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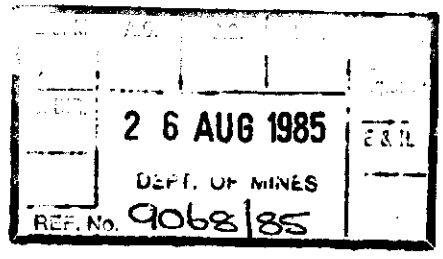

BILLITON AUSTRALIA

THE METALS DIVISION OF
THE SHELL COMPANY OF AUSTRALIA LIMITED

ROSSARDEN EL 18/84

PROGRESS REPORT ON EXPLORATION FOR THE PERIOD 28/9/84 TO 27/9/85

AUTHOR: A. WHITAKER
REPORT NO: 08-2957
DATE: AUGUST 1985

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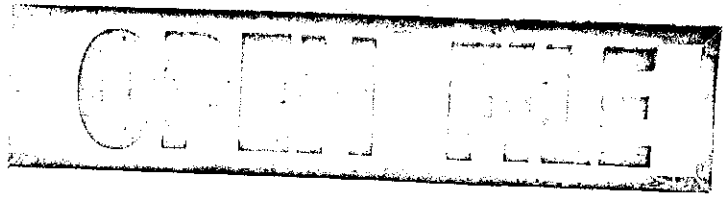

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097004

APPENDICES

Appendix 1 Optical Reports

Appendix 2 Rock Grab/Chip Assays

Appendix 3 Proposed Exploration Programme Sept. 1986

1.0 PROPERTY

Exploration Licence 18/84 was granted to The Shell Company of Australia Limited on 28th September.

The irregularly shaped 171 sq. km licence is largely covered by state forest and lies to the west and south of the township of Rossarden in N.E. Tasmania.

2.0 OBJECTIVES

A number of granite and sediment hosted tin prospects occur either in or near the licence. Exploration is being carried out to assess the varying styles and locate new tin carrying systems. The most significant occurrences in the region are Royal George, Aberfoyle, and Storeys Creek tin, tin-tungsten mines. The styles of mineralisation exposed by those mines are the most likely target types at this stage.

3.0 REGIONAL GEOLOGY (Fig. 2)

Silurian - Devonian (Mathinna Beds)

The oldest rocks in the area are sandstones, silty sandstones and siltstones of the Mathinna Beds. Previous workers have concluded that they are of deep water turbidity current origin.

The Mathinna Beds are complexly folded with the most prominent fold axes trending NW (330°) with bedding dipping both NE and SW. Quartz veining is common and often fills steeply dipping fractures roughly parallel to the fold axes.

Upper Devonian (Ben Lomond Granite)

Phases of the Ben Lomond Granite intruded the Mathinna Beds during the Upper Devonian. Where streams have cut deeply into the granite they expose a medium - coarse grained biotite granite with minor tourmaline and occasional phenocrysts of K-feldspar. Much of the exposed granite however is composed of a complex variety of porphyritic (feldspar, quartz) fine - medium grained granitic phases (optical reports - Appendix 1) similar to those observed adjacent to the contacts with the Mathinna Beds. Seltrust mapped two small areas of Mathinna Beds capping the main body of the granite just east of the Castle Cary Rivulet, at the head waters of Rosiers Creek. It is therefore thought that most of the outcropping granite phases are contact or near contact phases.

Permian - Triassic

Erosion prior and during the Permian unroofed much of the now exposed granite. Shallowly dipping Permian sediments now overlie both the granite and Mathinna Beds and are in faulted contact with the granite in several areas. The basal conglomerates contain cobbles of Mathinna Beds and granite adjacent to their respective source rocks and grade quickly up into sandstones and silty sandstones, many of which are fossiliferous. Some calcareous beds have been noted north east of Rossarden.

Overlying the Permian sediments are sandstones, siltstones and coal measures of Triassic age. No attempt has been made to separate these two rock groups when mapping.

Jurassic

Overlying the Permian-Triassic sediments in the west and north of the E.L. are extensive dolerite sheets. Although now hill (mountain) capping, the dolerites apparently intruded as sills.

Recent

Recent sediments cover much of the Ben Lomond Marshes area west of Rossarden. Dolerite tallus also covers rock types of interest in and to the north of the E.L. However, present day steam activity is largely eroding material from the tenement area.

4. WORK UNDERTAKEN DURING THE REPORT PERIOD

Summary

- Regional 1:25,000 geological mapping/sampling
- Stream sediment sampling
- Prospect mapping/evaluation

Discussion

4.1 Stream Sediment Sampling

Stream sediment sampling has been carried out over areas of granite and outcropping Mathinna Beds within the Licence. About 100 samples have been collected (Fig. 3) however not all assays have been returned from the laboratory. The sieved -10# samples were all assayed for Sn, As, Cu, Pb and Zn (Fig. 4). The tin anomaly thresholds (36 ppm Sn in Granite, 23 ppm Sn in Sediments) were determined in conjunction with stream sample results from the adjoining E.L., Avoca, and using Sinclair's graphical method (Sinclair, A.J. 1974). High assays of tin (132 - 1020 ppm Sn) were returned for streams draining the granite sediment contact, Tasmania Creek area, approximately 1 km west of Rossarden. Assays of 58 - 216 ppm Sn were returned for streams in the upper Gipps Creek area draining known lode and alluvial workings. Streams draining Mathinna Beds only have given poor tin results with the best anomaly, 45 ppm Sn, for a small stream 3 km E.S.S. of Rossarden.

Assays for As (1-27 ppm As), Cu (10-55 ppm Cu, one assay of 135 ppm Cu) and Pb (5-45 ppm) were generally low and of little significance. Streams draining contact metasediments in the Vickory Creek area and upper Abbortsford Creek - Barneys Road area have given generally high zinc assays (55-565 ppm Zn). The cause of the high zinc values is not known.

4.2 Prospect Evaluation

Rex Hill Mine

Rex Hill Mine was originally worked for silver lead ore in the late 1800's, however, it was mined for tin from 1899 to 1934. The mineralisation appears to be largely shear controlled with some breccia development, perhaps as a porphyritic (feldspar, quartz) medium-coarse grained alkali (biotite 5%) granite (Fig. 5). To bodies of porphyritic (quartz) fine grained alkali (Biotite 5%) granite cropout near the workings. Besides alteration of some plagioclase to sericite, little alteration is observed outside the confines of individual workings. The mine has produced something in the order of 850 tons of tin concentrate with grades thought to be in the order of 1.4% Sn. Chip sampling of some of the breccia gave a best assay of 0.42% Sn, 0.57% Cu, 2.85% Pb, 3.90% Zn and 163 ppm Ag. Gold assays were all low being 0.02 ppm or less. Although a number of small workings occur in close proximity (100m) to the main open cut, the general small size and limited extent of associated alteration suggest that little potential exists in the prospect area.

North Republic - Great Republic Mines

Both the North Republic (Fig. 6) and Great Republic workings occur close to the fault bound eastern margin of the N.W. trending belt of granite in the Gipps Creek area. The main granite in the zone is a medium grained biotite granite, however most of the workings are hosted by porphyritic (feldspar and quartz) fine grained alkalic (biotite 5%) phases. The workings dominantly expose quartz-sericite (± sulphides) lodes which form trends sub-parallel to the faulted granite margin. The workings indicate that mineralisation is discontinuous along strike and that there are few sub-parallel lodes.

As the lodes are narrow and as there is little development of alteration surrounding or adjacent to the lodes, neither prospect shows much potential.

Historical production from the Great Republic is believed to be 200t of Sn concentrates (Geological Survey Bulletin No. 46).

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5. CONCLUSIONS

Exploration to date has outlined two anomalies where follow-up work will be carried out. Additional areas may be highlighted when all the stream sediment analyses become available.

All anomalies will be field checked, and further sampling carried out. Initially this will consist of infill stream sediment sampling. It may eventually be necessary to grid some of the anomalies and complete thorough soil/rock chip sampling programmes in order to outline possible drill targets.

008

097009

560 000E

580 000E

5 390 000 N

5 370 000 N

E.L. 59/83 WHEAL LUTWYCHE
(STACPOOLE) 25km²

BEN LOMOND MARSHES

STOREY'S CK.

ROSSARDEN

GIPPS CK.

GREAT REPUBLIC

REX HILL

E.L. 18/84 ROSSARDEN
(SHELL) 171km²

ORMLEY HOMESTEAD

AVOCA

E.L. 7/78 ROYAL GEORGE
(CORNWALL/SHELL) 108km²

BROOKSTEAD

ROYAL GEORGE

ROY'S HILL

E.L. 30/84 AVOCA
(SHELL) 216km²

M

COLLUVIUM/ALLUVIUM /PERMIAN SEDIMENTS

DEVONIAN GRANITE

MATHINNA BEDS

PROSPECT

FAULT

E.L. BOUNDARY

N

0 5km

5 cm

Billiton Australia

Project: TASMANIA REGIONAL

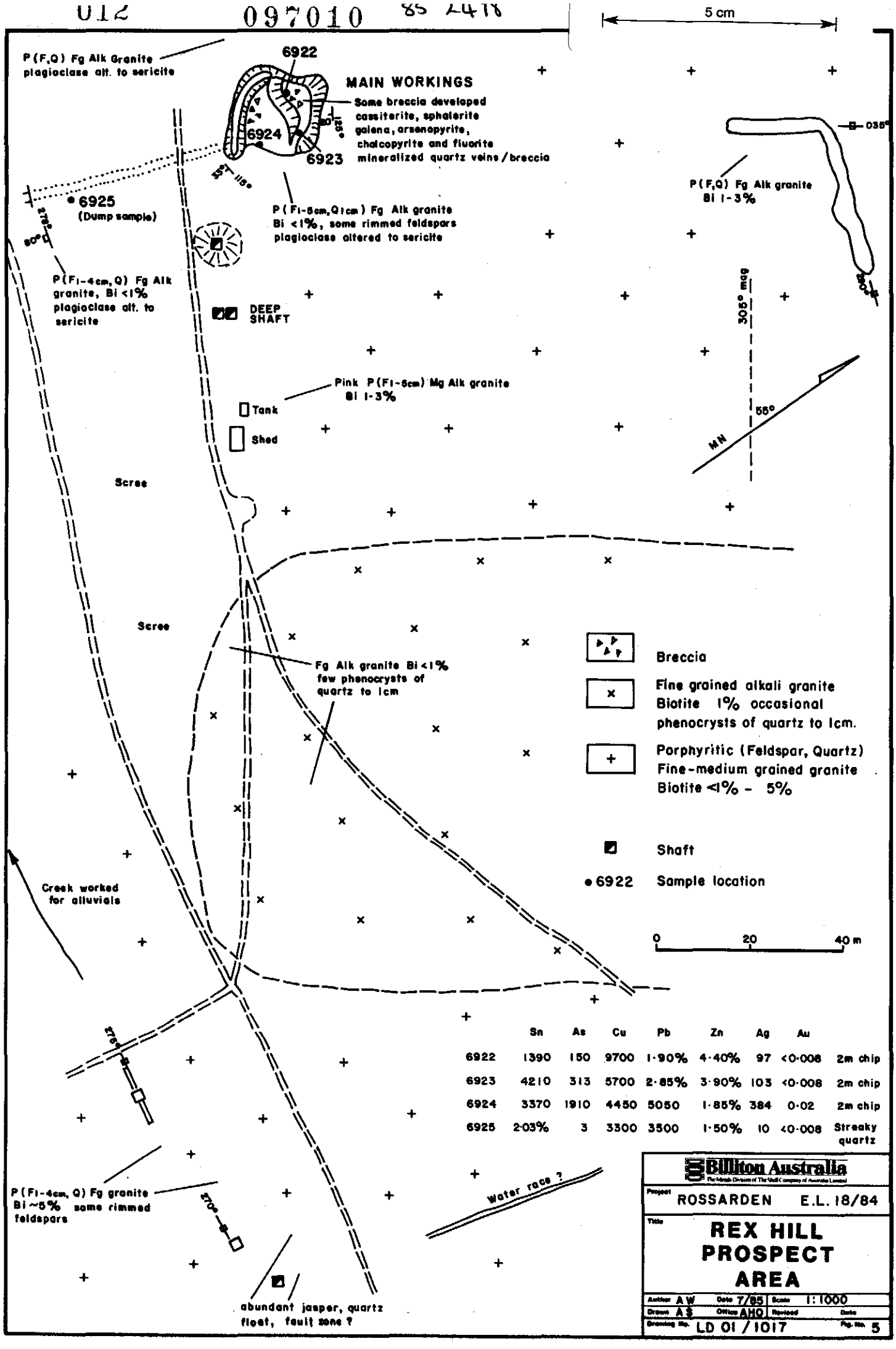
Title: LOCATION PLAN

Author D. C. Date 5/85 Scale 1: 250 000

Drawn J. B. Office AHO Revised Date

Drawing No. MT24/1085 Fig No. 1

012 097010 85 2478



	Sn	As	Cu	Pb	Zn	Ag	Au	
6922	1390	150	9700	1·90%	4·40%	97	<0·008	2m chip
6923	4210	313	5700	2·85%	3·90%	103	<0·008	2m chip
6924	3370	1910	4450	5050	1·85%	384	0·02	2m chip
6925	2·03%	3	3300	3500	1·50%	10	<0·008	Streaky quartz

Billiton Australia
The Minerals Division of The Shell Company of Australia Limited

Project: ROSSARDEN E.L. 18/84

Title: REX HILL PROSPECT AREA

Author A W	Date 7/85	Scale 1:1000	
Drawn A S	Office AHO	Revised	Date
Drawing No. LD 01 / 1017		Fig. No. 5	

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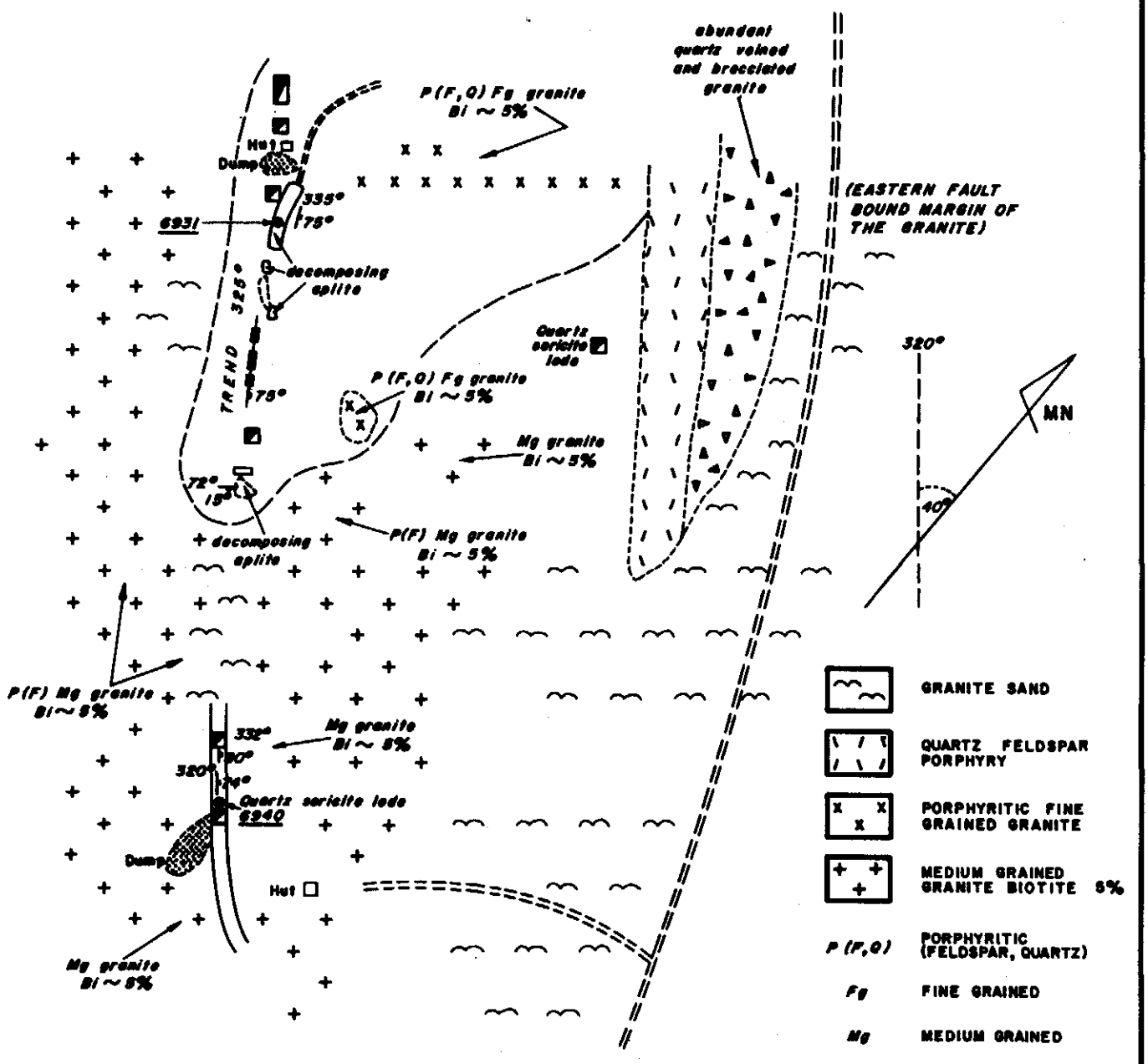

GRANITE SAND

QUARTZ FELDSPAR PORPHYRY

PORPHYRITIC FINE GRAINED GRANITE

MEDIUM GRAINED GRANITE BIOTITE 5%

P (F,Q) PORPHYRITIC (FELDSPAR, QUARTZ)

Fg FINE GRAINED

Mg MEDIUM GRAINED

Bi BIOTITE

PIT, SHAFT

TRACK

SAMPLE LOCATION

0 50 100

METRES

	Sn	As	Cu	Pb	Zn	Ag	SAMPLE DESCRIPTION
6931	1680	43	345	350	9110	9	Sulphide bearing altered aplite
6940	84	18	45	130	55	2·5	Quartz sericite lode

5 cm

Billiton Australia

The Metals Division of The Broken Hill Company of Australia Limited

Project TASMANIA
ROSSARDEN E.L. 18/84

Title

NORTH REPUBLIC WORKINGS

Author A.J.W. Date 7/85 Scale 1: 2000

Drawn K.M.R. Office AHO Revised Date

Drawing No. LD01/1018 Fig. No. 6

APPENDIX 1

OPTICAL REPORTS

Samples 6944
6946
6947
6950
6974
6973
6968

The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide (08) 79 1662
Telex AA82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

097013

amdel

28 June 1985

G 3/114/0

Shell Company of Australia Limited
Metals Division
PO Box 320
FINGAL Tas 7214

Attention: Mr A. Whitaker

REPORT G 6357/85

YOUR REFERENCE: Sample Despatch Order No. 08308/L001/LD03/AJW dated 24 May 1985

IDENTIFICATION: 6944-6974 (not inclusive)

MATERIAL: Eleven rock samples

LOCATION: Ben Lomond Granite, Tasmania

DATE RECEIVED: 29 May 1985

Investigation and Report by: Frank Radke

Chief, Geological Services Section: Dr Keith J. Henley

for Dr William G. Spencer
Manager, Mineral and Materials Sciences Division

jd/23

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PETROGRAPHY OF ELEVEN GRANITIC ROCKS

1. SUMMARY

Eleven samples submitted by the Shell Company of Australia Limited, Metals Division for petrographic examination were given the following rock names:

Sample and Thin Section No.	Rock Name
6971; TSC45017	Granite
6944; TSC45018	Granite
6946; TSC45019	Leucocratic granite
6947; TSC45020	Porphyritic microgranite
6950; TSC45021	Porphyritic rhyolite
6974; TSC45022	Tourmaline granite
6973; TSC45023	Tourmaline-topaz aplite
6968; TSC45024	Porphyritic granite
6954; TSC45025	Biotite granite
6955; TSC45026	Quartz-tourmaline rock
6958; TSC45027	Microgranite with quartz-tourmaline clots

This suite consists mainly of acid plutonic rocks of granitic composition which generally contain pneumatolytic-associated minerals such as fluorite, topaz and tourmaline. Many of these rocks have about equal proportions of potash feldspar and plagioclase and could be termed adamellites under some classifications.

These samples do not show a strong differentiation sequence in which feldspar compositions or ratios and mafic mineral components or the presence of minerals such as topaz, tourmaline and fluorite can all be related. Of these samples 6954 was obviously the least differentiated, most basic rock type containing a much higher mafic mineral component and relatively large large plagioclase to potash feldspar ratio with no fluorite, topaz or tourmaline. This rock also contains relatively large accessory apatite crystals.

The lack of biotite in many of these samples is considered to be due to late-stage deuteric or pneumatolytic alteration of original biotite to muscovite in many samples. Some samples contain biotite showing textural evidence of such replacement and other samples contain relatively large muscovite flakes with smaller intergrowths of opaque to translucent

minerals suggesting they represent completely altered biotite flakes.

There is no evidence in the samples from the Great Republic area to indicate that faulting was active during emplacement although such a possibility cannot be eliminated. There is no evidence of any cataclastic deformation of these samples.

2. PETROGRAPHY

All of the hand specimens have been stained with sodium cobaltinitrite after a hydrofluoric acid etch to detect the presence and location of potash feldspar.

Sample: 6971; TSC45017 AvocA

Rock Name:
Granite

Hand Specimen:
A coarse-grained rock comprised of pink to pale tan feldspar intergrown with grey quartz and minor black biotite flakes. Microchemical tests show that most of the feldspar is potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Potash feldspar	40
Quartz	35
Plagioclase	15
Biotite	5
Muscovite	2
Clay/sericite	1
Chlorite	trace-1
Topaz	trace-1
Fluorite	trace
Apatite	trace
Zircon	trace
Opaques and semi-opaques	1

This sample consists mainly of feldspar and quartz mosaics with a grain size ranging between 0.5 and several millimetres. The feldspar consists mainly of untwinned potash feldspar and smaller amounts of polysynthetically twinned plagioclase. Most of the potash feldspar forms anhedral to weakly prismatic crystals while the plagioclase typically forms subhedral, prismatic crystals. The quartz invariably forms anhedral crystals up to several millimetres wide which tend to form larger polycrystalline aggregates.

Biotite is disseminated through the rock as well developed flakes up to 1.5 mm wide which have a reddish-brown, pleochroic colour. Most of the biotite flakes have degraded characters containing lamellar intergrowths of opaque material along cleavage traces and many show incipient alteration to a pale green, weakly pleochroic chlorite. The rock also contains some well developed muscovite flakes up to 1.5 mm long which also generally contain lamellar intergrowths of opaque material suggesting that they represent original biotite flakes which have been replaced by muscovite. Minor muscovite also locally forms lamellar intergrowths with biotite flakes suggesting an incipient replacement feature. Minor muscovite also forms small, interstitial

flakes located between felsic mineral grains.

The potash feldspar generally exhibits a well developed ribbony perthitic texture and a small proportion of the potash feldspar crystals also have a patchy perthitic texture containing small irregular inclusions of polysynthetically twinned plagioclase. Most of the potash feldspar and plagioclase crystals show mild mantling containing clear outer margins. Within some areas small crystals of polysynthetically twinned plagioclase mantle potash feldspar crystals and most of the plagioclase crystals contain clear, unaltered outer margins around more turbid, weakly altered cores. Within some areas quartz also occurs as narrow interstitial fillings between feldspar crystals.

The plagioclase for the most part is quite fresh although most shows at least some alteration to finely divided sericite/clay. The rock contains one prismatic crystal believed to be have been originally plagioclase which has been completely replaced by weakly birefringent clay and minor sericite. This clay and sericite also contains moderate amounts of finely intergrown translucent iron oxides.

Traces of fluorite form small inclusions in plagioclase and lamellar intergrowths with biotite. Topaz forms anhedral disseminated crystals which are generally intergrown with quartz and show some alteration to sericite along grain margins and fractures.

Traces of apatite and zircon form small disseminated crystals up to 0.2 mm long which are generally intergrown with the biotite flakes. Opaques are disseminated through the rock as anhedral grains and aggregates as well as lamellar intergrowths with mica flakes.

This is considered a fairly typical granite showing some possible mild late-stage deuteric effects producing mantling of feldspars as well as replacement of biotite by muscovite.

Sample: 6944; TSC45018 POSSIBLE

Rock Name:
Granite

Hand Specimen:
This is a fine to medium-grained rock comprised largely of pale pink to grey feldspar intergrown with milky grey quartz. The rock has a porphyritic texture containing some larger quartz and feldspar crystals up to about 1 cm wide distributed through a finer-grained matrix. Black biotite flakes are also disseminated through the matrix. Microchemical tests show that approximately half of the feldspar consists of potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Potash feldspar	30
Plagioclase	30
Quartz	25
Biotite	5
Tourmaline	3
Muscovite	3
Sericite/clay	2
Apatite	trace
Zircon	trace
Fluorite	trace
Opaques and semi-opaques	1

This sample consists mainly of a relatively fine-grained (typical grain size between 0.2 and 2 mm) quartz and feldspar mosaic intergrown with some larger quartz and feldspar crystals. The feldspar consists of both polysynthetically twinned plagioclase which tends to form subhedral, prismatic crystals and untwinned potash feldspar which generally forms anhedral crystals. The quartz also typically forms anhedral crystals concentrated in polycrystalline aggregates up to several millimetres wide. A small proportion of quartz also forms small rounded inclusions within potash feldspar grains.

Biotite is disseminated through the rock as well developed flakes up to 2 mm long which are locally concentrated in flaky aggregates. Most of the biotite has a reddish-brown pleochroic colour with a somewhat degraded character containing localized lamellar intergrowths of opaque material as well as localized muscovite lamellae. Most of

muscovite forms disseminated flakes up to 0.5 mm long which tend form somewhat skeletal intergrowths with the feldspar. The plagioclase shows incipient to mild alteration to finely divided sericite and weakly birefringent clay which imparts a slight turbidity to it. The potash feldspar also generally has a slight turbidity due to possible localized very slight alteration to secondary phyllosilicates.

Tourmaline is disseminated through the rock as anhedral crystals up to 1.5 mm long which tend to have skeletal shapes being intergrown with quartz and to a lesser extent with feldspar. Most of the tourmaline has a pleochroic brown to orange colour with some colour zoning produced by bluish-green coloured patches. There is a tendency for the bluish-green colouring to occur marginal to very small inclusions suggesting that they might represent radioactive haloes around small radioactive inclusions in the tourmaline. Some of the tourmaline also exhibits very fine acicular marginal overgrowths with a dark blue colour. Fluorite occurs mainly as small (less than 0.1 mm) inclusions in plagioclase and lamellar intergrowths with biotite.

Traces of apatite and zircon form small disseminated crystals up to 0.1 mm wide which are generally intergrown with biotite or tourmaline. Opaques are generally intergrown with biotite or tourmaline as grains and lamellar intergrowths with biotite but some translucent, reddish-brown iron oxides also form small patches and staining of clay minerals.

This is a relatively fine-grained granitic rock containing accessory tourmaline.

Sample: 6946; TSC45019

Rock Name:
Leucocratic granite

Hand Specimen:
A fine to medium-grained rock comprised of pale grey to dull white feldspar intergrown with grey quartz. The rock contains some irregular black patches comprised of tourmaline which was positively identified in temporary oil mounts. The rock also contains a small number of prismatic greenish coloured patches comprised of soft clay which could represent altered feldspar crystals. Microchemical tests show that the rock contains a significant amount of potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Potash feldspar	40
Quartz	25
Plagioclase	20
Muscovite/sericite/clay	13
Tourmaline	1
Zircon	trace
Apatite	trace
Fluorite	trace
Topaz	trace
Biotite	trace
Opaques and semi-opaques	1

This is a medium-grained rock comprised of a hypidomorphic granular quartz and feldspar mosaic with a typical grain size ranging between 0.5 and 4 mm. The feldspar consists of both untwinned potash feldspar and polysynthetically twinned plagioclase. The plagioclase generally forms subhedral, prismatic crystals while the potash feldspar forms anhedral to weakly subhedral crystals. The quartz invariably forms anhedral grains.

Fibrous muscovite/sericite is disseminated through the rock as irregular patches up to 1 mm wide. Most of these patches contain some finely intergrown opaque to translucent iron and titanium oxides and are thought to represent completely altered biotite flakes. The only biotite noted in this sample occurs as small flakes up to 0.2 mm wide completely enclosed within quartz grains where they have been protected from the sericitization. These biotite flakes have a dark

brown, pleochroic colour. Sericite also occurs as an alteration product of plagioclase crystals. Most of the plagioclase shows only incipient alteration to finely divided sericite but a few large plagioclase crystals have been almost completely altered to finely intergrown sericite and weakly birefringent clay. These altered crystals would represent the greenish coloured crystals of soft clay noted in hand specimen.

Tourmaline is disseminated through the rock as small crystals which are concentrated in aggregates up to a few millimetres wide. Most of the tourmaline crystals have anhedral, somewhat skeletal shapes and a pleochroic brownish-orange colour showing some green zoning. Fluorite forms anhedral disseminated crystals which are generally associated with tourmaline-rich areas. Topaz forms disseminated crystals up to 0.5 mm wide which show some marginal sericitization. Traces of zircon and apatite form small disseminated crystals up to 0.2 mm wide which are generally intergrown with tourmaline or muscovite/sericite. Minor opaques are disseminated through the rock as finely divided grains and aggregates which tend to be concentrated in muscovite/sericite patches. Minor opaques also form very narrow fracture linings.

This is a highly leucocratic granitic rock with some muscovite/sericite which is most likely of late-stage deuteric origin and represents a replacement product of biotite and plagioclase.

Sample: 6947; TSC45020

Rock Name:
Porphyritic microgranite

Hand Specimen:
This is a massive rock with a porphyritic texture containing large dull white feldspar phenocrysts and grey quartz phenocrysts disseminated through a fine-grained, pink matrix. A dark, greenish-black mafic mineral is also disseminated through the matrix. Microchemical tests show that at least some of the feldspar phenocrysts are potash feldspar and that the matrix contains abundant finely intergrown potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Potash feldspar	30
Quartz	30
Plagioclase	25
Biotite	10
Sericite/clay	2
Fluorite	1
(?)Anatase	1
Topaz	trace-1
Zircon	trace
Apatite	trace
Opaques and semi-opaques	1

This sample consists mainly of an equigranular quartz and feldspar mosaic with a typical grain size of about 0.2 to 0.5 mm through which some larger quartz and feldspar phenocrysts are disseminated. The fine-grained matrix has a hypidiomorphic granular texture being comprised of subhedral plagioclase laths intergrown with anhedral to weakly subhedral potash feldspar and anhedral quartz. The potash feldspar phenocrysts generally have anhedral to subhedral shapes while the plagioclase phenocrysts generally exhibit subhedral shapes.

Biotite is disseminated through the rock as small flakes up to 0.5 mm long which have an intensely pleochroic brown colour. Some biotite forms flaky aggregates up to 1 mm in size and most of the biotite has a slightly degraded-appearing character. Minor sericite/clay occurs

as an incipient alteration product of plagioclase.

The rock contains traces of fluorite as disseminated anhedral grains up to 0.3 mm wide intergrown with the felsic matrix minerals and as small inclusions in plagioclase or fine lamellar intergrowths with biotite. Minor topaz occurs as small crystals up to 0.3 mm wide which are typically included in larger feldspar crystals. Traces of a translucent blue mineral believed to be anatase forms small disseminated grains and aggregates which are typically intergrown with biotite. Traces of zircon and apatite also form small disseminated grains and are also generally associated with biotite. Opaque to translucent iron oxides form small disseminated grains and aggregates as well as narrow intergranular fillings.

This is a fine-grained granitic rock with a very fresh character showing only mild degradation of biotite and incipient alteration of plagioclase.

Sample: 6950; TSC45021

Rock Name:
Porphyritic rhyolite

Hand Specimen:
This is a porphrytitic rock containing pale tan feldspar phenocrysts and grey quartz phenocrysts disseminated through an aphanitic pale brown matrix. Microchemical tests show that the feldspar phenocrysts consist mainly of potash feldspar and that the matrix contains only small amounts of finely disseminated potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Felsic matrix	40
Quartz phenocrysts	20
Sericite/clay	20
Potash feldspar phenocrysts	15
Muscovite	2
Vein quartz	1
Opaques and semi-opaques	2

This sample consists mainly of quartz and feldspar phenocrysts disseminated through a very fine-grained matrix. The matrix consists mainly of finely granular felsic minerals intergrown with finely divided sericitic phyllosilicates. The felsic minerals in the matrix have a typical grain size of about 0.1 to 0.2 mm forming a patchy textured mosaic. The sericitic phyllosilicates form very small flakes which are generally included within the felsic minerals or occur as interstitial fillings. Some small aggregates of sericitic phyllosilicates are also intergrown with the matrix.

The quartz and feldspar phenocrysts are generally between 0.3 and 5 mm in size. The quartz phenocrysts typically exhibit anhedral to weakly subhedral slightly embayed shapes. The feldspar phenocrysts consist mainly of potash feldspar which exhibits subhedral, prismatic shapes. The original plagioclase phenocrysts have been completely, or almost completely, replaced by finely divided sericitic phyllosilicates which pseudomorph euhedral prismatic crystals up to 2 mm long. The rock also contains a very small number of muscovite microphenocrysts as well developed flakes up to 0.4 mm long. These muscovite

microphenocrysts typically contain fine, lamellar intergrowths of opaque to translucent iron and titanium oxides oriented along cleavage traces.

The rock is transected by some granular quartz veins up to 0.3 mm wide. Minor opaque to translucent iron and titanium oxides form small disseminated grains and aggregates.

This is a porphyritic rock with a rhyolitic composition showing some alteration of original feldspar and probably mafic minerals to sericitic phyllosilicates.

Sample: 6968; TSC45024

Rock Name:
Porphyritic granite

Hand Specimen:
This is a massive rock containing large pink to dull white feldspar phenocrysts and grey quartz phenocrysts disseminated through a fine-grained, pink matrix. Microchemical tests show that the rock contains abundant potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Potash feldspar	35
Quartz	30
Plagioclase	25
Biotite	5
Muscovite/sericite	3
Topaz	1
Fluorite	trace
Tourmaline	trace
Opaques and semi-opaques	1

This sample consists mainly of a feldspar and quartz mosaic with a somewhat variable grain size ranging up to several millimetres. The feldspar consists of both polysynthetically twinned plagioclase which tends to form euhedral to subhedral, prismatic crystals and untwinned potash feldspar which generally forms anhedral crystals. The quartz also typically forms anhedral crystals which are locally concentrated in polycrystalline patches up to several millimetres wide. The plagioclase locally shows a weakly developed zoning containing narrow clear overgrowths. Most of the potash feldspar exhibits a ribbony, perthitic texture and is untwinned.

Biotite is disseminated through the rock as well developed flakes up to 0.8 mm long which have an intensely pleochroic brown colour. Much of the biotite contains fine intergrowths of a fibrous muscovite/sericite which appear to represent a replacement product of biotite. The biotite also tends to contain concentrations of opaque to translucent iron oxides some of which form fine lamellar intergrowths. The feldspar shows mild alteration to finely divided

sericitic phyllosilicates and this is best developed in the cores of some plagioclase crystals.

Topaz is disseminated through the rock as anhedral grains up to 0.3 mm wide, many of which tend to be totally included within feldspar crystals. Traces of fluorite also form small disseminated anhedral grains which are generally associated with feldspar as inclusions or anhedral to lamellar intergrowths with biotite. Traces of tourmaline were noted as angular, interstitial fillings between felsic mineral grains. Opaques are disseminated through the rock as anhedral grains and aggregates up to 0.2 mm wide.

This is a fine to medium-grained granitic rock with a moderately fresh character containing accessory topaz, fluorite and tourmaline.

Sample: 6973; TSC45023

Rock Name:
Tourmaline-topaz aplite

Hand Specimen:
This is a fine-grained rock comprised of dull white to pale tan feldspar intergrown with grey quartz and small amounts of a prismatic black mineral. Microchemical tests show that the rock contains abundant finely intergrown potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Potash feldspar	30
Quartz	25
Plagioclase	20
Muscovite	10
Tourmaline	7
Topaz	5
Sericite/clay	2
Opaques and semi-opaques	trace-1

This sample consists mainly of a fine-grained quartz and feldspar mosaic with a typical grain size ranging between 0.2 and 1 mm. The feldspar consists of polysynthetically twinned plagioclase which generally forms subhedral, prismatic crystals and untwinned potash feldspar which typically forms anhedral crystals. The quartz also forms anhedral, disseminated crystals and some larger quartz crystals up to a few millimetres in size are disseminated through the rock.

Both tourmaline and topaz form disseminated crystals up to approximately 1 mm long. The tourmaline generally forms euhedral to subhedral, prismatic crystals which have a pleochroic blue colour. Many tourmaline crystals exhibit a concentric zoning with darker coloured cores. The topaz generally forms anhedral crystals which are intergrown with the quartz and feldspar and show some marginal alteration to finely divided sericite.

Muscovite is disseminated through the rock as well developed flakes up to 1 mm long. Most of the muscovite forms smaller flakes below 0.5 mm in size which are intergrown with the quartz and feldspar. Minor finely

divided sericitic phyllosilicates locally form fine intergrowths with quartz and feldspar and also occur as an incipient alteration production of plagioclase. Most of the feldspar is very fresh showing only localized incipient alteration to sericitic phyllosilicates.

Minor opaques are disseminated through the rock as anhedral grains and aggregates as well fine intergrowths with phyllosilicates.

This is a fine-grained plutonic rock containing moderate amounts of disseminated tourmaline and topaz.

Sample: 6974; TSC45022

Rock Name:
Granite

Hand Specimen:
This is a medium-grained rock comprised of pale tan feldspar intergrown with grey quartz and small amounts of a black mineral. Microchemical tests show that the rock contains moderate amounts of disseminated potash feldspar.

Thin Section:
An optical estimate of the constituents gives the following:

	%
Quartz	35
Plagioclase	25
Potash feldspar	20
Muscovite	12
Tourmaline	5
Sericite/clay	2
Zircon	trace
Opaques and semi-opaques	1

This sample consists mainly of a hypidiomorphic granular quartz and feldspar mosaic with a grain size between 0.5 and several millimetres. The feldspar consists of both polysynthetically twinned plagioclase which generally forms euhedral to subhedral, prismatic crystals and untwinned potash feldspar which typically forms anhedral to weakly subhedral crystals. The quartz forms anhedral crystals which tend to be concentrated in aggregates up to several millimetres wide. A small proportion of the potash feldspar exhibits a patchy, perthitic texture containing irregular inclusions of polysynthetically twinned plagioclase.

Well developed muscovite flakes up to 3 mm long are disseminated through the rock forming intergrowths with the quartz and potash feldspar. Within localized areas the muscovite forms more finely divided flaky aggregates and a small proportion of larger muscovite flakes exhibit weakly developed radiating textures. More finely divided sericitic phyllosilicates and weakly birefringent clay locally form fine intergrowths with feldspar and plagioclase feldspar in

particular. Some sericitic phyllosilicates form small flaky aggregates intergrown with feldspar or quartz.

Tourmaline is disseminated through the rock as skeletal crystals up to 5 mm long which typically have zoned pleochroic colours ranging from a bluish-green to a pale brown.

Within one area of the thin section more finely granular aggregates of felsic minerals and muscovite are present and appears to be a slightly deformed region which has been subjected to granulation and mild recrystallization.

Traces of zircon form small disseminated crystals up to 0.1 mm long. Opaques are disseminated through the rock as very small grains and aggregates.

This is a medium-grained granitic rock with a high quartz content as well as approximately equal proportions of plagioclase and potash feldspar. The rock contains no mafic minerals but has a significant amounts of muscovite and accessory tourmaline.

APPENDIX 2

Rock Chip/Grab Assays

SAMPLE RECORD

Sheet 1 of —

METALS DIVISION

035

SAMPLE TYPE: — LOCATION / PROJECT: ROSSARDEN LD01 SAMPLER: — DATE: — MAP / PHOTO REF: —

ASSAY LAB: ANALABS SAMPLE DESPATCH ORDER NO: — ASSAY REPORT NOS: —

SAMPLE STORAGE: —

SAMPLE No.	LOCATION	ANALYSES							DESCRIPTION
		Sn	As	Cu	Pb	Zn	Ag	Au	
6920	500m SE of Rex Hill mine	546	20	375	155	70	1·0	<0·008	2m chip Qtz-Sericite lode
6921	" " " "	733	<2	370	165	75	5·5	<0·008	Chip of dump lode material
6922	Rex Hill mine	1390	150	9700	1·90%	4·40%	97	<0·008	2m Chip in opencut
6923	" " "	4210	313	5700	2·85%	3·90%	163	<0·008	2m Chip in opencut
6924	" " "	3370	1910	4450	5050	1·85%	384	0·02	2m Chip in opencut
6925	" " "	2·03%	3	3300	3500	1·50%	10	<0·008	Streaky quartz lode + sulphide
6927	Gipps Ck Rd ~1km from Rossarden Rd.	16	3	15	35	25	1·0	<0·008	Network quartz veined granite
6928	Gipps Ck ~200m W of Longtunnel min	10	<2	10	15	15	0·5	<0·008	siliceous breccia
6929		8	31	10	10	10	0·5		Quartz breccia
6930	Vicony Ck mine	579	1·59%	245	0·70%	4150	27		Sulphides in F.g. granite/aplite
6931	North Republic	1680	43	345	350	9100	9		Sulphides in F.g. granite/aplite
6940	" "	84	18	45	130	55	2·5		Quartz-sericite lode
6938	Great Republic	451	23	180	<5	25	1·0		Silicic lode
6939	" "	18	<2	5	5	10	0·5		laminated quartz-tourmaline
6953	" "	7150	<2	65	600	2·24%	15		Albite lode material
6972	BUFFALO BROOK	8	48	5	15	132	1·5		PYRITE BEARING QUARTZ (FAULT)

REMARKS: —

036

097034

BILLITON AUSTRALIA
THE METALS DIVISION
OF THE SHELL COMPANY OF AUSTRALIA LIMITED

ROSSARDEN EL 18/84

PROPOSED EXPLORATION PROGRAMME

SEPTEMBER 1986

Two main areas of anomalous stream tin geochemistry have been identified within the licence area Figure (1). The anomaly in the Tasmania Creek area is of high interest as it occurs at the intrusive contact of Granite with Mathinna Beds.

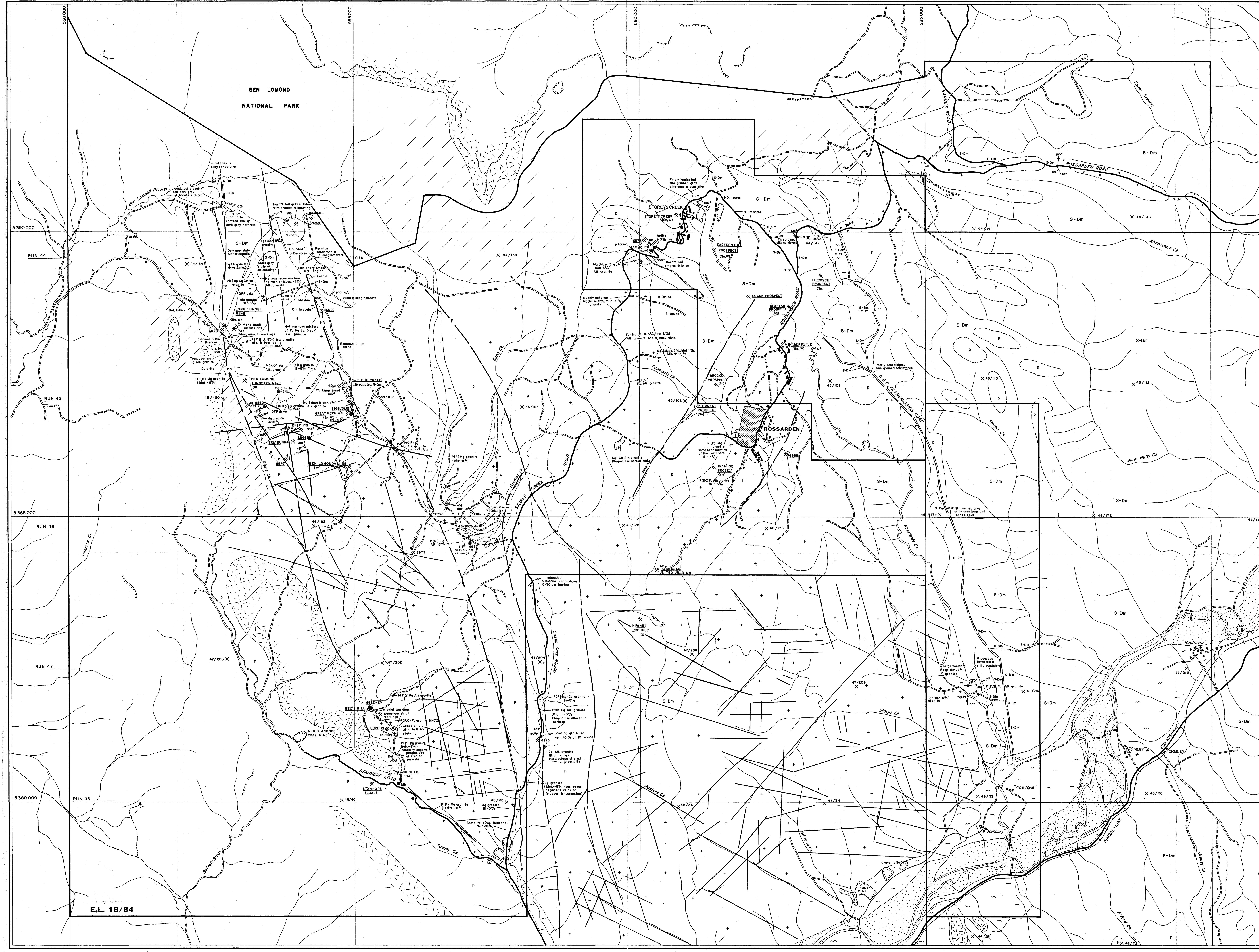
The anomaly at Gipps Creek is in an area of known workings. Further sampling should determine if they are the source of the anomaly.

Work in the forthcoming year will be aimed at locating the sources of the anomalies by stream sediment follow-up and geological mapping where required. Should the sources not become apparent, or results indicate the presence of possible significant mineralisation, it may be necessary to establish a grid over the area concerned and complete a programme of soil/rock chip sampling prior to delineating possible drill targets.

SUMMARY

The phases of Ben Lomond Granite exposed in the E.L. are largely porphyritic fine to coarse grained granites which are thought to be from the upper 200-300m of the granite body.

Stream sediment sampling for tin has so far highlighted two main areas, Tasmania Creek region just west of Rossarden and the area of known workings at 'Gipps Creek'.



RECENT

River alluvium (South Esk River)

Alluvium / colluvium

TERTIARY

Tb — Basalt

JURASSIC

Dolerite

Dolerite / tallus (Alt. Recent)

UNDIFFERENTIATED
TRIASSIC & PERMIAN

p — Sandstones, conglomerates, siltstones shale, coal measures

CARBONIFEROUS
– UPPER DEVONIAN

+ — BENLOMOND GRANITE

P (F,Q)	Porphyritic (Feldspar and quartz porphyroblasts)
Fg Mg Cg	Fine grained, Medium grained, Coarse grained
Bi, Tour, Musc.	Biotite, tourmaline, muscovite accessories
Alk. granite	Alkalic granite i.e. biotite content <5% gen. 1%
qtz. tour. clots	Quartz ring with tourmaline cores

SILURIAN – DEVONIAN

S-Dm — MATAINNA BEDS Sandstones, silty sandstones, siltstones Hornfelsed in places by the Benlomond Granite

6911 — Rock sample

Air photo linear

80° 127° — Jointing dip and strike (Bearings are magnetic)

80° 127° — Cleavage dip and strike

80° 127° — Bedding dip and stike

Geological traverse in granite - road, foot

5° — Granite/sediment contact, apparent dip direction

Fence, gate

Pit workings

Alluvial workings

× 45/112 — Airphoto centre, Run No. /Photo No.

TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1979 AND MOVES EASTERLY BY 0.1° IN ABOUT THREE YEARS

0 1 2
KILOMETRES

The Shell Company of Australia Limited
METALS DIVISION

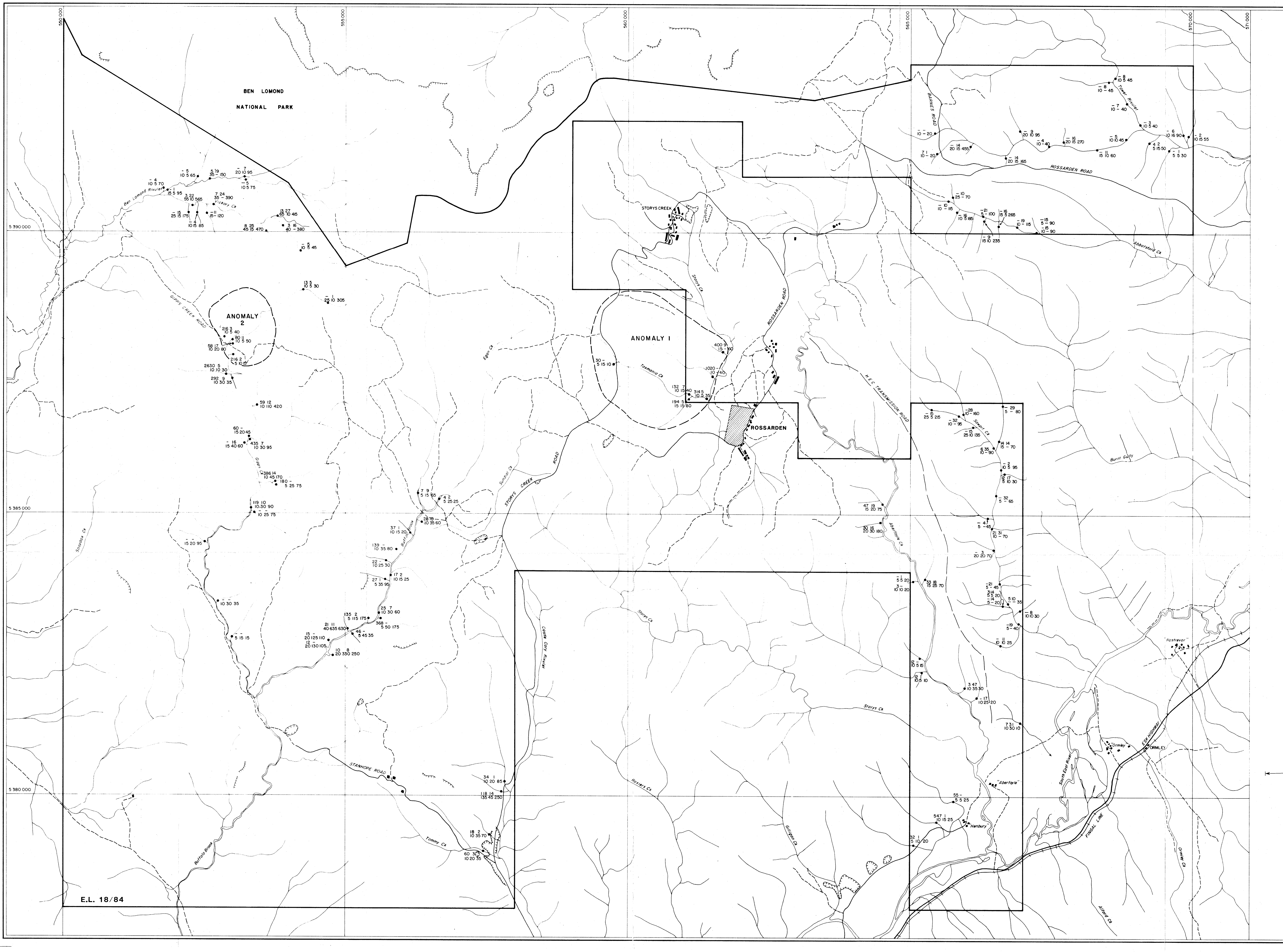
TASMANIA
ROSSARDEN E.L. 18/84

GEOLOGY

85-2478 009

SCALE	1:25 000	DATE	January 1985
AUTHOR	D. Carter	DRAWN	A.S., V.C
OFFICE	Melbourne/AHO	REP.No	
DRG.No	LD01/1013	FIG.No	2

BEN LOMOND
NATIONAL PARK
STORYS CREEK
ROSSARDEN
ROSSARDEN ROAD
STORYS CREEK ROAD
STANHOPE ROAD
H.E.C. TRANSMISSION ROAD
BARNES ROAD
GIPPS CREEK ROAD
Ben Lomond Rivulet
Storys Ck
Tasmania Ck
Aberfoyle Ck
Castle Cary Rivulet
South Esk River
Buffalo Brook
Tommy Ck
Roberts Ck
Burnt Gully Ck
Avoca
Ormley
Hanbury
"Aberfoyle"
Fingal Line
Esk Highway
9100 Stream Sediment Original Sample
9101cs Stream Sediment Check Sample
LOCATION PLAN
DEVONPORT
Rossarden
HOBART
097038
5 cm
0
2
KILOMETRES
The Shell Company of Australia Limited
METALS DIVISION
TASMANIA
ROSSARDEN E.L. 18/84
STREAM SEDIMENT
SAMPLE LOCATIONS
85-2478
010
SCALE 1:25000
DATE May 1985
AUTHOR A.W.
DRAWN V. Caton
OFFICE Melbourne/AHO
REP No
DRG No LD01/1015
FIG No 3
DATA BASE NUMBERS AS FOR SAMPLE NUMBERS



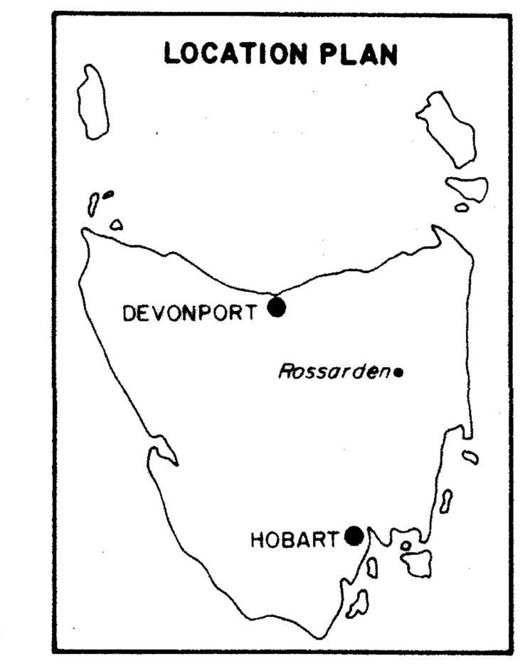
LEGEND

24 22 Sn As
10 - 65 Cu Pb Zn

All samples were sieved with the -10# portion retained for assay.

All values in ppm.

LOCATION PLAN



GN TN MN

GRID CONVERGENCE 0.5

GRID MAGNETIC ANGLE 14

5 cm

TRUE NORTH GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP MAGNETIC NORTH IS CORRECT FOR 1979 AND MOVES EASTERLY BY 0.1 IN ABOUT THREE YEARS

0 1 2
KILOMETRES

097039

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METALS DIVISION

TASMANIA
ROSSARDEN E.L.A. 18/84

STREAM SEDIMENT
ASSAY RESULTS

85-2478 011

SCALE	1:25000	DATE	May 1985
AUTHOR	A. W.	DRAWN	V. Caton
OFFICE	Melbourne/AHO	REP No	
DRG No	LD01/1016	FIG No	4