GEOTECH

Geotech International Pty Ltd

Partial Surrender Report

for EL2/2016 Royal George

for the Period 25 October 2016 to 24 October 2018

Date: November 2018

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OutSide InSight

CHARTERED PROFESSIONAL
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ABSTRACT

This report describes the investigations and activities completed within the surrendered portion of EL2/2016 during the period 25 October 2016 to 24 October 2018.

The Tenement is located 90km SE by road from Launceston.

The general area covers many occurrences of tin in quartz veins and greisen systems prospective for lithium.

A review of prospectivity found that the surrendered areas had poor potential for the discovery of tin and lithium deposits.

KEYWORDS

NE Tasmania
Geology
Mineralisation
Structure
Remote Sensing
Tin
Lithium
Production
Prospectivity
Targets
Exploration Licence

SUMMARY OF ACTIVITIES for surrendered portion of EL2/2016 Royal George for the Period 25 October 2016 to 24 October 2018

Work done by Geotech International Pty Ltd during the period consisted of

- Assemble and organise and assess past exploration data.
- Review and correct data for past stream sediment sampling.
- Review mineral deposits of the area
- Review various remote sensed datasets
- Establish structural controls on mineralisation
- Assess prospectivity for tin and lithium.

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
EL2-2016_2018_surrender_report.pdf	pdf	Annual/ Final Report
EL2-2016_2018 data.zip	zip	Mapinfo and excel files Stream sed geochem

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TABLES

FIGURES

1.0 INTRODUCTION

This report describes the investigations and activities completed within the surrendered portion of EL2/2016 during the period 25 October 2016 to 24 October 2018.

The Tenement is located 90km SE by road from Launceston, in north-east Tasmania.

Table 1 - Tenement Details

Tenement	Holder	Date Granted	For	Size
EL2/2016 Royal George	Geotech International Pty Ltd 100%	25 October 2016	All Minerals	60km^2
Reduced area				28km^2

The location, showing the full original tenement is shown on Fig 1.

The renewed portion of the tenement is shown on Fig 2.

The bulk of the underlying land is Private Land or Reserves unrestricted for exploration.

The project lies within the Tasmania 1:25,000 map sheets of Roys and St Pauls Dome. Much of the area lies in the Municipality of Northern Midlands.

Access is via sealed roads, formed local roads and other rough tracks.

The Tenement covers a number of quartz cassiterite vein systems, and tin bearing greisens, and some alluvial tin deposits. The Royal George deposit lies outside the licence, to the south-east.

2.0 GEOLOGICAL SETTING and MINERALISATION

The Tenement covers part of the Devonian Ben Lomond Batholith, where specialised fractionated granites occur. These granites were the source of fluids responsible for known tin deposits including the Royal George vein, greisen hosted Roy's Hill deposit and the Brookstead quartz vein systems.

All mineralisation occurs in the apical parts of the granite bodies and in the overlying Silurian Mathinna Bed clastic metasedimentary rocks. Contact metamorphic effects are mapped over a large area of the tenement, suggesting that granite lies beneath those metasedimentary rocks at shallow depths of less than 150m.

Unconformably overlying the Devonian and Silurian rocks is a flat lying unmineralised Permian and Triassic clastic/coalseam sequence.

In the Tenement area along the St Paul's River Valley the Permian and Triassic sequence has largely been eroded away. Because for example at Roy's Hill only a thin veneer of Permian is present less than 20m above the valley floor, much of the present land surface must be inherited from the Permian unconformity land surface.

Minor Tertiary basalt, with other unconsolidated Tertiary and Quaternary colluvium and alluvium, occupies part of the valley.

Fig 3 shows the distribution of known deposits, from the MRT Mirloch database. In the surrendered area there are only two minor basement hosted tin deposits both in granite, and there are alluvial tin workings south of Brookstead. The base map uses MRT's 1:25 000 geology maps, (Roy Hill and St Pauls Dome).

Note that there is an almost complete lack of tungsten in the area.

Past production of tin from the area is modest and most has come from the Royal George deposit, located in competitor ground about 2km SE of the Tenement. Within the surrendered part of the tenement there has been production of alluvial tin but the quantum is probably small and has been poorly documented.

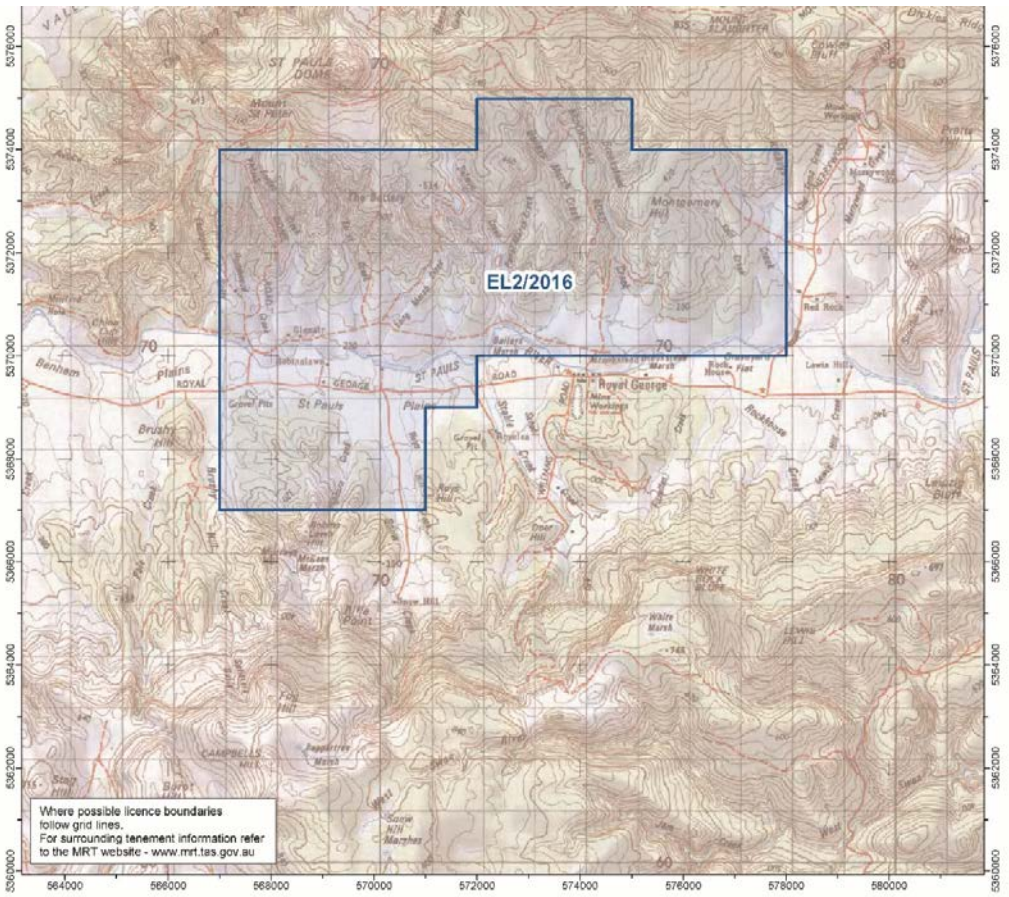


Fig. 1. Tenement Location.

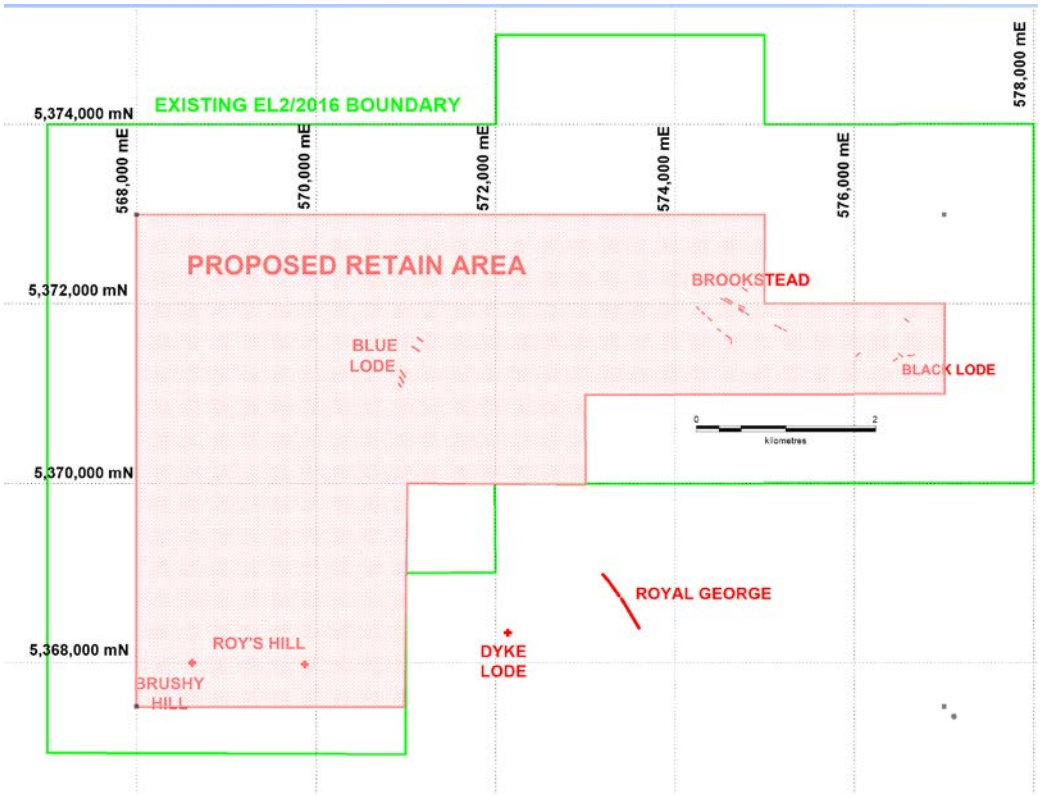


Fig. 2.

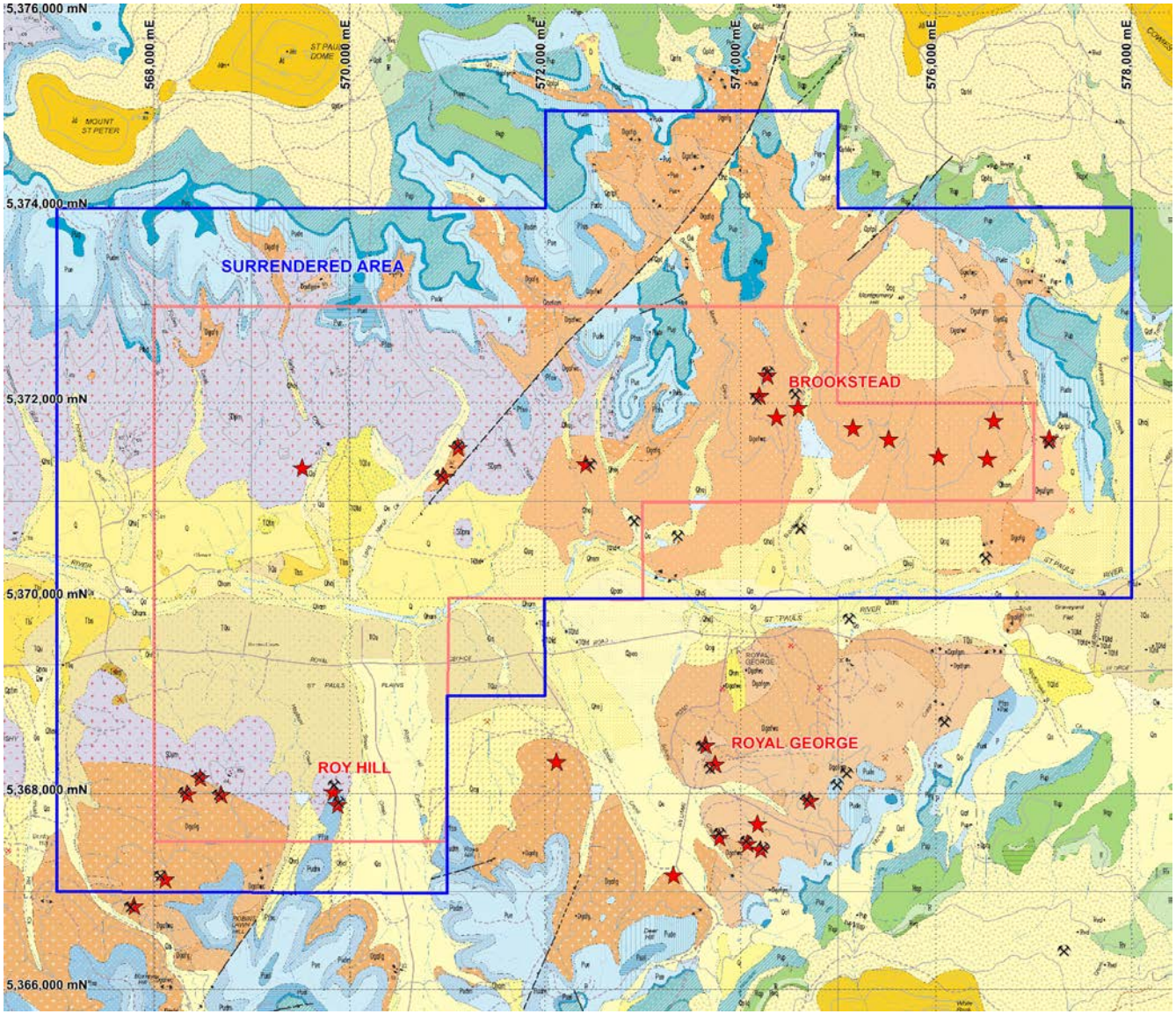


Fig 3. Distribution of known mineralisation on MRT 1;25 000 geology. Stars with picks are hard rock tin deposits, picks alone are alluvial tin deposits.

3.0 REVIEW OF PREVIOUS WORK

3.1 By Geotech International Pty Ltd

In 2017 Geotech carried out a review of prospectivity for lithium.

In 2018 Geotech's work comprised

- Assemble and organise and assess past exploration data.
- Review and correct data for past stream sediment sampling.
- Review mineral deposits of the area
- Review various remote sensed datasets
- Establish structural controls on mineralisation
- Assess prospectivity for tin.
- Generate exploration targets.

Detailed information on these follows in later sections of this report.

3.2 By Other Organisations

Past work by other organisations has been assembled. A summary of the work is compiled into a spreadsheet, Table 2.

Documented past work in the surrendered area has included:

(a) Mines Department:- publications from 1892 to 1929.
(b) R. D Beattie:- BSc Honours thesis on geology of the Royal George area, including descriptions of workings and mineralisation at Roy's Hill and Brookstead.
(c) Amax:- regional rock chip sampling; regional stream sediment sampling
(d) Shell:- regional rock chip sampling; regional stream sediment sampling
(e) Seltrust:- regional stream sediment sampling; mapping and rock chip sampling at Brushy Hill.

TABLE 2

MRT Open File	When	Who	Author	EL	What									Nearby EL2/2016			Notes
					Regional drainage geochem	Regional Rock Chip	Roys Hill	Brookstead	St Pauls Grid	Glenair	Blue Lode	Brushy Hill	Placers	Thompsons Gully	Dyke Lode	River Valley	
86-2556	1985	Shell	Whitaker	30/1984	X		X							X			
86-2549	1985	Shell	Whitaker	7/1978	X			X	X 2 p holes						X		
85-2408	84-85	Shell	Whitaker	7/1978				X	X 4 p holes								
85-2407	84-85	Shell	Whitaker	30/1984	X		X									X 6 p holes	
82-1701	1981	CRA	Dunn	7/1978													
84-2125	1984	Seltrust	Dunbar	48/1981	X		X					X		X			
84-2080	1983	Seltrust	Dunbar	48/1981	X		X					X		X			
84-2195	1984	Seltrust	Brady	48/1981	X		X					X		X			
81-1662	1981	CRA	Purvis	7/1978			X	X							X		
84-2088	1983	Shell	deGraff			X											
82-2062	1983	Shell	deGraff			X											
83-1994	1983	Amax	Vivian	7/1978						X							monthly reports only
83-2032	1983	Amax	Vivian?	7/1978	X	X				X	X				X		
	1967	Hons Thesis	Beattie				X	X					X				
37-0069	1937		Hitchcock					X									
0243-001	1895	Roys Hill Tin Mining Co					X										
GSB40	1929	Mines Dept	MacIntosh Reid				X	X					X				
UR1923_125-136	1923	Mines Dept	MacIntosh Reid					X									
UR1928A_004-9	1928	Mines Dept	Anon				X								X		
OS_170	1901	Mines Dept	Waller				X										
OS_143	1899	Mines Dept	Twelvetrees				X										
OS_098	1892	Mines Dept	Montgomery					X									
OS_109	1893	Mines Dept	Montgomery				X										
OS_110	1893	Mines Dept	Montgomery					X									

4.0 EXPLORATION COMPLETED DURING THE REPORT PERIOD

4.1 Assessment of Prospectivity for lithium.

Analogy with the Cinovec deposit.

The famous Cinovec lithium deposit near Zinnwald on the Czech Republic- German border has obvious geological similarities to deposits in the retained parts of the Tenement area. The lithium is contained in zinnwaldite, a lithium mica.

At Cinovec a pervasively altered and greisenised lithium-albite granite (with quartz, topaz, zinnwaldite and cassiterite) occurs in the upper part of a cupola, (European Metals, 2017).

Cinovec is an historic mine containing a significant undeveloped lithium-tin resource with by-product potential including tungsten, rubidium, scandium, niobium and tantalum. It is a globally significant hard rock lithium deposit with a total Inferred Mineral Resource of 514.8Mt @ 0.43% Li_2O. Within this resource lies one of the largest undeveloped tin deposits in the world, with total Indicated and Inferred Mineral Resources of 79.7Mt grading 0.23% Sn for 183kt of contained tin.

Metallurgical pilot testing of the Cinovec South ore in the 1970s achieved good recoveries (96% Sn and 84% W) using gravity and gravity/flotation flow sheets. Zinnwaldite reports to the gravity reject, from which it can be concentrated by magnets. Lithium carbonate was produced on industrial scale during mining in the 1970s.

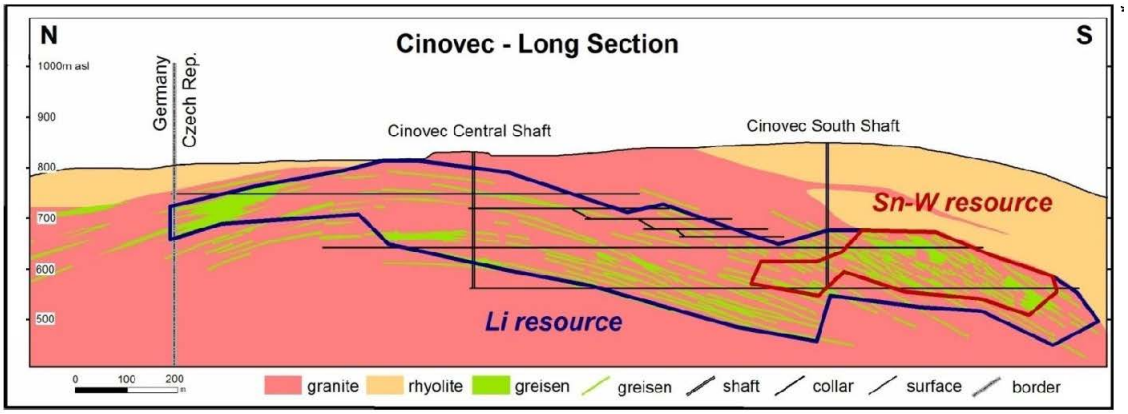


Fig 4. Cinovec schematic long section

It is interesting that much of the Cinovec lithium resource carries little or low grade tin, so the known low grades of tin in greisens in the Roy Hill area, if they are typical, need not be discouraging for lithium potential.

Previous records of and exploration for lithium in the area.

Zinnwaldite is known in the Mt Paris Pluton to the north, Higgins, (1990), but none is yet reported in the Ben Lomond Pluton.

The MRT RockChem database includes samples collected in and near the Tenement, analysed for lithium. These were derived from De Graaf, (1983).

De Graaf, (1983) and (1984) reported on 7 alkali granite and greisen samples and one quartz vein collected in the Ben Lomond Batholith near and in the Tenement. Most of the samples were from the Royal George tin deposit. The granites contain fluorite, topaz, and tourmaline so are highly fractionated. Lithium content varies from 90 to 230ppm - these values are high compared to Li content of non-specialised granites in the MRT RockChem database; such non-specialised granites generally contain less than 60ppm Li. The mica in the greisens is described as muscovite; zinnwaldite if it exists was not recognised. The location of the samples is shown on Fig 5.

Twelvetrees, (1899), reported bronze coloured micas, which he thought were lithia micas, in greisens at the Roy's Hill tin mine and the St Paul's tin mine.

Reid, (1923), and Reid & Henderson (1929), reported that greisen accompanying the tin bearing quartz veins at the Brookstead tin mine contained lithia micas.

An indirect reference to lithium in the greisens is in Petterd (1897), " *Zinnwaldite* (Lithia muscovite).Occurs in granite, and thus forms the common white mica of the stanniferous rocks of the East Coast."

Despite a thorough search of all past reports I can find no mention of previous company exploration specifically for lithium.

Lithium analyses were included in a suite of other analyses for two samples collected for uranium exploration by Minemakers, Fulton (2010). One sample, (to the south of the tenement), of sericitic granite contained 137ppm Li. The location of the samples is shown on Fig 5.

<u>Potential for lithium</u>

Lithium in commercially important concentrations could occur in lithium micas such as zinnwaldite and lepidolite.

Micas in greisens are abundant in the retained portion of the Tenement, but it is not known to what extent zinnwaldite is present as the dominant mica. As stated previously lithia micas are recorded but generally past descriptions of the mica in hand specimen and thin section refer only to white mica. Lepidolite because of its pink colour would probably have been recorded if it were present in the area, but zinnwaldite without chemical analysis can be difficult to identify and so may have been unrecognized. Most zinnwaldite can be a buff to bronze colour so especially in weathered rocks its identity can be masked.

Assuming that indeed the greisens are rich in zinnwaldite then the largest individual greisen bodies or the best swarms of greisens should be sought.

The most impressive known single body of greisen in the area is at the Roy's Hill Mine, but this is not in the surrendered area. Here a partly exposed flat lying greisen occurs as an altered carapace of granite, beneath the contact with Mathinna beds, in turn also overlain

unconformably by Permian sandstone. An area about 200m by 125m appears to contain greisen of thickness greater than 3m, at depths less than 10m; more greisen under thicker cover presumably extends further south. The greisen contains about 25% micas and about 0.3% tin, so if the mica is zinnwaldite the prospect holds commercial promise.

The best known swarm of greisen veins appears to be at Brookstead, also not in the surrendered area, where an obvious exploration target would be a granite hosted sheeted quartz-cassiterite vein system with zinnwaldite making up the micas in the accompanying greisen alteration.

The potential for greisens in the surrendered area is at the granite/Mathinna bed contact in the south west, but because there is no known mineralisation here the prospectivity is judged to be low.

4.2 Assemble and Organize and Review Past Mining and Exploration Reports.

All available relevant open file data, Mineral Resources Tasmania reports
and one available University thesis were assembled and a review was completed.
Table 2 shows the relevant reports and their coverage of the main prospects.

R D Beattie, in 1967, for an Honours BSc thesis, conducted detailed field mapping of the area, assisted with laboratory petrology, and some of the mineral deposits were visited, described and discussed.

More details of the work done by various explorers is in Section 4.4.

4.3 Review of Past Stream Sediment Sampling.

Stream sediment sampling was done by Shell, Seltrust, and AMAX, with differing methods of sample preparation, and differing elements analysed. The most useful analyses for the purposes of this review are for Sn, with W being almost absent in the area. Other elements such as Cu, Pb, Zn were checked to see if they were useful pathfinders to mineralisation, but are not.

MRT has digitised the location and analyses of most of the samples collected by Shell, Seltrust, and AMAX as part of their state-wide database; no samples from the area that are particularly relevant have been left out except for a few south of Brushy Hill. However the database has significant errors with the locations of Shell's samples in the Brookstead area. This includes samples east of 147.885 degrees E, and north of 41.808 degrees S. The effect is to position many samples too far north. To attend to those errors Shell's plan in [86_2549] was registered in mapinfo and the samples locations and Sn analyses were digitised into an excel file, appended to this report.

Note that only Sn values are recorded on this Shell plan and the method of sampling and analysis are not stated in their report. It is possible other elements were analysed but these are not mentioned or plotted.

A plot of Sn values including the incorrect ones is shown on Fig 6, and the corrected Sn plot is shown on Fig 7.

Prior to replotting the stream sediment data there were anomalies in the surrendered area, but after replotting all are in the retained area. In the surrendered areas there are now judged to be no anomalous values of significance or worthy of follow-up.

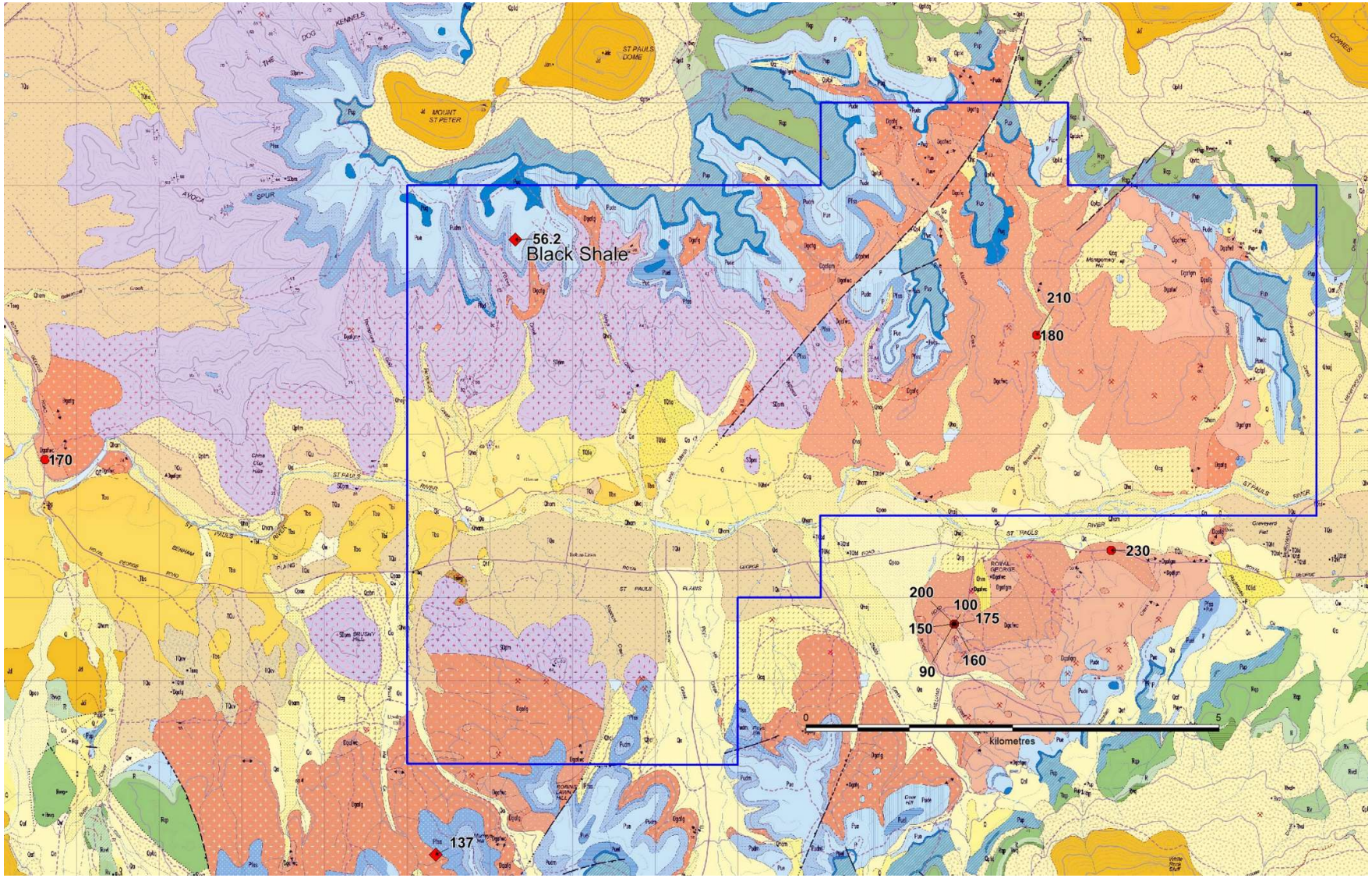


Fig 5 Lithium ppm in Rocks. All available published analyses. All are granite or greisen samples except the one labelled black shale. Red circles De Graaf 1984, Red diamonds Fulton 2010.

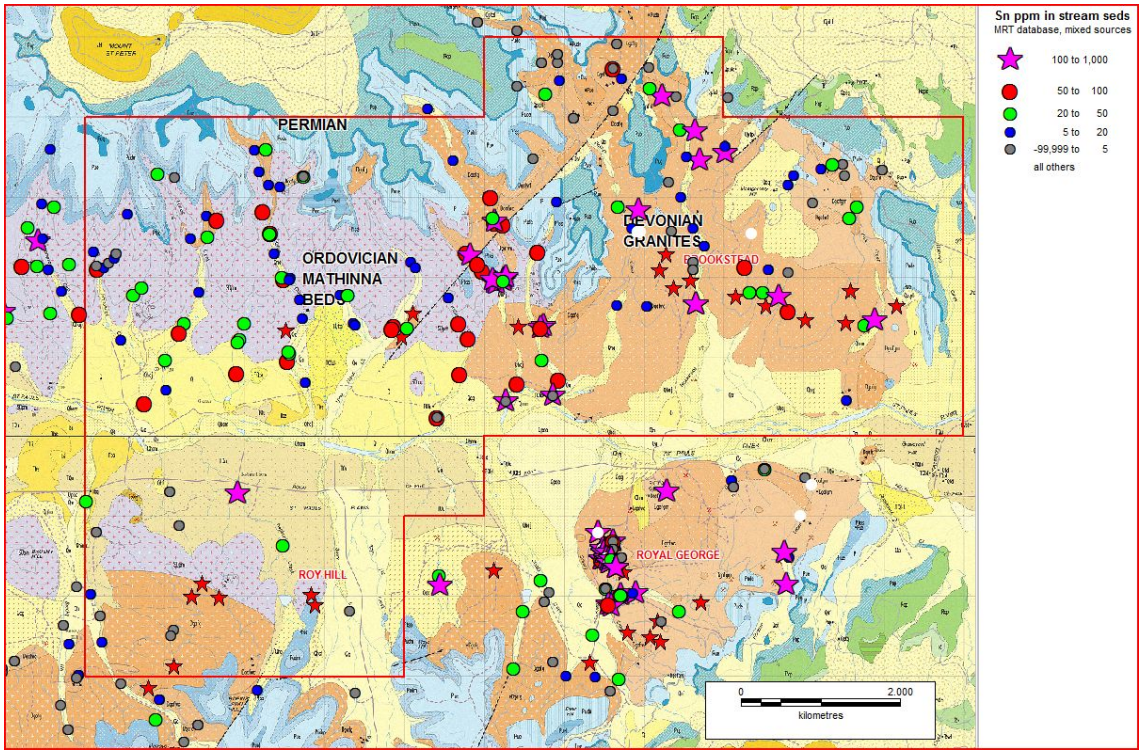


Fig 6. Sn, ppm, in stream sediment plotted from MRT database. This has errors in plotting of location of samples north of Brookstead. [Note that in this plot the small red stars are locations of Sn deposits, not geochem samples].

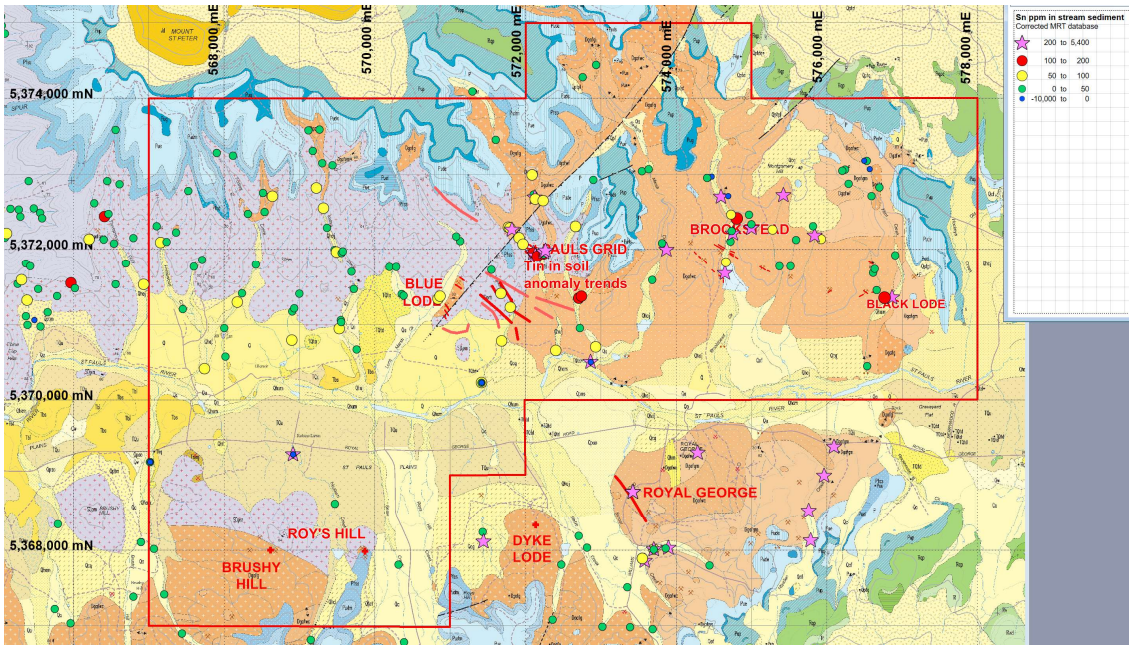


Fig 7. Sn, ppm, in stream sediments, corrected positions. [Note that the class intervals are different to those in Fig 6.]

4.4 Review of mineral deposit sampling and descriptions.

No deposits were located or described in the surrendered area.

4.5 Review of Airmagnetic data

Airborne TMI data was downloaded from GA's repository, imported into ERMapper and an enhancement of vertical sun was produced. I also possess and used a TMI image with NE sun, produced by MRT.

The aim was to determine if mineralisation had a magnetic expression which could be used for targeting. Unfortunately the known mineralisation such as Royal George and Brookstead has no magnetic expression.

However the TMI has proved useful to map:

(a) subsurface extent of Tertiary basalt in the St Paul's River valley floor. This is negatively polarized in the west and positively polarised in the east, suggesting that two flows exist.

(b) subtle low tenor responses in alluvial areas, possibly due to concentrations of ilmenite and magnetite, thus outlining the subsurface position of drainages,

(c) the structural architecture.

Fig 8 shows TMI with NE sun, showing these features.

4.6 Review of Airborne radiometric data

Airborne K U Th data was downloaded from GA's repository, imported into ERMapper and exponential enhancements with vertical sun were produced.

Results of note are:-

(a) all granites are enriched in K, U and Th, thus confirming their specialised fractionated nature.

(b) Elevated anomalous K occurs in much of the Mathinna beds in an east-west zone, Fig 9, but such anomalism is not a universal feature of the Mathinna beds, suggesting that here K anomalism is caused by K-mica alteration formed during metasomatism from fluids derived from granite below.

(c) There is a tendency for K Th and U anomalism to also concentrate in drainages.

4.7 Review of gravity data

A significant study by Leaman of ground gravity was done covering this area and the eastern coalfields, and is published in GSB60. A study of this has not been done.

4.8 Review of ASTER data

The MRT report and associated files assessing ASTER in NE Tasmania (Nunn et al 2007) was consulted. No features in the plots in that study (231 and 468 stretches, TM 741 simulation) correspond to known mineralisation and so cannot aid in the targeting of mineralisation.

All processed ASTER "products" for Tasmania were downloaded from the CSIRO website. These included CSIRO Landsat TM Regolith Ratios ; Green vegetation content ; Ferric oxide content ; Ferric oxide composition ; Ferrous iron index ; Opaque index ; AlOH group content ; Aluminium hydroxide group content ; AlOH group composition ; Aluminium hydroxide group composition ; Kaolin group index ; FeOH group content ; Ferric hydroxide group content ; MgOH group content ; Magnesium hydroxide group content ; MgOH group composition ; Magnesium hydroxide group composition ; Ferrous iron content in MgOH/carbonate ; Ferrous iron content in Magnesium hydroxide/carbonate ; Silica index ; Quartz index ; Gypsum index.

Disappointingly, for all products, no anomalies corresponding to mineralisation were identified.

However both the silica index and quartz index show distinct responses corresponding to the Royal George tailings and to areas south of Brookstead. These latter areas seem to be rehabilitated early alluvial tin workings on elevated river terraces.

4.9 Review of Landsat, Google and State Air photo Imagery

All these datasets were examined to aid targeting.

4.10 Review of DEM imagery

Airborne DEM data was downloaded from GA's repository, imported into ERMapper and an enhancements of vertical sun were produced.

Also 10m contours of topography for the N Midlands Municipality were downloaded from the web.

The data was studied especially to establish faults and joint sets for the area.

4.11 Review of Structural controls on mineralisation

Mineralisation in the area is dominated by lodes occupying tensional fractures, so a study to determine the structural setting in the area was made. All the various datasets reviewed above were used to interpret where structures occur.

There are two mapped faults trending NE through the Tenement and these obviously displace Silurian to Triassic rocks, but not Jurassic Dolerite. The granite displacement suggests a vertical throw.

Using DEM imagery, but also other datasets such as topographic contours, mapped geology, magnetics and radiometrics, an interpreted fault-fracture-joint pattern for the area was produced. The structures are dominantly NE but are displaced by a NW set. Some of these structures are shown on Fig 10.

It seems likely that this fault system has been active over a long period. Not only has it been active in post-Triassic times, but I suggest it was active during vein formation in the Devonian. A sinistral movement on the NE structures will explain the tensional vein lode fractures which dominantly trend east-west in both granite and Mathinna beds. Under this hypothesis, in order to be able to fracture, the particular granite we see exposed at surface must have been solid, and fluids responsible for mineralisation in all the veins must be derived from another granite phase, still molten, at depth. Presumably this lower granite phase is still not exposed. If this model is correct the style of mineralisation seen at Roy's Hill, namely greisen alteration of the granite carapace, may have formed at the

time of cooling of the earlier phase of the granite, and be separated in time from the later vein lode deposits.

4.12 Review of Prospectivity

See below, Section 5.

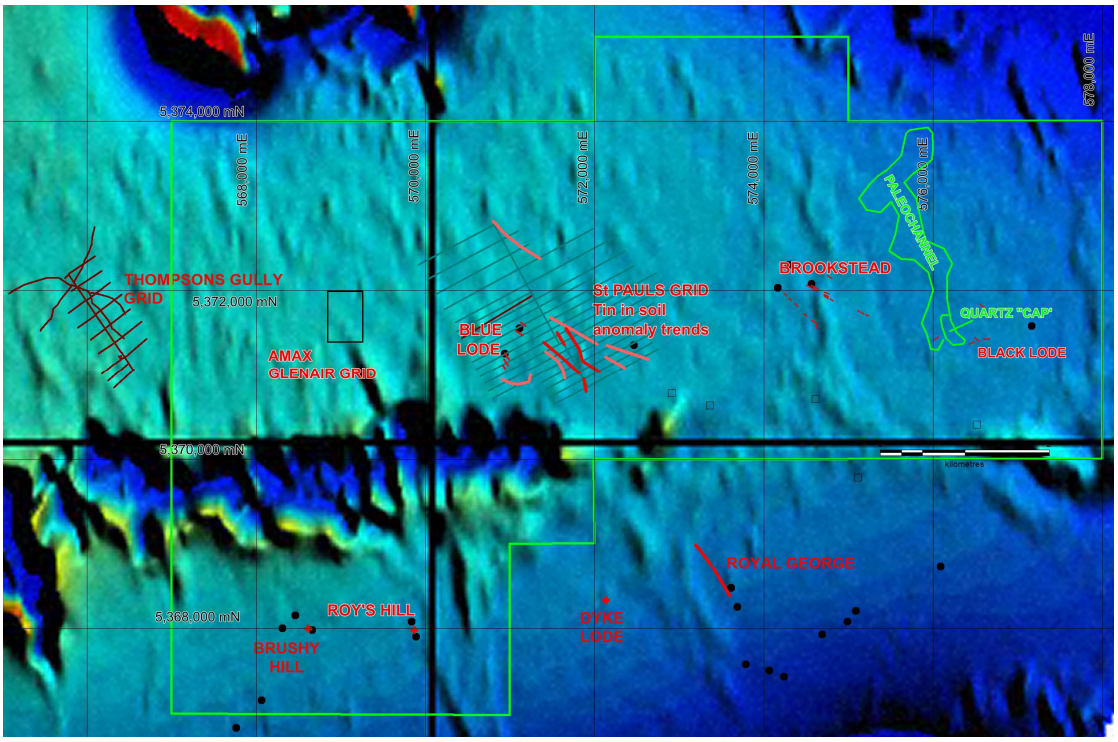


Fig 8. TMI imaged with NE sun, showing lack of any response by greisen or vein mineralisation.

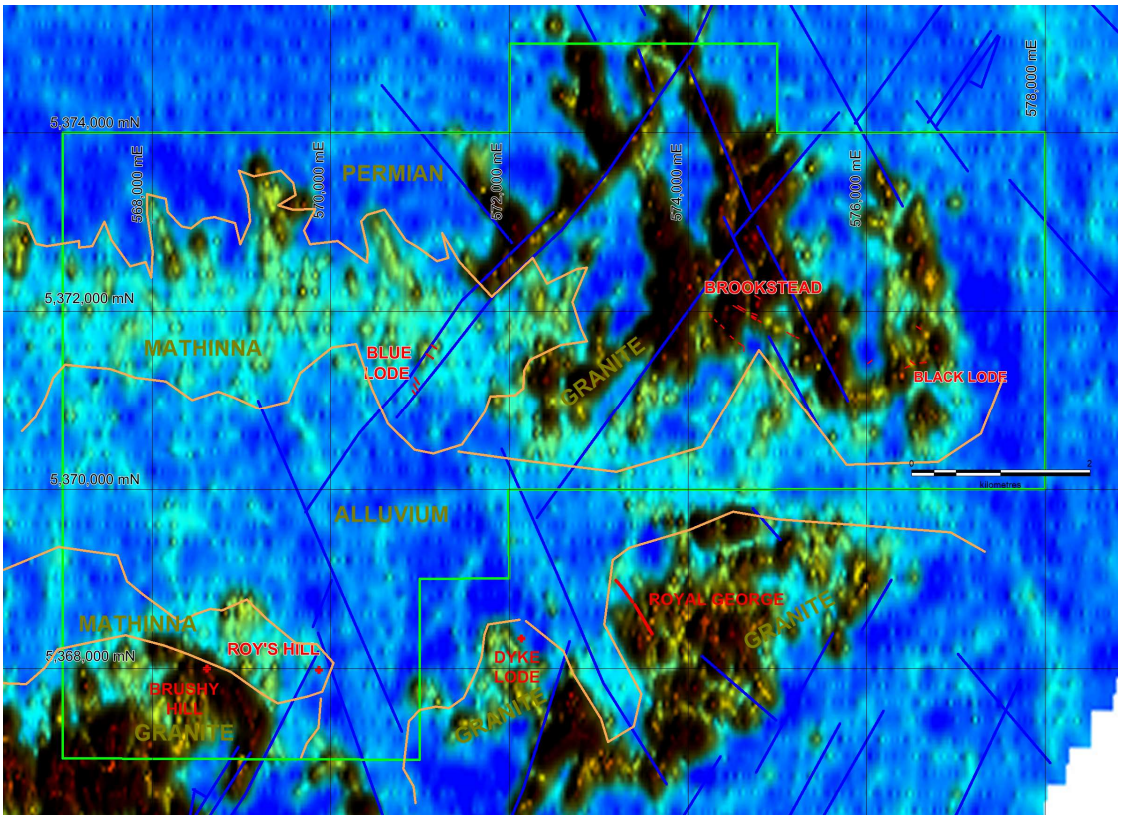
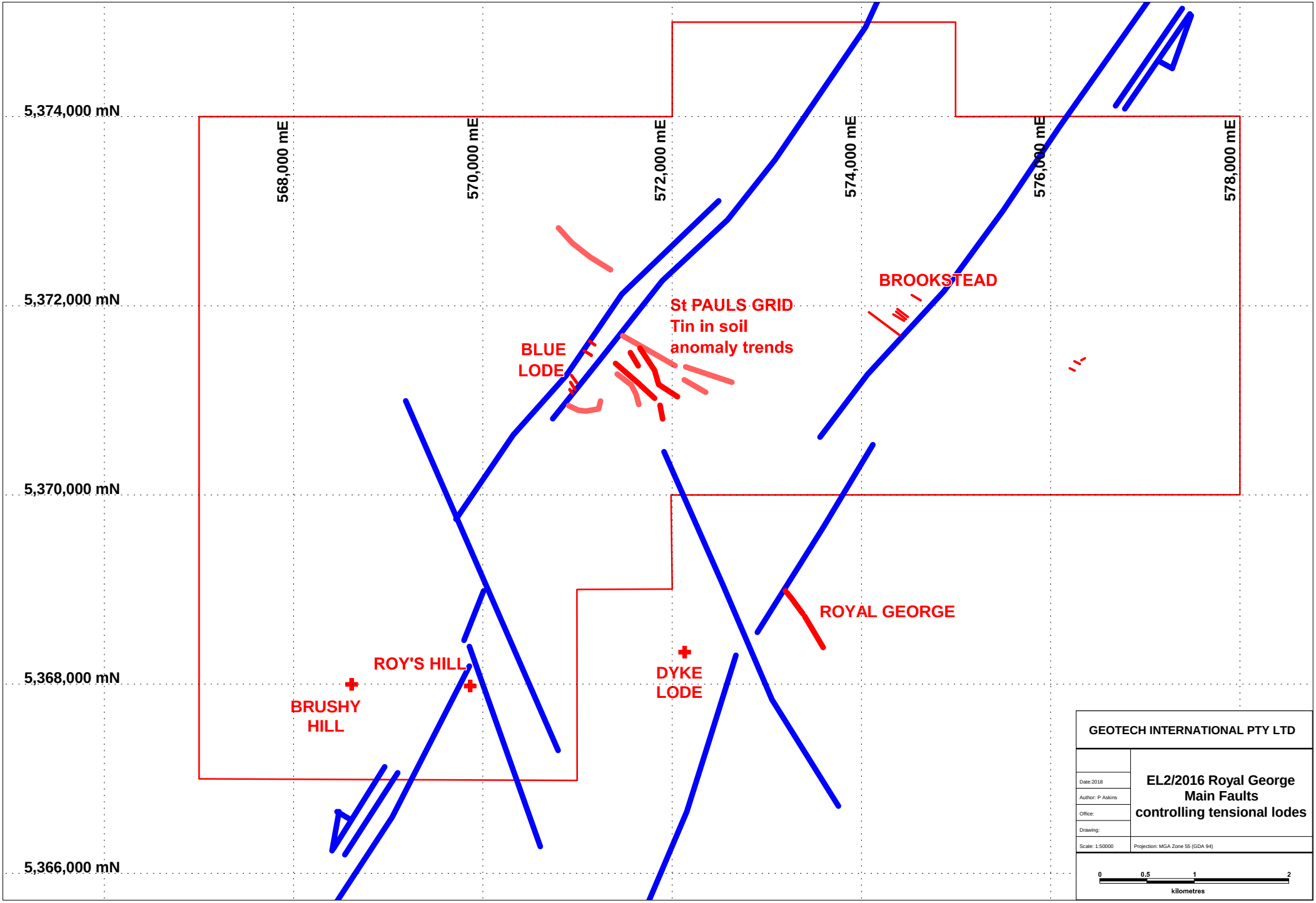


Fig 9. K channel airborne radiometrics, exponential stretch vertical sun, showing Mathinna bed anomalism.


5,374,000 mN
5,372,000 mN
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5,366,000 mN
568,000 mE
570,000 mE
572,000 mE
574,000 mE
576,000 mE
578,000 mE
BROOKSTEAD
St PAULS GRID
Tin in soil
anomaly trends
BLUE
LODE
ROYAL GEORGE
ROY'S HILL
BRUSHY
HILL
DYKE
LODE
GEOTECH INTERNATIONAL PTY LTD
Date:2018
Author: P Askins
Office:
Drawing:
Scale: 1:50000
Projection: MGA Zone 55 (GDA 94)
EL2/2016 Royal George
Main Faults
controlling tensional lodes
0
0.5
1
2
kilometres

Fig 10.

5.0 ASSESSMENT OF PROSPECTIVITY

5.1 General

If there are two phases of mineralisation as discussed in Section 4.11, there may be early greisens in the granite carapace and later vein systems quite separate from one another. The vein systems may extend to greater depths than might be normally expected because the source granite is lower than the host exposed granite.

In this area I believe that all exposed significant tin mineralisation will have already been discovered by prospectors, and only subsurface mineralisation, even if under only thin cover, is to be found. However prospectors would not have located or recognized zinnwaldite rich lithium mineralisation.

The styles of mineralisation of possible economic significance in this area are

(a) Single large veins in granite similar to the Royal George deposit. {This is the largest known deposit in the area, the available rubbery production and remaining resource calculations indicate that the pre mining deposit was about 1.5Mt@0.5%Sn, based on: past production about 170 000 t@0.65%, add the unrecovered tin in tailings @0.25%, and add the remaining resource estimate of about 1.2Mt@0.4%}. Based on the mining and prospecting history of the area, small veins are unlikely to be viable for company mining. In any event none are known in the surrendered area.

(b) Sheeted vein systems. If smaller veins were grouped close together they could constitute a viable bulk mining target. Again, none are known in the surrendered area. They could occur sub-surface in the anomalous K-altered Mathinna beds in the west of the Tenement, but targeting of systems here is difficult, and if they were too deep they would be uneconomic. If they existed close to surface I would expect some leakage anomalism at surface and such zones should be detectable in the stream sediment sampling, but no such anomalies exist.

(c) Greisens, especially at a granite carapace. Roy's Hill is the obvious candidate, outside the surrendered area. The potential for greisens in the surrendered area is at the granite/Mathinna bed contact in the south west, but because there is no known mineralisation here, the prospectivity is judged to be low.

(d) Placer deposits. These have been worked in the past especially downstream from Brookstead but they probably had small production and the best are probably worked out. Even if some unmined placer resources could be proved up, being close to the St Paul's River, there would be environmental issues probably preventing mining.

6.0 CONCLUSION

The surrendered portion of the Tenement was judged to be non-prospective.

7.0 EXPENDITURE

Expenditures for the full Tenement were reported elsewhere via Annual Returns. The portion of expenditure in the surrendered area was not computed.

8.0 REFERENCES

{not including Open File or MRT reports listed in Table 2}

Beatie, RD., 1967. The geology of the Royal George area. B.Sc. (Hons) thesis, University of Tasmania.

De Graaf, L, 1983. Regional Study of the Ben Lomond Granite, The Shell Co Aust Ltd, TCR83-2062.

De Graaf, L, 1984. A preliminary Regional Assessment of the Granites and Tin Potential of NE Tasmania, The Shell Co Aust Ltd, TCR 84_2088.

European Metals, 2017. Cinovec Lithium / Tin Project, http://europeanmet.com/projects-cinoveclithiumtinproject.html

Fulton, R, 2010, Exploration Licence 59/2007 Royal George annual and final report to 26 November 2010. Minemakers TTT Pty Ltd. TCR10_6181.

Higgins, NC, 1990. Comment on "Origin of alkali-feldspar granites: An example from the Poimena Granite, northeastern Tasmania, Australia" Geochimica et Cosmochimica Acta V54 No 8 pp 2305-2311.

Nunn, D et al, 2007., ASTER processing and interpretation of NE Tasmania. Global Ore Discovery for Mineral Resources Tasmania.

Petterd, WF, 1897. Notes on some recently discovered and other minerals occurring in Tasmania. Source unknown.

Reid, AM, 1923, Report on the Brookstead tin mine. Unpublished record, Tasmania Department of Mines, 12p, UR1923_125_136.

Reid, A.M., Henderson, Q.J., 1929, Avoca Mineral District, Tasmania Geol. Surv. Bull. 40.

Twelvetrees, WH, 1899. Notes on Some Tin Mines in the St Paul's River Valley, near Avoca. Tasmanian Secretary for Mines Report 1899-1900, Report OS-143.