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RECONNAISSANCE GEOLOGICAL SURVEY OF EXPLORATION LICENCE 15/68
 NEAR BRANXHOLM, NORTH EAST TASMANIA

A report by Michael Solomon

February 1971

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NB. p 9 & fig 1 missing from report
(not on microfiche either)

INTRODUCTION

At the request of Mr. H. T. Reardon, a geological survey of exploration licence 15/68 was carried out during January 1971 by the writer, Dr. D. I. Groves and Mr. J. Cocker. The purpose of the survey was to compile existing data, complete a reconnaissance map, assess the economic significance of the licence area, and make recommendations as to future work. The general distribution of the mineralization has already been outlined by Mr. Reardon and partners (principally RB Mining Pty. Ltd.) and plotted on generalized maps, and further information on the regional geology has been gathered from mapping by Mines Department officers and a University of Tasmania Honours student (Mr. V. Patel). The geology of the Mt. Paris, Mammoth, Bells Hill and Tinpot Creek mines has been described in previous reports by Dr. R. G. Taylor and the writer, and there are Mines Department reports on Ruby Flat, Mullins and the Star of Peace mines.

The geological mapping was carried out using enlarged aerial photographs and Government contour maps. The photographs are several years old and some difficulty was experienced in plotting recent tracks. To reduce drafting costs, the geology has been transferred onto an enlargement of the contour map, which accompanies this report as Figure 1. Due to the method of preparing the base map, there is a slight misalignment between contours and other surface features.

A number of mining leases, held for the New Mount Bischoff Mining Company by Mr. Reardon are excluded from the licence area (Fig. 1) and

were not examined during this survey. They cover the old Mt. Paris, Bell Hill and Tinpot Creek mines. Two other leases of 20 and 25 acres in the Mammoth area have been applied for by Mr. Reardon but not yet granted. Mr. Reardon has an option on a 5 acre lease over the Star of Peace mine, held by Mr. L. M. Barnett, and this area was inspected. In addition, Mr. L. M. Barnett holds a 16 acre lease on Black Creek and Messrs. W. J. and D. L. Mullins a 10 acre lease near Mt. Paris.

The area of E.L. 15/68, less mining leases referred to above, is approximately 27 $\frac{1}{4}$ square miles.

In a report of this nature, it is impossible to detail all the information gleaned during field work but an independent record of individual observations has been kept and this refers to positions numbered on the enlarged aerial photographs.

LOCATION AND ACCESS

The exploration licence lies south-east of Branxholm, on the Launceston-St. Helens road. Access to the area is given by a fairly extensive network of roads and tracks (see Fig. 1), some of which can only be negotiated by four-wheel drive vehicles. It is generally not possible to drive away from the tracks.

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The north-east half of the licence is hilly country dominated by granite and the south-west half, dominated by sandstones and slates, is a dissected slope falling some 1200 feet to the plain of the Ringarooma and Dorset Rivers.

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The south-east part of the area has been cleared but much of the remainder is covered by forest, though this is not particularly dense.

There are several water races in the area, the main one being that serving the Mt. Paris mine (Fig. 1). The old Mt. Paris Dam, which requires repair, is currently leased by the Briseis Tin Mining Co.

The average annual rainfall at Branhholm is approximately 45 inches.

GENERAL GEOLOGY

The topographic surface intersects the gently dipping roof of a Devonian granite pluton that was intruded into Siluro-Devonian sandstones and slates. The granite crops out mainly in the north-east half of the licence and the sediments (the Mathinna Beds) mainly in the south-west half (Figs. 1 and 2). The granite within a few hundred feet of the roof is mineralized with cassiterite, wolframite and minor iron, arsenic, copper and zinc sulphides and this zone has a surface outcrop 1 to $1\frac{1}{2}$ miles wide and trending north-west. Further outcrops of granite occur in the Mathinna rocks where these have been deeply eroded, showing that the sediments form a thin skin over the granite varying from zero to probably about 200 feet in thickness. The roof of the granite is irregular and probably modified by faults e.g. along the contact passing NNW by Bells Hill mine.

As is typical of this sort of environment the mineralization is patchy and variable in nature. The principal types are as follows:

1. Irregular, pod-, pipe- and dyke-like bodies of greisen occur within granite. The greisens locally carry irregularly disseminated cassiterite, wolframite, pyrite, arsenopyrite, sphalerite and chalcopryrite, and have a predominantly NW-WNW trend with subsidiary E-W (e.g. Bells Hill) and NE to NNE (e.g. Mammoth) trends.
2. Quartz veins, commonly in greisens, and carrying cassiterite and/or wolframite e.g. Coxs wolframite lode, trending NNE.
3. Kaolinised granite (e.g. in the Ruby Flat-Mullins-Mt. Paris area) locally carries disseminated cassiterite, especially near to greisen bodies. Though the kaolinization of the feldspar could be due to weathering it is suspected that it is related to a phase of hydrothermal activity associated with the tin mineralization.

These types of mineralization are distributed somewhat haphazardly within the NW trending zone of mineralized granite except that greisen dykes and kaolinization are more prominent in the western part of the zone. The principal mineral concentrations occur in five areas (excluding the mining leases) and each of these areas is dealt with in the next section. Their locations are shown in Fig. 1.

Tertiary basalt and gravels occupy Greys Hill and the Ringarooma plain.

THE MAIN MINERALIZED AREAS

AREA A: RUBY FLAT

Tin. In this area much of the granite is kaolinised and contains greisen dykes trending about 115° (magnetic). The dykes vary from a few inches to about 10 feet wide and though varying in width along strike, individual examples achieve lengths of over 600 feet. The spacing of the dykes varies from a few inches to several tens of feet and though it is difficult to estimate the total volume, a reasonable guess yields about 500,000 cu.yds. of greisen within the kaolinised area shown in Fig. 1, to a depth of 100 feet below surface. Cassiterite is visible in places in the dykes but is clearly very erratically distributed. Three samples taken by Mr. Reardon from loose fragments of greisen at one locality within area 1 (shown on Fig. 1) gave the following results:

	<u>Sn %</u>	<u>WO₃ %</u>	<u>Cu %</u>
1 (702082)	0.22	0.07	0.02
2 (702083)	0.22	0.12	0.02
3 (702084)	0.67	0.04	0.02

The soft kaolinised granite between the greisens has been extensively sluiced, presumably to recover cassiterite, and the greisens remain as ridges. Some reconnaissance auger boring by Mr. Reardon in area 1, on a line at right angles to the greisen dykes at the west end of area 1, showed cassiterite decreasing gradually away from a prominent cassiterite-rich dyke but no estimates of grade are available from this exploration work. Jack (Mines Department Technical Report No.6, 1962) reported the results of four sampling traverses across the workings in

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area 1. The samples were presumably chip samples of both altered granite and greisen and gave the following results (north to south on each traverse):

- Traverse (a) 120 ft. of trace to nil % Sn
 Traverse (b) 30 ft. of trace; 25 ft. of 0.81% Sn; 40 ft. of trace
 Traverse (c) 140 ft. of trace to nil % Sn
 Traverse (d) 100 ft. of trace; 5 ft. of 0.18% Sn; 80 ft. of 0.11% Sn.

It is probable that most of the high values are in or near greisens and the low in intra-greisen altered granite, suggesting that much of the cassiterite presumably recovered in sluicing the soft granite was derived from the greisen margins or the thin alluvium and soil cover, and possibly also from weathered granite.

Kaolin. The feldspars in the altered granite are completely kaolinised over a large area (Fig. 1). The kaolinization appears to be fairly shallow at the south-east end, judging by observations and the depth of sluicing, but becomes deeper and more intense towards the north-west where the sluicing has ^{locally} penetrated at least 40 feet below the old surface. On the north-west end of the kaolinised zone there is a large open cut (the Gordon Mine) that is reported to be 60 feet deep (it is now half-full of water). It is highly probable that the granite was kaolinised to this depth and there is no reason why the alteration should not go deeper. The relatively expensive mining involved in making this cut suggests the granite also carried appreciable cassiterite.

Two large parcels of kaolinised granite were collected by Mr. Reardon and submitted to A.P.P.M. who reported yields of 18% and 50% filler (?) grade.

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It is impossible to estimate tonnage satisfactorily, but there could be up to 4 million cu.yds. of kaolinised material if worked to say, 30 feet below present surface, allowing for about 30% losses due to patchy kaolinization. The south-east limits near the track have been ignored as the kaolinization appears to be less intense and shallower in this region. The kaolinised granite normally carries at least 30% kaolinite, but the percentage of satisfactory quality for paper manufacture has yet to be determined.

The price of filler grade is approximately \$40/ton c.i.f. and for surface grade about \$80/ton c.i.f. The price for china clay may be similar or slightly lower than that for filler grade.

In making these very rough calculations, the tongue of kaolinised granite running along the road north of Ruby Flat has been ignored, mainly because half of this tongue is outside the licence boundary. If exploration is pursued in the Ruby Flat area, every effort should be made to push the licence boundary further north in this area.

Summary of Area A. The interest in this area centres on the possibility of combining recovery of kaolinite and minor cassiterite from the altered granite and cassiterite from the greisens. It seems quite probable that substantial tonnages of commercial kaolinite are available but of course systematic sampling and testing are required to confirm this.

AREA B: MULLINS

This is an extension of the Ruby Flat mineralization. Widespread shallow workings are mainly in alluvial material (see Fig. 1) but there are several pits in restricted areas of soft, kaolinised granite within

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unaltered granite. Greisens are rare except in Mullins workings where there are also numerous quartz-cassiterite veins in granite porphyry. The kaolinization and greisen development are much more limited than in the Ruby Flat area and area B is thus less attractive from a tonnage aspect. Surface samples taken in traverses across the Guiding Star workings (area 2, Fig. 1) by Mr. Jack (Mines Department Technical Report 6, 1962) gave the following results:

Traverse (a) 42 ft. of 0.27% Sn; 12 ft. of 0.93% Sn

Traverse (b) 175 ft. of trace; 10 ft. of 0.6% Sn.

The results of three inclined diamond drills put down by the Mines Department in the same area, and reported by Jack (Mines Department Technical Report 7, 1963) give average grades as follows:

Hole 1: for first 50 ft. and also first 100 ft. below lowest workings - 0.01% Sn. The line of this hole coincides with surface sample traverse (a), and indicates the erratic nature of the tin mineralization.

Hole 2: for first 50 ft. below lowest workings - 0.07% Sn, and for second 50 ft. below lowest workings - nil % Sn.

The line of this hole coincides with surface sample (b).

Hole 3: for first 50 ft. below lowest workings - 0.02% Sn.

Taken with the surface samples, these results could conceivably indicate a reserve of 350,000 tons of altered granite, granite and greisen with 0.1% Sn (about 5lbs/cu.yd.).

c. 4.3 lbs Sn metal

AREA C: WALSH'S WORKINGS

Three cuts up to 30 feet deep in altered granite close to the roof reveal sporadic greisen dykes trending about 95°. The alteration of the granite appears to be only shallow and interest centres on the cassiterite mineralization which covers a considerable area.

Unfortunately no information is available on grade.

AREA D: BELLS PLAINS, NEW HOPE, ETC.

Over a large area of Bells Plains, trenches and back-hoe pits expose some 15-20 feet of alluvial material comprising sand, and cobbles and boulders of Mathinna Beds, greisen, granite and basalt. This material has concentrated in a local basin within the main mineralized zone of granite and clearly this is a prime target for further testing. A disturbing feature is that the content of greisen boulders is relatively low and as this material is the main source of mineralization, it suggests that the source rocks were not heavily mineralized. The large number of boulders and cobbles could also be a disadvantage as far as mining is concerned.

Some of the pits reveal weakly altered granite bedrock which provides no immediate encouragement. However, in the New Hope area, weakly kaolinised granite contains greisen bodies that are rich in cassiterite and sulphides, and the thin alluvial cover carries coarse grained, unrounded cassiterite crystals of local origin. Samples of the altered granite and greisens have been taken for tin analysis in the hope that there may be potential for a substantial low-grade deposit, though four samples taken by Mr. Reardon from greisens in unaltered granite west of the New Hope workings proved to contain only "trace" quantities of tin.

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The Exile workings further north show thin alluvium over both hard and altered granite.

South of Bells Plains (at No.1 prospect) soil and alluvial cover is reputed to carry cassiterite and gold but the material is too thin and discontinuous to be of interest. Greisens in the area do not appear to be strongly mineralized.

AREA E: MAMMOTH, STAR OF PEACE, ETC.

The granite mass from Bell Hill to the Star of Peace mine contains swarms of greisen pods, pipes and lenses, generally of NW trend together with subsidiary NNE-NE and E-W trends. The granite host rock is unaltered, in contrast to the Ruby Flat area, and generally appears barren, but cassiterite and sulphides are visible in greisens. All the larger greisen bodies have been examined in detail and the Mammoth and Brocks greisens have been mapped by compass and pace survey.

The Mammoth mine has been reported on previously by the writer and is also referred to by Jack (Mines Department Technical Report 10, 1966). The workings reveal two or three irregular pods of greisen with erratic tin and copper values and further sampling is required to try and assess the available tonnage, though fairly optimistic estimates indicate that only some 150,000 tons of greisen with about 0.4% Sn could be expected within 100 feet of the surface.

The Brocks mine worked a narrow greisen lode trending 120° and containing coarse cassiterite in quartz veins. The strike length is about 120 feet and the width only a few feet, yielding a negligible reserve per vertical foot. The adit indicates that the lode thins in depth and no further work is warranted on this prospect.

Several large greisen bodies crop out over an area about 2,000 feet SSW of the Mammoth mine (location 2, Fig. 1). The largest body is 800 feet long and 20 feet wide but if nearby irregular bodies are included, there is a potential million tons or so of greisen to 200 feet below the surface. Other measured gossans indicate tonnages of 300,000, 50,000, 30,000, etc. (in these smaller bodies a depth of about half the strike-length has been assumed for tonnage calculations). Most of these bodies have been sampled by systematic chip sampling (13 samples) and the assay results will indicate whether any of them are of further interest. Jack (Mines Department Technical Report 10, 1966) sampled several of the greisens but only gave two relevant assay results, as follows:

Small adit south of Mammoth adit portal	1.34% Sn
Small greisen veins at head of Gorge Creek (precise locality unknown)	0.49% Sn

These at least indicate promising mineralization in the greisens.

The Star of Peace workings, which lie on an isolated 5 acre lease (Fig. 1), have been extensively bulldozed and it is very difficult to gauge the importance of this area until the ground is cleared by sluicing. However there are numerous greisen fragments available and these indicate that unusually rich greisen bodies are present. In addition some of the granite is kaolinised and tin-bearing, increasing the potential of this prospect. The workings have been described by Jack (Mines Department Technical Report 10) who also took three samples, as follows:

Around old main shaft	1.13% Sn
Bottom of workings	0.61% Sn
Top of workings	0.10% Sn

Two samples taken by Mr. Reardon from costeans within the lease gave the following results:

	<u>Sn %</u>	<u>WO₃%</u>	<u>Ag (oz/ton)</u>
1 (700636)	6.5	trace	n.dt.
2 (702389)	0.51	0.78	0.48

It would be a distinct advantage if the ground around the lease could be covered by exploration licence, as mineralized greisen and kaolinised granite clearly extend south-east of the lease, and it might be politic to refrain from mapping the area until the licence situation improves.

CONCLUSIONS AND RECOMMENDATIONS

A considerable amount of surface prospecting has been carried out on the licence area, including bulldozing and some pitting. There seem to be five main zones of mineralization along the granite contact and available information on these has been reviewed. The nature of the mineralization precludes the use of standard geochemical and geophysical techniques and it appears that further exploration must be based on the well-tried methods of geological mapping, sampling and drilling. Enquiries are being made as to availability and cost of a satisfactory portable spectrometer X-ray which could accelerate prospecting and reduce the number of samples requiring assay. Though

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only giving approximate analyses for tin the instrument could be invaluable in delineating zones requiring more precise analysis.

The conclusions for these areas are as follows:

Area A: Ruby Flat

There is potential here for a large deposit of commercial kaolinite, as used (and required) by A.P.P.M., with cassiterite as a by-product that would pay for a substantial part of the extraction cost. Extraction is complicated by the presence of hard greisens in the soft granite. It is recommended that detailed geological mapping be carried out in conjunction with controlled sampling for both tin and kaolinite content. Initial sampling could be carried out by back-hoe, bulldozing and hand-boring. If results are promising, diamond (or percussion ?) drilling could be used to test the depth of kaolinization.

Area B: Mullins and Guiding Star

The relatively limited alteration of the granite reduces interest in this area though possibly useful reserves of tin are indicated. Further action would depend on results of exploration in Ruby Flat.

Area C: Walsh's Workings

Surface work is probably warranted here to determine the extent and grade of kaolinised granite.

Area D: Bells Plains

The extensive alluvial material should be sampled to determine grade. The samples already taken from the New Hope granites and greisens will give some indication as to whether this part of the area holds any promise.

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Area E: Mammoth-Star of Peace

The 13 chip samples taken from greisens in this area should give a fair indication as to whether further work is required. The results will have to be considered in connection with the size of the greisens and if the results are promising, further controlled samples should be taken to try and outline reserves. Succeeding exploration stages will probably involve drilling.

The Star of Peace is clearly of interest, as cassiterite mineralization is visible and several samples give promise of an economic grade. Following sluicing of the bulldozed material, the lease should be geologically mapped and systematically sampled.

M. Solomon

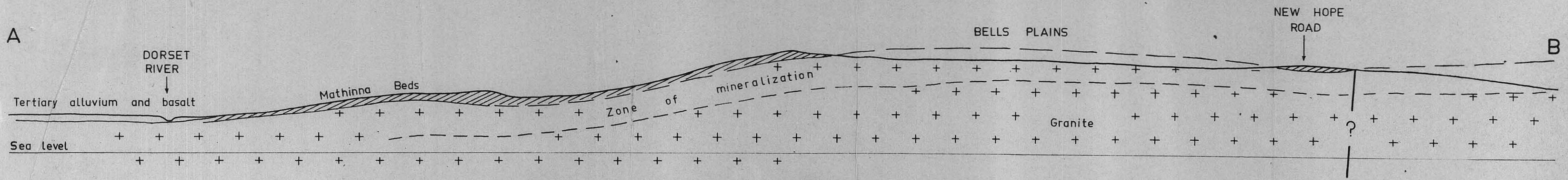
19th February, 1971.

for clay min \$15/T.

2. 200,000 T pa. x 20 years = 4,000,000 T.

Cannot stand high transport costs

? 30-50¢/kwh req



Vertical exaggeration X 3
 1 inch = 1300 feet

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FIGURE 2

For location see Figure 1.

