Talmina Trading Pty. Ltd.

Exploration Licence 2613

Finniss River, Northern Territory

Annual Report 1985

Licensee: J.W. Benger
Operator: Talmina Trading Pty. Ltd.
Period: 5th October 1984 – 4th October 1985
Submitted: January, 1986
Author: J.W. Benger
Location: Darwin 1:250,000 SD 52-4
Bynoe 1:100,000 5072
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SUMMARY

Exploration Licence 2613, comprising 23 blocks, is located 46 kilometres south of Darwin in the Finiss Range area.

Talmina Trading Pty. Ltd. has been exploring the area for tin/tantalite mineralization in the pegmatite under a joint venture agreement with the licensee J.W. Benger.

Exploration during 1984/85 consisted of costeaning, costean mapping, bulk sampling and sampling of pegmatites and alluvial/elluvial materials from all over EL 2613.

The pegmatites, which have been emplaced in Burrell Creek Formation, are zoned and a large proportion contain visible mineralization.

Microscopic and microbe studies of mineral concentrates has established that the ore mineralogy consists of tantalite-colombite, cassiterite, rutile, ilmenite, magnetite and amблиygonite.

The distribution of mineralization throughout individual pegmatites is patchy. Therefore, as exploration proceeds it is planned to utilise the pilot plant currently being used for bulk testing ore from MLN 1052 to sample and test material from EL 2613.
INTRODUCTION

Exploration Licence 2613 comprising 23 blocks of approximately 75 square kilometres was granted to J.W. Benger on 5th October 1983.

Talmina Trading Pty. Ltd. which currently holds rights to two leases, MLN 1052 and MLN 815, located within EL 2613 is carrying out exploration on the area through a joint venture agreement with the licensee. In September an application was lodged to convert the area contained within EL 2613 into two large mineral leases MLN 990 and MLN 991.

The licence area is located in a geological environment thought to contain tin/tantalite mineralization of significant economic potential. The mineralization is contained within an extensive suite of discrete granitic pegmatites generally trending northerly with the regional structure.

Current exploration activity by Talmina has been directed towards defining and mapping the pegmatite bodies and locating economic quantities of mineralization including columbite-tantalite, cassiterite, amblygonite and rare earth elements. In October 1985 Normet Pty. Ltd was commissioned to make a report on the treatment of amblygonite.

This report outlines the work done and results of exploration carried out by Talmina Trading Pty. Ltd. during 1984/85.

Exploration completed to date has comprised identification of pegmatites followed by ground checking, costeanning, mapping, sampling, and bulk sampling to establish the more important pegmatite occurrences requiring further mineralised assessment by drilling and bulk sampling.

Talmina has been operating a small 10ton/hour heavy-mineral extraction plant in MLN 1052 since 1981 for bulk sampling purposes to assess the grade and economic potential of the Saffums No.1 pegmatite. This plant has been replaced in May 1985 by a larger
pilot plant 40ton/hour to test material from pegmatite occurrences in EL 2613.

LOCATION AND ACCESS

The licence is located east of the Finness Range on the Darwin 1:250,000 sheet approximately 46 kilometres south of Darwin.

Access is possible via the Stuart Highway and Madora Road thence 17km along the Mt. Finness Road towards Wangi then westward for about 10km to the base camp along a dirt road upgraded to all-weather standard by Talmina.

The location map (Figure 1) shows the tenement situation and access to MLN 1052 and the base camp.

GEOLOGICAL SETTING

EL 2613 is located within a belt of sediments belonging to the Burrell Creek Formation of lower Proterozoic Age which runs in a general north to north-north-east direction through the centre of the Bynoe 1:100,000 sheet.

The majority of sequence consists of finely laminated siltstone interbedded with more massive beds of sandy greywacke siltstone, graphitic shale and minor quartz pebble and lithic conglomerate.

West of the licence area and the Finness Range the Burrell Creek sediments have been intruded by the Two Sisters Granite.

The siltstones which have been metamorphosed to muscovite phyllite and quartz mica schist have a well developed slatey cleavage whereas the more competent sandy units display a characteristic refracted sandstone cleavage. This major
foliation is regional in extent and is related to the predominant NNE fold direction. In high strain zones a crenulation cleavage has developed as a result of granite intrusion and/or introduction of pegmatite.

The pegmatites are present as discrete steeply dipping intrusives which strike generally in a NNE direction parallel to the regional foliation. An estimated 30 kilometre of strike length pegmatite has been identified by air photo interpretation and exploration to date. The pegmatites are suspected to be related to the nearby Two Sisters Granite but their origin and relationship to granitic rocks in the area has not been established.

Some of the outcropping pegmatites show significant heavy mineral content at surface and visible tantalite mineralization although patchy.

RESULTS OF PEGMATITE INVESTIGATION

1. WORK COMPLETED

Following regional field assessment and aerial photographic interpretation carried out by G.M.Kater of Greg Kater and Associates Pty. Ltd. the distribution of pegmatite occurrences and potential mineralized alluvial deposits within EL 2613 were postulated as shown on the accompanying 1:50,000 map (Figure 2).

Mineralized pegmatites were located in the field and some 1000 metres of costeans were completed to establish the form, structure and contact relationships of various pegmatites as well as provide sample material for bulk testing.

Approximately 2000 metres of costeans were examined and mapped.

2. PEGMATITE GEOLOGY

Host rock sediments crop out as persistent low undulating
ridges with the pegmatites represented especially on the ridge tops as quartz mica aggregates or milky quartz rubble. Recrystallisation of the contact rocks has made them more resistant to erosion and as a consequence pegmatite contact zones are readily identifiable.

Trenching has shown that pegmatite bodies are not limited to ridge tops but are also located under the alluvial flats.

The pegmatites vary greatly in size but are mainly discrete tabular bodies up to about 10 metres thick which may swell and thin along strike or branch into thin apophyses less than a metre across. More lenticular or bulging types similar to the Saffums No.1 pegmatite thicken to 35 metres at surface.

Mapping has shown that the surface representation of the various pegmatites may extent for more than 200 metres.

In general, the steeply dipping contacts which strike NNE are semi-concordant with bedding and the regional axial plane foliation.

Mapped field relation suggest that the form of intrusion is controlled by the more competent arenite members of the Burrell Creek Formation and regional fold structures.

The pegmatites are everywhere associated with quartz mica chiastolite schist. The chiastolite is present as small knotted aggregates or as larger interlocking rods to 10cm in length especially in the contact zones. Other forms of wall rock alteration include development of tourmaline needles, aligned with the long axis parallel to the contact, in areas where pegmatite has intruded grey to black shales.

During emplacement of some pegmatites a secondary crenulation cleavage was developed which has deformed the pre-existing foliation in adjacent schist outward from the contact zone. The deformation appears to be more severe in the vicinity
of the lenticular or bulging pegmatite bodies.

3. TEXTURE AND INTERNAL STRUCTURE

The granitic pegmatites generally have a coarse uneven texture with irregular variations in grain size of the component quartz, feldspar, brownish muscovite, occasional tourmaline and garnet.

Many of the pegmatite bodies have zoned internal structure consisting of prominent border zones less distinct wall zones and poorly developed cores.

Detailed costean mapping by D.Jutz has well illustrated the internal structure of a number of pegmatites as shown in Figures 2 to 6 in his report.

All of the pegmatites have border zones which are easily identified because of their sharp contacts, regular thickness rarely exceeding 50cms and fine grained greisen or aplitic composition. Not all the pegmatites are symmetrical because they may have only one border zone with the other contact showing some evidence of assimilation of wall rock although no wall rock inclusions have been noted.

Inside the border zone the texture becomes coarser and is characterised by development of book mica and orientation of the elongate quartz/feldspar minerals normal to the contact surface producing the distinctive stellar structure referred to by Jutz. This wall zone is not always present but quite often when well developed contains large tabular tantalite crystal aggregates. Internal greisenised zones carry similar rich values.

In general, intermediate and core zones are only recognisable in the wider pegmatite bodies. The intermediate zones are usually poorly developed and consist of coarse aggregates of quartz/feldspar or quartz/book mica with occasional greisen zones.
The core zones are characterised by much coarser textures which sometimes consist of massive quartz, giant amblygonite crystals or very coarse crystal masses of amblygonite with quartz.

Commonly the thinner pegmatites have cores of massive quartz especially in areas where the pegmatite swells along strike.

4. MINEROLOGY

Preliminary results from mineralogical studies of pegmatites in EL 2613 by Prof. G. Friedrich have been included in Volume 2 of the 1983/84 report.

Friedrich (May, 1984) established that the ore minerals columbite-tantalite, cassiterite, rutile, ilmenite and magnerite are present in the pegmatites and noted the occurrence of amblygonite in the pegmatite at Saffums No.1 deposit.

The minerals of the columbite-tantalite series form an almost continuous series of solid solutions within the range shown in the formula.

\[(\text{Fe, Mn}) \text{Nb}_2\text{O}_6 - (\text{Fe, Mn}) \text{Ta}_2\text{O}_6\]

The name columbite is used for minerals in which \(\text{Nb}\sim\text{Ta}\) and tantalite for those with \(\text{Ta} \sim\text{Nb}\).

Friedrich has shown that the minerogology at Saffums No.1 and Sandra Hill contains tantalite-columbite with \(\text{Ta} \sim\text{Nb}\). However, microbe data of selected cassiterite grains showed inclusions of columbite-tantalite in the cassiterite.

Chemically, the average values in weight % indicate high \(\text{Ta}_2\text{O}_5\) between 65 and 80%.
WORK DONE

Work carried out during the year included studies of the area within Exploration Licence 2613 by Dr. John Ivanac of Carins and Dr. John Cottle of Fluor Corporation. Dr. Ivanac's work is not available as information he collected is confidential to his client. Dr. Ivanac was carrying out an assessment of the area for a potential Joint Venturer.

Dr. Cottle's report is included with this report.

J. Crago, prospector, spent six weeks prospecting the main pegmatites in the area, in company with one other prospector and a Komatsu P.C. 200 excavator and operator.

Crago's work covered Martins, Sandra Hill, Turners, Chiastolite Hill, Saffum's 1, 11 & 111, Shaun, David, Fred's 1 & 11, Chinaman, also two previously unrecorded pegmatites.

Many pan samples were taken from all of these areas and estimates made of the grade and Ta - Sn ratio.

Bulk samples were taken from;

- Saffum's 1
- Saffum's 11
- Saffum's 111
- Sandra Hill
- Martin's

7,000 tonnes
3,000 tonnes
1,500 tonnes
1,500 tonnes
1,000 tonnes

Extensive roadworks were carried out during the year, including upgrading of existing roads.

1000 metres of costeasing was done and sampled and 1000 metres of previous costeasing was sampled. After many requests we have been unable to get a written report from J. Crago detailing results of his panning and sampling work.
Bulk sampling results are still being studied and a proper evaluation is difficult to assess at this stage due to the varying nature of the mineralization within the different pegmatites. John Middrie was employed for approximately 8 weeks on prospecting and then on mapping of the lease area. In May, 1985 the company's new bulk testing-production plant was commissioned. The plant subsequently had a lot of teething problems.

In September 1985 an application was lodged with the Department of Mines and Energy to convert the whole of E.L. 2613 into two Mineral Leases (MLN 990 & MLN 991).

The proposed expenditure on E.L. 2613 for 1985-86 is $250,000.
CONCLUSION

Exploration Licence 2613 contains an extensive suite of granitic pegmatite bodies intruded into sediments of the lower Proterozoic Burrell Creek Formation.

A strike length in excess of 30 kilometres of pegmatite has been estimated from photogeological interpretation but only a small proportion has so far been explored by costeaming and mapping.

Individual pegmatite bodies are mainly tabular in shape but the more important bulging types are zoned and preliminary work has shown that in these mineralization is associated with certain zones.

As the Ta$_2$O$_5$ content is in excess of Nb$_2$O$_5$, tantalite mineralization predominates.

The distribution of tantalite, lesser cassiterite and amblygonite mineralization in individual pegmatites is patchy so that sampling and grade estimation may be a problem. It is planned to overcome this by bulk testing samples from various pegmatites through the pilot plant.
**STATEMENT OF EXPENDITURE**

Expenditure for the year ending October, 1985 was:-

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$ 532785
## DRILL HOLE LOG SUMMARY

**PROJECT:** EL2613 - Sandra Hill  
**CO ORDINATES:** 9305E, 7660N  
**INCLINATION:** Vertical  
**DRILLER:** Hickey Drilling Co.  
**TYPE:** Non-cored Water @ 34m  
**DATE:** 5-11-84  
**HOLE NO:** SP 1

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<td>0-6</td>
<td>pegmatite, quartz/mica/40% kaolin oxidized red coloration</td>
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<td>7-</td>
<td>pegmatite, q/m/fine white kaolin, bleached white</td>
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<tr>
<td>16-19</td>
<td>pegmatite, visible tantalite, dirty grey</td>
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<tr>
<td>20-</td>
<td>pegmatite, pale green quartz, q/m/f, mica becoming coarse</td>
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<td>21-23</td>
<td>pegmatite c s mica/quartz</td>
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<td>24-</td>
<td>pegmatite, q/m/f, dirty grey</td>
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<tr>
<td>27-</td>
<td>pegmatite, wet sample, mica becomes finer</td>
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<td>34-39</td>
<td>pegmatite, c s mica/quartz</td>
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<td>pegmatite, q/m/f, kaolinised pink feldspar, some black MnO₂</td>
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### DRILL HOLE LOG SUMMARY

**PROJECT:** EL2613 - Sandra Hill  
**CO ORDINATES:** 9307E, 7666N  
**INCLINATION:** Vertical  
**DRILLER:** Hickey Drilling Co.  
**TYPE:** non-cored Water @ 27m  
**DATE:** 6-11-84  
**HOLE NO:** SP 2

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<td>pegmatite, q/m/kaolinised, bleached feldspar</td>
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<td>12-</td>
<td>pegmatite, becomes dirty grey</td>
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<td>15-19</td>
<td>pegmatite, q/m/f, coarse mica</td>
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<td>23-26</td>
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<td>27-</td>
<td>pegmatite, wet sample</td>
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<tr>
<td>34-39</td>
<td>pegmatite, coarse mica flakes</td>
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<tr>
<td>43-</td>
<td>pegmatite, q/m/pink feldspar, some black MnO₂</td>
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<tr>
<td>60-61</td>
<td>pegmatite, visible tantalite</td>
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<td>61</td>
<td>EQH</td>
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TALMINA TRADING PTY LTD

TANTALITE DEPOSIT FEASIBILITY SCOPING STUDY

FLUOR AUSTRALIA PTY LTD

MAY 1985
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1.0 SUMMARY

1.1 Objective

Fluor was requested by Northern Gold NL to inspect the Talmina Trading Pty Ltd - Northern Territory Tantalite Deposit and prepare a report outlining the scope of work required to determine the feasibility of producing approximately 1 Mt of ore per annum yielding 400 t Tantalite over a 10 year life.

1.2 Conclusions

Because detailed exploration and delineation of ore bearing zones is presently at an early stage Fluor recommends the following program of work.

(a) Development of an exploration program, the results of which will provide a data base for a project feasibility study.

(b) Supervise and where necessary participate in the execution of the above program.

(c) Perform a feasibility study of the project.
2.0 SCOPE OF WORK

The work scope will require a two phased approach comprising initial data collection and reserves estimation followed finally by a study of technical project feasibility and associated design requirements.

The suggested phased scope and associated general items of work are outlined below:

2.1 Phase I: Exploration/Evaluation

2.1.1 Geology

- Field exploration/evaluation
- Global reserves estimation

2.1.2 Metallurgy

- Plant inspection and measurement of present metallurgical balance.
- Installation of recommended facilities to achieve quantifiable recoveries for analysis of exploration phase bulk samples and to confirm the proposed metallurgical process.

2.2 Phase II: Feasibility Study

2.2.1 Geology

- Orebody/lode development
- Local ore reserves

2.2.2 Mining

- Lode/eluvial/alluvial production methodologies
- Mine planning design
- Production scheduling
2.2.3 Metallurgy

- Metallurgical testwork required to finalise flowsheet and plant design
- Flowsheet design based on testwork results and Flexmet flowsheet balancing computer program providing quick evaluation of circulating loads and precise specification of individual equipment items
- Option evaluation including, in conjunction with other disciplines, optimum size, number, configuration and location of process plant(s) relative to delineated reserves, mine plan and attendant materials handling task.

2.2.4 Engineering

- Plant design/equipment selection
- Accommodation/workshop/infrastructure
- Power/water facilities
- Tailings disposal
- Stockpile layout and design

2.2.5 Financial Evaluation

- Capital cost estimate
- Construction schedule
- Cash flow
- Operating cost estimate
- Financial analysis

As Phase II work depends entirely on the results of Phase I, only a detailed outline of Phase I scope is included here. Detailing of Phase II work is better addressed subsequent to Phase I exploration and evaluation.
3.0 PHASE I : DETAILED EXPLORATION PROGRAM

3.1 Geology

3.1.1 Field Exploration and Evaluation

The various sampling methodologies outlined in this program (eg, drillhole, channel and bulk sampling) should be progressively reviewed on a quantitative basis for applicability and relevance to grade determination. Also a check sampling program comprising submission of approximately 10% duplicate samples should be instituted to check for laboratory reproducibility.

3.1.2 Surveying

The setting up of a base line and associated surveyed grid has commenced.

This grid should be continued and expanded to fully cover the areas of interest with theodolite surveyed, pegged and cleared grid lines, every 100 m.

Intervening 50 m grid lines should be pegged and flagged to enable all subsequent field work to be tied into the grid with tape and compass.

3.1.3 Field Mapping

(a) Geology

(i) Prepare a detailed area map of all pegmatite and quartz lode outcrop exposures.

(ii) Map lode and country rock structures and orientation.

(iii) Delineate potential extent of Eluvium.

(iv) Delineate aerial extent of Alluvium.
(b) Geophysics

(i) Review available aeromagnetic data for potential usefulness in pegmatic lode delineation.

(ii) Run a limited number of ground magnetics traverses to test applicability to pegmatite lode delineation.

(iii) Review multi-spectral imaging to test applicability to lode delineation.

3.1.4 Pegmatite Lode Drilling

This program is to test subsurface structure, depth extent, grade and tonnage of lodes.

(a) Holes should be inclined air percussion, surveyed, and targeted at approximately 20 m vertical depth below surface.

(b) 1 m downhole samples should be taken and systematically laid out beside each hole.

(c) Depending on hole diameter 1 m samples should be split with a riffle splitter to yield approximately 10 kg of sample.

(d) Sample preparation should be carried out as described in Section 3.1.9.

(e) Holes should be spaced every 50 m along outcrop delineated and geologically interpreted pegmatite lodes.
3.1.5 Channel Sampling of Pegmatite Lodes

Pegmatite lodes and margins should be systematically sampled across strike on approximately a 1 m long channel basis and approximately every 20 to 30 m along strike. This sample support yielding approximately 10 kg channel samples every metre should provide indications of spatial grade variability and permit more rigorous differentiation of ore bearing zones from relatively barren zones and thus upgrade production throughout. The method should be as follows:

(a) Excavate across strike costeans approximately 1 m deep by 1 m wide every 20 to 30 m along strike of delineated lodes.

(b) Pegmatitic costean spoil should be stockpiled in a manner allowing later reclamation for bulk sampling.

(c) Commencing within the wall rock Burrell Creek Formation begin taking 1 m channel samples from fresh floor material. The first sample should be 1 m of wall rock material.

- channel dimensions should be approximately 5 cm wide by 10 cm deep by 100 cm long to yield approximately 10 kg of sample.

- the entire sample should be placed in a single bag and labelled as to pegmatite lode name, costean number and distance of sample end points from specific costean origin (all costeans should be surveyed by theodolite picking up points every metre along the costean and recording northing, easting and reduced level for the top edge on each side and the bottom centre of the trench).
3.1.6 Bulk Sampling of Pegmatite Lodes.

The full spoil from the costean intersection of pegmatite lodes should be processed by the plant to produce a bulk preconcentrate according to the following. If the costean intersection is large (say requiring more than a days processing or approximately 300 t) the bulk sample should be split into geographically continuous portions, ie the bulk sample costean spoil pile should be subdivided into roughly equal appropriately sized portions on a basis of length along the costean.

(a) The location of the bulk sample should be recorded as to pegmatite lode and costean, and also location within a costean in the case of an overly large total bulk sample.

(b) The bulk sample should be weighed accurately by for example a truck weightbridge or weightometer.

(c) The sample should then be crushed as part of the process plant operation and then treated through the process plant to form a preconcentrate.

(d) As with the drillhole and channel samples the product should be analysed for Tantalum (Ta), Niobium (Nb), Tin (Sn), Lithium (Li) and Tungsten (W).

3.1.7 Eluvial Sampling

The surveyed costeanning already proposed should be continued to the base of all ridges to test the potential grade and tonnage of eluvial material.

(a) Clearly the depth of costeans testing the eluvial area will be controlled by the depth of top soil and thus may require different equipment than that used to excavate the deeper pegmatite lode portion of the costean.
(b) Care should be taken that eluvium is removed and stockpiled separately where the costean is to be deepened for substantial intersections of pegmatite lodes. For example, all eluvial material should be stockpiled on the left side of the costean while material from the deeper cut portions could be stockpiled on the right side of the trench. Whichever separation method is chosen it should be adhered to for an entire costean such that the eluvial material is maintained on the same side of the trench to avoid confusion.

(c) The eluvial material should then be treated in exactly the same manner as that outlined for bulk sampling of the pegmatite lode intersections.

3.1.8 Alluvial Sampling

The alluvial filled valleys surrounding the present pegmatite lode ridges could attain considerable depth and may also exhibit a layered habit in terms of heavy mineral distribution. As a result, except in shallow areas (10 m), trenching will only indicate mineral contents of the alluvium to a certain depth.

(a) It is suggested that a program of pattern Rotary Air Blast (RAB) drilling be instituted to test an area of alluvium for heavy mineral content and develop an appropriate sampling procedure.

(b) The generally water saturated nature of these areas may prevent the use of heavy drilling equipment, however lighter truck mounted RAB drilling equipment should be suitable.

(c) A 20 x 20 m grid (tied into the license area grid) should be surveyed over the selected area and holes drilled every 20 m in both grid directions.

(d) Total samples should be taken every 1 m down the hole and laid out systematically beside the hole in rows.
(e) If the sample is wet it should be allowed to dry as much as possible and then split using a riffle splitter to produce approximately 10 kg of sample. The remaining sample for each metre should be left in place according to the systematic layout in case of further sampling requirements at a later date. A metre of sample from a 5 cm or 2" diameter hole will yield approximately 2.5 kg of material. A 10 cm or 4" hole will yield 10 kg and a 20 cm or 8" hole will yield approximately 40 kg of sample per 1 m length.

(f) The split sample should be bagged and labelled in detail as to hole label and 'from', and 'to' depth down the hole.

(g) These alluvial samples should be prepared for assay in the same way as the pegmatite lode channel samples.

(h) Assay results should be analysed in detail to establish:

- heavy mineral distribution
- appropriateness of sampling technique
- local and global heavy mineral grade and tonnage of the tested area.

(i) Systematic layout of 1 m samples will enable careful logging of drill holes to ensure that contact between alluvium base and in situ country rock/material is recognised and incorporated in assay result analysis. Non-recognition of this contact may severely effect mine design parameters (grade, tonnes etc) and thus prejudice the selection of an appropriate mining methodology, eg dredging.
(j) Once the characteristics, habit and appropriate sampling methodology is established for the alluvial test area the program, with any appropriate modifications, should be expanded to test other alluvial areas. This is necessary because even given the most favourable scenario of 30 km of geological and grade continuous pegmatite lode averaging 5 m width and 20 m depth, up to 50 percent of the total grade and tonnage for the proposed 1 Mt annual production over a 10 year project life will still need to come from a combination of eluvial and predominantly alluvial material.

3.1.9 Drillhole and Channel Sample Preparation

(a) Samples should be accurately weighed as soon as practicable after collection, eg at the end of a day of sample collection in field. The sample should be weighed in the bag and an allowance for the bag subtracted.

(b) The particle size of the entire sample should be reduced to approximately 2 mm by use of a small crusher. Care should be taken to retain all sample and the crusher cleaned to prevent sample to sample contamination.

(c) The entire sample should then be carefully washed or panned to float away fine light minerals, mica clay, etc. The larger quartz, feldspar or other non-heavy mineral particles should not be rejected or panned out of this preconcentrate.

(d) In any case, in the initial stages of the program and intermittently thereafter, the pan washed reject material should be collected in its entirety, dried, and also sent for assaying. If carried out for 5 to 10 percent of samples this will enable analysis of the suggested sample preparation procedure and subsequent incorporation of any required modifications.

(e) The preconcentrate should be transferred to a plastic sample bag and labelled in detail.
(f) The preconcentrate sample should then be sent to a recognised mineral assay laboratory (eg Comlabs, Analabs) for analysis of:

Ta, Nb, Sn, Li and W

Initially, analysis for rare earth elements (REE) could also be conducted to determine whether any of these elements show potential concentrations worthy of recovery as by-products.

3.1.10 Global Reserves Estimation

Sample result analysis should include.

(a) The reconciliation of assay results for:

- channel samples
- bulk samples and,
- drillhole samples

(b) The definition of local barren and non-barren zones within pegmatite lodes to ensure maximum efficiency of both mining and treatment production operations.

(c) The determination of global reserves for each pegmatite lode and for the EL2613 area as a whole.

3.2 Metallurgy

3.2.1 Metallurgical Accounting

(a) The metallurgical balance for the existing plant should be derived to quantify present recovery and tonnage treated.

(b) Distribution of values between the various tailings and stockpile streams should be assessed along with the distribution of values in the various size fractions of those streams.
3.2.2 Plant Operation Review

(a) Based on losses determined from the metallurgical balance recommendations can be made to improve plant performance.

(b) These recommendations may include reconfiguration of the plant flowsheet and could extend to advising the purchase of additional cost effective equipment.

3.3 Timing and Costs

If the results are favourable this Phase I program would take approximately nine months to complete. Again, given favourable results it could prove up approximately 10 Mt of ore and would cost on the order of $1.5 M to $2.0 M.

These figures are based on a total of approximately 40,000 m of drilling split relatively evenly between pegmatite lode and alluvium drilling. Also included is the assaying of approximately 40,000 samples comprising approximately 20,000 alluvium samples, 8000 channel samples, 6000 pegmatite lode drilling samples, 2000 pegmatite lode bulk samples and 4000 check assay samples.
FINAL REPORT ON PROSPECTING EL2613

FINNISS RIVER

Author:
J.N.Crago  11-3-86
At the request of Mr. R. Cleaver and J. Benger, I was asked to evaluate the "in sight" reserves, and potential reserves at Finniss River and to advise on future directions for the project. This overview involved evaluating previous exploration, scout sampling of existing pits and establishing general operating parameters of the installed concentrator.

After establishing that "ore" was +0.15 Ta₂O₅, exploration was rather narrowly focused on proving ore for the concentrator, because "reserves available for mining ore small in relation to the installed capacity of the treatment plant". For various reasons not relevant to this report the concentrator had by industry standards very high operating costs and as such only very high grade feed was ore. The 1985 exploration season was influenced by these facts.

PREVIOUS WORK

Previous exploration had been conducted under the direction of Mr. N. Wigg and it was very evident very extensive costeaming and sampling of the known pegmatites and their likely extensions had been carried out. Subsequently Mr. J. H. Niddrie was engaged to initiate a methodical programme of mapping and sampling and this work was quite advanced when Mr. Niddrie opted not to return to the site. It was decided to start from scratch and to ignore previous work, except the mapping of G. Kater and Associates.

WORK CARRIED OUT JUNE JULY AUGUST 1985

In company with J. Benger all known pegmatites believed to contain significant mineralization were located, access prepared, and excavator utilized to obtain a clean sampling face. The pegmatite was channell sampled at regular intervals, and samples were also taken from the spoil heaps, panned, bagged and details of sample location etc. recorded. The concentrated heavy minerals were tested in a zinc dish with 10% HCL a visual estimate was recorded of the ratio of Sn to black minerals, the black minerals at that stage being assumed to be tantalite.

At first pass pegmatites consistently showing +90% SnO₂ were excluded from further work, although their estimated Ta₂O₅ grade was recorded for re-evaluation at a less pressing time. As a result of these field tests 14 pegmatites were selected for sampling as to grade size and Ta : Sn ratios. (see table 1).
Significant results were obtained at Saffums #2 north west zone, Turners and Martins. Sandra's pegmatite while possessed of high Ta to Sn ratios failed to give potential ore grades. Prospecting showed grades only intermittently higher than 0.1kg/m³ Ta₂O₅, however detailed testing was carried out due to its large dimensions 400m x 30m. The results of this detailed evaluation is shown in Table 2. It will be seen that ore grades were obtained at Saffums #2 North West, Martins and Turners. The ore grade pegmatites were not mapped in detail, their approximate diamensions measured using topofil and compass a potential reserve figure based on observed grade and surface diaments was made for both pegmatite and colloival (see table 3). As it was evident from the first pass evaluation that the known pegmatites would not support the current mining operation a search for new pegmatites was initiated, a caterpillar D6 was used to form crossings over large drainages that had blocked access previously 2 pegmatites were located in the area located in plan b patchy mineralization was obtained from surface prospecting. Elsewhere using the excavator a pit was dug to bedrock and samples taken every 50cm estimated values were below 0.05 Ta₂O₅ except in the interval 5.00m to 5.50m which graded about 0.05 Ta₂O₅ (visual estimate of zinced concentrates). The pit was sited to test a swarm on Chiasolite Hill the Freds group of pegmatites a high tantalte area. The results were dis-couraging more by the absence of values the materials in the pit being low energy derived silts, mud, sand oner laterite. The drainage tested was orientiated NNE-SSW and similar results were obtained to the north on adjoin-ing areas held by Greenex, it is notable that the economic mineralization there is in a generally east west drainage (lees) I have advised Talmina to test E-W oriented drainages in preference to the more numerous N-S as a matter of priority in the end of course all potential alluvial areas should be test-ed. The east to west system represents remenants of tertiary paleo-channel and were probable active during a period of different climate and higher energy. Lees drainage contains coarse gravels and cobbles covered by a reasonably clean sand with a surface of 2 meters of striped silt.

Considerable time was spent simply walking the ground in a methodical search for pegmatites as usually there is no dispersal train of mineral to back track to them, it is for that reason I am confident not all the pegmatites outcropping on the exploration licence have been found. Due to a prior engage-
ment on Cape York I was unable to spend any more time after 10th September to follow up the prospects described herein and my recommendations for further work to be done. It is evident that Tantalite and Cassiterite mineralization is widespread over the Licence and a great deal of basic grassroots is both warranted and necessary to prove sufficient reserves before undertaking a mining operation.
TABLE 2
Our ref: LP3708  
Your ref: 408767

Dear Sirs,

16th August, 1985

Please find tabled below the weights of samples after drying and pulverising. Unfortunately the samples had gone through our preparation procedure before we realised that we should have weighed the concentrates - our apologies for this mistake on our part.

The weights recorded below will be indicative of the actual sample weight sent to us except that there will have been some slight loss of the sample during pulverising stage which we normally estimate to be less than 1 gm.

Again our apologies for the inconvenience this may have caused.

| AR 373 | 3.6908 |
| 374    | 14.0730 |
| 375    | 10.8715 |
| 376    | 6.0021 |
| 377    | 8.3092 |
| 378    | 4.3711 |
| 379    | 13.0340 |
| 380    | 7.6177 |
| 381    | 1.4013 |
| 382    | 4.8307 |
| 383    | 2.4476 |
| 384    | 4.7453 |
| 385    | 7.4822 |
| 386    | 10.0464 |
| 387    | 2.9249 |
| 388    | 3.4550 |
| 389    | 4.3421 |
| 390    | 4.4200 |
| 391    | 3.8153 |
| 392    | 4.7489 |
| 393    | 7.6921 |
| 394    | No sample |
| 395    | 11.6182 |
| 396    | 7.0348 |
| 397    | 4.0969 |
| 398    | 21.9022 |
| 399    | 12.9111 |
| 400    | 5.9850 |
| AR 401 | 3.5268 |

Yours faithfully,

R. BOWEN

SGS AUSTRALIA Pty Ltd.
ANALYTICAL REPORT ON SAMPLES SUBMITTED BY / ON BEHALF OF

Talmaina Trading Pty Ltd.,

P.O. Box 196,

Berrimah, N.T. 5788

Our Ref LP3708 / G16528
Your Ref 408767
Date Received 12 AUG., 1985
Date Completed 16 AUG., 1985
Number of Samples 29
Pages in Report 3

Issued at Perth on 16 AUG., 1985

Incorporated in New South Wales, a member of the SGS Group (Societe Generale de Surveillance)
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Analysis Code M-14 M-14 M-14
Method of Preparation SP4C SP4C SP4C
SAMPLE PREPARATION CARRIED OUT

PREPARATION CODE .. SP4C
Sample has been dried if necessary and whole sample pulverised in a Chromium Steel Mill.

METHOD OF ANALYSIS USED

ANALYSIS CODE .. M-14
Fusion XRF method with corrections for inter-element matrix effects using MORISH correction.
Precision of analysis is +/- 5% at 10X LLD.
FINNIS RIVER TANTALITE PROJECT

PROGRESS REPORT

OCTOBER 1984

G. N. KATER
B.Sc.  M.Aus.  I.M.M.
GREG KATER & ASSOCIATES PTY. LIMITED
FINNIS RIVER TANTALITE PROJECT

INTRODUCTION

The Finnis River Tantalite Project is owned 80% by Talmina Trading Pty. Ltd., a private Northern Territory Company and 20% by Tiffany Resources Ltd., a listed Canadian Company.

The Project Area is held under Exploration Licence 2613 and two Gold Mining Leases, G.M.L.'s 167B and 168B, which are within E.L. 2613. The Exploration Licence was granted on 5th October, 1983 for a period of six years, and covers a total area of 75 square kilometres.

The area is accessible by 47 kilometres of bitumen and gravel roads south of Darwin.

The area contains extensive suites of pegmatite lodes which are hosts to tantalite and tin mineralisation in the Licence area. The area was first prospected by tin miners in 1880's, who were disappointed to find that most of the heavy mineral was not tin but tantalite. A number of old shallow pits are evidence of this early prospecting. Between 1981 and 1984, inspection of surface exposures together with air-photo interpretation delineated pegmatite lodes with an aggregate strike length of about 80 kilometres.

Recent extensive trenching across an aggregate 20 kilometres length has exposed near-vertical pegmatite lode material varying in thickness between 2 and 37 metres. A large proportion of the pegmatites contains visible tantalite. Values vary between 0.5 kilograms/tonne of tin-tantalite concentrates where little or no heavy mineral is visible up to 75 kilograms/tonne in visible rich patches.

Weathering and erosion of the pegmatites during formation of the present flat to gently rolling terrain has produced widespread mineralised eluvial deposits along the flanks of the pegmatites. In addition, large alluvial flats following ancient water courses are known to contain some tantalite mineralisation and warrant testing for potential dredging operations.

Resource estimates are as follows:

Measured Reserves:

151,000 tonnes @ 1.48 kg/t tantalite concentrate

Indicated Reserves:

905,000 tonnes @ 1.30 kg/t tantalite concentrate

Inferred Resources:

10,000,000 tonnes above 0.44 kg/t tantalite concentrate
RESULTS OF RECENT BULK TESTING

Talmina, during the first half of 1981, constructed a small pilot plant, consisting only of a grizzly and sluice, within G.M.L. 167B and approximately 2,000 tonnes of eluvial and pegmatite material was washed through. More than a tonne of heavy mineral was recovered and separated into two concentrates:

1) 774 kilograms of tantalite concentrate grading 32.4% tantalum pentoxide, 41% niobium pentoxide and 0.91% tin.

2) 381 kilograms of cassiterite concentrate grading 69.7% tin and 3.0% tantalum pentoxide.

Thus recoveries were 0.4 kg/cu.m of tantalite concentrate and 0.2 kg/cu.m of cassiterite concentrate. It was reported by G. N. Kater, at the time that recoveries were confined to sizes between 1 and 3 millimetres whilst a considerable quantity of large and fine particles was lost.

Subsequently a more comprehensive bulk testing pilot plant, comprising grizzly, trommel and jigs, was constructed to further test eluvials and pegmatite material in G.M.L. 167B. During 1982, more than 5,000 tonnes of material was treated, recovering 5,174 kilograms of heavy minerals for an average total heavy mineral content of approximately 1.0 kg/tonne separated into 0.70 kg/tonne tantalite concentrate, 0.25 kg/tonne cassiterite concentrate and 0.05 kg/tonne waste. Most fine material was recovered in this second treatment plant; however, it was observed by the writer that a significant quantity of rich tantalite ore was lost in grizzly and trommel oversize material which is still stockpiled on site. Losses were at least 50% of total heavy mineral.

Tantalite concentrates averaged 40.5% tantalum pentoxide, 40.2% niobium pentoxide and 1.4% tin.

Cassiterite concentrates averaged 73% tin and 1.5% tantalum pentoxide.

Electron Microprobe studies conducted by the Technical University Aachen, West Germany, on heavy minerals from the area suggest that average concentrates containing 80 to 81% combined tantalum and niobium pentoxide should be attainable. Such a concentrate is expected to be readily marketable. Minerals, such as antimony and arsenic, which are normally penalised by tantalite consumers, were not detected in the concentrates.

RESOURCE ESTIMATES

Resource estimates are made on the basis of work conducted during 1981 to 1984 by Prof. Alan Jopling, Dr. Ross Fardon, Prof. Gunter Friedrich, Neville Wigg and G. N. Kater. Grade estimates are made on the basis of bulk sampling in G.M.L. 167B and sampling and field observations of oversize stockpiles and trenches.
The first resource estimates in G.M.L. 167B"(Saffums Lease) were made in 1981 (Jopling, Kater) when an indicated reserve of 170,000 tonnes of mineralised eluvials was measured. This was subsequently confirmed by systematic bulk sampling of both eluvial and pegmatite material. By August 1984 the pegmatites had been exposed by traxcavator to depths up to 7 metres.

Subsequent resource estimates were made by Dr. Fardon (May 1984) and G. Kater (September 1984) based on sampling, observation and measurement. Whilst volumes of reserves can be measured with accuracy, average grades are more difficult to assess owing to the variable nature of mineralisation in the pegmatites, and thus grade estimations are made with heavy reliance on bulk testing experience in addition to sampling. Overall grades, outside the lease bulk tested, can only be classified as measured and proven status after further bulk testing is completed. Therefore the following resource classifications are made:

1. **Measured Reserves**: Accurate measurement of size and estimation of average grade with high confidence. Includes stockpiles.

2. **Indicated Reserves**: Good accuracy in measurement of real size projected to 10 metres depth, and estimation of average grades based on trenches with reasonable degree of confidence.

3. **Inferred Resources**: Inferred from lines with widespread trenching and grades based on widespread sampling.

The following estimates are made:

**A. G.M.L. 167B (SAFFUMS LEASE)**

**MEASURED RESERVES**

**Stockpiles:**

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<th>Tonnes Estimated</th>
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<td>0.5 kg/t Sn</td>
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**Oversize stockpile:**

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<td></td>
<td>0.25 kg/t Sn</td>
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**Eluvial:**

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<td>0.5 kg/t Sn</td>
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**Pegmatite:**

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<td>0.5 kg/t Sn</td>
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</tr>
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</table>
INDICATED RESERVES

Eluvial:

85,000 tonnes estimated @ 0.75 kg/t Ta O concentrate
and 0.25 kg/t SnO concentrate

*Pegmatite:

70,000 tonnes estimated @ 0.75 kg/t Ta O concentrate
and 0.25 kg/t SnO concentrate

* Pegmatite estimates are made to the lowest excavated depth or a maximum of 10 metres. Several zones with tantalite concentrate values up to 75 kg/t have been exposed and may raise the overall grade.

B. TURNERS/MARTINS/SANDRAS ZONES:

This zone, in the central portion of the Exploration Licence 2613, is of special interest, as trenching has been conducted over a distance of 2.25 kilometres exposing widths of pegmatite between 15 and 37 metres. At Turners/Martins a length of 1,100 metres and at Sandras a length of 400 metres have average widths of 25 metres. A 750 metre section in between has sparse trenching and tonnage can only be inferred. The zone is still open at both ends. Tantalite concentrate values from trench sampling varied between 0.5 kg/tonne, where little or no tantalite is visible, and up to 75 kg/tonne where tantalite is visible. Visible tantalite is common. Indicated Reserves are estimated to a maximum depth of 10 metres and Inferred Resources to a maximum of 20 metres.

INDICATED RESERVES:

Turners/Martin:

550,000 tonnes @ 1.5 kg/t Ta O concentrate
2 5
and 0.5 kg/t SnO concentrate
2

Sandras:

200,000 tonnes @ 1.5 kg/t Ta O concentrate
2 5
and 0.5 kg/t SnO concentrate
2

INFERRED RESOURCES:

Turners/Martins:

550,000 tonnes @ 0.75 kg/t Ta O concentrate
2 5
and 0.25 kg/t Ta₂O₅ concentrate

Sandras:
200,000 tonnes @ 0.75 kg/t Ta₂O₅ concentrate
and 0.25 kg/t Ta₂O₅ concentrate

Martins/Sandras:
300,000 tonnes @ 0.5 kg/t Ta₂O₅ concentrate
and 0.2 kg/t SnO₂ concentrate

C. OTHER AREAS

Estimates of potential by Dr. Ross Fardon are based on widespread trenching over 20 kilometres strike length of an overall estimated total of 80 kilometres length of pegmatite zones. Some trenches have exposed over 20 metres width of pegmatite whilst others show widths from 2 to 6 metres.

Average width of 5 metres is considered to be realistically conservative. Dr. Fardon's sampling avoided zones of obviously high grade tantalite to determine a background value of 0.4 kg/t Ta₂O₅ concentrate.

Hence Dr. Fardon's estimates to a maximum depth of 20 metres are as follows:

INFERRED RESOURCES

Eluvial:
4,000,000 tonnes above 0.4 kg/t Ta₂O₅ concentrate

Pegmatite:
5,000,000 tonnes above 0.4 kg/t Ta₂O₅ concentrate

D. RESOURCE SUMMARY

MEASURED RESERVES:
151,000 tonnes @ 1.48 kg/t Ta₂O₅ concentrate

INDICATED RESERVES:
905,000 tonnes @ 1.3 kg/t Ta₂O₅ concentrate

INFERRED RESOURCES:
10,000,000 tonnes above 0.44 kg/t Ta₂O₅ concentrate
PROPOSED TREATMENT PLANT

A proposed treatment plant designed to treat 9,000 tonnes per month is currently being constructed with the following objectives:

- To produce 10,000 to 12,000 kilograms of tantalite concentrate per month (85% recovery) or 120,000 to 140,000 kilograms per year. This would be estimated to contain 48,000 to 58,500 kg (105,000 to 123,000 lb.) per year of tantalum pentoxide and a similar quantity of niobium pentoxide.

- To raise all reserves to proven status by bulk treatment runs.

- To use the material to test markets in Europe, Asia and U.S.A.

- To complete a feasibility study for significantly larger production.

Recent engineering studies indicate that mining and treatment costs would be about A$8 per tonne of ore which translates to a cost per pound (lb) of contained tantalum pentoxide of A$7.20 to A$10.60 for recovery grades of 1.5 kg/t and 1.0 kg/t of tantalite concentrate respectively.
CHEMICAL PROPERTIES OF FINNIS RIVER TANTALITE

From results of bulk testing and electron microprobe studies the tantalite product (after separation from tin concentrate) is likely to range between the following total chemical range depicted by (1) and (2) below:

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<th>(1)</th>
<th>(2)</th>
<th>Bulk Average</th>
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<td>42.0%</td>
<td>40.5%</td>
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<td>NbO</td>
<td>42.0%</td>
<td>39.0%</td>
<td>40.2%</td>
</tr>
<tr>
<td>SnO</td>
<td>1.3%</td>
<td>1.5%</td>
<td>1.4%</td>
</tr>
<tr>
<td>FeO</td>
<td>7.6%</td>
<td>7.2%</td>
<td>7.4%</td>
</tr>
<tr>
<td>MnO</td>
<td>9.1%</td>
<td>9.5%</td>
<td>9.3%</td>
</tr>
<tr>
<td>TiO</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td></td>
<td>98.8%</td>
<td>99.5%</td>
<td>99.1%</td>
</tr>
</tbody>
</table>

Likely average chemical composition of tin concentrate would be:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>TaO</td>
<td>1.5%</td>
</tr>
<tr>
<td>NbO</td>
<td>1.5%</td>
</tr>
<tr>
<td>SnO</td>
<td>92.7%</td>
</tr>
<tr>
<td>FeO</td>
<td>0.4%</td>
</tr>
<tr>
<td>MnO</td>
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</tr>
<tr>
<td>TiO</td>
<td>0.3%</td>
</tr>
<tr>
<td>WO3</td>
<td>0.1%</td>
</tr>
<tr>
<td></td>
<td>96.6%</td>
</tr>
</tbody>
</table>