Annual Report

for EL31/2011 Great Musselroe River

for the Period 5 December 2011 to 4 December 2012

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Date: November 2012

OutSide InSight

CHARTERED PROFESSIONAL
THE AUSTRALASIAN INSTITUTE OF MINING & METALLURGY

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ABSTRACT

This report describes the exploration activities completed within EL31/2011 during the period 5 December 2011 to 4 December 2012. This is the first annual report for the first year of grant of the Tenement.

The Tenement is located generally north, east, and south of Gladstone, a small mining town located 140 km east of Launceston.

The Tenement covers a number of past producer alluvial tin mines and many known alluvial tin deposits, but there are very few known basement tin deposits.

There has been a long history of investigations since 1874. Large scale mining for tin ceased in 1982. Past production of cassiterite is about 3,100 tonnes, and unmined resources, calculated by various authors, total about 1,400 tonnes.

There has been no past exploration for bedrock tin mineralisation.

The area is characterized by relatively poor outcrop. Much of the basement rocks are covered with various types of unconsolidated sediments, from Eocene to Recent in age, most of which are tin bearing.

In the district the original sources of the tin were phases of the Devonian tin-bearing granites of the Blue Tier Batholith. Tin occurs as cassiterite in quartz and greisen vein systems in the roof zone of the granites near the contact with overlying Silurian Mathinna Beds.

The company's main focus is exploration for tin, in alluvial deposits and in bedrock.

Work completed during the period comprised compilation of past investigations and review of the data to

- determine the distribution and nature of known tin deposits
- compile past production and estimates of remaining known tin resources
- assess the prospectivity of the areas for untested or undiscovered alluvial tin and basement tin mineralisation.

Work done for other commodities including sapphires, clay, gold, heavy minerals, and rare earths is also reviewed.

No field work has been undertaken.

The potential to find undiscovered alluvial and basement tin deposits is rated to be very high.

KEYWORDS

NE Tasmania
Geology
Mineralisation
Alluvial
Paleochannel
Leads
Primary Deposits
Granite
Mathinna Group
Tin
Sapphire
Clay
Gold
Heavy minerals
Rare Earth Elements
Past production
Resources

SUMMARY OF ACTIVITIES for EL31/2011 Great Musselroe River for the Period 5 December 2011 to 4 December 2012

Compilation of

- previous company and government investigations and mining activities
- geochemical exploration survey data
- geophysical datasets (airmagnetics, radiometrics, gravity)
- satellite remote sensing datasets (Aster, Landsat)

This data was then reviewed to

- determine the distribution and nature of known mineral deposits
- compile past production and estimates of remaining known resources
- assess the prospectivity for untested or undiscovered alluvial tin and basement tin mineralisation.

No field work has been undertaken.

CO-ORDINATES

All lat/long co-ordinates in this report refer to the GDA94 Datum, unless stated otherwise.
All AMG co-ordinates in this report refer to the GDA94 - Zone55, unless stated otherwise.

FILE SUMMARY LIST

File name	Format	Contents
El312011_2012_01_report.pdf	pdf	Annual Report
El312011_2012_02_appendix.pdf	pdf	Appendix- MRT searches

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1.0 INTRODUCTION

This report describes the exploration activities completed within EL31/2011 (The 'Tenement') during the period 5 December 2011 to 4 December 2012. This is the first annual report, for the first year of grant of the Tenement.

For convenience the project is named "Musselroe Project".

The Tenement is located generally north, east, and south of Gladstone, which is a small mining town located 140 km east of Launceston, in north-east Tasmania, Fig.1.

Table 1 – Tenement Details

Tenement	Holder	Date Applied	Date Granted	Size
EL31/2011 Great Musselroe River	Tin Dragon Pty Ltd 100%	20 May 2011	5 December 2011 (Categories 1 and 5)	190km^2

There are small Mining Leases for category 1 minerals which are excluded from the tenement in the Riverside and Dorset Flats areas, as illustrated on Fig 2.

The bulk of land within the tenement is logged state forest, timber plantation and timber reserves. Some private farming land is concentrated in the northern-most parts of the Tenement.

The project lies within the Tasmania NE (SK55-21) 1:250,000 map sheet, and the 1:25,000 map sheets of Gladstone, Lanka, Spurrs Rivulet, Derby and Pioneer.

Access is via a sealed major road between Gladstone and Pioneer. Formed local roads and logging tracks and other rough tracks provide access within the project area.

The tenement covers a number of past producer alluvial tin mines and many known alluvial tin deposits, but there are very few known basement tin deposits.

Past production of cassiterite is about 3,100 tonnes, and unmined resources calculated by various authors total about 1,400 tonnes.

The company's main focus is exploration for tin, in alluvial deposits and in bedrock.

Work completed during the period comprised compilation of past work and review.

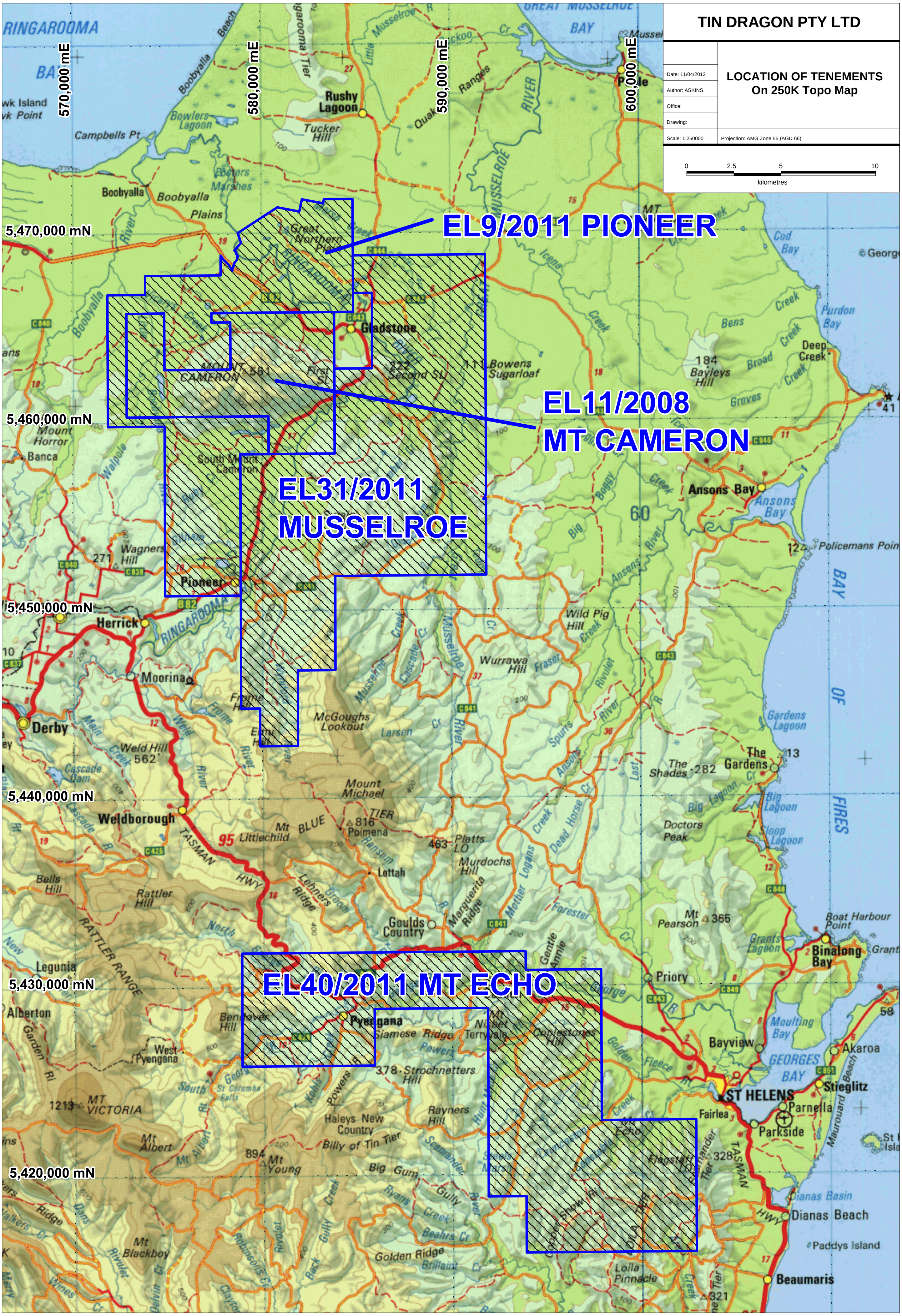

TIN DRAGON PTY LTD
LOCATION OF TENEMENTS
On 250K Topo Map
Date: 11/04/2012
Author: ASKINS
Office:
Drawing:
Scale: 1:250000
Projection: AMG Zone 55 (AGD 66)
0
2.5
5
10
kilometres
EL9/2011 PIONEER
EL11/2008
MT CAMERON
EL31/2011
MUSSELROE
EL40/2011 MT ECHO
570,000 mE
580,000 mE
590,000 mE
600,000 mE
5,470,000 mN
5,460,000 mN
5,450,000 mN
5,440,000 mN
5,430,000 mN
5,420,000 mN
Gladstone
Pioneer
Herrick
Derby
Moorina
Weldborough
Pyengana
ST HELENS
Ansons Bay
Binalong Bay
Beaumaris
Rushy Lagoon
Boobyalla
RINGAROOMA
BAY OF FIRES

Figure 1

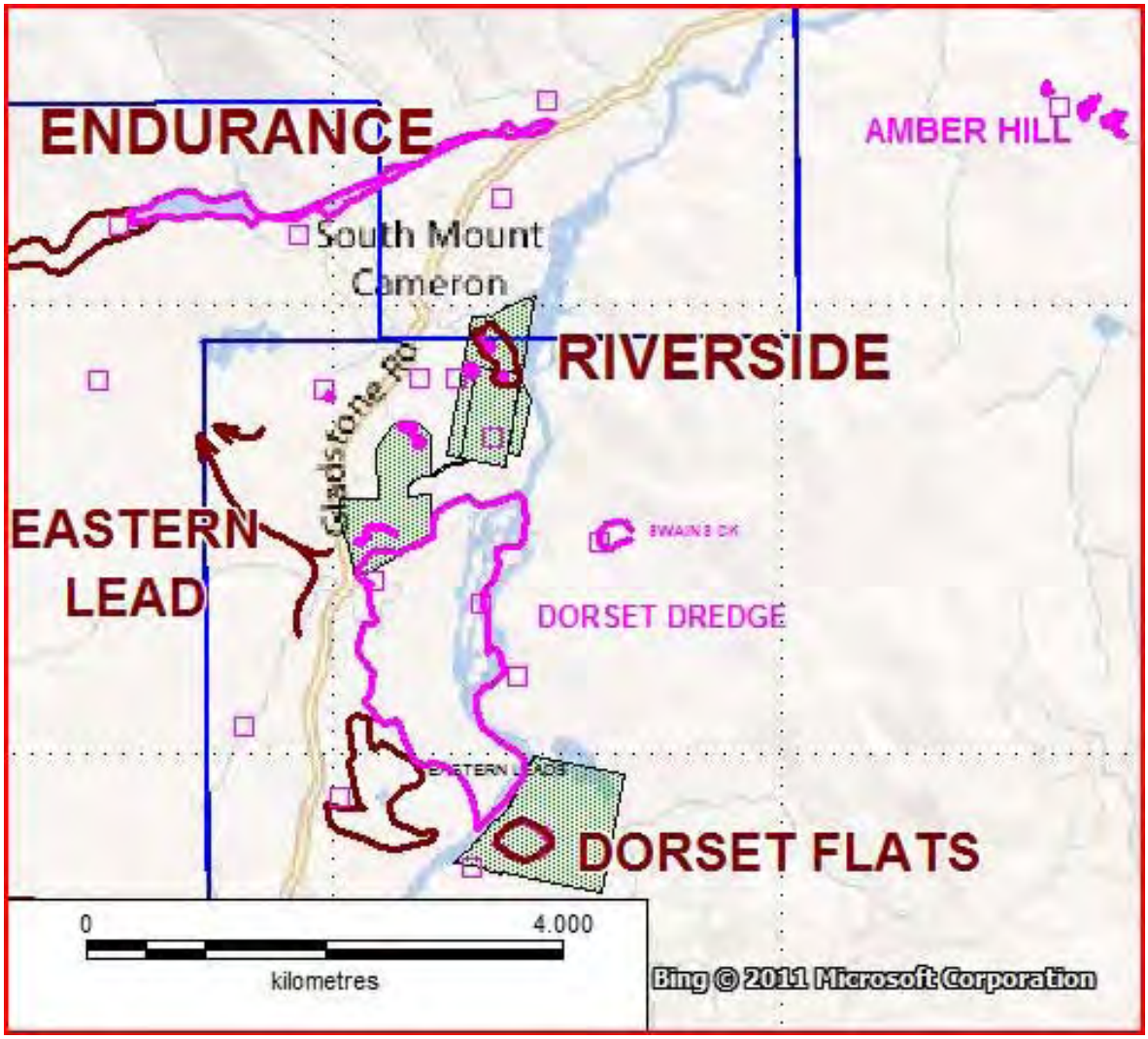


Fig 2 Mining Leases at Riverside and Dorset Flats excluded from EL31/2001

2.0 GEOLOGICAL SETTING and MINERALISATION

Some general notes on the geology of the Tenement follow; more detail of the geology and mineralisation is presented in each of the sections on deposit areas.

The area is characterized by relatively poor outcrop. Much of the basement rocks are covered with various types of unconsolidated sediments, most of which are tin bearing.

Nearly all known metallic deposits in the Tenement are alluvial tin (with accessory gold, monazite, sapphires) hosted in paleochannels (leads). Some tin deposits in basement rocks occur around Gladstone, but this area is outside the Tenement. Given the widespread alluvial occurrences, the lack of known tin mineralisation in basement is striking, Fig 4.

In the district the original sources of the tin were phases of the Devonian tin-bearing granites of the Blue Tier Batholith, whose solid geology is shown on Fig 3. Tin occurs as cassiterite in quartz and greisen vein systems in the roof zone of the granites near the contact with overlying Silurian Mathinna Beds.

The relevant placer history of the region commenced in Permo-Triassic time (ca 250Ma) with the unroofing and erosion of the granitic rocks. In late Jurassic time (ca 150Ma) further uplift occurred with intrusion of extensive igneous dolerite sheets followed by a long period in the Late Cretaceous (ca 75Ma) of widespread and intense erosion. Deep weathering of the granites during this period resulted in liberation of large amounts of cassiterite from the granitic hosts and their deposition in alluvium of the streams draining the highlands.

During Middle Eocene time (ca 46Ma) volcanic activity commenced along the Blue Tier and into the Boobyalla area with the extrusion of the Older Basaltic lava flows. It is likely that these were emplaced along stream valleys incised into the pre-Eocene granitic land surface, and so buried the older alluvial cassiterite deposits.

From the Mid Eocene to Late Oligocene (ca 46 to 24Ma) uplift and a humid tropical climate resulted in rapid erosion of the basalts, and renewed liberation of cassiterite from granites and reworking and upgrading of the earlier pre Middle Eocene alluvial deposits. The Middle Miocene (ca 14Ma) saw a second period of basaltic volcanism with extensive lava flows down many of the larger valleys in the Derby area, causing diversion of the Ancestral Ringarooma River.

Post Middle Miocene to Recent alluvial deposits were then formed along the alluvial flats of the Ringarooma River and other rivers.

In the far north there were marine incursions which have reworked the earlier alluvials.

In summary there has been a complex history of placer formation where reworking has concentrated cassiterite to generate a perhaps unique set of tin deposits.

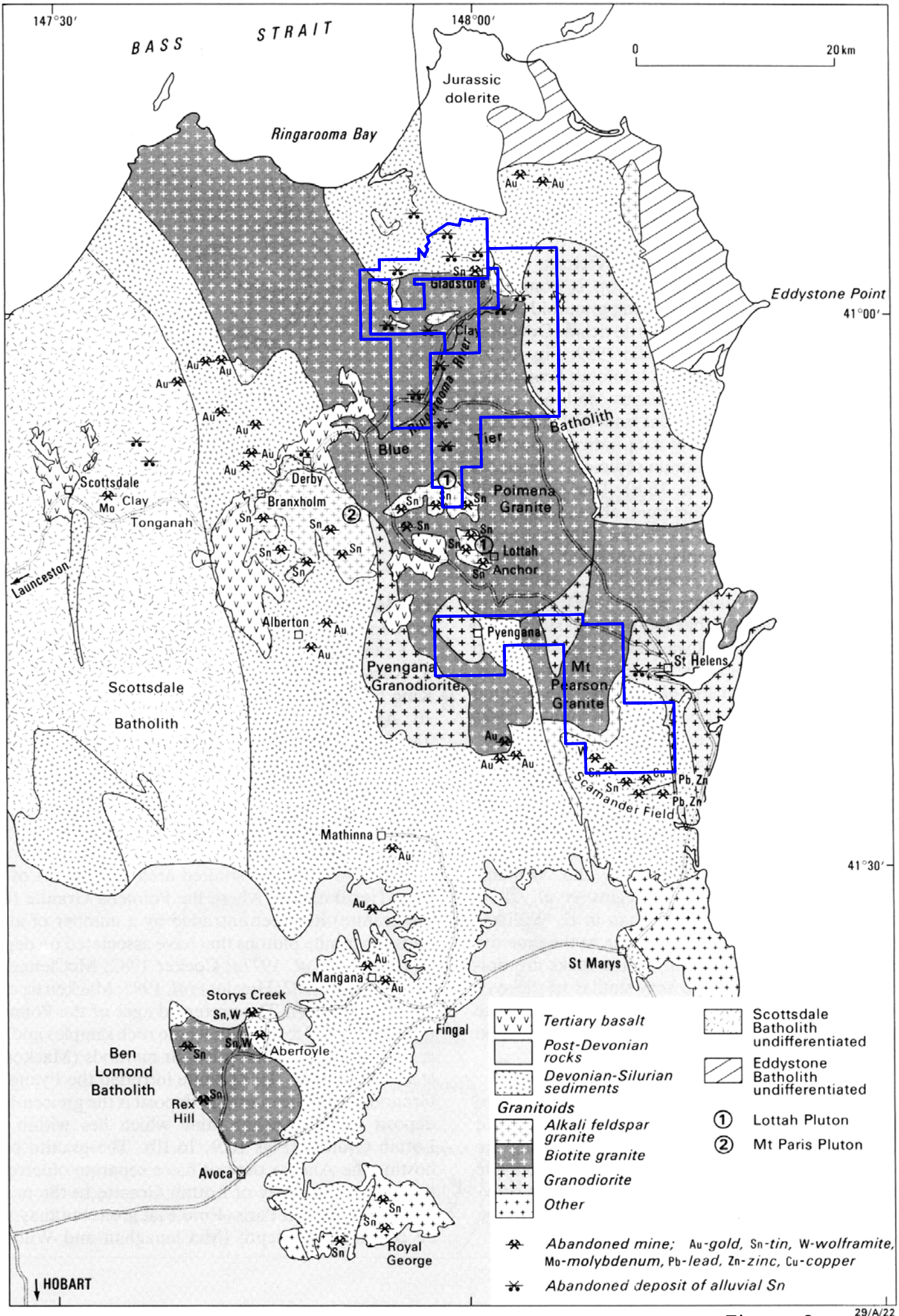
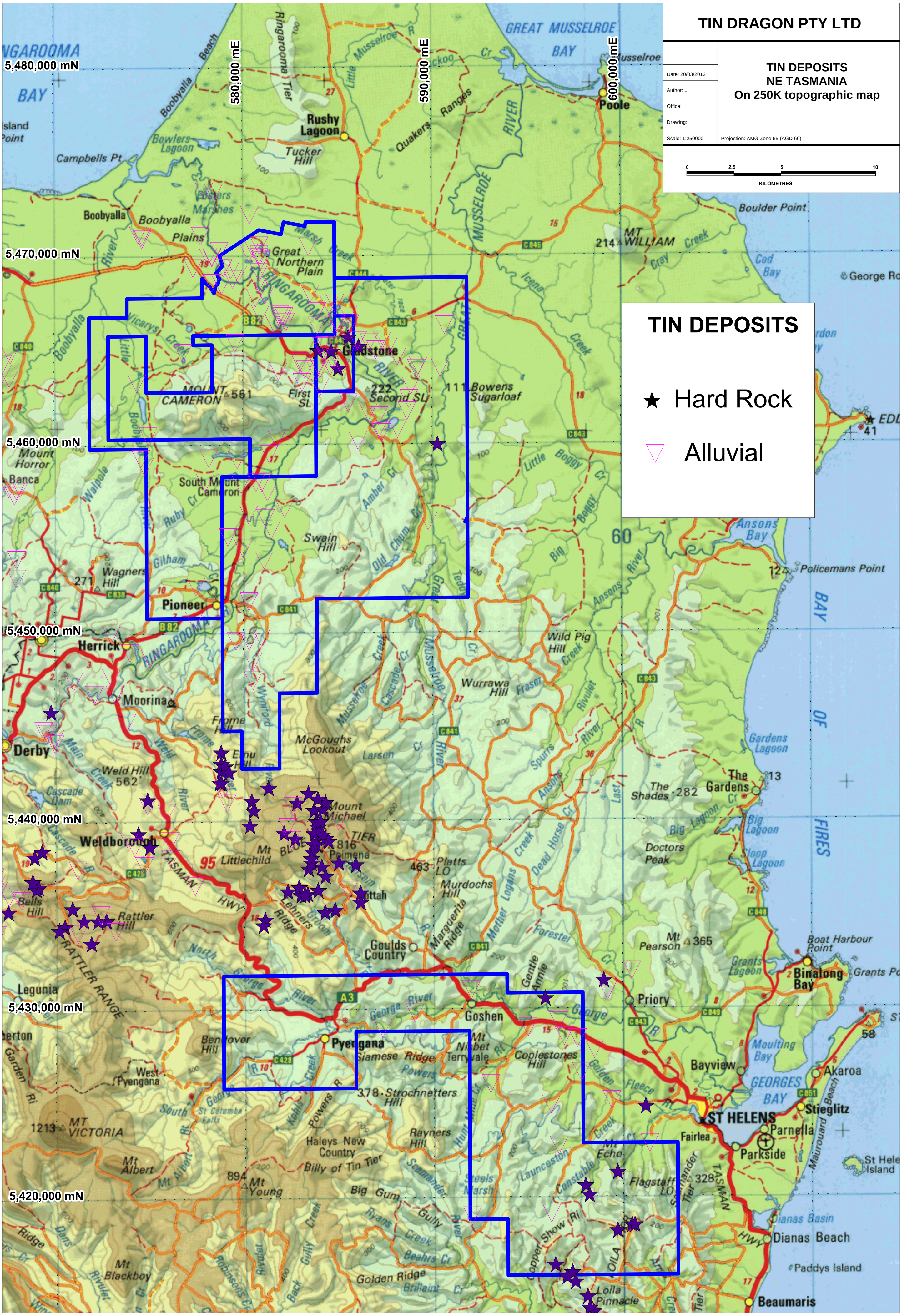
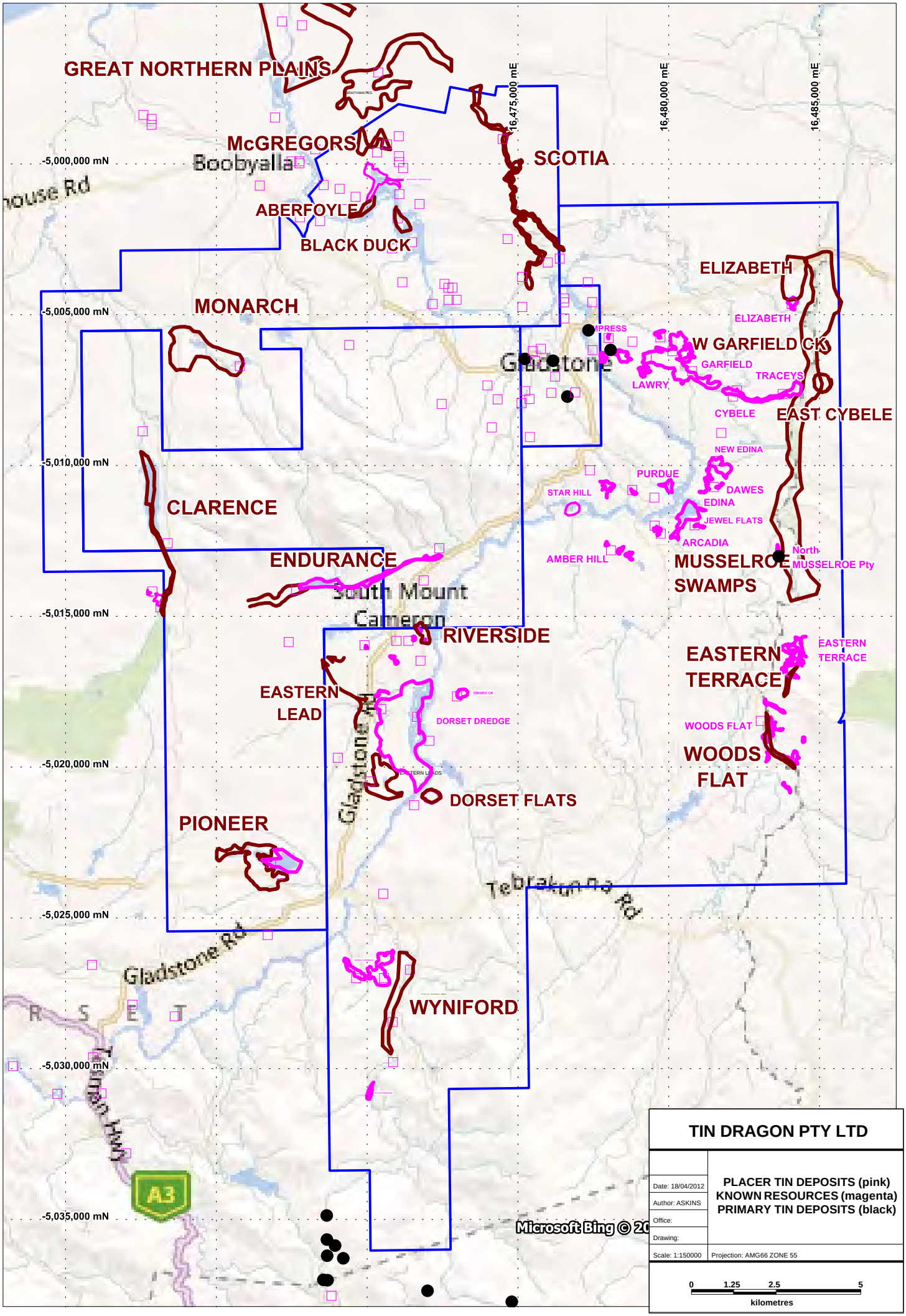

147°30′
BASS STRAIT
148°00′
0
20 km
Jurassic dolerite
Ringarooma Bay
Eddystone Point
41°00′
Gladstone
Clay
Ringarooma River
Blue Tier Batholith
Poimena Granite
Lottah
Anchor
Derby
Branxholm
Scottsdale
Mo Clay
Tonganah
Launceston
Alberton
Pyengana
Pyengana Granodiorite
Mt Pearson Granite
St Helens
Scottsdale Batholith
Scamander Field
Pb, Zn
Mathinna
41°30′
St Marys
Mangana
Storys Creek
Sn, W
Aberfoyle
Fingal
Ben Lomond Batholith
Rex Hill
Avoca
Royal George
HOBART
Tertiary basalt
Post-Devonian rocks
Devonian-Silurian sediments
Granitoids
Alkali feldspar granite
Biotite granite
Granodiorite
Other
Scottsdale Batholith undifferentiated
Eddystone Batholith undifferentiated
① Lottah Pluton
② Mt Paris Pluton
Abandoned mine; Au-gold, Sn-tin, W-wolframite, Mo-molybdenum, Pb-lead, Zn-zinc, Cu-copper
Abandoned deposit of alluvial Sn
29/A/22

Figure 3



TIN DRAGON PTY LTD
Date: 20/03/2012
Author: ..
Office:
Drawing:
Scale: 1:250000
Projection: AMG Zone 55 (AGD 66)
TIN DEPOSITS
NE TASMANIA
On 250K topographic map
0 2.5 5 10
KILOMETRES
TIN DEPOSITS
Hard Rock
Alluvial
5,480,000 mN
5,470,000 mN
5,460,000 mN
5,450,000 mN
5,440,000 mN
5,430,000 mN
5,420,000 mN
580,000 mE
590,000 mE
600,000 mE
Gladstone
Pioneer
Herrick
Moorina
Derby
Weldborough
Pyengana
Goshen
Priory
ST HELENS
Binalong Bay
Stieglitz
Parnella
Akaroa
Beaumaris
Poole
Rushy Lagoon
Boobyalla
Great Northern Plain
Mount Cameron
South Mount Cameron
Mount Michael
Goulds Country
Legunia
Mt Victoria
Mt Young
Bowens Sugarloaf
Mt William

Figure 4

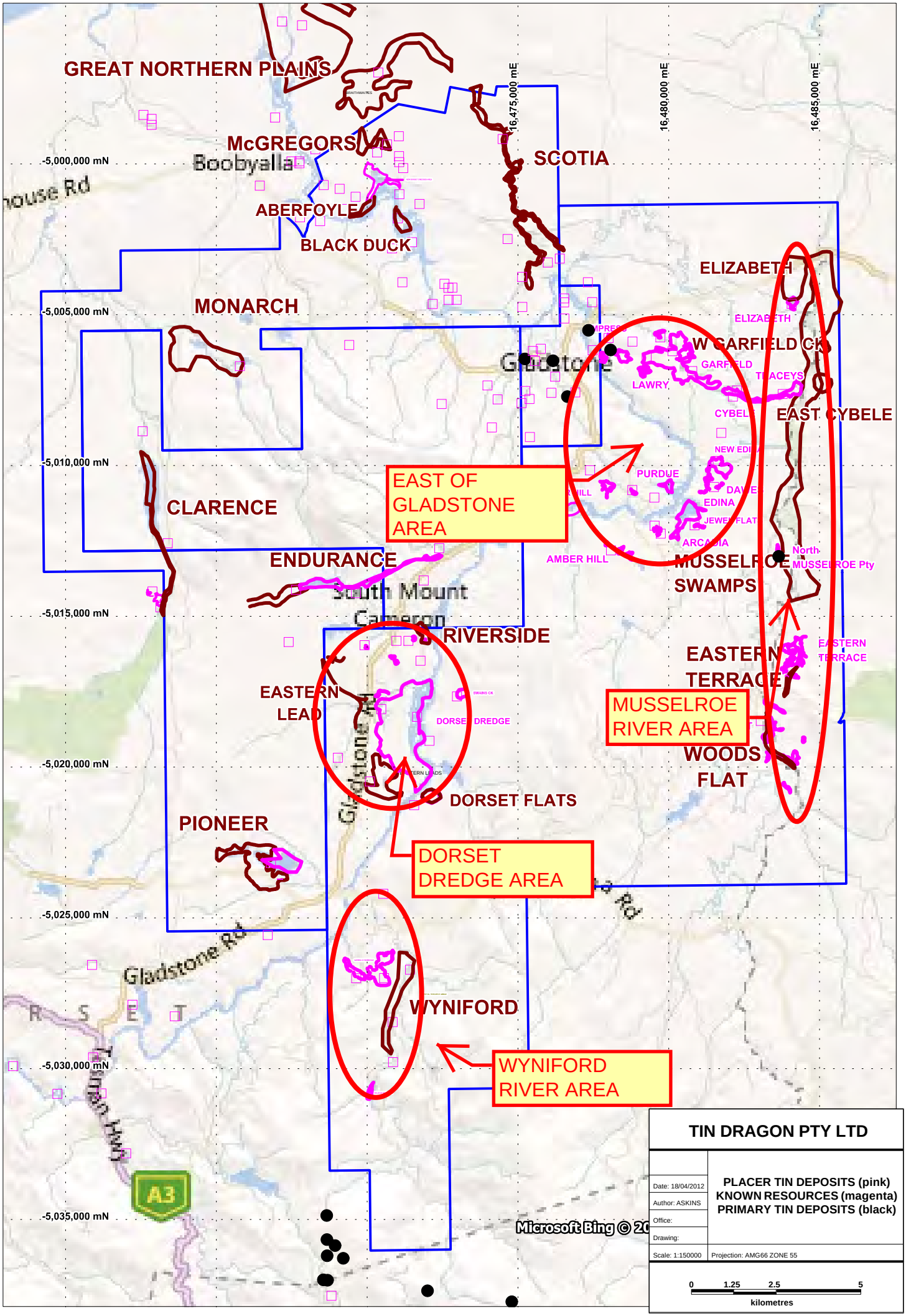


TIN DRAGON PTY LTD

Date: 18/04/2012	PLACER TIN DEPOSITS (pink)
Author: ASKINS	KNOWN RESOURCES (magenta)
Office:	PRIMARY TIN DEPOSITS (black)
Drawing:	
Scale: 1:150000	Projection: AMG66 ZONE 55

0 1.25 2.5 5
kilometres

Figure 5



TIN DRAGON PTY LTD	
Date: 18/04/2012	PLACER TIN DEPOSITS (pink) KNOWN RESOURCES (magenta) PRIMARY TIN DEPOSITS (black)
Author: ASKINS	
Office:	
Drawing:	
Scale: 1:150000	Projection: AMG66 ZONE 55

0 1.25 2.5 5
kilometres

Figure 5B

3.0 REVIEW OF PREVIOUS WORK

This is the first report by Tin Dragon Pty Ltd in the first year of grant of the Tenement; thus there is no previous Tin Dragon activity to report.

Previous work by other organisations is the subject of the bulk of this report.

The main players have been:
Aust Anglo American
BMI Mining
Department of Mines
Endurance Tin Mining Co
Kangaroo Metals
Kibuka Mines (Triako – Amdex Mining Group)
Macquarie Harbour Mining
Mineral Holdings
Storeys Creek Tin Mining Co
Utah
Van Dieman Mines

A brief review of the past history of mining in the district is useful to place the previous investigations in context:

The first documented discovery of tin in north eastern Tasmania was by George Renison Bell at several locations in the Boobyalla River catchment in 1874. Prospecting in the ensuing two years to 1876, explored all the region's waterways and identified the bulk of the region's major alluvial tin deposits, including the Krushka Brothers strike at the Briseis mine (Derby) and William Bradshaw's discovery of the Pioneer tin deposit. These mines and their surrounding mineral fields developed rapidly and private settlements were gazetted as townships by the Crown. A port and town was established at Boobyalla, north of the tenements, but these are now abandoned.

Most production occurred before 1900 but continued at a reduced level until 1982 when the remaining large mines such as the Pioneer and South Mount Cameron mines closed.

The tin, which occurs as cassiterite in basal gravel in placers in the Tertiary/QuaternaryRecent sediments stretching from near Branxholm to Ringarooma Bay, was derived from erosion of the tin-rich granites. The main mines were the Briseis, Pioneer, and Endurance. Mining also occurred in the Tertiary sediments west of St Helens. Recorded production until the early 1960s was about 41,660 tonnes of metallic tin [64-381]. Most of the mining was by hydraulic sluicing but some dredges were used including the Dorset dredge which operated from 1944 to 1971.

Of interest is the Chinese history of tin mining in the district. Chinese tin miners were amongst the early pioneers of NE Tasmania and were the largest group of non-European immigrants to early Tasmania. They started arriving in the late 1870s and at their peak in the 1880s numbered around 1,000. In places Chinese outnumbered Europeans by up to 10 to 1. They were present at Weldborough, Branxholm, Gladstone, Pioneer, Garibaldi and Moorina. They were industrious and tended to work the small scale, poorer, more isolated mine sites, displaying considerable ingenuity in getting water to their alluvial mines. The population was transient with people staying only long enough to accumulate sufficient funds to move on.

Consequently their dwellings were mainly temporary bush huts. After a collapse of the tin price some moved to the larger settlements of Launceston and Hobart where they mostly became market gardeners and merchants. Today the remaining evidence of the Chinese is being documented and publicized by local Shires with a program called the Trail of The Tin Dragon.

4.0 EXPLORATION COMPLETED DURING THE REPORT PERIOD

Work done by Tin Dragon during the period consisted of compilation of

- previous company exploration and mining activities, and any previous relevant investigations by for example MRT
- all past geochemical exploration survey data
- geophysical datasets such as airmagnetics, radiometrics, and gravity surveys.
- satellite remote sensing datasets such as Aster and Landsat.

This data was then reviewed to

- determine the distribution and nature of known mineral deposits
- compile past production and estimates of remaining known resources
- assess the prospectivity of the areas for untested or undiscovered alluvial tin and basement tin mineralisation.

No field work has been undertaken.

A considerable effort has been made to compile all previous work by previous companies and by MRT, by downloading it from the MRT website. The Appendix contains a number of search results from the website, used to compile the data.

Areas of the Tenement where tin deposits cluster have been covered in separate sections of this report. In each of these sections previous work is reviewed.

The sections covering tin deposits are, as illustrated on Fig 5B:-

- Musselroe River Area
- East of Gladstone
- Dorset Dredge Area
- Wyniford River Area

Work for other commodities is reviewed in separate sections on:-

- Sapphires
- Other Minerals

Appraisal of controls of mineralisation, utilising the various datasets, and target generation, are ongoing.

For convenience in the text of the report, references to the company reports have usually been merely as the MRT report nunber, for example [66-0430]. The relevant full reference can be located in the Appendix.

5.0 MUSSELROE RIVER AREA

This area includes Woods Flat, Eastern Terrace, and Musselroe Swamps. All other deposits are covered in the East of Gladstone Area, section 6.0 of this report. The general distribution of deposits is shown on Fig 6.

Geology

The geological history of alluvial deposits in this area is complex, and the limited exploration done here has provided only some clues to unravel it.

Utah, in various reports, for example [66-0430], thought that there were three stages, and I (PWA) can add another Recent stage:-

- Recent, where the Great Musselroe River has become choked and swampy and a veneer of sediment is developing.
- ?Quaternary ("stage 3") located in the valley floor of the Great Musselroe River; the river has cut down to fresh bedrock locally; examples include Woods Flat.
- Miocene (stage 2") clayey sands, rounded wash, no easily traceable channels, interpreted to be flood plain deposits.
- Eocene ("stage 1") has a basal quartz wash, common lignitic material, pyritic, now discontinuous because of faulting and erosion, dated by spore palynology at Eastern Terrace.

The Quaternary deposits have clearly formed locally by reworking of the Eocene ones, and constitute the largest potential resources.

The entire length of the Quaternary deposits of the Great Musselroe has a coincident uranium and thorium anomaly in imaged airborne radiometrics, suggesting that it would be a good potential source of monazite.

There are no reported sapphires and none can be expected because no source basalts have been mapped in this drainage system.

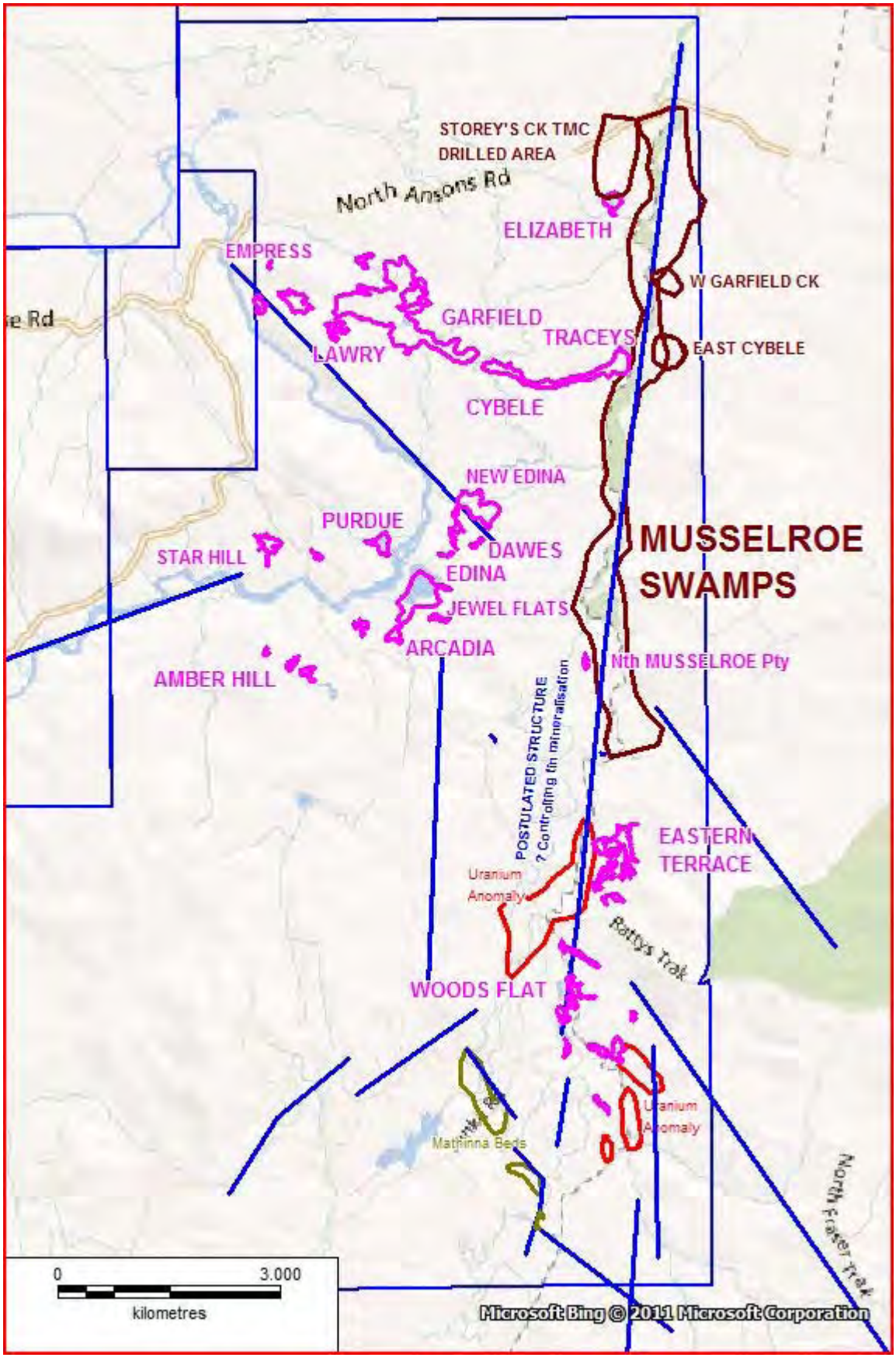


Figure 6 Known Alluvial tin workings, area drill tested at Musselroe Swamps, structures, prospective Uranium anomalies.

Eastern Terrace

History and production [66-0430] The earliest recorded mining in the southern Mussel Roe River area was at the Eastern Terrace. The upper shallow stanniferous ground was worked intermittently to a maximum of 3.7m depth by a number of operators from as early as 1890 until 1959. The principal operator was the Great Mussel Roe Proprietary Company, which abandoned the area in 1901. From the size of the pits it appears that 500,000m^3 of material of unknown grade were mined.

Geology The Eastern Lead is a narrow (max 180m wide), deeply incised channel with headwaters rising to a watershed separating the lead from Wood's Flat to the south [68-0532]. The Eastern Lead contains abundant marcasite throughout, and the basal wash contains only trace amounts of tin with almost no ilmenite or other heavy minerals. The finest-grained sediments towards the base of the Eastern lead are distinctive laminated brown carbonaceous siltstones with marcasite and some fragments of lignitised wood, and are overlain by sand, silt and clay seldom more than 4m thick. This is generally capped by 30-50cm of silicified silts immediately below the topsoil. Where the lower sequence is exposed there can be “gutters” in the current topography of presumably reworked relatively recent lenticular wash. The cassiterite concentrate from these gutters is coarse, nuggety in nature, and contains a high proportion of ‘chats’ (?silicified lag), with minor ilmenite. The source area for this tin appears to be the exposed granite immediately surrounding the Eastern Terrace because cassiterite occurs in granitic eluvium in the head waters of the gutters.

Drilling Apart from a line of six holes drilled by the government in 1902 (Twelvetrees, 1916), the only drilling conducted here has been by Utah in 1964. The positions of the government holes are not accurately known, and are shown approximately on Utah maps.
Utah noted that previous mining was less than 5m deep and taken to a siltstone "false bottom" rather than to bedrock. The aim of their drilling was thus twofold: (1) to establish if the stanniferous upper wash zone was present in confined gutters or as a sheeted deposit of more or less uniform grade, and (2) to establish if payable tin existed in deeper ground below the siltstone false bottom.
Along 5 lines spaced about 600m apart 22 holes were drilled to bedrock. Six holes drilled in the northern part of the Terrace penetrated a narrow, deep, sharp-sided channel with basement at 16 to 27m below the surface. The maximum width (north end) is 180m. To the south the floor of the valley rises steeply south to a watershed. The lower wash horizon varies from 0.5 to 5m in thickness, with cassiterite concentrations up to 100g/m^3.
The drilling demonstrated poor potential below the false bottom and that the tin in the upper part of the sequence is contained in narrow gutters rather than in a sheeted uniform horizon. Previous operators have already mined some of the narrow gutters following the richer values. The total thickness of the alluvium in these gutters varies from 1.5 to 4m, with the stanniferous concentrations of up to 1200g/m^3 occurring primarily in the wash horizon, which is up to 2m thick but generally much thinner.
Ilmenite occurs in small quantities with the cassiterite of the upper wash, but only trace amounts have been detected in the lower marcasitic sequence and/ or the lower wash.

Resource Utah stated [68-0532] that it was difficult to assess resources for the stanniferous material in the upper irregular gutters as insufficient drilling had been done, but estimated around 400,000m^3 at grades between 150 and 300g/m^3 could possibly exist.

Wood's Flat

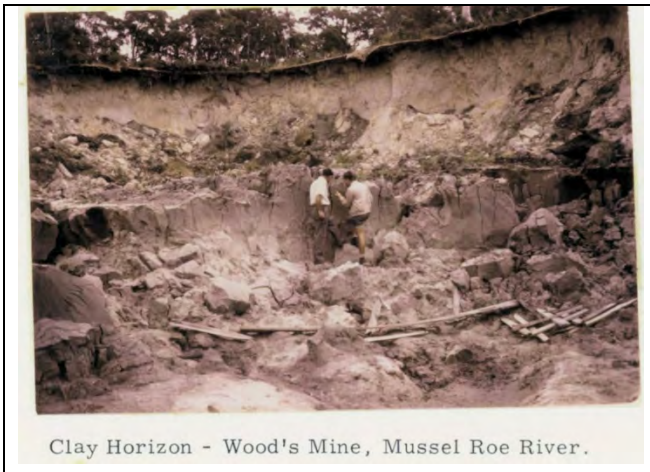
History and production [66-0430] The first recorded mining activity was by M.H. Groves and F.D. Richardson, who held the ground in 1946. No production figures are known, but a recovery of 600g/m^3 is quoted by Keid [UR1946_073-80]. In the period 1948-1957 the property was leased by the Lanka Tin Mining Company who treated 200,000m^3 of material. In 1957 Dunn and Park began operating a pit and treated 17,000m^3. In 1959 Wood and Bartels acquired the property and from 1960 operations continued under the sole ownership of V. Wood, the lessee in 1963-4 at the time Utah took out an option to purchase. A calculation based on pit surveys carried out by Utah showed that to February 1964 Mr Wood worked 255,000m^3 of material with an average recovered grade of 330g/m^3. This production figure differs from the official MRT records, which Utah believed to be incorrect. Production from 1964 has not been published but could possibly be obtained via a search of MRT records.

Geology This is probably a Quaternary Stage 3 deposit; it differs from the alluvium at the Eastern Terrace in a number of respects including absence of carbonaceous sediment and marcasite, and presence of much ilmenite. It could be partly derived from reworking of original southerly extensions of the Eastern Terrace leads. The heavy mineral concentrate of the wash at Wood's Flat contains abundant fine and coarse grained (to 6mm) rounded cassiterite with an approximately equal quantity of ilmenite, minor coarse-grained well rounded tourmaline, zircon and fine-grained reddish garnet. Utah thought that Jurassic dolerite, though not seen at Wood's, is known to exist to the east and south, and is the source of the large quantities of ilmenite; the source of garnet is not discussed.
The thick section of coarse alluvium containing the carbonaceous material is overlain by fine sand, silt and clay, complexly inter-fingered. The sequence is considered to represent sediments deposited by a river migrating laterally across the broad valley floor.

Drilling A number of local companies and individuals are known to have carried out some drilling [68-0532]; namely, Endurance Tin Mining Company N.L. , Storey's Creek Tin Mining Company N.L. , Lanka Tin Mining Company N. L. , the Star Hill Syndicate (Mr Lawry), and Mr Wood. Of these only the testing by the Endurance Tin Mining Company was extensive, but unpublished, however data was available to Utah who plotted it on their maps.
In 1951 the Endurance Tin Mining Company drilled 80 holes varying in depth from 1.5 to 19m.This showed two main, nearly parallel channels in the bedrock with other smaller tributary channels. It also indicated one major and two subsidiary stanniferous runs, which are not contained in the basement channels but are on the flanks of the channels and in part on the high between them. The Endurance drill data is
Utah in 1963 went into an option agreement at Wood's Flat based on their estimate that there was potential for a reserve of 3.8Mm^3 at a grade of 600g/m^3. An initial scoping study made before the option was entered into estimated that a total resource of 3.25Mm^3 at a recoverable grade of 255g/m^3 mined at a rate of 750,000m^3/yr would be viable.
Utah drilled 63 holes varying in depth from 1.8 to 11m, averaging 7.5m, in lines (when combined with Endurance drilling) about 300m apart, revealing greater complexity in the

basement configuration than was suggested by the Endurance drilling. Two distinct stanniferous runs are indicated which are only roughly coincident with the deposits found by Endurance. Their relationship to the basement channels is not entirely clear, as some high values are found in the channels but most are on the channel flanks, probably on the inside of bends. Cassiterite occurs in trace amounts throughout the sequence but the higher concentrations are restricted to the wash horizon at the bottom. Values from a trace to 50g/m^3 were recorded from the upper clay, silt and fine-grained and coarse-grained alluvium. Values in the wash horizon vary from 50 to 2400g/m^3.

Resource Drill lines were too far apart to project relative positions of the stanniferous gravels with any real hope of accuracy. The overall average grade (weighted by holes) of the Endurance drilling is 420g/m^3, compared to the Utah figure of 210g/m^3.The discrepancy between the figures is not readily explained, and presumably is some combination of natural variability and quality of drilling/sampling.
Utah calculated that Wood's Flat contained 940,000m^3 at a grade of 190g/m^3 in a deposit 7.3m deep. These volumes and grades were so far below their scoping study requirements that the option was not exercised.


Clay Horizon - Wood's Mine, Mussel Roe River.

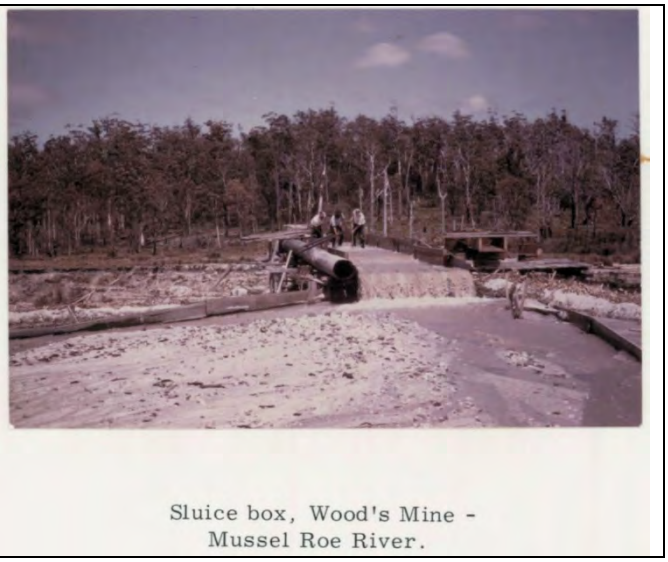

Sluice box, Wood's Mine - Mussel Roe River.

Figure 7. Woods Mine (from 64-0381 by Warin & Appleby for UTAH)

Musselroe Swamps

History There is no recorded production for this very large area of flat often swampy alluvial flats for a 7.5km strike along the valley of the Great Mussel Roe River. The area had obvious appeal for explorers seeking large dredgeable resources, so was explored in the 1960s and 1970s by Utah and BMI Mining. No work is recorded since then.

Geology The area hosts vast volumes of probably Quaternary Stage 3 alluvium of similar style to that at Woods Flat.
This area is a broad linear heavily wooded river swamp, which is rather deeply incised into a more extensive Tertiary sediment and granite covered area. The Great Mussel Roe River is entirely restricted to the swamp, and in winter flood flows the full width at shallow depth, and in the drier summer period it has a meandering channel seldom greater than 6m wide

and 3m deep. Positive granite basement rocks bar both ends of the swamp, and the river passes through these bars in joint controlled V section valleys. A number of granite restrictions pinch off the swamp along its course.

Drilling Directly in the swamp there was one limited hand boring program carried out by the Department of Mines, but drilling is dominated by that conducted by Utah [66-0430] and BMI Mining Ltd [72-0843]. On adjacent river flats other small drill programs have been carried out by the Department of Mines and Storey's Creek Tin Mining Co. N L; however, only sketchy results are available.
The government in 1954 drilled 99 holes at 30m spacings on three lines 80m apart.
Utah in 1965 concentrated on the potential of a swampy 3km zone between Traceys and North Musselroe, which they referred to as Test Area 5.The original proposal was to test the swamp as a possible dredging proposition, and called for drilling on five lines at about 1200m spacing. However, due to the nature of the swamp itself, in part heavily timbered with abundant fallen logs, or open reed swamp with still water up to 1.5m deep, the cost of clearing traverse lines suitable for a drill rig led to the clearing/ drilling of only 3 lines, covering 2.5km length of swamp.
In all, 38 holes totalling 337m, eleven with values greater than 60g/m^3, the peak ones being 340g/m^3 over 10m and 470g/m^3 over 8.7m, were completed in the swamp, and a further 31 holes, totalling 346m, were drilled to extend the drill lines on the adjacent river flats, where drilling found significant values in one area (see below). Alluvium varied in depth from 5 to 14m, and consists of complexly interbedded coarse grained sands, silty sands and clay, with in part a thin basal stanniferous wash on granite basement. The basement was hard and unweathered on two of the lines.
BMI Mining Ltd in 1971 aimed to check the area for a potential resource of 21Mm^3, especially south of areas drilled previously by Utah. They drilled 90 percussion holes for 945m, ie an average depth of 10m, with up to 14.5m to basement. Holes were spaced every 30m along lines roughly 500m apart, sampling all the profile at intervals of 1.5m.
Cassiterite was generally confined to the bottom few metres of alluvium, where locally values reached 600g/m^3, but often around 150g/m^3.
These values are quite encouraging considering that the area tested has a 7.5km strike length, width 300m, though BMI considered the results poor and did not produce any further estimates of the resources.

Resource
Although BMI did not produce a post-drilling resource calculation, Utah calculated that their drilling potentially located two 1200m sections with resources of 587,000m^3 at 135g/m^3 and 553,000m^3 at 190g/m^3.
It is extraordinary that the swamp is tin bearing over such a long 7.5km strike, in which drill density is sparse, so a high potential must exist for more resources to be found.

Elizabeth aka **Park, Groves and Richardson**

This deposit was being mined at the time of a 1952 visit by A Reid from the Department of Mines [UR1952_129-145]. The first two clean-ups produced about 2t of cassiterite, but no full records of production have been located.

Storey's Creek Tin Mining Co. N L drilled from Elizabeth north to the Anson's Bay Road; only sketchy results are available but Utah [66-0430] plotted the locations on their plan and calculated that there was a resource of 1,100,000m^3 at 70g/m^3.

East Cybele Creek Terrace

This area, located NE of Traceys on the east side of the Musselroe River, was drilled in 1953 by the Department of Mines [UR1954_062-71]. Utah reviewed the data and calculated a possible resource of 68,500m^3 at 180g/m^3.

West of Garfield Creek

One drilled line, MR2, on this western terrace intersected stanniferous wash for which Utah estimated a resource of 40,000m^3 at 120g/m^3 over a 60m length.

Potential for Primary Tin Deposits

This area is vast and coarse alluvial tin occurs in many places suggesting that bedrock sources are close by, yet no deposits are recorded and no exploration has been conducted for them. Only at the Eastern Terrace has the granitic source of cassiterite been recorded, (see above).
The country rocks beneath and surrounding the Tertiary alluvial deposits are Devonian granitic rocks; the main rock type is a coarse-grained biotitic adamellite but in common with other granitic areas of the NE Tasmanian tinfields, according to Utah, close search reveals a number of other granitic types, particularly a late stage leucogranite, intrusive into the main mass. The granitic rocks are strongly jointed and in places veined by thin quartz, pegmatite and greisen. The exposed granite is generally hard and weathers along joints into large rounded boulders. Below the Tertiary cover, the granite is commonly weathered, chiefly by decomposition of the feldspars to a pasty, incoherent, gritty mass, containing angular quartz fragments and some unweathered biotite. The weathering is sometimes in excess of 7m in depth. Soils over weathered granite and extensive Tertiary cover have doubtless hindered prospectors from locating bedrock mineralisation.
Around 2km south of Woods Flat there is a belt of mapped Mathinna Beds. No known mineralisation is recorded here. No exploration has been recorded, yet the Beds and the contact with granite may be prospective for tin mineralisation. The Beds may in part be the source of tin at Woods Flat, and being contact metamorphosed could be the source of garnet known in the concentrates at Woods Flat.
Near Woods Flat and Eastern Terrace there are uranium anomalies (airborne radiometric survey)- these could reflect different phases of granite, possibly mineralised so would be worthwhile exploring.
The Great Musselroe River and terraces are a remarkably straight north-south system. This is postulated to be a fault zone and the fracture system could control tin mineralisation, occurring perhaps in sheeted veinlet systems of similar style to those known for example at Emmaville in the New England area of New South wales. If basement mineralisation were generally confined to the valley, this would explain why cassiterite occurs for such an extraordinary distance along the valley, yet not being exposed, has remained undetected.

6.0 EAST OF GLADSTONE

This area includes a number of deposits generally east and south of Gladstone, but some in the Musselroe valley are in section 5.0 of this report. The general distribution of deposits is shown on Figs 5, 6.

It is important to note that this area contains a multitude of alluvial deposits, whose names and locations can be confusing. The deposits have often suffered name changes, and changes of owners after which they are named, and there are differing plots by varied authors of the actual deposit locations.

General History [08-5633]

Mining of recent alluvium and Tertiary deep lead deposits to the east and south of Gladstone occurred spasmodically from the 1870s for about 90 years. Workings tended to be numerous and relatively small with no operator finding a deposit of sufficient size to ensure production over a number of decades. Production has come from a number of places (Empress, Lawrys, Cybele, Traceys, Edina, New Edina, Purdue, Arcadia, Lanka, Amber Hill, Amber Creek etc) along old stream courses believed to be sourced from high ground to the west.
Records of tin production are incomplete and very often only rough estimates that come from early Department of Mines' annual reports. The main period of operations from the deep leads appears to be 1900-1930 with the most productive mine during this time being the Edina which was producing about 1.5t of concentrate (at approx 73% Sn) per month in 1901. The richest mine in the 19th century was evidently the Empress, 7kms NE of Gladstone, which at its peak produced 100t of cassiterite (at least) for 1885-1886.

In the mid 1880s the Mt Cameron Hydraulic Tin Mining Company Ltd commenced construction of a water race from the Musselroe River to Gladstone but upon exhaustion of their capital the government bought it in 1887. It still operated into the 1990s, but the heydays were the 1920s and 1930s when there was more than 96km of race, including syphons. The race acted like a barometer in determining the fluctuations of the local tin mining industry. As new tin deposits were opened up, so the race would be upgraded or modified to meet their demands for water. The race was abandoned or closed down where areas had been worked out. Fig 8 shows the extent of the Mt Cameron water race system in this area.

The early miners did not have access to drilling equipment to assist in the discovery of new leads or extensions of those they were working, so as early as 1901 Twelvetrees recommended that the Mines Department provide assistance for test drilling. In 1904 Cybele Tin Mines drilled 142 holes at Garfield Ridge. Then a more extensive government campaign was mounted in 1916 with 515 bores for 2,810m (Blake 1937A). This drilling was undertaken by the government with the prospector paying half the cost of the program. Further government programs took place in 1937, 1945, and 1953 and other forms of assistance were also given to miners, including cash to purchase equipment.

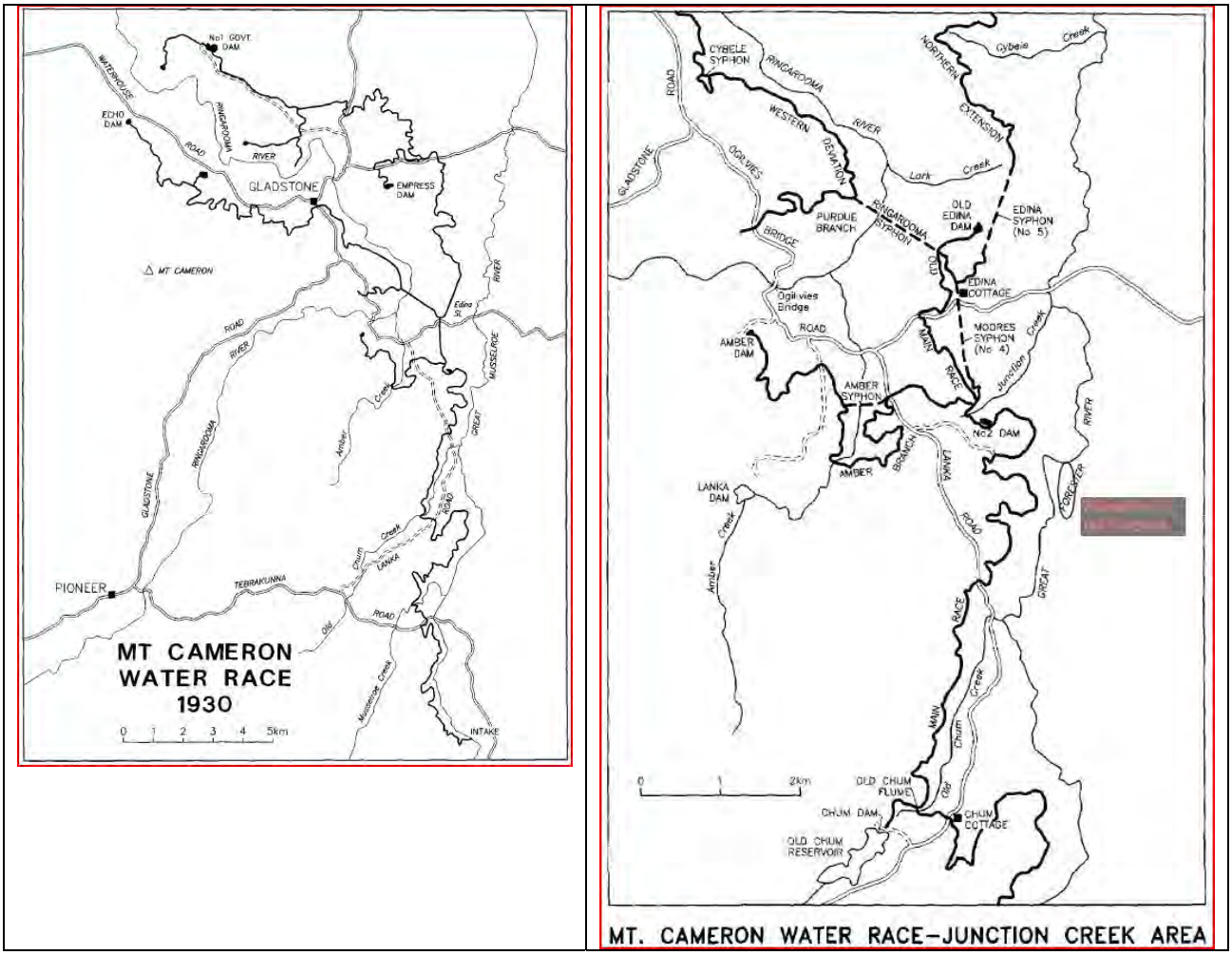


Figure 8. Mt Cameron Water Race in the Gladstone East Area

Amber Hill

Of particular interest are the results from the 1937 Government drilling of 53 holes for 962m, spaced 20m apart on lines 40m apart. Only 17 of the holes intersected cassiterite bearing gravel and this was of variable grade, however a number of high value intersections were recorded (eg. 3.2m of 3.6kg/m^3 from 13.4m, 1.5m of 8.4kg/m^3 from 10.2m, and 3.0m of 11.2kg/m^3 from 15.9m. Portion of the Amber Hill lead has been mined but it is not known whether any high grade parts remain. It is reported [Keid UR1952_129-145] that production was halted in 1952 when the lead narrowed and the height of the overburden made working it unsafe. Production 1950 to 1952 was 14.14t cassiterite concentrate, and limited records show the recovered grades varied between 240 and 420g/m^3.

Garfield aka **Lawry's**

This ground was one of the earlier alluvial tin mines in the Gladstone District, [Indep Geol Rept in Prospectus Macquarie Harbour Mining Limited]. Chinese miners are believed to have been the first to exploit it but they only worked an upper bed of alluvium. This may have been because they could not handle the major development necessary to mine the richer deep lead or they may have thought they were at the bottom of the formation. It is mentioned by Montgomery 1891 when he discusses the geology of the tin leads and tries to

make sense of the complexity of the deposits. The Mathinna Beds are exposed on the eastern side of the workings and granite is exposed nearby, so Garfield is located close to the upper granite margin. Twelvetrees 1901 states that Garfield had been profitable years ago but pumping costs had caused the mine to close. The drift is thick here ranging to 20m. In 1904-6 The Cybele Tin Mines NL drilled 142 holes indicating enough material to commence mining but there were doubts over the reliability of the work. Mining by Garfield Tin Mining Co commenced in 1926, but ceased in 1929. Drilling was undertaken and showed the main alluvial lead extended over 2km. Although the greatest thickness of alluvium was 20m commercial concentrations of tin were only present in the uppermost bed which is less than 6m thick. In addition to drilling a number of shafts were sunk to more accurately assess the grades of the wash. A total of 1,350,000m^3 was estimated to be available for sluicing from the top bed. No grades were quoted, [UR1928A_076_86, UR1928B_137_140]. In the early 1960s the Star Hill Syndicate mined the resource; Utah, exploring here at the time noted production of 25t of cassiterite per year, and in 1962 20t from 73,000m^3 for 275g/m^3.Utah attempted a few exploratory drill holes at Lawry's in 1964 but was unsuccessful because holes failed to reach bedrock.
It is apparent that the lower Tertiary alluvium, assumed to be Eocene, is almost barren and the later alluvium is tin bearing. The same applies to the Cybele-Elizabeth area, see below. This could be because the cassiterite in the younger alluvials is derived from reworking of the Eocene material, or that only in the post Eocene period were the stanniferous bedrock sources exposed.

Star Hill

The Star Hill Syndicate operated here (west of the Ringarooma River) commencing in 1935 and when work ceased in 1939 they shifted NE to the Garfield area.
Production reported in UR1952_129-145 was about 12t cassiterite concentrate.

North Cybele

Utah drilling to the north of Cybele towards Elizabeth, partly based on IP anomalies, found a carbonaceous siltstone-bearing Tertiary lead, which was traced for 1500m, but it carried negligible tin. It is east of a ridge of Mathinna Beds, and Utah thus believed that tin in the area was confined to stanniferous granite to the west, ie in the Lawry's workings area.
Drilling in 1953 by the Department of Mines at Garfield Creek near the junction with the Musselroe River, and 700m south of the Elizabeth workings, found stanniferous alluvium for which Utah[66-0430]estimated a resource of 23,000m^3 at 170g/m^3. Keid [UR1954_062-71] stated that the stanniferous alluvium cut into older Tertiary alluvium; so it is probably Miocene or younger.

Arcadia-Purdue-Jewel Flats-Edina- Dawes

Production from Purdue, Jewel Flats, Edina and Dawes, worked from before 1901 to 1921, was calculated by Utah [64-0381] to total 1,180,000m^3; grade not known except that at Purdue 300,000m^3 was at about 600g/m^3.
Limited drilling by Utah indicated that these were Quaternary terrace deposits of the present Ringarooma River with little tonnage potential (in the areas drilled).
This area could yet have considerable stanniferous alluvial potential.

Potential for Primary Tin Deposits

There is considerable potential for basement tin mineralisation in the area between Garfield and Enterprise. In this area there is a zone of contact of granite with Mathinna Beds, so it is likely that the apical parts of the granite have only just been exposed and granite could be at very shallow depths below the Mathinna Beds. Reid reported in 1928 [UR1928A_076-86] of exposures of greisen and aplite at several alluvial mined localities. In some places such as Empress the greisen was visibly rich in cassiterite.
Despite this potential there are no recorded attempts to mine or explore the basement.

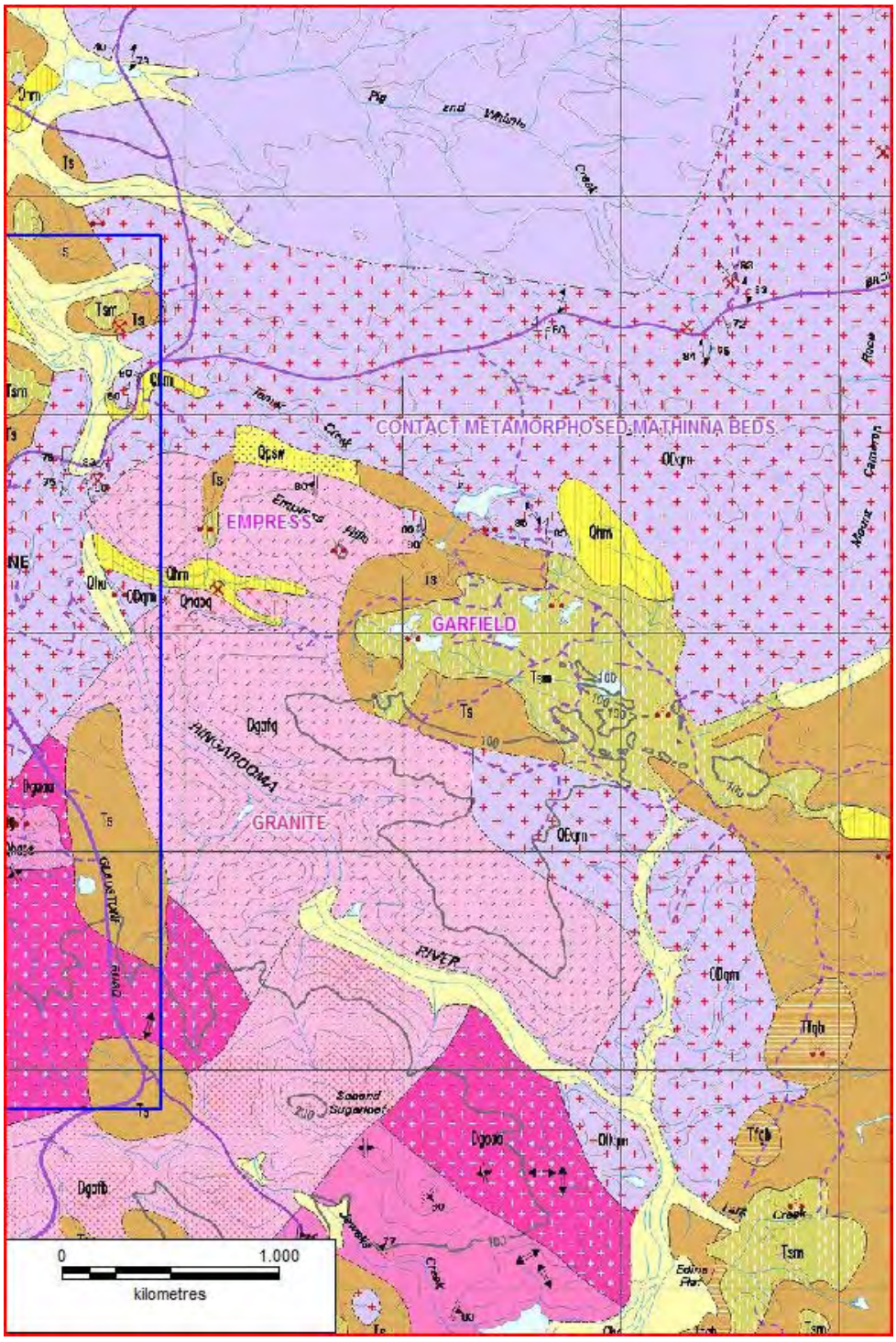


Figure 9. Contact zone granite with Mathinna Beds.

7.0 DORSET DREDGE AREA

This area contains the site of the large former producer, the Dorset Dredge, and the current producing deposits at Riverside and South Mt Cameron. The Eastern Lead system trends towards Endurance from the Riverside/South Mt Cameron/Dorset Dredge areas. Progressing further south and on the eastern side of the Ringarooma River are the Dorset Flats deposits. Areas within the Riverside, Mt Cameron and Dorset Flats deposits are excluded from the Tenement, Fig 2.

Dorset Dredge

History: (Source: Neale & Fleming, Kibuka Mines, 80-1497)
In the early 1900s attempts were made by several companies to recover tin by dredging from alluvial flats of the Ringarooma River. These dredges were steam-driven and used sluice boxes to recover tin and gold.

The earliest recorded dredging operations, by the Gladstone Tin Development Company, commenced in August 1905 near Gladstone using a bucket dredge. It was later dismantled and shipped to Victoria.

In the Dorset Flats area, approximately 3.5km north of Pioneer, two dredges operated in the early 1900s. These were the Ringarooma Bucket Dredging Company and the Dorset Bucket Dredging Company.

Figure 10

The Ringarooma Bucket Dreding Company commenced operations in 1907 and produced the following amounts of tin and gold:

Year	Material mined, m^3	Cassiterite conc, tonnes	Grade, g/m^3	Gold, g
1907	186000	29.5	160	?
1908	?	54.1		2796
1909	?	32.4		3717

The Dorset Bucket Dredging Company was formed in March 1906 and firstly instigated a drilling program. 47 holes were drilled about 15m apart on three lines; average depth of alluvium was 4.8m and the average grade was 706 g/m^3, with values as high as 2.8 kg/m^3. A further 33 holes in higher ground to the east; average depth was 5.8m and the average cassiterite grade was 356 g/m^3. Of these holes 8 contained no cassiterite. After these satisfactory results the bores gave satisfactory results, dredging was commenced, with the following production:

Year	Material mined, m^3	Cassiterite conc, tonnes	Grade, g/m^3	Gold, g
1907	179,000	42	237	1493
1908	?	67	?	1834
1909	?	32	?	3471
1910	?	18	?	617

In 1910 a new company, the South Mount Cameron Tin Dredging Company was formed from the Dorset Bucket Dredging Company and the plant was altered and repaired. The Company however had very disappointing results. In 1911, according to the Annual Report of the Secretary of Mines, 4.93t cassiterite and 303g gold were obtained. In 1912, the Company evidently ceased operations however 2.75t cassiterite and 46.6g gold were won in the first quarter of that year.

Little interest was shown in the alluvial flats along the Ringarooma River south of Mt Cameron until 1935 when Austral Malay Tin Limited drilled Dorset Flats with 63 hand bores at 120m intervals along lines 240m apart running across the valley. Austral Malay appears to have abandoned the area after completion of this work.

During the Second World War when tin was in short supply because of the occupation of the major tin-producing nations in South-East Asia by the Japanese, the Minerals Production Committee of the Department of Supply and Shipping carried out a survey of Australia's tin resources. Dorset Flats was amongst the tin occurrences examined. This area offered the possibility of rapid proving and of being a producer with minimum manpower if equipped with a bucket dredge. The area previously drilled had low average tin values in comparison with the large low grade dredging areas in Malaysia. Nevertheless the urgency of the time, the high tin price and factors favouring equipment were considered collectively to warrant exploitation of the property.

In 1942 the Mineral Production Committee drilled a further 73 holes along lines midway between the Austral Malay drill lines. The results of the two drill sets closely agreed and

from them an area of 9.7ha was selected having an average depth of 8.8m and comprising approximately 8.6Mm^3 at an average cassiterite grade of 196g/m^3. The drilling found gold but in such small quantities that grade could not be estimated. Tin and gold values were restricted to the basal wash, the overlying alluvium being barren.

In 1943-1944 the Commonwealth Government obtained a gold dredge from Redbank in Victoria and dismantled, redesigned and re-erected it on the Dorset Flats. Operations commenced in October 1944. Mining of Dorset Flats was completed by July 1959. The area yielded just over 2000t of tin concentrate assaying 75% Sn and 171kg gold for a total throughput of 19Mm^3, ie a cassiterite grade of 105g/m^3.

The dredge was then transferred to the Dorset Extended Flats approximately 1.6km downstream from the Dorset Flats. The transfer was accomplished by sluicing a 550m long channel through a ridge, towing the dredge through the channel and dredging from the channel exit to the Extended Flats -a distance of 700m and a fall of 12m.
Productive operations on Dorset Extended commenced in August 1959 and were completed in May 1963. Dorset Extended Flats yielded approximately 432t of tin concentrate assaying 75% Sn and 43.5kg gold for a total throughput of 3.98Mm^3, i.e. a cassiterite grade of 100g/m^3.

In June 1960 Storeys Creek Tin Mining Company purchased the Dorset Dredge and associated assets from the Commonwealth Government.

After mining the resources at Dorset Extended the dredge was dismantled and re-erected 22km downstream at the New Dorset area, (outside the Tenement), where operations commenced in April 1964, and ceased in March 1971.

Riverside and South Mt Cameron, and **Eastern Leads**

In 2008 Kangaroo Metals Ltd (KML) held, but failed to exercise, an option to purchase the Riverside Mining Lease 7M/2001 and the then surrounding EL21/2002.

No results of work for the ML are available from the MRT website, and Kangaroo Metals reported incorrectly to MRT that no work was done on the Exploration Licence. Actually some reporting of work done is available in various 2008 reports to ASX.

KML released a JORC indicated plus inferred resource at Riverside of 367t SnO_2 at an average grade of 449g/m^3, (ASX release 13 June 2008).

At South Mt Cameron, just to the south of Riverside, they also trench sampled old Amdex tailings and tailings plus unworked alluvium in Gunns Quarry, both of which areas are now in Mining Lease 18M/2009. (Sept 2008 Quarterly Report). Tailings of about 170,000m^3 had grades around 220g/ m^3. The unworked alluvial terrace above the tailings area was pitted to depths in excess of 6.5m, with no basement identified. The preliminary grades on these full face samples varied from 500 to >1500g/m^3, with a total volume within the tested area of >45,000 m^3. Additional areas outside the defined testing area were noted.

A regional study was carried out for which little information was given. Fig 11, extracted from this KML report shows the extent of identified potential alluvial deposits in the Eastern Leads systems.

Work by Kibuka [79-1355] suggested that the Eastern Lead (including Corduroy Ck lead) perhaps ranked in potential size behind Pioneer and equalling the Endurance lead. In 1983 when farmed out to Australian Anglo American, the area except for swampy parts was drilled, finding low tin values, [83-1945]. No work has since been done. There is still doubt whether this area has been adequately drill tested; research by Tin Dragon of past work done in this general area is as yet incomplete.

Prospectivity for alluvial deposits

The Dorset Dredge worked a Quaternary age river terrace deposit, formed from former abandoned channels of the Ringarooma River.

There appears to be little potential for remaining river terrace resources immediately along strike or laterally from the known dredged areas.

Potential does exist though in the general area for older alluvial leads such as at the Eastern Leads system.

Prospectivity for basement deposits

I have not noticed any written reference to bedrock mineralisation which may have been encountered during drilling or during mining of the dredged resource.

The presence of coarse grained cassiterite and other recovered heavy minerals like gold and large grains of sapphire suggests that the basement source is nearby. It has been assumed that there are cassiterite bearing greisen veins developed in granite near its upper contact with Mathinna Beds, and gold in quartz veins in the Mathinna Beds, and that this upper contact zone has been removed by erosion. However it is possible that basement mineralisation in the form of granite hosted sheeted micro-veins of quartz and greisen does occur below the dredged alluvium, or close by. Such systems have never been explored.

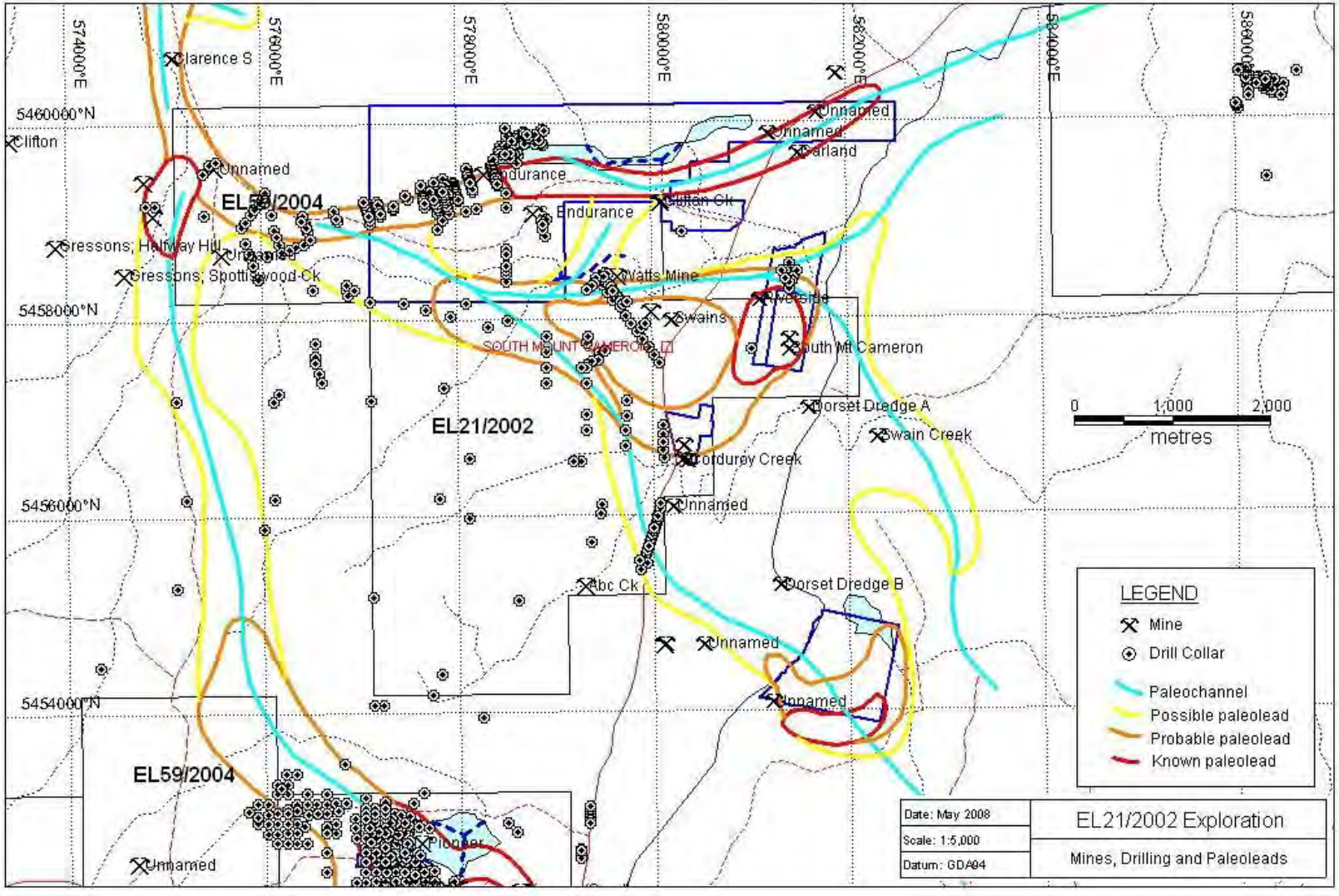


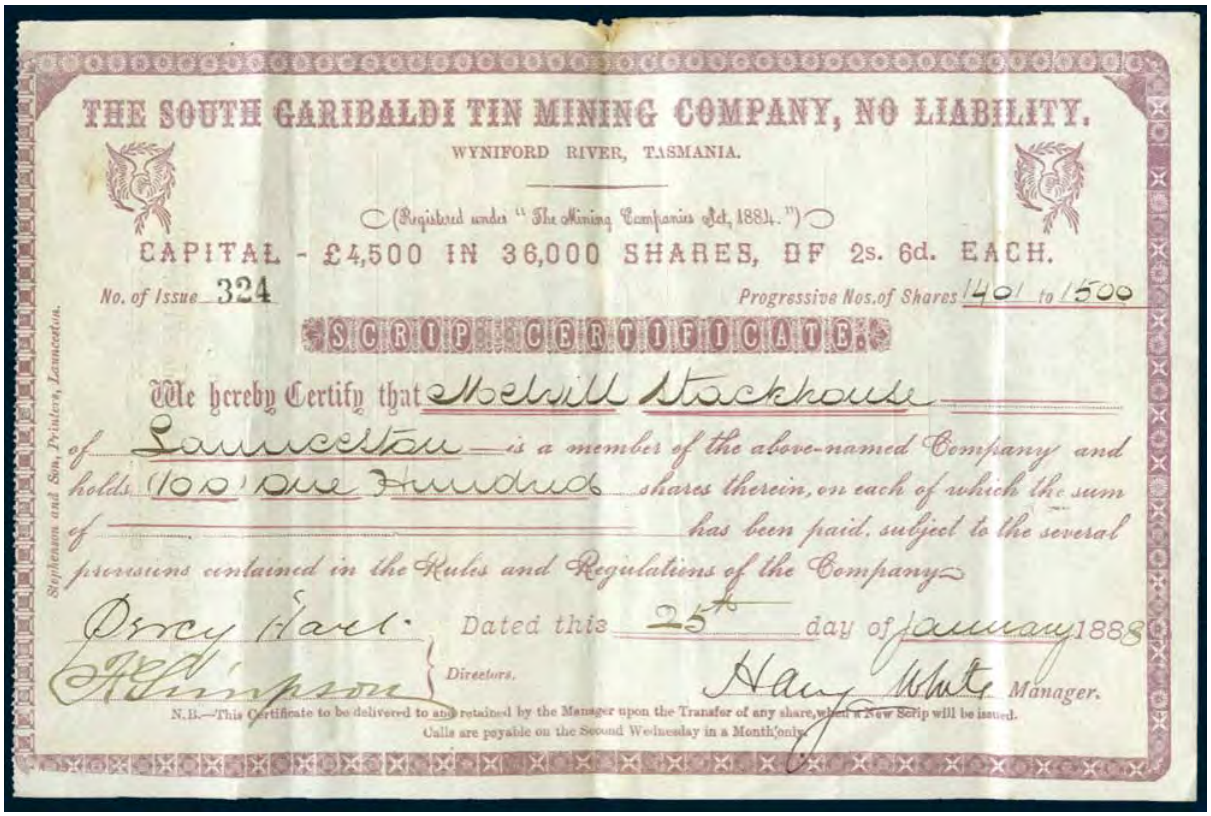
Figure 11

KANGAROO METALS LIMITED

8.0 WYNIFORD RIVER AREA

History

Tin mining was commenced in the Wyniford area in the 1870s by Chinese miners. Companies operating in the area included the Garibaldi Tin Mining Company (reporting in local newspapers in 1876) and The South Garibaldi Tin Mining Co NL operating in the 1880s.By the year 1888 a town had become well established at Garibaldi on the western bank of the river some 3km south of Pioneer. Mining appears to have peaked in the area in about 1891 and by 1893 was in decline as most of the easily worked ground had become exhausted. Subsequently European miners constructed water races throughout the area, particularly around Garibaldi and worked extensions to the older workings. The Rajah Tin Mining company operated from before 1928 to at least 1935.



THE SOUTH GARIBALDI TIN MINING COMPANY, NO LIABILITY.

WYNIFORD RIVER, TASMANIA.

(Registered under "The Mining Companies Act, 1884.")

CAPITAL - £4,500 IN 36,000 SHARES, OF 2s. 6d. EACH.

No. of Issue 324 Progressive Nos. of Shares 1401 to 1500

SCRIP CERTIFICATE.

We hereby Certify that Melvill Stackhouse

of Launceston is a member of the above-named Company and holds (100) One Hundred shares therein, on each of which the sum of _____ has been paid, subject to the several provisions contained in the Rules and Regulations of the Company.

Dated this 25th day of January 1888

Percy Hart. Directors.

H. Simpson

Hary White Manager.

N.B.—This Certificate to be delivered to and retained by the Manager upon the Transfer of any share, when a New Scrip will be issued.

Calls are payable on the Second Wednesday in a Month only.

Stephenson and Son, Printers, Launceston.

Figure 12. January 1888, must be a lucky area.

In the mid 1970s several small machine mining operations commenced in the upstream areas (such as the Wildcat workings). For a short period B.M.I Mining held a small 10 acre lease in the upstream section but did not conduct any work on the ground.
In 1968 Texins Development Pty Limited were granted an exploration Licence over the Wyniford and surrounding areas (EL 6/68). In 1973-1974 Geophoto Resources Consultants, for Texins, conducted reconnaissance field work, pitting and sampling of alluvial deposits. 172 backhoe pits were dug, 152 of which were channel sampled, and a total of 300 samples processed. Subsequently Geophoto derived resource volumes and grades, see VDM work below.
By the early 1980s all mining activity had ceased.

In 2002 Mineral Holdings Australia Pty Limited were granted EL 1/2003, which was transferred to Van Dieman Mines Pty Ltd (VDM) in 1974. VDM conducted exploration until 2009, see below.

Geology

The Upper Devonian to Lower Carboniferous Blue Tier Batholith acid igneous intrusive rocks form basement throughout the area. These intrusives are generally porphyritic, coarse grained biotite or biotite-muscovite granites and adamellites. Locally there are minor coarse to very coarse grained pegmatitic varieties. Cassiterite in the Wyniford River alluvials is considered to be derived from these intrusives.

Field mapping by VDM indicates at least four periods of alluvial deposition within the Wyniford watershed. These consist of recent active stream deposits, Quaternary units and both younger and older Tertiary terrace deposits. The latter is a very old high level alluvial deposit located well away from the present stream valley. The alluvial units are masked in many places by thick layers of old alluvial mine tailings particularly in the vicinity of Garabaldi Township.

VDM note in 2008 that the younger Tertiary deposits appear to be the most significant of the cassiterite bearing deposits however they do not appear to "consistently" contain gem minerals other than topaz and granitic zircon. Regarding the Quaternary deposits VDM were by then silent about sapphire content; the area reputedly carries sapphires (see section on sapphires in this report), so it seems more sampling will be necessary to verify their presence in the Wyniford River valley deposits.

VDM Exploration

Four bulk samples, of about 30m^3, using an excavator, from 3 areas were processed. One bulk sample from the south, sample 3, in the area of the Wildcat Workings, had coarse cassiterite, in sizes up to 10 mm, much of it being locked on greisen or quartz fragments.
VDM spent some time carrying out, but did not complete, field locations of earlier Geophoto pits, so that more accurate resource calculation could be made.
They discovered a hitherto unrecognised older Tertiary lead to the west of the river, but carried out no sampling there.

Resources

During the period 1973 to 1974 Geophoto Resources as consultant to Texins Development Pty Limited conducted a comprehensive program of backhoe pitting and sampling along the river terraces flanking the Wyniford River. As a result of those works Texins established two distinct resource volumes, which were recalculated by VDM to be:

Quaternary Alluvium (including Tailings)
352,000m^3 at a grade of 320g/m^3 of 72% SnO2

Tertiary Alluvium
Between 23,700m^3 and 34,500m^3 at grades of between 760 and 979g/m^3 of 72% SnO2

In 2007 Kinnane as consultant to VDM calculated a JORC resource of:
0.85Mm^3 @0.65kg/m^3 for 552.5t cassiterite.
It was annotated with this comment:

> "Current exploration activities including GIS and database studies will result in a further upgrade for this deposit to at least "measured" status. Gem component unclear, tin component established by test pitting and bulk sampling. Topaz and spinel features as a possible additional gem product"

No details of the calculation, nor outline map of the resource were provided.

Kinnane in VDM report [06_5319] noted that the resource covered a central area where Geophoto conducted pitting, and considerable potential existed to the south and to the north.

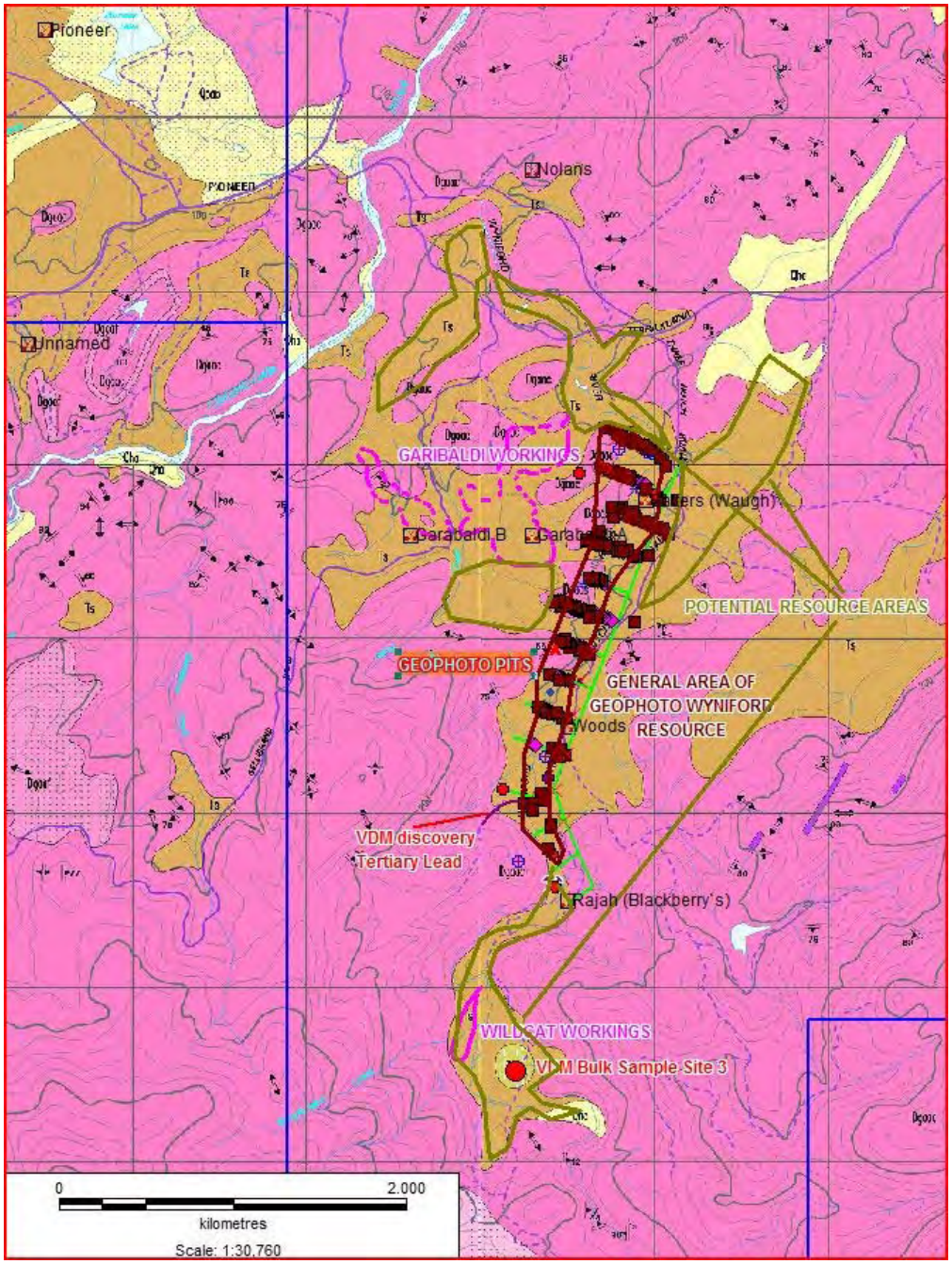


Figure 13 WYNIFORD RIVER RESOURCES

Potential for basement mineralisation

It has been assumed by previous operators that the cassiterite in the alluvials is derived from the well mineralised greisen bodies in the Blue Tier Range to the south, outside the Tenement.

It seems more likely that there are nearby sources, and that as yet undiscovered mineralision hosted in the local granites exists widely. This is supported by the noted presence by VDM of cassiterite in greisen and quartz in the south of the area. It is also supported by the extraordinary area of tin anomalism in stream sediment sampling in this area, as illustrated. There is no reported exploration of basement, yet the potential is rated high.

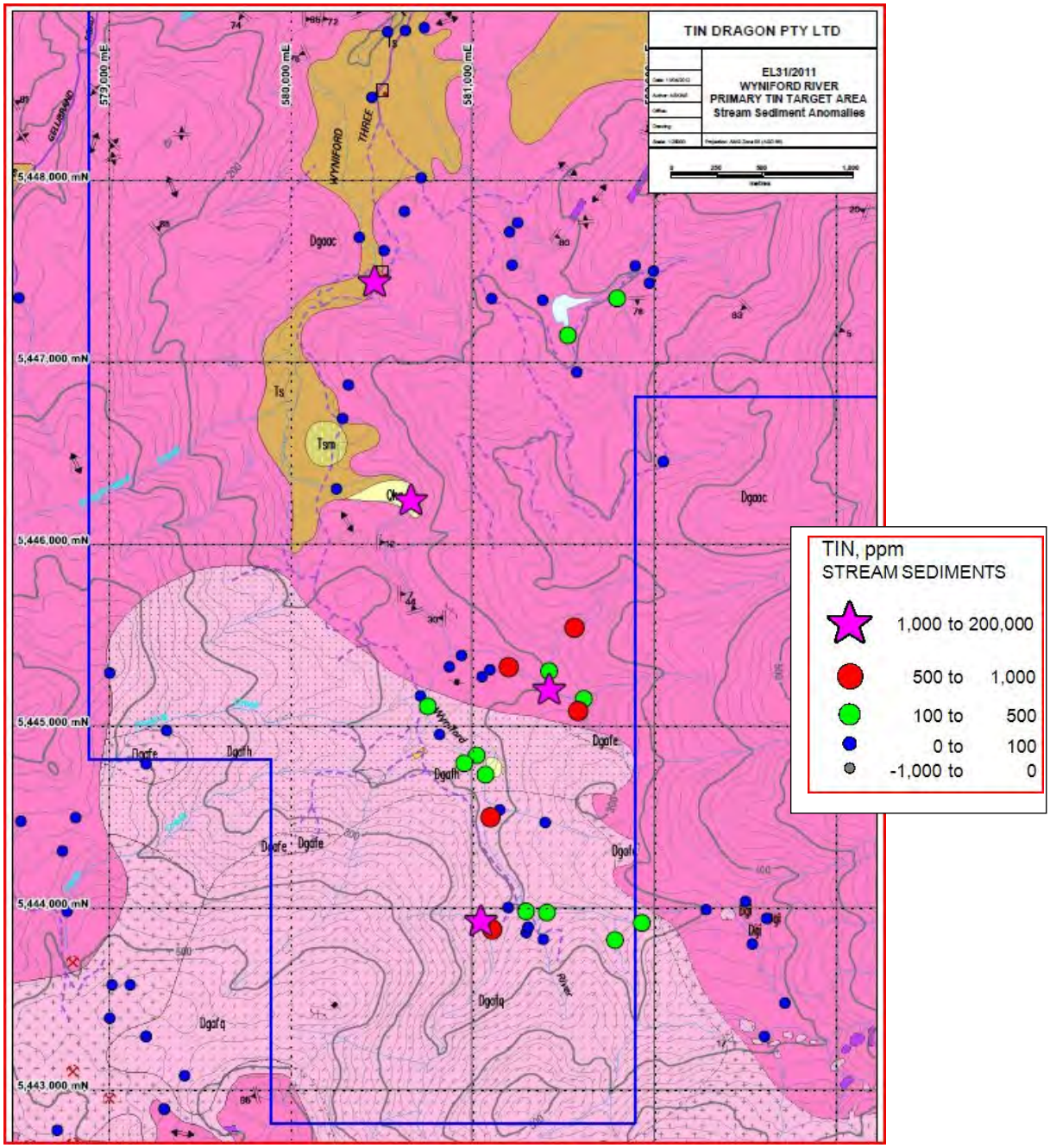


Figure 14. Regional Stream Sediment Sampling Wyniford River Area.

9.0 SAPPHIRES

Introduction

[The following was largely derived from the web site or the 2004 Prospectus of Van Dieman Mines (VDM), from MHAPL reports such as 01-4616, and VDM reports such as 09_5928 and 10_6111].

Sapphire has been recorded from a number of localities throughout Tasmania, however it is only those locations in the north and north east that have sufficient size potential to become attractive for large scale mining exploitation. Sapphire was regularly reported as a component of the tin bearing alluvial gravels in north east Tasmania and was often recovered from tin shed concentrates at such operations as the Briseis, Pioneer, and Endurance Mines and from the Dorset dredging operations in the Ringarooma River. Alluvial localities with known sapphire are shown on the map below:

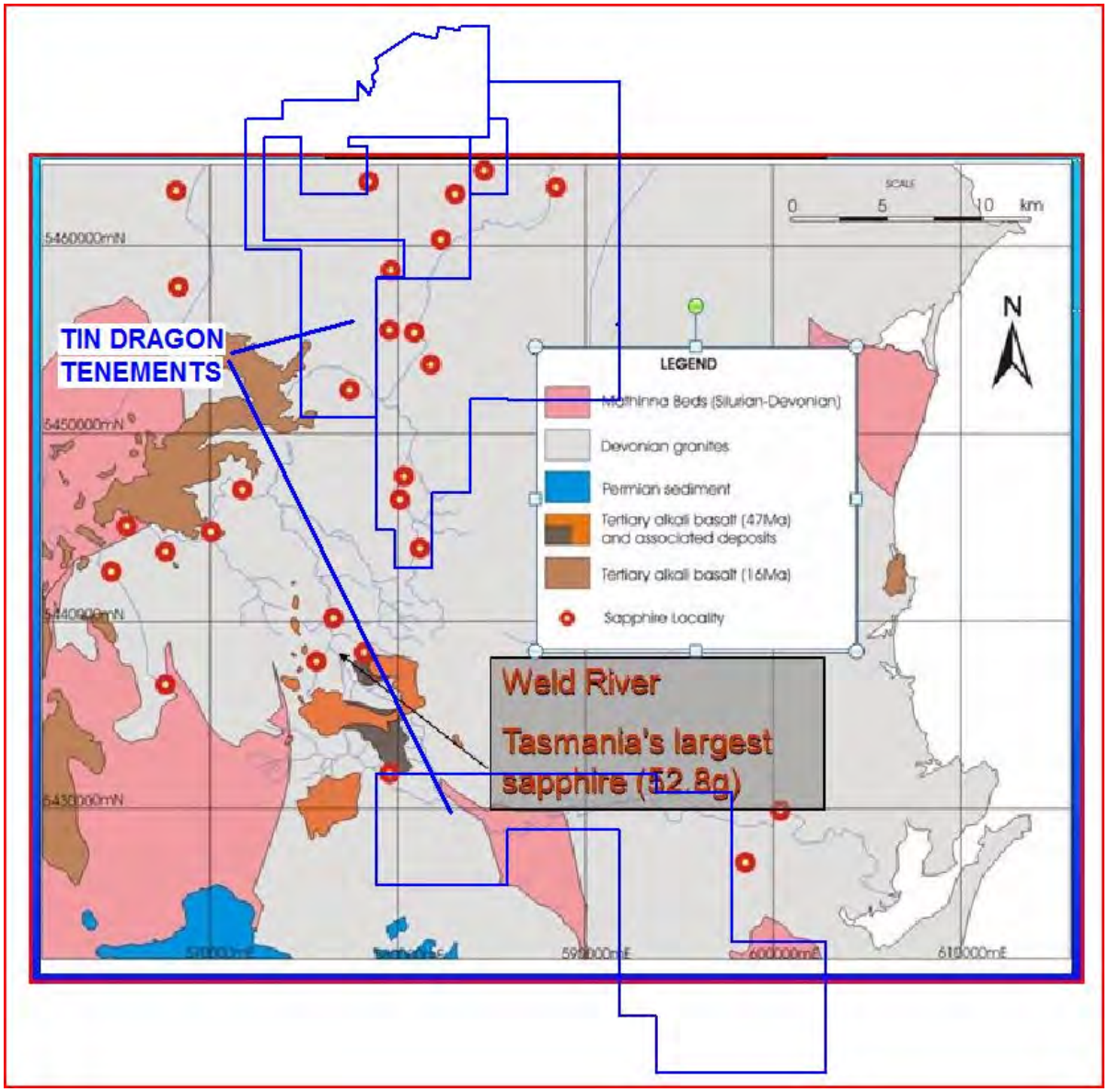


Figure 15. SAPPHIRE LOCALITIES NE TASMANIA, after McGee 2005

B McGee in a BSc Hons thesis Uni Tas in 2005 studied the age and ultimate bedrock source of the sapphire, focussing on Weld River area. Dating of zircon inclusions in sapphire of 47 ±4Ma is the same age as the Weldborough Basalt confirming that the basalts, including explosive phases such as tuffs, ash flows and agglomerates, brought the sapphire to the surface. He concluded that Weldborough basalts, including are the source of all sapphire, spinel and zircon found in the Ringarooma, George and possibly the Boobyalla River catchments, yet he admits that there is no reason (he had no evidence that) the more common Miocene younger basalts did not also yield sapphires.
Sapphire size varies from 1mm through to pieces of more than 25mm. They have a dominant blue hue, pale to beautiful cornflower, exhibited by the 20% gem fraction of the sapphire concentrate. A small component also has a milky appearance like the Sri Lankan Gueda gems that heat treat to the finest blue.
The sapphire bearing stanniferous deposits of the Weld River are probably the best known and exploited. In addition to blue stones these streams contain green, brown, black, red and rarely yellow gems, and star sapphire is quite common particularly in Spinel and Black Creeks.
It is unlikely that any stand-alone sapphire deposits will be located, because average tin bearing alluvium seems to contain about 2g/m^3, of which around 20% seems to be of gem quality. According to VDM [Kinnane, 10_6111] sapphire is by far the second most significant valuable component of the heavy mineral fraction in alluvial tin deposits in NE Tasmania. Thus sapphire will, if recovered, significantly enhance the economic viability of future tin mines because it is a minor component in most of the known alluvial tin deposits.

According to GemSelect, in 2011 sapphire is the second best-selling coloured gem in the USA, after tourmaline.

History

Early tin miners first reported the presence of sapphire from many mining locations throughout the north east. None of those early reports were quantified and sapphire was not treated as a significant component of the alluvial deposits. Generally it was not of interest to miners and explorers.
Sapphire is a significant component of the tin shed tailings at the Pioneer, Endurance and Dorset Mines. Previous operators report that sapphire of fine blue colour was regularly recovered from the primary and secondary jig beds during clean-up.
There have been a number of significant stones recovered by fossickers. A 264 carat stone was recovered in the Weld River [Catalogue of Minerals of Tasmania, MRT]. In 1933, a 900 carat stone was reported to have been discovered in mining detritus at the Weld River.
Mineral Holdings Aust Pty Ltd (MHAPL) in 1999 obtained a Special Exploration Licence SEL22/1999 over a vast area of the north east corner of the State, (2693 km2). In 2004 Van Dieman Mines (VDM) acquired this tenement from Mineral Holdings Australia (MHA), as part of a package of 13 exploration tenements, all located in NE Tasmania. Reconnaissance exploration by MHAPL has confirmed that gem quality sapphire is a component of many of the tin bearing alluvial leads, and along with gold and other heavy minerals comprises a potential economic component previously overlooked in most test programs.
A statistical review was carried by MHAPL on the size range of sapphires in public and private collections. All parcels of sapphire recovered by MHAPL in its test programs since 2001, or observed in the collections of local miners and prospectors appeared to contain

between 20 to 30% blue gem material. Large stones, greater than 6mm, were rarely observed although historically such stones were regularly reported to have been recovered during alluvial tin sluice box and jig plant clean-up. Such stones are in the collection of the Derby Museum, and other private collections in the region. The absence of such stones in most parcels can be explained by their removal by the owners as specimens or for cutting.
In addition to the sizing analysis, MHAPL arranged to have some small parcels of very poor quality blue sapphire/corundum heat-treated, by an Australian gem cutter. Heat treatment proved effective in that most untreated parcels containing between 20 and 30% blue gem, appear to improve to between 30 and 40% blue gem.
VDM's exploration of sapphires included some bulk testing, acquisition from prospectors of parcels of sapphires, and they sought alliances with gemstone cutters and marketers.
In 2007 VDM and Columbia Gem House (CGH) formed a 50:50 joint-venture company called "V Columbia" to market all gemstones recovered from VDM's Tasmanian operations. Columbia Gem House, Inc. is a vertically-integrated gemstone mining, cutting and marketing company and is a charter member of the American Gem Trade Association. Columbia Gem House, Inc. is perhaps best known as the world's largest supplier of brand-name exotic gemstones. Sample rough and finished gemstones, including blue sapphires and black spinel, were displayed at two major USA gem shows in 2007 and 2008. The product name "Tasmin Blue" was being used before VDM went into liquidation.
In 2007 VDM arranged for a heat treatment of parcels of sapphires taken from outside Tin Dragon's current tenements. They reported that heat treatment was successful and sapphires did not become very dark, which can commonly happen elsewhere. This is apparently especially true of basaltic sapphire which often has a large rutile content, and heating can render the material too dark for gem use.
The benefits of heat treatment of gemstones are many. Key benefits are that the removal of impurities through heating generally causes the stone to exhibit a more consistent and transparent colour, which is aesthetically pleasing to a potential buyer, and that a heated stone is generally easier to cut.
Relevant bulk testing in Tin Dragon tenements is reviewed below.
VDM's exploration expenditure for sapphires in Special Exploration Licence SEL22/1999 was reported to MRT to be $826,000.

Sapphire Exploration in the Tenement

DORSET DREDGE

The Ringarooma River is also considered to be a significant sapphire source. Stones observed by Kinnane from VDM varied from -1 mm to +10 mm in size, most are rounded a few angular. Hues are predominantly of fine blue but there is a larger green, partly blue-green, brown, black and star component. Kinnane reports that John Volker the ex-manager of the Dorset Dredge possessed a small parcel of fine blue stones obtained by him when the dredge was working the Dorset Flats. Volker advised that coarse and fine sapphire was regularly observed on the primary and secondary jig beds during clean-up. Heavy "ragging" of the jigs to enable high grade tin concentrate production would not have been conducive to the recovery of the much lighter sapphire and that much of the sapphire would have been washed from the bed into tailings.

RIVERSIDE (SUMMERS)

This area lies west of the Ringarooma River and north of areas previously worked by the Dorset Dredge. The resources are apparently Quaternary River Terraces, not Tertiary leads. Kinnane [10_6111] stated that in 2003 abundant bright blue sapphire can be observed on the beds of the primary and secondary jigs at the then current operation at "Summers Mine".
The unmined wash returned values averaging 13.5g/m^3, a significant result when the same samples also yielded 1.83kg/m^3 of cassiterite and 125mg/m^3 of gold. Further the sapphire samples contained 32% of blue gem, 36% star and the balance brown sapphire and corundum. A dished sample from the wash face at the mine yielded two dark grey sapphires each of 0.4 carats in weight.
Abundant blue sapphire can be observed on top of the primary and secondary jig beds and in the tailings being discharged from the plant. The observed abundance of sapphire supports a primary grade of well in excess of 2g/m^3. Summers heavily rags his jigs, his final tin concentrates consistently averaging in excess of 76% Sn. Such practice is not conducive to sapphire recovery.

WYNIFORD

The Wyniford River drainage has yielded large fine blue sapphire particularly in the area around Salter and Woods Mines. Sapphire recovered from the Wyniford River is usually of a fine blue colour although fancy stones (pinks) and yellow stones are reported as being common.
VDM collected 12 samples from this drainage system. Initial reconnaissance samples returned sapphire only from sites in the downstream section of the River close to its junction with the Ringarooma River, but re-sampling confirmed that sapphire of blue, yellow, green and parti–colour hues is a significant constituent of the tin bearing alluvials of the mid to upper reaches of the Wyniford system.
VDM purchased from prospectors a parcel of sapphires from 3 to 4m deep alluvials in the Wyniford River in the vicinity of the Woods Alluvial Tin Mining operation. The 200g parcel consisted of mixed gem, sapphire / corundum, zircon, topaz, quartz, cassiterite and spinel.
A resource here is estimated by VDM to be 0.4Mm^3 at +3.0 g/m^3 of Sapphire (30% gem quality).
It should be remembered that all material sampled and processed to date is effectively tailings from previous mining operations; "virgin" material is yet to be processed.

Figure 16. VDM pilot plant at Wyniford River

EAST OF GLADSTONE and MUSSELROE AREAS

No sapphires are reported from these areas of alluvial tin production. There are no known basalts nearby or up-drainage so no sapphires can be expected to occur.

10.0 OTHER MINERALS

Apart from Tin and Sapphires the Tenement has prospectivity for clay, ion-adsorption rare earth deposits, gold, tungsten, tantalum, monazite, zircon, rutile, ilmenite, and other gemstones such as topaz and peridot.

Clay

There are large deposits of kaolinite clays associated with both alluvial and eluvial (weathered granite) tin workings in NE Tasmania. Known clay deposits within the Tenement are as follows:

Scotts

In 1961 [63-0355] the Dorset Kaolin Division of Storeys Creek Tin Mining Co drilled out a resource of 140 000m^3 of 77 brightness.

The Ballarat Clay Company (BCC)[79-1322] in 1971-5 carried out further drilling, partly in areas exposed at the time by mining of the Eastern Leads tin deposit. The conclusion was that in the area extending south¬easterly from Scotts to the Ringarooma River there is a very large volume of high-yield saprolite but that only small isolated patches reach or exceed 80 brightness.

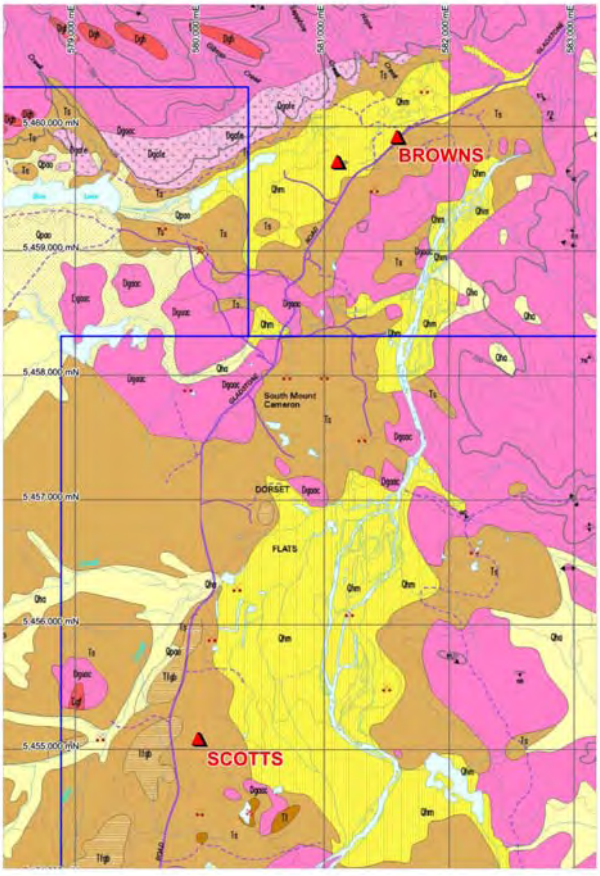


Figure 17. Location of Scotts Clay Deposit

Amber Hill Area

BCC report that a pipeline cut saprolite with 78.5 brightness and 48% yield at minus 20 microns. Hand sampling from selected exposures in a creek bed south-easterly from the workings returned 82.0 brightness and 46% minus 20 microns.
In 1970 fourteen churn drill holes encountered reasonably good material. One had 4.5m averaging 84.6 brightness and 50.7% minus 20microns.
Samples supplied to Englehard Minerals and Chemicals Corporation of Menlo Park, Edison, N.J., as consultants, were reported as being more promising for coating clay production than other Tasmanian crudes submitted to them.
In 1972 a bulk sample was obtained and the 7micron fraction prepared from it was reported by the Australian Mineral Development Laboratories to be "dominantly highly crystalline kaolinite, with a trace (less than 5%) of mica-illite and a trace of quartz (approximately 1%). No halloysite was detected". The absence of halloysite was regarded as an indication of probably lower viscosity for clay suitable for blade coating of paper.
In 1973 the area was mapped and additional drilling done in an unsuccessful endeavour to prove some finite reserve. Average thickness of the known first-class white saprolite was "only" three or four metres, and no extension of the deposit was found.
In 1977 a further bulk sample of some 15t was obtained for local pilot plant work but it did not help in solving the viscosity problem.

Lark Creek

Located 4.2km SE of Gladstone, at AMG Z55 588700E/5462300N. BCC report that good quality white granite saprolite was exposed in a tin sluicing lease and surface samples taken in 1971 showed 83.5 brightness and 52% minus 7microns. It wasdrilled in 1974 to test the thickness of exposed material. In two holes the maximum depth capacity of 4.5m was reached in good quality material, one hole bottomed at 4.25m, one at 3.3me and one at 1.5m. Four holes intersected only stained saprolite. A composite sample of obviously commercial grade material from these bores had a minus 12micron brightness of 81.0 and a minus 5 micron brightness of 82.0.
It was apparent that some small production was possible from the area stripped by sluicing but drilling to extend to an economic sized resource failed to find quality clay under the overlying alluvium in an easterly direction.

Arcadia

The Arcadia workings are situated on the eastern side of the Ringarooma River about 2.4km NE of Amber Hill. BCC report that poor quality saprolite is exposed at a tin mining lease and surface samples taken in 1970 averaged 73.7 brightness and 59.5% minus 20microns. From 1971 to 1978 23 drill holes were completed but inferior clay was intersected in all areas.

Garfield-Cybele

BCC reports that the extensively mined area had an exposed bottom in slate-sandstone but there are isolated patches of granite saprolite particularly along Cybele Creek. Much of the area was held under mining leases and active mining was in progress at the time (around 1970-1979), so that it was not practicable to carry out drilling. A saprolite bottom sample had the very good minus 20 micron brightness of 87.2 with a yield of 54%.

There are possibilities in the area of patches of good quality primary and secondary clay but in spite of the considerable surfaces exposed from time to time by the mining operations, there was no indication that an extensive deposit was likely to be uncovered.

Garibaldi

Granite saprolite is exposed in old workings on the northern flank of Garibaldi Hill. Samples from exposed faces taken byBCC in 1970 showed good yields but sub-marginal brightness. In 1975 hand drilling of the most promising exposures showed a falling-off of colour and yield within two or three metres of the surface. A composite sample from three bores had a minus 12micron brightness of 76.1 which improved to 78.5 in the minus 5micron fraction. These results were not sufficiently encouraging to justify drilling.

Gold

Gold is a common component of the heavy mineral suite in many of the alluvial deposits in the Gladstone- Mt Cameron region and often gold was recovered as a minor though significant by-product of mining.

Gold being heavy is unlikely to have travelled far so it is probable that the bedrock sources are close to the alluvial deposits. There are known small quartz vein hosted gold deposits in a cluster south of Gladstone, hosted in Mathinna beds. Some contain cassiterite. Presumably there is granite at shallow depths below. It is possible that similar veins in similar rocks are the sources of the gold in the widespread alluvials. These rocks are now eroded away or not exposed or possibly are exposed but unrecognized.

The potential for significant basement stand-alone gold mineralisation is low, because intense prospecting in this area would likely already have discovered it.

Below are notes on known gold in the more important alluvial deposits in the Tenement:

Dorset Dredge recovered sufficient gold from its operation to meet part of its annual cost. VDM claimed that the gold grade averaged around 30mg/m3.It is not known if the recovery process, having been optimised for cassiterite was able to efficiently recover gold.
Pioneer, Endurance and Monarch. Gold is reported to occur here in the concentrates, though we can find no supportive literature. WE have seen no gold reported in the production records, so we assume the gold content here is negligible.
In this respect the resources of gold in these tin deposits calculated by VDM, albeit they are JORC compliant, are possibly unreliable.

Riverside. VDM reported unmined alluvium wash returned 125mg/m3 of gold.

Star Hill and Amber Hill. Gold occurs in the tailings sampled by MHAPL.

Tungsten

Quartz veins containing some wolframite occur in the group of primary deposits south of Gladstone, outside TD tenements.

In the Tenement there are no known tungsten deposits. There is no potential for tungsten in the alluvials because tungsten minerals are too soft to survive erosion and transport, however there is definitely potential for primary deposits, which likely would be of quartz vein styles in both granite and Mathinna Beds, and probably hidden under the extensive cover of alluvium and soils.

Ilmenite and Rutile

Ilmenite is the most abundant of the titanium bearing minerals. Field observations indicate that ilmenite content substantially exceeds that of rutile. Much of the ilmenite was traditionally lost to tailings and no effort has been made to quantify content in exploration programs, (except for one program by VDM in the Fosters Deposit in the Great Northern Plains, outside TD tenements).
None appears to have been produced as a by-product in the district though there is ample justification for this for the future, because content can be significant. For example AMDEX reported in 1981 [81-1528] that at Pioneer concentrate from the basal alluvium contains 58.9% cassiterite, 28.1% ilmenite, 6.5% monazite, 3.4% zircon, 1.6% topaz, 1.5% 'others'.

Rare Earth Oxides – Monazite and Xenotime

VDM reported that the tin shed tailings from Pioneer, Endurance and the Dorset Dredge all contain appreciable quantities of these minerals. They report to the magnetic fraction of the heavy mineral concentrate and comprise between 0.2 to 5% by weight of the concentrate.
Morrison [10_6109] states that at Pioneer, monazite comprised 6% of the heavy mineral assemblage and was considered a nuisance rather than a credit.

There probably are considerable amounts of these minerals in all the alluvial tin deposits but rarely has it been quantified and rarely produced as a by-product. The Endurance Mine sold 34t of monazite in 1934 but the mode of production is unknown, [95-3703]. It has been noted as abundant in concentrates in mines in the areas east and south-east of Mt Cameron. The Mt Cameron granite probably has a high monazite content judging by its high thorium response in recent airborne surveys by MRT, see Figure 18.

The rare earth content of monazites was studied by MHAPL by submitting to AMDEL Laboratory a sluiced concentrate from an unstated site in the Great Northern Plains, [99-4334]. The monazite contained 24.4%Ce, 1.84%Y, 6.59%Th, and 0.39%U.

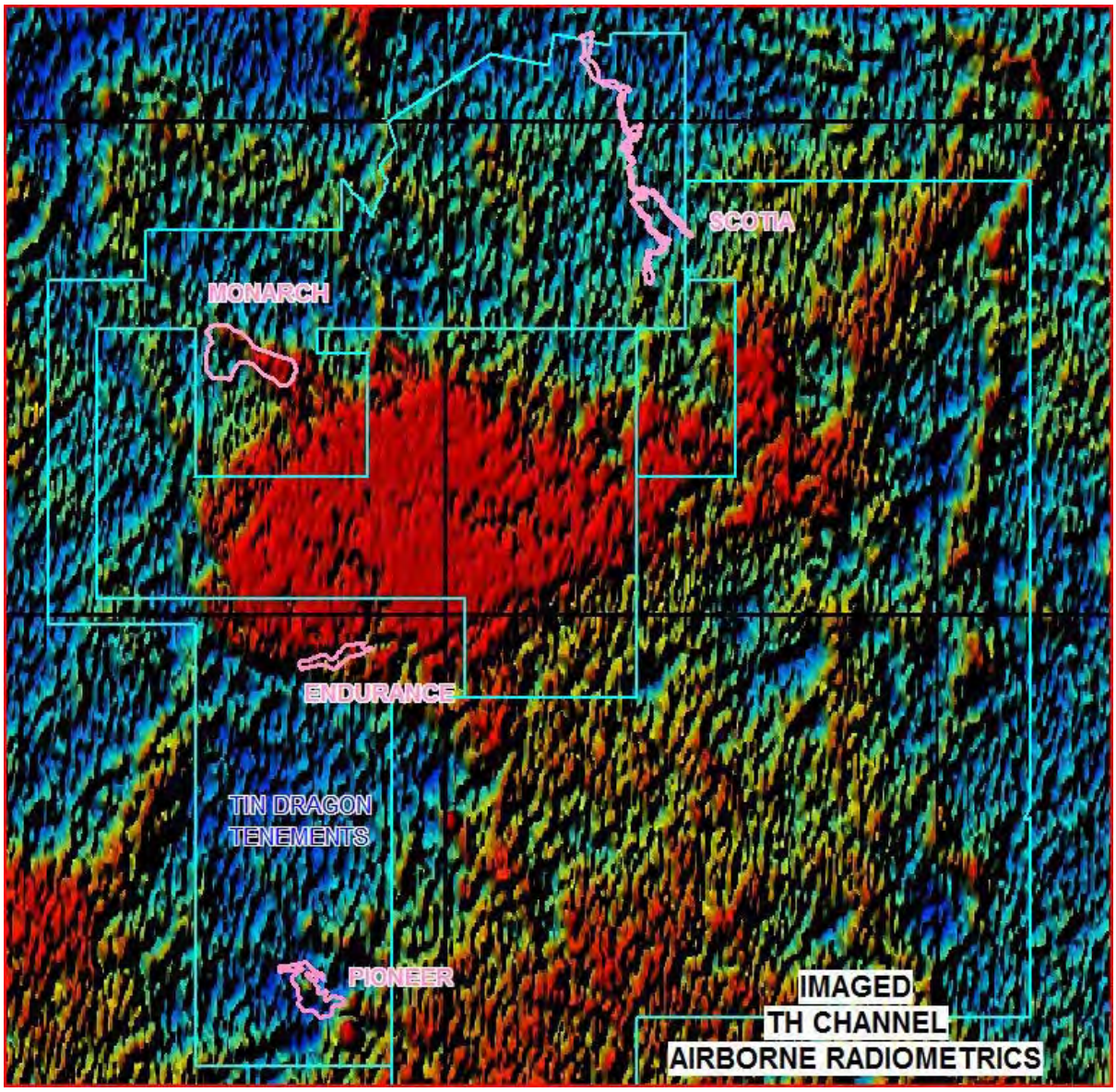


Figure 18. Intense Thorium anomaly corresponding to the Mt Cameron granite body.

Zircon

VDM reported that 3 types of zircon have been recognized in the alluvial deposits including: Fine zircon grains, -5 mm in size, commonly observed in the cassiterite concentrates at all mine locations, considered to have been derived mainly from granitic rocks. Like ilmenite and monazite it has not been produced as a by-product nor sought in exploration programs, though given its high price at present it has clear economic importance in the future.
Two separate generations of coarse zircon observed at widespread locations in the north east, derived from the Tertiary basaltic units. The material varies in size from 1mm to +10mm. Colour varies from pale red to bright foxy red. A proportion of the larger stones makes attractive facetted gems, but are apparently quite rare.

Tantalite/Columbite

There is no known occurrence of tantalite/columbite is the district. As a very minor component of concentrates there is chemical analytical evidence of tantalite–columbite series minerals in areas north-west of Gladstone, outside the Tenement. (Kinnane, in GNP Report_11 2003, reports on studies of concentrates from drilling programs by Santos and MHAPL. This found evidence that at least some of the Ta + Nb occurs within cassiterite, and that Ta+Nb: Sn was 1:170).

Topaz

Gem quality topaz, some of considerable size and excellent blue colour is known on the north side of Mt Cameron, for example in Sexton Ck, 2.6km west of Gladstone, Twelvetrees 1916. Occurrences in the Tenement probably exist but references to them have not been found.

Peridot (Olivine)

According to VDM gem quality green olivine is abundant in the Younger Tertiary Basalts particularly in the vicinity of the Briseis Mine at Derby. Grains of bright apple green olivine have been reported from most of the alluvial deposits.
There is a low expectation that the deposits in the Tenement will yield a significant quantity or quality of peridot.

Rare Earth deposits of Ion-Adsorption Types

Kinnane, in GNP Report_11 2003, reports on testing for this style of rare earth deposit, known at Chinese producing mines. This work was at Monarch and Aberfoyle Hill, north-west of Gladstone.

The high thorium airborne geophysical responses in the area, and the deep weathering and ocurrences of clays, augur well for the development of this style of mineralisation, which has not yet been sought in the Tenement.

11.0 TOTAL ALLUVIAL TIN RESOURCES

Table 2 below lists all calculated resources from previous explorers, including the possible and potential categories, and adds the known production so as to produce a calculated **Endowment** for the Tenement of **4500 tonnes of cassiterite**.

Table 2 Tin Endowment

ENDOWMENT - PRODUCTION PLUS RESOURCES - Tonnes Cassiterite			
DEPOSIT	**Production**	**Resources**	**TOTAL-Endowment**
Riverside –South Cameron Indic. JORC		240	240
Riverside –South Cameron Inferred JORC		127	127
Dorset Dredge	2,714		2,714
Musselroe Utah-1		71	71
Musselroe Utah-2		95	95
Elizabeth	2	69	69
East Cybele Ck		11	11
North Cybele			4
West Garfield Ck	95	4	99
East Terrace		72	72
Woods Flat	59	161	220
Amber Hill	14		
Star Hill	12		
Wyniford	200	553	753
TOTAL	**3096**	**1403**	**4499**

In addition to those calculated resources, there are known deposits with as yet no calculated resources (including Potential and Possible resources discussed by various previous explorers), and of course, undiscovered deposits. These known and potential resources have been discussed in the various chapters of this report. Clearly there are vast unexplored areas where new resources and extensions to known ones could occur.

In past years the ground was held by a plethora of individual prospectors and companies, with varied competency to explore, and so the fragmented tenement situation meant that to explore comprehensively was not possible. Because Tin Dragon has acquired such a large Tenement block there is now a unique opportunity to explore all areas with modern exploration, unhindered by competing land access.

12.0 PRIMARY HARD ROCK MINERALISATION

The potential for primary tin resources in the Tin Dragon areas, in my view, has not been addressed by previous owners of the deposits and leases. This issue has been discussed throughout this report.

There is a natural tendency for alluvial miners to seek alluvials and not bedrock tin sources- and vice versa for hard rock explorers.

The cassiterite and the other heavy mineral suites have traditionally been regarded as derived from greisen systems in the main ranges of the Blue Tier to the south, but there is the likely possibility that a large proportion is derived from local sources. Basement rocks in these local areas are almost completely unexplored for any style of deposit. The area has very high potential for discovery of basement deposits.

13.0 GENERAL CONCLUSIONS

A long history of investigations since 1874 has concentrated on finding evaluating and mining alluvial tin resources. No exploration for basement tin mineralisation has yet been done

It is estimated that 3100 tonnes of cassiterite were mined to 1982, and there are known calculated unmined resources of 1400 tonnes.

The potential to find basement tin deposits is very high.

14.0 RECOMMENDATIONS FOR FUTURE WORK

Compilation and appraisal of datasets is proceeding, so as to develop target areas for further exploration.

Field visits are necessary to advance the geological knowledge of the area, to help understand the complex alluvial history, and to search for basement mineralisation.

15.0 EXPENDITURE

Expenditures have been reported via MRT Quarterly Returns.

16.0 REFERENCES

[A full reference list has not been attempted because my librarian skills and interest are limited. The Appendix covers references from which information in this report has been drawn].

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