REPORT ON EXPLORATION LICENCE NO. 2188

for

R.B. MINING PTY. LTD.

by

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OPEN FILE
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SUMMARY

EL 2188 was applied for to enable exploration for tin, tantalum and associated metals to be carried out. Tantalite is the main mineral sought after.

During 1980 EL 2188 was geologically mapped on a regional scale of 1: 80,000 to enable the most favourable areas for tantalite mineralisation to be defined. Three areas were outlined, these being 1 Western Pegmatites, 2 Ivy mine area and 3 Ringing Rocks.

Small occurrences of tantalite and tin mineralisation are known in the Western Pegmatite and Ivy Mine areas, but no mineralisation has been located at this date at Ringing Rocks. Virtually all the areas of interest around the Ivy mine area are within EL 1958 and are the subject of a separate report.

The Western pegmatite belt was flown by low level colour photography at a scale of 1 : 10,000 during July and an area of 125 square kilometers has been mapped at photo scale.

The tantalite occurrences located to date all occur associated with pegmatites. A profusion of white quartz reefs within the Western Pegmatites appear to be mainly "sweat" veins and are not related to tantalite mineralisation. Some veins however could be part of pegmatite intrusions.

The aeolian sand cover over the greater part of the EL will require a great deal of time and exploration money to be spent on the area to determine its true potential.

It is recommended that exploration continue in 1981 with a detailed sampling and mapping programme.

INTRODUCTION

E.L. 2188 was granted to A.V. Miller and G. Corbett on 13th November, 1979. R.B. Mining Pty. Ltd. has since purchased A.V. Miller's 50% interest in the whole of the Exploration Licence.

Field work was commenced by R.B. Mining Pty. Ltd. during May 1979 and a semi-permanent base camp was established near West Dam in the south central portion of the licence area. A four man crew was employed with the mapping programme from May to October.

This report summarises the work carried out during that time and is the first report on the area.
The 1980 field season is now complete and field work will re commence in March - April 1981, as soon as favourable weather conditions return.

EL 2188 covers part of Neutral Junction and Stirling pastoral leases, with the main areas of outcrop lying within Neutral Junctions boundary. Good relationships are maintained with both station managements.

No aboriginal land claims or sacred sites are known in the Licence area.

LOCATION & ACCESS

EL 2188 is centred at Latitude 21°23' South and Longitude 133°50'E. Its centre is 10 km NW of Barrow Creek settlement on the Stuart Highway and is 300 Km by road north of Alice Springs and 200 km South of Tennant Creek.

Accommodation, fuel, telephone and hotel services are the only features available at Barrow Creek.

A graded dirt air strip suitable for light planes lies 2 km south of Barrow Creek adjacent to the Stuart Highway.

Access can be made to nearly all areas within the E.L. by 4 wheel drive vehicles but thick mulga scrub limits access in some areas. Motor bikes have proved to be an excellent form of transport within the area. Vehicle movement within the E.L. would be impossible after heavy rain.

The area is quite remote and all supplies need to be obtained in Alice Springs. However, Neutral Junction and Stirling stations both maintain stores with basic tin food and clothing for sale.

PHYSIOGRAPHY & CLIMATE

The Licence area is flat and basically featureless apart from a line of mesas at Barrow Creek and several lines of quartzite ridges in the Mt. Nelson area and in the area north of Hugo Jacks tin show.

A low rise running north-south in the central part of the licence area (referred to as the Western Pegmatites) forms a water shed for east and west flowing streams which tend to disappear quickly in the flat aeolian-sand covered expanses on either side of the rise.

Rainfall in the area averages 250mm per annum and falls mostly between October and April. However, rainfall is very erratic and unreliable. Above-average rains have fallen for the past 4 or 5 years and a return to drier years may be imminent.
Vegetation throughout the area is semi desert and consists of open mulga scrub and grass on the flat sand covered plains with spinifex grass preferring the few elevated sections.

WATER SUPPLIES

Surface water in the area is available in creeks for short times after heavy rain. Surface dams hold water for longer periods, but permanent water is only available from bores.

It appears that the main course of Taylor Creek contains the only fresh bore water in the area while other creek systems contain only salty bore water. Neutral Junction station put down two bores in 1969 in the main creeks on either side of the Western Pegmatite rise with only very salty water being encountered at about 25 meters.

The "Salt Lake City" bore adjacent to the highway and 20 km north of Barrow Creek is salty but suitable for stock use, as is Burns bore on Barrow Creek near the settlement.

Water for drinking and domestic purposes can currently be obtained only from Neutral Junction homestead supply or from New Barrow bore on Taylor Creek just to the north of the E.L. boundary.

Water supply will become a serious consideration for an ongoing exploration programme.

HISTORY OF THE AREA

Very little prospecting or exploration activity has been carried out in the area in the past. A few old prospectors pits were located around the Western Pegmatite belt during the field programme and 4 small prospects have been worked in the 1950's. In each case a small shaft and a few pits have been dug and a small amount of tin or tantalite produced. No production records are available. The prospects are referred to as:

(a) Hugo Jacks tin
(b) Johannsons Tantalite
(c) Slippery Tantalite
(d) Q.T. Tin.

In 1956 and 1961 geological mapping for the 1:250,000 scale plan was carried out by the Bureau of Mineral Resources.

The only recorded Company reports on the area are those of Kewanee Australia Pty. Ltd. who worked in the region from 1970 to 1973. During that time they carried out a gridding and sampling programme in the areas around the western pegmatites, the Ivy Tin mine (on current E.L. 1958) and an area known as Ringing Rocks on E.L. 2188.
Kewanees' exploration appears to have been mainly for Copper, Lead and Zinc using geochemical sampling methods. Many samples were also assayed for tungsten and tin but only a few were assayed for tantalum.

Several trenches were bulldozed at Ringing Rocks and at the Ivy tin prospect and a rock chip sampling programme carried out without encountering successful results. The area was relinquished in 1973 after the company intersected copper-nickel mineralisation in a diamond drillhole at Taylor Hills, well to the north of EL 2188 and their work was then concentrated on the new find.

In 1978 the N.T. Department of Mines and Energy flew part of the Ringing Rocks and Ivy mine areas in colour photography but did not follow up with an intended mapping programme.

In 1978 Mr. A.V. Miller located tantalite on EL 1958 which ultimately led to the application for EL 2188.

**REGIONAL GEOLOGY**

(a) **ARCHAEN - Arunta Complex**

The oldest rocks in the Licence area are mapped as Archaen in age and are considered to be part of the Arunta Complex. (Barrow Creek 1:250,000 Geological Map). These rocks are predominantly sediments but include basic lava flows or tuffs.

The rocks have been subjected to strong folding, faulting and high grade metamorphism. Rock types are dominantly quartz mica schists with phyllite, quartzite, amphibolite and calc silicates. Gneiss occurs near granite contacts and numerous granitic intrusions occur in the Archaen rocks. The regional strike of the foliation is north west with steep dips.

(b) **Lower Proterozoic - Hatches Creek Group.**

These sediments unconformably overlie the Arunta complex and are strongly folded and faulted. They consist predominantly of sandstone with minor greywacke, shale and acid to intermediate lavas. Sandstones and greywackes of this sequence outcrop at the North East corner of the Licence area where minor quartz veining is present in the rocks.

Dolerites and gabbros have been intruded into the sediments and one such occurrence lies near the eastern boundary of the Licence area.
The Hatches Creek group is not included in the Local Geology of EL 2188 due to its minor presence and lack of pegmatites on the NE and E boundaries.

(c) Lower Proterozoic - Granites.

Granite intrudes the Arunta Complex and the Hatches Creek Group. Numerous granite occurrences have been mapped on the 1:250,000 Barrow Creek sheet and have all been tentatively assigned a Lower Proterozoic age.

The Barrow Creek granite outcrops over an area of some 1800 square kilometers and lies immediately south of EL 2188. The granite outcrop trends NW-SE and minor isolated Sn, W and Ta occurrences are known on extensions of this trend to the south east, as at Utopia station.

To the north west, within the Licence area and beyond it, other granites occur which may be extensions of the Barrow Creek granite. These granites however are rarely exposed, but appear to be extensive in area.

(d) Upper Proterozoic - Central Mt. Stuart Beds.

These beds rest unconformably on the Archaen and Lower Proterozoic rocks. They are most extensive south and east of Barrow Creek settlement but thin rapidly to the north and north west. They are almost completely eroded within EL 2188.

The basal part of the beds outcrop in the Barrow Creek area and consist of cross bedded, ripple marked sandstones, grits and siltstones. Higher in the sequence to the south and east arkose, sandstone and siltstone occur in a sequence to 240 meters thick.

The beds were laid down on a very uneven topographic surface and beds high in the sequence rest on basement rocks. The beds have low undulating dips with a regional dip to the S.W. N.W. trending faults have occasionally displaced the beds.

(e) Tertiary

Chalcedony and soft silty limestone occur in the western half of the Barrow Creek 1:250,000 geological plan. They have been tentatively assigned a Tertiary age by Smith and Milligan due to similarities with more extensive deposits to the south. They appear to be freshwater lake deposits.

A small occurrence lies near the southern boundary of the Licence area.
(f) Quaternary

Aeolian sands cover the greater part of the region as a thin coating on areas of sub outcrop or as deep infillings of previous valleys. Clays, sands and gravels have been intersected in various drillholes in the region to depths of 85 meters. Records of drill logs in the Barrow Creek area however are not well documented and the depth of Quaternary alluvials in the Licence area can only be guessed at.

LOCAL GEOLOGY

(a) Archaen

These rocks outcrop sporadically in the eastern half of E.L. 2188. The western half is virtually all covered by aeolian sands and it is not known if the Archaen rocks or Lower Proterozoic granites underlie this area.

The main exposure lies near the centre of the Licence area in a broad N.E. trending belt of rocks known as the Western Pegmatites. Other exposures occur to the east — mainly on E.L. 1958 and to the north in an area known as Ringing Rocks.

Brecciated quartzites outcrop as prominent ridges in places throughout the Licence area. Most of these trend east-west or north-east. They may represent silica-filled fault lines but appear to be originally quartz sandstones which have been broken, sheared and recemented. They commonly occur within granites as massive undigested units.

The schistosity of the Archaen rocks within the Licence area trends mainly north-south or north east, against the regional north west trend. A greater degree of schistocity appears to be present in the east around the Ivy tin mine than in the western pegmatites.

The 3 main areas of Archaen rocks outcropping within the Licence area are described:

(i) Western Pegmatites. — The rocks in this area are mainly quartz mica schists and amphibolites. Other rock types noted were quartzites and phyllites with minor chlorite schist. Quartz reefs are common throughout the whole area and pegmatites occur in zones near granite contacts.
The original sediments in the schist sequence were mainly fine grained clayey sandstones with minor shales, mudstones and sandstones. Occasional thin coarse grained sandstone beds were also deposited and where units have been observed in the schists, the schistosity was parallel to the original bedding.

The schists are predominantly fine grained quartz-sericite rocks. In places they have been altered to a quartz tourmaline lode which is often found at the terminal points of quartz lodes or pegmatites but also occurs widely on its own. A gradational change along and across strike from quartz sericite schist to quartz tourmaline schist is evident where tourmaline is present. The areas of tourmalinisation are often extensive.

Quartz lenses are very common throughout the schists. These are described in a later section.

The amphibolites occur as thick parallel sequences or as discontinuous lenses within the sediments. The thicker units tend to be uniform in width and can be traced along strike for up to 4 km before being obscured by aeolian sands or cut by faulting. The more narrow units can commonly be traced intermittently along strike. The narrow units tend to be lenticular, especially in the south end of the field where shearing has undoubtedly resulted in their discontinuous lensy nature. Small isolated pods several meters in diameter can occasionally be found in sediments. The amphibolites tend to outcrop poorly and they have been traced mainly by float.

The amphibolites are considered to be bedded basic lava flows or tuffs. Some lenses of amphibolite may have been deposited in that form but secondary shearing has played a part in shaping others.

Schistosity is evident in most amphibolites. However some units outcrop as massive homogeneous boulders or tors giving the impression that they post date the strong regional schistosity. However, their field setting does not support this impression.

One petrological description of amphibolite was described as consisting of "well lined thin prismatic to acicular hornblende crystals, subparallel laths of andesine, and interstitial granular aggregates of andesine and minor quartz. There are fairly evenly distributed short stringers of magnetite, probably representing re-crystallized primary magnetite.

The fabric of the rock is extensively recrystallised and no primary textures have survived."
Epidote alteration is minor but widespread within the amphibolites which show some degree of schistosity. The alteration is generally limited to narrow veins and patches. However, one amphibolite unit lying adjacent to and sub-parallel a large fault on the Stirling side of the fence in the southern part of the area has been completely altered to an epidote rock. This unit can be traced for 1.4 km and is approximately 100 meters thick. Traces of copper occur in small pits within the unit near the Q.T. tin prospect.

Quartz veins and pegmatites occasionally cut across amphibolite units.

Structure

The Archaen rocks of the Western pegmatites generally trend north-south and have a steep easterly dip. A strong schistocity is evident throughout and is parallel the bedding. A fairly regular north-south trend is evident in the northern section while a north-east trend is more pronounced in the southern section.

Faulting and shearing is very common with the most pronounced systems trending at approximately 5°-10°, 45°-50°, 80°-85°, 110° and 170°.

A highly complex shear zone lies south-east of Johansson's prospect and is associated with a change in the regional trend of the schists. A second major fault in the south occurs as a large arcuate shear trending at about 170°. A change in the strike of the schistosity is associated with this fault.

The importance of the various shear zones is not clear as many are inferred and lie under sand cover.

(ii) Ritting Rocks – This area lies in the northern section of EL 2188 in an area of low relief, but several low rises occur on which the Archaen rocks partially outcrop along with granite, pegmatite and quartz reefs.

The area appears to be at the contact of a flat-topped granite intrusion – which accounts for the complicated outcrop outlines of granite, schists and pegmatites.

The Archaen rocks are comprised of schists and amphibolites as at the Western Pegmatites but outcrops of calc-silicate rocks are also common. The calc-silicates have a characteristic weathered limestone appearance but no carbonates appear to remain in the rocks. They are typically dark green in colour.
No detailed mapping has been carried out in the area and no structural details have been outlined. Much of the area is covered by sand.

Scheelite traces were reported from this area by Kieweno Aust. Pty. Ltd., but no tin or tantalite mineralisation has been reported to date.

(iii) Eastern Areas - Nearly all the Archean outcrops to the east lie within EL 1958, which is the subject of reports on that area. However it is noted that the schists here are much more micaceous than the western pegmatites and appear to be more highly metamorphosed.

Outcrops are very limited due to sand cover. A small area of outcrop on the eastern boundary of EL 1958 and within EL 2188 lies adjacent to a grid on the Stuart Highway. Here micaceous quartzites and minor quartz mica schists have been intruded by quartz veins up to 3 meters wide. No pegmatites have been noted and no mineralisation was located in the area. The low hill formed by the outcrop has been used as a road metal on the adjacent highway.

(b) LOWER PROTEROZOIC

(i) Granites - Granite is widespread within EL 2188. It is probable that all the granites are part of the Barrow Creek granite.

The Barrow Creek Granite is a coarse grained tourmaline-muscovite-biotite granite and is commonly porphyritic with numerous xenoliths in places. Outcrops of other granites within the Licence area are highly weathered but are mainly medium to coarse grained muscovite biotite granites with associated pegmatites and quartz tourmaline reeves.

On the western boundary of the Western Pegmatites the granite contact is associated with the junction of the flat plains and the low rises. The flat plains are underlain by granite and the rises are formed by the more resistant Archean rocks. The westward extent of the granite beneath the plains is not known.

Granite separates the Ringing Rocks area and Western Pegmatites. It is inferred that granite also separates the eastern area around the Ivy tin mine from the Western Pegmatites. Very little evidence is available to support this but the following are indicators:

1. A coarse grained sand, similar to that derived from granite occurs just north of the access track from the Ivy tin mine to Hugo Jacks tin mine about half way between the two prospects.

2. The large amount of granitic material encountered in an unsuccessful drillhole for water 1 km west of Millers camp, indicates the close proximity of granite in the area.
(ii) Pegmatites and Greisens — Pegmatites are associated with all the granites within the E and they occur in granites, schists and amphibolites. They appear to be most common within schists close to granite contacts. Greisens are rarely seen.

Only rocks containing felspar, quartz and muscovite have been referred to as pegmatites in mapping. No interpretation has been made for quartz reefs which might be part of obscured pegmatite or greisen lodes — the weathered quartz scree obscuring the softer micaceous sections of such lodes.

Pegmatite lodes observed to date are narrow — commonly 0.5 to 1.0 meters wide, and limited in strike. They usually occur parallel to the regional schistosity and occur in groups or zones. Occasional small isolated lenses are found.

(iii) Quartz Lodes — Quartz lodes are extremely common throughout the western pegmatite belt. Mapping indicates that most of the lodes are "sweat" veins which have been formed from silica remobilised from the sediments during metamorphism.

Nearly all veins are short and lenticular and probably fill small drag folds. Most veins would be shorter than 50 meters while some are short and thick and resemble pipes with widths up to 10 meters. One vein south of West Dam can be traced by intermittent outcrop for 350 meters with an average width of 2 meters.

Occasional traces of muscovite have been noted in a few quartz reefs which could well represent the siliceous sections of pegmatite veins. Other reefs contain tourmaline and ilmenite and may also be pegmatitic in part.

(iv) Mineralogy — The following heavy minerals have been identified in the field and confirmed by assay — magnetite, haematite, ilmenite, cassiterite, tantalite, tourmaline and wolframite. Magnetite, haematite and ilmenite are very wide spread and are present in all panned concentrates in variable amounts. Their ultimate source rocks are probably the Archaean amphibolites. Cassiterite, tantalite, tourmaline and wolframite occurrences are rare and restricted to only a few minor occurrences.

(a) UPPER PROTEROZOIC

These ferruginous quartz sandstones occur as hard remnants capping the Barrow Creek Granite and have led to the formation of impressive mesas. Small remnants of the sandstones have been found overlying the granite outcrops on the western side of the western pegmatite belt. A small outcrop has also been found overlying granite south of the Ringing Rocks prospect indicating that the whole of the area was covered by sandstone in Lower Proterozoic times.
The sandstone occurrences near the Western Pegmatites are all close to the base of the current erosion surface. They are also at lower elevations than the rises forming the Western Pegmatites and much lower than the ridges forming Mt. Nelson. A very uneven Lower Proterozoic erosion surface is therefore indicated and it is assumed that the Western Pegmatites and other high surfaces of ancient rocks such as Mt. Nelson were much higher hills before the current erosion cycle began wearing them away.

Post Upper Proterozoic faulting is evident in the Barrow Creek mesas. A west north west trending fault with a vertical throw of approximately 15 meters has resulted in the north block being upthrown and as a consequence Stapletons Pinnacle now forms a high remnant of the upthrown block. The age of similar faulting in the Barrow Creek area is regarded as Carboniferous.

(d) TERTIARY

A sequence of chalcedony rocks occurs in the southern central portion of the Licence area. This outcrop is 1 kilometer long and up to 150 meters wide and stands some 10 meters above the surrounding plain. Chalcedony boulders are also found near the northern boundary of the Licence along the Neutral Junction boundary fence.

(e) QUATERNARY

The concept of a deep alluvial-filled valley system is important for the alluvial tantalite potential of EL 2188. Very little evidence is available to negate or support this concept. If such a stream system exists it is an obvious target for buried alluvial concentrations of tin and tantalite. The present drainage system does not have enough energy to form economic alluvial concentrations.

SUMMARY AND CONCLUSIONS

Mapping has indicated that:

(a) Granite and granite contact zones are widespread in the Licence area.

(b) Pegmatites are numerous within the Licence area and are generally restricted to granite contact zones. Not all contact zones contain pegmatites.

(c) Pegmatites appear to be very rarely mineralised with tantalum or tin.

(d) Quartz veining is extremely common in Archaen rocks. Most veins are not of pegmatite origin. A few may represent pegmatite occurrences.