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THE ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED
West Coast Department

GEOLOGICAL DEPARTMENT

FINAL REPORT

on

THE BLUE TIER TIN PROSPECT

by

P S Lavers

July 1962

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AMG REFERENCE POINTS ADDED

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ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LTD.
West Coast Department

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MEMORANDUM

To: The Superintendent

July 30, 1962

From: Chief Geologist

Subject: BLUE TIER

The final report on the Blue Tier area by P.S.Lavers is submitted herewith.

The area of 35 sq. miles was pegged on July 11, 1959, and granted as EL7/59 on August 4, 1959. After a preliminary reconnaissance of the whole area it was decided to restrict investigations to the area surrounding the various old mines of the field. The tin bearing granite has an irregular domal shape with the mining field situated near the crown of the dome.

It is a common feature of this type of tin deposit that during cooling and crystallisation of the granite intrusion the more volatile tin bearing fluids rise to the top of the magma and form lenticular deposits within the cupola portions of its irregularly shaped roof or pegmatite veins in the overlying country rock.

This is just what happened at Blue Tier, but, unfortunately, the subsequent erosion of the land surface has unroofed all the significant cupolas and the streams have transported the majority of the cassiterite to the surrounding alluvial areas, which were worked so vigorously years ago.

All that was left up on the Tier were small isolated patches which formed the sites of the now defunct mines.

Mr. Lavers' report assesses the situation very well, and, in the face of this, further interest cannot be justified.

Exploration licence EL7/59 will expire on August 4, 1962, and it is recommended that no further extension be applied for.

V M Cattle

CHIEF GEOLOGIST

per J S Gregory

VMC:vw

cc: JGM (2); Supt. (2);
Geol.(2); Dir. of Mines (1)

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THE BLUE TIER TIN PROSPECT

C O N T E N T S

THE BLUE TIER TIN PROSPECT

INTRODUCTION

Exploration licence EL7/59 covers an area of 35 (7 x 5) sq.miles near the N.E. coast of Tasmania, and contains the Blue Tier tinfield (see pl.I). The area lies about 10 miles N.N.W. of St.Helens and includes the abandoned towns of Lottah and Poimena.

This field has been sluiced and mined to produce about 9,000 tons of tin oxide since 1875. Only one mine, the Anchor, was at any stage a major continuous producer, its output totalling 3,000 tons. Total production of all other mines on the field was about 1,000 tons, the remaining 5,000 tons having been produced by sluicing.

Apart from small vein deposits the tin lodes were pneumatolytically altered areas within a granite called the "Tin Granite", which intrudes an older granite called the "Porphyritic Granite".

The objects of this investigation were:

a) To map geologically this intrusion in order to deduce its overall structure;

b) To examine the known occurrences of tin bearing areas in an effort to discover the ore controls;

c) If a) and b) were achieved, to use this knowledge in assessing the field, and in seeking possible new deposits.

In addition to the tin investigation, a large zone of "greisen" was bulk sampled for assay for beryllium, which often occurs as Phenacite or Bertrandite in this type of rock.

LITERATURE AND PREVIOUS WORK

The most important information on the field is contained in:

1) 1928 Geological Survey Bulletin No. 38
"Blue Tier Tin Field" by A.McIntosh Reid and Q.J.Henderson, Tas. Dept. Mines
2) 1943 Unpublished Report
"Tin Deposits of the Blue Tier District by D.E.Thomas Tas. Dept.Mines.

The latter report records and reviews all other available literature on the area until that date. Since then, in 1946, H.G.W.Keid in an unpublished report of the Tasmanian Dept. of Mines discussed alluvial deposits, mainly in areas north and north-east of EL7/59.

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The production and grade data used in the present investigation were obtained from 1) and 2) above.

In 1904 the Mt. Lyell Mining and Railway Company carried out an exploratory programme of trenching and drilling in the central part of the present licence area. The results, in the form of a value-contour plan, are incorporated in this report.

In 1960 this Company commenced its programme of investigation. Dr. Barry Scott abstracted the pertinent information from the literature, whilst Mr. Peter Rodda prepared a radial plot-base map and carried out some geological mapping.

PROCEDURE ADOPTED

The boundary between the two granites was mapped on aerial photographs at a scale of approximately 25 chains to the inch, this information being transferred to the planimetrically corrected base map. During the traverses, the structure of the boundary was deduced when possible from its relationship to the undulating topography.

Samples were collected along suitable lines at selected structures and prepared for spectographic analysis to discover if the "background" content of tin showed any structurally controlled variation (see Appendix I).

PHYSIOGRAPHY

The area concerned in the investigation consists of a plateau at about 2,200-2,300 ft. above sea level, with the more prominent hills rising to 2,900 ft. A number of rivers and their tributaries drain the area, and have transported large quantities of tin from it to form the alluvial deposits worked in the vicinity of St.Helens, Goshen and Priory, on the east, and Weldborough, Herrick, Pioneer, South Mt. Cameron and Gladstone of the Ringarooma Valley on the West and North.

Some investigators consider the deep leads of the Derby district also originated in a Tertiary drainage system from the Blue Tier.

GEOLOGY

This is only a summary of the pertinent reasoning and conclusions that arose from the investigation. Fuller geological description is supplied in Appendix I.

In the region there is an extensive intrusion of porphyritic granite into lower Palaeozoic (probably Silurian) sediments with occasional remnant cappings of Permian sediments and Tertiary Basalts.

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In the licence area the porphyritic granite is intruded by a later granite, with which the tin mineralisation is associated, and detailed mapping was confined to the boundary and structures of this intrusion.

There are two types of tin deposit - the small quartz fissure filling type, which cut through the porphyritic granite, and the larger pneumatolytic deposits within the tin granite.

The bulk of the alluvial tin won in surrounding areas must have originated in the erosion of deposits of the latter type. Consequently, most attention was paid to working out the controlling features of such deposits, and to looking for possible new ones.

From his own and the work of previous investigators, the author is satisfied that the deposits occur within the tin granite, where it is pneumatolytically altered and its boundary forms either cupolas or dyke like offshoots from larger domal structures in the intrusion, and that enrichment is confined to the uppermost portions (the top 60 - 70 ft.) of these.

This is strongly supported by the occurrence of the Anchor, Don Duco, Crystal Hill, Liberator, Australia, Summit, Southern Cross, Moon, New Moon, Michael and Kent workings, where the abovementioned conditions were found in every case.

The cross sections (see plate 3) suggest that the cupolas on the main domes of tin granite have all been unroofed, and, in consequence, the major portion of the tin content has been lost to the surrounding alluvial fields.

The only remaining cupola of any significance lies on section G.H. between sections C D and A B. The roof of this cupola has only been exposed to a small extent at the Moon workings, but here the assay contours (see plate 4) show very limited and patchy distribution, with only a small zone bearing more than 0.2% Sn. This would certainly present a poor target for further testing.

ASSESSMENT OF THE FIELD

A) TIN

1) Previous Production and Grade - The Anchor mine produced a total of 1,400,000 tons of ore averaging 0.15% Sn. Other mines produced between 5,000 and 50,000 tons at higher average grades (up to 0.35% at the Southern cut of the Australia). All the workings display selective mining of the irregular and limited rich patches, so that even the low grades obtained are much higher than the true bulk grade of the deposits.

2) Possible new deposits - The only likely new deposits would occur beneath porphyritic granite cover east and west of the Moon workings in the cupola mentioned earlier.

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3) Results of testing

a) The value contour map (plate 4) shows the relationship of tin content to the geology in the central part of the field. This is adopted from the results of a very thorough trenching and drilling programme carried out by the Mt.Lyell Mining and Railway Co. It is readily seen that even within a suitable trap structure the occurrence of ore of economic grade (putting 0.2% as a minimum) is rare

b) The author collected samples for spectographic analysis in such a way as to test the effect of the boundary structure on the pattern of tin distribution. The results show that there is no significant background distribution, even in favourable structures, since the tin values ranged from .00001% to .00005% except for sample C5, which contained .0001% Sn. This even though C1, C2 and C3 were collected in the working face of the Summit Mine!

c) Most of the mines still contain some tin, but from records and the author's own discussions with prospectors and miners of the area, it is quite apparent that the remnants are patchy and limited.

4) Conclusions

In all, the total reserves of known mineralisation never exceeded 2,000,000 tons of 0.2% ore, occurring erratically throughout a number of favourable traps.

There is no reason to believe that the only remaining untested trap would contain reserves or grades of a greater order of magnitude, or that ore distribution would be more regular.

Any further exploration would have to be in the form of densely patterned drilling to counter the patchiness of the field. The nature and value of the target do not justify such a programme.

B) BERYLLIUM

The most extensive greisen zone, near the Moon workings, was bulk sampled, and found to contain no beryllium. The spectographic analyses showed that the 33 samples in groups A,B,C and D also contained no beryllium.

RECOMMENDATIONS

It is concluded that no further work is justified in the Blue Tier area, and it is recommended that licence EL7/59 be allowed to expire.

Philip S. Power
Geologist

Appendices attached

Appendix I — The Geology of the Blue Tier area
" II — Sampling Procedure and Results

APPENDIX I

The Geology of the Blue Tier Area

GENERAL STATEMENT

The North East coast of Tasmania contains extensive intrusion of biotite and biotite hornblende granite and granodiorite into moderately folded lower Palaeozoic rocks.

This intrusion is itself intruded by a much smaller mass of biotite muscovite granite in the Blue Tier region.

Permian sediments and a Tertiary sequence of basalt flows unconformably overlie these units.

In this area tin is found only in the small intrusion of biotite muscovite granite.

a) The "Porphyritic" granite

This is the larger granite mass. In the licence area it is generally a medium to coarse grained granite consisting of quartz, orthoclase, biotite and sometimes hornblende, with enlarged elongate phenocrysts (½" - 3") of oligoclase. The quartz is also often enlarged. These features give the granite its name.

In the North Eastcorner of the licence area there are elongate zones of a more even grained, less acid granodioritic phase, which are remarkably straight. In this area they outline a fault which is probably the same fault as that mapped further west. These zones probably represent pre-intrusion stratigraphic or structural features of the country rock sediments, as they are not related to any discernible structural features of the intrusion itself. The same rock types occur again at and about Lottah, and although it is suspected that the two zones correlate, this could not be established, as the intervening ground was often poor in outcrop and carried dense scrub.

The granite is structurally simple (i.e. generally massive) containing no inherent or induced foliations. It does possess vertical joint sets, most commonly set at N.W.-S.E. and N.E.-S.W., mutually inclined at angles of 70° - 110°, and also some minor shearing in some places.

There is no tin in this granite.

b) The "Tin" granite

This body is contained wholly within the porphyritic granite.

It is an even, fine to medium and rarely coarse grained biotite-muscovite granite. Often, either mica is considerably mor

abundant than the other. The rock is often altered, as described later, but normally it is composed of quartz, mica, potash feldspar and minor plagioclase feldspar. Occasionally a little hornblende, magnetite and apatite occur as accessory minerals.

The boundary between this and the porphyritic granite is distinct where it is observable. Generally it is accompanied by a pegmatite band 1" - 9" wide in the porphyritic granite. This band is deeply ironstained next to the tin granite, where there often appears to be a concentration of biotite and (?) secondary magnetite. Where the pegmatite band is not present the boundary is smooth and sharp within the order of grainsize of the tin granite. Whenever it can be seen the boundary appears to be an intrusive one.

STRUCTURES IN THE TIN GRANITE

The tin granite possesses vertical joint sets (less regular than in the porphyritic granite) and less commonly, a horizontal set.

Unlike the porphyritic granite, the tin granite also possesses an inherent foliation, which forms close set, shear like partings in weathered and near surface outcrops.

This foliation was found to be parallel to the boundary in every case where both were observable. Furthermore, where the boundary was mapable, but did not crop out, and its attitude was apparent from topographic relationships, the foliation was again parallel to it.

Hence the structure of the boundary could be determined at points well within the tin granite body by observation of this foliation. This means that extrapolation in construction of the cross sections was reliable. This feature also demonstrated the structural controls over pneumotolytic processes and ore emplacement.

Broadly the tin granite is a dome, elongated in a N.S. direction. This is stepped in an E.W. direction by four smaller E.W. trending domes. The southernmost three subsidiary domes correspond roughly to the base, the rim and the mid portion of the plateau, while the fourth, extending to the north western part of the area, is accentuated by a fault in the vicinity of the Wyniford River. The sense of movement of this fault is North block up and West, but no exact idea of amount of movement can be obtained.

Each of the major East-West domal structures has superimposed on it a series of smaller cupolas or "pimples". There are also dyke-like offshoots and dykes of tin granite emanating from the boundary.

THE ALTERATION AND MINERALISATION

Within the domes, and associated with the flat roof areas on the smaller cupolas there are zones of pneumotolytic alteration and

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greisenisation. Many of the offshoots are similarly altered. These zones of alteration are the host to the tin mineralisation, which would be contemporaneous, and all the productive mines were in such a zone.

It is considered that this localisation is due to the trapping of the pneumatolytic components of the magma in the tops of the cupolas, since these are the lightest constituents, being the last of the fluid phase to crystallise.

The alteration of the rock involves the following:-

i) breakdown of feldspar into quartz and fine mica and elsewhere to kaolin,
ii) the recrystallisation of muscovite mica to a finer state (sericite),
iii) the partial formation of chlorite and (?) zeolites from biotite,
iv) the introduction of fluorite, topaz, pinite and cassiterite, and v) further breakdown of the topaz to prosopite

Elsewhere the alteration consists of greisenisation, that is, almost total invasion of quartz and muscovite mica.

c) <u>The Aplite and Pegmatite Dykes</u>

These are a minor feature, and only two aplite dykes were large enough to warrant mapping. Some of the pegmatite dykes are mineralised and show alteration features similar to those of the tin granite.

The dykes are probably segregated offshoots from the tin granite, and are different in texture and composition from the offshoots mentioned earlier.

d) <u>The Permo-Carboniferous Sediments</u>

Within the licence area these occur only as a small flat lying cap of conglomeratic quartzite and siltstones on the top of Mt. Littlechild.

Elsewhere in the region Permian sediments extensively overlie the older granites unconformably.

e) <u>The Basalt</u>

This occurs in the South West corner of the mapped area. It comprises an irregularly based sequence of flows, and though it covers small deep leads elsewhere in the North east region, it is of no consequence here. There are occasional dykes of the same rock, only one of which was mapable on the scale used, traversing the granite.

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APPENDIX II

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Sampling Procedure and Results

Design of the Sampling

When the structural control over the mineralisation had been established it was decided to test:

1) a small unaltered cupola
2) a larger tin bearing cupola
3) a portion of a cupola side where it was steeply dipping

in order to see if there was any pattern in the distribution of tin going inwards from the boundary.

Samples A1-A5, and B1-B7 were collected for case (1), Samples C1 - C11 for case (2), and samples D1-D10 for case (3).

Procedure

An Abney level and tape were used to ensure a 10 ft. vertical separation between sampling points for groups A, B and C, and a 10 ft. horizontal separation between sampling points for group D.

About 1 lb. of clean fresh rock was collected at each point. The samples were ground in porcelain mortars and sieved through an 80 mesh nylon screen. A powdered duplicate and a hand specimen were retained and about ½ lb. of powdered material from each sample was submitted for spectographic analysis at Risdon.

The localities are shown on the map (Plate 2).

Results

The results are listed below:-

Sample No.	% Sn.	% Be
A1	<.0001	0
A2	"	"
A3	"	"
A4	"	"
A5	"	"
B1	<.0001	0
B2	"	"
B3	"	"
B4	"	"
B5	"	"
B6	"	"
B7	"	"

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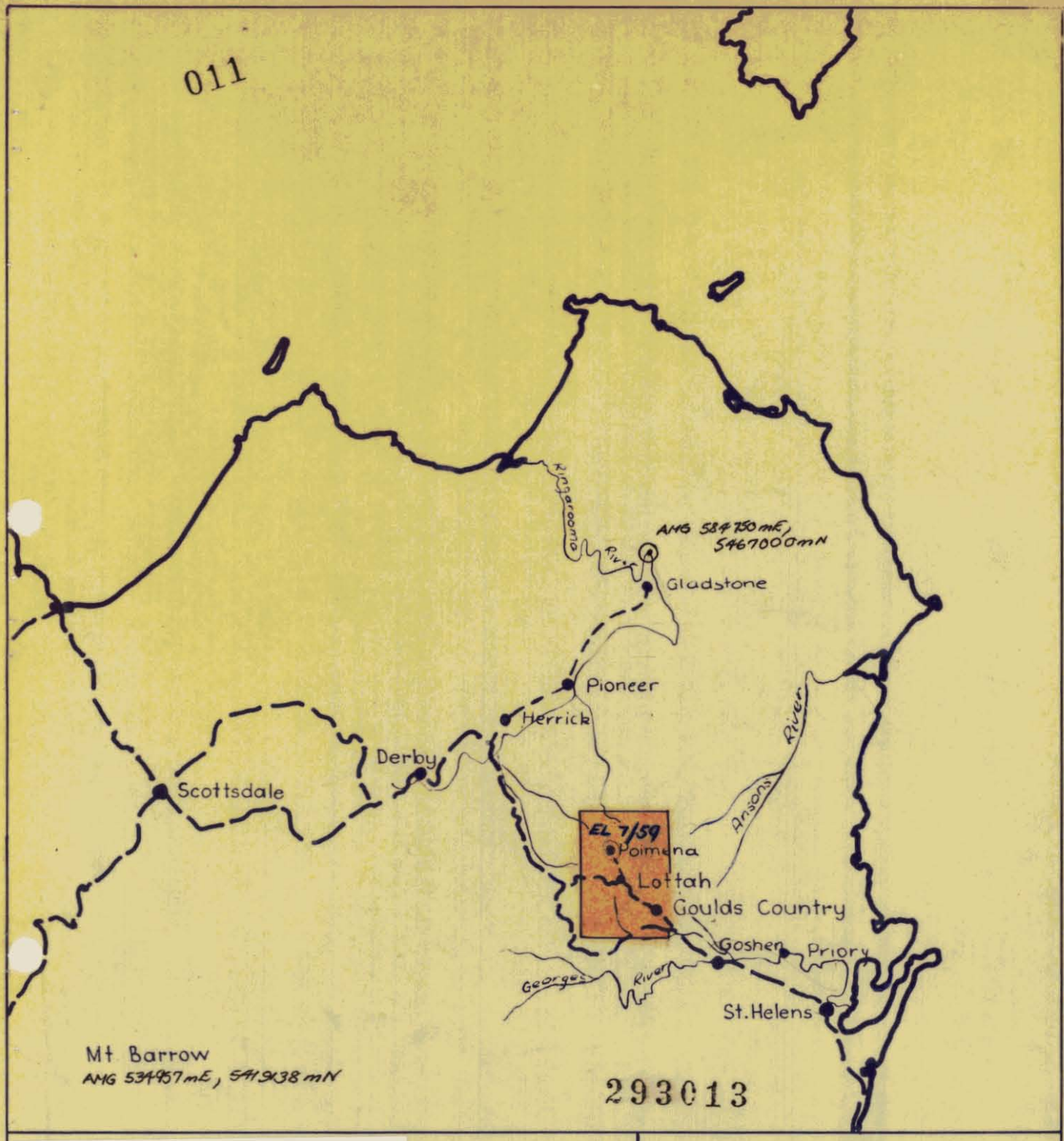
Sample No.	% Sn.	% Be
C1	<.0001	0
C2	"	"
C3	"	"
C4	"	"
C5	.0001	"
C6	<.0001	"
C7	"	"
C8	"	"
C9	"	"
C10	"	"
C11	"	"
D1	<.0001	0
D2	"	"
D3	"	"
D4	"	"
D5	"	"
D6	"	"
D7	"	"
D8	"	"
D9	"	"
D10	"	"

The report from the spectographer says that the tin content ranged from an estimated 0.00001%, but was mostly of the order of 0.00005%.

About 25 lbs. of greisenised rock were collected from the vicinity of the Moon workings, and were crushed and quartered down to about 1 lb. This was assayed for Beryllium, but contained none.



AMG REFERENCE POINTS ADDED

5 cm

BLUE TIER PROJECT

LOCATION MAP

Scale 8 m. to 1 in

E.Z.Co. W.C.D. GEOL. DEPT. ZO 1031

Plate 1

Δ MASHER HILL

7+6

7+5

7+4

Macmichael Ck

Shallow

Steep

Michael

Δ MT MICHAEL

Steep

Sun Flat

Shallow

Wynyard R.

Velocipede Ck

Samples A

Samples D

Samples B.

Camp Ck

8+2

Moon Ck

Seven Mile Ck

Southern Cross

Moon R.

8+0

POIMENA

7+9

Shallow

Steep

See plate IV for inset

Latter R.

Summit

Samples C.

Δ MT LITTLECHILD

Australia

Tin Dish Ck

Maria

Louise

Ransome Ck

R.

Crystal Ck

Shallow

Shallow

Dam

Pine Track

LOTTAH

LOTTAH LITTLE PLAINS RD

Steep

Dead Horse Ck

Stoney Ck

Liberator

0+4

0+3

Anchor

Blue Tier Run 7/250- 0+5

5+4 Ringarooma Run 1/430-

Groom River

TASMAN HIGHWAY

To PYENGANA

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Geological Map

BLUE TIER TIN PROSPECT

Scale 1" = 1650' Date 16·5·62.

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PLATE 2.

- Deduced Local attitude of boundary surface of tin granite
- Boundary of tin granite Horizontal
- Boundary of tin granite Vertical.
- Geological boundary established
- Geological boundary inferred.
- Geological boundary adopted from MacIntosh Reid & Henderson (1928) & Thomas (1943)
- Fault
- Road
- Track

- Porphyritic Granite
- Indicates less acid zones
- Tin Granite
- Aplite dyke
- Basic dyke
- Basalt
- Sediments (Permo-Carboniferous)

5 cm

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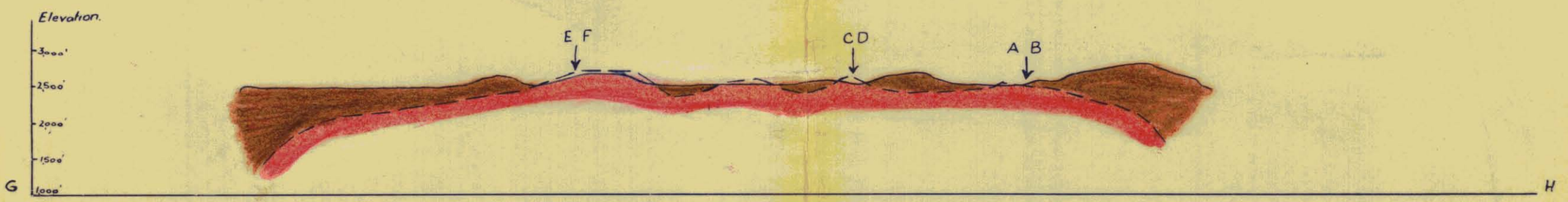
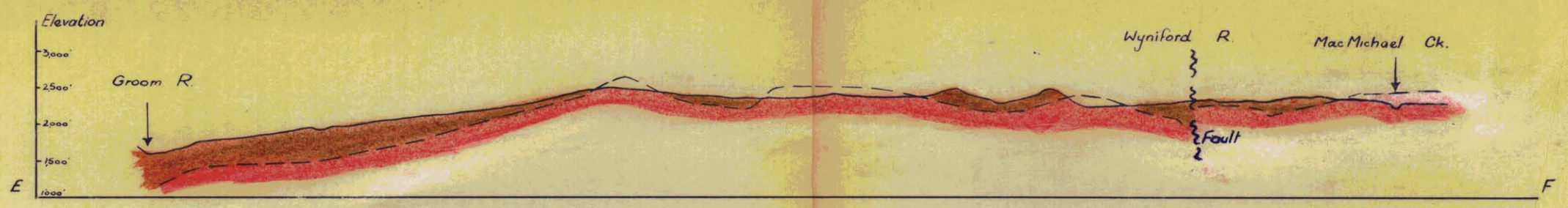
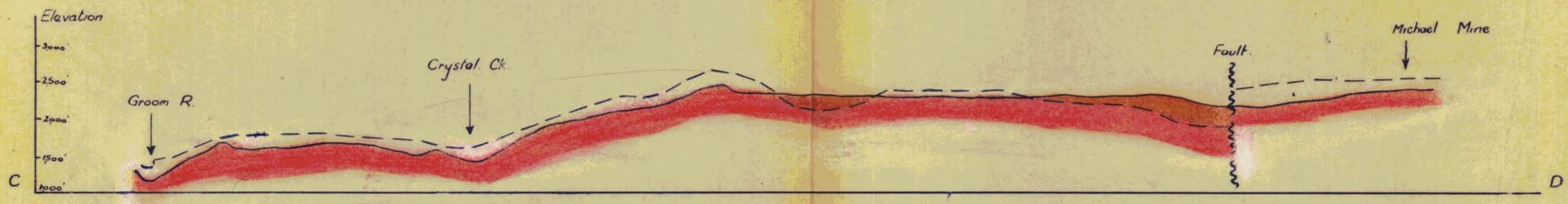
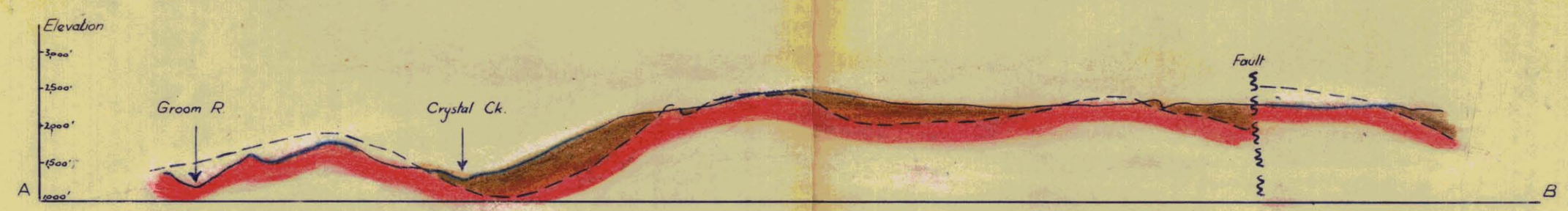
BLUE TIER REGION



CROSS SECTION LOOKING NORTH







5 cm

Porphyritic Granite.

Tin Granite.

—— Ground Level.

--- Boundary

CROSS SECTIONS LOOKING WEST

Showing probable structure of boundary

of tin-bearing granite

Scale : 1" = 1650' Date: 16-5-62

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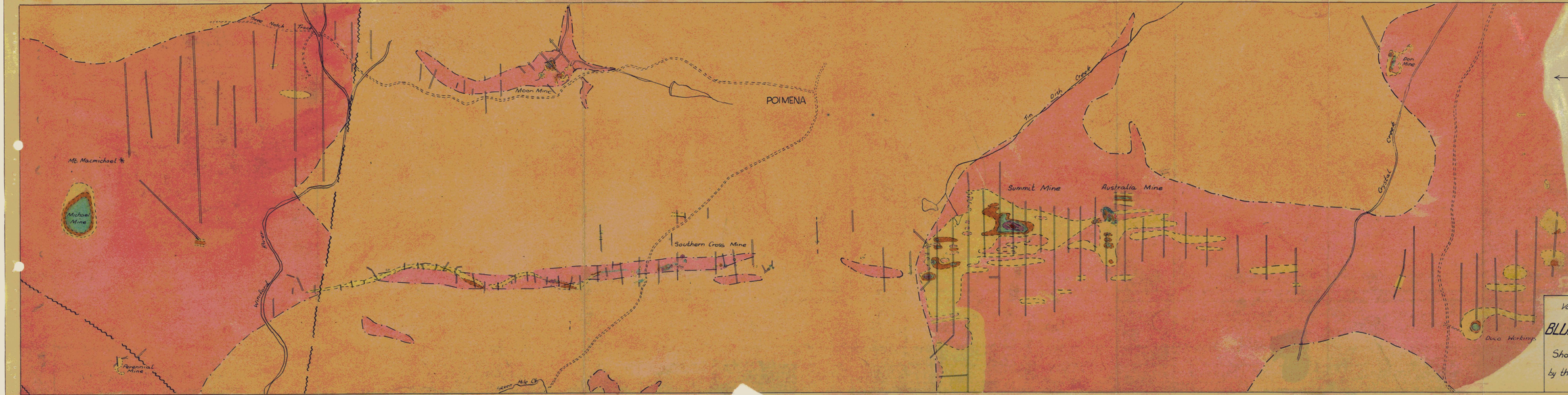
PLATE 3



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Value Contour Plan.

BLUE TIER PROSPECT.

Showing results of sampling by the Mt. Lyell Mining & Railway Co

PLATE IV.