

# VAN DIEMAN MINES PTY LTD

RL 1 / 2002 - RINGAROOMA RIVER

ANNUAL REPORT

PERIOD ENDING 30<sup>th</sup> JUNE 2005

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**DATE PREPARED:**

15<sup>th</sup> June 2005

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## EXECUTIVE SUMMARY

In June 2004, Van Dieman Mines (VDM) exercised its "Option to Purchase" from Mineral Holdings Australia Pty Ltd (MHAPL). Following Ministerial approval of the transfer to VDM the company commenced to work in its own right on the tenement.

VDM commenced activities by checking all previous database information and rechecking digitising of map based data. Offshore drill data were re-assessed and where discrepancies were located additional checks of the MRT archives conducted. The preliminary ore resource statements prepared by Terrence Willstead & Associates were checked and a variety of dredging scenarios for the group resources investigated. Further field inspections were undertaken and quotations sought for the drilling of at least three holes in the palaeo-channel. A general shortage of available drill rigs in Tasmania may mean that VDM has been unable to fulfil its drilling commitment.

VDM, as part of this work, has confirmed that the tenement contains a substantial and potentially economically viable tin bearing resource. This forms part of a much larger resource, the Great Northern Plains Resource, which extends to the south and also northwards, offshore into Ringarooma Bay. Preliminary dredge mining for several of the onshore areas has been investigated and data relating to that study is being reviewed as a possible mining technique for this deposit. That information is appended.

During the year VDM appointed Encom Technology of Sydney to consolidate the database and manage that database on an ongoing basis. The purchase of Trimble DGPS equipment and specialist mapping software will enable VDM to better control acquisition of field data.

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## 1.0 INTRODUCTION

During the year VDM continued to compile the MHAPL data and also additional data acquired from the archives of Mineral Resources Tasmania. Major discrepancies were located in the offshore data sets and an effort was made, without great success, to locate in MRT archives original data sets.

Encom has now rechecked accuracy of digitised data and compiled those data onto a map base. The figures appearing in this text reflect their work. Preliminary 3D orebody simulation has been completed for the Great Northern Plain and a basement topographic contour map in both 2D and 3D completed. This work will be extended offshore during 2005 - 2006.

Information received relating to possible dredging scenarios is being reviewed and resources recalculated to reflect varying cut-off grades and stripping ratios (double dredging). In support of those works further feasibility and environmental studies have commenced.

VDM is mindful of the obligation to drill one hole in the palaeochannel. To date the company has been unable to source a rig suitable for alluvial testing due in part to a shortage of rigs and an excess of drill activities. VDM will pursue such drill program subject to availability of a specialist alluvial drill rig and grant of access by Mineral Resources Tasmania.

## 2.0 LOCATION AND ACCESS

The centroid of the tenement is located at approximately 5,477,000mN, 577,000mE some 15 km north west of the township of Gladstone and 4 km north-north east of the abandoned township of Boobyalla in north east Tasmania. See Figure 1. Approximately 50% of the tenement lies onshore on the northern edge of the Great Northern Plain, the balance offshore in Ringarooma Bay.

Access is, at this time, difficult. Formed farm tracks provide access from the Cape Portland Road through Rushy Lagoon and Red Hill Holdings to the vicinity of Bowlers Lagoon. Locally around Bowlers Lagoon access is difficult, swampy ground and high wind blown dunes make vehicular access near impossible.

## 3.0 EXPENDITURE STATEMENT

Expenditure for the past twelve monthly period, June 2004 to June 2005, was \$10,750.00.



FIGURE 1 - LOCATION PLAN, RL 1 / 2002

## 4.0 HISTORICAL BACKGROUND

There has been no mining activity conducted on this section of the Great Northern Plain, the nearest workings are located along the northern bank of the Ringarooma River approximately 8 to 9 km south of the tenement.

During the period 1930 to 1982 a number of companies conducted exploratory drilling programs across the Great Northern Plains, they include:

- 1930: Austral Malay Tin - scout drilling;
- 1930 / 40's: Delta Tin Mines - 33 holes for 591 metres in the Delta and Fosters marshes areas;
- 1956-58: Dorset Tin Dredging - 37 holes for 575 metres using a 400 mm bulk rig. The first major resource derived at 45 M m<sup>3</sup> at 55 gm/m<sup>3</sup>;
- 1958: Rio Tinto Australia Exploration - located the Scoloch Lead;
- 1966: Utah Development - 100 auger and 27 churn drill holes mostly regional;
- 1966-69: Tasmanian Offshore Exploration - conducted regional bathymetric surveys, marine seismic surveys and a drill sampling program comprising some 138 holes in the ocean bottom sediments.
- 1967: Tasmanian Mines Department - a program of holes around the Chimneys area located the Braithwaite's deposits;
- 1972: WANEX - 124 holes for 1,244 metres around McGregor's Mine;
- 1978: Preussag - drilled 23 reverse circulation holes for 470 metres, several holes in areas immediately adjoining the tenement; and
- 1981 - 82: Hellyer Mining - completed 155 churn drill holes for 3,263 metres and 8 Calweld drill holes for bulk samples. Of those holes some 23 holes were drilled within the northern section of RL 15/1987 immediately adjoining RL 1/2002.

Of those programs only Ocean Mining (1966 to 1969) conducted work within the tenement boundaries however Hellyer / Santos (1981 - 82), Preussag (1978) drilled holes within the area immediately adjoining RL 1 / 2002. See Figure 5. Those holes lie at the northern end of the Great Northern Plains marine embayment and within the resource defined in that feature by VDM. The offshore work conducted during the 1966 to 1969 period established that the marine embayment of the Great Northern Plain extended offshore for some 15 km, a distinct channel was located and a resource of some 190 to 200 M m<sup>3</sup> delineated.

## 5.0 GEOLOGY

Previous geological work undertaken by Mineral Holdings is being re-assessed in light of the basement topographic studies completed by Encom. This work recognises and confirms the development, during the Tertiary period, of a major marine embayment that now hosts the marine tin bearing deposits.

### 5.1 REGIONAL SETTING

It is not proposed to provide a detailed description of the older geological units, a brief outline of the nature of each major unit occurring within the tenement is provided in tabulated form. See Table 1 and the geological map included as Figure 2.

The tabulation sets out the significance of each unit. It is the Tertiary units, in particular the basal sections, that are of economic significance as they contain the heavy mineral concentrations; cassiterite, tantalite, gold and sapphire being the most economically important.

The Tertiary marine embayment is a significant local feature and appears to have hosted a number of regressive and transgressive phases during that period. The presence of the embayment is supported by drill data (Great Northern Plains drilling (See Figure 5), by previous gravity geophysical surveys conducted by Shell Exploration in 1981 and by aeromagnetic data (See Figure 3).

It is most likely that the tenement encompasses only areas of marine sedimentation. The basement topographic appearing here as Figure 4 indicates that a possible tributary feeder channel may occur in the south eastern section of the tenement. This feeder channel is postulated to represent the northern end of the Scoloch Lead, an extension of the Scotia deposits.

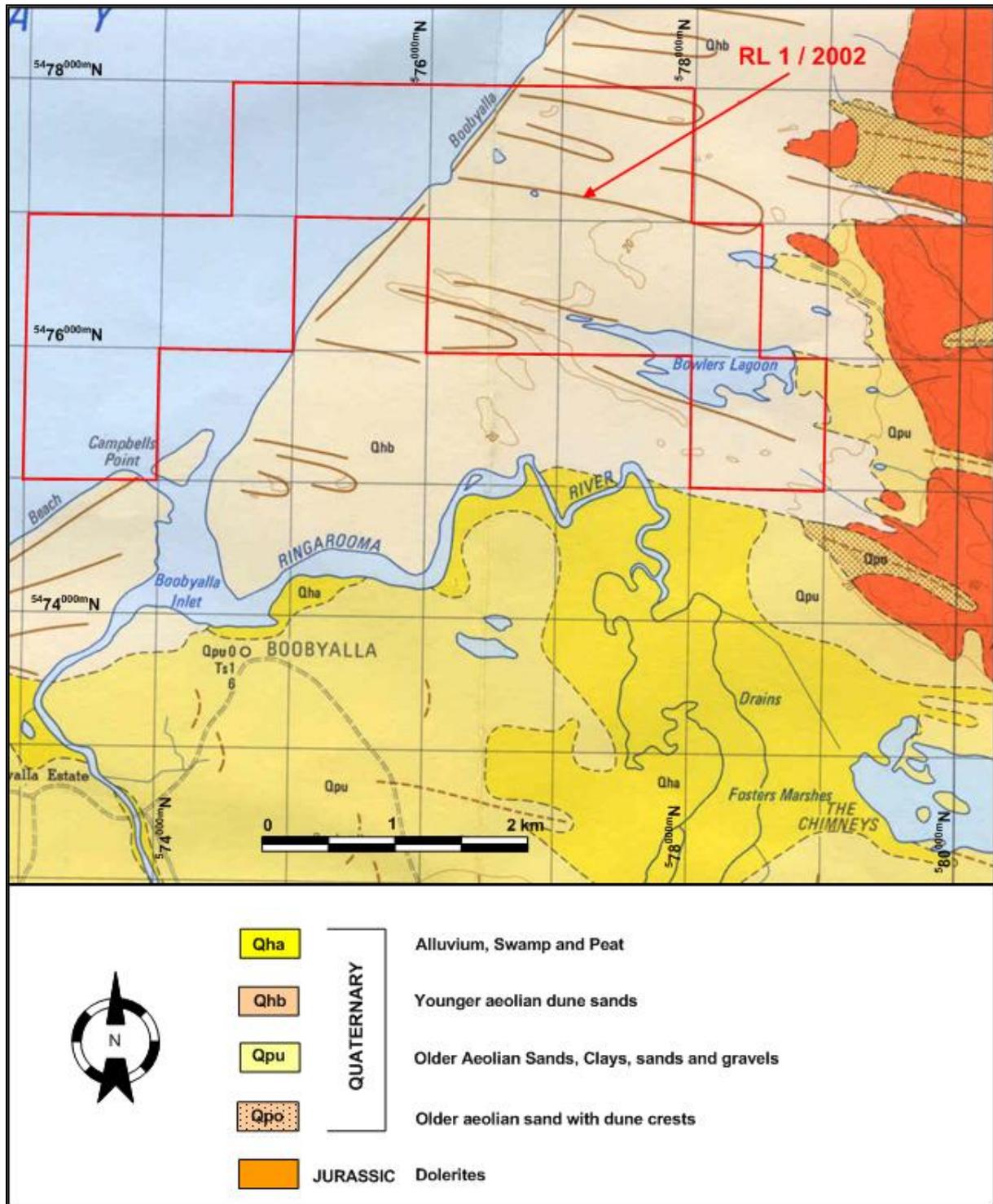


FIGURE 2 - REGIONAL GEOLOGICAL MAP

**TABLE 1**  
**REGIONAL GEOLOGICAL SETTING**  
**MAJOR GEOLOGICAL UNITS**

AGE	UNIT	DESCRIPTION	SIGNIFICANCE
DEVONIAN - CARBONIFEROUS	Blue Tier Batholith	Porphyritic fine to coarse grained granite / adamellite and biotite-hornblende granodiorite	Forms the tin rich Mt Cameron Massif to the south of Aberfoyle and basement around the southern edge of the Tertiary marine embayment. Locally may be a source of tin.
JURASSIC	Dolerite	Dolerite	Forms a resistant basement outcrop and is the bounding feature of the eastern edge of the Tertiary marine embayment. Sporadic outcrops may occur resting on granite basement along the southern edge of the embayment
ORDOVICIAN TO DEVONIAN	Mathinna Beds	Quartzwacke turbidite sequence locally hornfelsed adjacent to granite bodies	Forms basement in parts of the Aberfoyle area and its low weathering resistance may lead to the development of tin rich Tertiary channels cut into this unit.
TERTIARY	Unnamed	Sands, clays and gravels, locally bouldery. Lignite zones at some localities. Some evidence of ferricrete and silcrete development.	Basal layers are generally tin (cassiterite) enriched, locally of economic significance. Also known to contain gold, sapphire, rutile, zircon and ilmenite.
QUATERNARY	Unnamed	Highly variable; sands, clays, peats, Aeolian dune deposits, swamp and marsh deposits.	Locally represent overburden zones over Tertiary tin bearing alluvial deposits

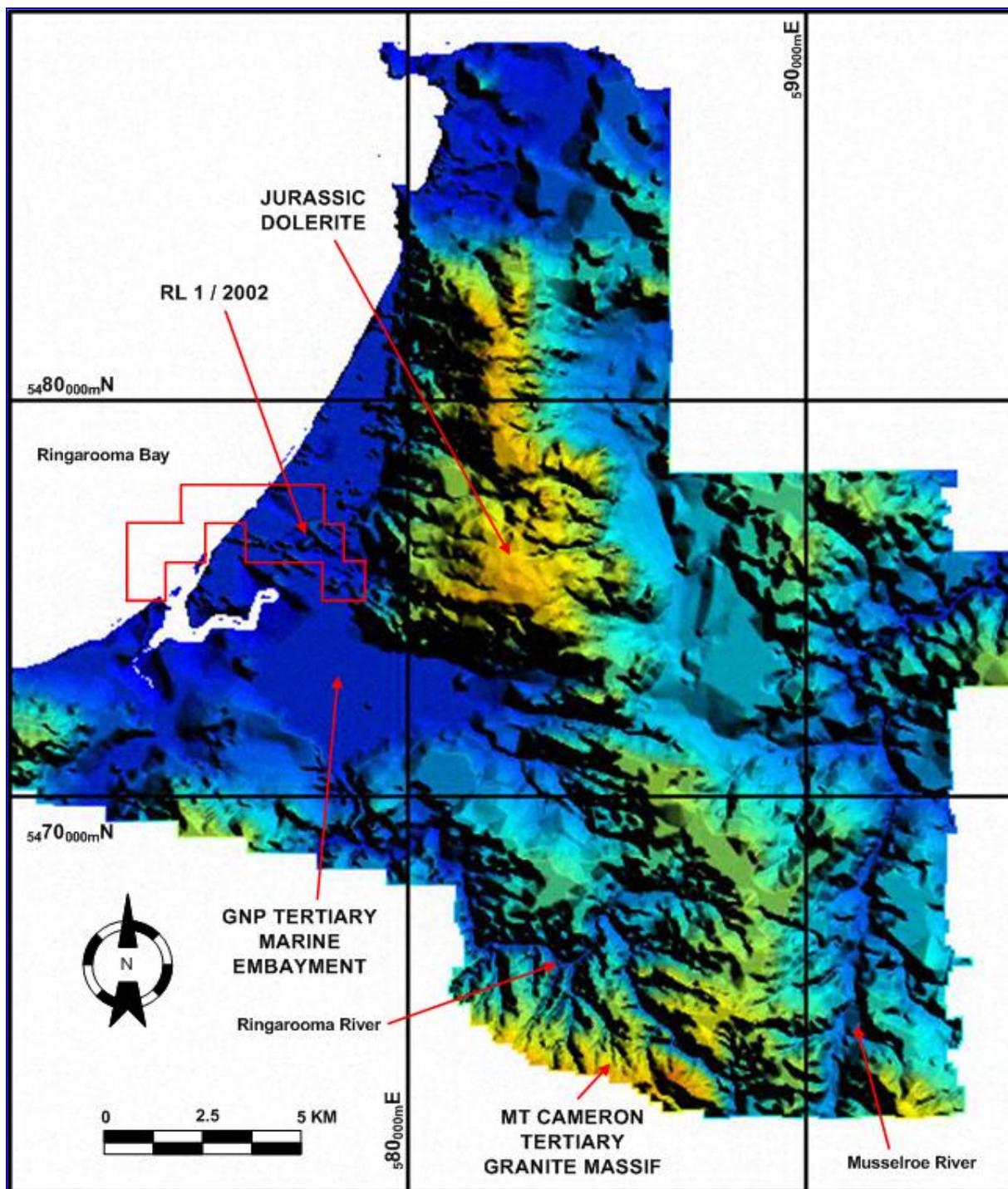


FIGURE 3 - REGIONAL GEOPHYSICAL MAP

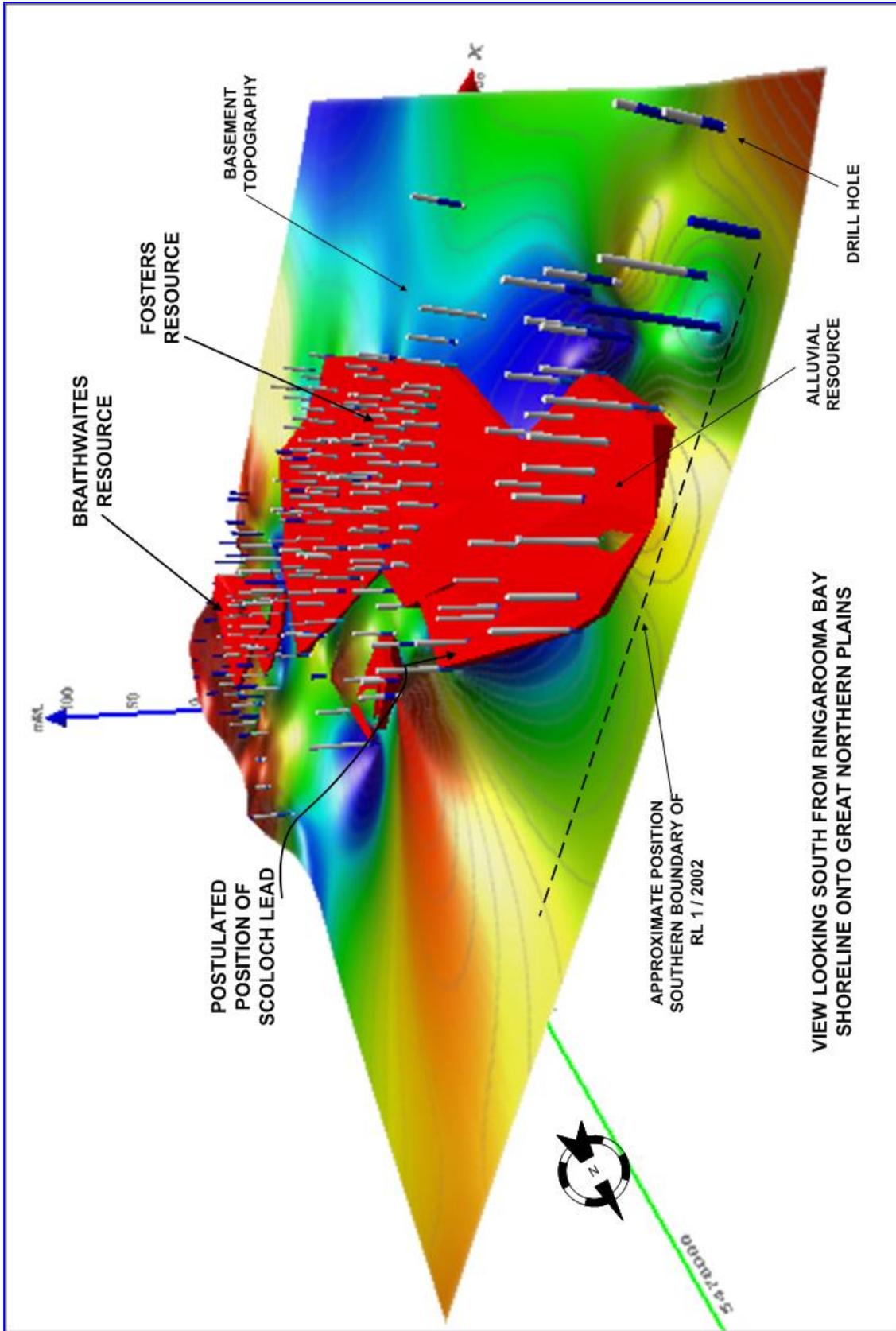


FIGURE 4 - BASEMENT TOPOGRAPHIC MAP, GREAT NORTHERN PLAINS

The sediment sequence developed in the embayment consists of surface soils, peaty swamp deposits and thick clay horizons overlying and grading downwards into sands, grits and pebble and cobble beds. More coarse basal horizons are expected to be developed along the eastern edge of the embayment where prevailing winds and seas have caused more rapid erosion of the Jurassic dolerite. There is some evidence of marine reworking within the onshore sedimentary profile, multiple layering of tin bearing horizons occurring as lens like deposits at several locations.

The current shoreline at Ringarooma Bay hosts major aeolian and marine sand beds, their deposition caused by dominant westerly winds. It is most likely that a similar climatic environment existed during the Tertiary with sand build-up at Aberfoyle, deep inside the embayment and along the eastern strand line being driven by both tidal and climatic factors and also by alternating periods of transgression and regression.

Offshore the water depth contours appear to indicate that the channel closely follows a seabed topographic low zone. See Figure 6. As only three holes were drilled in this zone further drilling would be required to accurately determine channel boundaries. See Figure 5. Previous investigations by MHAPL indicate that there has been some recent, marine, near-shore reworking of the tin bearing channel deposits with longshore movement of heavy minerals.

It has proved difficult to create a basement topographic map at this time. Further data is required in relation to offshore drill hole depths and hole completion detail. As data come to hand such map will be produced.

## 6.0 ORE RESOURCE:

The ore resource defined within the marine embayment in tenements adjoining the RL on the Great Northern Plain continues north westward into RL 1 / 2002 and thence offshore into Ringarooma Bay. See Figure 5.

The work by Terence Willsteed & Associates for Van Dieman quotes the Great Northern Plain (Fosters) Resource as comprising some 34.1 million bank cubic metres (bcm) containing an average grade of 260.36 gm / bcm of cassiterite. This resource was calculated with its northern cut-off boundary along the southern boundary of RL 1 / 2002. It is estimated that the tenement, from that point to the coastline of Ringarooma Bay, contains a further 19 million bcm at grades of around 180 gm / bcm of cassiterite.

From the shoreline of the Bay the tin bearing resource channel trends north westward into Bass Strait for some 15 km. The resource reported for the whole of the offshore is 190 million m<sup>3</sup> at an average grade of between 150 and 250 gm / m<sup>3</sup> of cassiterite. Of that resource only a small near-shore wedge defined by three drill holes, 205, 207 and 228, occurs within the RL. See Figure 5 and Appendix 10.1. At this time no work has been undertaken to better define the offshore resource and further drilling across the trend of the channel both on and offshore will be required.

Work aimed at increasing resource reliability is ongoing and will form an integral part of the Van Dieman work program for the coming year.

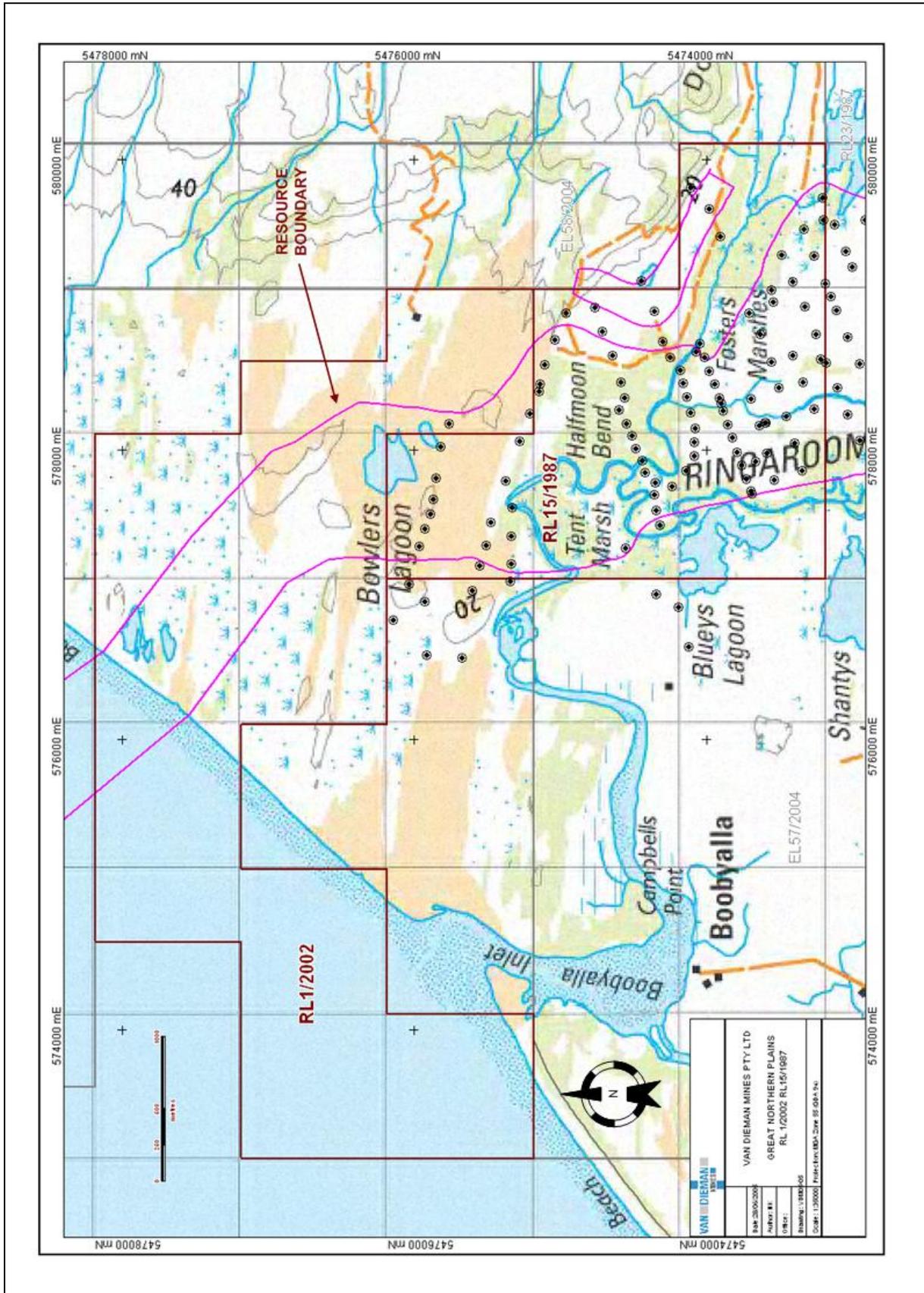


FIGURE 5 - DRILL HOLE LOCATIONS AND RESOURCE OUTLINES

## 7. CONCLUSIONS:

The onshore section of the tenement is considered to contain a highly prospective extension of the Great Northern Plains tin bearing alluvial resource. Preliminary estimates infer that the extension contains some 19 million bcm at grades of around 180 gm / bcm cassiterite. In addition it is believed that the resource also contains valuable accessory minerals; gold, tantalite, zircon, rutile and possibly sapphire.

The entry of a possible feeder lead, the Scoloch Lead, into the embayment close to the southern boundary of the tenement may give rise to increased grades or to multiple layers of tin bearing sediment. Reworking of that material along the doleritic basement of the eastern side of the embayment may also have created longshore, north - south trending strand deposits. Further work will be required to substantiate these assumptions.

In addition to the onshore potential, the offshore section of the tenement is also considered to contain tin bearing deposits both as channel fill material and as near-shore marine reworked wedges and longshore strand line deposits. GIS studies now appear to indicate that the offshore channel may pre-date the formation of the onshore marine embayment and represent a palaeo-river channel (the ancestral Ringarooma River or equivalent). Further modelling will be required to determine the relationship of the offshore and onshore sedimentary sequences.

Exploration during the coming year will be oriented to further delineating and defining these resources.

## 8. RECOMMENDATIONS:

The following work programme is recommended for the coming year, 2005 - 2006:

- a. Construction of 3D models and basement topographic maps for the offshore area and tying these to the onshore database;
- b. The works detailed in (a) will be used to site potential drill holes in the palaeochannel north of Bowlers Lagoon and in the nearshore marine environment;
- c. Make application for access to drill sites onshore;
- d. Re-assess offshore data sets including bathymetry and marine seismic and recalculate the offshore marine resources.

## 9. BIBLIOGRAPHY:

BERKMAN. D.A. (Ed) 2001.

Field Geologist Manual

The Aus IMM, Monograph No. 9, Fourth Edition.

BRAITHWAITE. J. B. 1976

Great Northern Plain, A Possible Dredging Area.

Mineral Resources Tasmania, File TR20\_62\_76

LEE. S. D., 1983

Geological Summary Report, Great Northern Plain, EL 19 / 77, CML 42M / 76  
& ELA 17 / 82.

Santos Limited, Unpublished.

MACARTHUR. N. A. & MASON. A. J. 2000

Pre Feasibility Review, Ringarooma Alluvial Tin, sapphire and Mineral sand  
Project. 25<sup>th</sup> September 2000.

Mineral Holdings Australia Pty Limited, Unpublished.

### HELLYER MINING & EXPLORATION

a. (Extract). 1982

Quarterly Progress Report to Oct. 1982.

Great Northern Plain, CML 42M / 76.

b. Drilling Records, Great Northern Plain. 1983.

c. Analytical Results, 1981

WONG. Y. F., 1979

Ringarooma Joint Venture, North-East Tasmania. Scout Drilling Report.

Preussag Australia Pty Ltd. Unpublished.

ZEPHYR MINERALS NL. 1995

Compilation File of Data Relating to the Great Northern Plains.

## 10. APPENDICES:

## 10.1 OFFSHORE DRILL DATA:

HOLE NUMBER	WATER DEPTH	INTERVAL DRILLED	BASEMENT DEPTH	GRADE gm/T Sn	SG T/ m <sup>3</sup>	GRADE gm/m <sup>3</sup> Sn	GRADE gm/m <sup>3</sup> SnO <sub>2</sub>
207	MHAPL Bottom Sample				1.6		
207	MHAPL Bottom Sample				1.6		
228	MHAPL Bottom Sample				1.6		

## 10.2 DREDGE MINING DATA:



MEMO	MTI HOLLAND BV	No. M04/0023	d.d. 12-01-2004
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**To** : Jan Willem de Wit  
**From** : Taco de Boer  
**Subject** : Tin mining Tasmania  
**Copy to** : C.J. Verkaik, H. van Muijen

### Introduction

This memo describes a short evaluation of the Scotia Tin project and other nearby projects in Tasmania with respect to dredgeability and economic value.

### Reference

- Fax, d.d. 8/9/2003 from Niugini Resources with filled in Questionnaire Dredge Mining Equipment
- Ore resource assessment of Scotia project, no EL 32 / 2001
- Reassessment The Pioneer Project, no EL 12 / 2000
- Reassessment The Endurance Project, EL 11 / 2000
- Correspondence between Mr Kinnane and our Mr. De Wit

### Summary information Scotia project

**History:** First mining activity 1891. In 1930's Scotia became a reserve and mining ceased. Many old workings present in the neighboring areas, mostly using hydraulic monitoring and sluice boxes. Maximum slopes angles reported of not exceeding 60° (Some kind of free flowing material). No active mining since 1980's in the whole area.

**Location:** North-East Tasmania, low populated area, vicinity small village (Gladstone), good infrastructure, river nearby but not clear if runs over deposit, power supply nearby (3 phase 415V). Old alluvial workings present. Landscape consists of heath en forest

**Deposit:** Around 42 sq. kms, narrow steep channel, 50-150 m width, with a maximum depth of 35 metres. Length more than 10 km. Total difference in height between beginning of channel and end not exactly known. Topsoil clayey sand + organic material (roots) dry removed for rehabilitation Overburden 15-20 m thick consists of sands, pugs and sandy clays with some lignitic layers and some large pebbles, especially along the edges of the channel deposit. Intermediate low grade wash which should be treated either as overburden or as low grade ore. Lead consists of cassiterite bearing alluvial and estuarine deposits (Tertiary). Gravely and pebbly wash, which becomes more angular near the flanks. (Large boulders may be present). Bedrock irregular (old riverbed) and consists of hard sandstone and slates with quartz veins. No information about hardness and rate of weathering. According literature strength values (UCS) vary for Sandstone from 40-100 MPa and for Slate from 20-250 MPa. Highest mineralization in horizons just above the bedrock. Possible additional value of ore because of accessory minerals, such as gold, sapphire and tantalite, but no indication of hard data.

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MEMO MTI HOLLAND BV No. M04/0023 d.d. 12-01-2004

Figure 1 gives a cross-sectional view of the deposit

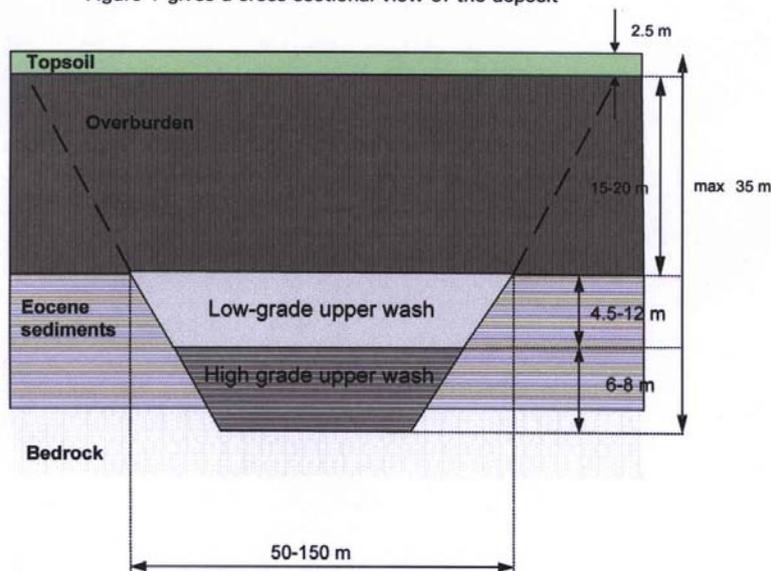


Figure 1: Cross-section Scotia deposit

### Soil conditions

#### Overburden:

The overburden of the Scotia project has a thickness of 15-20 metres and consists of sands, pugs and sandy clays with some lignitic layers and some large pebbles, especially along the edges of the channel deposit. With respect to dredgeability the overburden can be removed with a hydraulic type of dredge, preferably with cutting blades of teeth. Due to the presence of clay variations in production may be expected.

#### Lead deposit:

The lead deposit consists of a low grade upper wash and a high upper wash. Both should be considered as ore. Gravely and pebbly wash, which becomes more angular near the flanks. Large boulders may be present. Cassiterite and gravel have the same hardness. The bedrock around the lead deposit is hard and irregular, while highest grades of cassiterite can be expected in these irregularities. With respect to recovery of valuable material part of the bedrock should be dredged as well. However, there is no data about the condition of this bedrock. If its completely weathered a mechanical type of dredging would be best. If not a hydraulic dredging method would give the best results in cleaning these irregularities. The hardness, shape and size of the bedrock and gravely wash will result in high wear rates of the dredging installation.

### Resources + Values

An evaluation of the resources is attached in appendix 1. In the evaluation the overall recovery of the cassiterite is expected to be 80% (from mining questionnaire). The average grades for the Scotia project and Endurance are from Surface to Basement. The Pioneer project gives the average cassiterite grade for the lead only.



**MEMO** **MTI HOLLAND BV** **No. M04/0023** **d.d. 12-01-2004**

The total value of the deposit is calculated with today's tin prices and is the value of the tin metal in the deposit present. When only a tin-concentrate is produced, smelter/refining costs will significantly lower the total value. The value/m<sup>3</sup> dredged material includes both dredging of overburden and ore.

Niugini Resources indicates the presence of accessory minerals, especially gold and gemstones (sapphire) are mentioned. No data about grades are given, but if present they could increase the value of the deposit, but also require higher processing costs to separate these accessory minerals from the tin-concentrate. If these accessory minerals are not separated from the concentrate these could lead to extra deductions in the concentrate price.

In appendix 1 it can be seen that the costs for dredging and concentrating the mineral should be lower than \$ 1,10 per m<sup>3</sup> dredged material. This is calculated with current tin prices, which are at the highest level in several years.

### Benchmarking Tin

The benchmark of today's tin operations is PT Timah in Indonesia. This company produces around 40.000 tonnes of Tin annually and has its own smelter facilities. The worldwide production of Tin in 2001 was 242.000 tonnes. The worldwide demand for tin remains more or less constant over last few years.

Pt Timah operates 22 Bucket ladder Dredges in Indonesia both onshore and offshore. Their deposits cover a large area and overburden is sometimes pre-stripped by CSD's. The average overburdens of these deposits are more than 20 metres and the are mined in several benches. The maximum dredging depth of the Bucket ladder dredges is around 40-50 metres. Their equipment is already completely depreciated and they have a very low cost-price. The average grade of their deposits is around 400-500 gr/m<sup>3</sup> (Surface to Basement).

### Mining scenarios

The most prosperous project is the Scotia project in terms of value in the ground. Table 1 gives an overview of the different mining scenarios.

Years	Annual Amount to be dredged		Annual Amount to be dredged	
	Proven only [m3]	Annual Value [USD]	Proven + indicated [m3]	Annual Value [USD]
5	4.277.470	\$4.699.487	8.546.870	\$9.678.461
10	2.138.735	\$2.349.743	4.273.435	\$4.839.231
15	1.425.823	\$1.566.496	2.848.957	\$3.226.154
20	1.069.368	\$1.174.872	2.136.718	\$2.419.615

Table 1

For the Scotia project a stripping ratio of 1.2 to 1 can be considered as mentioned in the Ore Resource Assessment of Niugini. In terms of value only the 5 and 10 years are interesting.

	5 years	10 years	Unit	Number of shifts	1
Overburden	2333166	1166583	m3	Hours per shift	10 hrs
Ore	1944305	972152	m3	Working days/a	365 days
Production rate ore	761	380	m3/h	Working hours	3650 hrs
Production rate overburden	913	457	m3/h	Operating efficiency	70%
				Production hours	2555 hrs



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The plant feed capacity is planned to be 300 m<sup>3</sup>/hr in-situ solids. For this case the 10 years mining scenario would suit the plants feed capacity. However the planned annual production hours of the dredge are considered very low compared to the capital investment of a dredge. With a 10 years mine life the annual amount of tin metal that would be produced from this mine will be around 700 tonnes.

For mining this deposit at least two dredges are needed.

The overburden is 15-20 metres thick and would be difficult to control when mined with one bench. The best option is to mine the overburden in two benches of each maximum of 10 metres, with a cutter suction dredger. In case this is dredged with one dredge it will involve more relocations of the dredge. The maximum inclination of the overburden is not reported and should be determined.

The lead deposit consists of both high and low grade basal wash. In case only one dredge pond is chosen for both overburden and ore dredges, this indicated that the ore dredger must be capable of dredging as deep as 35 metres. This requires a large sized dredge with a rather low capacity. A Bucket Ladder Dredge could mine the complete thickness of the lead. In case of a hydraulic dredge probably two benches are required. This increases the size of the dredge pond.

Another option could be pre-stripping the overburden completely and than lowering the water table and using same dredge for mining the lead.

## Discussion

### Conclusions:

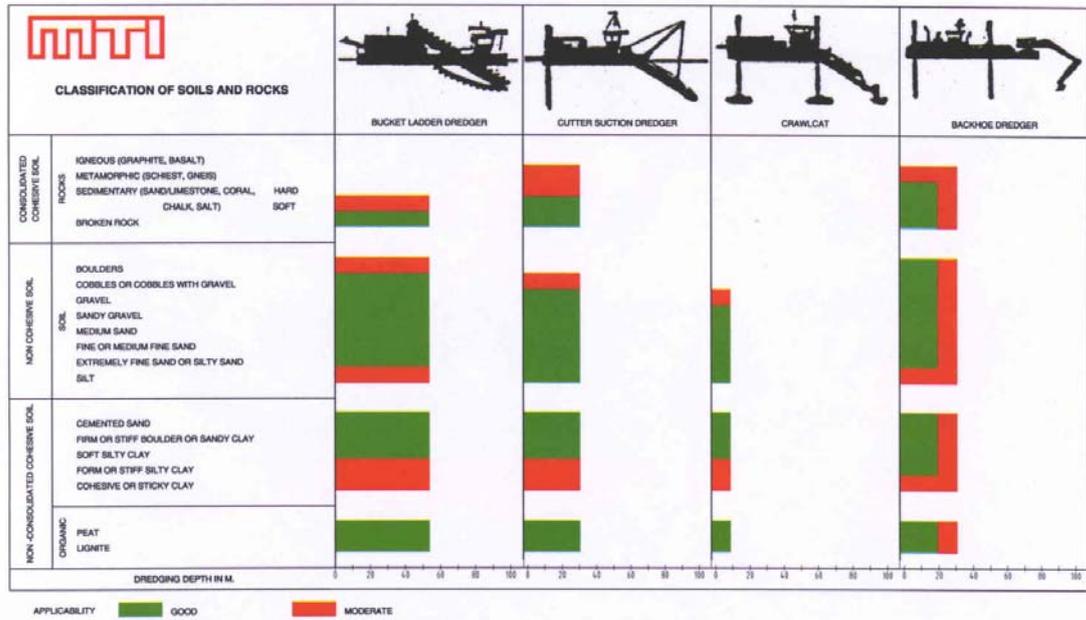
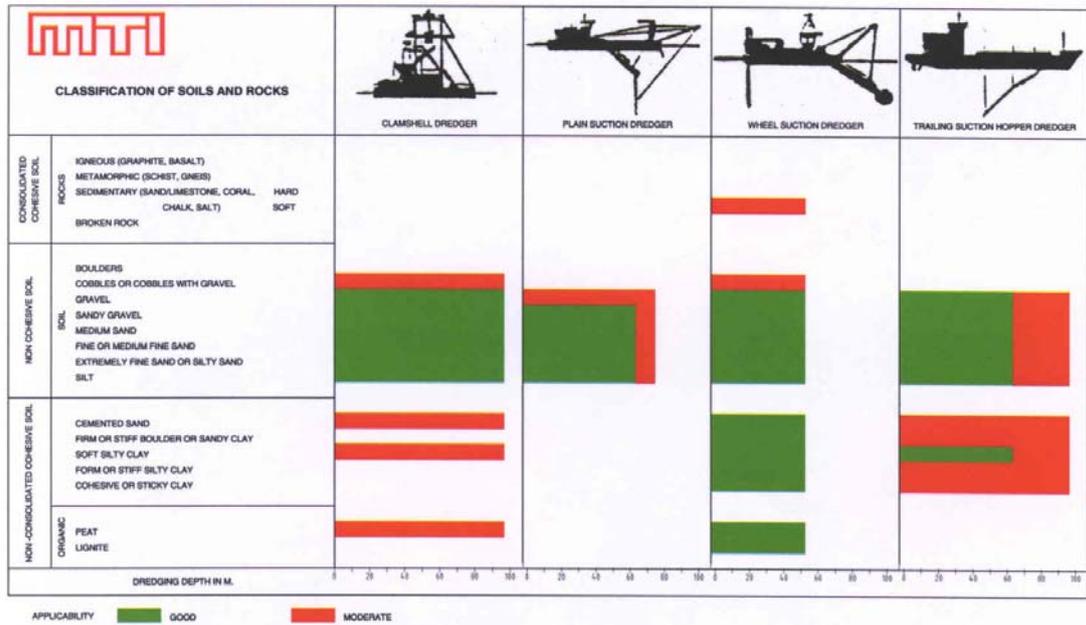
The geotechnical information about the overburden, lead deposit and bedrock is limited, no data about hardness, cementation, rate of weathering and cohesion are given. This means that at this stage it is difficult to select the best type of dredge, especially for the mining the tin layers.

The maximum dredging depth of the deposit is 35 metres. A new dredge which is capable of dredging at these depths will require high capital costs. PT Timah has a similar dredging depth sometimes even higher, but their dredges and treatment plants are already completely paid off. Furthermore their deposits cover a large area, while this deposit is a narrow channel. This means that dilutions of tin bearing material can be quite high. The bedrock consists of hard rocks and is very irregular. This could lead to difficulties in dredging all the valuable material, because the cassiterite has the highest grade near the bedrock and in these irregularities.

No indication of grades of accessory valuable minerals are given. This means that only a forecast was made of the total value of the tin in the deposit. The total costs for overburden removal, dredging of ore and concentrating the mineral should be less than \$ 1,10 m<sup>3</sup> dredged material with current tin prices. With two dredgers of which one is capable of dredging at 35 metres and a treatment plant and probably high wear rate due to angular shaped gravel and bedrock, this is most likely not a viable project. The other projects Endurance and Pioneer have even lower values per m<sup>3</sup> dredged material.

### Further Steps:

The presence of accessory minerals such as gold and sapphire could significantly increase the total value of the deposit. This should be investigated first.



DREDGING EQUIPMENT AND APPLICABILITY