in other States.

The Regional Forestry Agreement (RFA) between the Federal Government and the State Government of Tasmania will impact on the Forestry Act (1920). In a December 17, 1996 Joint Press Release by the Minister for the Environment (Senator Robert Hill) and by the Minister for Resources and Energy (Senator Warwick Parer) titled "Regional Forests Agreements and Mining" the Federal Government undertook the following;

> *...to ensure the conservation and protection of dedicated forest reserves while allowing, subject to stringent environmental requirements, exploration and mining in forest areas of lesser conservation value.*

The release went on to recognise, "...the contribution of the minerals industry to the national economy and the importance to the industry of ongoing access for mineral exploration."

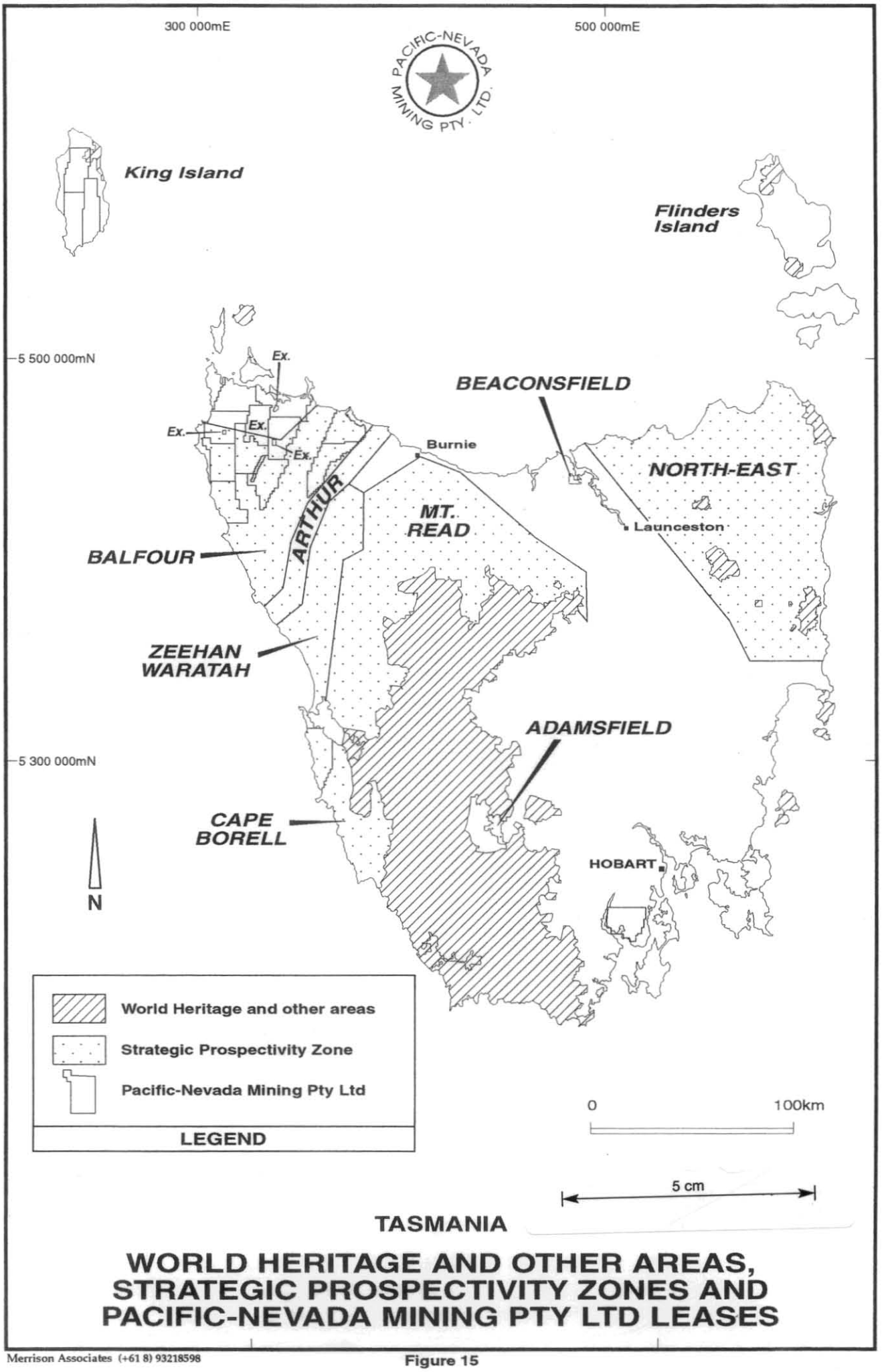
The Regional Forests Agreement (RFA) was to have been in place by June 30, 1997. It was eventually signed in November 1997. None of the areas held by Pacific-Nevada have been adversely affected by the RFA.

Approximately three-quarters of Tasmania is available to exploration and mining (Figure 13). The southern half of the lease block in the north-west of the State is within the Balfour SPZ. The single lease to the south of Strahan is located with the Cape Borell SPZ.

6. Environmental Considerations

Exploration and mining is subjected to strict environmental controls in Tasmania. This is no different to other parts of Australia and it is now an expected cost in this business.

There are a number of operating mines in Tasmania. Some, such as the Mt. Lyell Mine, are operating despite historic environmental problems that are being managed in conjunction with the State Government. Other current and viable operations such as the Henty Mine, are relatively new and have successfully operated since inception under very strict environmental guidelines. The Henty Mine is within a few hundred meters of a World Heritage Area.



WORLD HERITAGE AND OTHER AREAS, STRATEGIC PROSPECTIVITY ZONES AND PACIFIC-NEVADA MINING PTY LTD LEASES

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Figure 15

7. Schedule of Tenements

Tenements were acquired in April 1997 by Morritt Holdings Pty Ltd and in June 1997 by Pacific-Nevada Mining Pty Ltd. All Morritt Holding leases have been subsequently vended into Pacific-Nevada. The area selection was based entirely on the available data. Final area selection was made using the airborne magnetic data acquired by the State Government as part of the data acquisition to support the Regional Forest Agreement (RFA) process.

Table 2. Lease Application Status Chart

Application # & Name	Beneficial Interest	Area (km)	Renewal Date	Expenditure Commitment Year 1	Expenditure Commitment Year 2
ELA9/97 Currie	**Pacific-Nevada Mining P/L 100%**	241	5 years from grant date	$60 250	$120 500
ELA10/97 Cape Sorell	**Pacific-Nevada Mining P/L 100%**	250	5 years from grant date	$62 500	$125 000
ELA11/97 Smithton	**Pacific-Nevada Mining P/L 100%**	243	5 years from grant date	$60 750	$121 500
ELA12/97 Edith Creek	**Pacific-Nevada Mining P/L 100%**	247	5 years from grant date	$61 750	$123 500
ELA13/97 Sumac Rivulet	**Pacific-Nevada Mining P/L 100%**	246	5 years from grant date	$61 500	$123 000
ELA14/97 Lovell's Creek	**Pacific-Nevada Mining P/L 100%**	246	5 years from grant date	$61 500	$123 000
ELA15/97 Arthur River	**Pacific-Nevada Mining P/L 100%**	248	5 years from grant date	$62 000	$124 000
ELA16/97 Marrawah	**Pacific-Nevada Mining P/L 100%**	248	5 years from grant date	$62 000	$124 000
ELA17/97 Montagu	**Pacific-Nevada Mining P/L 100%**	247	5 years from grant date	$61 750	$123 500
EL23/97 Pegarah	**Pacific-Nevada Mining P/L 100%**	229	5 years from grant date	$57 000	$114 000
EL24/97 Detention River	**Pacific-Nevada Mining P/L 100%**	218	5 years from grant date	$53 750	$107 500
EL 25/97 Robbins Island	**Pacific-Nevada Mining P/L 100%**	176	5 years from grant date	$58 750	$117 500
EL26/97 Neasey Creek	**Pacific-Nevada Mining P/L 100%**	249	5 years from grant date	$61 250	$122 500
EL27/97 Temma	**Pacific-Nevada Mining P/L 100%**	247	5 years from grant date	$61 250	$122 500
EL28/97 Reekara	**Pacific-Nevada Mining P/L 100%**	198	5 years from grant date	$58 750	$117 500
EL29/97 Cygnet	**Pacific-Nevada Mining P/L 100%**	245	5 years from grant date	$61 250	$122 500
		3 778		**$966 000**	**$1 932 000**

Note: Fifteen of the sixteen leases were submitted to the Minister for approval during the week commencing November 16, 1997. Only the Cygnet lease is pending submission to the Minister.

8. Conclusions

The following conclusions can be drawn:

1. The cluster of world class ore bodies in north-western Tasmania identifies the rocks of this region as having a particular propensity for mineralisation. The Savage River magnetite deposit and the now-recognised association of iron-associated gold mineralisation in the historic Corinna Goldfield provide a clue to the exploration potential in the Proterozoic rocks of this area. The worldwide occurrence of profitable gold and gold/copper ore bodies as well as copper ore bodies within rocks of the Proterozoic provides significant additional encouragement to explore in this area.

2. There is an obvious spatial relationship between focal structures and recognised world-class ore bodies. This recognition has come from interpretation of the available magnetic and gravity data sets.

3. Excellent geological information has been compiled by Mineral Resources Tasmania (MRT). It is sufficient to enable the explorer to determine the potential of the Proterozoic rocks to host gold, gold-copper and copper ore bodies.

4. Morritt has made the critical paradigm-shift from the historical exploration focus on the Palaeozoic Dundas Element rocks (the Mt Reed Volcanics) to a new exploration focus on the Proterozoic Rocky Cape Element rocks of north-west Tasmania. It is these paradigm-shift that has enabled the significance of the exploration potential in the Proterozoic rocks to be unlocked.

5. There is an opportunity to find at least one additional world-class ore body in the north-west of Tasmania. Considering the rocks being targeted, this opportunity will first and foremost be for a gold ore body, but the chance of drilling into a gold-copper ore body or a copper ore body is also excellent. There is an as-yet untapped opportunity for detecting diamond bearing pipes.

6. Gold and copper exploration targets to all intents and purposes are ready to drill. The excellent quality of the MRT magnetics and gravity data along with the available geology has resulted in a number of exploration targets. The gravity bull's eye anomalies flanking important lithological breaks in the vicinity of litho-structural pinch-downs and intersecting focal structures provide the geologically sound basis to begin the drill-testing of these targets.

7. Diamond exploration targets will be identified along the Early Permian(?) extensional structures that are identified on the gravity data set. Pipes with a positive magnetic signature will be rapidly identified with the use of high resolution magnetics. Those without a positive magnetic signature may be recognised by a negative magnetic bull's-eye within rocks with a generally positive magnetic background signature. Otherwise, conventional heavy concentrate sampling techniques can be deployed utilising creeks draining from the target structures.

8. The Tasmanian Government through MRT is very supportive of the explorer. From making suitable data available to the passing of the Special Prospectivity Zone (SPZ) Act of 1992 and to the general can-do attitude of the MRT this support is evident.

9. The infrastructure is in place. It includes a nearby, readily available and trained work force, hydro-electric power, port facilities and roads etc. It is however acknowledged that the initial development may be difficulty due to the rugged terrain and sometimes severe climatic conditions.

10. Native Title has, to this point in time, not been an impediment to exploration and mining in Tasmania.

11. The discovery and development of a new ore body will provide an economic boost to Tasmania. Considering the current economic climate of this State it is likely that a development of this nature will be viewed favourably and will receive the kind of support that is offered at the exploration level.

The ground held by Pacific-Nevada Mining Pty Ltd in north-western Tasmania is an outstanding exploration opportunity.

The presence of targets that will need little additional exploration effort before being drilled enhances this opportunity. It is not unreasonable to anticipate that at lease one of these already-identified targets will produce a gold and/or copper ore body of substantial size. The regional coincidence of alluvial diamonds and the Early Permian(?) extensional structures provides a focus for diamond exploration. Beyond the obvious gravity anomaly-associated targets this area remains one of the best exploration opportunities in Australia for gold, base metals and diamonds.

References

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Staff 1997: Mineral exploration opportunities in Tasmania - A summary of opportunities for mineral exploration and mineral resource development in Tasmania, June 1997. Mineral Resources Tasmania, 72p.

WH Twelvertrees 1917: Diamonds in Tasmania. In the "Tasmania Mines Department Circular #4, p3-15.

Appendices

Extracts from two reports documenting alluvial diamonds in the vicinity of the leases held by Pacific-Nevada Mining Pty Ltd. The documents have been retyped for clarity - the originals were difficult to read as photocopies.

APPENDIX 1

836044

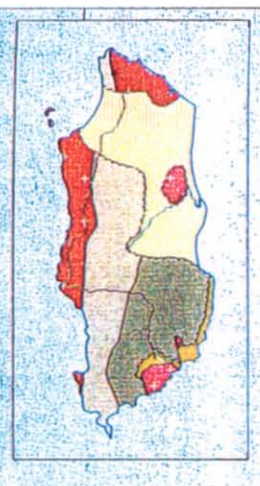
MAP S&E 5.1A

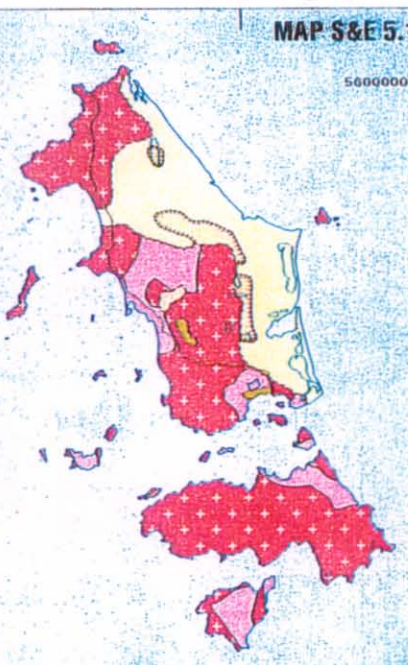
5 cm

TASMANIA

Comprehensive Regional Assessment

GENERALISED GEOLOGY OF TASMANIA
(STRATOTECTONIC ELEMENTS MAP)





400000mE
500000mE
600000mE
300000mE
6500000mN
6400000mN
6300000mN
6200000mN
5600000mN
5500000mN
5400000mN
5300000mN
5200000mN

SMITHTON
BURNIE
DEVONPORT
SCOTTSDALE
LAUNCESTON
STRAHAN
SWANSEA
HOBART
GEEVESTON

N

0 20 40 60
Distance in Kilometres

RFA

NOV 1996

MAP S & E 5.1B

TASMANIA
Comprehensive Regional Assessment

GENERALISED GEOLOGY OF TASMANIA

(STRATOTECTONIC ELEMENTS MAP)

Compiled by: D. B. Seymour and C. R. Calver 1995

QUATERNARY — Unconsolidated clastic sediments

Erosional surface

TERTIARY — Consolidated and unconsolidated sediments (Ts); basaltic volcanics (Tb)

Erosional surface

LATE CARBONIFEROUS - TRIASSIC — Shallow marine to non-marine, dominantly clastic sedimentary sequences (Parmeener Supergroup).

Erosional surface.

LATE MIDDLE DEVONIAN — Terrestrial cavern-filling deposits (Eugenana Beds)

Angular unconformity.

EARLY MIDDLE DEVONIAN

LATE CAMBRIAN - EARLY DEVONIAN — Non-marine to marine, clastic and carbonate, dominantly shelf sequences (Wurawina Supergroup and correlates) (Dw (; Late Cambrian turbidite sequences (upper Dundas Group and correlates) (Jud).

Angular unconformity in some areas, apparent conformity in others.

MIDDLE - LATE CAMBRIAN — Conglomeratic turbidite sequences, including lower Dundas Group and correlates (Jd), dominantly felsic intermediate volcanic and associated volcano-sedimentary sequences, including Mt Read Volcanics (Jv).

Erosional surface of Jd on Jum; angular unconformity of Jv on Jm.

EARLY - MIDDLE CAMBRIAN — Mafic-ultramafic complexes (Jum), dominantly clastic sedimentary rocks (Ja); mafic volcanics (Jb). Structurally emplaced, probably allochthonous.

NEOPROTEROZOIC — Clastic and carbonate shelf, and volcaniclastic rift-related sequences (Js), mafic volcanics (Jb). (Includes Success Creek Group and Crimson Creek Formation and correlates).

Angular unconformity of Js on Jo and Jm.

Quartzarenite turbidite sequences (Donah and Burnie Formations and correlates).

MESOPROTEROZOIC -?NEOPROTEROZOIC — Metamorphosed, mafic, pelitic and quartzitic sequences and amphibolite (Arthur Metamorphic Complex, - metamorphic equivalents of Ju + Jo +/- Js +/- Jb).

MESOPROTEROZOIC — Relatively unmetamorphosed, dominantly sandstone/mudstone sequences (Ju); metamorphosed, dominantly pelitic and quartzitic sequences and amphibolite (Jm).

Felsic pyroclastic rocks (St Marys Porphyrite)

Angular unconformity

Marine quartzwacke turbidite sequences (Mathinna Group) (MF Tasmania Element)

UNDIFFERENTIATED UNITS

Js +/- Jd

Undetermined basalts and mafic volcanic lavas, sequences of either rift or allochthonous association (Js +/- Jb +/- Ja +/- Jb)

IGNEOUS INTRUSIVE ROCKS

CRETACEOUS — Syenite

JURASSIC — Dolerite

LATE CARBONIFEROUS - DEVONIAN — Dolerite dykes

Granitoids

MIDDLE CAMBRIAN — Granitoids

NEO-PROTEROZOIC — Dolerite dykes

Granitoids

Undefined boundary

Conformable boundary

Angular unconformity

Disconformity or erosional surface

Transitional boundary

Intrusive boundary

Fault, nature unspecified

Normal fault, downthrown side indic

Wrench fault, relative movement ind

Thrust fault, teeth on upper plate.

Trend of lithological layering.

AXIAL TRACES OF MAJOR FOLDS

Anticline, age unspecified

Syncline, age unspecified

Overturned syncline, age unspecific

Overturned anticline, age unspecifi

Dip direction of axial surface indi

Devonian fold, generation unspecifi

Western Tasmania Devonian fold - ea

Western Tasmania Devonian fold - la

Mega-kink boundary - position appro

Mega-kink boundary - inferred.

GEOPHYSICAL LINEARS

Major magnetic lineament or gradien lower values indicated where applic

Major gravity lineament or gradient lower values indicated where applic

Devonian granitoid intrusives - 2km derived from geophysical interpreta

Deep drillhole, basement lithology

The geological data for this map were compiled from Tasmanian Geological Survey Geological Atlas 1:250,000 digital series maps and other sources.

Digital base information from Land Information Bureau, Department of Environment and Land Management.

Map produced August 1995 by Data Management Group using G.I.S. software.

Source data correct as at August 1995

Maps&E5.2

TASMANIA

Comprehensive Regional Assessment

Mineral Occurrences and Deposits

KING ISLAND

FLINDERS ISLAND

- Gold and silver
- Iron and associated commodities
- Base metals
- Tin and tungsten
- REE/U/Zr
- Coal and associated commodities
- Construction materials
- Other commodities
- Deposits with current resources
- Element boundary (for legend see map S&E 5.4)

SMITHTON · BURNIE · DEVONPORT · SCOTTSDALE · LAUNCESTON · STRAHAN · SWANSEA · HOBART · GEEVESTON

Great Lake · Lake Gordon · Lake Pedder

DEPOSITS WITH CURRENT RESOURCES (MINRES)*

ID	NAME	COMMODITIES
1	HELLYER	SB SN AG AU BI CD CU PB
2	HENTY	AG AU
3	MATHINNA	AU
4	MOUNT LYELL	AU AG CU
5	ROSEBERY	AG AU BI CD CU PB SB ZN
7	HAREFIELD	CB
8	FINGAL	CB
9	DALMAYNE	CB
10	DOUGLAS RIVER	CB
11	LANGLOH	CB
12	WOODBURY	CB
13	ROSEVALE	CWB
14	MERRYWOOD	CB
15	MT NICHOLAS	CB
16	TONGANAH	CK
17	RINGAROOMA BAY	SN
18	RENISON	SN
19	KING ISLAND	WO3
20	MOUNT PELION	WO3
21	OAKLEIGH CREEK	WO3
22	BARNES HILL	CR
23	STRAHAN	CR
24	WILSON RIVER	CR
25	KARA	FE WO3
26	BIRTHDAY BAY	FE
27	SAVAGE RIVER	FE
28	NODDY CREEK	ASB
29	ARGENT TUNNEL	ASB
30	ANDERSON CREEK	ASB
31	DIAL RANGE	MN
32	BEACONSFIELD	AU
33	BLYTHE RIVER	FE
34	COMSTOCK	FE
35	HAMPSHIRE	FE
36	HIGHCLERE	FE
37	LONG PLAINS SOUTH	FE PH
38	NATONE	FE
39	ROCKY RIVER	FE PH
40	FARRELL	AG CD PB ZN
41	ZEEHAN SLAG DUMPS	ZN AG PB
42	HERCULES	AG CU PB ZN
43	SOUTH HERCULES	AG AU CU PB ZN
44	OCEANA	AG PB ZN
45	ANDERSONS CREEK	CO NI

* Resources for all Tasmania included in table

COMMODITY ABBREVIATIONS	
AG	SILVER
ASB	ASBESTOS
AU	GOLD
BI	BISMUTH
CB	COAL - BLACK
CD	CADMIUM
CK	KAOLIN
CO	COBALT
CR	CHROMIUM
CU	COPPER
CWB	COAL - BROWN
FE	IRON, IRON ORE
MN	MANGANESE
NI	NICKEL
PB	LEAD
PH	PHOSPHATES (P_2O_5)
SB	ANTIMONY
SN	TIN
WO3	TUNGSTINIC OXIDE
ZN	ZINC

Mineral potential assessed from current data held by Mineral Resources, Tasmania. Assessments will require periodical revision as new data and knowledge become available.
King Island and the Furneaux Group are not included in the assessment as they lie outside the Tasmania Comprehensive Regional Assessment (CRA) region.

The key item 'Gold and silver' includes deposits where the major commodity is gold or silver. 'Iron and associated commodities' includes deposits where the major commodity is iron, titanium, manganese, chromium, osmium/iridium or platinum. 'Base metals' includes deposits where the major commodity is copper, lead, zinc or nickel. 'Tin and tungsten' includes deposits where the major commodity is tin, tungsten, molybdenum, bismuth, arsenic or antimony. 'REE,U,Zr' includes deposits where the major commodity is a Rare Earth Element, uranium or zircon. 'Coal and associated commodities' includes occurrences where the major commodity is coal, graphite or oil shale. 'Construction materials' includes occurrences where the major commodity is building stone, clay, dolomite, granite, limestone, slate or sandstone. 'Other commodities' includes occurrences where the major commodity is asbestos, barite, bauxite, fluorite, gems, lime sands, magnesite, ochre or phosphorus.
Mineral occurrences are from MIRLOCH, a Mineral Resources Tasmania (MRT) database. Mineral resources are from MINRES, a Bureau of Resource Sciences (BRS) database.
A mineral resource is a mineral deposit location with reported grade and tonnage data.

Distance in Kilometres

RFA

40 0000 mE · 50 0000 mE · 60 0000 mE

60 0000 mN · 50 0000 mN · 40 0000 mN · 30 0000 mN · 20 0000 mN

5 cm

TASMANIA

Comprehensive Regional Assessment

TENURE AND LAND STATUS

KING ISLAND

FLINDERS ISLAND

SMITHTON

BURNIE

DEVONPORT

SCOTTSDALE

LAUNCESTON

STRAHAN

SWANSEA

HOBART

GEEVESTON

40 0000 mN

50 0000 mN

60 0000 mN

30 0000 mN

20 0000 mN

23 0000 mE

40 0000 mE

50 0000 mE

60 0000 mE

LEGEND

- Dedicated Conservation Reserves
- Informal Reserves
- Other Public Land
- Private Land
- Special Prospectivity Zone boundaries

5 cm

0 20 40 60

Distance in Kilometres

RFA

AUSTRALIA TASMANIA

November 1996

APPENDIX 2 EXTRACT 1

Extract from the TASMANIA MINES DEPARTMENT CIRCULAR # 4

DIAMONDS IN TASMANIA

by W.H TWELVERTREES, Government Geologist. John Vail, Government Printer, 1918; p3-15. The extract is from p10-15.

DISCOVERIES OF DIAMONDS IN TASMANIA

An incorrect reference to diamonds in Tasmania is made in Max Bauer's work on "Precious Stones" (Spencer's translation, 1904, p 225), as follows:-

"Tasmania has recently been added to the list of diamond-producing countries. According to newspaper reports, a large number of stones were found at the end of the year 1894 in Corinna, one of the richest goldfields of the island. The reported occurrence caused a rush of diamond seekers into Tasmania from the Australian mainland; many companies of the exploitation of the deposits sprang up, but apparently with no marked results."

The real facts are that 16, or at most 18, diamonds have been authenticated. They were mostly about 1/8 carat in weight, one reaching 1/3 carat.

These have all been found near Corinna in the Donaldson Range district, between the Savage and Donaldson Rivers. In December, 1894, L. Harvey, prospector for the New Donaldson Building Company, brought to Launceston two diamonds, one of which he stated that he had found in Sunday Creek, on the west side of Mt. Donaldson, which flows into the Savage, and the other in Harvey's Creek, which falls into the Badger, also a tributary of the Savage River. These were transparent octahedra, tinted straw-yellow at the apices.

In the same year the late Mr. Leslie Jolly brought a diamond back from the same district: this also had the characteristic tinge of yellow of the apices.

Another prospector (Lawson) found five specimens at the Donaldson Range, the exact locality has not been verified, but they are believed to have been discovered in either Middleton's Creek or the Badger. They also had the same tinge at the apices.

In 1906 Mr. T. Batty, of Long Plain, found a specimen in Harvey's Creek. It weighed 0.025 gramme or about 1/8 carat. It was a brilliant octahedral crystal, tinted faint greenish-yellow at the apices. The crystal faces had the curves characteristic of diamonds. It contained numerous fluid cavities of microscopic size.

Another specimen has been recorded from Middleton's Creek, which flows into the Savage River north of Corinna.

A parcel of gem sand form near the Hellyer River, in the Waratah district, was sent to England by the Van Diemen's Land Company many years ago, and this was reported to contain small diamond. It has not been possible to ascertain the locality of the sand.

It is quite a usual thing for diamonds from different fields and countries to be distinguished by certain differences and similarities and one may record the constant yellow apices as characteristic of the Savage River or Donaldson district as a diamond province.

INFORMATION FOR PROSPECTORS

The few diamonds which have been found hitherto are sure and certain indications that more remain to be discovered. They were found at a time when unusual activity prevailed on the alluvial fields near Corinna. These fields are now idle, but it is a warranted position that diamonds are still in the gravels waiting to be removed. They are in all probability present in sands which the osmiridium workers are treating by escaping, unnoticed in the waste. Being so small and so much like grains of quartz to a cursory glance, it is possible that they elude notice in considerable number. Even in the blue ground in South Africa diamonds are seldom seen in the course of mining. G. F. Herbert Smith in his "Gem-stone" (1912, p 147), says -

"The diamonds are so sparsely, though regularly scattered through the mass, that even of the actual workers in the mines but few have ever seen one in the blue ground."

Again P. A. Wagner in his "Diamond Fields of Southern Africa" (1914, p 137), says -

"So sparsely distributed, however, is the gem that it is only by the merest chance ever observed *in situ*. It may be pointed out in substantiation of this statement that there are miners who have worked for over twenty years in Kimberley pipes without having ever come across a diamond."

In confirmation of this, Mr. A McIntosh Reid, Assistant Government Geologist, who has had personal experience at the De Beers Mine, informs the writer that he was told by an employee there that in the course of his 22 years work underground he had never seen a diamond in the rock. The yield of the matrix in South African mined varies from 5 to 20 carats per 100 loads of 16 cubic-feet (3/4 ton).

In Tasmania the district in which the diamonds were found while working the auriferous alluvial has long been abandoned by miners and no discoveries have been announced for the last 12 years. The osmiridium workers higher up the Savage have been too much engrossed with their special mineral, to pay much attention to anything else, nevertheless, wherever osmiridium is present in the alluvia there is a possibility of diamonds turning up though they are likely to be sporadic, and it will hardly pay for a prospector to devote his time exclusively to the search for stones. It would be well however for all who are washing sands in this district for osmiridium to be on the look-out, for diamonds. Unfortunately, the crystals are apt to escape with the quartz grains and this renders detection difficult.

The only minerals which in the least resemble diamond to the experienced eye are quartz, topaz, and white sapphire. Small water clear crystals of quartz are often known locally as diamonds, the limpid stones of tops from Killiecrankie Bay, on Flinders Island, are well known as "Killiecrankie diamonds", and the collector who first attempted to dispose of them in London, as a kind of diamond got into trouble over the transaction. But quartz and sapphire crystallise in the hexagonal system, and topaz in the orthorhombic system, while diamond belongs to the cubic system and has most frequently a dodecahedral or octahedral habit. None of the minerals mentioned will scratch a diamond. It may be mentioned here that tin country minerals are not necessary companions of diamond and are only present where certain conditions obtain . Thus prior to the existing river systems, the sands of the plains between Bald Hill and Corinna received accessories of sediment from the tin-bearing Meredith Range, and this has mingled with the waste from the serpentines, so that in some places and to some extent a mixture of minerals has resulted which have no community of origin.

The curved convex crystal faces of diamond specimens are of great assistance in identification. The pitted surface furnish an additional identification. When the crystal form and curvature, weight, hardness, pittings of surface, is added the yellow tint of the apices, the prospector has an aggregate of characters upon which he may rely as regards stones from the Bald Hill, Savage, and Donaldson diamond province. In cases of doubt with regard to any particular specimens, they may be tested in the Geological Survey laboratory, Launceston, free of charge.

In looking round Tasmania for likely diamond fields, it is not sufficient to locate mere exposures of serpentine, for the solid rock will fail to reward the prospector. Beds of alluvial derived from the serpentine are what is required, and again these beds should be payable propositions for gold or osmiridium, as it is extremely improbable that any appreciable output of diamonds will result in any other way than in the course of gold (or osmiridium) winning. This is why the Savage and Donaldson districts are indicated as promising fields. Other serpentine districts are Dundas, Trial Harbour, Macquarie Harbour, Wilson and Huskinson Rivers, Denison Range, Styx River, Anderson's Creek, Salisbury & c., but some of these outcrops are not accompanied by alluvial deposits of any importance an therefore carry only bare possibilities.

It has been thought by some prospectors that the tin fields of the north-east coast might carry deposits of the gem. Specimens of other gems and substances from that part of the island have been brought to the Geological Survey under the impression that they were diamonds, and in one instance the prospector was firmly convinced that he had struck the blue ground which is diamond bearing in South Africa. Hence, it seems quite time to make available some definite information respecting diamond and its occurrence. An outstanding fact is that no peridotite rock has ever been recorded in association with the granites of the eastern and north-eastern tin-fields; in the west of the island the massive tin-bearing granites are surrounded by fringes of gabbroid and ultra-basic rocks, some of which are most probably the matrices of diamonds. The question arises whether diamonds could be looked for in the debris or alluvial shed from granitic rocks.

It cannot be denied that in some other parts of the world there are occurrences of diamond, which have been considered a suggestive of a pegmatitic source.

It must be added, however, that the literature of these occurrences is not absolutely convincing. In Russian Lapland, a district characterised by gneissose rocks intersected by pegmatites, some sands carry sparsely diamonds associated with garnet, zircon, tourmaline & c., and it has been assumed that the diamonds have been derived from the gneiss and pegmatites. Too little is known of the geology for the source to be looked upon as established. References to pegmatites in India and Borneo as being sources of diamonds are also lacking in precision. The occurrence of diamonds in Rhodesia, associated with tourmaline, sapphire, &c., in gravel lying on decomposed granite may also be cited, but a diamondiferous pipe of kimberlite rock in granite exists in the same region, and similar pipes may have furnished the diamonds now found in the gravels and conglomerate.

It would not be correct to say that pegmatites are absolutely impossible sources of diamonds, for it is known that these rocks contain certain quantities of carbon gases, but it is also true that basic and especially ultra-basic rocks contain these in far greater proportions. It would seem that the acid rocks of the tin districts are not promising for diamonds, and the total absence of any record of a discovery in such localities, though a negative feature, is in harmony with an *a priori* anticipation that a search would not meet with success.

As indicated above, discoveries of diamonds in Tasmania are most likely to be made by individuals on the look-out for them while working gold-bearing or osmiridium alluvial derived from the weathering or serpentinised rocks; and the Donaldson and Savage River districts seem at present the most promising in this respect, though alluvial country anywhere round the serpentine fringes of the Meredith Range has possibilities which should be borne in mind.

W. H. TWELVETREES,
Government Geologist.
Launceston, 21st August, 1918.

EXTRACT 2

Extract from the GEOLOGICAL SURVEY OF TASMANIA - BULLETIN # 17, p38, 1914.

IX - DIAMONDS

The peridotite rock of Bald Hill possesses additional interest as being the probable source of the few small diamonds which have been found from time to time in the neighbourhood of Mt. Donaldson, near Corinna, in gold-bearing wash.

In 1894, L. Harvey, prospector of the New Donaldson Sluicing Company, found a small diamond in Harvey's Creek, which heads in the Donaldson Range and falls into the Savage River: and another in Sunday Creek on the west side of Mt. Donaldson, flowing also into the Savage. Lawson found some also in Sunday Creek, and another has been recorded from Middleton's Creek, which flows into the Savage River north of Corinna. The respected prospector, Mr. T. Batty, found one in Harvey's Creek in 1906. Mr. W. F. Petterd, in his "Catalogue of the Minerals of Tasmania," mentions 16, or at the most, 18, stones as authenticated. These gems were mostly octahedra, about one-eighth of a carat in weight, one reaching one-third of a carat. They have a slight yellow tinge at the apices.

These have all been found in the district round the Donaldson Range between the Savage and Donaldson Rivers. The range consists of slates, sandstone, and conglomerate of Pre-Silurian age, and no serpentine rock is known in the neighbourhood. Between the Rio Tinto Mine and the Specimen Reef serpentine is said to exist on Serpentine Hill, but the main exposure of peridotite rock, from which these diamonds were probably derived, is the Bald Hill Range. A parcel of gem sand from near the Hellyer River was sent to England by the Van Dieman's Land Company many years ago, and it was said that a small diamond was detected in it; if so, it most likely came from the Bald Hill itself. Osmiridium is found associated with gold in some of the creeks around Mt. Donaldson, and unless some yet undiscovered serpentine exists there, it seems likely that the creeks are dissecting ancient gravels, to which the Bald Hill peridotites contributed. It is not probable, however, that many stones will come to light on the osmiridium field itself; the chances are greater lower down the Savage. Whatever finds eventuate will certainly be casual ones. Prospecting for the gems would be an almost hopeless task. It is sufficient for the present merely to draw the attention of those who are working in this region and recommend that a look-out be kept for diamonds while sluicing.