Jenny Castleman
FINAL REPORT

EXPLORATION LICENCE 4673

REPORT ON ACTIVITIES - YEAR TWO - AND FINAL REPORT

LICENCEES: JOHN ROBERT BRUCE
JOHN HAWKES MULES

1:250,000 SHEET: ILLOGWA CREEK SF53-15
1:100,000 SHEET: QUARTZ 5951

AUTHOR: BURTON MURRELL PhD MAustIMM MAIG

CONTENTS

1. SUMMARY AND FINAL REPORT

This area had been of interest to prospector J.R. "Bluey" Bruce for many years prior to the granting of EL4673 and he brought with him the results and knowledge of many man-months of prospecting the area. While a letter from the Principal Registrar to the licencees dated 21/4/86 notes that the annual report for year one does not substantiate the stated expenditure, there is no doubt in the authors mind that the value had been expended in feet-on-the-ground prospecting.

Six areas of lead-zinc mineralization with gahnite in calc-silicate "elipsoids" in the Irindina Gneiss were reported as a result of the year one program. The consultant compared these with Gamsberg or Broken Hill type mineralization.

During year two joint work with Preussag was hoped to lead to a joint venture agreement to finance further work, but unfortunately the scaling down of activities in Australia by Preussag resulted instead in them failing to supply the promised analyses of an extensive sampling program. Only verbal agreements had been entered into.

A small reconnaissance magnetic survey was undertaken by the licencees using a borrowed instrument but no drilling targets were indicated in the vicinity of known mineralization. No plans appear to have been made from this survey and no records kept.

No work was undertaken in year three except joint venture negotiations with White Industries. The optimism of the licencees that money would be obtained for further work, is evidenced in the fact that they paid their rent for year three and reduced their area in the hope that results from Preussag would identify further targets

Work on the licence area was de facto suspended before the end of year two, but efforts were made to obtain support for further work from major mining houses.

2. INTRODUCTION

This is an attempt to piece together the history of work by others on EL4673 in the period between 20 September 1985 and cancellation of the title on 22 October 1987.

3. WORK CARRIED OUT

3.1 A letter from the Secretary dated 17-06-87 mentioned that no work plan had been submitted for year three (1986/87). The copy of the Annual Report for year one which is available to the author shows the southern half of the original licence area marked off for relinquishment. It is therefore assumed that the rent for year three was paid and notice of blocks to be retained was given, in response to a letter signed by Janece Barnes on 28-07-86.

Apart from this inferred action, it appears to the author that work had been suspended on this licence area prior to the end of year two (awaiting the results from the year two program) and that no work was ever undertaken in year three, though serious efforts were made to involve a new joint venture partner.

3.2 During year two negotiations were apparently under way with Preussag with the aim of entering a joint venture with them. Negotiations were conducted through one John Hill who was apparently a manager in Melbourne.

At least two visits were made by a Preussag geologist to the area, and on these two an extensive program of rock-chip sampling was undertaken by him and the licencees; the samples were taken by Preussag for analysis. A verbal agreement had been entered into that the results were to be made available to the licencees for the annual report and as part of the expenditure commitment. It appears that despite of a number of promptings via telephone, the information was never provided by Preussag, presumably due to the scaling down of their operations in Australia. This left little of substance for the licencees to report.

In addition to prospecting and rock-chip sampling undertaken in year two, J.R. Bruce undertook an orientation program using a borrowed magnetometer to see if he could gernerate drilling targets from the areas of known gahnite/pyrrohtite bearing calc-silicate rocks. No targets were identified.

In year three, up to the time of cancellation, negotiations were under way with White Industries who were acquiring interests in exploration properties in the area to enter into a joint venture on this and other areas under title.

3.2 Expenditure. No records of expenditure appear to exist but some idea of the expenditure may be gained from the following.

(a) Two field visits, sampling , analysis and overheads would probably have cost Preussag between $10,000 and $20,000.
(b) Mr Bruce had other interests in the White Range area but it is probably reasonable to attribute one third of his years work plus vehicles and camp overheads to this licence area. In addition there were contributions by Mules, Carthew and assistants from Mr Bruces family.

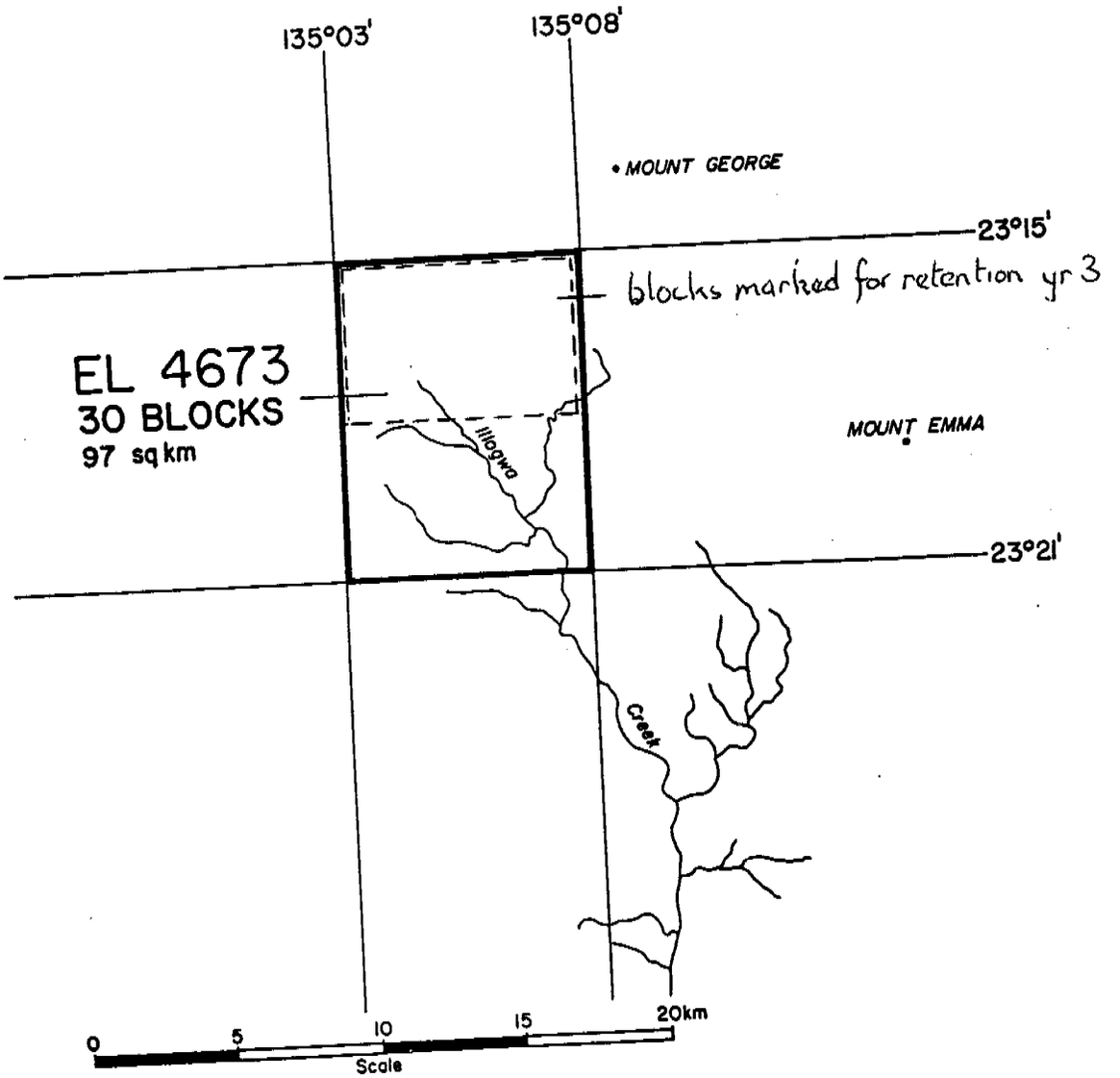
The author feels that it would be reasonable to allow that in terms of effort the expenditure covenant had been fulfilled. The unfortunate behavior by Preussag however left little to report.

The expenditure of effort on this area by Mr Bruce predates the granting of EL4673. The author was shown some of this mineralization by him in 1980 while reviewing an exploration proposal in the area for CRA Exploration, and even at that time it was obvious that years of prospecting had been expended in that area. The argument is therefore respectfully tendered that the Bruce & Mules partnership fulfilled their exploration obligations, though in a somewhat unorthodox manner and certainly deficient as far as formal reporting goes due to a lack of skills and resources when compared to major mining companies.

4. CONCLUSIONS

I conclude that this was an unfortunate committment by the licencees with the expenditure set far higher than could reasonably be expended by private individuals while thoroughly prospecting the area. All the discoveries were reported in year one but necessity to involve a joint venture partner to proceed further led to overcommitment with no results. As the licencees normally have had to engage a consultant to report for them, reporting a negative result was delayed far too long while awaiting results from Mr Hill.

Plan of Area


135°03'
135°08'
• MOUNT GEORGE
23°15'
blocks marked for retention yr 3
EL 4673
30 BLOCKS
97 sq km
Illogwa
MOUNT EMMA
23°21'
Creek
0
5
10
15
20km
Scale

NORTHERN TERRITORY OF AUSTRALIA

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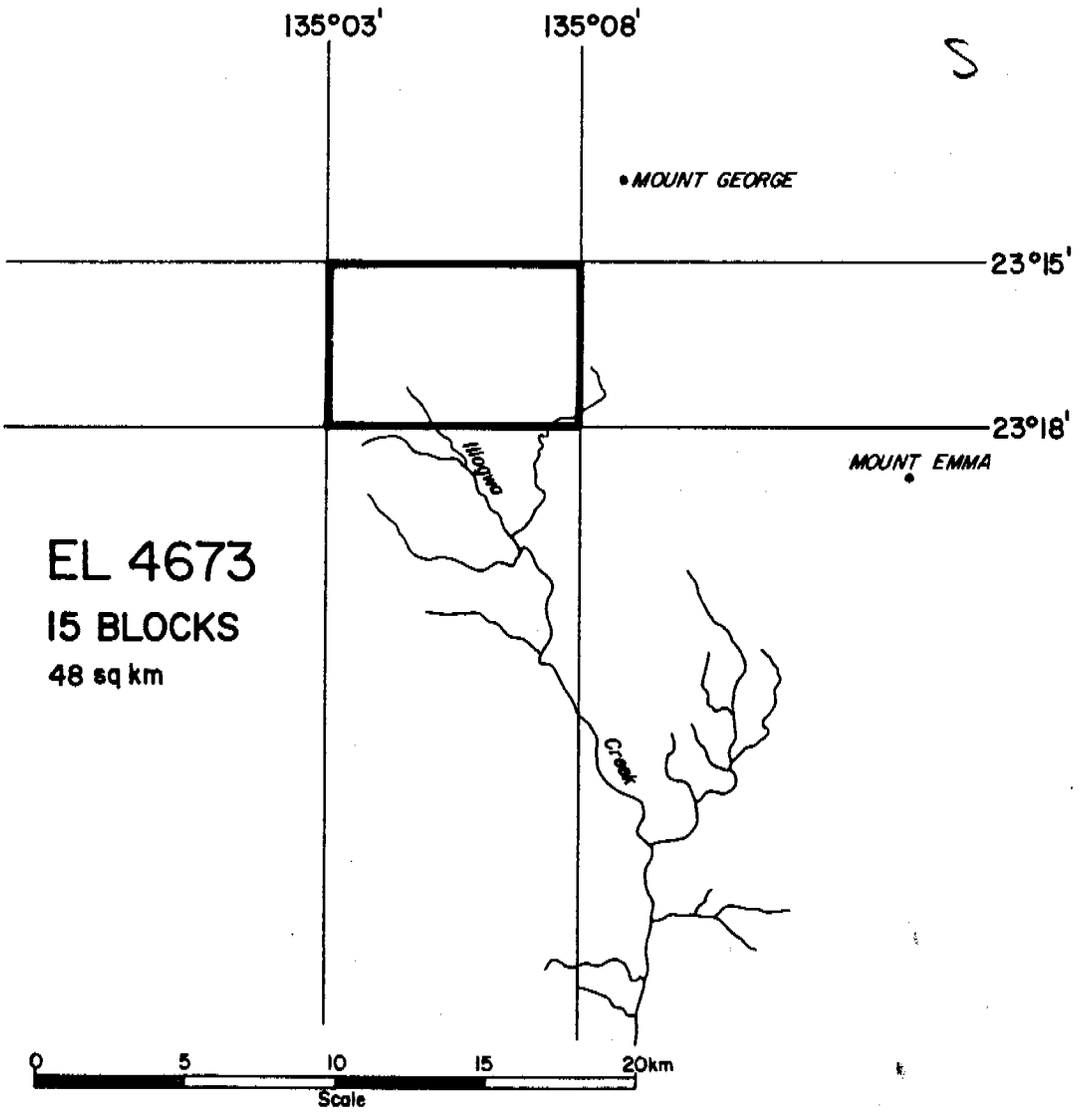
Mining Act

NOTIFICATION OF CANCELLATON OF LAND HELD UNDER EXPLORATION LICENCE

It is hereby notified that the land shown hereunder will cease to be the subject of Exploration Licence No. 4673 effective 14 days from the date of this notice.

D. M. J. HART
Principal Registrar



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ES 4/12
758.0115

FILE No. E.L. 4673

INTERNAL MINUTE

To: JENNY CASTLEMAN

15/10/85

Re subject licence held by Bruce + Mules.
I spoke to Bluey Bruce on 14/10/85 and he said that he would provide work proposals + expenditure for Year 2 + Annual Report by the end of this week.
Also confirming rent of $150-00 for Year 2 of the licence was paid on 23/9/85 (O/R 690865). Apologies for not giving you written advice prior to now.

Lass McColl
Mining Registrar
Alice Springs

NT 5751 8
EL 4673-85

THE SECRETARY
DEPARTMENT OF MINES AND ENERGY
P.O. BOX 2330
ALICE SPRINGS
NT 5750

DEAR SIR,

I REFER TO EXPLORATION LICENCE 4673 IN THE QUARTZ LOCALITY.

OUR EXPLORATION PROPOSALS FOR THIS YEAR ARE AS FOLLOWS. (21-9-85 + 21-9-86)

(1) PROSPECTING FOR MORE MINERALIZED CALL-SILICATES.

(2) ADDITIONAL MAPPING OF KNOWN AREAS + NEW AREAS AS THEY OCCUR

(3) ASSAYS OF CALL SILICATES AND SOIL SAMPLES.

(4) GEOCHEMICAL + GEOPHYSICAL SURVEYS TO TAKE PLACE ON THE MOST PROSPECTIVE AREAS.

(5) WHEN THE ABOVE PROGRAM IS COMPLEATED A DRILLING VENTURE WILL BE ENTERED INTO IF WARRENTED

THE ESTIMATED EXPENDITURE FOR THIS PERIOD IS EXPECTED TO BE BETWEEN $50 - $60,000.

YOURS SINCERELY

J. Hughes

FOR T.H. HUGHES - T.R. BRUCE.

0 PROSPECTING. ~~POSSIBLE~~ EXPENDITURE ~~REPORTING FORMAT~~ EL. 4673 J R Bruce - J.H. Mo

Major Activity	Staff Salaries	Staff Wages	Consultants/ Contractors' Fees	Vehicles	Travel . Other	Accom.	Field Accom.	Field Equip.	Office Exp.	Other	Sub-Totals
Geology		18,000	6000	12000	5000	1000	19,000	4,000	2,000		58,000
Geochemistry											
Geophysics											
Access								16,000			16,000
Gridding											
Drilling:											
- diamond											
- other											
Drafting			1000								1000
Metallurgy											
Engineering											
Environmental											
Other											
SUBTOTALS		18,000	7000	12,000	5000	1000	19,000	20,000	2000		75,000

TOTAL 75,000.

LOCAL OFFICE OVERHEADS

HEAD OFFICE OVERHEADS

GRAND TOTAL 75,000.

2.3 A10

John R. Bruce, John H. Mules, and Endras Pty. Ltd.

ALICE SPRINGS

Reconnaissance Activities on Exploration Licence 4673 (Boots Dam Area) between 21 September 1984, and 20 September 1985.

Northern Territory Department of Mines.

by

S. Carthew, B. Sc. (hons) A. Aust. I.M.M.

September 1985

CONTENTS

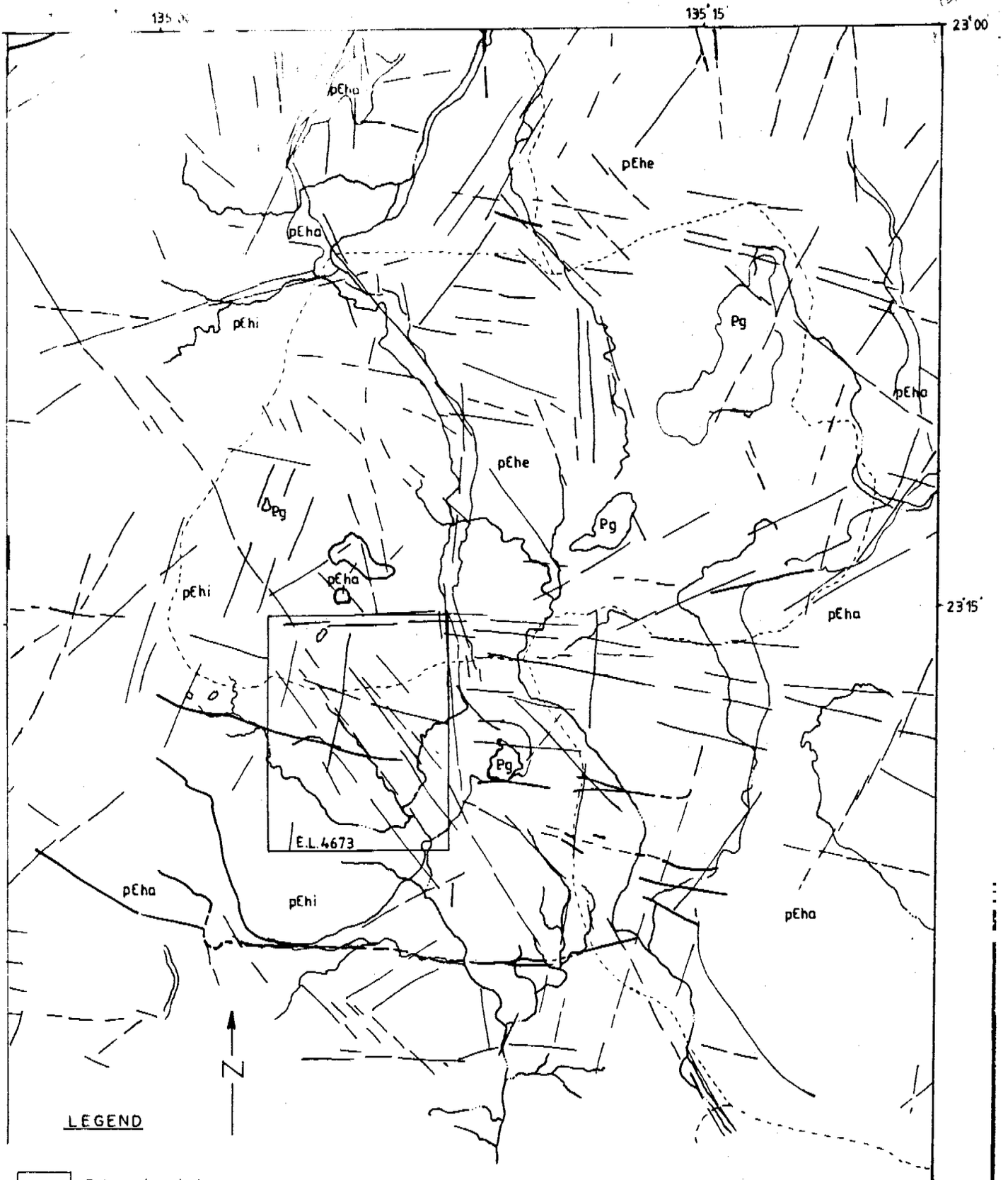
1. INTRODUCTION

The Boots Dam Exploration Licence (EL 4673) of 30 sub-blocks totalling an area of 97 square kms. in the Huckitta Dome area, was granted to Mr. J. R. Bruce, Mr. J.H. Mules, and Endras Pty. Ltd. on the 21st of September 1984. This E.L. is found on the QUARTZ 1:100,000 sheet in the northwest quadrant of the ILLOGWA CREEK (SF53-15) 1:250,000 sheet, some 160km east of Alice Springs, and is reached by graded road between Claraville Station and Harding Spring Bore.

Endras Pty. Ltd. and prospectors Bruce and Mules are continuing general prospecting activities to enhance the mineral potential of the general Arunta province..

This report details their reconnaissance work together with an inspection by the writer during the period 21st September 1984 to 20th September 1985. During this programme intensive search for Broken Hill-Agneys type mineralization has taken place in part of an Early Proterozoic basin recognized. This style of mineralization is sought in chemical sediments overlying a general intermediate to basic pile of volcanics near to a cross cutting structure within early Proterozoic sediments.

The nature of the work completed thus far has been landsat interpretation, regional ground inspection, gossan prospecting, and trenching.



LEGEND

Pzr	Retrograde schist zone
Pg	Granite, granodiorite, gabbro
pEhb	Brady gneiss
pEhi	Irindina gneiss
pEha	Bruna gneiss
pEhe	Entia gneiss

J.R. BRUCE, J.H. MULES, ENDRAS PTY. LTD.

LOCATION AND LANDSAT INTERPRETATION

SCALE 1:250 000

Kms 5 0 5 10 15 20 Kms

Geology from ILOGWA CREEK Sheet SF-53-15

2. SUMMARY

During the first year of operations, prospecting has found six mineralized areas of calc-silicate elipsoids. A landsat study shows that there is a strong northwest to southeast lineament trend passing through the area which minifests itself as numerous quartz veins on the ground.

It is considered that the mineralized calc-silicate elipsoids, the magnetite rich gneiss (after quartzite) found outside the EL, and the presence of apatite encourage exploration for a Broken Hill - Gamsberg style of mineralization in this general area.

3. RECOMMENDATIONS

In EL 4673 it is recommended that:-

1) prospecting for mineralized calc-silicates continue,
2) additional mapping(at 1:25,000 scale) of the mineralized horizons take place,
3) a more detailed investigation by way of gridding, grid mapping at 1:500 scale, geochemical and geophysical surveys take place on the more prospective localities, eg locality one, described above.

4. REGIONAL GEOLOGY

The basement rocks within E.L.4673 are part of the Arunta Block which is a cratonised complex of igneous, sedimentry and metamorphic rocks. This block extends for about 1000 km. east west and 400km. north south. It consists of a cratonised complex of igneous, sedimentary and metamorphic rocks of Archean to Lower Proterozoic age, that have been intruded by granites early in the Carpentarian (fig.2).

The rocks have been divided into three divisions on the basis of gross lithological differences and are tentatively regarded as chronological or strataigraphic correlatives [Stewart and Warren 1977]. They were deposited in three major, east-west trending, fault bounded tectonic zones [northern, central, and southern].

Division 1 consists of mafic and felsic granulites interpreted as chemical equivalents of a volcanic sequence that was deposited in a developing east-west graben structure on ensialic crust. In the Harts and Strangways Ranges, this granulite sequence is succeeded unconformably by rocks of amphibolite facies as part of the Central Tectonic Zone.

Division 2 consists of an argillaceous sequence in part sandy, now metamorphosed to greenschist facies that pass laterally into amphibolite facies equivalents of the Harts Range Group [Joklick 1955] and to granulite facies equivalents of Reynolds Range. This division was deposited with waning volcanic activity in troughs flanking the graben.

Division 3, which unconformably overlies Division 2, consists of more mature quartz rich sediments with minor volcanics, and completes the cycle of sedimentation.

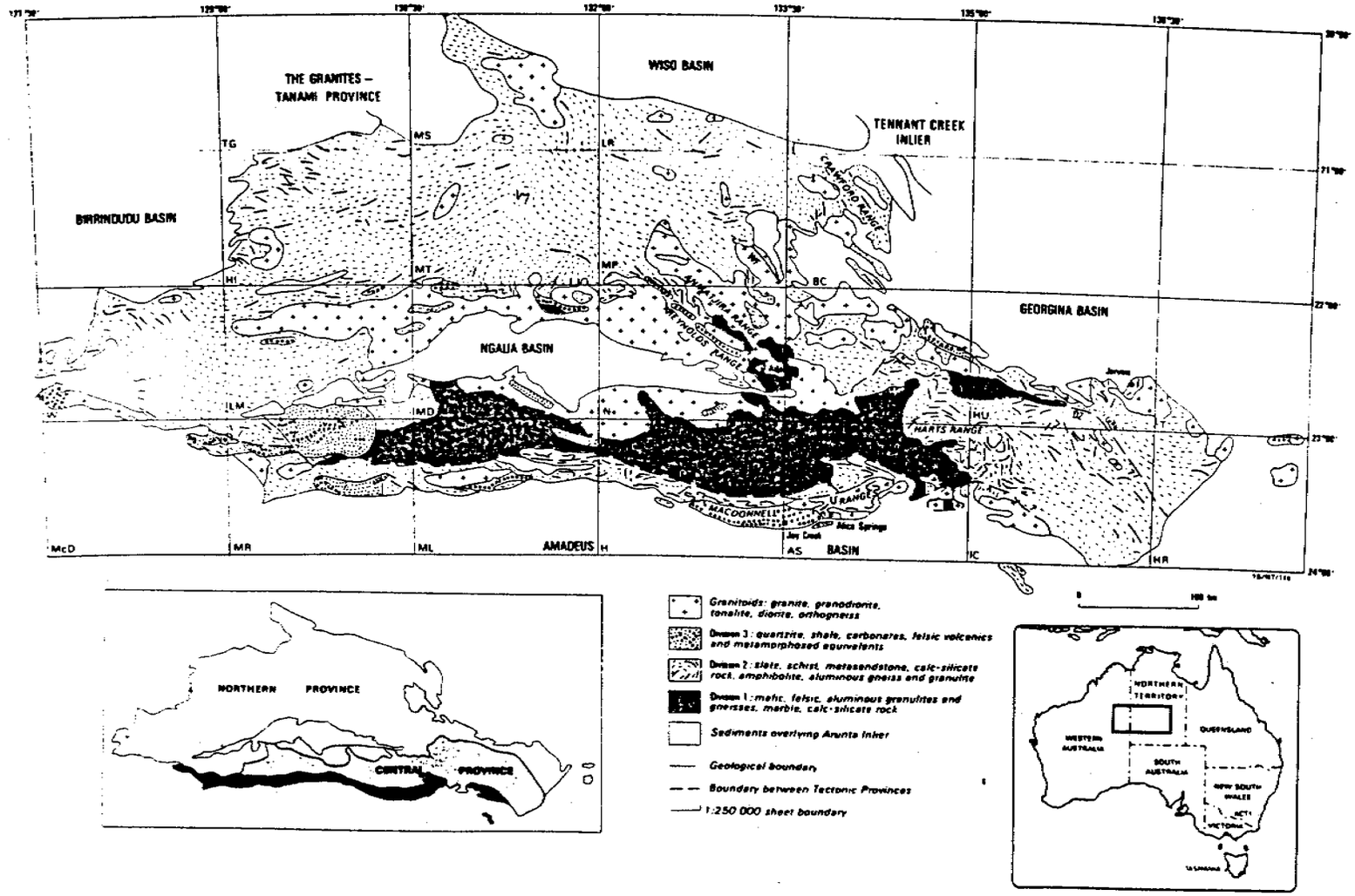


Fig. 2 Geological map of the Arunta Inlier showing major stratigraphic divisions and tectonic provinces. Large and small dots or dashes indicate known and inferred trends of lithologic layering, respectively. RZ = Redbank Deformed Zone, HZ = Harry Creek Deformed Zone, DZ = Delny-Mount Sainthill Fault Zone, WF = Walabanba Fault Zone. Initials in bottom left corners of sheet areas denote names as follows: A, *Alcoota*; AS, *Alice Springs*; BC, *Barrow Creek*; H, *Hermannsburg*; HI, *Highland Rocks*; HR, *Hay River*; HU, *Huckitta*; IC, *Illogwa Creek*; LM, *Lake Mackay*; LR, *Lander River*; McD, *MacDonald*; MD, *Mount Doreen*; ML, *Mount Liebig*; MP, *Mount Peake*; MR, *Mount Rennie*; MS, *Mount Solitaire*; MT, *Mount Theo*; N, *Napperby*; T, *Tobermory*; TG, *The Granites*; W, *Webb*.

The Metemorphic grade varies between low greenschist and granulite facies. Isotope dating indicates four widespread episodes of regional metamorphisim resulting from tectonism and/or granitic emplacement. The first, of granulite grade, is the Strangways Metemorphic Event, which occurred about 1800m. years ago. The second and third, [Chewings Phase] generally of amphibolite grade, accompanied the granite intrusion of 1500 to 1600m. years ago [Hurley et al 1964, Armsrong and Stewart 1975, Offe and Shaw 1983]. The fourth, the Ormiston Event of 1000 to 1100m. years ago, produced migmatisation at a number of entres in the central part of the southern zone, and was closely followed by intrusion of syntectonic granites, dolerite dykes, and gabbroic bodies.

Following uplift and erosion, the Arunta Block forms basement to several intracratonic shallow-marine sedimentary basins of Adelaidean to Paleozoic age [fig.2] Epicontinental sands of the Heavitree Quartzite and equivalents were deposited unconformably over basement, and sedimentation continued with minor disconformity into the Upper Paleozoic, when the Alice Springs Orogeny (400m years ago) deformed both the basement and cover rocks. Widespread thrust faulting, isoclinal folding and nappe complexes were produced around the northern margins of the basins, accompanied by widespread metamorphism of the basement rocks. Carboniferous continental molasse material was then deposited together with the extensive peneplanation and localised ferricrete and silcrete formation.

5. STRUCTURE and LANDSAT IMAGERY INTERPRETATION

EL 4673 is within the Central Tectonic zone (Shaw and Stewart, 1975, Shaw et al 1979)(fig,2). This zone is bound to the north by the Delry - Mount Sainthill Structure (Warren 1978, Carthew 1983) and to the south by the east-west Redbank Deformation Zone, a major reverse fault (Offe and Shaw 1983). The major structures crossing this central tectonic zone are the gravity and landsat Woolanga Lineament (Anfiloff and Shaw 1973) trending 330° swinging easterly into the Redbank deformation zone, and the landsat-aeromagnetic Harts Range - Mount Baldwen lineament (Carthew1983) which trends 075° between these two locations.

The Illogwa Shear Zone (Shaw and Freeman 1984) is a late stage schist zone where thrusting has been associated with the Alice Springs Orogeny. It separates the Alberta Metamorphics in the south from the Harts Range Group (Joklick 1955) in the north, and is found on the southern margin of EL 4673.

The Harding Springs Slide is a low angle south dipping fault that separates the Entia Gneiss from the Bruna Gneiss over a distance of 20km east of EL 4673 (Freeman and Shaw 1984).

The principal fold structure of the area is the complex double dome known as the Entia Domal Structure (including the Huckitta and Inkamulla Dome) around which the Harts Range group is draped with shallow dips. This structure has been intruded by granite. EL 4673 is found in the sediments of the Harts Range Group on the fringe of Huckitta Dome. These principal structural elements are shown in figures 1 and 2.

Ground inspection has shown that intense layer parallel fabrics with strong linear components are pervasive throughout EL 4673. Recent structural and tectonic studies by post-graduate students of Adelaide University interpret these structures to be part of a tectonothermal event during which time thrust mappe development and the intrusion of the Bruna Gneiss took place (Ding et al 1983, James et al 1985).

2 PROSPECTING. ~~POSSIBLE~~ EXPENDITURE ~~REPORTING FORMAT~~ EL. 4673 J R Bruce - J.H. Mc

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Drilling:											
- diamond											
- other											
Drafting			1000								1000
Metallurgy											
Engineering											
Environmental											
Other											
SUBTOTALS		18,000	7000	12,000	5000	1000	10,000	20,000	2000		75,000

TOTAL 75,000.

LOCAL OFFICE OVERHEADS

HEAD OFFICE OVERHEADS

GRAND TOTAL 75,000

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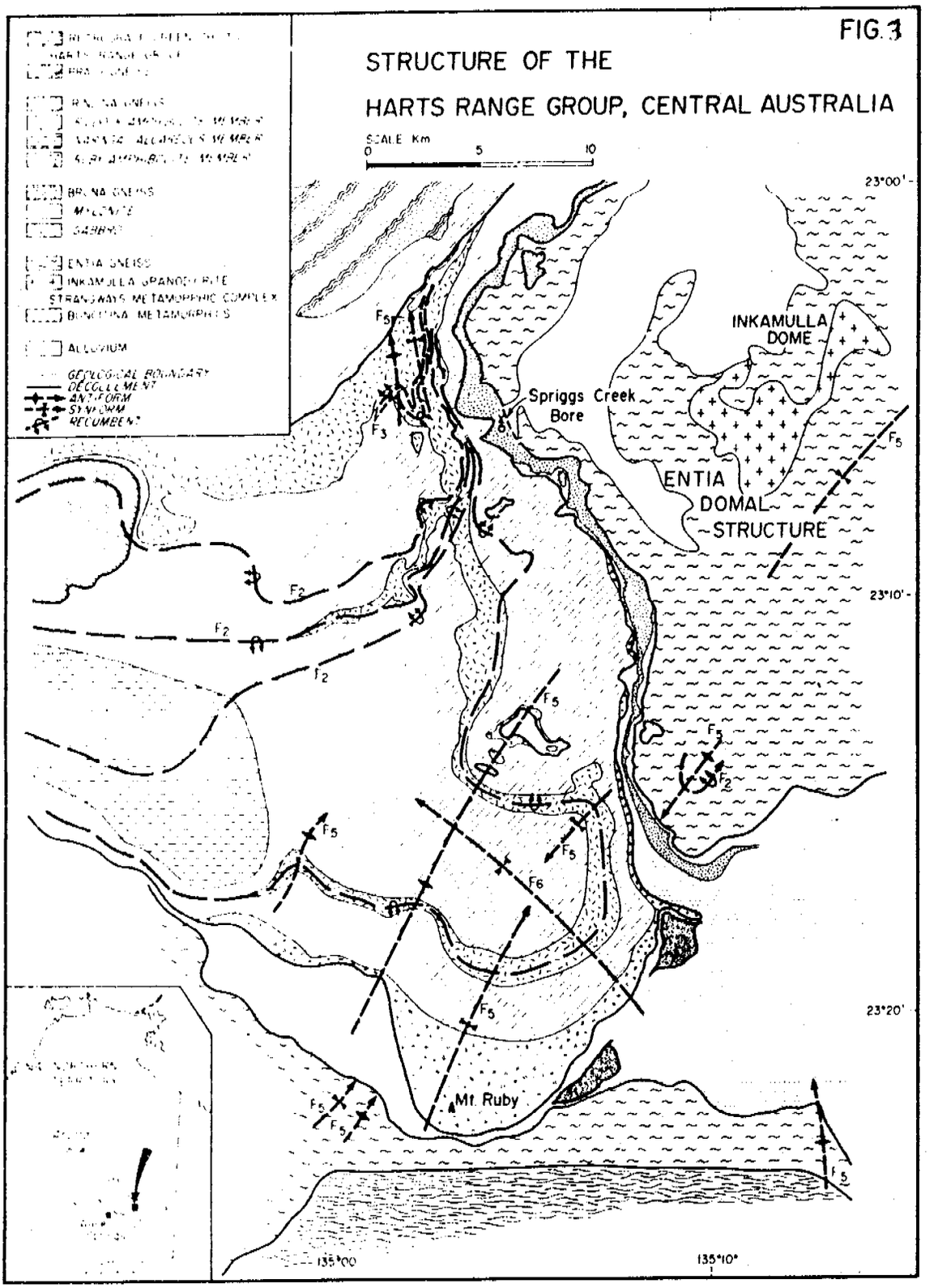
FIG. 3



After Adelaide University

6. LOCAL GEOLOGY

Mapping by the N.T. Geological Survey and the Bureau of Mineral Resources has shown that the Albarta Metamorphics Southeast of EL 4673 are of Division One, and that the Harts Range Group belongs to Division 2. (Shaw et al 1982, Stewart et al 1984)

A detailed examination of the Harts Range Group by post-graduate students from Adelaide University is revealing that the Oonagalbi gneiss complex and the Entia gneiss complex is forming an Archaen ? -Early Proterozoic basement to the Irindina supracrustal assemblage and that the Bruna Gneiss intruded along a thrust plane during an early Proterozoic tectonothermal event (James et al 1985, Ding and James 1985). Accepting the revised nomenclature of the Adelaide University studies; only the Irindina supracrustal assemblage crops out in EL 4673 (fig).

Irindina Gneiss

The Irindina Gneiss was named by Joklick (1955) as the third unit of his Harts Range Group. Directly overlying the Bruna granite gneiss, the basal unit of the Irindina Gneiss is the Ruby Amphibolite Member. It is up to 2,000m thick at Mt. Ruby (just south of EL 4673) and thins rapidly away from this, and its mapped configuration is exaggerated by topographic expression. This well layered massive para-amphibolite interfingers with biotite gneiss and they themselves have been metamorphosed to amphibolite facies.

Overlying this, the Irindina Gneiss is predominantly a monotonous pelitic gneiss, expressed largely as biotite gneiss with minor calc-silicate horizons and carbonates characterised by rapid lateral thickness and facies variations. This unit passes into the Riddoch Amphibolite, a strongly layered mafic amphibolite. Pelitic gneisses overlie this amphibolite horizon. These rocks have been metamorphosed to amphibolite facies.

The gneisses are interpreted to have been pelitic sediments, the calc-silicates were probably calcareous marls and the amphibolite may have been an intermediate to basic volcanic.

Numerous quartz veins trend northwesterly (325°) throughout the area, and one trends easterly (090°) from Boots Dam.

Faults within the E.L. trend in two directions, east-west (100°), and northwest (325°), parallel to the numerlus quartz veins. Intense layer parallel fabrics with strong linear components are pervasive within all lithologies and plunge northerly. This lineation is parallel to the axial plane trends between 160° and 200° of small scale folding. Many of these small scale folds are overturned or reclined. This phase of folding is part of a tectonothermal event associated with the Chewings Phase (D2) of deformation (Shaw et al 1979).

A second phase of folding of upright open fold generations is reflected in the folded outcrop pattern of the Riddoch Amphibolite. These structures are intersected by north-west trending structures marked by quartz veins.

7. MINERALIZATION

Six mineral occurrences of silver, lead, zinc, and copper have been found within the EL. All mineralization has been found in elipsoids of calc-silicates with a general biotite gneiss and amphibolite sequence. These localities are described as indicators that may lead to finding Gamsberg - Broken Hill style mineralization beneath.

Locality 1. Boots Dam, north side of road.

Two hundred metres north of the Harding Springs road, and 2.5km southeast of Boots Dam, a cluster of five calc-silicate elipsoids are found in an area of 200 sq. metres. These elipsoids range in size from 1m x 1.5m to 6m x 6m. Thew are a spessitine - bustamite - diopside - gharnite amphibole calc-silicate hosted in a biotite gneiss. Two trenches have been dug to determine the size of the elipsoids.

Locality 2. Boots Dam, south side of road.

One hundred metres south of the Harding Springs road and 2.5km southeast of Boots Dam, a family cluster of elipsoids are found over and area 200 metres square. These elipsoids are amphibolite pyroxene and horneblende granulites (BD1,2,&3. Appendix 1.), containing gharnite-sphalerite (zinc gossan)-pyrite and prrhotite. The sulphide content is between 5% and 10% of the rock.

Locality 3. Boots Dam.

By the west side of the Salthole Dam road and 1.5 km south of the Harding Springs road turn-off, a calc-silicate elipsoid is found in a general sequence of biotite gneiss and amphibolite. This calc-silicate elipsoid is of gharnite-bustamite-quartz with minor sphalerite and is 3m x 3m in size.

Locality 4. (Riddoch Amphibolite Locality)

In the Riddoch Amphibolite Member, 5.3km south of Boots Dam, galena in minor amounts has been found in calc-silicate elipsoids. The elipsoids are hosted in a general sequence of para amphibolite, and garnet biotite gneiss, Numerous elipsoids 0.6m x 0.6m are found in the general area.

Locality 5. boots Dam.

On the north side of Harding Springs road, 1.5km southeast of Boots Dam, galena and sphalerite mineralization has been found in small calc-silicate elipsoids. These elipsoids are hosted in a general biotite gneiss sequence.

Locality 6.

Galena, sphalerite, malachite, and apatite are found in spessitine-garnet-quartz-calc-silicate elipsoids 0.5km north of Locality 5.

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