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

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 (Tertiair). 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.

Figure 1 gives a cross-sectional view of the deposit

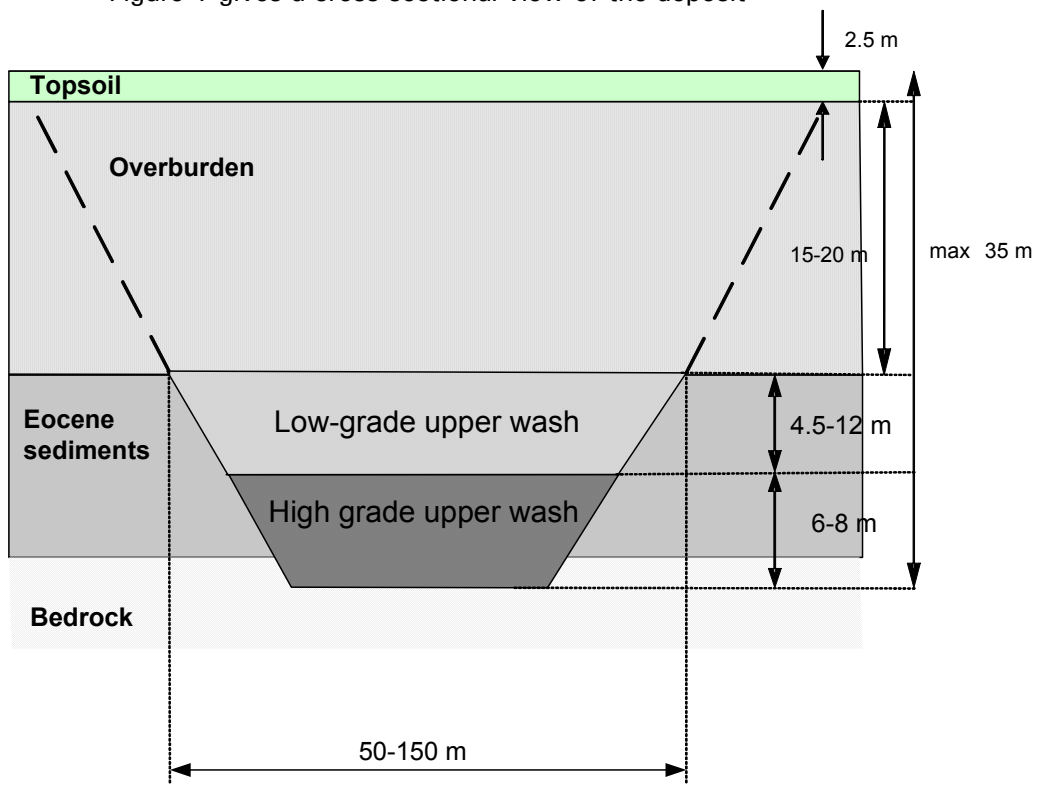

Figure 1: Cross-section Scotia deposit

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.

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^3 dredged material includes both dredging of overburden and ore.

Niugini Resources indicates the presence of accessory minerals, especially gold and gem-stones (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^3 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/m3 (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
Overburden	2333166	1166583	m3
Ore	1944305	972152	m3
Production rate ore	761	380	m3/h
Production rate overburden	913	457	m3/h

Number of shifts	1
Hours per shift	10 hrs
Working days/a	365 days
Working hours	3650 hrs
Operating efficiency	70%
Production hours	2555 hrs

The plant feed capacity is planned to be 300 m3/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 m3 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 m3 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.