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Prospect 603

114001

CSR MINERALS & CHEMICALS DIVISION

EXPLORATION OF E.L. 11/78,
GEORGE RIVER PROSPECT
ST. HELENS DISTRICT, TASMANIA

79-1407

EMR 86/79

Received by Dept. of Mines
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SYDNEY
December 1979.

G.C. HALL

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ALLUVIAL	PRIMARY
GEOCHEMISTRY	DRAINAGE
SAMPLING	PETROGRAPHY
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1. INTRODUCTION

Exploration Licence No. 11/78 was granted to CSR Limited during September, 1978. The application for this tenement was the result of a regional appraisal of N.E. Tasmania for an area which would include a spread of tin mineralisation from Tertiary alluvials through to lode and disseminated possibilities in both country rock and mineralising granite.

The present report describes the geological concepts which guided exploration, the methods and results of that exploration.

E.L. 11/78 covers an area of 303 km^2 immediately west of St. Helens on the north-east coast of Tasmania.

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2. SUMMARY AND RECOMMENDATIONS

Exploration of E.L. 11/78 by the Exploration Group of CSR Limited has located four separate prospects which to different degrees deserve further exploration. The tenement is known as the George River Prospect and covers part of the Blue Tier Tin-field in north-east Tasmania. One alluvial and three hard-rock prospects have been delineated within the exploration licence.

2.1 Thureau's Lead

DERWENT CREEK 930230 → 930260

Comprehensive drill testing of this palaeo-channel by the Tasmanian Mines Department in the vicinity of past workings did not locate any tin at depth. The tributary streams to the palaeo-channel, almost without exception, carried tin to the palaeo-channel and were worked for their tin content. There remains a substantial interval between the tributary workings in the Derwent Creek and the nearest drill section at the Boggy Creek workings. This interval is over 5,000 m long and the palaeo-channel at Boggy Creek is 700 m wide and 200 m deep.

ARGONAUT RD. to FLOWERS RVT.

This interval of the palaeo-channel is prospective if it can be established that there are tin accumulations over bedrock downstream from the Derwent Creek workings. Attempts to hand auger this area were unsuccessful due to fallback below the water table.

Two sections could be drilled by reverse circulation across the palaeo-channel. One in the vicinity of the Derwent Creek and if tin accumulations are encountered the other in the middle of the untested interval. Holes should be drilled to bedrock at 200 m spacings but the reverse circulation method or cable tool method. Use of the reverse circulation method is dependent upon a successful drilling programme by Wallis Geochemical Drilling at Amdex's Pioneer tin mine in early 1980.

T.C.R 801479

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2.2 Johnson's Hill (8515-872.337)

An area of altered granite and greisen with several quartz veins is located in the Lottah Granite. This is the principal tin-bearing granite of the Blue Tier tinfield. Small streams draining this hill show coarse tin when basal material from the headwaters of the old workings is panned. This area was traversed irregularly for rock chip geochemistry and retraversed on a rectangular soil sample grid. A small tin/tungsten anomaly was outlined. Coarse tin was recovered in the area of this anomaly from panned soil samples. Rock chip sampling did not locate any significant mineralisation, although greisen and altered granite samples are anomalous in tin (300 ppm) and tungsten (1750 ppm).

Exploration of this area is hampered by dense regrowth and steep topography. The prospect straddles the tenement boundary shared with Renison Limited (joint venture partner Hellyer Mining and Exploration Pty. Ltd., to the tenement title holders).

No further work is recommended in this area.

2.3 Mt. Pierson Granite (8515- MOONLIGHT MARSH -946.274)

An extensive area of fractured granite shedding tin in alluvium was outlined within the Mt. Pierson Granite. Numerous traverses were undertaken in areas of past alluvial mining activity. Despite the extensive past alluvial mining activities few sources for the tin were reported from within the Mt. Pierson Granite.

A grid was established over a small drainage basin (Moonlight Marsh) representative of the larger area in an effort to locate the source of the tin. Strong fracturing and jointing is evident at all scales and these joints have been invaded by silicified granite breccia, fine grained granite and quartz tourmaline veins.

The fine-grained granite carries pyrite (arsenopyrite) and tourmaline. All three rock types appear to carry up to 1% by volume cassiterite. This programme established that vertical veins and breccia diatremes are located in the Mt. Pierson granite. Deep weathering however, restricts reasonable outcrops to the steepest slopes or in the base of the old workings.

This larger area is prospective for larger diatreme or vein stockwork deposits and further exploration of this area is recommended. This exploration should consist of a detailed stream sediment survey of the broad area qnd rock chip sampling of altered rock types.

2.4 Mathinna Beds

Intensive sampling and traversing was undertaken in the vicinity of two Geophoto prospects - Upper Scamander and Copper Show Creek.

(8515-949.155)

The Copper Show Creek prospect shows a zone of anomalous base metal values in soil samples around veins of massive sulphide in fractured quartzite. The veins trend 040°, the regional fault-joint trend. The sulphide is tin and gold-bearing but mainly consists of arsenopyrite, galena and minor chalcopyrite.

(8515-938.178)

The Upper Scamander prospect contains copper anomalies in soil samples coincident with weak I.P. anomalies. The sequence shows silicification, brecciation, quartz mica and quartz tourmaline minerals. The prospect was diamond drilled without success. ← I suspect, by Geophoto!

The entire area encompassing these two prospects was sampled by stream sediment, heavy mineral and rock chip techniques. A zone of narrow limonitic gossans and quartz veins in siltstone carrying up to 3,000 ppm Sn was located between the Copper Show Creek and Upper Scamander prospect.

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The remainder of the Mathinna Beds areas should be stream sediment sampled in detail with heavy mineral samples taken for each major drainage.

2.5 Other Work

If further work is undertaken, the following items should be noted :

- follow up of Geophoto radiometric anomalies "O" and "U".

- orientation studies of the Hogans Track Goldfield occurrences in order that all areas of Mathinna Beds may be evaluated for Hogans Track type gold deposits.

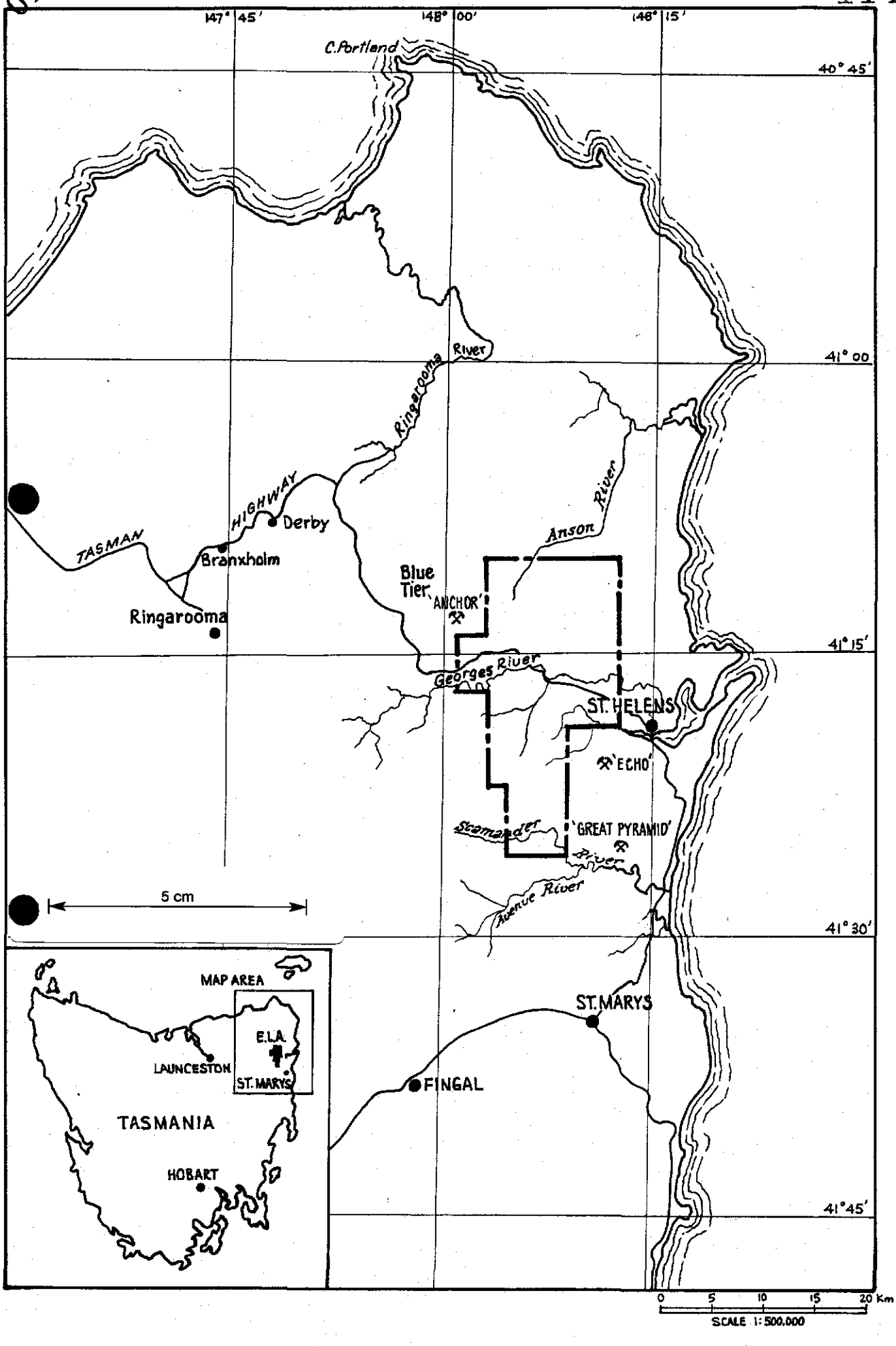

FIG. 1. LOCATION MAP - GEORGES RIVER E.L.11/78 TAS.

3. LOCATION AND ACCESS

E.L. 11/78 lies 3 km west of St. Helens township and is bisected by the Tasman Highway (refer Figure 1). The tenement covers 303 km^2 of hilly topography. The northern half of the E.L. contains the headwaters of the Anson River. The principal drainage basin within the E.L. is the lower reaches of the George River. The southern half of the tenement covers part of the Scamander River drainage basin.

The E.L. includes cleared grazing land which covers the alluvial flats within the principal drainages. The primary vegetation pattern is open gum forest with local dense undergrowth. The main land uses are agriculture and forestry.

Access into the area is via the Tasman Highway. Access within the E.L. is by various graded roads and forestry tracks. A reasonable network of roads and tracks provides access to most parts of the E.L. Most of these are shown on the accompany plans (Dwg. Nos. K554-1 and K5542).

Elevations of 300 m are common in the metasedimentary country featuring steep sided hills while granite country shows 100 m elevations rising to a maximum of 700 m on the Blue Tier.

4. PREVIOUS EXPLORATION

Tin was first worked in N.E. Tasmania in 1882 and a spate of activity dominated by individual prospectors and small mining companies continued until 1910.

Between 1910 and the mid-1950's exploration was mainly undertaken by the Mines Department who conducted a programme of investigation and evaluation of the principal tin occurrences.

Exploration has been continuous since the mid-1950's with the following companies being active :-

RTZ	-	alluvial testing
EZ	-	airborne E.M. survey and follow-up
BHP	-	testing the Pinnacles and Great Pyramid
Austminex	-	sampling structural anomalies
Utah Devel.	-	sampling alluvial tin areas
Aberfoyle	-	drill testing the Great Pyramid prospect
Geophoto	-	exploration and drill testing 1968-73.

This work is well summarised in Mortimer (1974).

At the present time, BHP, Renison and Abminco are active in the area.

The Mines Department's programme has resulted in several definitive publications on the geology and mineralisation of the area; (Groves, et al, 1977 and Groves, 1972).

TABLE I - ROCK UNITS E.L. 11/78

AGE	LOCAL NAME	DESCRIPTION
Tertiary		Sandstone, gravel, clay
Upper Devonian		Dolerite dykes
		Acid granitic rocks, aplite, quartz, feldspar, prophyry
	Lottah Sheets Constable Creek Sheet	Medium grained biotite-muscovite granite/adamellite locally fine grained and greisenous
	Poimera Pluton Mt. Pierson Pluton	Coarse grained/porphyritic biotite granite/adamellite
	St. Helens Pluton Gardens Pluton Pyengara Pluton	biotite hornblende granodiorite, diorite, porphyritic in places
Upper Silurian	Mathinna Beds	Sandstone, shale and silstone

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5. GEOLOGY

E.L. 11/78 covers granitic rocks of part of the Blue Tier Batholith which is a post-kinematic granite complex. The complex covers 1,800 km^2 of N.E. Tasmania (Groves, 1977). The Upper Devonian complex intrudes Lower Silurian Mathinna Beds, which comprise a thick sequence of thin bedded sandstone, siltstone and mudstone.

Many different phases are recognised within the batholith. A general trend from early basic granodiorite intrusives (featuring hypersthene and hornblende) through to granite adamellite intrusives is observed. This trend culminates in a series of granite/adamellite intrusives featuring muscovite and greisen.

This section will only describe the rock types occurring within the E.L. (For a more complete description of the geology of the Blue Tier Batholith, see Groves, et al, 1977). Table 1 shows the rock units cropping out within the tenement.

The geology of E.L. 11/78 is shown on Dwg.No. K554-1 and petrographic descriptions of rock samples mentioned in this section are contained in Appendix I.

5.1 Mathinna Beds

The main rock type is a sandstone or coarse siltstone, generally in units 0.1 m to 1.0 m thick. The lithology is poorly sorted and argillaceous. Minor lithologies include siltstone and shale.

The sequence has been subject to low grade regional metamorphism, with phyllites showing preferred orientations of sericite and chlorite. The sequence has been folded during the Tabberabberan Orogeny resulting in a series of major folds, whose axes strike 150°. Superimposed on these folds are minor folds of shorter wavelength.

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The Blue Tier Batholith passively intruded this folded sequence. Hornfels developed in the contact metamorphic aureoles (GRR 114) and tin and other mineralisation entered the fractured country rock. Sample GRR 113 from the Great Pyramid tin mine and GRR 112 from the Copper Show Creek adit are representative of this mineralisation. Passage of this mineralisation was associated with several types of alteration, and samples GRR 109 (quartz-tourmaline) and 110 (quartz-mica) are representative of this alteration.

5.2 *Hornblende Granodiorite*

Three plutons of this general composition occur within the tenement. They are :-

Gardens Pluton
St. Helens Pluton
Pyengana Pluton

These plutons are not observed in any detail, except in auger holes where weathering of hornblende produces a distinctive green colouration. Hornblende is a distinguising characteristic of these plutons.

5.3 Biotite Granite - Adamellite

Two plutons of this composition occur within the tenement. They are :-

Poimena Pluton
Mt. Pierson Pluton

These plutons comprise the main bulk of the Blue Tier Batholith.

The Mt. Pierson pluton is coarse-grained and is rarely porphyritic. The rock unit shows even texture, and is of granite adamellite composition. On air photos it shows a characteristic highly jointed pattern of moderately dark grey tone. The jointing is very pronounced. Three directions were measured in the Moonlight Marsh area :-

100°/vertical
160°/vertical
040°/45° N.W.

These joint directions often carry quartz tourmaline veining (± suspected cassiterite), fine grained red aplite and an unusual white weathering black quartz rock rock of obvious plutonic origin (GRR 138). The first two rock types are often associated, while the last was once observed to crop out in a circular pattern suggestive of a diatreme or pipe. This material carried small blebs of galena. The aplitic rock carried disseminated pyrite (marcasite) which is locally abundant.

The Mt. Pierson pluton crops out as distinctive massive granite tors separated by sandy soil. The relationship of the granite tors to joints is only seen in the fresh exposure in the base of the alluvial workings or on the steep rock hillsides. These joint infillings are thought to be the source of the alluvial tin in the lower George and Scamander River areas.

The acid rock units intruding the joints are probably related to the Constable Creek sheet granite.

The Poimena pluton is extremely coarse grained and is usually porphyritic, with large (to 3 cm) laths of feldspar and biotite in a medium grained groundmass. The rock unit gives rise to large granite tors and a white sandy soil which is reflected in aerial photographs as a massive appearance and light grey tone. This rock unit is not tin bearing.

5.4 Granite Sheets

Two groups of muscovite-biotite, granite/adamellite occur within the tenement. They are :-

Lottah Sheets
Constable Creek Sheet

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These granites are thought to be late stage differentiates of the Poimena and Mt. Pierson plutons respectively and to have a sheet-like form. This rock type is the "tin granite".

The Constable Creek granite intrudes along the contact of the Mt. Pierson granite and the Mathinna Beds. Exposures in the vicinity of Mt. Echo, 3 km SE of St. Helens show the upper contact to be flat lying in this area. The granite is similarly thought to underlie the Mathinna Beds in the south-east corner of the E.L. The dyke-like nature of the granite in the southern part of the E.L. suggests the granite probably does not underlie the Mathinna Beds in the south-west corner. The granite is usually fine to medium grained, with two micas and a distinctive red colouration. Mapping in the Haley's Creek area has indicated that the granite is probably not as extensive as shown on the accompanying geology plan, which is based on Groves, et al, (1977). Samples, GRR 95 and 115 are typical of the Constables Creek type.

A distinctive aerial photo pattern was not discerned for this unit. As mentioned above the fine grained aplite which occupies joint planes within the Mt. Pierson granite is thought to be related to the Constable Creek sheet.

The Lottah Sheets consist of medium to fine-grained granite showing two micas. Three areas occur within the tenement. They are :-

Platts Lookout
Gould's Country
Sweets Hill

This granite type contains most of the hard-rock tin prospects on the Blue Tier tinfield. The tin occurs in greisenous veins or in flat lying greisen sheets within this granite, e.g. the Anchor tin mine (Groves & Taylor, 1973). Sample GRR 116 is taken from the Anchor tin mine.

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The Platts Lookout occurrence is a medium grained granite with biotite and minor muscovite. Pegmatites, alaskites and aplite dykes are associated with this granite.

The Gould's Country occurrence is a fine grained granite especially near the western contact, with zones of of medium-grained muscovite-biotite granite. This granite shows greisen at the contact with the Poimena Granite in the vicinity of Steve Hyde's Homestead on the Anchor Road. In this locality the granite is strongly jointed, without biotite but showing large muscovite crystals adjacent to or within the joint planes. Small muscovite crystals occur within the granite blocks defined by these joint surfaces (sample GRR 146).

Elsewhere fine-grained granite shows quartz veining, blebs of tourmaline, and the generally "rotten" appearance of weathered altered granite.

The granite forms topographic highs on the surrounding Poimena surface, and in cleared forest areas has a bright white airphoto tone. Usually these outcrops are densely forested and support a vigorous undergrowth.

5.5 Dolerite

Dolerite of probable Devonian age was observed intruding the Lottah Granite in the vicinity of Halls Falls on the Groom River and intruding the Mathinna Beds in the vicinity of the Scamander River granite dyke. The dykes are about 10 m wide and strike 040^{o} (sample GRR 111).

5.6 Tertiary Sediments

A significant thickness of Tertiary sediment (up to 100 m) has accumulated in the palaeo Georges River in a deposit known as Thureau's Lead. The sediments are mainly sandy-clay and clayey sand with minor conglomerate, clay and intercalated basalt (Jack, 1964). Elsewhere the drainages contain grey black sandy clay over quartz-rich gravel wash. This wash is often tin bearing in areas draining the Mt. Pierson Granite.

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6. EXPLORATION CONCEPTS

6.1 Alluvial Cassiterite

Alluvial cassiterite is widespread within the E.L. especially between Goshen and St. Helens. Here, mining in the past has mainly been concentrated along Thureau's Lead which follows the path of the former Georges River. Exploration by mining companies and the Department of Mines along the buried channel has indicated low grade ground (0.06 kg/m^3 Sn) with the cassiterite concentrated where reworking by the present river has occurred (Jack, 1964).

No economic or sub-economic alluvial cassiterite has yet been found deep in the buried valley. This suggests the Tertiary gravels are barren, with erosion and concentration of cassiterite, a recent phenomena. The possibility that a deep, narrow, but rich lead exists should not be entirely discounted until adequate assessment of the valley system is undertaken. The possibility of deep leads being preserved within an older buried valley system outside the known river systems appears remote. This is due to a combination of the large amount of outcrop and an incised topography.

6.2 Eluvial Cassiterite

No eluvial cassiterite deposits have yet been reported in the E.L. The potential for such deposits still existing is remote as past mining activity was extensive. Any such deposit would have been mined as a shallow alluvial deposit. Some small eluvial cassiterite areas may still exist. The most economical means of exploring for these is to :-

- research old records for coarse and/or rich cassiterite areas;
- panning the streams for source areas;
- identifying source areas during exploration for more extensive alluvial deposits.

6.3 Primary Cassiterite

Primary cassiterite is known to occur within the E.L. principally as greisenous lodes associated with the more acid phases of plutonism, i.e. the biotite muscovite granites known as Lottah and Constable's Creek Sheets. The cassiterite is concentrated in greisenous lodes in the contact zone of the acid granites and in the country rock. Stockwork-like vein swarms are known in both the granite at the Anchor Mine on the Blue Tier, west of Lottah; and in the Mathinna Beds at the Great Pyramid, southeast of the present E.L. No doubt other similar deposits have yet to be recognised.

The types of cassiterite mineralisation expected to be associated with the relatively passively intruded stocks and sheets in northeastern Tasmania are summarised as follows :-

.. vertical greisenous quartz tin veins;
.. horizontal quartz tin veins;
.. tin-wolframite veins;
.. a concentration of small veins of the above to form a stockwork.

This mineralisation is usually concentrated either in the granites or contact sediments, although horizontal quartz tin veins are more likely in the roof zone of small bodies of late biotite granite and tin wolframite veins in the country rock above cupolas.

Various areas within the E.L. appear worthy of renewed effort for primary cassiterite. These are in or surround the stanniferous-bearing Constable's Creek and Lottah micaceous granites and include both "hard rock" and altered "soft rock" deposits. Of immediate interest is the north-south contact between the Constable's Creek granite and the Mt. Pierson adamellite just southwest of St. Helens. Here, large areas of alluvial cassiterite have been mined previously. This cassiterite may have been shedding from a concentrated or disseminated source located in the contact zone.

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6.4 Wolframite and Molybdenum

Quartz veins with wolfram and minor molybdenum occur in north-northeast to north-east trending tension fractures around Wolfram Creek, just outside the south-east boundary of the E.L. Similar veins may exist in the Mathinna Beds inside the E.L., or perhaps trapped in a small cupola of granite (cf. the Echo Prospect on Constable's Creek) which as yet, is unexposed in our area. Stockworks of these veins may also exist where the competence of the rocks allowed concentrated fracturing.

6.5 Copper, Silver, Lead and Zinc

Northwest trending fractures containing copper mineralisation with minor lead, zinc and silver occur in the Mathinna Beds surrounding the granites to the south-east of the E.L. Mapping by geologists working for the Tasmanian Mines Department has recognised a zonation of mineralisation around the granites. This progresses from cassiterite, to wolfram-molybdenum, to copper, to an outer silver-lead-zinc zone, (Groves, 1972).

The possibility that a lode of copper or silver-lead exists in the small amount of country rock exposed in the E.L. should not be ignored but must be minimal. This is because the Constable's Creek Granite is plunging shallowly to the southeast and is probably never far from the surface within the E.L. On the other hand this makes this southern area more prospective for tin and/or wolfram and molybdenum.

The possibility of replacement deposits in the area is also remote as the Mathinna Beds are a particularly monotonous sequence of sandstones, siltstones and laminated mudstones with a high argillaceous or siliceous content.

6.6 Gold and Silver

Gold and silver bearing quartz lodes are known to the immediate west of the E.L. in the Brilliant Creek area.

These are considered to be associated with more basic biotite granodiorites which crop out west of the E.L.

Similar lodes could occur in the tenement. Previous work by Geophoto in the early 1970's delineated some anomalies in this area that were subsequently drilled. These should be re-evaluated.

7. SAMPLING AND ASSAY TECHNIQUES

Samples were labelled as follows :-

GR - Georges River Prospect, followed by either of -:
S - stream sediment
H - heavy mineral sample
L - soil sample
LH - composite panned soil sample
R - rock sample

Samples were analysed as follows :-

GRR 1-79, GRL 1-20, GRS 1-21 (for Cu, Pb, Zn, Ag, Cd, Bi by AAS using a perchloric/nitric acid digestion; Mo and W by colorimetry; and Sn, As, Sb, Au by emission spectroscopy).

GRR 80-147, GRR 21-158, GRLH 159-180, GRS 22-176 (for Cu, Pb, Zn, Co, Bi by AAS using a perchloric/nitric acid digestion; Mo and W by colorimetry; and Au, Ag, As, Sn by emission spectroscopy.)

Stream sediment and heavy mineral samples were collected concurrently at most sample sites; however, there are sample sites where either heavy mineral or stream sediment samples were collected exclusively. The sites for heavy mineral only are -

82, 83, 87-92, 97, 109, 110, 112, 115-120, 122, 128, 157, 158, 174, 175, 177-183

Stream sediment only :-

19, 26, 31, 67, 80, 94, 111, 121, 159, 167-173.

The following samples were either lost or the numbers not used :-

GRS/H	27, 28, 99, 100	GRR 101
GRS	68-73, 81, 101	GRL 122, 129

Locations of samples prefixed GRS, H or R are shown on the accompanying plan DWG No. K554-2.

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Stream sediment samples were taken from old stream banks as far as possible, and the presence of fresh sandy wash (contamination) was noted. The type of float on the creek and the bedrock was noted also. The soil auger was used in areas of bad contamination or clay overburden. Samples were and sieved to -20 mesh, before pulverising for analysis.

Heavy mineral samples were sieved to -20 mesh before panning.

Soil samples were collected from the C horizon and split into two samples. One sample was bagged for drying, sieving at -20 mesh, pulverising and assaying. The other sample was panned and provided a visual estimation of tin content. The panned soil samples were grouped into composite samples for check assays.

A sample of beach sand (GRLH 180) and beach sand with tin concentrate (1% Sn) added (GRLH 179) were included as check assays. A disturbing feature of this check was the high Sn assay (300 ppm) of sample Nos. 180 suggesting laboratory contamination.

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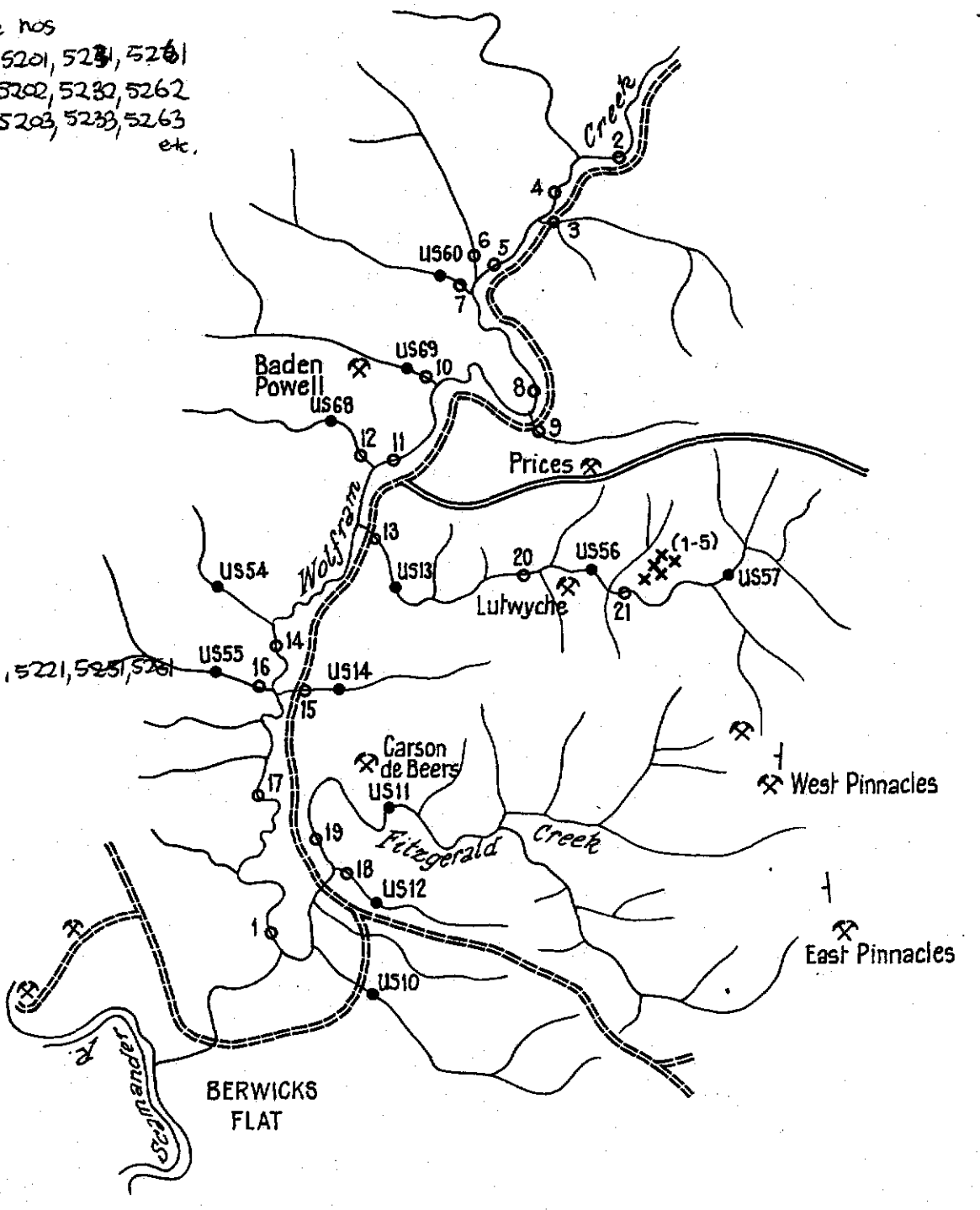
Data base nos
1 - 5001, 5201, 5251, 5261
2 - 5002, 5202, 5252, 5262
3 - 5003, 5203, 5253, 5263 etc.
4 -
5 -
6 -
7 -
8 -
9 -
10 -
11 -
12 -
13 -
14 -
15 -
16 -
17 -
18 -
19 -
20 -
21 - 5021, 5221, 5251, 5261



REFERENCE

- ⚒ *Mine or prospect*
- US68 ● *'Geophoto' stream sediment sample location and number*
- 20 ○ *CSR Limited MCD stream sediment and heavy mineral sample location and number*
- (1-5) × *CSR Limited MCD soil sample locations (refer pages 16, 17)*

5 cm

0 500m

SCALE SEEMS WRONG; SEEMS TO BE 0 – 1000m (1:25,000)

FIG.2. WOLFRAM CREEK ORIENTATION SURVEY - E.L.11/78 TAS.

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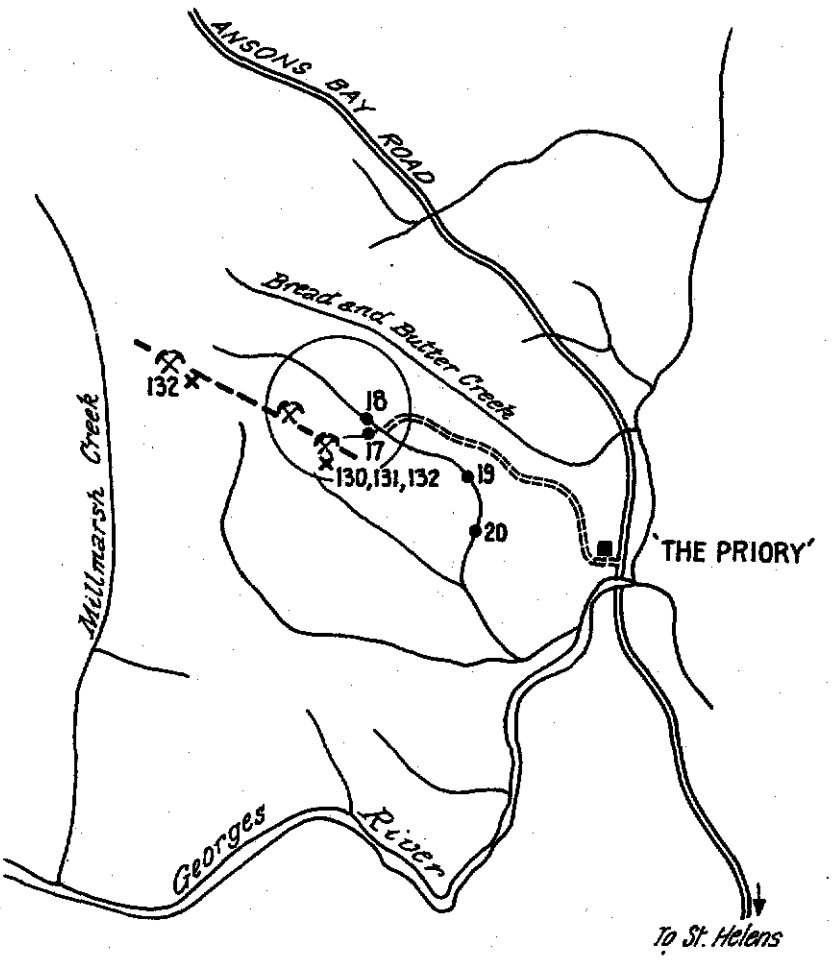

NOTE : Soil sample sites
15-18 from auger holes just above bedrock
19,20 auger samples from bedrock
167-73 weathered bedrock

SCALE 1: 25,000
0 500m

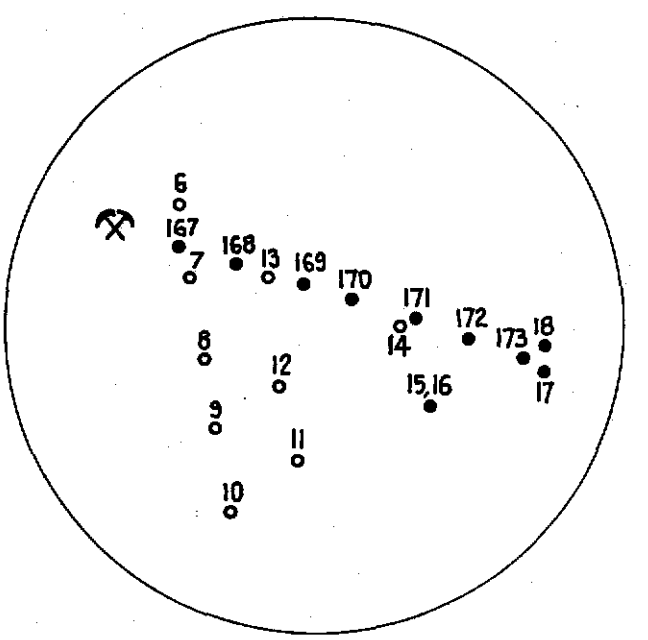

FIG.3. PRIORY ORIENTATION SURVEY

8. ORIENTATION SURVEY

Two test areas were selected to evaluate the effectiveness of geochemistry and heavy mineral studies in identifying known mineral deposits. These areas are :-

Wolfram Creek area - W, Mo and Sn veins in Mathinna Beds.

Priory area - Sn lode in granite

8.1 Wolfram Creek (Figure 2)

Stream sediment and heavy mineral samples were collected from the old stream banks in the Wolfram Creek watershed. Numerous small quartz veins carrying varying amounts of wolfram and molybdenum are known within the area. These sometimes carry small amounts of sulphides. The sample positions are shown on the accompanying sketch map.

Five soil samples were taken on the slopes below small wolfram-molybdenum quartz veins on the Lutwyche Prospect in an attempt to follow any values encountered in the stream to their source. The soil samples are from the B horizon. The soil on these steep sided hills is thin with a thick scree of broken rock.

8.2 The Priory (Figure 3)

A series of soil samples were taken down-slope from this small tin-bearing lode. The soil samples were taken from the B. horizon. Auger samples were also taken in the small depressions draining the area. Samples were taken of the material above the weathered granite bedrock. The possibility of contamination of the samples due to the old workings upstream cannot be discounted as the area of contamination is difficult to assess.

8.3 Geochemistry

The orientation samples were sent to A.C.S. Laboratories, Adelaide for sieving into four fractions :-

-20 mesh +40 mesh
-40 mesh +60 mesh
-60 mesh +80 mesh
-80 mesh.

Each fraction was analysed as follows :-

.. Cu, Pb, Zn, Bi, Ag, Cd using a perchloric/nitric acid digestion and read on the AAS.
.. Mo and W by colorimetry.
.. Sn, Sb, As, Au by emission spectroscopy (semi-quantitative).

Assay results are contained in Appendix II.

8.4 Heavy Mineral Samples

The panned samples were sent to Minpet Services for separation by bromoform and visual mineral identification according to a predetermined analysis sheet.

Result sheets are contained in Appendix III.

8.5 Geochemical Results

A suite of elements were geochemically assayed in the hope of highlighting minor element concentrations as indicators for primary Sn-W mineralisation. Most of the element concentrations were below the limit of detection of the geochemical method used, and were not of any great use. However, Cu, Pb, Zn, W and Sn showed promise.

An R mode cluster analysis of the four size fractions of the Wolfram Creek data was undertaken by Earth Science Computer Services. The results of that data are contained in Appendix V.

The results show that coarser fractions are more useful with a -20/+80 or -20/+60 mesh fraction being optimum. W and Sn are complementary, and Cu/Zn also, with these two groups being related in coarser fractions. Pb is independent as is Sn in the finer fractions.

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This data shows the use of -80 mesh sample and Cu/Zn analyses as indicators for tin mineralisation of the Wolfram Creek type does not optimise the size of the geochemical response of such mineralisation.

The Priory data shows i) no significant base metal values are associated with the lode; and ii) a general spottiness of the values with a preference for higher values in coarser fractions. Again -20/+60 or -20/+80 fractions appear optimum. For lode deposits in "tin" granite, tin is the best indicator.

The bedrock auger programme (GRS 167-173) and the rock assay results (GRR 130-2) confirm this data. The Anchor Mine rock samples also show the same pattern with a suggestion that Zn and W anomalies may be complementary with tin deposits. The alteration around the Priory Lode shows high arsenic values (GRR 132)

8.6 Heavy Mineral Results

Heavy mineral data was obtained for the Wolfram Creek area only. Trends are reported below.

(a) tourmaline grains become finer with increasing distance from the granite contact.
(b) zircons are rounded (reworked from sediments)
(c) cassiterite is a minor mineral in streams draining W-Mo shows
(d) cassiterite is a major mineral in streams draining Sn shows with GRH 8 being highly anomalous.
(e) cassiterite is a minor mineral in streams draining the granite contact.
(f) limonitic detritus is common.
(g) wolframite doesn't report in the heavy mineral fraction in streams draining W-Mo shows.
(h) contact metamorphic minerals reported widely.

9. ALLUVIAL TIN EXPLORATION

Some time was spent examining the old alluvial workings in order to :-

.. establish their extent and thus delineate unworked areas;
.. to establish or confirm the grade of these areas; and
.. ascertain the source of the cassiterite.

Alluvial mining has been carried out to bedrock from the vicinity of the Anchor Mine in the northwest of the area to the Powers Rivulet in the east. The Groom River and the George River below its junction with the Groom River were the principal rivers worked. Local information suggests the George River flats at Goshen contain tin. The Siamese Tin Company who held the lease over these flats ceased operations before mining this area. The area is cleared and sown to pasture and local resistance to drill testing the river flats should be expected.

The Groom River still contains tin, in the basal boulder beds as the early tin miners could not move these boulders. The amount of tin remaining and the yardage of overburden discourage testing of this area. No attempt was made to sample these areas in order to confirm this information.

Alluvial mining has been carried out to bedrock in many of the streams which drain the Mt. Pierson granites. Most of these streams would have drained into Thureau's Lead. Examination of these workings shows the alluvial miners by-passed the swamp or marsh areas. Auger testing of these areas showed most of them to contain tin in quartz gravel beneath 1.5 to 5 m of grey sandy clay. Areas tested in this manner include :-

Area	Sample Nos.
Steeles Marsh	159-166, 177H*
Carters Marsh	176
Terryvale Marsh	not tested
Marshes on Albion Creek	174H
Moonlight Marsh	178
Rattray Marsh	144-156.

Marshes of similar potential include those in the headwaters of Constables Creek (Transit Flat) where local information suggests unworked alluvial areas remain. The early miners were not able to provide sufficient water to nozzle effectively and the clay overlying the gravels made shovelling too difficult.

Steelesand Rattrays Marshes were investigated in some detail. They are large areas where no mining activity has been undertaken, but whose drainage basins are located on the favourable Mt. Pierson Pluton.

Steeles Marsh covers an area of 1-2 km^2 on Treloggens Creek, a tributary to the Scamander River. The marsh has been drained, cleared and sown to pasture. Clay-rich sediments up to 5 metres thickness were intersected in the auger sampling. Tin-bearing wash was not intersected although some panned heavy mineral samples show minor amounts of cassiterite (163 and 165). Treloggens Creek below limit of headward erosion shows major amounts of cassiterite (177), although not a great weight of concentrate was obtained from the panned sample. Geochemical assays confirm these results with 1,000 ppm Sn for GRS 177.

Rattrays Marsh covers a much larger area from the Anson River in the west to the Last River in the east and includes Dead Horse and Fight Creeks. The marsh is partially drained and sown to pasture. Clay-rich sediments overlie sand wash (up to 3 m thick). Tin was intersected in minor amounts in samples 147, 151, 152 and 154 and in major amounts in 153, 150 and 149. However, the amount of concentrate for the last

* Heavy mineral sample only.

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two samples is suspiciously high especially in view of the fact that heavy mineral sample 157 contains a large amount of pyrite which was visually observed in sample 150. Samples 157 and 158 were of tin-bearing wash taken from a mineral claim held by Reynolds on Saxelby Creek on the Argonaut Road and were expected to contain cassiterite. It would appear that samples 150-157 and 149-158 have been interchanged on the heavy mineral report. The low geochemical values for tin from the stream sediment data confirm these results.

9.3 Thureau's Lead

In the area known as Thureau's Lead, tin has been won from the surface sediments to a maximum depth of 5 m. The sediments are unconsolidated sands and sandy clays overlying clay-rich sediments. The early miners nozzled down to the clay-rich sequence which was referred to as "marine bottom". The principal workings appear to coincide with the junction of major tin-bearing tributary streams with the palaeochannel.

Bog Creek workings	:	Bells Marsh Creek
Clio Hill workings	:	Albion Creek
Argonaut workings	:	Saxelby/Argonaut/Golden Fleece Creeks
Ruby Flat workings	:	Launceston Creek
Medeas Cove workings	:	Constable Creek

The tin was very fine and black. Concentrates of 50% Sn were obtained with the principal contaminants being gold, sapphire, zircon and wolfram. However, in each set of workings local areas of coarser ruby tin were encountered. Sufficient gold was recovered to pay the miners wages. The reported grades were extremely low, and these grades were confirmed by sampling faces left standing in each of the principal workings.

Neither the early prospect pitting (usually only to the water table) nor the later drilling in 1963 by the Department of Mines (Jack, 1964) has located any cassiterite over the granite bedrock. The section lines were drilled on

100 m centres and section lines are shown on DWG No. K554-1. The section lines were located about the old workings. Examination of the original logs leaves little room for doubt as to the accuracy of the 1963 drilling. Appendix V includes a copy of Jack's 1963 report and a table of past production records.

The headwater area of Thureau's Lead was not drilled by the Mines Department in 1963 and the section below the old workings in Hunt Mine and Derwent Creeks above the Bog Creek workings could be drill-tested. This area is of approximately 5,000 m long, 700 m wide and up to 200 m deep. Bells Marsh and Derwent Creeks and the Groom River are tin-bearing and the early mines did not work this section of Thureau's Lead.

The greater part of this area is open forest with only a small area around Terryvale Homestead sown to pasture.

The absence of economic tin accumulations in Thureau's Lead can be explained as follows :-

i) the tin-bearing basement areas were not exposed during sedimentation, or
ii) the tin-bearing alluvials were eroded and replaced by rapid sedimentation.

Both these hypotheses explain the bimodal tin grain size; the coarse red tin being of recent origin, the fine black tin being reworked alluvial tin already contained within the sediments of the lead. There is uniform low grade tin distributed throughout the lead.

The George River is presently cutting into its base at the Priory Bridge and a sample of the older alluvium was panned for tin (GRH 174). This sample shows a major concentration of tin in a fairly heavy concentrate. This tin is believed to represent the material Albion Creek was bringing to the palaeochannel.

10. PRIMARY TIN EXPLORATION

Three main target areas were selected for detailed investigation. They are :-

.. Lottah Granite sheets
.. Mt. Pierson Granite area including the Constable Creek Granite; and
.. Mathinna Beds area.

10.1 Review of Past Company Activity

Geophoto's work contains the only systematic sampling, with assays for Cu, Pb, Zn, Mo, Bi (not Sn or W) on the -80 mesh fraction.

An airborne radiometric survey was very comprehensive and outlined several interesting anomalies which were not apparently followed up by Geophoto staff. In particular an anomaly was obtained over a cupola of Constables Creek granite within the Mathinna Beds; the granite contains a greisen rich in Mo-W (Echo Prospect, Figure 1). Although this anomaly lies outside of our tenement, two other comparable anomalies located over Mathinna Beds within a kilometre of the Constables Creek granite were obtained within the tenement. These anomalies labelled"0" and "U" are shown on DWG No
File Reports Q41/24 and 28).

A fracture analysis of the area was undertaken by Geophoto's parent company, Texas Instruments using a computer modelling technique (Tas. File Reports Q33/15 and 41/30). A fracture cluster anomaly approach had also been used by Austminex in 1965 with some success. Austminex soil samples were assayed for copper and anomalous results were followed up (Tas. File A41/8).

10.2 Lottah Granite Sheets

The three principal outcrop areas are Platts Lookout, Goulds Country and Sweets Hill. Each of these areas was investigated.:-

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.. stream sediment and heavy mineral samples were taken from streams draining the granite contact (the most favourable locus for mineralisation).

.. traversing of the geological contact and rock chip sampling was undertaken to confirm Mines Department mapping and to collect samples from areas of interest.

10.2.1 Platts Lookout (8515 — 901.375)

Difficulty was experienced in mapping the boundaries of the Platts Lookout mass. Alaskites, aplites and coarse pegmatite phases of this granite were found on road traverses. No greisenous areas were encountered in this mass.

Difficulty in obtaining representative stream sediment samples due to high run-off and contamination from forestry work led to streams draining the eastern portion being resampled by augering. As far as possible, samples on bedrock were obtained. Below the water table fallback in the basal gravel was a significant problem. The Platts Lookout area had not been sampled in detail by any exploration company nor is any tin mineralisation reported from past prospecting.

Geochemical assays of stream sediment and rock chip samples show no obviously anomalous values, although tin, tungsten and molybdenum show some variation, to 20 ppm. Heavy mineral concentrates consist mainly of biotite, zircon, ilmenite and locally andalusite and tourmaline. Grains were usually angular and 0.1 to 0.2 mm in size. Trace amounts of cassiterite and wolframite were locally observed.

10.2.2 Goulds Country/Sweet Hill (8515 - 896.327)

The Goulds Country/Sweets Hill masses are surrounded by old alluvial workings. Mica-rich, fine grained granite and quartz veining were found on a topographic high (known as Johnson's Hill) on the northern

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margin of the E.L. Numerous rock samples were taken from an area which appears to be shedding tin into the small creeks draining it. This area, Johnson's Hill, warranted more detailed sampling and a soil auger programme on 200 m centres was conducted. Some lines were extended to the granite contact. Lines were oriented 045, and sample sites flagged and labelled.

The location of the soil samples and the distribution of composite sample groups is shown on DWG K554-3.

Geochemical assays of stream sediment and rock chip samples show few obviously anomalous values, although tin, tungsten, molybdenum and bismuth show variations. Direct observation of previous alluvial workings combined with discussions with local residents proved a more effective means of prospecting in this area. Quartz tourmaline veins, greisen and altered granite were located during traversing the central ridge. Clearing of land for agricultural activities has introduced considerable contamination into the sampling environment.

Heavy mineral concentrates consist of biotite, ilmenite, andalusite and zircon with local concentrations of cassiterite. These concentrations of cassiterite are independent of geochemical stream sediment anomalies but are coincident with previous mining activity.

Assays of soil samples proved very poor indicators of mineralisation. A coincident tungsten, tin, copper, zinc anomaly is outlined near the tenement boundary in the vicinity of alteration observed near rock chip traversing. Again a spottiness of tin values is observed. Tin and tungsten anomalies are coincident in assays of composite soil heavy mineral samples and in soil samples.

10.3 Mt. Pierson Granite Area

The majority of the streams draining this granite show a strong structural orientation. This is especially so of those creeks that have been mined for their tin content. It appears that alluvial tin is being brought to the area of the former George River by these north-easterly trending streams. The extent of these alluvial workins and their relationship to the Mt. Pierson Granite is shown on DWG NoK554-2. Rock chip and stream sediment sampling was not undertaken in this area. Instead some time was spent examining the old alluvial workings in order to ascertain the source of the cassiterite. The streams are shedding cassiterite at present times. Quartz-tourmaline scree is abundant in the Albion Creek, Boggy Creek and Argonaut workings. This core is tin-bearing in places (GRR 133).

Traverses were undertaken in the Argonaut, Ferntree Hill, Boggy Creek, Saxelby Creek and Moonlight Marsh areas. In each case the creeks draining these areas were mined for tin (both alluvial and eluvial) without a source ever being located. An exception is the Priory Lode which shed into Bread and Butter Creek. Traversing in each of the above areas revealed float of three different rock types :-

- fine-grained granite aplite;
- quartz veining with tourmaline;
- an unidentified siliceous rock.

Petrographic analysis of these rock types show them to contain 2% by volume cassiterite, although rock assays are generally very low.

A representative area of small drainage (Moonlight Marsh) containing coarse alluvial tin was soil sampled on a 200 m grid in an attempt to locate a tin source. The grid, geochemical contours and the composite sample areas are shown on DWG No. K554-4.

Sampling in the Moonlight Marsh area revealed a consistent joint pattern within the Mt. Pierson Granite. The

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joints had been invaded by each of the above rock types. Joint outcrops were relatively scarce as the joint horizons tend to weather leaving an intervening granite tor. On the side of Copplestone Hill (a significant topographic high), a small pipe-like outcrop of siliceous material of 20 m diameter (GRR 138) was located in association with flat joints infilled by tourmalinised microgranite and quartz tourmaline veining. Soil samples in this area show coarse tin. As this rock association shows tin values, a structural analysis should be undertaken to locate large features of this type.

Geochemical assays of soil samples show an amorphous pattern without any significantly high values. Rock chip samples of quartz-tourmaline veining and aplitic granite show values to 1,000 ppm Sn. Panned soil samples show tin in concentrates in several disconnected locations. Significantly some of these locations are downslope from the breccia and aplite/quartz veining described above (2.2 E/0.5S). The other anomalies are also downslope from the widespread veining.

10.4 Mathinna Beds

Most areas of Mathinna Beds within the tenement are possibly underlain by granite plutons and thus are favourable areas for exploration. There are three principal outcrop areas :-

Haley's Creek area
Hogans Creek area
Pyengana and Goshen Roof Pendants.

10.4.1 Haley's Creek

Geophoto carried out regional stream sediment sampling over this area and obtained a copper anomaly in the headwaters of Haley's Creek. An adit and shaft were also located. These two prospects were then tested separately as the Upper Scamander Prospect and the Copper Show Creek prospect, respectively. These are shown on DWG No.K554-1.

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Geophoto reports on the work carried out on the prospects and the geochemical data were reviewed. Detailed stream sediment and heavy mineral sampling was undertaken by CSR staff on both major and minor streams. A geological appraisal of the area was carried out with stream bed and ridge top traverses. Numerous rock chip samples were taken on these traverses and a geological map produced. Sample locations are shown on DWG No.K554-2.

(a) Copper Show Creek Prospect. This prospect is located near the junction of Haley's Creek and the Scamander River on the eastern boundary of CSR's tenement. An adit, a small shaft (water-filled) and several costeans are located on small quartz veins trending 050 in a large quartzite band trending 150, dipping 80° west. The quartzite veins carry minor arsenopyrite, pyrite-marcasite, galena and sphalerite with blebs of chalcopyrite (GRR 12 to 18).

The cross-cutting veins strike at 050 and are vertical to westerly dipping. These quartz veins are common throughout the area and most have been prospected to some extent. The quartzites can be followed along strike for some distance and frequently suffer minor displacement by north-east trending faults. Limonitic gossanous material is commonly found in these faults and throughout the area. Usually it is found in the more shaley members of the Mathinna Beds.

Geophoto's exploration of this prospect consisted of three parallel survey lines, 60 m separation, bearing 340° and of 720 m length were cut to the east of the workings. B horizon soil samples at 30 m spacing were assayed for copper, lead, zinc and silver.

A NNE trend for mineralisation was established while assays of vein mineralisation showed values up to 1.52% As and 460 ppm Pb. Samples of iron stained quartzite band assayed up to 6.8% Pb, 0.29% Zn, 105 ppm Ag and 35% As (Geophoto Report 1970/83).

CSR's exploration of this prospect revealed a further shaft and a trench opened on the same quartzite, some 800 m NNW of the main adit. Assays of the vein material from the main adit (GRR 12) confirm the copper-arsenic nature of the mineralisation, but also show gold (8.5 mm), tin (300 ppm) and antimony (1,000 ppm) values.

Assays of the vein material in the trench (GRR 13-18) show copper, lead, zinc, tin, silver and arsenic values.

(b) Upper Scamander Prospect. This prospect is located in the headwaters of Haleys Creek. Geophoto's detailed stream sediment sampling revealed anomalous copper values over a wide area. Gridding, mapping, soil and rock geochemistry were followed by an induced polarisation survey and then a limited diamond drilling programme was undertaken. A single hole was sited on a weak I.P. and soil copper anomaly. The hole was depressed normal to the bedding. The core showed minor chlorite-quartz breccia zones with anomalous base metal values. Sulphides of copper and lead were visible in trace quantities on joint planes (Geophoto Reports 1970/1A, 1970/a, 19701B and 1971/44).

CSR's exploration aimed to detect disseminated tin stockwork deposits of the Great Pyramid type. This type is considered the most likely discovery in this Haley's Creek area of Mathinna Beds.

.. Stream Sediments. The stream sediment results show a much smaller anomalous area for base metal values than was evident in the Geophoto survey. Again the granite sediment contact is anomalous (samples GRS 24, 25, 23, 29, 30, 33, 32) while in Haleys Creek sample GRS 111 was anomalous. The other main creek draining the Upper Scamander anomaly was not stream sediment sampled (heavy mineral sample only).

The difference in the geochemical results reflect the different size fractions; -20# (CSR) against -80# (Geophoto).

.. Heavy Minerals Samples. The major constituent of the heavy mineral samples is ferruginous siltstone (both magnetic and non-magnetic varieties). Detrital heavy minerals usually rounded and locally abundant are also common. These include zircon, rutile, ilmenite, magnetite with minor amounts of anatase, sphene, etc.

Tourmaline grains are of major abundance, usually angular and coarse, and rarely as fine needles. Metamorphic mineral assemblages are also noted.

Minor amounts of cassiterite are noted in samples 22, 30, 76, 77, 101, 114, 115, 116, 117, 81, 83 and 89. This cassiterite is probably shedding from the sulphide veins outlined above.

Trace amounts of gold, scheelite and wolframite are also detected.

.. Rock Chip Sampling. In the area of the Upper Scamander Anomaly limonitic gossanous quartz float is found on the western side of the hill together with small quartz veins carrying minor amounts of galena, arsenopyrite and pyrite (GRR 40, 41, 42, 43). Gossans from this area show high Sn and W values (GRR 81, 83, 84, 85, 86, 60, 59).

DDH's 1 and 2, drilled by Geophoto, were sited to test weak I.P. anomalies and broad copper anomalies along the base of a quartzite. Quartz-mica and quartz-tourmaline veins are also common in the area. No mineralisation is visible there, but the tourmaline carries anomalous tin values (GRR 52, 58). Quartz-tourmaline rock (GRR 44) is equivalent to petrographic sample GRR 109 and quartz mica rock GRR 73 is equivalent to petrographic sample GRR 110.

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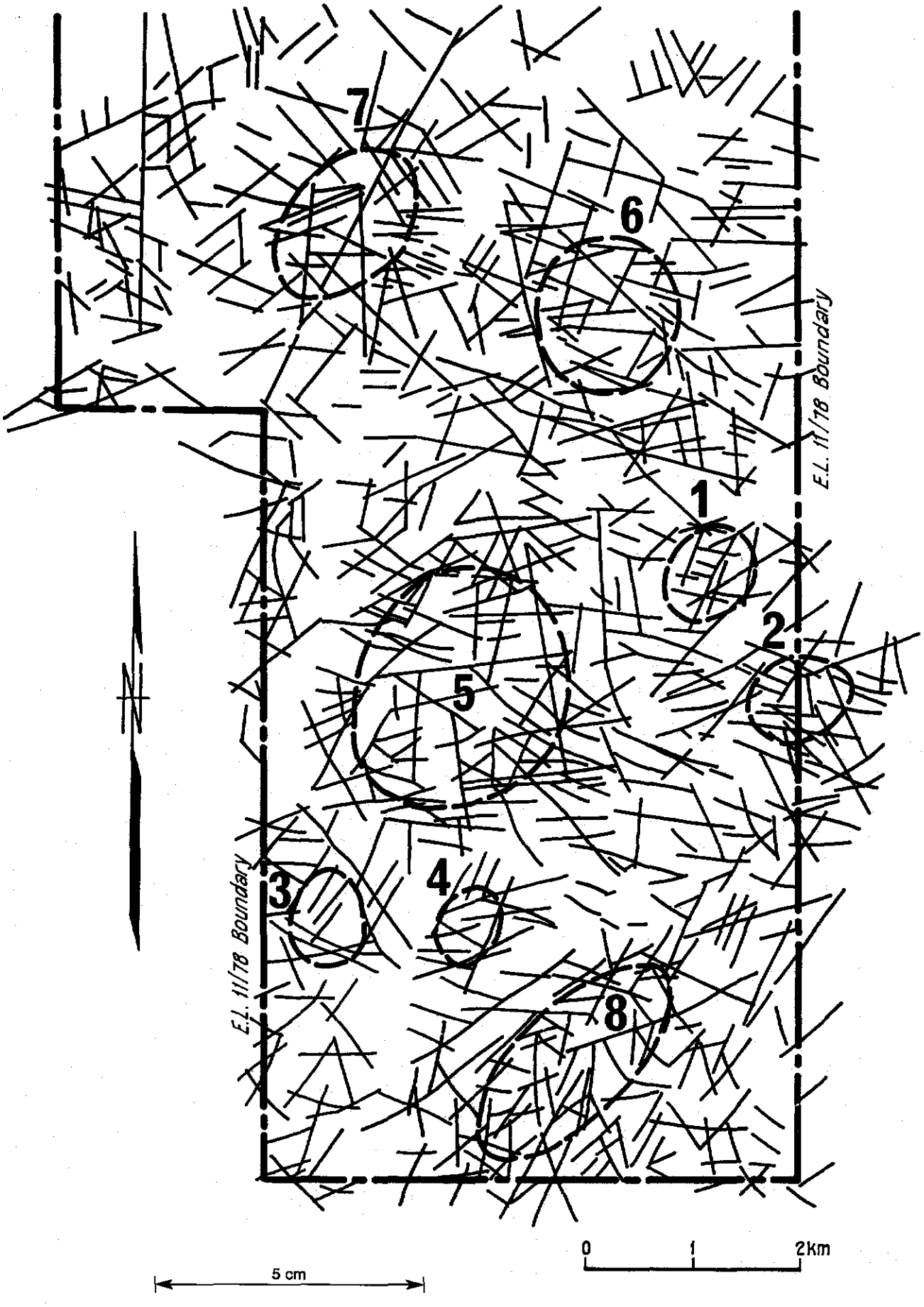

FIG.4. CONCENTRATIONS OF FRACTURES - E.L.11/78 TAS.

Two structural anomalies located in the Copper Show Creek were subject to follow-up work which is discussed in detail in the following section.

.. Structural Analysis (Figure 4). Geophoto carried out a computer generated structural analysis of their tenement. The raw data was examined to locate those areas within E.L. 11/78 where a concentration of structures or patterns suggest buried intrusions. It should be noted that Geophoto expressed some doubt as to the viability of the original data because of the strong east-west bias on the aerial photos due to coincidence shadows and the flight lines (Geophoto Reports Tas. File Q41/30, Q33/15).

As a preliminary investigation into the viability of this concept four small structural anomalies in the Mathinna Beds were checked on the ground. Stream sediment and heavy mineral samples were collected from streams draining the anomalies and some rock chip samples were collected.

Two of these anomalies were in the headwaters of Haley's Creek and two along Queen of the Earth Creek.

The anomalies on the Copper Show Creek area (1 and 2) were found to have surface expressions. Anomaly 1 covers an area of soil copper anomaly as sampled by Geophoto. Float of granite was also found in this area which is some distance and over a ridge from apparent contact. Hornfelsing is also more common and coarser with an occasional vein of quartz and mica.

Anomaly 2 was evident as a scarcity of outcrop in Haley's Creek. Where outcrop exists, the normally siliceous well-bedded rocks have the appearance of a well-fractured or ruptured area. Geophysics and geochemistry should be considered over these two areas to fully assess them.

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Anomaly 3 was not evident on the surface and occurs at the junction of the two creeks, Brilliant Creek and Queen of the Earth Creek. The area was sampled intensely. Stream sediments showed no really high values, while rock chip assays (GRR 94 and 95) showed evidence of minor mineralisation. Cassiterite is noted in minor proportions in sample 93.

Anomaly 4 appears to be the result of a small quartz dolerite-like intrusion found on the ridge top, near the contact with the granite.

It is obvious that these structural anomalies can be identified on the ground and further work along these lines is warranted. This is especially so in those areas in the granite that coincide with areas that appear to be shedding tin, notably Anomalies 5 and 6.

10.4.2 Hogans Track Area

This area was sampled by Geophoto and the results of that survey have been reviewed. Besides investigation of two structural anomalies (Nos. 3 and 4) no other work was undertaken in this area. The area is prospetive for gold deposits of the Hogans Track Goldfield type. Radiometric anomaly 0 is worthy of further investigation.

10.4.3 Goshen and Pyengana Roof Pendants

These areas of Mathinna Beds were not investigated at all, though the Geophoto geochemical data was reviewed. This data showed an area of anomalous Zn values in the Pyengana area, which could be further investigated. These areas are prospective for Sn and Au deposits. A source for the gold in Thureau's Lead has yet to be established.

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APPENDIX I

PETROGRAPHIC REPORT

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Minpet Services

76 McLachlan Avenue, Rushcutters Bay, N.S.W. 2011 — P.O. Box 24 Rushcutters Bay, N.S.W.
Telephone 357 6423 — after hours 665 4986

Ref: PJC:5/79

4th August, 1979.

The Chief Geologist,
Minerals & Chemicals Division,
CSR Limited,
G.P.O. Box 483,
SYDNEY, N.S.W. 2001.

Attention: Mr. G.C. Hall

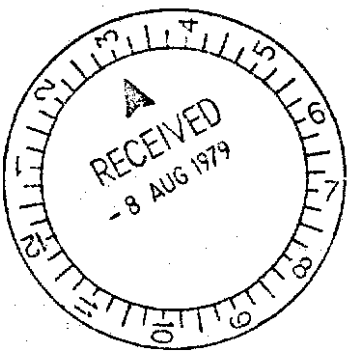
Dear Sir,

A PETROGRAPHIC STUDY OF SEDIMENTS AND GRANITES FROM E.L.11/78 AND NEIGHBOURING AREAS, ST. HELENS, TASMANIA

Herewith petrographic work on rocks from the St. Helens area, completed as requested in Mr. Hall's letter dated 22nd May, 1979. Mineralogical work on the panned sediments collected by Mr. Hall at that time will be completed as soon as possible.

Yours faithfully,

P.J. CURTIS



MINPET SERVICES

76 McLachlan Avenue, Rushcutters Bay, N.S.W., 2011

REPORT NO. 5/79

A PETROGRAPHIC STUDY OF SEDIMENTS AND GRANITES FROM E.L. 11/78 AND NEIGHBOURING AREAS, ST. HELENS, TASMANIA.

(for Mr. G.C. Hall, CSR Geologist)

1. INTRODUCTION

This report comprises the petrographic part of a request for petrographic and mineralogical work (by Ian Neuss in the first instance, and latterly by Greg Hall) on rocks and stream sediments from the St. Helens area of Tasmania.

The rocks include sediments and breccias, and 'granites' from the area. As well as identification of rock types, it is requested that pneumatolysis, evidence of alteration and brecciation phenomena associated with and observed in specimens from CSR's E.L. 11/78 is compared with similar known rocks from neighbouring areas.

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2. SUMMARY/DISCUSSION

2.1 Required to compare GRR 116 with GRR 95, 114, 115, 138 and 147.

GRR 116 : Coarse grained granodiorite.
GRR 95 : Medium grained granoblastic leucoadamellite - contains cassiterite.
GRR 114 : Granitic differentiate and Mathina Beds = quartz-biotite-orthoclase hornfels.
GRR 115 : Microadamellite.
GRR 138 : Coarse dioritic pegmatite intrusive, brecciated.
GRR 147 : Microadamellite.

Greisenisation appears to be slight in all granitic rocks examined, except GRR 95. Brecciation exists only in the dioritic pegmatite (GRR 138) and this does not obviously lead to pneumatolysis.

2.2 To compare GRR 113 with GRR 109 and 110.

GRR 113 : Quartz wacke.
GRR 109 : Siltstone or silicified quartz wacke (cf. GRR 113 texture), tourmalinised, brecciated.
GRR 110 : Quartz breccia, tourmalinised.

GRR 113 is a quartz wacke and GRR 109 is possibly a silicified quartz wacke. The specimen GRR 110 is of brecciated coarse quartzite (pre-silicified quartzose sediment?). All specimens show pneumatolytic alteration. Pneumatolysis is the main alteration effect in all three specimens, producing cassiterite only in GRR 113; zinnwaldite and tourmaline in GRR 110 and tourmalinisation with some relict arsenopyrite pseudomorphs in GRR 109.

2.3 Identification of the following rock types is as follows.

GRR 111 : A very coarse grained dolerite altered to a metadolerite consisting of plagioclase (An_{35}) and brown-green hornblende altering to actinolite. The texture is characteristically that of a dolerite hyperbyssal intrusive.

GRR 112 : A quartz wacke of rounded and subangular quartz grains of mainly sand-size with a matrix of illite and chert. Contains a little tourmaline but mainly cross-cutting veins of arsenopyrite associated with coarse muscovite and quartz, sericite and chlorite. Traces of chalcopyrite are present peripherally to veins or along vein fractures.

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TABLE 1: BRECCIATION AND ALTERATION OF GRANITIC ROCKS, ST. HELENS AREA, TASMANIA.

SPECIMEN NO.	GREISENISATION	BRECCIATION	ALTERATION
GRR 116	Incipient along 'veins'.	Nil.	Pneumatolytic activity - slight of potash feldspars. Hydrothermal(?) biotite → muscovite, bleached + iron oxides.
GRR 95	Potash feldspar clear.	Nil.	Pneumatolytic → trace of cassiterite. Biotite, bleached + magnetite.
GRR 114	Granite. Slight along one fracture (biotite also crystallised in similar fractures). Metasediment. Potash feldspar, clear.	Fine fractures occur where elongate biotite laths occur. Nil.	Slight hydrothermal alteration of plagioclase. Nil.
GRR 115	Slight sericitisation of orthoclase.	Nil.	Moderate kaolinisation → sericitisation of both feldspars.
GRR 138	Nil.	a) Coarse plagioclase - in intrusive phase? b) After silicification - presumed occurred after cooling of intrusive.	Extreme kaolinisation of feldspars, chloritisation of biotite. Epidotisation of biotite(?) and plagioclase, slight after brecciation. Silicification
GRR 147	Possibly slight of orthoclase altering to coarse growths of muscovite along hair-line fractures passing through adjoining feldspars.	Nil.	Bleaching of biotite. Slight kaolinisation and incipient sericitisation of both plagioclase and orthoclase feldspars.

TABLE 2 - BRECCIATION AND ALTERATION OF SILICIFIED BRECCIATED ROCKS, ST. HELENS AREA, TASMANIA

SPECIMEN NO.	BRECCIATION	ALTERATION
GRR 113	Few fractures(?) now occupied by quartz, muscovite, cassiterite veins.	Pneumatolytic as below but no silicification.
GRR 109	Strongly brecciated.	Pneumatolytic + silicification (hydrothermal).
GRR 110	Strongly brecciated	Pneumatolytic → argillic + silicification. Tourmalinisation + zinnwaldite, hydromuscovite.

3. PETROGRAPHIC INVESTIGATION

(a) Identification No. GRR 95/MPS 15.

Field Description: Granite, fine-grained, saccharaoidal texture occurs as a layer in coarse grained granite.

Petrographic Name: A medium grained granoblastic leuco-adamellite.

Mineralogy	Volume %
Quartz	38
Orthoclase	27
Plagioclase (An_{16})	31
Muscovite	,2
Biotite (altered)	1
Apatite	1
Cassiterite	<1

Texture: A medium grained granoblastic layered texture of quartz, sodic plagioclase and orthoclase. Only quartz has a somewhat coarser texture. The specimen is silicified, and present are small grains of shredded muscovite engulfed by larger feldspar plates. Recrystallisation of plagioclase along grain borders is noted and results in engulfing of apatite and cassiterite crystals. Interstitial minerals have been replaced/absorbed during recrystallisation. Altered biotite occurs as small bent shreds and shows exsolved magnetite along cleavages, and is otherwise bleached. Cassiterite is present as small to medium sized crystals (up to 0.4 mm) wedged in between feldspar and quartz.

Metamorphism: Hornfelsed.

Alteration: Some recrystallisation of feldspar is noted. Most feldspars are almost clear of alteration products. Biotite shows alteration to magnetite and a bleached micaceous material.

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(b) Identification No. GRR 109/MPS 7.

Field Description: Taken from beside track 200 m south of DDH 2. Quartz chlorite veining ± tourmaline in silicified brecciated quartzite.

Petrographic Name: Siltstone (or quartz wacke), brecciated and tourmalinised.

Mineralogy	Volume %
Quartz	80
Epidote	2
Tourmaline	12
Magnetite } Limonite }	4
Arsenopyrite	2

Texture: A quartz breccia invaded by numerous brownish tourmaline crystals varying 0.03 x 0.01 mm to 0.2 x 0.08 mm. The larger grains are those that have penetrated along veins, the smaller grains are there present as a mass of needles occupying what was previously a cavity. The rock, secondarily silicified after tourmalinisation, consists of coarse to fine quartz, the latter occupying 'fractures' in the breccia as recrystallised fine breccia. In any case, much of the coarser material appears to be recemented finer quartz as it shows typical pseudo-strain effects of quartz particles in random optical orientation.

Magnetite is part-limonitised and occurs mainly as medium-sized (0.03 to 0.10 mm) octahedra, many having been limonitised. Limonitic material occupies fractures with tourmaline. Wedges of arsenopyrite occurs as large as 0.5 mm. Arsenopyrite present was part of a pre-pneumatolytic mineralisation in fractures of the quartzite, showing that fracturing occurred well before pneumatolysis. Traces of coarse epidote accompany tourmaline in 'fractures'.

Alteration: Mineralisation preceded pneumatolysis in fractures of quartz siltstone, later secondarily silicified.

/....

Remarks: There is no textural evidence this altered rock was originally a granite, subsequently tourmalinised, though there is strong evidence it is a tourmalinised siltstone subsequently silicified.

/....

(c) Identification No. GRR 110/MPS 8. Shows red-black staining. Possible greisen. Taken 10 miles south of DDH 2.

Field Description: Quartz mica rock.

Petrographic Name: Tourmalinised, coarse quartz breccia.

Mineralogy	Volume %
Quartz	42
Tourmaline	19
Zinnwaldite(?)	19
Hydromuscovite	17
Limonite	3

Texture: Distribution of pneumatolytic and hydrothermal minerals erratic, in line with irregular fracture and brecciation of massive quartzite. Large platey quartz shows evidence of brecciation and healing of fractures by secondary silicification. Large areas of the rock section are filled with coarse tourmaline blades (to 1.5 x 0.2 mm) associated with coarse interstitial zinnwaldite plates having wider extinction angle and higher polarisation colours than does muscovite mica.

Fine sericite flakes as unoriented fine tufts has entered as a later replacement phase where it is seen to have replaced the coarser tourmaline and zinnwaldite. Unlikely to be a weathered effect as it is seen to be replacing coarse tourmaline laths. Secondary, now limonite in fractures occur along which the later secondary alteration mineral formed, replacing tourmaline and zinnwaldite.

Alteration: Weak argillisation followed pneumatolysis, afterwards silicification set in.

(d) Identification No. GRR 111/MPS 9. A hill south of Scanander River, near smaller of Ian's circles.

Field Description: Dolerite? coarse grained to 3 mm, plagioclase, hornblende ± quartz and black mica.

Petrographic Name: Coarse metadolerite.

Mineralogy	Volume %
Plagioclase (An_{35})	72
Brown-green hornblende → actinolite	20
Brown biotite	1
Quartz	2
Chlorite	2
Iron oxides	3

Textures: An unusually coarse texture for a metadolerite but all the basic textural characteristics of a dolerite are there. Present are elongate but coarse laths of decussate plagioclase. Some grains are almost squat, and show albite twinning as well as the normal Carlsbad type shown by plagioclase in hypabyssal intrusive rocks. The twinning is fairly sharp where not obscured by masses of poikiloblastic fine stellate groups of actinolite needles. The actinolite outside plagioclase boundaries appears to be feeding from squat brown-green hornblende which exsolves iron oxide in process of alteration. Chlorite present (only spottily) is also a decomposition product of the hornblende. Irregular mosaics of sutured grains of quartz are mainly clear but some are poikiloblastic with fine actinolite needles.

Alteration: Retrograde hornblende → actinolite + chlorite.

Metamorphism: Of possible low amphibolite grade, reduced to green schist.

Remarks: There is a relict sub-ophitic texture present and barely enough residual quartz for the amphibolite to have derived from a metasediment. Also the more brownish, brown-green hornblende grains are most commonly found in iron-rich dolerites as the brown colour is attributed to the presence of titanium.

/....

(e) Identification No. GRR 112/MPS 10. From Copper Show, dump outside adit.

Field Description: Quartzite, grey-green massive with veins of arsenopyrite, galena, minor pyrite and chalcopyrite.

Petrographic Name: Quartz wacke, mineralised.

Mineralogy:	Volume %
Quartz	45
Chert	14
Illite	12
Chlorite	2
Muscovite/sericite	3
Tourmaline	2
Zircon	<1
Arsenopyrite	20
Chalcopyrite	1
Covellite	1

Texture: Identical to GRR 113, a quartz wacke. Here the quartz grains (0.04 to 0.9 mm, median 0.22 mm) are slightly more rounded and are set in a fairly abundant matrix of fine illite. However, the rock has been partly silicified so that chert has replaced the illite and margins of quartz grains. Quartz shows bedding and the sediment is typically of stream channel type with scattered large porphyrotopes showing gouged surfaces from being saltated along stream beds. Veins of muscovite/sericite contain major arsenopyrite and minor chalcopyrite having covellite replacement rims, cut across the bedding of the rock, but some mica-rich veins have been silicified with chert. Chlorite is abundant around sulphides. Tourmaline present is coarse, rounded detrital grains from a previous mineralisation phase/era.

Alteration: Mineralisation + chloritisation.

(f) Identification No: GRR 113/MPS 11. From adit 4 of the Great Pyramid Mine.

Field Description: Quartzite - brown, fawn, massive with bands of cassiterite in joints and on bedding planes. Crystals to 1mm.

Petrographic Name: Quartz wacke.

Mineralogy:	Volume %
Quartz	64
Chert	10
Illite	15
Muscovite	3
Cassiterite	5
Iron oxides	3
Zircon	<1

Texture: An argillaceous sandstone/silt sediment of subangular rounded quartz grains (0.04 to 0.4 mm, median 0.08 mm) having an abundant fine illite matrix; shows moderate to abundant chertification of quartz grains neighbouring illite-rich cross-cutting veins, possibly degraded feldspar. These veins cross-cut the rock randomly. Coarser veins contain abundant pegmatitic quartz, muscovite and cassiterite as large grains to maximum 2 x 1 mm. Elsewhere cassiterite is scattered through the rocks groundmass as fine grains (~ 0.06 mm) associated and enveloped by limonitic iron oxide.

Alteration: Pneumatolytic followed by hydrothermal.

Remarks: Veins appear not to follow well defined fracture patterns, are irregular as in GRR 109, though quartz of neighbouring veins is recrystallised to chert rather than appearing fragmental. Sediment is similar in mineralogy and texture to some Crimson Creek siltstone types as at Stanley River, Western Tasmania. This specimen is in no way similar to the mineralised brecciated coarse quartz of specimen GRR 110. There are however strong resemblances with GRR 109, a silicified quartzitic

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sediment. The latter shows veins of coarse quartz to have been cemented to the rock fragments, and cherty quartz veins follow irregular fracture planes. Cassiterite mineralisation is not seen in either GRR 109 or 110.

(g) Identification No: GRR 114/MPS 12. Contact zone in Creek near Ian's smaller circle.

Field Description : Mathina Beds/granite - coarse grained.

.. Mathina Beds

Petrographic Name: Quartz-biotite-orthoclase hornfels. A large orthoclase content for a hydrothermally altered sediment(?) More likely a granitised sediment.

Mineralogy	Volume %
Quartz	45
Orthoclase	30
Biotite	25
Magnetite and zircon	<1

Texture: A fine grained equigranular, sheared and hornfelsed rock showing shear elongation and subsequent recrystallisation of quartz, biotite and feldspar. Poikiloblastic quartz contains fine inclusions of biotite, and somewhat larger rounded inclusions of biotite and feldspar. The biotite is typically brown and in spite of shear has the characteristics of an overprinted hornfels crystallinity texture.

Metamorphism: Hornfelsed by proximity of granite.

.. Granite

Petrographic Name: A leuco-granite, differentiate - does not easily fall into a strictly sub-granite igneous classification.

Mineralogy	Volume %
Quartz	65
Orthoclase	10
Plagioclase	20
Muscovite	2
Biotite	3

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Texture: A coarser grained and more typical looking granite than is GRR 95. Twinning is fine and sharp in small feldspar grains but large grains show very faint twinning. Plagioclase has combined albite and Carlsbad twins and is determined to be a sodic-oligoclase, probably similar to the one in GRR 95. Brown biotite occupies fine fractures along feldspar:quartz grain boundaries and within orthoclase grains present as fine elongate laths slightly chloritised and ragged at ends. Muscovite is as in GRR 95, is rare and mainly engulfed by feldspar. Much of the feldspar shows crystal forms, unlike as in GRR 95, and has not been recrystallised to the extent of GRR 95. Cassiterite is not seen.

Muscovite shows replacement of orthoclase along a vein-like fracture at one edge of the section. Vermicular quartz structures occur between adjoining quartz and orthoclase.

Alteration: Hydrothermal with slight kaolinisation of plagioclase feldspar and slight chloritisation of biotite.

/....

(h) Identification No: GRR 115/MPS 13. On Launceston Creek road before Ann's Creek turnoff, just past house.

Field Description: Granite, fine-grained, even-sized quartz and feldspar, black mica grains, minor tourmaline spots.

Petrographic Name: Microadamellite.

Mineralogy	Volume %
Quartz	40
Orthoclase	30
Plagioclase	30
Biotite (chloritic)	< 1
Apatite	< 1
Tourmaline	< 1
Epidote	trace

Texture: Similar to GRR 114 in having euhedral lath-like feldspar forms (unlike GRR 95), but rock is slightly finer grained (median 0.4 mm, rather than median 1.1 mm of GRR 114). Feldspars in GRR 115 show incipient kaolinisation along grain cleavages and no muscovite occurs, only similarly (to GRR 114) biotite pseudomorphs of fine narrow lath-like forms between feldspar grains are now completely chloritised and contain abundant limonite. Some poikiloblastic crystal forms of feldspar and quartz (possibly some apatite) occur embedded within coarse feldspar plates and are therefore earlier quartz > feldspar forms (reversal of crystallisation order, or granitised sediment?). Epidote as anhedral pale green granules appear to have formed partly at the expense of biotite.

No cassiterite is seen. Pale blue fragmented tourmaline as small squat grains are embedded in orthoclase.

Alteration: Mild kaolinisation and slight sericitisation of feldspars, chloritisation of biotite.

Metamorphism: -

(i) Identification No: GRR 138/MPS 16. Subcrops over 10 m area. From Coppleston's Hill behind Moonlight Marsh.

Field Description: Black, siliceous plutonic rock, a possible pipe structure.

Petrographic Name: Coarse dioritic pegmatite(?), brecciated.

Mineralogy:	Volume %
Plagioclase	20
Quartz	57
Chlorite	12
Epidote	5
Pyrite	3
Pyrrhotite	1
Cassiterite	2
Sphene	<1

Texture: A coarse plagioclase:quartz breccia. Shows large breccia fragments (several mms) of aggregates of plagioclase, much kaolinised and epidotised, though albite and Carlsbad twins are readily seen. Abundant fractures within and between aggregates of breccia fragments are lined with apple-green chlorite and traces of epidote. A little blebby iron oxide (to 0.6 mm) is also included in fractures. Potash feldspar is not seen. Between plagioclase grains are mosaics of quartz (median size 0.4 mm) now silicified but containing abundant interstitial shreds of chlorite. Coarse cassiterite as uneven pitted grains with high refringence and birefringence occur embedded in quartz mosaics and cloudy plagioclase plates.

Small pyrrhotite grains (0.05 x 0.04 mm) show mutual attachment to pyrite grains of similar size. Most grains of this size in veins are subhedral pyrite. Also pyrrhotite grains (~ 0.02 mm) occur as corroded nuceli within larger pyrite masses (~ 0.1 mm).

Alteration: Kaolinisation, chloritisation and epidotisation occurred after brecciation, but before silicification.

Remarks: An altered intrusive breccia rock, a granite pegmatite differentiate? The only specimen examined so far in the present series to show significant brecciation. No galena was seen in the polished section.

Brecciation: Coarse plagioclase shows brecciation before and during late stage silicification, followed by some shear of quartz and feldspar.

(j) Identification No: GRR 116/MPS 14. Anchor Mine.

Field Description: Granite. Greisenised, medium grained, two micas, quartz potash feldspar, probably altered (sericitic), minor epidote, cassiterite, fluorite and tourmaline.

Petrographic Name: Coarse grained granodiorite.

Mineralogy	Volume %
Quartz	55
Microcline	10
Plagioclase	27
Muscovite/sericite	4
Cassiterite	1
Biotite - bleached	2
Chlorite	1

Texture: A coarse textured granite, somewhat similar to that of GRR 114, except that in GRR 116 the biotite grains, though grossly altered, are not squeezed between the leucocratic minerals present. Muscovite in this rock does not show the 'regular' intergrowths seen in GRR 147. The feldspars are mainly sieved with fairly coarse textured sericite and grow to radiate clusters around edges of grains. This preceded kaolinisation which developed within and through the feldspars. However much of the plagioclase remains clear - particularly the smaller grains which are euhedral prisms, and display sharp albite and Carlsbad twinning. The microcline shows clear, cross-hatch twinning. It is interesting that potash feldspar of Georges River E.L. 11/78 appears to be orthoclase. Alteration is patchy and sericite makes substantial inroads into both feldspar types locally, particularly coarse grains. This is not seen in Georges River E.L. 11/78. Pale fibrous chlorite appears to have grown at the expense of the sericite in one place.

Bleached biotite contains secondary iron oxide and primary zircons with radioactive haloes.

/....

Alteration: Fairly extensive of feldspar, biotite. Hydrothermal alteration has followed along veins incipient greisenisation of potash feldspar present.

Remarks: There are some similarities between GRR 116 and GRR 114 only. Though GRR 114 shows destructive sericitisation of feldspars; microcline is present, as are cassiterite and pale fibrous chlorite. No fluorite is observed.

/....

(k) Identification No: GRR 147/MPS 17. From Steve Hart's place. Taken at contact of Lottah Granite with overlying Pormena Granite.

Field Description: Granite - fine-grained, white-orange with quartz. feldspar, large white mica; largest flakes are adjacent to joints.

Petrographic Name: Microadamellite.

Mineralogy	Volume %
Quartz	40
Orthoclase	22
Plagioclase	26
Muscovite	6
Biotite (altered)	5
Magnetite (as octahedra)	1

Texture: Very similar tn grain size and in other textural features to GRR 115, i.e. fine-grained, equigranular, except that the latter shows appreciable alteration of plagioclase and to a less extent orthoclase. There are appreciably more recognisable mica minerals in GRR 147. Clear, even, outer (more albitic) grains are disposed around all plagioclase grains. Orthoclase shows slight dusting with kaolinite. Quartz grains tend to occur in mosaics with rounded forms rather than as large plates. However, muscovite is present as large flake platelets which show regular intergrowths with potash feldspar. There are appreciable intergrowths between feldspar and quartz showing perfect euhedra of one mineral inside plates of the other. This was noted in other granites of the series and may indicate the high-level nature of the granite. Biotite is mainly altered to bleached mica with magnetite though some relict clear olive-green biotite remains.

Alteration: Slight kaolinisation and incipient sericitisation. Chloritisation of biotite.

Remarks: No evidence of brecciation, though the muscovite becomes prominent locally along fine fractures and stringers containing the mineral partly replacing adjoining orthoclase crystals. Biotite along some fractures is bleached associated with a deposit of magnetite.

4. REFERENCES

(1) Petrographic Report - Specimens of Diamond Drill Cores from Livingstone Creek, Tasmania - Part II.
PACMINEX PTY. LIMITED REP. PMR 108/74.

(2) Petrographic Report - Specimens from Stanley River, Stanley Reward Grid, Tasmania.
PACMINEX PTY. LIMITED REP. PMR 161/75.

P.J.C.
August 1979

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APPENDIX II

ASSAY RESULT SHEETS

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Stream sediment and soil.
Preparation: Dry, sieve, split and pulverize. Sheet No.: 1.
Batch No.: A 2912. Date: 6/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

DATA BASE No	Sample Description	Cu ppm	Pb ppm	Zn ppm	Co ppm	Bi ppm	W ppm	Mo ppm
5022	GRS 22	20	<20	40	10	<20	<2	5
5023	3	30	40	60	30	<20	10	2
	4	10	20	30	<5	<20	40	2
	5	10	120	20	10	<20	5	2
	6	20	<20	30	<5	<20	5	2
	9	20	20	30	10	<20	10	5
	30	30	40	80	20	<20	10	2
	1	20	20	40	30	<20	2	2
	2	20	40	50	20	<20	10	<2
	3	30	20	80	30	<20	2	<2
	4	10	<20	10	<5	<20	<2	<2
	5	10	<20	10	<5	<20	<2	2
	6	10	<20	10	<5	<20	2	2
	7	10	<20	20	10	<20	<2	2
	8	10	20	30	<5	<20	<2	5
	9	10	20	10	<5	<20	<2	2
	40	10	<20	10	<5	<20	<2	2
	1	10	<20	10	10	<20	<2	2
	2	10	<20	10	15	<20	<2	2
	3	<2	<20	10	<5	<20	<2	2
	4	10	<20	10	<5	<20	<2	2
	5	<2	<20	10	10	<20	<2	2
	6	10	<20	20	<5	<20	<2	2
	7	10	<20	20	<5	<20	<2	10
	8	<2	<20	10	<5	<20	<2	5
	9	10	<20	10	10	<20	<2	5
	50	<2	<20	20	<5	<20	2	5
	1	<2	<20	20	<5	<20	2	2
	2	<2	<20	10	<5	<20	<2	5
	3	10	20	30	<5	<20	<2	2
	4	10	20	20	<5	<20	10	10
	5	<2	<20	10	<5	<20	<2	5
	6	<2	40	10	<5	<20	<2	5
	7	10	<20	10	<5	<20	<2	5
	8	10	<20	10	<5	<20	5	5
	9	20	<20	30	<5	<20	20	5
	60	10	40	20	<5	<20	5	2
	1	10	<20	10	<5	<20	<2	2
	2	10	<20	20	10	<20	<2	2
	3*	10	<20	20	10	<20	<2	5
	4	10	20	20	<5	<20	<2	2
	5	<2	<20	30	10	<20	5	5
	6	10	40	10	<5	<20	<2	5
	7*	30	40	50	20	<20	<2	5
	74	10	<20	10	<5	<20	<2	5
	5	20	20	40	<5	<20	20	5
	6	10	20	10	<5	<20	<2	5
	7	10	20	20	10	<20	<2	10
5078	GRS 78	10	<20	10	10	<20	<2	10

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS.
W and Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd. Sydney.

Signed .....

NATA

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* not on map

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Stream sediment and soil.
Preparation: Dry, sieve, split and pulverize. Sheet No.: 2.
Batch No.: A 2912. Date: 6/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

DATA BASE NO.	Sample Description	Cu ppm	Pb ppm	Zn ppm	Co ppm	Bi ppm	W ppm	Mo ppm
5079	GRS 79	10	<20	10	<5	<20	<2	5
	80	10	40	20	<5	<20	<2	5
	4	10	<20	20	10	<20	<2	5
	5	10	20	20	<5	<20	<2	5
	6	20	20	40	<5	<20	<2	5
	93	10	40	30	10	<20	<2	10
	4	10	20	20	<5	<20	<2	10
	5	10	20	20	10	<20	<2	<2
	6	20	40	20	20	<20	<2	<2
	98	10	20	40	20	<20	<2	10
	102	10	<20	30	10	<20	10	10
	3	<2	<20	20	<5	<20	10	10
	4	10	<20	10	<5	<20	<2	5
	5	10	<20	10	<5	<20	<2	5
	6	10	<20	20	10	<20	2	5
	7	10	<20	20	<5	<20	2	5
	8	10	20	20	20	<20	5	10
	111	80	20	80	20	<20	2	5
	3	20	<20	30	10	<20	2	2
	4	30	<20	60	<5	<20	2	2
	121	20	<20	20	10	<20	2	5
	3	20	20	50	20	<20	<2	10
	4	10	20	10	10	<20	<2	5
	5	20	20	50	10	<20	<2	5
	6	20	<20	30	20	<20	<2	5
	7	10	<20	20	<5	<20	<2	2
	9	10	<20	10	10	<20	<2	10
	130	<2	<20	20	<5	<20	<2	2
	1	<2	<20	20	<5	<20	<2	5
	2	10	<20	40	10	<20	<2	2
	3	10	20	20	<5	<20	<2	2
	4	10	<20	10	<5	<20	<2	2
	5	<2	<20	10	10	<20	<2	10
	6	10	20	10	<5	<20	<2	10
	7	10	20	40	20	<20	<2	10
	8	10	20	30	<5	<20	<2	10
	9	<2	20	20	<5	<20	<2	5
	140	10	20	20	<5	<20	<2	2
	1	10	<20	20	<5	<20	<2	2
	2	<2	<20	30	10	<20	<2	5
	3	<2	40	20	10	<20	<2	2
	4	10	40	10	<5	<20	<2	5
	5	<2	20	10	<5	<20	<2	2
	6	10	20	20	<5	<20	10	5
	7	10	20	10	<5	<20	<2	2
	8	10	<20	10	10	<20	<2	2
	9	10	<20	<2	10	<20	<2	5
	150	10	<20	10	10	<20	<2	10
5151	GRS 151	<2	<20	10	<5	<20	<2	5

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS.
W and Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.

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114075

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Stream sediment and soil.
Preparation: Dry, sieve, split and pulverize.
Batch No.: A 2912.

Sheet No.: 3.
Date: 6/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

DATA BASE No.	Sample Description	Cu ppm	Pb ppm	Zn ppm	Co ppm	Bi ppm	W ppm	Mo ppm
5152	GRS 152	10	<20	20	20	<20	<2	<2
	3	10	40	10	20	<20	<2	2
	4	10	<20	20	10	<20	<2	5
	5	10	<20	10	<5	<20	<2	<2
	6	10	20	10	10	<20	<2	2
	9	10	20	10	<5	<20	5	<2
	160	10	<20	10	<5	<20	5	<2
	1	10	20	30	<5	<20	10	2
	2	10	40	30	10	<20	5	<2
	3	10	<20	10	<5	<20	2	2
	4	10	<20	10	20	<20	<2	2
	5	10	20	30	<5	<20	10	2
	6	10	20	20	<5	<20	20	5
	7*	10	<20	10	<5	<20	2	<2
	8*	<2	<20	10	<5	<20	10	2
	170*	10	20	20	<5	<20	10	<2
	1*	10	40	40	<5	<20	10	<2
	2*	<2	40	40	10	<20	2	<2
V	3*	10	20	20	10	<20	<2	<2
5176	GRS 176	10	40	30	<5	<20	10	<2
	GRL 21	10	<20	<2	10	<20	10	<2
	2	10	<20	10	10	<20	5	<2
	3	<2	<20	10	<5	<20	5	2
	4	10	<20	20	<5	<20	5	<2
	5	10	20	10	<5	<20	<2	<2
	6	10	20	10	10	<20	5	5
	7	10	<20	20	<5	<20	<2	<2
	8	10	20	10	<5	<20	10	2
	9	10	20	10	10	<20	2	<2
	30	10	<20	10	10	<20	5	<2
	1	10	20	10	<5	<20	5	<2
	2	<2	40	10	10	<20	2	<2
	3	<2	<20	<2	<5	<20	10	2
	4	<2	<20	20	10	<20	5	2
	5	<2	40	10	10	<20	2	<2
	6	<2	20	<2	<5	<20	20	<2
	7	10	<20	10	<5	<20	<2	<2
	8	10	20	10	10	<20	10	<2
	9	10	<20	10	10	<20	<2	<2
	40	10	20	10	<5	<20	2	2
	1	10	<20	10	<5	<20	<2	<2
	2	<2	40	10	<5	<20	10	<2
	3	10	100	20	10	<20	2	2
	4	<2	<20	10	10	<20	<2	10
	5	<2	<20	<2	<5	<20	5	5
	6	<2	<20	10	<5	<20	20	2
	7	10	<20	10	<5	<20	<2	2
	8	<2	20	<2	<5	<20	<2	<2
	9	<2	<20	< 2	<5	<20	5	2
	GRL 50	<2	<20	<2	<5	<20	2	2

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS.
W and Mo by Colorimetry.

*not on map

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.

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114076

075

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Stream sediment and soil.
Preparation: Dry, sieve, split and pulverize. Sheet No.: 4.
Batch No.: A 2912. Date: 6/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Co ppm	Bi ppm	W ppm	Mo ppm
GRL 51	<2	20	<2	10	<20	<2	<2
2	<2	<20	10	<5	<20	<2	2
3	10	<20	10	<5	<20	<2	2
4	<2	<20	<2	10	<20	<2	<2
5	<2	<20	10	10	<20	<2	<2
6	<2	<20	10	10	<20	<2	80
7	<2	<20	10	<5	<20	<2	2
8	<2	<20	10	<5	<20	<2	2
9	<2	<20	<2	<5	<20	<2	<2
60	<2	<20	10	<5	<20	2	2
1	<2	<20	<2	10	<20	2	2
2	<2	<20	<2	<5	<20	<2	<2
3	<2	20	<2	<5	<20	<2	2
4	10	<20	<2	<5	<20	<2	2
5	<2	<20	20	20	<20	<2	2
6	<2	<20	10	10	<20	<2	2
7	<2	20	10	<5	<20	<2	2
8	<2	<20	10	<5	<20	<2	2
9	<2	<20	10	<5	<20	<2	<2
70	<2	20	20	<5	<20	<2	<2
1	<2	40	10	<5	<20	<2	<2
2	10	<20	10	<5	<20	2	2
3	10	<20	10	10	<20	40	<2
4	30	20	20	10	20	40	5
5	20	<20	20	<5	<20	<2	5
6	20	20	20	<5	<20	5	<2
7	10	20	20	10	<20	10	<2
8	10	<20	30	<5	<20	5	2
9	10	20	20	10	<20	20	<2
80	10	20	20	10	<20	5	<2
1	10	40	10	10	<20	<2	<2
2	<2	<20	10	10	<20	5	2
3	10	20	10	<5	<20	2	2
4	10	<20	20	<5	<20	40	5
5	10	<20	20	10	<20	20	2
6	<2	<20	10	<5	<20	5	2
7	10	40	20	<5	<20	5	2
8	10	20	30	10	<20	20	10
9	10	<20	20	10	<20	40	5
90	10	<20	10	10	<20	5	5
1	10	<20	20	20	<20	20	10
2	10	20	30	<5	<20	40	5
3	10	20	20	10	<20	40	5
4	10	40	20	<5	<20	20	5
5	<2	<20	20	<5	<20	20	5
6	10	20	30	10	<20	20	5
7	10	<20	10	<5	<20	20	5
8	20	<20	40	<5	<20	20	10
9	10	20	10	<5	<20	20	5
GRL 100	20	<20	20	<5	<20	10	5

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS.
W and Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Stream sediment and soil.
Preparation: Dry, sieve, split and pulverize. Sheet No.: 5.
Batch No.: A 2912. Date: 6/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Co ppm	Bi ppm	W ppm	Mo ppm
GRL 101	10	20	20	10	<20	10	5
2	<2	<20	30	10	<20	2	<2
3	10	20	20	10	<20	5	<2
4	10	60	20	<5	<20	2	<2
5	10	20	20	10	<20	5	2
6	<2	<20	20	10	<20	<2	2
7	<2	20	10	<5	<20	<2	2
8	<2	<20	10	<5	<20	<2	2
9	<2	<20	10	<5	<20	<2	2
110	20	20	20	<5	<20	10	2
1	20	20	20	10	<20	<2	<2
2	10	<20	20	<5	<20	20	5
3	10	20	20	10	20	10	10
4	10	40	20	10	<20	20	5
5	10	<20	20	<5	<20	5	2
6	10	<20	10	<5	<20	<2	<2
7	10	<20	20	<5	<20	<2	5
8	10	<20	20	<5	<20	<2	5
9	10	40	10	<5	<20	<2	2
120	10	20	20	<5	<20	<2	2
1	10	<20	20	<5	<20	<2	2
3	10	40	20	10	<20	<2	<2
4	10	20	20	<5	<20	<2	<2
5	10	<20	10	<5	<20	<2	2
6	10	40	20	20	<20	2	2
7	10	<20	20	<5	<20	2	<2
8	20	<20	60	<5	<20	5	2
9	Sample missing.						
130	10	<20	20	<5	<20	20	2
1	20	20	30	10	<20	2	5
2	10	20	30	<5	<20	2	2
3	10	<20	20	<5	<20	<2	5
4	<2	40	20	10	<20	<2	2
5	10	60	20	<5	<20	<2	<2
6	10	<20	20	10	<20	<2	2
7	10	40	20	20	<20	<2	2
8	10	20	20	<5	<20	5	5
9	10	20	10	<5	<20	<2	2
140	<2	40	20	<5	<20	<2	2
1	10	40	30	20	<20	5	5
2	10	<20	20	<5	<20	5	2
3	20	<20	30	10	<20	20	2
4	<2	20	20	10	<20	10	2
5	10	40	20	<5	<20	10	2
6	10	<20	20	<5	<20	5	2
7	10	40	30	<5	<20	5	2
8	<2	20	20	10	<20	5	2
9	20	40	30	10	<20	40	5
GRL 150	10	40	20	<5	<20	20	5

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS.
W and Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Stream sediment and soil.
Preparation: Dry, sieve, split and pulverize.
Batch No.: A 2912.

Sheet No.: 6.
Date: 6/6/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Co ppm	Bi ppm	W ppm	Mo ppm
GRL 151	20	60	20	20	<20	40	2
2	10	40	30	<5	<20	<2	2
3	10	20	40	<5	<20	<2	<2
4	<2	60	20	<5	<20	<2	2
5	<2	40	20	10	<20	<2	<2
6	10	20	10	10	<20	<2	2
7	10	60	20	20	<20	5	2
GRL 158	<2	20	20	<5	<20	5	2
Repeat and check -							
GRS 40	10	<20	10	<5	<20	<2	2
60	10	40	20	<5	<20	5	2
102	10	20	30	10	<20	10	5
134	10	<20	10	<5	<20	<2	2
161	10	20	30	<5	<20	10	2
GRL 33	<2	<20	<2	<5	<20	10	2
53	10	<20	10	<5	<20	2	<2
72	10	<20	10	<5	<20	<2	2
102	10	<20	20	<5	<20	2	2
127	10	<20	20	<5	<20	2	2
145	10	40	30	<5	<20	10	2

Sn, Au, As, Ag by
EMISSION SPEC. TO FOLLOW.

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS; W by Colorimetry.
Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.

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114079

ADELAIDE
Tel.: 272 5733

[redacted]

A.C.S. Laboratories Pty. Ltd.
[redacted]
50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush and pulverize.
Batch No.: A 2913. O/N 18175

Sheet No.: 1.
Date: 28/5/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm 1	Pb ppm 2	Zn ppm 3	Co ppm 4	Bi ppm	Mo ppm	W ppm
GRR 80	190	40	50	<5	70	5	2
1	40	20	20	10	<20	<2	2
2	190	60	40	10	<20	<2	5
3	220	80	130	20	<20	<2	40
4	170	40	30	20	<20	<2	20
5	290	80	120	10	<20	2	10
6	130	520	30	10	<20	<2	5
7	90	80	70	40	<20	2	20
8	10	20	10	10	<20	2	<2
9	10	<20	10	<5	<20	<2	<2
90	20	80	100	30	<20	2	5
1	20	<20	40	10	<20	<2	<2
2	40	60	250	50	<20	2	5
3	10	<20	60	40	<20	<2	<2
4	110	60	190	40	<20	5	5
5	10	<20	10	<5	<20	2	5
96A	20	20	40	20	<20	5	10
96B	5	<20	30	<5	<20	2	5
7	10	20	10	10	<20	<2	<2
8	10	20	10	<5	<20	2	10
9	<2	<20	10	10	<20	<2	5
100	10	<20	10	<5	<20	2	10
2	10	<20	<2	<5	<20	2	40
3	<2	20	10	<5	<20	2	<2
4	10	20	20	<5	<20	5	10
5	10	20	20	<5	<20	5	<2
6	10	<20	10	<5	<20	20	5
7	<2	40	20	<5	<20	2	5
108	10	20	40	10	<20	10	<2
116	50	<20	80	<5	<20	<2	20
7	<2	<20	220	10	20	2	20
8	10	<20	10	<5	<20	5	<2
9	<2	<20	<2	<5	<20	2	<2
20	<2	<20	20	10	<20	2	<2
1	<2	20	40	<5	<20	2	<2
2	20	<20	70	20	<20	5	<2
3	<2	<20	60	10	<20	2	5
4	10	20	50	10	<20	<2	<2
5	10	40	40	<5	<20	2	<2
6	<2	120	60	<5	<20	2	<2
7	10	<20	30	10	<20	2	<2
8	<2	40	10	<5	<20	<2	<2
9	<2	20	40	20	<20	2	<2
30	40	40	10	<5	<20	<2	5
1	70	60	<2	<5	<20	<2	5
2	30	80	20	<5	<20	2	10
3	<2	40	20	<5	<20	2	<2
4	10	20	<2	10	<20	2	<2
GRR 135	<2	20	20	<5	<20	2	5

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS; Mo by Colorimetry; W by Colorimetry; Au, Ag, As, Sn by ES2.

DISTRIBUTION: Pacminex Pty.Ltd.

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★47131

079

114080

ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977 6485

A.C.S. Laboratories Pty. Ltd.
50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush and pulverize.
Batch No.: A 2913.

Sheet No.: 2.
Date: 28/5/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Co ppm	Bi ppm	Mo ppm	W ppm
GRR 136	<2	40	10	10	<20	2	<2
7	30	20	120	10	<20	<2	<2
8	10	40	20	10	<20	5	<2
9	10	<20	30	<5	<20	2	<2
40	10	<20	10	<5	<20	<2	2
1	10	<20	<2	10	<20	2	<2
2	<2	20	10	<5	<20	5	<2
3	10	40	20	<5	<20	5	10
4	<2	<20	10	<5	<20	2	10
5	<2	40	20	10	<20	2	10
6	10	20	10	10	20	2	5
147	10	20	20	<5	<20	<2	<2
GRLH 159	10	20	10	<5	<20	2	>200
60	<2	<20	10	<5	<20	<2	100
1	10	<20	10	<5	<20	5	100
2	10	<20	10	<5	<20	2	200
3	<2	20	10	10	<20	<2	40
4	10	20	10=	<5	<20	2	20
5	30	20	20	20	<20	2	10
6	20	20	10	<5	<20	2	5
7	10	<20	10	<5	<20	<2	10
8	10	20	20	<5	<20	<2	<2
9	<2	<20	20	10	<20	<2	<2
70	10	<20	10	<5	<20	<2	<2
1	<2	<20	<2	<5	<20	<2	<2
2	10	<20	10	<5	<20	<2	<2
3	<2	<20	10	<5	<20	<2	10
4	<2	<20	10	10	<20	<2	<2
5	<2	<20	<2	<5	<20	<2	5
6	<2	<20	<2	<5	<20	<2	<2
7	20	<20	<2	<5	<20	<2	<2
8	10	<20	10	<5	<20	<2	<2
9	<2	<20	10	10	<20	<2	200
GRLH 180	<2	<20	<2	10	<20	<2	<2
Repeat and check -							
GRR 93	10	20	60	40	<20	<2	<2
108	10	20	50	10	<20	<2	<2
142	<2	20	10	<5	<20	<2	<2
GRLH 168	10	20	20	<5	<20	2	2

ANALYTICAL METHODS: Cu, Pb, Zn, Co, Bi by AAS; Mo and W by Colorimetry; Au, Ag, As, Sn by ES2. to follow.

DISTRIBUTION:

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.

Area: Georges River, Tas. O/No.18175.

Samples of: Rock samples.

Preparation: Crush, grind and split. Sheet No.: 1.

Batch No.: A 2918. Date: 5th July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Au ppm	Ag ppm	As ppm	Sn ppm
GRR 80	<3	<1	<50	300
1	<3	<1	<50	1000
2	<3	<1	<50	10
3	<3	<1	<50	3000
4	<3	3	<50	1000
5	<3	<1	<50	2000
6	<3	<1	<50	1000
7	<3	<1	<50	<1
8	<3	<1	<50	1
9	<3	<1	<50	10
90	<3	<1	<50	1
1	<3	<1	<50	3
2	<3	<1	<50	<1
3	<3	<1	<50	1
4	<3	<1	<50	<1
5	<3	<1	<50	100
96A	<3	<1	<50	<1
96B	<3	<1	<50	3
7	<3	<1	<50	30
8	<3	<1	<50	30
9	<3	<1	<50	30
100	<3	<1	<50	80
102	<3	<1	<50	10
3	<3	<1	<50	20
4	<3	<1	<50	10
5	<3	<1	<50	10
6	<3	<1	<50	10
7	<3	<1	<50	30
108	<3	<1	<50	3
116	<3	1	<50	1000
7	<3	<1	<50	10000
8	<3	<1	<50	30
9	<3	<1	<50	30
20	<3	<1	<50	10
1	<3	<1	<50	3
2	<3	<1	<50	1
3	<3	<1	<50	3
4	<3	<1	<50	1
5	<3	<1	<50	<1
6	<3	<1	<50	1
7	<3	<1	<50	3
8	<3	<1	<50	10
9	<3	<1	<50	3
30	<3	30	<50	>10000
1	<3	1	<50	>10000
2	<3	<1	2000	1000
3	<3	<1	50	1000
4	<3	<1	50	1
5	<3	<1	<50	30
GRR136	<3	<1	<50	1000

ANALYTICAL METHODS:

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.
G.Hall, Dee Why.

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081

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Georges River, Tas.
Samples of: Rock samples.
Preparation: Crush, grind and split.
Batch No.: A 2918.

Sheet No.: 2.
Date: 5th July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Au ppm	Ag ppm	As ppm	Sn ppm	
GRR 137	<3	<1	<50	500	
8	<3	<1	<50	30	
9	<3	<1	<50	100	
40	<3	<1	<50	1000	
1	<3	<1	<50	10	
2	<3	<1	<50	30	
3	<3	<1	<50	10	
4	<3	<1	<50	100	
5	<3	<1	<50	3000	
6	<3	<1	<50	10	
7	<3	<1	<50	10	
GRLH 159	<3	<1	<50	100	
60	<3	<1	<50	1000	
1	<3	<1	<50	1000	
2	<3	<1	<50	300	Johnsons Hill.
3	<3	<1	<50	300	
4	<3	<1	<50	300	
5	<3	<1	<50	300	
6	<3	<1	<50	300	
7	<3	<1	<50	100	
8	<3	<1	<50	100	
9	<3	<1	<50	10	
70	<3	<1	<50	100	
1	<3	<1	<50	100	
2	<3	<1	<50	100	Moonlight
3	<3	<1	<50	1000	
4	<3	<1	<50	300	Marsh
5	<3	<1	<50	1	
6	<3	<1	<50	300	
7	<3	<1	<50	30	
8	<3	<1	<50	100	
9	<3	<1	<50	>10000	
GRLH180	<3	<1	<50	100	check samples.

ANALYTICAL METHODS:

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.
G.Hall, Dee Why.

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*ro/3924

082

114083

ADELAIDE
Tel.: 272 5733

[redacted]

A.C.S. Laboratories Pty. Ltd.
[redacted]
50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tas. (O/No.18162).
Samples of: Rock.
Preparation: Crush, grind and pulverize. Sheet No.1.
Batch No.: S A 2873. Date: 20/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Cd ppm	Bi ppm	Mo ppm
GRR 1	25	20	30	<2	<5	<20	2
2	1450	20	355	<2	5	<20	2
3	125	20	30	<2	<5	315	5
4	125	80	70	<2	<5	<20	<2
5	10	<20	10	<2	<5	30	2
6	10	<20	30	<2	<5	<20	<2
7	30	20	70	<2	<5	<20	<2
8	45	130	215	<2	5	<20	<2
9	270	40	15	<2	<5	<20	<2
10	<2	<20	15	<2	<5	<20	<2
1	10	<20	10	<2	<5	<20	<2
2	6000	140	15	30	5	370	
3	110	<20	20	<2	<5	<20	5
4	3700	1560	25	40	5	110	2
5	900	9500	2250	80	10	125	<2
6	3800	>10000	1700	280	10	315	<2
7	950	310	35	20	<5	30	2
8	280	90	15	<2	<5	90	
9	25	150	25	<2	<5	<20	20
20	10	20	25	<2	<5	20	10
1	15	60	20	<2	<5	60	2
2	20	20	10	<2	<5	30	5
3	90	50	90	<2	5	30	100
4	40	20	10	<2	<5	30	2
5	15	<20	35	<2	<5	<20	2
6	5	20	25	<2	<5	<20	2
7	10	20	15	<2	<5	<20	<2
8	5	20	10	<2	<5	<20	<2
9	5	20	15	<2	5	<20	<2
30	5	40	20	<2	<5	<20	<2
1	5	<20	5	<2	<5	<20	2
2	35	20	15	<2	<5	<20	<2
3	80	20	30	<2	<5	50	<2
4	380	20	90	<2	<5	20	2
5	120	30	10	<2	<5	<20	<2
6	130	60	50	<2	<5	<20	2
7	5	30	10	<2	5	<20	2
8	10	<20	10	<2	<5	<20	<2
9	110	40	50	<2	<5	<20	<2
40	1050	60	1250	<2	10	<20	<2
1	235	1850	140	20	10	<20	<2
2	710	70	220	<2	10	<20	2
3	420	40	90	<2	<5	<20	2
4	20	20	15	<2	<5	<20	<2
5	45	<20	10	<2	<5	<20	<2
6	130	20	120	<2	5	50	<2
7	10	<20	10	<2	5	<20	<2
8	<2	<20	10	<2	<5	<20	<2
9	20	<20	25	<2	<5	<20	<2
GRR 50	5	20	20	<2	<5	<20	<2

ANALYTICAL METHODS: Cu, Pb, Zn, Ag, Cd, Bi, by AAS.
Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd.
Tasmania.
Sydney.

Signed [signature]

★47131

083

114084

ADELAIDE
Tel.: 272 5733

A.C.S. Laboratories Pty. Ltd.

50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania. (O/No.18162)
Samples of: Rock.
Preparation: Crush, grind and pulverize. Sheet No.: 2.
Batch No.: S A 2873. Date: 20/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Cd ppm	Bi ppm	Mo ppm
GRR 51	<2	30	10	<2	5	<20	<2
2	115	20	50	10	<5	<20	<2
3	20	<20	20	<2	5	<20	<2
4	10	<20	20	<2	5	<20	<2
5	5	20	10	<2	<5	<20	<2
6	30	<20	15	<2	<5	<20	<2
7	30	520	140	<2	<5	<20	2
8	280	200	75	<2	<5	<20	20
9	30	190	50	<2	5	<20	5
60	350	<20	20	<2	<5	340	<2
1	10	<20	10	<2	<5	<20	<2
2	25	20	10	<2	<5	40	2
3	<2	<20	5	<2	<5	20	<2
4	10	20	40	<2	5	<20	<2
5	85	30	105	<2	<5	50	<2
6	45	50	70	<2	<5	<20	<2
7	565	720	385	<2	10	20	2
8	40	110	45	<2	10	<20	<2
9	10	20	30	<2	<5	<20	2
70	505	120	45	<2	<5	<20	2
1	20	200	20	<2	<5	<20	<2
2	30	20	20	<2	<5	<20	<2
3	15	<20	30	<2	<5	<20	20
4	260	80	350	<2	5	20	5
5	95	100	60	<2	<5	<20	<2
6	10	<20	15	<2	<5	<20	<2
7	65	30	20	<2	<5	<20	<2
8	15	<20	20	<2	<5	20	<2
GRR 79	170	20	215	<2	<5	<20	<2
Repeat and check -							
GRR 15	900	9500	2200	65	10	120	<2
37	5	30	10	<2	5	<20	2
55	5	20	10	<2	<5	<20	<2
70	510	130	45	<2	<5	<20	<2

ANALYTICAL METHODS: Cu, Pb, Zn, Ag, Cd, Bi by AAS.
Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd.
TASMANIA.
STANLEY.

Signed .....

★47131

084

114085

ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977 6495

A.C.S. Laboratories Pty. Ltd.
63 ALEXANDER STREET
MANLY, N.S.W. 2095

50 Mary Street,
(P.O. Box 3)
USLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.

Area: Tasmania. (O/No.18162.)

Samples of: Rock.

Preparation: Crush, grind and pulverize. Sheet No.: 3.

Batch No.: S 2873. Date: 27/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Ag ppm	Au ppb	Sn ppm	Sb ppm	Bi ppm
GRR 1	5		10	<30	<50
2	10		100	<30	<50
3	5		30	<30	<50
4	40		<1	<30	<50
5	60		30	<30	<50
6	<2		10	<30	<50
7	<2		30	<30	<50
8	<2		30	<30	<50
9	5		30	<30	<50
10	<2		30	<30	<50
1	<2		30	<30	<50
2	Interference	>500	300	1000	>10000
3	5	85	100	<30	1000
4	10	50	3000	<30	1000
5	2	15	3000	<30	<50
6	20	10	1000	<30	<50
7	10	10	100	<30	<50
8	Interference	85	100	<30	>10000
9	5		1000	<30	<50
20	>200	1760	300	<30	<50
1	20		300	<30	<50
2	10		100	<30	<50
3	10		30	<30	<50
4	<2		100	<30	<50
5	2		30	<30	<50
6	<2		300	<30	<50
7	<2		30	<30	<50
8	<2		30	<30	<50
9	2		30	<30	<50
30	<2		30	<30	<50
1	<2		<1	<30	<50
2	<2		10	<30	<50
3	<2		30	<30	<50
4	20		30	<30	<50
5	5		30	<30	<50
6	5		30	<30	<50
7	<2		<1	<30	100
8	<2		<1	<30	<50
9	5		3000	<30	100
40	2		30	<30	<50
1	Interference		<1	<30	>10000
2	2		<1	<30	<50
3	5		<1	<30	<50
4	<2		300	<30	<50
5	2		<1	<30	<50
6	10		30	<30	<50
7	<2		100	<30	<50
8	<2		<1	<30	<50
9	<2		1	<30	<50
GRR 50	<2		10	<30	<50

ANALYTICAL METHODS: Ag by Colorimetry; Au by GRP.
Au by CRA/AAS.
Sn, Sb, Bi by OES.

DISTRIBUTION: Pacminex Pty.Ltd., Tasmania.
Sydney.

Signed.....

★47131

085

114086

ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977 6495

A.C.S. Laboratories Pty. Ltd.
63 ALEXANDER STREET
MANLY, N.S.W. 2095

50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania. (C/No.18162)
Samples of: Rock.
Preparation: Crush, grind and pulverize. Sheet No.: 4.
Batch No.: S A 2873. Date: 27/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Ag ppm	Cu* ppm	Au ppb	Sn ppm	Sb ppm	As ppm
GRR 51	<2			<1	<30	<50
2	<2			3000	<30	<50
3	<2			3	<30	<50
4	<2			1	<30	<50
5	<2			1	<30	<50
6	<2			100	<30	<50
7	<2			30	<30	<50
8	5			1000	<30	<50
9	20			3000	<30	<50
60	5			1000	<30	<50
1	<2			10	<30	<50
2	40			300	<30	<50
3	<2			<1	<30	<50
4	<2			3	<30	<50
5	<2			1	<30	<50
6	<2			<1	<30	<50
7	>200	1000		30	<30	100
8	20			100	<30	<50
9	<2			<1	<30	<50
70	5			300	<30	1000
1	<2			100	<30	<50
2	<2			<1	<30	<50
3	5			30	<30	<50
4	<2			10	<30	10000
5	<2			30	<30	<50
6	<2			1	<30	<50
7	<2			100	<30	<50
8	10			10	<30	<50
GRR 79	5			10	<30	<50
Repeat and check -						
GRR 15	5		15			
37	<2					
55	<2					
70	5					

ANALYTICAL METHODS: Ag by Colorimetry; Cu* by XRF.
Au by CRA/A.A.S.
Sn, Sb, As by A.A.S.

DISTRIBUTION:

Signed: R Lean

★47131

086

114087

ADELAIDE
Tel.: 272 5733

[redacted]

A.C.S. Laboratories Pty. Ltd.
[redacted]

50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania. (O/No.13162)
Samples of: Rock.
Preparation: Crush, grind and pulverize.
Batch No.: S A 2873. - 20#

Sheet No.: 5.
Date: 20/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description		Cu ppm	Pb ppm	Zn ppm	Ag ppm	Cd ppm	Bi ppm	Mo ppm
GRL 01		165	<20	75	<2	<5	<20	2
Wolfram Creek. 2		50	20	30	<2	<5	<20	<2
3		55	<20	30	<2	<5	<20	<2
4		35	20	25	<2	5	<20	<2
5		40	30	30	<2	<5	<20	2
6		10	60	5	<2	<5	<20	10
7		<2	<20	5	<2	<5	<20	<2
8		<2	<20	10	<2	<5	<20	<2
9		5	<20	5	<2	<5	<20	<2
10		<2	<20	5	<2	5	<20	<2
11		<2	<20	5	<2	<5	<20	<2
12		<2	<20	5	<2	<5	<20	<2
Priory 13		<2	<20	<2	<2	<5	<20	<2
14		<2	<20	5	<2	<5	<20	<2
15		<2	20	20	<2	<5	<20	2
16		5	<20	5	<2	5	<20	<2
17		<2	<20	10	<2	<5	<20	<2
18		5	20	15	<2	<5	20	<2
19	DATA BASE NO.	<2	<20	10	<2	<5	30	<2
GRL 20		<2	<20	15	<2	<5	<20	<2
GRS 01	5001	30	40	65	<2	5	<20	<2
2	|	5	60	15	<2	<5	<20	<2
3	|	25	40	180	<2	<5	<20	<2
4	|	<2	90	30	<2	<5	<20	<2
5	|	5	90	40	<2	5	<20	<2
6	|	5	<20	20	<2	5	<20	<2
7	|	50	50	75	<2	<5	<20	<2
8	|	15	30	40	<2	<5	<20	<2
Wolfram Creek. 9	|	35	20	60	<2	<5	<20	2
10	|	20	40	85	<2	<5	<20	<2
1	|	20	50	40	<2	<5	<20	<2
2	|	20	40	70	<2	<5	<20	<2
3	|	30	40	65	<2	5	<20	2
4	|	15	20	40	<2	<5	20	<2
5	|	10	20	35	<2	5	<20	2
6	|	20	40	55	<2	5	<20	2
7	|	10	<20	35	<2	<5	<20	<2
8	|	20	80	100	<2	<5	20	<2
9	↓	40	60	130	<2	<5	<20	<2
20	↓	45	<20	65	<2	<5	20	2
GRS 21	5021	45	<20	95	<2	<5	<20	2
Repeat and check -								
GRL 14		<2	<20	5	<2	<5	<20	<2
GRS 12		20	40	70	<2	<5	<20	<2

ANALYTICAL METHODS: Cu, Pb, Zn, Ag, Bi, Cd by A.A.S.
Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd.
Tasmania.
Sydney.

Signed J R Lewis

★47131

087

114088

ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977 6495

A.C.S. Laboratories Pty. Ltd.
63 ALEXANDER STREET
MANLY, N.S.W. 2095

50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush, grind and pulverize.
Batch No.: S 2373. - 20#

Sheet No.: 6.
Date: 27/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

	Sample Description	V ppm	W* ppm	Sn ppm	Sb ppm	As ppm		
2	GRL 01	10		1	<30	<50		
	2	5		<1	<30	<50		
	3	40		<1	<30	<50		
	4	2		1	<30	<50		
	5	2		10	<30	<50		
	6	<2		1000	<30	<50		
	7	<2		1000	<30	<50		
	8	<2		30	<30	<50		
	9	<2		30	<30	<50		
	10	<2		10	<30	<50		
	1	<2		30	<30	<50		
	2	<2		<1	<30	<50		
	3	<2		100	<30	<50		
	4	<2		10	<30	<50		
	5	<2		10	<30	<50		
	6	<2		30	<30	<50		
	7	<2		3	<30	<50		
	8	<2		1	<30	<50		
	9	<2		10	<30	<50		
	GRL 20	<2		30	<30	<50		
1	GRS 01 5001	5		30	<30	<50		
	2	<2		10	<30	<50		
	3	2		10	<30	<50		
	4	10		30	<30	<50		
	5	2		30	<30	<50		
	6	20		30	<30	<50		
	7	10		30	<30	<50		
	8	10		30	<30	<50		
	9	>200	300	1000	<30	<50		
	10	10		30	<30	<50		
	1	10		30	<30	<50		
	2	10		30	<30	<50		
	3	20		1000	<30	<50		
	4	20		30	<30	<50		
	5	<2		10	<30	<50		
	6	<2		10	<30	<50		
	7	<2		30	<30	<50		
	8	<2		100	<30	<50		
	9	2		3000	<30	<50		
	20	60		1	<30	<50		
	GRS 21 5021	10		30	<30	<50		
	Repeat and check -							
	GRL 14	<2						
	GRS 12	10						

ANALYTICAL METHODS: V by Colorimetry; W* by XRF.
Sn, Sb, As by HG2.

DISTRIBUTION:

Signed: [signature]

★47131

088

114089

ADELAIDE
Tel.: 272 5733

[redacted] SYDNEY
Tel.: [redacted]

A.C.S. Laboratories Pty. Ltd
[redacted] ALEXANDER STREET
[redacted] MANLY, N.S.W. 2095

50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush, grind and pulverize. - 40#
Batch No.: S: A 2873.

Sheet No.: 7.
Date: 20/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Cd ppm	Bi ppm	Mo ppm
GRL 01	165	60	75	2	<5	<20	<2
2	60	30	30	<2	<5	<20	<2
3	60	40	35	<2	<5	<20	<2
4	35	30	30	<2	<5	<20	<2
5	35	20	30	<2	<5	<20	<2
6	<5	<20	10	<2	<5	<20	<2
7	<5	<20	10	<2	<5	<20	<2
8	<5	<20	10	<2	5	<20	<2
9	<5	20	10	<2	<5	<20	<2
10	5	<20	10	<2	<5	<20	<2
1	5	<20	5	<2	5	<20	<2
2	<5	<20	5	<2	<5	<20	<2
3	<5	<20	5	<2	5	<20	<2
4	<5	<20	10	<2	5	<20	<2
5	5	20	15	<2	<5	<20	<2
6	<5	20	10	<2	<5	<20	<2
7	<5	<20	10	<2	<5	<20	<2
8	<5	40	15	<2	<5	<20	<2
9	5	20	20	<2	<5	<20	<2
GRL 20	<5	30	10	<2	<5	<20	<2
GRS 01 5001	20	40	60	<2	<5	<20	<2
2	10	60	15	<2	<5	<20	<2
3	30	60	180	<2	<5	30	<2
4	10	80	35	<2	<5	<20	<2
5	10	100	60	<2	<5	<20	<2
6	<5	30	25	<2	<5	<20	<2
7	50	40	80	<2	5	<20	<2
8	20	50	50	<2	<5	<20	<2
9	60	30	80	<2	<5	<20	2
10	25	40	85	<2	<5	20	<2
1	20	20	50	<2	5	<20	<2
2	20	20	70	<2	<5	<20	<2
3	40	30	80	<2	<5	<20	<2
4	15	20	50	<2	5	<20	<2
5	5	<20	20	<2	<5	<20	<2
6	25	50	60	<2	<5	20	<2
7	20	20	30	<2	<5	<20	<2
8	30	80	90	<2	<5	<20	<2
9	45	50	115	<2	<5	<20	<2
20	40	20	100	<2	<5	<20	<2
GRS 21 5021	45	30	80	<2	<5	<20	2
GRL 14	<5	<20	10	<2	5	<20	<2
GRS 12	15	20	65	<2	<5	<20	<2

ANALYTICAL METHODS: Cu, Pb, Zn, Ag, Cd, Bi by AAS.
Mo by Colorimetry.

Signed [signature]

DISTRIBUTION:
★47131
Pacminex Pty.Ltd.
Tasmania.
Sydney.

089

114090

ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977 6495

A.C.S. Laboratories Pty. Ltd.
63 ALEXANDER STREET
MANLY, N.S.W. 2095

50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush, grind and pulverize.
Batch No.: S A 2873. -40#

Sheet No.: 8.
Date: 27/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	I ppm	W* ppm	Sn ppm	Sb ppm	As ppm		
GRL 01	10		<1	<30	<50		
2	5		10	<30	<50		
3	40		30	<30	<50		
4	2		3	<30	<50		
5	2		1	<30	<50		
6	<2		300	<30	<50		
7	<2		1000	<30	<50		
8	<2		30	<30	<50		
9	<2		30	<30	<50		
10	<2		300	<30	<50		
1	<2		30	<30	<50		
2	<2		10	<30	<50		
3	<2		30	<30	<50		
4	<2		1000	<30	<50		
5	<2		<1	<30	<50		
6	<2		10	<30	<50		
7	<2		<1	<30	<50		
8	<2		1	<30	<50		
9	<2		1	<30	<50		
GRL 20	<2		<1	<30	<50		
GRS 01 5001	5		<1	<30	<50		
2	<2		<1	<30	<50		
3	5		<1	<30	<50		
4	2		1	<30	<50		
5	5		1	<30	<50		
6	20		30	<30	<50		
7	40		3	<30	<50		
8	20		1	<30	<50		
9	>200	290	100	<30	<50		
10	2		30	<30	<50		
1	40		30	<30	<50		
2	2		3	<30	<50		
3	40		10	<30	<50		
4	80		30	<30	<50		
5	<2		<1	<30	<50		
6	<2		<1	<30	<50		
7	<2		3	<30	<50		
8	<2		100	<30	<50		
9	5		1000	<30	<50		
20	40		10	<30	<50		
GRS 21 5021	10		30	<30	<50		
Repeat and check -							
GRL 14	<2						
GRS 12	2						

ANALYTICAL METHODS: I by Colorimetry; W* by XRF.
Sn, Sb, As by ES2.

DISTRIBUTION:

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ADELAIDE
Tel.: 272 5733

[redacted]

ANALYTICAL RESULTS

A.C.S. Laboratories Pty. Ltd.
[redacted]
50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

Samples from: Pacminex Pty.Ltd.
Area: Tasmania. (O/No.18162)
Samples of: Rock.
Preparation: Crush, grind and pulverize.
Batch No.: S A 2873. - 60#

Sheet No.: 9.
Date: 20/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Cd ppm	Bi ppm	Mo ppm
GRL 01	160	20	75	2	5	<20	2
2	70	20	30	<2	<5	<20	<2
3	50	<20	30	<2	<5	<20	<2
4	35	20	25	<2	5	<20	<2
5	25	40	25	<2	<5	<20	<2
6	<2	<20	10	<2	<5	<20	<2
7	<2	30	10	<2	<5	<20	<2
8	5	20	10	<2	5	20	<2
9	<2	20	10	<2	5	<20	<2
10	5	<20	10	<2	5	<20	<2
1	<2	<20	5	<2	5	<20	<2
2	<2	30	10	<2	5	<20	<2
3	5	<20	10	<2	<5	<20	<2
4	<2	<20	10	<2	5	<20	<2
5	5	70	30	<2	5	<20	<2
6	<2	<20	10	<2	<5	<20	<2
7	5	20	10	<2	<5	<20	<2
8	5	20	15	<2	<5	<20	<2
9	<2	<20	15	<2	5	<20	<2
GRL 20	<2	40	20	<2	<5	<20	<2
GRS 01 5001	10	50	50	<2	<5	<20	<2
2	5	40	15	<2	<5	<20	<2
3	25	40	170	<2	<5	<20	<2
4	10	140	30	<2	<5	<20	<2
5	10	120	65	<2	<5	<20	<2
6	5	40	25	<2	5	<20	<2
7	60	50	90	<2	<5	20	<2
8	25	60	60	<2	<5	<20	<2
9	65	20	80	<2	<5	<20	<2
10	25	60	90	<2	5	<20	<2
1	20	30	45	<2	<5	<20	<2
2	15	30	70	<2	5	<20	<2
3	45	50	75	<2	<5	<20	<2
4	20	20	60	<2	<5	<20	<2
5	20	20	20	<2	<5	<20	<2
6	20	20	60	<2	<5	<20	<2
7	15	20	20	<2	<5	20	<2
8	30	60	80	<2	<5	<20	<2
9	50	60	115	<2	<5	<20	<2
20	45	40	55	<2	5	<20	<2
GRS 21 5021	55	20	85	<2	<5	<20	<2
Repeat and check -							
GRL 14	<2	<20	10	<2	5	<20	<2
GRS 12	20	30	70	<2	5	<20	<2

ANALYTICAL METHODS: Cu, Pb, Zn, Ag, Cd, Bi by AAS.
Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd.
Tasmania.
Sydney.

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114092

ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977 6495

A.C.S. Laboratories Pty. Ltd.
63 ALEXANDER STREET,
MANLY, N.S.W. 2095
50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush, grind and pulverize. -60#
Batch No.: SI 2373.

Sheet No.: 10.
Date: 27/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	W		Sn ppm	Sb ppm	As ppm		
GRL 01	5		1	<30	<50		
2	2		1	<30	<50		
3	20		1	<30	<50		
4	<2		1	<30	<50		
5	2		< 1	<30	<50		
6	<2		300	<30	<50		
7	<2		1000	<30	<50		
8	<2		30	<30	<50		
9	<2		10	<30	<50		
10	<2		30	<30	<50		
1	<2		100	<30	<50		
2	<2		30	<30	<50		
3	<2		30	<30	<50		
4	<2		30	<30	<50		
5	<2		<1	<30	<50		
6	<2		10	<30	<50		
7	<2		1	<30	<50		
8	<2		10	<30	<50		
9	<2		<1	<30	<50		
GRL 20	<2		<1	<30	<50		
GRS 01 5001	10		10	<30	<50		
2	2		10	<30	<50		
3	5		100	<30	<50		
4	5		10	<30	<50		
5	10		3	<30	<50		
6	5		10	<30	<50		
7	10		3	<30	<50		
8	5		30	<30	<50		
9	150		30	<30	<50		
10	2		<1	<30	<50		
1	20		30	<30	<50		
2	2		<1	<30	<50		
3	20		30	<30	<50		
4	60		30	<30	<50		
5	<2		10	<30	<50		
6	<2		<1	<30	<50		
7	<2		<1	<30	<50		
8	<2		100	<30	<50		
9	2		300	<30	<50		
20	60		10	<30	<50		
GRS 21 5021	10		<1	<30	<50		
Repeat and check -							
GRL 14	<2						
GRS 12	2						

ANALYTICAL METHODS: W by Colorimetry.
Sn, Sb, As by AS2.

DISTRIBUTION:

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ADELAIDE
Tel.: 272 5733

A.C.S. Laboratories Pty. Ltd.
50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush, grind and pulverize. - 80#
Batch No.: S A 2873.

Sheet No.: 11.
Date: 20/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Cd ppm	Bi ppm	Mo ppm
GRL 01	165	40	70	5	<5	<20	2
2	65	<20	35	<5	<5	<20	<2
3	50	40	30	<5	<5	<20	<2
4	30	20	25	<5	<5	<20	<2
5	25	<20	20	<5	<5	<20	<2
6	<5	<20	5	<5	<5	<20	<2
7	<5	<20	10	<5	<5	<20	<2
8	10	<20	20	<5	5	<20	<2
9	5	20	10	<5	<5	<20	<2
10	<5	<20	5	<5	<5	<20	<2
1	<5	<20	<5	<5	<5	<20	<2
2	<5	<20	10	<5	<5	<20	<2
3	5	<20	10	<5	<5	<20	<2
4	5	<20	10	<5	<5	<20	<2
5	5	40	20	<5	5	<20	<2
6	<5	<20	20	<5	<5	<20	<2
7	<5	20	15	<5	<5	<20	<2
8	5	30	20	<5	<5	<20	<2
9	5	40	25	<5	<5	<20	<2
GRL 20	5	60	30	<5	<5	<20	<2
GRS 01 5001	25	40	60	<5	5	30	<2
2	5	30	10	<5	<5	<20	<2
3	20	30	150	<5	5	20	<2
4	10	140	40	<5	<5	<20	<2
5	15	120	70	<5	5	<20	<2
6	<5	<20	25	<5	<5	<20	<2
7	55	50	85	<5	5	<20	<2
8	20	50	65	<5	<5	<20	<2
9	60	20	100	<5	<5	<20	<2
10	25	30	85	<5	5	<20	<2
1	25	20	50	<5	<5	<20	<2
2	15	20	60	<5	<5	<20	<2
3	45	50	80	<5	5	<20	<2
4	25	20	55	<5	<5	<20	<2
5	10	<20	30	<5	<5	<20	<2
6	30	40	60	<5	5	30	<2
7	20	20	40	<5	<5	<20	<2
8	30	70	95	<5	<5	<20	<2
9	55	70	125	<5	<5	<20	<2
20	40	40	50	<5	<5	20	<2
GRS 21 5021	50	20	90	<5	<5	30	<2
Repeat and check -							
GRL 14	5	<20	10	<5	<5	<20	<2
GRS 12	15	20	65	<5	<5	<20	<2

ANALYTICAL METHODS: Cu, Pb, Zn, Ag, Cd, Bi by AAS.
Mo by Colorimetry.

DISTRIBUTION: Pacminex Pty.Ltd.
Tasmania.
Sydney.

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ADELAIDE
Tel.: 272 5733

SYDNEY
Tel.: 977 6495

A.C.S. Laboratories Pty. Ltd.
63 ALEXANDER STREET
MANLY, N.S.W. 2095

50 Mary Street,
(P.O. Box 3),
UNLEY. 5061.

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Tasmania.
Samples of: Rock.
Preparation: Crush, grind and pulverize. -80#
Batch No.: SA 2873.

Sheet No.: 12.
Date: 27/4/79.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	W ppm		Sn ppm	Sb ppm	As ppm		
GRL 01	5		<1	<30	<50		
2	5		1	<30	<50		
3	10		1	<30	<50		
4	<2		1	<30	<50		
5	2		3	<30	<50		
6	<2		100	<30	<50		
7	<2		300	<30	<50		
8	<2		1	<30	<50		
9	<2		<1	<30	<50		
10	<2		100	<30	<50		
1	<2		10	<30	<50		
2	<2		10	<30	<50		
3	<2		100	<30	<50		
4	<2		30	<30	<50		
5	<2		<1	<30	<50		
6	<2		<1	<30	<50		
7	<2		1	<30	<50		
8	<2		<1	<30	<50		
9	<2		<1	<30	<50		
GRL 20	<2		<1	<30	<50		
GRS 01	60		<1	<30	<50		
2	2		<1	<30	<50		
3	<2		1	<30	<50		
4	5		3	<30	<50		
5	5		<1	<30	<50		
6	5		10	<30	<50		
7	5		30	<30	<50		
8	5		10	<30	<50		
9	60		10	<30	<50		
10	2		10	<30	<50		
1	40		10	<30	<50		
2	<2		1	<30	<50		
3	40		3	<30	<50		
4	10		<1	<30	<50		
5	<2		<1	<30	<50		
6	<2		<1	<30	<50		
7	<2		1	<30	<50		
8	<2		100	<30	<50		
9	<2		300	<30	<50		
20	20		10	<30	<50		
GRS 21	10		1	<30	<50		
Repeat and check -							
GRL 14	<2						
GRS 12	2						

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ANALYTICAL METHODS: W by Colorimetry.
Sn, Sb, As by OS 2.

DISTRIBUTION:

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Soils.
Preparation:
Batch No.: A 2912.

Sheet No.: 1.
Date: 2nd July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Sn ppm	Au ppm	As ppm	Ag ppm
GRS 22 5022	3	<3	<50	<1
3	1	<3	<50	<1
4	3	<3	<50	<1
5	1	<3	<50	<1
6	1	<3	<50	<1
9	10	<3	<50	<1
30	1	<3	<50	<1
1	<1	<3	<50	<1
2	<1	<3	<50	<1
3	1	<3	<50	<1
4	3	<3	<50	<1
5	1	<3	<50	<1
6	3	<3	<50	<1
7	3	<3	<50	<1
8	1	<3	<50	<1
9	1	<3	<50	<1
40	1	<3	<50	<1
1	<1	<3	<50	<1
2	1	<3	<50	<1
3	1	<3	<50	<1
4	<1	<3	<50	<1
5	1	<3	<50	<1
6	1	<3	<50	<1
7	1	<3	<50	<1
8	1	<3	<50	<1
9	1	<3	<50	<1
50	1	<3	<50	<1
1	<1	<3	<50	<1
2	<1	<3	<50	<1
3	1	<3	<50	<1
4	3	<3	<50	<1
5	1	<3	<50	<1
6	1	<3	<50	<1
7	1	<3	<50	<1
8	1	<3	<50	<1
9	10	<3	<50	<1
60	1	<3	<50	<1
1	<1	<3	<50	<1
2	<1	<3	<50	<1
3	<1	<3	<50	<1
4	<1	<3	<50	<1
5	1	<3	<50	<1
6	<1	<3	<50	<1
67	30	<3	<50	<1
74	<1	<3	<50	<1
5	1000	<3	<50	<1
6	<1	<3	<50	<1
7	<1	<3	<50	<1
8	<1	<3	<50	<1
GRS 79 5079	<1	<3	<50	<1

ANALYTICAL METHODS: Sn, Au, As, Ag by ES2.

DISTRIBUTION: Pacminex Pty.Ltd.,
Sydney.

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Soils.
Preparation:
Batch No.: A 2912.

Sheet No.: 2.
Date: 2nd July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Sn ppm	Au ppm	As ppm	Ag ppm
GRS 80 5080	<1	<3	<50	<1
4	10	<3	<50	<1
5	<1	<3	<50	<1
6	<1	<3	<50	<1
93	<1	<3	<50	<1
4	<1	<3	<50	<1
5	<1	<3	<50	<1
6	<1	<3	<50	<1
8	<1	<3	<50	<1
102	3	<3	<50	<1
3	1	<3	<50	<1
4	30	<3	<50	<1
5	<1	<3	<50	<1
6	<1	<3	<50	<1
7	<1	<3	<50	<1
8	<1	<3	<50	<1
111	<1	<3	<50	<1
3	1	<3	<50	<1
4	<1	<3	<50	<1
121	<1	<3	<50	<1
3	<1	<3	<50	<1
4	<1	<3	<50	<1
5	<1	<3	<50	<1
6	<1	<3	<50	<1
7	<1	<3	<50	<1
9	<1	<3	<50	<1
130	<1	<3	<50	<1
1	<1	<3	<50	<1
2	<1	<3	<50	<1
3	<1	<3	<50	<1
4	<1	<3	<50	1
5	1	<3	<50	<1
6	1	<3	<50	<1
7	1	<3	<50	<1
8	3	<3	<50	<1
9	3	<3	<50	<1
140	3	<3	<50	<1
1	3	<3	<50	<1
2	1	<3	<50	<1
3	3	<3	<50	<1
4	1	<3	<50	<1
5	1	<3	<50	<1
6	1	<3	<50	<1
7	1	<3	<50	<1
8	<1	<3	<50	<1
9	3	<3	<50	<1
150	1	<3	<50	<1
1	<1	<3	<50	<1
2	30	<3	<50	<1
GRS 153 5153	1	<3	<50	<1

ANALYTICAL METHODS: Sn, Au, As, Ag by ES2.

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.

*ko/3924

Signed .....

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Soils.
Preparation:
Batch No.: A 2912.

Sheet No.: 3.
Date: 2nd July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Sn ppm	Au ppm	As ppm	Ag ppm
GRS 154 5154	1	<3	<50	<1
5	<1	<3	<50	<1
6	1	<3	<50	<1
9	1	<3	<50	<1
160	<1	<3	<50	<1
1	3	<3	<50	1
2	3	<3	<50	<1
3	1	<3	<50	<1
4	1	<3	<50	<1
5	10	<3	<50	<1
6	1	<3	<50	<1
7	100	<3	<50	<1
8	300	<3	<50	<1
170	30	<3	<50	<1
1	1	<3	<50	<1
2	50	<3	<50	<1
3	1	<3	<50	<1
GRS 176 5176	1000	<3	<50	<1
GRL 21	50	<3	<50	<1
2	100	<3	<50	<1
3	3	<3	<50	<1
4	10	<3	<50	<1
5	20	<3	<50	<1
6	10	<3	<50	1
7	100	<3	<50	<1
8	10	<3	<50	<1
9	1	<3	<50	<1
30	1	<3	<50	<1
1	1	<3	<50	<1
2	1	<3	<50	<1
3	1	<3	<50	<1
4	30	<3	<50	<1
5	10	<3	<50	<1
6	1	<3	<50	<1
7	1	<3	<50	<1
8	3	<3	<50	<1
9	30	<3	<50	<1
40	30	<3	<50	<1
1	300	<3	<50	<1
2	3	<3	<50	<1
3	3	<3	<50	1
4	1	<3	<50	<1
5	3	<3	<50	<1
6	1	<3	<50	<1
7	<1	<3	<50	<1
8	30	<3	<50	<1
9	1	<3	<50	<1
50	1	<3	<50	<1
1	1	<3	<50	<1
GR1 52	3	<3	<50	<1

ANALYTICAL METHODS: Sn, Au, As, Ag by ES2.

DISTRIBUTION: Pacminox Pty.Ltd., Sydney.

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A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.,
Area: Sydney.
Samples of: Soils.
Preparation:
Batch No.: A 2912.

Sheet No.: 4.
Date: 2nd July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Sn ppm	Au ppm	As ppm	Ag ppm
GRL 53	3	<3	<50	<1
4	<1	<3	<50	1
5	1	<3	<50	<1
6	3	<3	<50	<1
7	3	<3	<50	<1
8	30	<3	<50	<1
9	1	<3	<50	<1
60	<1	<3	<50	<1
1	<1	<3	<50	<1
2	<1	<3	<50	<1
3	30	<3	<50	<1
4	3	<3	<50	<1
5	<1	<3	<50	<1
6	3	<3	<50	<1
7	1	<3	<50	<1
8	1	<3	<50	<1
9	3	<3	<50	<1
70	1	<3	<50	<1
1	1	<3	<50	<1
2	1	<3	<50	<1
3	1	<3	<50	<1
4	30	<3	<50	<1
5	30	<3	<50	<1
6	<1	<3	<50	<1
7	<1	<3	<50	<1
8	<1	<3	<50	<1
9	<1	<3	<50	<1
80	1	<3	<50	<1
1	<1	<3	<50	<1
2	1	<3	<50	<1
3	<1	<3	<50	<1
4	1	<3	<50	<1
5	1	<3	<50	<1
6	<1	<3	<50	<1
7	1	<3	<50	<1
8	<1	<3	<50	<1
9	<1	<3	<50	<1
90	<1	<3	<50	<1
1	<1	<3	<50	<1
2	<1	<3	<50	<1
3	<1	<3	<50	<1
4	<1	<3	<50	<1
5	1	<3	<50	<1
6	3	<3	<50	<1
7	3	<3	<50	<1
8	1	<3	<50	<1
9	1	<3	<50	<1
100	3	<3	<50	<1
1	3	<3	<50	<1
GRL 102	1	<3	<50	<1

ANALYTICAL METHODS: Sn, Au, As, Ag by ES2.

DISTRIBUTION: Pacminex Pty.Ltd.
Sydney.

Signed R Leamon

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*o/3924

098

114099

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Soils.
Preparation:
Batch No.: A 2912.

Sheet No.: 5.
Date: 2nd July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Sn ppm	Au ppm	As ppm	Ag ppm
GRL 103	1	<3	<50	<1
4	1	<3	<50	<1
5	<1	<3	<50	3
6	1	<3	<50	<1
7	<1	<3	<50	<1
8	<1	<3	<50	<1
9	1	<3	<50	<1
110	1	<3	<50	<1
1	1	<3	<50	<1
2	1	<3	<50	<1
3	3	<3	<50	1
4	<1	<3	<50	<1
5	1	<3	<50	<1
6	1	<3	<50	<1
7	1	<3	<50	<1
8	<1	<3	<50	<1
9	<1	<3	<50	<1
120	<1	<3	<50	<1
1	<1	<3	<50	<1
2	<1	<3	<50	1
3	<1	<3	<50	<1
4	<1	<3	<50	<1
5	1	<3	<50	<1
6	1	<3	<50	<1
7	3	<3	<50	<1
8	30	<3	<50	3
9	Sample missing.			
130	10	<3	<50	<1
1	30	<3	<50	<1
2	3	<3	<50	<1
3	10	<3	<50	<1
4	3	<3	<50	<1
5	1	<3	<50	<1
6	3	<3	<50	<1
7	<1	<3	<50	<1
8	1	<3	<50	<1
9	<1	<3	<50	<1
140	1	<3	<50	3
1	1	<3	<50	1
2	1	<3	<50	1
3	10	<3	<50	<1
4	30	<3	<50	1
5	3	<3	<50	<1
6	<1	<3	<50	1
7	<1	<3	<50	<1
8	3	<3	<50	<1
9	1	<3	<50	<1
150	3	<3	<50	<1
1	1	<3	<50	<1
GRL 152	10	<3	<50	<1

ANALYTICAL METHODS: Sn, Au, As, Ag by ES2.

DISTRIBUTION: Pacminex Pty.Ltd.,
Sydney.

*ro/3924

Signed .....

099

114100

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

ANALYTICAL RESULTS

Samples from: Pacminex Pty.Ltd.
Area: Sydney.
Samples of: Soils.
Preparation:
Batch No.: A 2912.

Sheet No.: 6.
Date: 2nd July, 1979.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	Sn ppm	Au ppm	As ppm	Ag ppm
GRL 153	1	<3	<50	<1
4	3	<3	<50	<1
5	3	<3	<50	<1
6	3	<3	<50	<1
7	<1	<3	<50	<1
GRL 158	1	<3	<50	<1

ANALYTICAL METHODS: Sn, Au, As, Ag by ES2.

DISTRIBUTION: Pacminex Pty.Ltd., Sydney.

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Signed R. Lewis

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APPENDIX II - MAP SHOWING DISTRIBUTION OF SAMPLE PLOTS E.L. 11/78, GEORGE RIVER, TASMANIA. (REFER MAP K554-2)

APPENDIX III

HEAVY MINERAL IDENTIFICATION REPORT

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114102

REPORT NO. 18/79

MINPET SERVICES

MINERAGRAPHIC STUDY AND DISCUSSION OF HEAVY MINERAL CONCENTRATES FROM THE GEORGES RIVER PROSPECT (E.L. 11/78) ST. HELENS - TASMANIA

November, 1979.

(for Mr. G.C. Hall, Geologist, CSR Limited)

102

114103

CONTENTS

1. INTRODUCTION

In March, 1973 a 'saturation' programme for collecting heavy mineral samples within and adjoining E.L. 11/78, Georges River, St. Helens, N.E. Tasmania, was undertaken firstly by Mr. I.D. Neuss. When Mr. Neuss retired from CSR the work was completed by Mr. G.C. Hall. Approximately 183 samples were collected in all.

Heavy mineral separations were done partly by me whilst working for CSR Limited, partly by me at the Minpet Services premises and partly by Mr. E. Sky of Geochemical and Mineralogical Laboratories Pty. Ltd. The results of this investigation are contained in this report.

2. SUMMARY

Briefly Surveying the Prospect Areas

Proceeding from south to north of the Exploration Licence.

Brilliant Creek : This shows very little cassiterite but some traces of Au in creeks draining from the west.

Copper Show Creek : Traces of cassiterite, scheelite and gold were detected from streams draining western areas of relief from north to south of the area but economic minerals fade out towards the south-east corner of the map.

Therefore the southern E.L. area shows only traces of mineralisation which is fairly widespread at Copper Show Creek and local at Brilliant Creek.

Steeles Marsh : Minor traces of cassiterite adjoin Steeles Marsh along Treloggers Creek only, with a major amount present in sediment at sample point 177 at the southern end. The cassiterite is coarse, abundant and fresh. No gold and tungsten are present.

Johnsons Hill : Mineralisation concentrates along southeast-northwest and east-west stream systems draining off a high central area on two flanks with sporadic coarse cassiterite present at one point (76) on the southeast-northwest system, traces of gold (75), major cassiterite, minor wolfram and traces of gold and scheelite at 103. Very little of anything occurs in the southern east-west trending stream but 128 on the west side contains major cassiterite and a little wolframite and scheelite adjoining mining country.

Platts Lookout : Sampled on the flanks of hilly country embracing Platts Lookout.

Cassiterite and tungsten minerals occur weakly in scattered occurrences in river courses flanking the hilly country, east, west and south.

Rattray Marsh: Spotty, abundant tin mineralisation (153, 150 and 149) on a tributary of Fight Creek, neighbouring Horse Creek and Anson River to the west of the district.

Just outside the E.L. (central south-east margin of the E.L.) coarse mineralisation, fresh cassiterite (179, 180 and 181) associated with monazite.

Just within the central east margin of the E.L. there is an abundance of coarse cassiterite (174).

Mineral associations with the cassiterite are sketchy, though in places it is monazite, elsewhere andalusite with or without zircon, tourmaline and occasionally biotite. Where coarse and abundant, mineralisation will be close to a contact metamorphic aureole where strongly metamorphosed sediments and zircon/biotite rich granites are close by.

Tungsten as mainly scheelite with some wolframite is present as traces in all samples except from Steeles Marsh and Rattray Marsh.

Gold occurs mainly on the Johnson's Hill area in tributaries flanking the Ransom River and also in the Copper Show Creek area along tributaries of the stream which joins the Scamander River (south-east portion of the map).

3. DISCUSSION

3.1 Brilliant Creek (Sketch Map 1)

The heavy mineral sample plots may be arranged in groups of tributaries as :-

(a) 93, 94; (b) 95, 96, 97; (c) 98;
(d) 123, 124; (e) 125, 126, 127.

(a) 93 and 94

Unfortunately there were two samples numbered 93, though they are basically similar. In both samples 93 and 94, there is a moderate amount of cassiterite present. Zircon is also a dominant mineral.

(b) 95, 96 and 97

No cassiterite is seen but gold occurs as a trace in 96 and zircon is a minor quantity with anatase. Some calc-silicate minerals are present.

(c) 98

An abundance of tourmaline but no cassiterite is present, and zircon is a minor quantity.

(d) 123 and 124

Much ferruginous siltstone, minor zircon but otherwise nothing of interest is in these samples.

(e) 125, 126 and 127

Calc-silicate metamorphic minerals, appreciable zircon and tourmaline are in 125 and 126. No minerals of interest are seen.

/.....

Only cassiterite in group (a) and gold in group (c) are of interest in this section.

3.2 Copper Show Creek (Sketch Map 2)

Arrangement of sample plots is according to stream catchment.

(a) 24 and 25

Cassiterite is present in sample 24, but only as a trace, which possibly indicates a common source with sample 22 in group (b). A calc-silicate/metamorphic and pneumatolytic source (+ skarn ?) is indicated.

(b) 22, 23 and 26 (missing)

Sample 23 is 'the odd man out' in this series and further demonstrates a common source of sediment from the catchment for 22, 24 and 25 somewhere between rock sampling points Δ 2, Δ 79, Δ 3 and Δ 4. Traces of wolframite and scheelite are noted in addition to cassiterite and abundant tourmaline.

(c) 109, 110, 111 (missing) 112 and 115

Samples 109, 110 and 112 indicate a common source of heavy minerals with common ferruginous siltstone, tourmaline and zircon, but with conflicting trace mineral assemblages. No cassiterite is indicated but a calc-silicate/ferruginous siltstone/metamorphic source of sediments. Sample 115 shows common ferruginous siltstone, tourmaline and actinolite and also cassiterite with a source from somewhere to the north (see group (b)).

(d) 118, 119, 120, 121 (missing) and 122

Specimens 118 and 119 show traces of tin and 119 a trace of wolframite. Tourmaline and zircon are abundant in both specimens. Otherwise minor and trace mineral components conflict. Ferruginous siltstone (118) is common with group (c) above and presence of cassiterite (see 115 above). A possible common source of tin for samples 115 and 118 (?) whose major mineral assemblages are similar. See also sample 120 with traces of cassiterite and scheelite, abundant zircon, and minor ferruginous siltstone and tourmaline. Sample 122 is also in the group and shows the presence of wolframite and scheelite. There is therefore an interesting tungsten source somewhere to the north and north east of the join of the stream tributaries and also in this area and just to the west is a source of cassiterite (see groups (a), (b) and (c) above.

(e) 113, 114, 116 and 117

Ferruginous siltstone, abundant zircon, tourmaline and presence of calc-silicate minerals in samples 113 and 114 are noted. Cassiterite is present in minor quantities in 114, 116 and 117 indicating a wide area of origin but in an approximate east-west trend when linked with sources indicated by groups (a), (b), (c) and (d) above.

(f) 83, 84, 85 and 86

All these samples show a common ferruginous siltstone sedimentary source. Cassiterite and scheelite are present in all specimens save 86, which is presumably more remote from the source of these minerals. Zircon and tourmaline are both in appreciable proportions in all specimens. Gold

is present as a trace in sample 86. Again there is an indicated source of tin and tungsten to the north of the river system and as indicated by sample 85, from the east.

(g) 70, 71, 72 and 73

A trace of gold only is seen in sample 70, but this is in a more southerly catchment from group (e) where gold was found in sample 86. No tin or tungsten minerals are seen and the presence of appreciable zircon and tourmaline in 70 and 71 indicate nothing but the minerals are notably much worn and are not fresh. The sampling was too far south of exposed tin and tungsten veins.

(h) 67 (missing), 68, 69 and 101 (missing)

Comments made are only on samples 68 and 69 as the remaining samples are missing.

A great abundance of ferruginous siltstone occurs here with appreciable tourmaline and very little zircon (?) in 69 where cassiterite is present as a trace. A separate source from the cassiterite as noted above.

(i) 31 (missing), 32 and 33

Traces of cassiterite and scheelite are indicated. A common area of origin of cassiterite at higher elevation between samples 32 and 69 (group (h) above) . Large amounts of ferruginous material occur in both specimens.

(j) 29 and 30

A calc-silicate source with additional appreciable zircon and tourmaline, the former being fresh where the minor cassiterite is present in sample 30.

(k) 87, 88, 89, 90, 91 and 92

A nondescript heavy mineral association indicates variable sources or fractionation. The only common presence is that of ferruginous siltstone and ilmenite and of coarse appreciable zircon and tourmaline. Cassiterite is present as a minor quantity in 89 and as traces in 92, which may tie in with cassiterite in group (ix) on the other side of the hill(s) to the west. Traces of scheelite are seen in 91, again tying in with group (ix) and maybe shows a common tin/tungsten source.

There appears to be an area of tin shedding in hills above the river system in groups (a), (b), (c), (d), (e) and (f); scheelite in (b), (d) and (f); and gold in (f), (g) and in the hills above the SE river system.

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4. STEELE'S MARSH SAMPLES

Progressing from north to south by tributaries to Trelogger's Creek :-

166 : A large amount of tourmaline, zircon and minor monazite.

165 : Minor cassiterite and traces of monazite. Abundant tourmaline and zircon.

163 : Major zircon and minor monazite. Pyrite occurs in both 165 and 163 and minor biotite is present in 163.

159 : Missing.

160 : Minor zircon and traces of tourmaline in an epidote-rich sample.

162 : Major monazite and minor cassiterite. Possibly shows proximity to Mt. Pierson Granite which according to information on the large map supplied is actually shedding tin (from the west).

161 : Abundant zircon and minor tourmaline only - with traces of biotite.

GRR 126 : Major tourmaline and minor zircon; sample point adjoins a granite contact (?); trace of andalusite.

177 : Major cassiterite, monazite and zircon and minor coarse tourmaline. Low sphericity could mean first cycle material and coarse nature of mineral could equate with closeness to granite contact.

/.....

There is no definite pattern to cassiterite abundance which suggests that Trelogger's Creek flanks a north-south granite contact where tin veins occur sporadically. Monazite however, invariably accompanies cassiterite in this area.

Samples taken east of Steeles Marsh, trending north-south from just south of Deacons Creek to Hogan's Road.

(a) 120, 119, 118 --- 176

The first three samples are discussed in area (2) under section (iv) and contain a little cassiterite, with 119 and 120 containing traces of wolframite and scheelite respectively. Sample 176 is very rich in cassiterite and monazite and the cassiterite is present to 90 percent, +60 mesh and subangular. From an area close to source.

5. JOHNSONS HILL SAMPLES - Northwest Corner of Large Map (from samples taken in Ronson River or its tributaries

(i) 102 : A large volume of biotite and zircon in this concentrate. Other than that, the metamorphic minerals, tremolite, andalusite and traces of staurolite are present in addition to minor epidote.

(ii) 103 and 104 :

.. 103 contains major cassiterite, minor wolframite, and traces of gold and scheelite. The contact metamorphics present are major andalusite and traces of cordierite.

.. 104 from an adjoining tributary. Major biotite, minor contact metamorphic andalusite and trace cordierite so probably adjoining a granitic contact with sediments.

(iii) 74 and 75 : Trace of gold in 75. Abundant contact metamorphic mineral andalusite in 74 and abundant biotite in 75. Antigorite, anthophyllite and talc suggests the proximity of metamorphosed ultramafics ?

(iv) 76 and 77 : Major cassiterite in 76 and minor cassiterite in 77 indicates vein cassiterite from a common area to the south west. There is a great abundance of zircon in both specimens. Contact metamorphics in both samples and hornblende, talc, and anthophyllite features as traces in 77 (ultramafic source as per group (iii)). Shales and ultramafic rocks adjoins a granite.

/.....

78 and 79 : Andalusite and zircon and minor biotite feature largely with traces of gold in 79. No tin.

80 and 105 : Biotite and zircon are major minerals in 80, with minor and traces of contact metamorphic minerals. Zircon is strong in 105 with contact metamorphic minerals and a trace of zinnwaldite indicates the proximity of tin ?

108 : Biotite has a major presence and zircon is minor with a trace of andalusite - some distance from granite contact ?

128 : Major cassiterite, minor wolframite and traces of scheelite are associated with minor contact mineral andalusite and traces of garnet. Cassiterite present is largely +2 mm and close to source with a low sphericity.

Proximity of cassiterite veins shown by samples 103, 128 and 76 in different catchment areas. Direction of tin shedding may be outwards from central area on map. Samples 103 and 128 also indicate associated (?) tungsten and gold is in 75 and 79 from the divide between catchments on opposite side of ENE/WSW trending hill.

6. PLATTS LOOKOUT SAMPLES (north of area (4) in the E.L. 11/78)

6.1 Tributaries Flowing NW to NE

(i) 143 and 66 :

.. 143 : More than 90 volume percent of ilmenite and zircon and most zircons are fresh.

.. 66 : Largely ilmenite and zircon.

(ii) 142 : Abundant tourmaline and zircon, minor spinel and biotite.

(iii) 141 : Abundant zircon. More than 90 volume percent zircon and ilmenite.

6.2 Streams and Tributaries Flowing East and South East on East Side of High Country Flanking Platt's Lookout

(iv) 140, 41 and 42 :

.. 140 : Largely ilmenite and zircon, minor rutile and biotite. Grains are mostly unworn.

.. 41A and 41B : Biotite and zircon with minor leucoxene. A great abundance of zircon.

.. 42 : Largely biotite, zircon and ilmenite. Traces of scheelite (?)

6.3 Stream Flowing North with Tributaries Flowing East (proceeding southwards)

(v) 43 : Largely biotite and zircon. Traces of scheelite.

/.....

(vi) 138 : Largely biotite, ilmenite and zircon.

(vii) 44 and 45 : Ilmenite and tourmaline and traces of scheelite.

(viii) 46 and 139 : Biotite, ilmenite and zircon. Minor epidote.

(ix) 136, 137 and 47 : Mainly biotite, zircon and ilmenite; though minor tourmaline and cassiterite are present in 136.

(x) 49 and 135 : Mainly ilmenite and zircon. Minor biotite and tourmaline in 49. Minor biotite in 136.

(xi) 52 : Major tourmaline and zircon. Minor ilmenite.

(xii) 50, 51, 134 and 133 : Zircon, ilmenite and magnetite in 50, and zircon and actinolite in 134. Minor minerals variable but with minor biotite in 151 and 134.

(xiii) 53 : Major, ilmenite, tourmaline and zircon and minor metamorphics.

(xiv) 131 and 132 : Largely ilmenite and zircon with minor calc-silicate minerals and contact metamorphic minerals.

Few cassiterite occurrences and traces of scheelite shedding from high country around Platts Lookout.

/.....

6.4 Streams and Tributaries on West Side High Country Flanking Platts Lookout

39 : Major ilmenite and minor zircon.

38 : Largely biotite, ilmenite, minor epidote and zircon.

34, 35 and 36 : Biotite, ilmenite, and andalusite, minor zircon and rutile.

37 : Major biotite, ilmenite and epidote but with traces of wolframite.

58, 60, 61, 62 and 68 : Biotite, ilmenite, zircon and andalusite with minor cassiterite in 58, wolframite in 62, and 68 is mainly ferruginous siltstone.

64 and 65 : Ilmenite, magnetite and zircon, minor or trace zircon and andalusite.

57 : Largely biotite and epidote, minor andalusite and traces of cassiterite and scheelite.

56 : Major ilmenite and zircon, minor andalusite.

55 (missing)and 129 : Ilmenite and zircon, biotite and andalusite, trace of cassiterite.

54 and 130 : Biotite, ilmenite and minor to trace andalusite. Trace of cassiterite and scheelite in 54 and minor cassiterite in 130.

Cassiterite occurs in minor to trace quantities and scheelite and wolframite in trace quantities in streams and tributaries, both east and west of the high country. Heavy mineralogy is largely monotonous except at the trace level, since it consists mainly of ilmenite, zircon, and andalusite with sporadic biotite and epidote.

/.....

7. RATTRAY MARSH (situated in the far north east of the E.L. Main stream runs N-S)

Last River

152 : As in previous areas of the E.L. ilmenite and zircon are major minerals but minor cassiterite occurs in company with tourmaline and biotite.

Fight Creek/Horse Creek Confluence

145 : The usual large abundance for the E.L. of biotite, ilmenite, zircon and epidote with associated contact metamorphic minerals.

Fight Creek

151 : Largely ilmenite with minor cassiterite and contact metamorphic minerals.

153 and 154.: Coarse cassiterite and abundant zircon in 153. Minor cassiterite with abundant ilmenite and calc-silicate minerals.

151 : Minor cassiterite associated with tourmaline, contact metamorphics and abundant ilmenite.

Horse Creek

150 : Major coarse fragmentary cassiterite, and minor zircon.

144 : Largely biotite, ilmenite and zircon

155 and 156 : Mainly ilmenite, zircon and epidote.

Most Westerly Stream System

146 : Largely ilmenite, zircon and epidote.

147 : Biotite, ilmenite and zircon with minor cassiterite and tourmaline, epidote and andalusite.

148 : Ilmenite, zircon and epidote, minor andalusite and tourmaline.

149 : Largely coarse angular cassiterite with traces of andalusite, tourmaline and zircon.

As in previous areas no strict pattern to cassiterite and distribution, though presence of andalusite and tourmaline together indicate the possible presence of the mineral. However, very coarse cassiterite does occur in major amounts in 153, 150 and 149 and this would show proximity to a source but the localities are scattered.

Later Sampling shown on the Large Map

(i) Just outside the southern boundary of the E.L. north of Launceston Creek.

179, 180 and 181 : Coarse subangular, major cassiterite occurs in all these samples with major monazite in 181, minor monazite in 180 and traces of the mineral in 179. Tourmaline and zircon occur in all samples with traces of contact metamorphic minerals.

(ii) Just inside the southern boundary of the E.L. north of Launceston Creek.

157, 158 and 183 : The earlier samples, 157 and 158 contain pyrite; 157 contains zircon and epidote. However, 183 is similar to 179, 180 and 181 in containing major coarse cassiterite and also monazite, tourmaline and zircon in minor quantities.

(iii) Moonlight Marsh (138, 178)

178 : is a very small sample (0.03 g) and consists largely of tourmaline.

138 : is a fairly small sample (0.4 g) consisting largely of biotite, ilmenite and zircon.

(iv) Central Eastern Margin of the E.L.

133 : With major ilmenite, zircon and calc-silicate minerals.

174 : Contains an abundance of subangular coarse cassiterite and hornblende, minor epidote, tourmaline, andalusite, etc., and trace monazite.

(v) North west of E.L. boundary, outside the Prospect.

117 : Minor cassiterite, major zircon and tourmaline.

The associate mineralogy with major and minor cassiterite is very variable with, in places, tourmaline plus contact metamorphics, particularly andalusite. Yet elsewhere there is an association with major to minor monazite.

REFERENCES

1. Memorandum from I.D. Neuss to P.J. Curtis. "Heavy Mineral Samples for Concentration and Identification of Minerals Present, Especially Cassiterite". Date 17/3/79.

2. Memorandum from I.D. Neuss to P.J. Curtis. "Additional Heavy Mineral Samples for Concentration and Identification of Minerals Present". Date 26/3/79.

APPENDIX I : TABLE I - HEAVY MINERAL CONCENTRATES FROM E.L. 11/78, GEORGES RIVER, TASMANIA

APPENDIX 1: HEAVY MINERAL CONCENTRATE, MINERALOGICAL ANALYSES, GEORGES RIVER EL. 11/78, TASMANIA

HS/	GRH/	Rock Types	MINERALS PRESENT: Actinolite	Anatase	Andalusite	Antigorite	Apatite	Augite	Barkevikite	Biotite	Cassiterite	Chlorite	Cordierite	Corundum	Diopside	Epidote	Forsterite	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Monazite	Phlogopite	Pyrite	Rutile	Scheelite	Scheelite	Sphene	Spinel	Staurolite	Tourmaline	Tremolite	Wolframite	Wollastonite	Zircon	Particle Size Range mms: Maximum	Particle Size Range mms: minimum	Particle Size Range mms: median	Degree of Roundness	Concentrate Weight g.	Additional Information	Minerals Present - additional
1	01	LR3								2			1								1		2						1			3				3	1·2	·06	·15	1>3	·67	Tourmaline, coarse Angular	Fluorite 1
2	02	–								1	2			1			2						2				2					3				2	1·4	·07	·20	1>3	·37	Tourmaline Vari-coloured, Angular	
3	03	LR3								3			1	1	1								2									3	2			2	1·5	·05	·21	1>3	·67	Biotite aggregates are common	
4	04	–												1			2						1						2			3	1				1·0	·20	·28	1	1·15	Very coarse fraction (+60#) 60 vol %	
5	05	LR1		1						1							1										2					3				2	2·0	·07	·09	1>3	·88	Coarse fragments 50 Volume present Abundance of very fine	
6	06	LR3								1							1										1					3	1			3	1·5	·03	·06	3>1	1·05	Coarse fragments 50 Volume present Abundance of very fine Zircon and Tourmaline.	
7	07	LR3								1	1			1			1				1							2			1		3				2	1·5	·03	·10	1>3	·93	Ilmenite Particles >70% Concentrate.	Ilmenite 1
8	08	LR3									2																2			1		3			1	2	1·5	·03	·14	1>3	10	Most minerals are fragmentary.	
9	09	LR3	1	1								1	2								1			1								3	2			2	1·4	·03	·21	1	1·9	Ilmenite 40% of Concentrate.	
10	10	LR3	1				1				1										2			2				1		1		3				3	1·5	·01	·03 ·15	1>3	·68	Tourmaline very fine	
11	11	LR3									2						1							1				2		1		3				3	1·2	·01	·14	1>3	14	Return to coarse fragmentary tourmaline? most minerals present.	Anhydrite 1
12	12	LR3								2	2			1							2			1		1		2				2				3	2·0	·03	·08	2>3	·43	Tourmaline now minor, Rutile more abundant. Ilmenite particles = 25 per cent.	
13	13	LR3									2						2					1				1							3	2	1		3	2·0	·02	·05 ·03	1>2	1·7	Tourmaline is fined grained	
14	14	LR3	3								1				2	1								1									3				2	1·2	·03	·06	1>2	·65	Hazydy Vari coloured Tourmaline	
15	15	FS3	1	1											1									1				2					2				3	2·0	·05	·4	3>2	·25	mag rounded zirc fragmented. Zircons	Xenotime 1
16	16	FS3	1	1						2	2																	2					2				3	1·0	·01	·21	2>3	·51	ilmenite rock particles > 60 per cent	
17	17	FS3. AS1.		1							2										2							2					2				3	1·5	·07	·11	3>2	·40	ilmenitic rock particles >40 percent.	
18	19	FS3. AS1.									3				2													2		2				2			3	1·7	·01	·18	1>2	5·0	Abundant fragmental coarse Cassiterite 70% grains present.	
19	20	FS3 AS3		1							3																	2					3	2			3	1·5	·02	·21	2>3	1·0	Fragmental coarse Cassiterite.	
20	21.A	AS3. FL1.		1							2													1									3	3			2.	1·6	·01	·14	1>2	·32	Fine grained Cassiterite	
21	21.B	AS3 LR2.		1							3	1		1										2						1			3				3	1·4	·02	·14	2>1	·11		
22	22			1							2					2						1		1						1	2		3		1		3	1·4	·03	·17	1>2	·26		
23	23	AS3. LR2														1		1				1		1									1				1	1·5	·02	·20	1>2	·26		
24	24	LR1									1				1						3				1			2					3				3	1·6	·03	·20	3>2	·72		
25	25	LR1. AS3.								1							1							1									3	1			2	1·0	·04	·13	1>2			
26	29	LR3. FA3.													1	1																	2	1				1·5	·03	·20	1>2	·38		
27	30	LR3		1							2				1							2		3										1			2	1·4	·07	·21	1>2	·60	40. vol. % magnetic	
28	32	LR3								3	1					2					1	3		3										2			1	1·1	·04	·21	1>2	·46		

APPENDIX 1: HEAVY MINERAL CONCENTRATES, MINERALOGICAL ANALYSIS, GEORGES RIVER, TASMANIA. FL 6/75

No.	Grid	Rock Type	Actinolite	Anatase	Andalusite	Antigorite	Apatite	Augite	Barkevikite	Biotite	Cassiterite	Chlorite	Cordierite	Corundum	Diopside	Epidote	Forsterite	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Monazite	Phlogopite	Pyrite	Rutile	Scapolite	Schaelite	Sphene	Spinel	Staurolite	Tremolite	Tremolite	Wolframite	Wollastonite	Zircon	Particle Size Range mm Max.	Min.	Mode	Degree of Rounding	Count Wt g	Additional information	Minerals Present additional
29	33.A.	LR.3																															1			3		1·5	·02	·21	1>3	·27	>50vol.% particles magnetic	
30	33.B.	LR.3.																		2													2			2		1·4	·05	·09	1>2	·81	>50vol.% particles magnetic	
31	34.			3						3										3		1	1						1				2	1		2		1·4	·05	·29	1	·23	large abundance of coarse Biotite.	Parasilicite 1
32	35	LR.3		3						3					1					3			1				1									2		1·2	·07	·21	1	·20	large abundance of fine	
33	36			3						3										3			1				2		1							2		1·5	·05	·21	1	·30		
34	37		1	1						3					3					3			1				1						2	1		2		1·5	·03	·18	1	·50	silicate Calc-silicate mineral influx.	
35	38A		1							3					2					3		1	1				1									2		1·4	·05	·17	1	1·2	large abundance of Ilmenite	Thoriasilicite 1
36	38B.		1	1						3					2					3			1				1									2		1·6	·04	·22	1	1·0	large abundance of coarse Biotite	
37	39		1												1					3							1									2		1·3	·10	·21	3>2	1·1	large abundance of Ilmenite	
38	40			1																3							1					3	2			2		·9	·02	·50	1	·05		
39	41.A.			1						3																							1					1·4	·06	·30	1	·09		
40	41B.									3										3		1	1														3		1·0	·05	·07	1	·10	large abundance of Zircon	
41	42.			1					1	3	1					1				3		1	2				1		1				1				3		1·2	·04	·08	1	·09	Abundant. Zircon, varicoloured.	
42	43			2						3					1	2				2			2				1		1								3		1·2	·03	·11	1>3	·19	" " "	
43	44											1								3			1	1						1			3						·8	·05	·21	1	·09		
44	45			2	1					3	1	1				1				3		1	3				1						2					1·1	·01	·08	1	·12	" " "	
45	46			1						3						2				3		1	2														3		·6	·03	·14	1	·36		
46	47			1						3		1				2				3		2	2																1·0	·06	·25	1	·16		
47	48									3					1	1			1	3		1	2														3		1·0	·05	·06	1	·22	The -60 fraction is 95 Vol.% Zircon of variable provenance	Idocrase 1
48	49			1						2										3		1	2					1		1			2				3		·80	·05	·08	1=2	·11		
49	50		2	1											2					3			3						2				2				3		1·2	·04	·14	1=2	·18	Much Zircon is coarse, fresh.	
50	51			2						2					1		1			3			2							1							3		1·1	·04	·17	1	·55		
51	52																			2		1	1					1		1			3				3		1·0	·04	·06	1	·05		
52	53		2	2						2										3			1					1		1			3				3		1·6	·02	·06	1	·63	large abundance of Zircon of different origin	
53	54			2						3	1									3			1					1		1			1				3		1·4	·01	·07	1	·26	More than 95 vol.% of minerals are Zircons of variable origin	
54	56			2												1				3			1					1		1			1				3		1·2	·05	·08	1	·61		
55	57			2						3	1				2	3				2								1									2		1·0	·04	·21	1=2	·35		
56	58			3						3	2				2					3		1	2				1						1				2		1·4	·05	·14	1	·23		
57	59		1	2						3	2				2	2				3			2	2					2				1				3		1·6	·04	·06	1=2	·80		
58	60			2						3	1					2				3		1		1				1		1			1				3		1·4	·03	·11	2	·46		
59	61				1					2						2				3		1	1								1						3		1·0	·04	·10	1=2	·32	large abundance of Zircon	Anthophyllite 1
60	62			3						3						2				3		1	1											1			3		·80	·04	·11	1	·21	large abundance of Zircon and andalusite Andalusite	
61	63			3		1				1		1				1				3		1	2			2			1			1					2		1·4	·04	·11	1	·31		
62	64			2						2						1				3			1				1										2		1·4	·02	·21	1	·19		

APPENDIX 1: HEAVY MINERAL CONCENTRATES : MINERALOGICAL ANALYSIS, [illegible] RIVER, TASMANIA [illegible]

MINERALS PRESENT

HS/	GR/	Rock Type	Actinolite	Anatase	Andalusite	Antigorite	Apatite	Augite	Barkevikite	Biotite	Cassiterite	Chlorite	Cordierite	Corundum	Diopside	Epidote	Forsterite	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Monazite	Phlogopite	Pyrite	Rutile	Scapolite	Schaalite	Sphene	Spinel	Staurolite	Tourmaline	Tremolite	Wolframite	Wollastonite	Zircon	Particle Size Range Max	Min	Md	Degree of Round-ness	Conct. Wt	Additional information	Minerals Present - additional
63	65.A				1					1											3			2				1										1	1.0	.02	.18	1	1.66	More than 95% of grains are ilmenite - coarse grained	
64	65.B		1							2					2	2					3			3				1										3	1.4	.02	.06	1	.61	More than 80% grains are Zircon	
65	66		1													1					3			1														3	1.3	.05	.21	1	.46		
66	68	FS.3	1																					1				2			1			1	2			2	2.0	.05	.10	2>3	1.62	More than 60% coarse . F.S.	Anthophyllite 2
67	69	FS.3	1							1	1	1																						3				1	2.0	.03	.05	2>3	.43	About 60% coarse . F.S.	
68	70	FS.3														1			1		2		1	2				2						2				3	1.4	.02	.06	1 3	.36	Great abundance of Zircon	Anthophyllite 1
69	71	OS.3 FS.3																			2			1			1	1						1				2	2.0	.02	.06	2>1	.46	Some Zircon fragmented.	Anthophyllite 1
70	73	FS.3								3		1									3			1			1											3	1.5	.02	.07	2>1	.04		
71	74				3																3			1				1				1		1				1	1.2	.06	.09	2	.10	About 60% andalusite remainder largely ilmenite	Talc 2.
72	75				2	3				3					2				1		3			1														3	1.2	.02	.07	2	.17		Anthophyllite 2 Talc. 1
73	76				2						3									1	3			2														3	.80	.04	.06	1>2	.16	More than 90% Zircon	Anthophyllite 1
74	77				1						2										3			2				1										3	1.5	.06	.10	2	.07	Large Zircon Abundance	
75	78				2					2						3					3			1														3	1.0	.02	.07	2	.09	Large zircon abundance	
76	79			2	3					3									1		3		1	1														3	1.0	.05	.11	1	.08		
77	80			1	2					3		1				2		1			3		1					1										3	1.5	.05	.17	1	.06		
78	86	FS.3												1					1		3			1				1						2				3	1.2	.04	.11	2>3	.41		
79	101	FS3	1	1						1	2									1				1				1						2				3	2.0	.05	.07	2=3	.47	F.S. is 95% of Concentrate.	
80	102				2					3						2					3			1									1		2			3	1.6	.05	.22	2	.45	Biotite is >80% Concentrate.	
81	103				3					1	3		1							1	3									1	1			2		2		2	1.1	.05	.14	1	.12		
82	104	FS2			2					1				1							3		1	1										1				2	1.2	.05	.10	1	.29	Large abundance ilmenite (1.40%).	Zinnwaldite 1
83A	105				2					1											3			1				1					1					3	1.1	.03	.06	1	.04		Zinnwaldite 1
83.B	106	FS 3			3					2														1														2	1.2	.05	.14	1>2	.13		
84	107				1					2	3	1									3			1				1			1							2	1.1	.03	.21	1	.89		
85	108	FS.3								2											3																	2	1.2	.05	.14	1	.20		
86	109	FS.3	1							2					1									1				1						2				2	1.5	.01	.06	2>1	.95	More than 95% Concentrate is F.S.	
87	110	FS.3			1																													2				2	1.1	.03	.06	2>3	.58	"	
88	112	AS 3 FS.3																			1			1				2						2	1			2	1.3	.02	.06	1>2	.62	"	
89	113	FS.3								1											3			2				1						2	1			3	1.5	.03	1.0	2>1	.23	More than 60% Concentrate is Zircon pitted, ovoid, colourless.	
90	114	FS 3	2							1	2										2			1				1						2				2	1.7	.03	.06	2>3	.64	An abundance of fine Tourmaline and Zircon.	
91	115	FS.3 AS 3								1	2										2							2						2				3	1.5	.02	.07	1>3	.22		
92	116	FP.S FS.3		1							2										3			1				1						2				3	1.2	.03	.05	1>3	.36		
93	117	FS2									2										2			2				1						3				3	1.1	.03	.04	3>2	.31	Zircon >70% concentrate Tourmaline part. fragmentary.	
94	118	FS.3		1							1										2			1							1			3				3	1.5	.03	.09	2>3	.43	Tourmaline commonly angular.	
95	119		1								1										3			2										3		1		3	1.4	.03	.18	3>2	.14	Magnetite, fine or rounded, pitted Zircon, rounded, pitted, Tourmaline commonly fragmented.	

114126

APPENDIX I: Heavy mineral concentrates, mineralogical analysis, Georges River, EL [illegible] Tasmania

115/	Site	Rock Type	Actinolite	Anatase	Andalusite	Antigorite	Apatite	Augite	Barkevikite	Biotite	Cassiterite	Chlorite	Cordierite	Corundum	Diopside	Epidote	Forsterite	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Monazite	Phlogopite	Pyrite	Rutile	Scapolite	Scheelite	Sphene	Spinel	Staurolite	Tourmaline	Tremolite	Wolframite	Wollastonite	Zircon
96	72	FS.3.		1														1										2	1					2				3
97.	81	AS.3.		1	2					2	3										2			1									1					3
98.	82				2			1		3	1										3		1	1						1								2
99.	83.	FS.3.									2							1			3		2	2				1		1								3
100	84.	FS.3.			1						1					1		1			3			2				1		1				1				3
101	85.	FS.3. TS 2	1	1							1			1							3		1	2				1		1				2				3
102.	87.	FS. 3. AS. 2.		1									1								2			1				1					1	1				2
103.	88.	FS.3.		1										1							3			1				1					1	1				3
104.	89	FS.3.		1							2										2			1										2				2
105.	90	FS.3. AS.3.		1																	2			1											1			2
106.	91	FS 3.	1																		2			1						1								3
107.	92	FS.3 AS3.	1								1										2			1														3
108.	93.	FS.3. AS 3		1	1						2										3			3				1						2				3
109	120	FS.2.	1	1							1										3			1				1		1				2				3
110.	122.	FS.2 TS.2								1											3			3			1	1		1						1		3
111.	93.	FS.3.		1							2										2			2	1			1						1				3
112.	94.	FS 3	1	2																								3			1			1				2
113.	95	FS.3.		2																	1			1				1						2				2
114	96	FS.3		2												1	1		1		1							1										2
115	97	FS.3		1																	2						1	2						1				2
116.	98	FR.3			2							1						2																3				2
117.	123	FS.3		1																	2			1				1						1				2
118	124	FS 3		3											1						2			1				1										2
119	125	TS.3																			3		2	3										1				-
120.	126.	FS.3		1	2													1			3			1										3	1			2
121	127	FS.2								3					2			2			2			3				2						3				3
122	128.				2						3							1			2			1						1				1		2		
123.	129				2					2	1					1					3		1	1				1										3
124.	130.				1					2	2					1					3		1	1										1				3
125	131				1		1			1						2		1			3		1	1														3

115/	Particle Size Range: Max'm	Min'm	Med'n	Degree of Rounding	Conc. Wt. g.	Additional information	Minerals Present - additional.
96	3.0	.03	.07	2>3	.27.	Zircon > 90% concentrate.	Baryte. 1
97.	3.5	.02	.07	1>2	.35.	Cassiterite, coarse, subangular grains.	Zinnwaldite. 1
98.	3.0	.05	.13	1	.35.	Ilmenite > 90%. strongly leucoxenised.	
99.	2.5	.01	.05	3	1.25	Massive fragmental magnetite. Zircon > 60%. concentrate.	
100	3.0	.02	.08	3	.48	"	
101	3.0	.04	.06	2>3	.28	massive Magnetite.	
102.	2.9	.01	.14	1	1.19.	" FS. > 90% Concentrate.	
103.	5.0.	.01	.07	1	.89.	Zircon partly fragmental. Largely ferruginous siltstone.	Anthophyllite 1
104.	4.0	.02	.07.	1	.68	"	
105.	4.0.	.01	.06	1	.76	Ferruginous siltstone., mainly	Talc 2.
106.	6.0	.01	.06	1	1.02.	Magnetite massive.	
107.	3.0	.05	.14	1	.62.	"	Talc 1.
108.	2.2	.03.	.07	2>3	.48.	magnetite, fine, pitted, grains.	
109	4.0	.01	.06	2>3	.20		
110.	1.5	.05	.09	2>3	.32	Magnetite, fine and coarse pitted grains Zircon very abundant.	
111.	3.0	.02.	.06.	2>3.	.48		
112.	1.7	.03	.07	2	.73		
113.	3.5	.03	.11	2>3	.89.		
114	2.9	.05	.07	2>3	1.07		
115	4.0	.06	.14	2>3	2.08		
116.	2.5	.04	.17	2>3	.38.		Anthophyllite 1
117.	2.5	.04	.17	2>3	1.47		
118	2.0	.05	1.20	2>3	.50		Dolomite 1 Perovskite 1
119	1.5	.06	.18	1	10/14.	Ilmenite > 60% remainder mainly Tremolite schist.	
120.	2.1	.04	.07	2>3	.66	Zircon, very variable sphericity.	
121	1.6	.05	.18	2>3	.36	Tourmaline, vari-coloured	Perovskite 1
122	5.0	.06	.20	1	29.9	Coarse Cassiterite . . +2mm.	Perovskite 1
123.	1.1	.03	.07	1	.14		
124.	2.0	.04	.07	1>2	.09		Perovskite 1
125	1.5	.03	.09	1	.23		Anthophyllite 1

11127

APPENDIX I HEAVY MINERAL CONCENTRATES : MINERALOGICAL ANALYSIS, SEVERN RIVER, FC 11/73, TASMANIA

HS/	GSII	Rock Type	Minerals present: Actinolite	Anatase	Andalusite	Antigorite	Apatite	Augite	Bastnaesite	Biotite	Cassiterite	Chlorite	Cordierite	Corundum	Diopside	Epidote	Fergusonite	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Monazite	Phlogopite	Pyrite	Rutile	Scapolite	Scheelite	Sphene	Spinel	Staurolite	Tourmaline	Tremolite	Wolframite	Wollastonite	Zircon	Particle Size Range: Max.	Min.	Av.	No. of Kinds	Count wt g	Additional information	Minerals Present - additional
136	132				2					1					2					3			1				1									3	.80	.02	.07	1	.51		
137	133		1		1										2	2				3	1		2										1			3	1.0	.02	.05	1	1.01		Perovskite 1
138	134		3		1					2													1									3			3	1.1	.03	.05	2?1	.19		
139	135				1					2					1	1		1		3	1	1							1							3	1.2	.02	.14	1	.71	more than 70% ilmenite.	Perovskite . 1
130	136				2					1	2					1				3	2						1		1				2			3	1.2	.05	.14	1	.17		
131	137				1					3								1		3	2	1							1				1			3	1.0	.02	.04	1	.73	Zircon 70% of concentrate.	
132	138				1					2				1		2				3	1	2					1					2				3	1.6	.05	.10	1	.25		
133	139		2		1					3				1						3	1	1				2						1				3	1.6	.03	.10	1	.49		Perovskite 1
134	140		1							2				1		1				3						2						1				3	1.5	.03	.08	1	.18		Perovskite 1
135	141		1							1				1						3		1					1		1				1			3	1.4	.03	.06	1	.24	Ilmenite + Zircon > 90% of concentrate.	
136	142									2						1				3			1				1				2	3				3	1.4	.03	.07	1	.07	Bimodal mineral population of Zircon and Ilmenite.	
137	143				1					2				1		1				3		2					1		1							3	1.0	.03	.07	1	.03	Ilmenite and Zircon equals > 90% concentrate.	
138	144					1				3		1								3		2	1				2		1							3	1.6	.02	.05	3?2	.41	major minerals > 95% of all minerals present.	Perovskite 1
139	145		2		1					3						3		1		3	1	2					1									3	1.5	.03	.14 .08	1	.63		
140	146				1					2					1	3				3	2	2											1			3	1.5	.02	.14	1	.40		
141	147				2					3	2	1				2				3	2	2					1						2			3	1.2	.03	.08	1	.28		
142	148		1		2					2						3		1		3		2					1						2			3	1.5	.03	.08	3?2	.08		
143	149				1						3					1				1													1			1	1.5	.06	.21	1	77.9	Cassiterite is Coarse Angular brown and red banded and mottled and yellow grains. Few darker grains are Magnetic.	
144	150		1								3									1	1	1											1			2	1.5	.03	.21	1	4.64	Much of cassiterite is coarse fragmentary banded, blotchy, Red, Brown, Yellow, or Red-yellow, black fragments greasy, lustre, irregular, sharper.	
145	151		1		1					1	2									3	1	2							2			2				1.6	.02	.06	1	.16		Cummingtonite 1
146	152		1							2	2									3	1	1					2					2			3	2.5	.03	.07 .06	2?1	.36	Cassiterite, yellow.	
147	153										3									3		2										1			3	2.6	.05	.25	1	.67	To 50% of concentrate is Zircon.	
148	154										2				1	2		2		3	1	1										1				1.8	.06	.14	1	.63		
149	155															3		1		3	2	1					2										1.5	.04	.06	1	.27	Pyrite as fine globular and Fibrous growths.	
150	156									2								1		3		1										2			3	2.5	.06	.12	2?1	.80		
151	157									2						3		1		2		1					3					1			3	3.5	.03	.14	1	9.98	Pyrite - fine globular growth part leached constitutes 780% of Concentrates.	
152	158									3						3		1	1	3		1										2	2			3	1.5	.06	.14	2?1	.08		
153	160																			3	1	1										1			2	1.1	.07	.21	2	.53		

APPENDIX I HEAVY MINERAL CONCENTRATE MINERALOGICAL ANALYSIS, GEORGES RIVER, EL 11/75, TASMANIA

115/	Grid/	Rock Type	Actinolite	Anatase	Andalusite	Antigorite	Apatite	Augite	Bastnasite	Biotite	Cassiterite	Chlorite	Columbite	Corundum	Diopside	Epidote	Forsterite	Garnet	Gold	Hornblende	Ilmenite	Kyanite	Leucoxene	Magnetite	Monazite	Phlogopite	Pyrite	Rutile	Scapolite	Scheelite	Sphene	Spinel	Staurolite	Tourmaline	Tremolite	Wolfsmite	Wollastonite	Zircon	Particle Size Range Max'm	Min'm	Median	Degree of Rounding	Conc. Wt g.	Additional information	Minerals Present + additional
																				MINERALS PRESENT																												
154	161									1										3	1	1				1							2					1·1	·04	·17 ·08	1	·63	Zircon present is coarse	
155	162			1						2					1		2			3	1	1	3														3	2·0	·14	·24	1	10·4		
156	163									2					3					3	2	1	2	2									3				3	1·1	·06	·14	1	·24		
157	164									2				2	2	1				3		1	3			1							3				3	·8	·03	·07	1	·45		
158	165										2				2	2				3	1	2	1	2									3				3	1·1	·02	·07	1	·47		
159	166									2				1	3					3	2	1	2										3				3	1·6	·07	·14	1	·73		
160	174				2						3				2	1		3	2			1	1										2				2	5·0	·07	·21	2	7·09	Etched block (± 5mm rounded >brown > red > yellow. Cassiterite, subangular, rounded clear grains of pitted Translucent, large (> 1mm.).	
161	175		1							2	2			1	1	2				3		1	3	2	1								3				2	2·1	·02	·14	2=1	·26		Topaz 2
162	176										3				2	1						1	3										1				2	3·1	·05	·14	1?2	1·77	Cassiterite 90% ± 60 # is brown > red > yellow. Cassiterite 70% +/- 60 # is brown > red > yellow. - Subangular grains.	
163	177										3				2	1				3		1	3										2				3	4·0	·09	·10	1?2	·42	80% + 60 #, 5% - 60 #. Concentrate is Cassiterite. brown > red > yellow Subangular grains.	
164	178									2					2	2				2		1											3				3	0·7	·03	·10	1	·03		
165	179									1	3		1		2	2				1			1										3				3	7·5	·07	·10	1?2	17·0	Cassiterite >90% + 60 # Brown > brown-red ac. 10%. +/- 60 # is Cassiterite. All Subangular grains.	
166	180			1							3					1							1	2					1				2				3	3·2	·07	·14 ·07	2?1	3·04	Cassiterite >95% + 60 #. Red, brown, red, Black >> yellow ac. 40% +/- 60 # concentrate is Cassiterite. All Subangular grains.	
167	181										3					1		1					1	3						1			2				2	5·0	·04	·21	2?1	9·31	Cassiterite >70% + 60 # Brown - black > red > yellow. ac 60% +/- 60 # concentrate is Cassiterite. All Subangular grains.	
168	182		1	2							3					2		1		3			1							1			3				2	2·1	·03	·14 ·06	2?1	1·36		
169	183		1								3					3				3		1	2					2					2				2	2·9	·05	·10	2	14·4	Cassiterite >95% + 60 # Brown - black > red > yellow. Subangular to Subrounded grains.	

APPENDIX IV

ORIENTATION SURVEY DATA

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114132

CSIRO

Minerals and Chemicals Division

MEMO TO MR. G.C. HALL REF. RDW/SS/603

FROM R.D. WALKER DATE 11th June, 1979

COMPUTER ANALYSIS - GEORGES RIVER, TAS.

Attached please find the above analysis carried out by Earth Science Computer Services. The following comments can be made :-

- .. the relationship between the elements Cu, Zn, Pb, W and Sn are stronger in the coarser fractions.
- .. Pb has a poor relationship with all others and hence is useless as an indicator.
- .. Sn behaves almost independently in the two fine fractions.
- .. Cu and Zn are always together.
- .. W is still an indicator element for tin and vice versa.
- .. in the coarse fraction there is some suggestion that Cu/Zn runs with tin.

It would thus seem that the orientation study can be used as a basis for extending the analysis to the old Geophoto data over the whole area.

R.D. WALKER

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	Cu	Pb	Zn	W	Sn
Jc	1.000				
	-0.252	1.000			
	0.710	0.118	1.000		
	0.252	-0.362	0.024	1.000	
	0.204	0.247	0.270	0.181	1.000
Ko	1.000				
	0.005	1.000			
	0.725	0.157	1.000		
	0.247	-0.391	0.295	1.000	
	0.260	-0.213	0.353	0.442	1.000
Lo	1.000				
	-0.239	1.000			
	0.591	0.156	1.000		
	0.307	-0.081	0.203	1.000	
	0.150	0.291	0.199	0.326	1.000
To	1.000				
	0.131	1.000			
	0.722	0.208	1.000		
	0.226	-0.002	0.135	1.000	
	0.267	0.211	0.426	0.020	1.000

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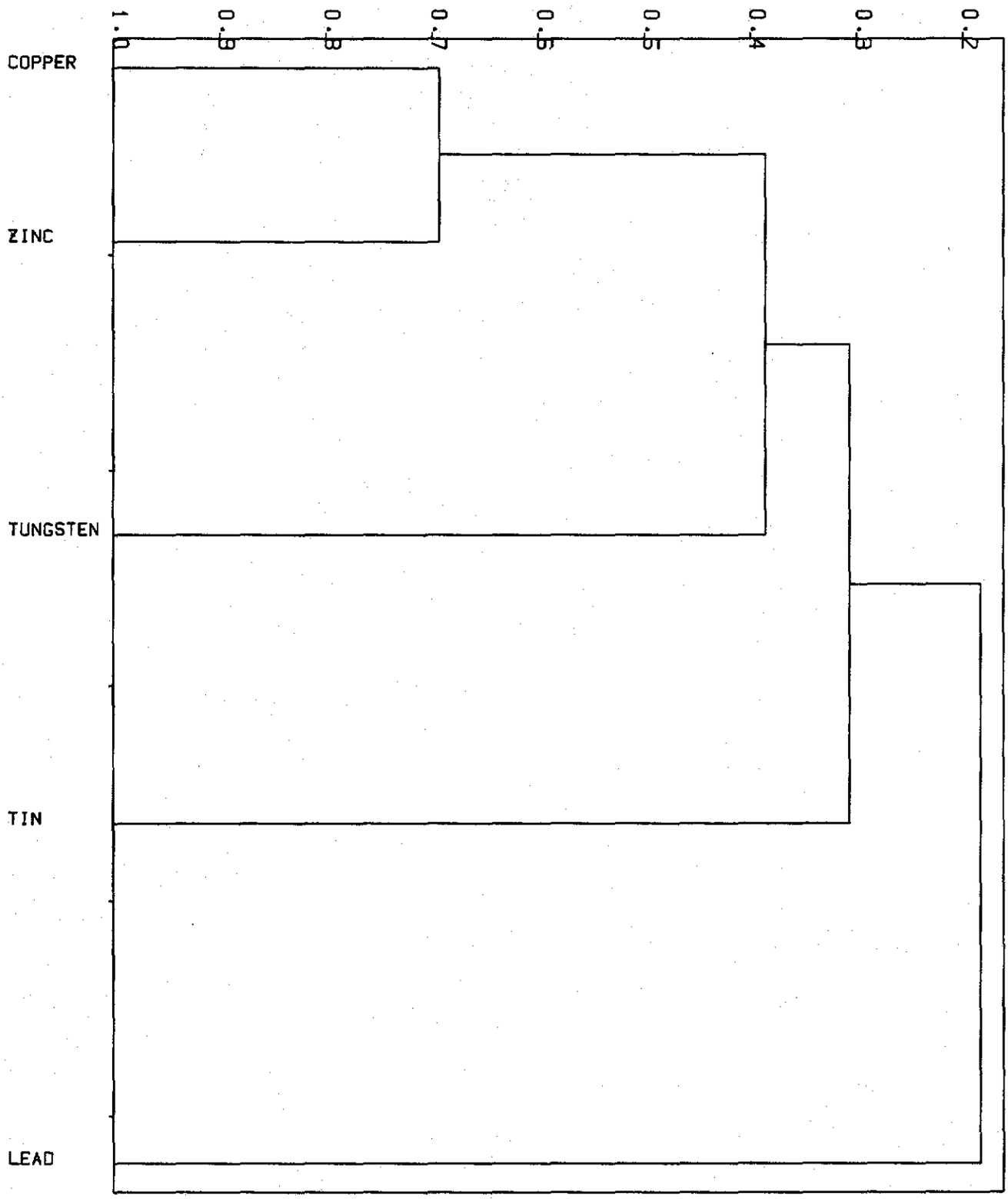
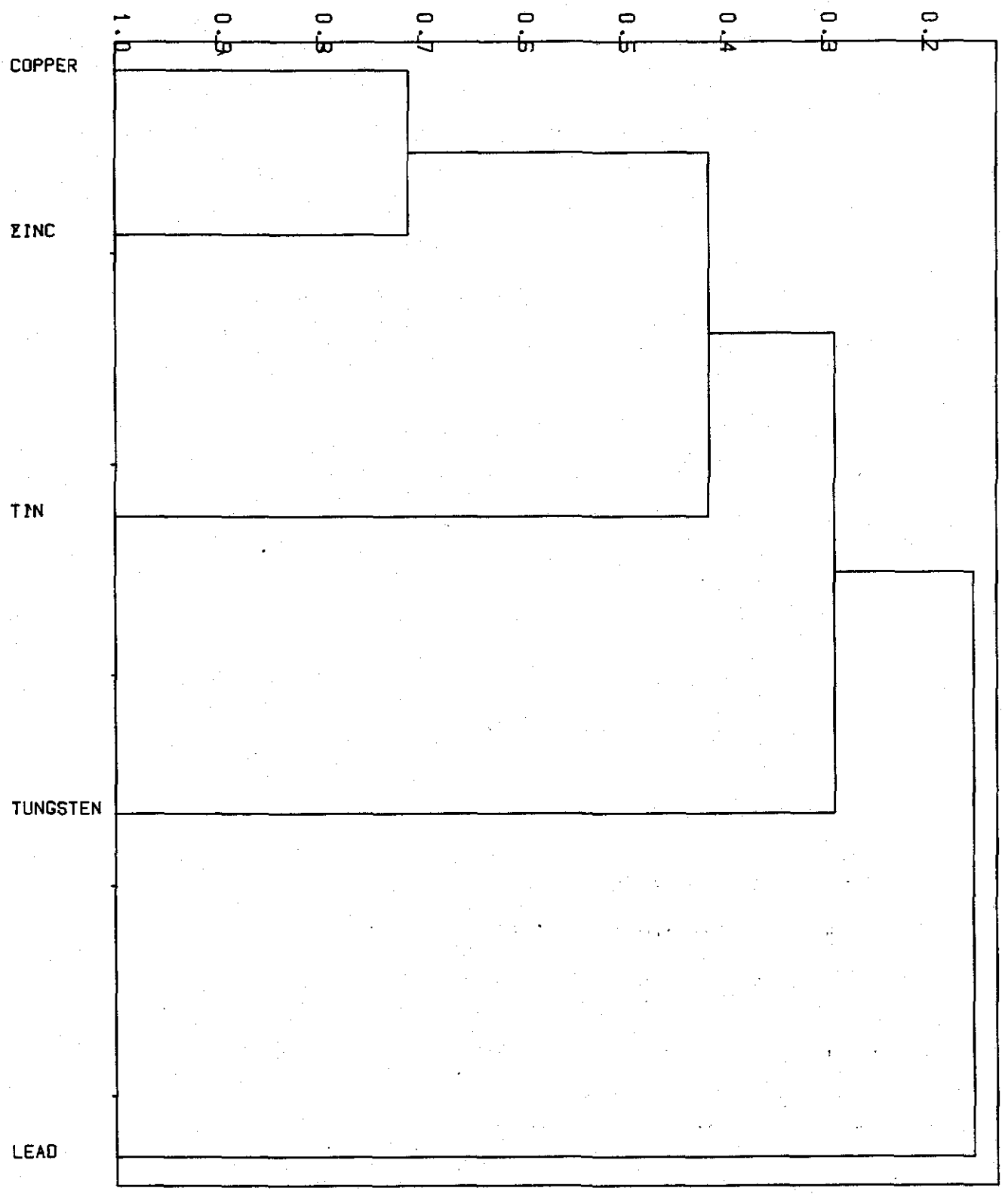
CSR EXPLORATION GRS SURVEY

ALL



CSR EXPLORATION GRS SURVEY -20



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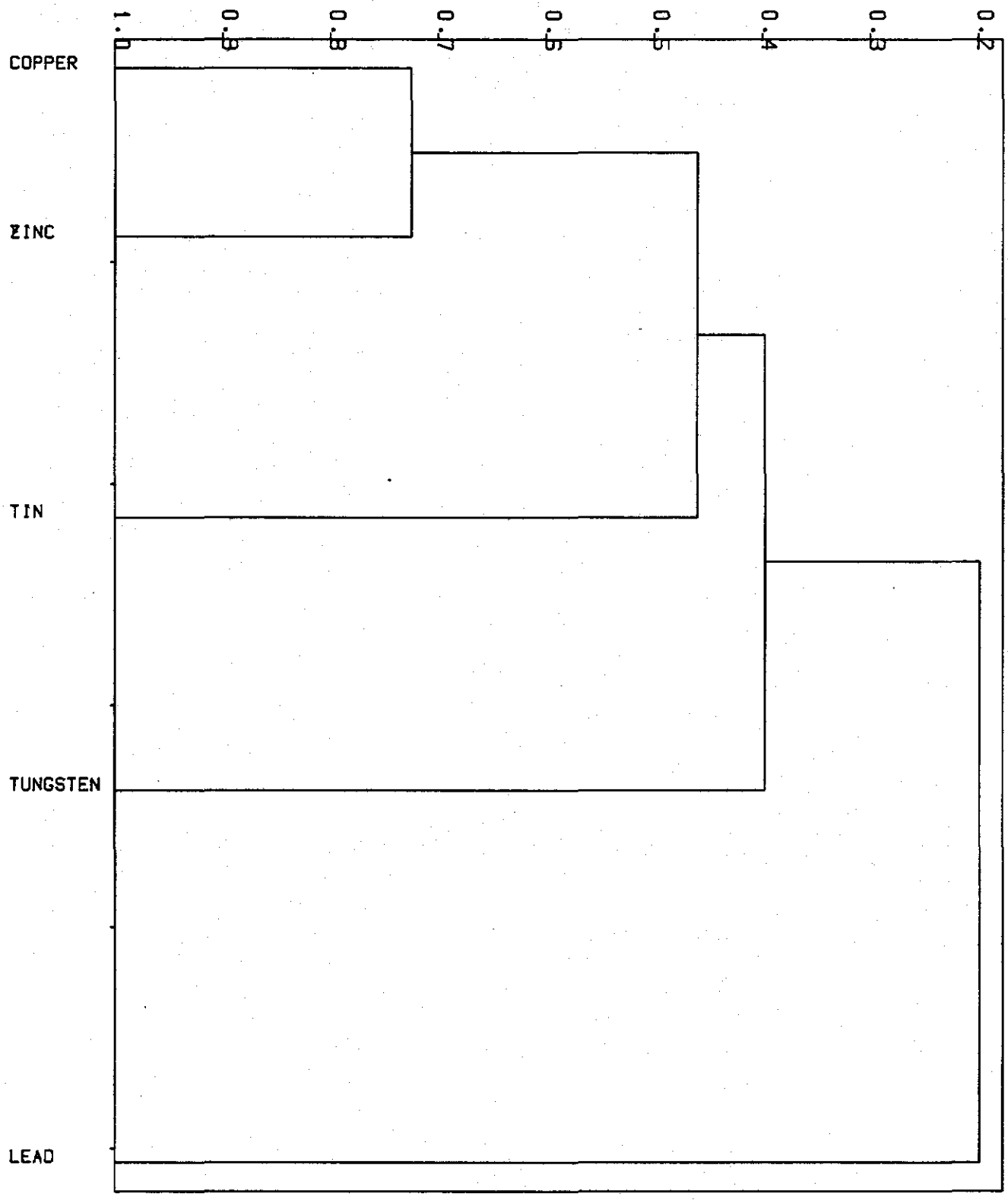
CSR EXPLORATION GRS SURVEY -40



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-60

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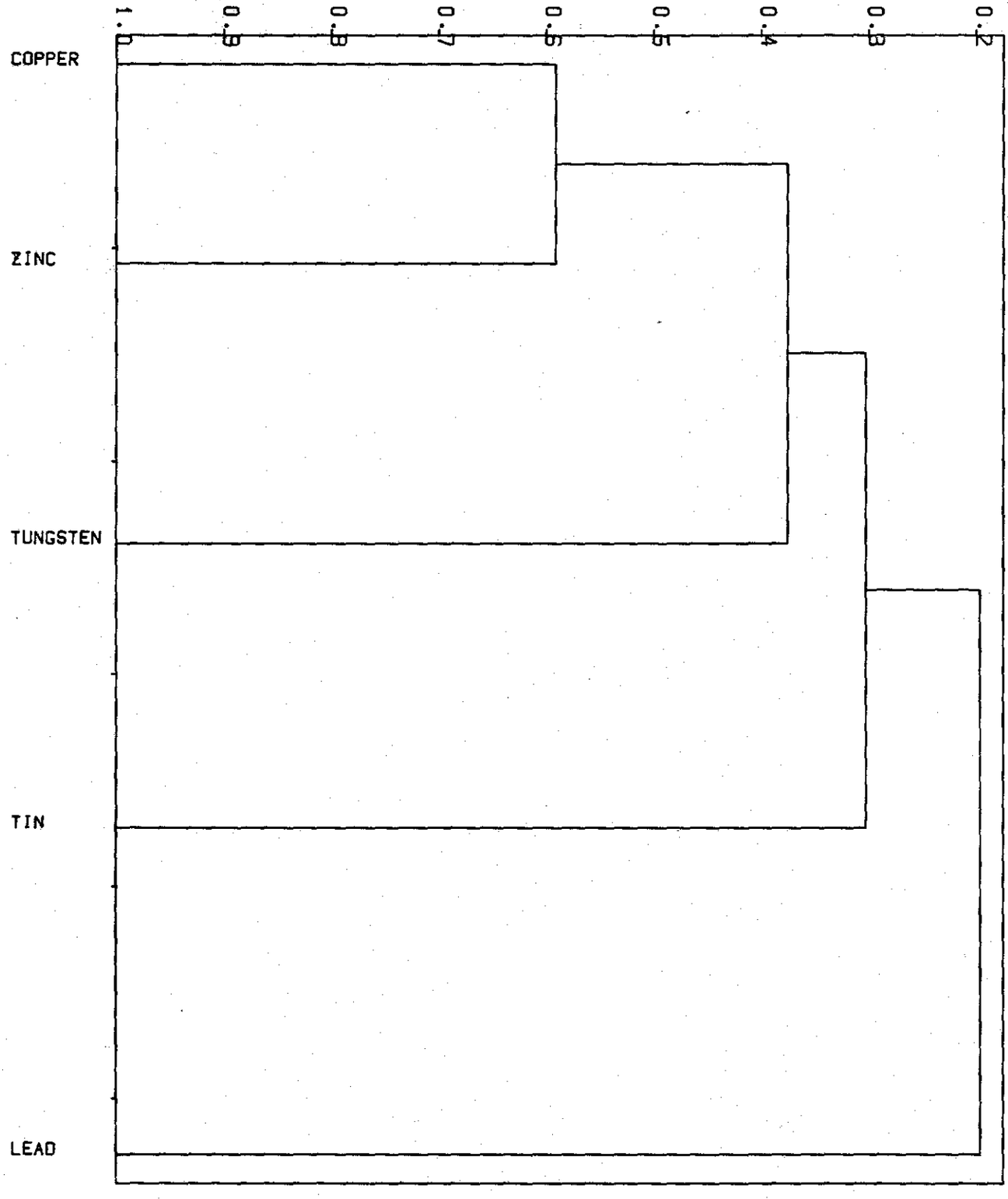

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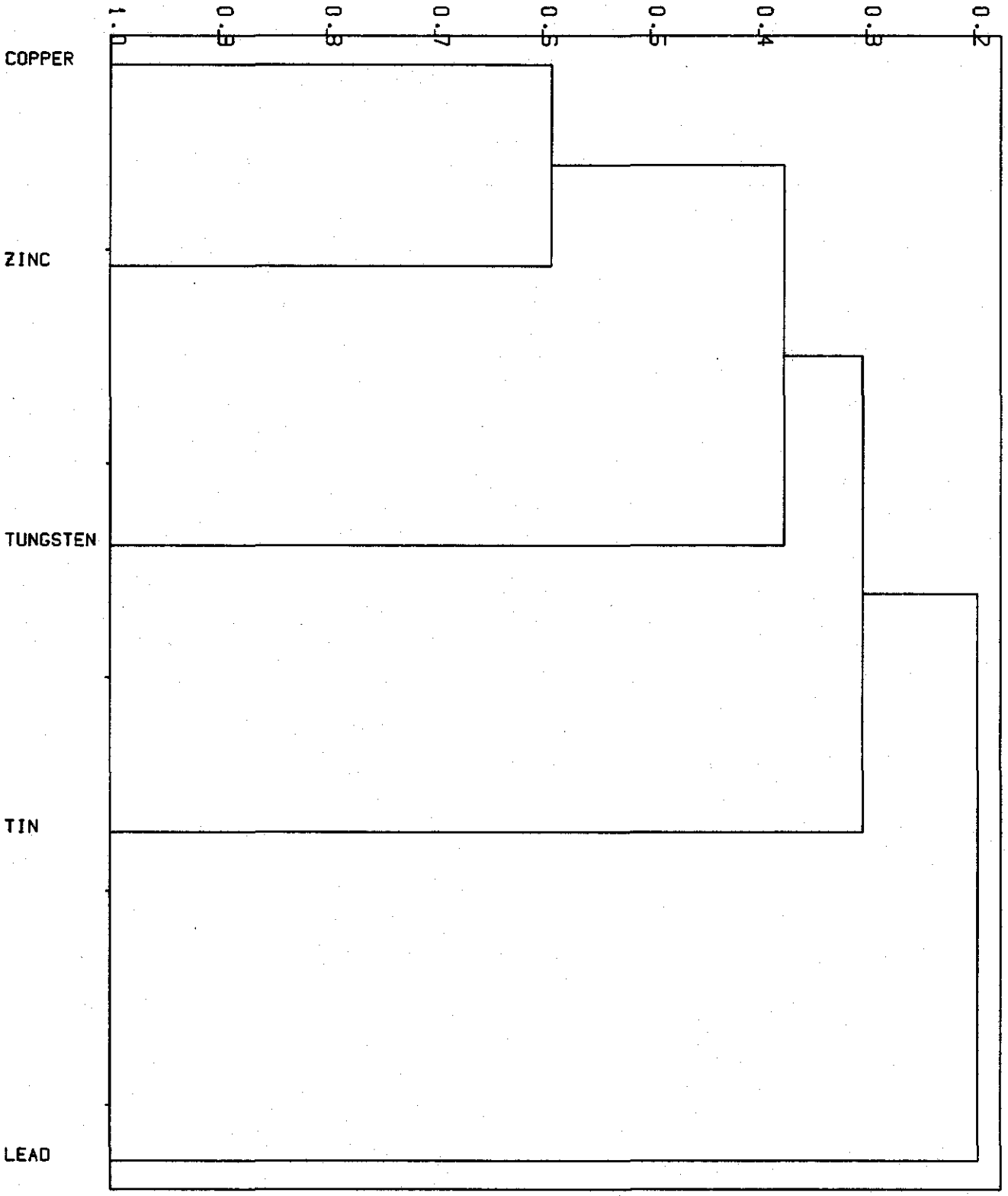
114138

EXPLORATION GRS SURVEY 80



APPENDIX V

ALLUVIAL TIN DATA

Altitude ft. a.s.l.	Description of rocks	Thickness ft.
3488	Well bedded, coarse, fissile siltstone and medium-grained flaggy sandstone.	12
3500	Hard, black, micaceous siltstone. It is non-	20
3520	fissile and has a conchoidal fracture. It contains abundant small black plant fragments.	

Cradle Cirque Siltstone

A black, calcareous, well-bedded siltstone, containing brachiopod shell fragments at 3520 feet a.s.l., marks the end of the freshwater deposit. This formation extends from 3520 to 3790 feet a.s.l. The exposure of the lower portion is not good as it occurs on the ledge created by the Lake Holmes Coal Measures. The lower portion appears to be a well-bedded micaceous siltstone with 5-10% pebbles. Spiriferids, strophomenids and fenestellids are abundant. The upper portion is better exposed. It is mainly a well bedded, brown coloured argillaceous siltstone with bedding units 6 inches to 1 foot thick. The pebbles are well rounded and vary in size from ¼-4 inches. Beds of fine quartzose siltstone, calcareous siltstone and limestone, averaging 1 foot in thickness, are found within the top 30 feet. Brachiopod fragments are common, and some bands of siltstone have a pseudo-stratification due to the profusion of bryozoa.

Benson Peak Sandstone

The Benson Peak Sandstone (3790-3805 feet a.s.l.) is a greywacke sandstone 15 feet thick, which forms a prominent bench at this altitude around the greater part of Mt Inglis. It is a green greywacke sandstone composed of quartz (varying in size from 2 mm down to silt size), disoriented muscovite flakes and small clay pellets (1 mm in dia.). It contains about 15% of fragments of calcite, angular quartzite, siltstone and quartz-mica schist. In addition to these rock fragments, in the matrix there is about 20% of subrounded quartzite granules of medium sphericity and average size ¼ inch. Thin roundstone conglomeratic bands (2-3 inches thick) also occur. It is massive, and thickly bedded in 3 feet units. Some are rich in bryzoal fragments.

Waterfall Valley Siltstone

This formation is also not well exposed, being covered by a thin blanket of moraine. Immediately above the Benson Peak Sandstone, at 3805 feet a.s.l. is 7 feet of an argillaceous thickly bedded siltstone containing 2% of quartzite pebbles. This is interbedded with a band of pebbly siltstone (up to 30% pebbles), one foot thick. The pebbles are well rounded, ellipsoidal and mostly of quartzite. One well-rounded, elongate cobble of (Cambrian) quartz-porphyry was found.

Commencing at an altitude of 4000 feet is about 20 feet of poorly sorted grey-blue calcareous fissile siltstone with abundant sub-angular to sub-rounded quartz granules and large clastic mica flakes, 2 mm in diameter. At 4089 is a 3 feet thick exposure of brown well-bedded siltstone with 5% quartzite pebbles. The base of the next formation is not exposed here but occurs at an altitude of about 4100 feet. The Waterfall Valley Siltstone therefore extends from 3805 feet to about 4100 feet and is about 295 feet thick.

Sandstone on the Summit of Mt Inglis

This unit consists of feldspathic siltstone passing upward into sandstone. The altitude of the base is not known precisely but it occurs at approximately 4100 feet. The lower half consists of regularly-bedded greenish-grey siltstone (2-3 feet thick units) with thinner sandstone bands. The sandstone has a weak colour lamination parallel to the bedding. It contains small globular and discoid clay pellets 0.5 mm to 2 mm in diameter. It is unfossiliferous, but contains abundant small black carbonaceous plant fragments. Pebbles are very rare.

The upper half is a well-bedded, otherwise massive, quartzofeldspathic sandstone, inter-bedded with thin siltstone bands. The individual sandstone beds average 3 feet in thickness. The sandstone is a creamy-brown colour with a green tinge. It is well sorted and contains small amounts of fine mica.

11. THUREAU'S DEEP LEAD, ST. HELENS

by R. Jack.

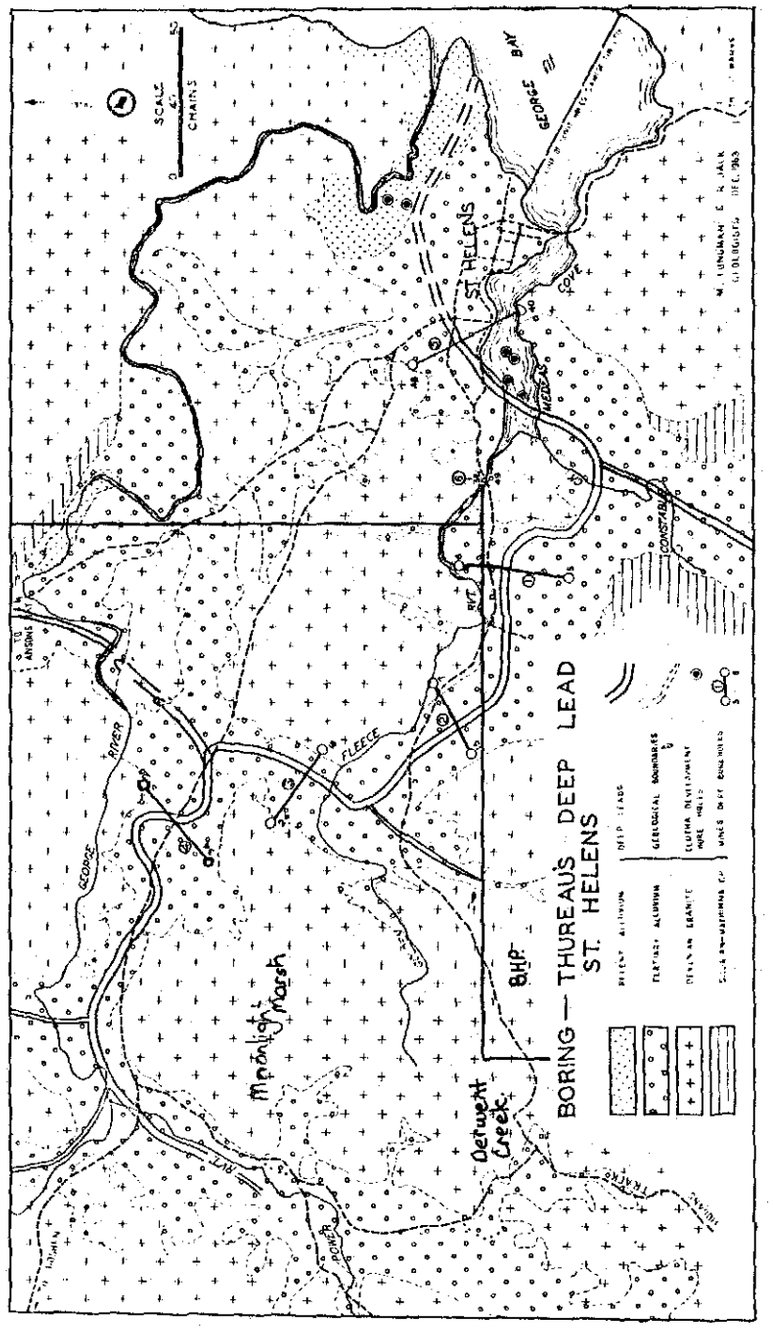
INTRODUCTION

The deep lead near St Helens was first reported on by G. Thureau in 1888 and subsequently became known by his name. Working of the surface of the lead started prior to 1888 and continued spasmodically for over 50 years. During this time much of the surface of the lead was sluiced to a depth of up to 15 feet. Exploration of the lead has been very inconclusive; Montgomery (1893) reported that prior to his visit numerous shafts had been sunk on the lead but all had to be abandoned before reaching the bottom of the lead owing to the heavy inflow of water. Later exploration was similarly inconclusive as none of the holes bored in the deep lead were bottomed, nearly all being stopped at less than 50 feet though some were continued to over 100 feet.

Thureau's Lead is considered to be the course of the former George River and extends from approximately 7 miles west of St Helens to George Bay. It followed a sinuous course which is now followed in part by the Power Rivulet, George River and Golden Fleece Rivulet. To evaluate the tin content of the lead a boring campaign was begun by the Department of Mines in the latter part of 1961, and continued until October, 1963, during which 49 holes were bored in six areas of the lead.

GEOLOGY

The country rock in the area drained by the deep lead is mainly granite though Mathinna Group sediments occur to the SW of Medeas Cove and there form the southern boundary of the lead. Except for this area the lead is entirely within granite and all bore holes were bottomed in granite. The path of the old river valley can be easily traced on the present land surface by the abundance of pebbly wash and fine gravel resulting from the erosion and removal of the fine sand and clay from the upper part of the lead. The surface gravel extending to 18 inches in depth is usually stanniferous and its age is probably Recent.



5 cm

FIGURE 19.

The probable course of the deep lead is shown on the map accompanying this report (Figure 19). Its course has been determined from the information available, mainly recent bore holes and old shafts. The lead now starts in the area drained by the Power Rivulet, though it probably extended further west in Tertiary times and has since been removed by erosion. The lead flows northerly until it approaches the George River where it swings easterly and in this area two small tributaries join the lead from the direction of Priory. The lead then continues easterly for about 2½ miles before swinging south to a course followed by the Golden Fleece Rivulet. The deep lead again diverges to the south of the Golden Fleece Rivulet to pass south of a large granite hill at the head of Medeas Cove, then the lead continues on a NW course to enter George Bay to the south of the present George River.

Dating of spores in the old river sediments has indicated a likely age of Lower Oligocene. The spores were collected by M. Longman of the Department of Mines in the bank of the creek near Bore No. 16 on line No. 3. As these sediments are 20 to 30 feet above the basalt found during the boring of the lead it is probable that the age of the basalt is Lower Tertiary. After the filling of the valley with basalt there was a considerable time break before sedimentation was renewed as the river recut its channel on the edge of the basalt flows. The thickness of the sediment above the basalt varies in the lead and is over 100 feet where intersected on Line No. 2. The age of these sediments is probably Middle to Late Tertiary though the topmost beds could have been reworked at a later date by small streams. Sandy gravel is fairly persistent over much of the surface of the lead. These sediments are not one continuous horizon but occur as a series of steps of different elevation and represent surfaces corresponding to sea levels during the Tertiary. It is probable that the deep lead stream was diverted to the course of the present George River as a result of a rise in sea level of approximately 200 feet. This is thought to have occurred during the Later Tertiary as there is no evidence of sea level fluctuations of this magnitude in the Quaternary. Alternatively the river may have been diverted as the result of faulting or warping but there is no evidence for this in the Late Tertiary or Quaternary.

BORING

Boring of the lead was by Ruston Bucyrus 22 R W Churn Drill; this gave a 7½ inch external diameter hole with a casing of 6 inches diameter. In all, 49 holes were bored, the deepest hole being 272 feet. The total footage drilled was 4811 feet.

Six lines were drilled mainly over the unworked parts of the lead and a full profile of the lead was obtained on each line except line No. 1. On this line 6 holes were completed with little result before adverse drilling conditions caused the abandonment of further drilling. The holes were generally spaced at 300 feet intervals and on line No. 3 at 100 feet intervals in the deeper part of the lead. It is considered that this spacing was close enough to test fully the old lead for economic alluvial deposits. On line No. 1, a geophysical gravity profile was obtained by the Bureau of Mineral Resources before drilling began. This profile corresponds closely with the evidence yielded by the limited amount of drilling done on this line.

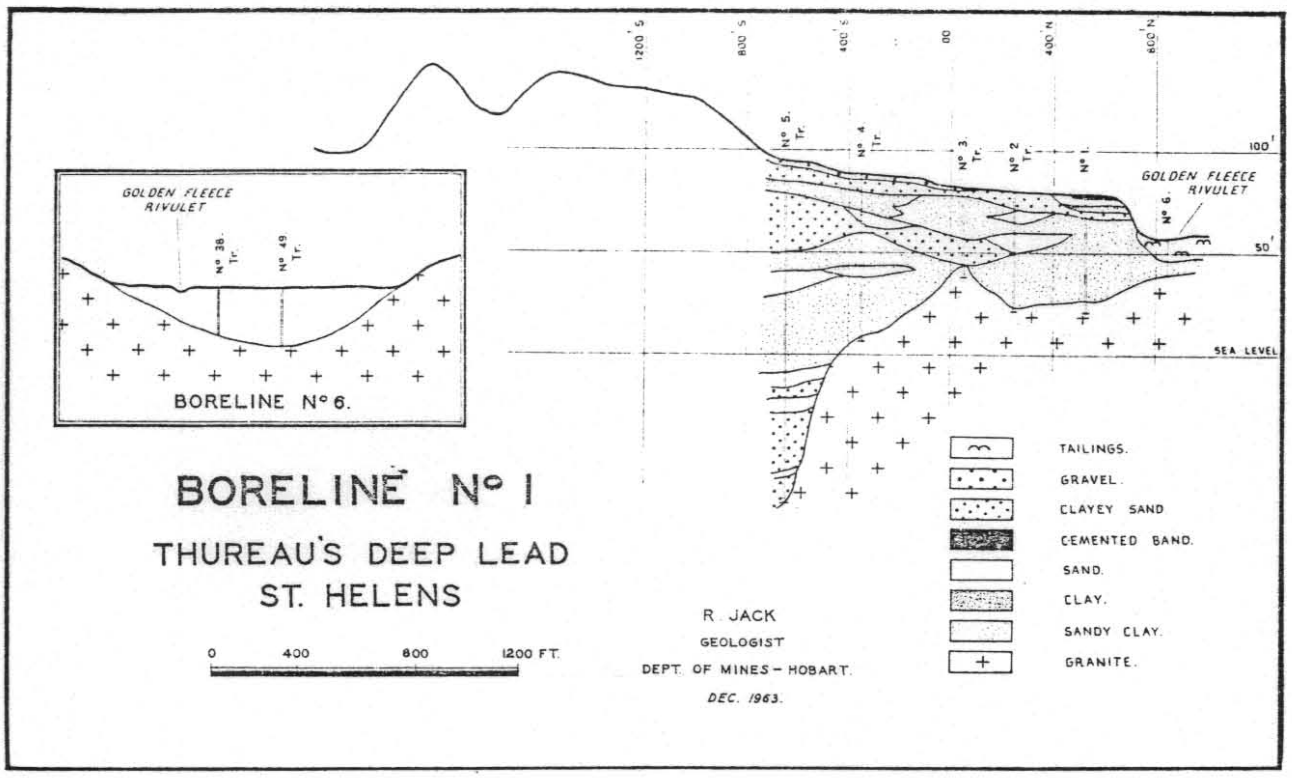


FIGURE 20.

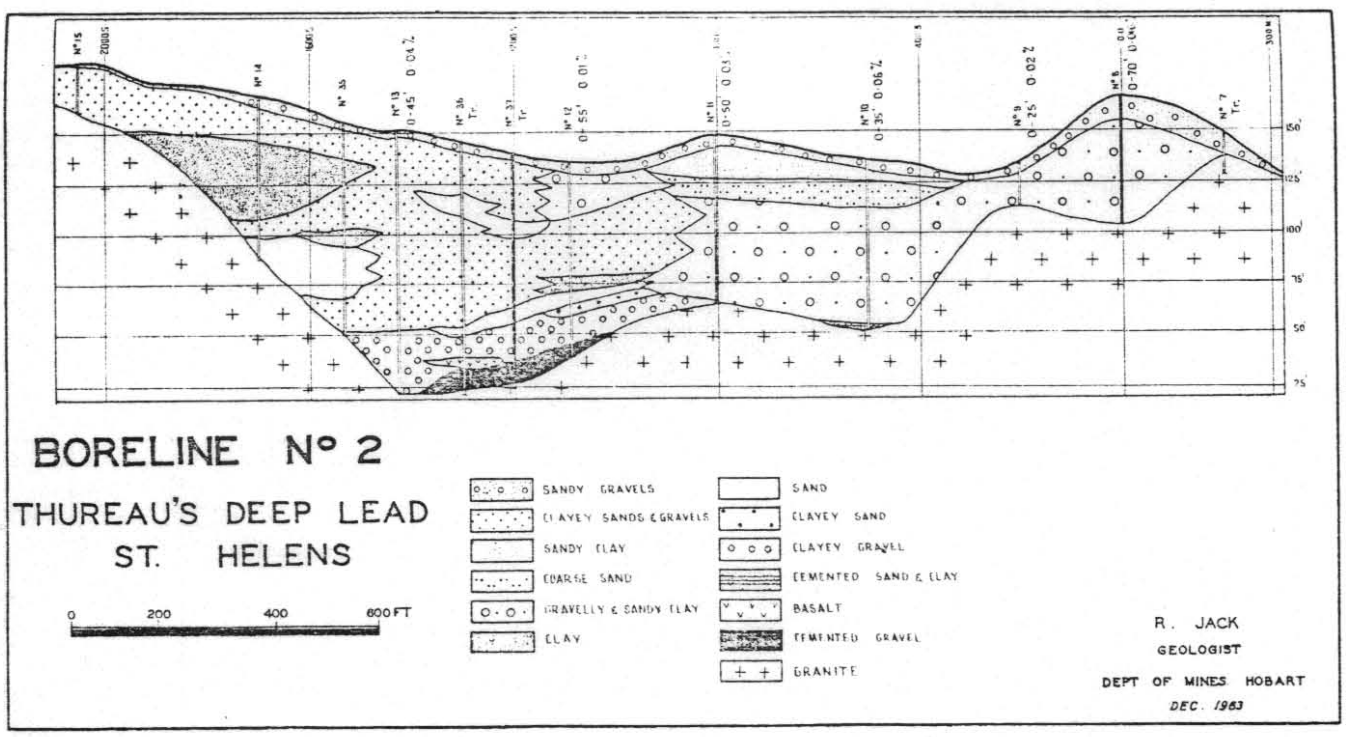


FIGURE 21.

5 cm

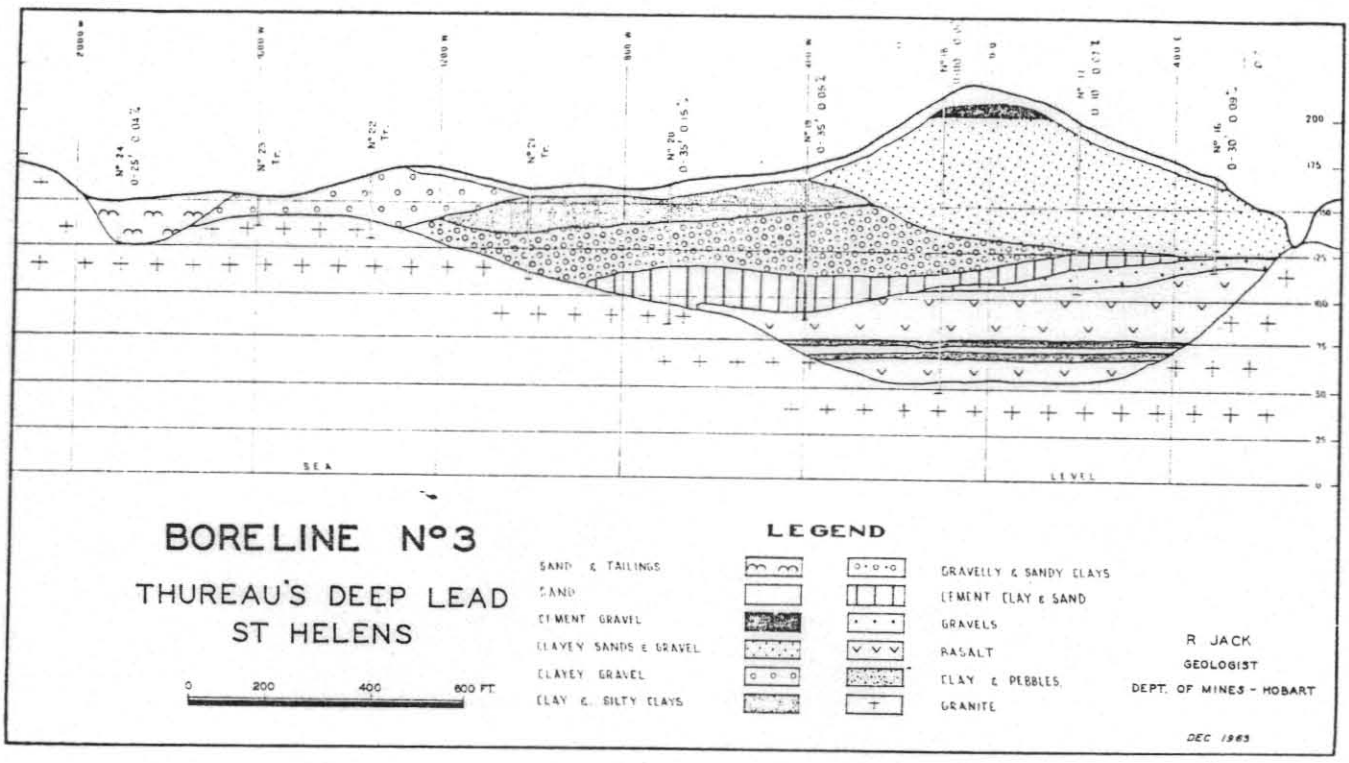


FIGURE 22.

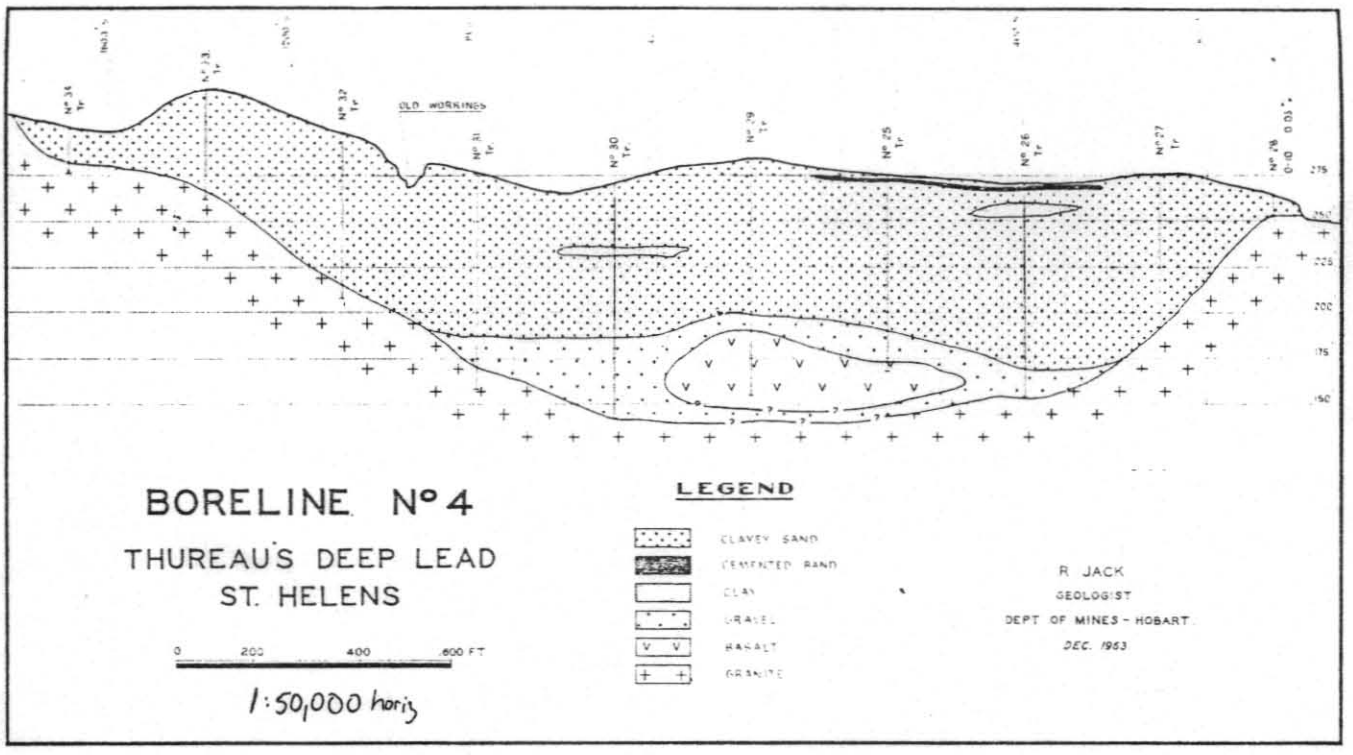
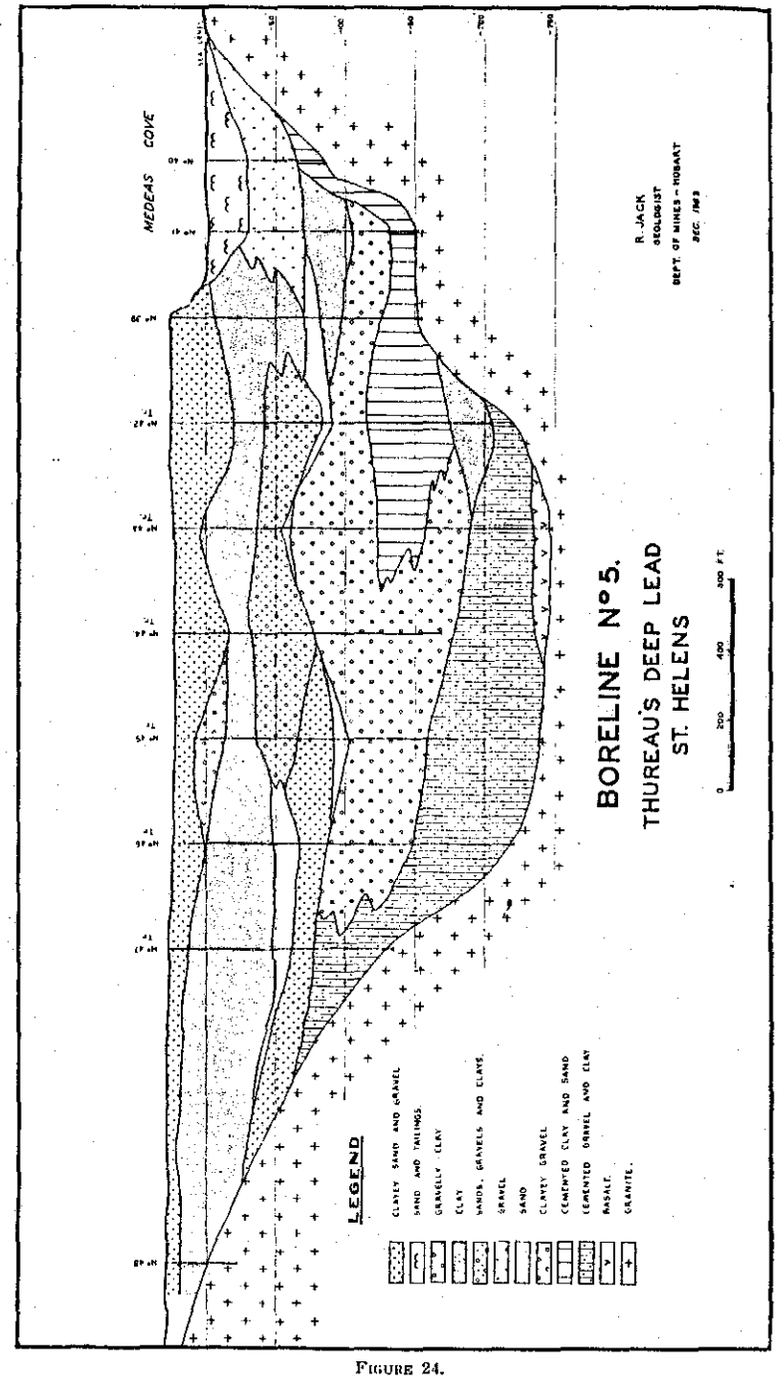


FIGURE 23.

5 cm



5 cm

FIGURE 24.

The types of sediments in the holes were dominantly sandy clay and clayey sand, with occasional gravel and sand beds. Cemented clay and gravel beds were found near the bottom of the lead. Heavy mineral concentrates from the drill samples were found to consist of zircon, pyrite, garnet, ilmenite, siderite, pleonaste and smaller amounts of cassiterite and magnetite. It was generally found that the cassiterite, garnet, zircon and ilmente were concentrated in the higher parts of the lead. Pyrite occurred throughout the lead excepting the topmost horizons and occasionally it was replaced in depth by siderite.

On lines Nos. 2, 3, and 4 basalt flows were intersected and on line No. 5 basalt boulders or a very thin remnant of a flow was found at approximately 100 feet below present sea level. A thin band of sediment occurs between the basalt flow and the granite bedrock but contains no appreciable amount of tin. Holes Nos. 28 and 49 near the bridge crossing the Golden Fleece Rivulet were drilled to determine the course of the old deep lead. These holes, being shallow, prove that the outlet of the deep lead to the sea is not followed by the Golden Fleece Rivulet, the old lead having diverged to the south of the granite hill before swinging NW to enter George Bay.

The highest tin value of all the samples treated was 0.16 lbs per cubic yard calculated to 70% Sn. Generally the tin was only present in trace amount, i.e. less than 0.1 lbs. per cubic yard. The absence of any high tin values in the lead indicates that the sediments in the lead were derived from granite containing very little tin mineralization and that the reworking of these sediments has not yielded any economic alluvial deposits.

CONCLUSIONS

Boring of Thureau's Deep Lead has shown that there is no economically workable concentration of alluvial tin in the deeper parts of the old stream valley. The surface enrichments on the lead were probably the result of reworking of the sediments during the Tertiary sea level changes. This reworking has probably involved the removal of a considerable thickness of sediment to concentrate the tin into a workable deposit. Although the term "deep lead" is used throughout the report and the area has been known for many years as Thureau's Deep Lead, it is considered that the term is incorrectly applied as no economic or even sub-economic alluvial tin occurs deep in the old stream valley. The area has been thoroughly tested and no further boring can be recommended in this buried stream valley.

REFERENCES

MONTGOMERY, A., 1893—Report on Thureau's Deep Lead, near Georges Bay. *Rep. Sec. Min. Tas. for* 1892-93.

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TABLE 1.

σ_{n-1} = 0·106
$\bar{x}$ = 0·2
n = 48

YEAR	YARDAGE yd^3	Sn WON tons	MINE OR SYNDICATE	VALUE OF GROUND Kg/m³.
1932	88,300	21·8	Argonant Siamese Tin Syndicate.	·33
	38,330	8·5	Fern tree, Georges Bay Tin Mine	·29
		17·6	miscellaneous small drifts.	
1933	20,009	12·1	Argonant S.T.S.	·32
	50,220	8.94	Georges Bay Tin Mine (G.B.T.M.).	·24
		13.58	miscellaneous	
		4.03	Hunt Mine	
1934	359,800	59·8	S.T.S. various	·22
	45,820	7.0	G.B.T.M.	·20
		3	Hunt Mine	
		17	miscellaneous.	
1935.	393,300	86·76	S.T.S. various	·29
	47,000	7·5	G.B.T.M.	·212
		5·2	Hunt Mine	
		17·2	~~to~~ miscellaneous.	
1936.	423,900	60·8	S.T.S. various	·19
	70,124	9·7	Sarsaby G.B.T.M.	·18
		1·6	Hunt Mine	
		11	miscellaneous.	
1937	369200	67·7	S.T.S. various	·24
	92888	12.0	G.B.T.M.	·17
	38500	4·7	Gorbers Groom Rw. Gorbers Tin Mines	·16
	35 tons one	·43	Priory Lode.	
		4	Hunt Mine	
		10	~~various~~ miscellaneous.	

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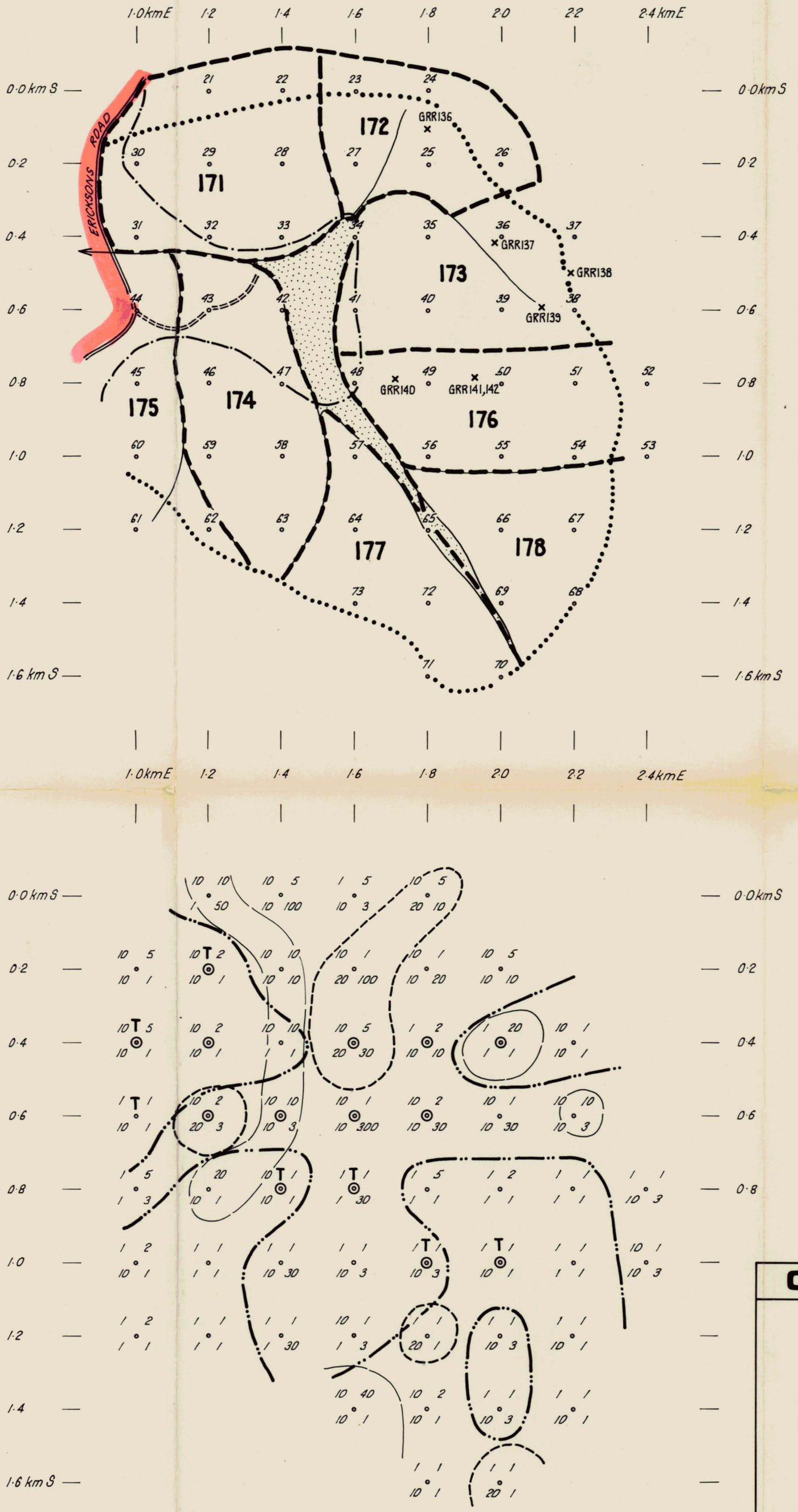
1938	400,600	60.4	S.T.S.	.20
	130650	14.15	G.B.T.M.	.14
		2.26	Hout Mine	
	38,800	6.23	Goshen	.21
		9.2	Miscellaneous.	
1939.	242 900	29.28	S.T.S. worked by Goshen.	.16
	76500	8.35	G.B.T.M.	.15
		1.56	Hout Mine	
	75,000	10.2	Goshen.	.18
		20.55	~~Various~~ miscellaneous.	
1940	157 000	25.6	S.T.S by Goshen.	.22
	75 000	9.86	Goshen	.17
	38 500	2.2	G.B.T.M.	.075
		.46	Hout Mines	
		10.4	miscellaneous	
1941.		41.45	S.T.S by Goshen. 8oz/yd³.	
water	63,00	.89	Goshen	.19
shortages.		2.04	G.B.T.M.	
		10.47	miscellaneous.	
1942		27.79	S.T.S by Goshen	
		3.94	Goshen	
		1.75	G.B.T.M.	
		3.97	miscellaneous.	
1943		32.56	Goshen.	
1944	147500	28.19	Bog N°2 Goshen.	.25.

1945		35.55	Goshen	
	12,000	5.25	Bell Creek	.58
		.64	miscellaneous	
		.44	Goulds Country by Goshen.	
		2.06	Albion.	
1946.		.57	Goulds Country by Goshen.	
		1.39	Albion	
	219 300	16.54	Goshen at St Helens.	.10
	19 000	5.69	Bell Creek	.40
		.63	miscellaneous.	
1947.		.21	Goulds Country by Goshen	
		1.42	Albion	
	216,920	23.80	Goshen at St Helens	.15
	13,000	3.95	Bell Creek	.40
		.42	miscellaneous.	
1948.		1.26	Goulds Country by Goshen	
		abandoned	Albion	
	102 700	~~12~~.11	Goshen at St Helens	.15
	6 000	1.99	Bell Creek	.44
		.55	miscellaneous.	
1949.		.53	Goulds Country by Goshen	
	22,300	7.37	Goshen at St Helens	.44
	6,000	1.21	Bell Creek	.27
		1.08	miscellaneous.	
1950		1.50	Goulds Country by Goshen	
	30,600	6.10	Goshen at St Helens	.26
	18,000	1.08	Bell Creek	.07
		1.65	miscellaneous	

1951.		1.0	Goulds Country Goshen	
	64,200	8.48	Goshen at St Helens	.175
	6,000	.701	Bell Creek	.155
		.98	miscellaneous.	
1952.		.21	Goulds Country Goshen	
	36,700	3.16	Goshen at St Helens	.114
	7,000	1.43	Bell Creek	.271.
		1.21	miscellaneous.	
1953.		1.00	Goulds Country Goshen	
	67800.	3.57	Goshen at St Helens	.07.
		.72	Bell Creek	
		1.06	miscellaneous	
1954.		.13	Goulds Country Goshen	
	52,000	4.79	Goshen at St Helens	.122
	1000	0.05	Bell Creek	.07.
		1.8	miscellaneous.	
1955.		.172	Goulds Country	
	74 050	10.76	Goshen at Golden Fleece.	.19
	5000	.27	Bell Creek	.07
		.61	~~Mis~~ miscellaneous	
1956.	47,100	5.80	Goshen at Golden Fleece.	.16
		2.47	Bell Creek	
		1.25	miscellaneous	
1957	45900	9.0	Goshen at Fern Tree Creek, Groom.	.26
		.6	Bell Creek.	
~~1958~~				
1958	60300	11.0	Goshen at Groom Rd, Launceston Ck	.24
1960	78000	9.0	Goshen at Groom Rd.	.15
1961.		7.5	Goshen at Groom Rd.	


2692
585 000mE
588 000mE
590 000mE
595 000mE
600 000mE
601 000mE
5 441 000mN
5 440 000mN
5 435 000mN
5 434 000mN
5 430 000mN
5 428 000mN
5 425 000mN
5 420 000mN
5 419 000mN
5 415 000mN
5 412 000mN
MT. MICHEAL
SUN FLAT
MOON (Sn)
POIMENA
LOTTAH (Sn)
RANSOM (Sn)
LOTTAH
VICTORY (Sn)
ANCHOR (Sn)
116 granite
117 greisen
LOTTAH ROAD
Laffer Creek
PLATTS LOOKOUT
MURDOCHS ROAD
MURDOCHS HILL
NEW ENGLAND ROAD
Reids Creek
Chilcott's Creek
Mother Logans Creek
MOTHER LOGANS ROAD
TERRYS HILL ROAD
CLIFFORDS ROAD
fine grained granite
epidotised granite
Ansons River
Dead Horse Creek
Fight Creek
ANSONS BAY ROAD
coarse grained granite
hornblende in granite
granite
RATTRAYS MARSH
Last River
THE DOCTORS PEAK
MT. PEARSON
Bosses Creek
Littlechilds Creek
Forester
Albion Creek
Rattrays Creek
JOHNSONS HILL
GOULDS COUNTRY
Ransom River
Kunnaran Creek
Anderson Creek
146 granite contact
ANCHOR ROAD
TASMAN HIGHWAY
Honeymoon Creek
Groom River
SWEETS HILL
Terry's Creek
GOSHEN
PYENGANA
GEORGE RIVER
Apteds Creek
GENTLE ANNIE RIDGE
Marsh Creek
Bells
Bread and Butter Gully
PRIORY
BOGGY CREEK
MINE WORKINGS
CLIO HILL
MOUNT NISBET
Rivulet
Terryvale Marsh
TERRYVALE ROAD
Powers
138 siliceous rock
Moonlight Marsh
COPLESTONES HILL
RILEYS HILL
Fleece Creek
MINE WORKINGS (ARGONAUT)
Rivulet
ARGONAUT ROAD
RUBY CREEK
ST. HELENS
Mud Flats
MEDEAS COVE ROAD
Constable Creek
SILVER ECHO (S)
MOUNT ECHO
Launceston Creek
fine grained 115 granite
Golden Creek
Saxelby
POWERS ROAD
POWERS RIDGE
Powers Rivulet
STROCHNETTERS HILL
Derwent Creek
Hunt Mine Creek
GIRDYS HILL
RAYNERS HILL
Deacon's Creek
FERNTREE HILL
HOGANS ROAD
Steeles Marsh
Carters Marsh
Scamander River
RISKY RIDGE
Treloggens Creek
Three Star Creek
Ann Creek
TRANSIT FLAT
Big Gum Gully
Ryans Creek
UPPER SCAMANDER PROSPECT
granite float
dolerite/qtz
DD2
110 quartz/mica
Carters Creek
DOUBLE EVENT (Au)
Beahrs Creek
TRAFALGAR (Au)
GOLDEN RIDGE
BRILLIANT (Au)
GOLDEN RIDGE (Au)
BADEN POWELL (W-Mo)
PRICE (W-Mo)
COPPER SHOW CREEK PROSPECT
Halers Creek
Wolfram Creek
LUTWYCHE (W-Mo)
QUEEN OF THE EARTH (Au)
Brilliant Creek
Queen of the Earth Creek
Mathinna/granite contact
95 granite
Hollow Gully
Horrible
CARSON DE BEERS (W-Mo)
PINNACLES (Sn)
Scamander River
HOGANS ROAD
REFERENCE
QUATERNARY - TERTIARY — Q-T — Alluvium
PERMIAN — P — Fluvioglacial sediments
UPPER DEVONIAN — Dolerite
1 — Lottah Pluton
5 — Constable Creek Pluton
6 — Poimena Pluton
7 — Mt Pierson Pluton
12 — Scamander Tier Dyke
13 — Unnamed granodiorite
14 — St Helens Pluton
15 — Garden Pluton
SILURO - DEVONIAN — M — Mathinna Beds
Main Palaeochannel
Tributary Palaeochannel
Mine or prospect
Au Gold
Sn Tin
S Base Metal Sulphides
W Wolfram
Mo Molybdenum
Geological boundary - accurate - approximate
Unconformity
Trend line
Strike and dip of bedding
Strike and dip of jointing
Fault
Anticline
Watercourse
Road, track
House
E.L. boundary
Petrographic sample and number
Radiometric Anomaly
Geochemical Anomaly ('Geophoto')
'Mines Dept.' Drill Sections
PACMINEX PTY. LIMITED
E.L. 11/78, GEORGES RIVER, TAS.
GEOLOGICAL MAP
114149
SCALE : 1 : 25,000
DRAWN : G.C.H. / P.R.
DATE : Aug. / Nov. '79
REVISED :
DRG. No. K 554 - 1
5 cm
REPORT 79-1407
2692

2693
585 000 m E
588 000 m E
590 000 m E
595 000 m E
600 000 m E
601 000 m E
5 441 000 m N
5 440 000 m N
5 435 000 m N
5 434 000 m N
5 430 000 m N
5 428 000 m N
5 425 000 m N
5 420 000 m N
5 419 000 m N
5 415 000 m N
5 412 000 m N
MT. MICHEAL
MOON
POIMENA
LOTTAH
ANCHOR
LAFFER
Laffer Creek
LOTTAH ROAD
JOHNSONS HILL
GOULDS COUNTRY
ANCHOR ROAD
TASMAN HIGHWAY
Honeymoon Creek
Anderson Creek
Groom River
Ransom River
Kunnarea Creek
MURDOCHS ROAD
PLATTS LOOKOUT
MURDOCHS HILL
NEW ENGLAND ROAD
Reids Creek
Chilcott's Creek
Mother Logans
MOTHER LOGANS ROAD
TERRYS HILL ROAD
Terry's Creek
CLIFFORDS ROAD
Ansons River
Dead Horse Creek
ANSONS BAY ROAD
Fight Creek
RATTRAY MARSH
Last River
THE DOCTORS PEAK
MT. PEARSON
Bosses Creek
Littlechilds Creek
Forester
OLD WORKINGS
Albion Creek
Rattrays Creek
Bread and Butter Gully
PRIORY
GENTLE ANNIE RIDGE
Apteds Creek
Bulls Marsh Creek
GEORGE RIVER
TASMAN HIGHWAY
BOGGY CREEK
MINE WORKINGS
CLIO HILL
MOUNT NISBET
TERRYVALE
Powers Rivulet
ROAD
MOONLIGHT MARSH GRID
COPLESTONES HILL
RILEYS HILL
Fleece Rivulet
MINE WORKINGS (ARGONAUT)
ARGONAUT ROAD
RUBY CREEK
ST. HELENS
MEDEAS COVE ROAD
Constable Creek
Golden
Saxelby
Launceston Creek
MOUNT ECHO
POWERS ROAD
POWERS RIDGE
STROCHNETTERS HILL
RAYNERS HILL
Hunt Mine Creek
Derwent Creek
Deacon's Creek
STEELES MARSH
FERNTREE HILL
HOGANS ROAD
CARTERS MARSH
Scamander River
RISKY RIDGE
Treloggens Creek
Three Star Creek
Ann Creek
TRANSIT FLAT
Big Gum Gully
Ryans Creek
Beahrs Creek
Carters Creek
UPPER SCAMANDER
COPPER SHOW CREEK
GOLDEN RIDGE
Brilliant Creek
Queen of the Earth Creek
Horrible Hollow Gully
HOGANS ROAD
Wolfram Creek
Halls Rivulet
Scamander River
REFERENCE
Watercourse
Road, track
E.L. boundary
Watercourse, alluvium mixed in whole or part
Area of Mt. Pierson Granite actively shedding tin, based on previous alluvial mining activity
Stream sediment and/or heavy mineral content sample location and number
Rock chip sample location and number
DATE BASE NOS FOR STREAM SEDIMENT SAMPLES: ADD 5000 (eg 087 becomes 5087; 116 becomes 5116)
DELETE
5 cm
PACMINEX PTY. LIMITED
114150
E.L. 11/78, GEORGES RIVER, TAS.
GEOCHEMISTRY
SAMPLE LOCATION MAP
See also Fig 2 (page 18)
SCALE : 1:25,000
DRAWN : G.C.H. / P.R.
DATE : Aug./Nov. '79
REVISED :
DRG. No.
K 554-2
79-1407
2693



REFERENCE

- Graded road
- Track
- Drainage divide
- Water race (abandoned)
- Water course
- Marsh
- 53 — Soil sample location and G.R.L. nos.
- GRR 140 — Rock chip sample location and nos.
- 177 — Composite panned soil sample areas / Composite panned soil sample nos.

N

Geochem. values in p.p.m

Cu	W
Zn	Sn

- Cu
- Zn
- W
- Sn

⊙ · Heavy mineral trace in panned soil sample

T Tourmaline

114151

5 cm

CSR LIMITED-MCD

E.L. 11/78, GEORGES RIVER, TAS.
MOONLIGHT MARSH GRID

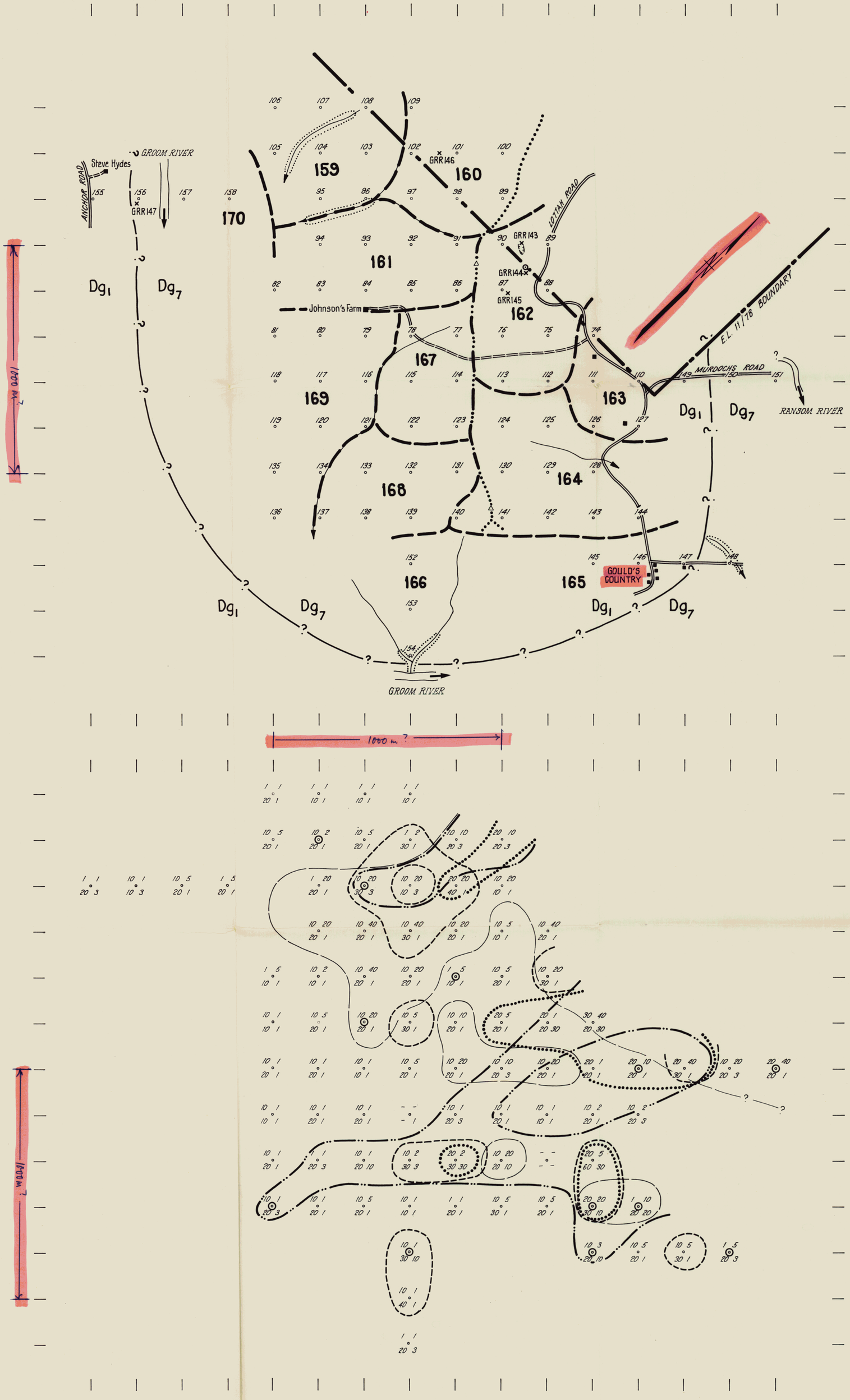
GEOCHEMISTRY

1:10,000 ?

SCALE :	1 : 1000	DRG. No. K554-3
DRAWN :	G.C.H. / P.R.	
DATE :	Aug / Nov. '79	
REVISED :		

79-1407

2694



REFERENCE

- Road, track
- Aerial marker
- Farmhouse
- Watercourse
- Alluvial workings
- Quarry
- Hill top
- E.L. boundary
- Geological boundary
- 126 — Soil sample location and G.R.L. nos.
- GRR143 — Rock chip sample location and nos.
- Drainage divide
- Composite panned soil sample areas
- 163 — Composite panned soil sample nos.

Geochem. values in p.p.m.

Cu	W
Zn	Sn

- Cu ≥ 20
- Zn ≥ 30
- W ≥ 10
- Sn ≥ 3
- ⊙ Heavy mineral trace in panned soil sample

114152

5 cm

CSR LIMITED-MCD

E.L. II/78, GEORGES RIVER, TAS.
JOHNSONS HILL GRID

GEOCHEMISTRY

1:10,000 ?

SCALE	1: 1000	DRG. No. K 554-4
DRAWN	G.C.H. / P.R.	
DATE	Aug. / Nov. '79	
REVISED		

79-1407

2695