72-854

AN APPRAISAL

OF

NARACOOPA RUTILE LIMITED

(Receiver Appointed)

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Rutile & Zircon Mines
(Newcastle) Limited

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SUMMARY

1. The maximum tonnage of recoverable rutile in the reserves is 30,000 tons. However, as the estimate of the high rutile: zircon ratio in the richest area is in question this tonnage of rutile may not be realised.

2. In order to obtain satisfactory operation of the plant it is considered that a capital outlay of approximately $300,000 is essential.

3. Production of 20,000 tons rutile from the higher grade ore can be obtained by moving the Rougher plant to a new site. This operation will last for about 2½-3 years with a work force varying from 41 to 45 at the mine.

4. Adopting the most optimistic assumptions for the value of rutile and zircon produced, but writing down the balance sheet value of the fixed assets to their probable disposable value, the Company's nett present worth is estimated at minus $159,000.

INTRODUCTION

Two writers of this report visited the plant of Naracoopa Rutile Limited on 23rd and 24th February, 1972, after actual mining operations had ceased. Both had, however, visited the operation on previous occasions. *

This appraisal is based on observations made during that visit and discussions with the Mine Manager and staff, and a critical examination of records made available at the mine, from the Sydney offices of the Company and the Receiver. (Mr. E.P. Groombridge of Cooper Bros. & Co.).

LOCATION

The mining operations and separation plant of Naracoopa Rutile Limited are just north of the small settlement of Naracoopa at the centre of the east coast of King Island, some 16 miles from Currie, the main town of the island, situated directly opposite on the west coast. King Island in Bass Strait is politically a part of Tasmania but derives most of its services from Melbourne.

The island has a Fokker Friendship passenger service operating five days a week between Melbourne and Tasmania. In addition, air freight and passenger charter services are available. Any operation on King Island is hampered by lack of suitable harbours and heavy freight relies on the irregular service given by the 210 ton "King Islander" operating between Melbourne and the poor port of Currie. The position will improve within the next few months when the new harbour at Grassy is opened and the 900 ton roll-on roll-off "Straitsman" commences operation between Melbourne and Smithton, Tasmania.

The jetty at Naracoopa is used by the small vessels which transport bulk rutile and zircon to Devonport, Tasmania, and oil shipments are pumped ashore to oil storage tanks at Naracoopa from tanker vessels anchoring off-shore.

HISTORY

Operations commenced on the Sea Beach in February, 1969. The mining method was by dragline feeding trucks which delivered to a stockpile and reclaim system.

The grade of mined material was sufficiently high (+60% H.M.) to be acceptable feed for the wet section of the separation plant.

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* Mr. D.C. Haigh was primarily concerned with the economic evaluation and did not visit the plant.

Initial operations were plagued by "start up" problems and production did not reach 600 tons rutile per period until November, 1969.

The original system for the despatch of products in 3 ton Nylon "Bulker" bags to Stanley was unsatisfactory. An alternative system of bulk handling to Devonport was commenced in February, 1970, and has been successful.

Production during 1970, when the highest grade and cleanest material was being mined, was profitable, although not up to the projected production levels, due to labour problems and plant deficiencies.

The planned operation for 1971 was to commence the mining of Lanherne Beach to supplement the diminishing production from the Sea beaches. Treatment of this fossil beach deposit required the use of a "Rougher" concentration unit to produce a concentrate of similar grade to that of the original beach concentrate (+60% H.M.).

The Rougher unit commenced operation in March, 1971, but delays in the commissioning of this plant resulted in the delivery of an overall low grade concentrate to the "Wet" plant.

Continued operational problems coupled with the heavy staining of the mineral resulted in an unsatisfactory production performance, both as to tonnage and grade of products in 1971.

Production since commencement of operations is as follows:-

	Rutile	Zircon
1969	5,239	3,347
1970	7,408	6,075
1971 (to 12.12.71)	6,821	3,770
	19,468	13,192*

* Plus 2749 tons stockpiled.

The Company failed to achieve success when treating the high grade and clean ore and the depleted reserves have been found to be insufficient to justify the additional capital required to correct the deficiencies of the plant.

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RESERVES

The reserve position is covered by a separate report attached. This indicates a top limit of 30,000 tons of Rutile in the resources adjacent to the separation plant. (APPENDIX A)

The Cowper Point areas are only at the prospecting stage. At present there is no indication that economic reserves occur at this location.

Generally speaking operational performance over the past three years has confirmed the accuracy of the original drilling as to tonnage and grade.

It is estimated from the original drillings that the area mined contained 28,800 tons of Rutile and 29,111 tons of Zircon. Actual production to date is 19,468 tons of Rutile and 15,945 tons of Zircon. This gives an overall Rutile recovery of 67.5% and Zircon 54.5%.

The area immediately ahead of the mining operation, sufficient for 10 months operation, is of much higher grade than that already mined and also of the residue.

It is pointed out that the reported R/Z ratio within the H.M. of this high grade area is 3.3. In the mined area it was 0.6 and in the residue 1.5. This is an abnormally high deviation within the high grade area. As the R/Z ratio has an important bearing on the output of the Separation plant it is recommended that this factor be checked should continuation of operations be contemplated.

MINING OPERATION

An open-cast method of mining has been adopted.

Topsoil is stripped from the surface by bulldozer and stacked at the side of the orebody. Mining is then performed by a bulldozer which delivers material to a stockpile within the operating radius of a dragline. The dragline, which is sitting at approximately ground level, then delivers the material to a primary screen and pulping unit.

The orebody is partially indurated and rests on a clay and gravel base. The bulldozer plays an important part in fragmenting the indurated material and reducing oversize loss. Even so the loss, particularly at the rougher plant trommel screen, is considerable. (see Figure 2).

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The mining operation is performed by a contractor - Highland Mining - on a tonnage won basis. At the time of inspection the mining face had advanced to the maximum economic distance from the primary screening unit and this unit in turn was situated at its maximum allowable distance (600 ft.) from the rougher plant.

The contract unit price (budgeted 24¢) is considered a satisfactory price for the work done. The actual price, however, for the year 1971 was 42¢/ton delivered, this higher figure resulting from standby payments and additional machine use within the mining operation.

Although the unit cost is reasonable the mining method has not been successful for the following reasons:-

(1) It has not achieved the necessary continuity of pulp flow to the rougher plant.

(2) The marrying of a contractor with a production operation subject to different priorities has caused problems. The local management states it is necessary for all activities to be under the one control. Our experience supports this contention.

After treatment at the rougher plant tailings are returned to the open-cut via a pipeline and cyclone. The continual necessary movement of this cyclone has resulted in considerable lost production time.

No rehabilitation of the mined areas has yet been undertaken.

After reviewing the mining operation with the object of raising production to budget requirements, the following recommendations are made:-

(1) The dragline and pulping unit be replaced by a front-end loader and pulping unit installed in the open-cut. Although the open pit base is wet a suitably shod machine will perform the task provided the design of the pulping unit does not require any inclines to be negotiated.

(2) The necessary equipment to perform all mining activities be purchased and operated by Company personnel. This equipment to include the

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equivalent of one Cat D7 and one Cat 950 loader for continuous mining, one Cat D7 for standby, stripping, restoration, etc., one Cat 950 loader for standby, dry plant operation and loading.

(3) The operating area of the open-cut be isolated by damming and tailings be discharged into the cut from an open bore pipeline.

TREATMENT

Processing of the sand after mining is done in three operations, referred to as the "Roughing", "Wet" and "Dry" Plants. (see Figure 1).

A. Rougher Plant

This section was built towards the end of 1970 and was intended, initially, to up-grade the last of the reserves of the Sea and Milford Beaches and, subsequently, to treat the inland "fossil" Lanherne Beach.

Sand is dumped by dragline or front-end loader on to a grizzly with the undersize feeding to a coarse trommel screen where it is pulped before dropping into a surge bin. The sand slurry is pumped to a secondary trommel and surge bin through an extensible line (currently operating at a lead of 600 ft. which is the maximum for the present pump and motor - see Figure 2).

Concentration is effected by banks of "Cudgen Trays" arranged for Primary, Secondary and Scavenger flow. The plant was designed to produce a 65% H.M. concentrate and to treat 125 t.p.h. with a feed of 12% H.M. and to be capable of handling up to 200 t.p.h. as the head grade dropped to 7.5% H.M.

As with any pinched-sluice plant, control of pulp density at around 60% solids is essential and a steady flow rate is important. There is a gamma-gauge pulp density measuring device and provision is made for automatic density control. However, the operational surge capacity in the system is probably only in the order of 10 minutes and with the very erratic method of mining and feeding the plant, steady operation has rarely been achieved. As a result, productivity, concentrate grades and recoveries have been well below target. Operation has also been hampered by an inadequate water pumping system.

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Basic requirements to obtain satisfactory performance from the mining and rougher concentration operations are:-

(i) Direct control of mining by the Company's staff, preferably using its own mining equipment (as indicated above).

(ii) Installation of a more positive and controllable feeding system to the primary trommel and bin.

(iii) Improvement of the water supply system by provision of a pump returning the water from the tailing dam to the water pond adjacent to the rougher plant.

B. Wet Plant

Despite a clear indication in the original feasibility study for the mining of Lanherne Beach that a stockpile of concentrate between the rougher and wet plants was essential, the attempt was made to feed the rougher concentrate direct. Inevitably, all the surges from the mining operation were transmitted throughout all three treatment sections and, in latter months, the rougher concentrate was stockpiled and fed to the wet plant as required. Feed was augmented by reclaiming high grade tailings stacked in the vicinity of the wet plant. (see Figure 3).

The Wet Plant consists of:-

(i) 32 Primary Spirals making Primary concentrate as feed to the wet magnets, a middling for retreatment on the Secondary Spirals and a tailing for discard.

(ii) 12 Secondary Spirals (with their own middlings) making Primary concentrate and discardable tailing.

(iii) Three 10-pole "Gill" wet magnets in parallel followed by two additional magnets retreating the non-magnetic product. All magnets make a magnetic fraction ("Ilmenite") for discard.

(iv) 8 Scott wet tables which are supposed to make a 98% H.M. Concentrate from the second stage Gill non-magnetic fraction and a tailing returned to the secondary spirals. A top-cut from the tables is re-dressed periodically to produce a small amount of saleable tin concentrate.

Apart from minor modification to the plant circuit the only change in the original wet plant has been the addition of the second stage of wet magnetic separation.

The shaking tables were erected on structural steel frames. Secondary vibration almost wrecked the mill building and, despite extensive stiffening of the structure, the operation of the tables is still adversely affected, resulting in low grade concentrate and high tailings. The tables should be re-erected on solid concrete foundations.

A report by S.B. Hudson in 1957 on the treatment of heavy mineral sands from the Naracoopa area stressed the need of surface cleaning to facilitate high tension separation and to improve the colour and quality of the zircon. Subsequent investigations have endorsed this recommendation.

In the original wet plant an "impingement" attritioner was installed. It is not clear how effective this is but, even with the lightly stained mineral from the Sea and Milford Beaches, separation difficulties were experienced. It is surprising, therefore, that no provision for proper attritioning was made in the proposals made for the treatment of the indurated and heavily stained material from Lanherne Beach by Kenneth McMahon & Associates.

Research work done by several consultants engaged by Naracoopa Rutile suggests that mechanical attritioning with hydrochloric acid should remove most of the iron coating, but a subsequent treatment with caustic soda may also be necessary to remove organic coatings. Treatment with hydrofluoric acid, etc., as practised in Western Australia, should also be investigated. Even the single step would be costly, but experience inother plants has indicated that it could have a profound effect on the productivity of the

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dry plant. Inclusion of some form of attritioning is considered essential. Cost of this operation could be around $1.50 per ton of material treated which would probably be the non-magnetic fraction from the Gill magnets. The wet tables would be effective in washing out slimes and residual chemicals.

C. Dry Plant

A number of weaknesses in the original dry plant have been corrected. These have included:-

(i) A new dryer.
(ii) A third primary high tension separator.
(iii) Electrostatic plate separators as final cleaners.
(iv) A second Air Table for zircon.
(v) Screens on final rutile and zircon products.

As indicated above, it is believed that effective attrition cleaning of the mineral prior to drying will do much to improve the operation of the dry plant. However, the high intensity magnets on both sides of the circuit are overloaded and a 2 x 3 roll Reading High Intensity Induced-Roll magnet should be installed on the rutile side and the Reichert rutile magnet transferred to the zircon circuit. Since the installation of the second stage of wet magnetic separation, there has been very little work left for the 7-pole cross belt to do, and this machine could be traded in for the I.R. magnet.

With proper feed preparation and plant control, this plant should be capable of producing 150 and up to 200 t.p.w. of rutile and a corresponding tonnage of zircon. However, in addition to residual staining of the zircon, the presence of the alumina minerals, kyanite and topaz, introduces a special problem and only "foundry grade" zircon can be produced.

SERVICES

Housing - Retention of a stable labour force at King Island, where accommodation is not readily available, is difficult. The Company has

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five houses in Currie for senior staff and two at Naracoopa for the Plant Foreman and a maintenance man. A good standard barracks to house twelve men in single rooms is located on the lease and is served by two female cooks. The remainder of the work force of about forty find their own accommodation. Provision of additional housing and regular transport to and from Currie has been considered, but could not be financed.

Power - The Rougher plant has its own portable Dorman diesel-electric plant which is just adequate for the present load.

Two Merlees-Brush diesel alternators and a standby Caterpillar unit located in an annexe to the Separation plant provide power for the wet and dry plants and offices. Generation costs are reasonable (approximately 2.5¢/unit) and reliability of supply is quite good.

Office - The mine office accommodation is adequate.

No facilities are available for surveying. This service is performed by a firm of surveyors in Launceston.

The laboratory is badly hampered by lack of a suitable microscope,but facilities otherwise are basic but adequate.

Concentrate Handling - As indicated above, bulk handling of concentrate is now done satisfactorily.

Concentrate is carted from the product bins to a bulk storage shed at the landward end of the Naracoopa jetty. This has sufficient space for storing bulk products, but there would appear to be some risk of cross-contamination which could be reduced by provision of a brattice curtain dividing the shed. Material is picked up by front-end loader, carted by tip truck along the jetty and tipped into the ship's hold.

Unloading at Devonport by a moveable bucket elevator was not witnessed, but is reported to be satisfactory. The storage shed rented from the Marine Board of Devonport has proved to be liable to flooding and the last shipment of mineral was wetted.

Overall cost of handling the finished products is quite satisfactory.

PROPOSED OPERATING PROGRAMME

In order to obtain the best economic realisation of the reserves it is desirable to move the Rougher Plant to a site to the north of the Separation Plants. From this position it appears that upwards of 20,000 tons rutile could be recovered from the higher grade areas. Our calculations have been made on this basis to determine the viability of resuming operations. In the event that operations were continued an economic appraisal at the time would determine whether a further movement of the Rougher Plant was justified.

As indicated above, it is considered necessary to spend some capital in order to obtain satisfactory operation of the property. The minimum expenditure is estimated at:-

MINING		
Two D7 Bulldozers @ $66,000 each		$132,000
Two Cat.950 Loaders @ $38,000 each		$ 76,000
Modifications to loading system, water pumps, etc.		$ 42,000
		$250,000
SEPARATION		
One 2 x 3 Roll Reading H.I. Magnet, 2-cell Attritioner, Pumps, etc.		$ 50,000
	TOTAL	$300,000

No provision has been made for additional housing. In the short remaining life of the mine such expenditure could not be justified and it is assumed that with present difficulties in finding employment, operators would be prepared to accept inconvenient and possibly an inferior standard of accommodation.

The distribution of values in the reserves has suggested that the operation be conducted in two phases. In the first phase, when the high grade sand will be mined, the Wet and Dry Plants will be operated at full capacity and in the second phase, on the lower grade sand, the mining and rougher plants will be run at their limit of capacity and the separation plants will operate part time. On this basis the schedule of operation will be:-

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First Phase

The mine will operate for two 10-hour shifts, 5 days per week treating 7800 tons sand per week averaging 25% HM, 3.4% Rutile, 1.0% Zircon.

The Separation Plant (Wet and Dry) will operate 3 shifts per day, 7 days per week to produce 200 tons Rutile and 50 tons Zircon per week for a total of 10,000 tons Rutile.

Second Phase

The mine will operate 3 shifts per day, 7 days per week treating 20,000 tons sand per week averaging 10% HM, 0.9% Rutile, 0.6% Zircon.

The Separation Plant will operate 3 shifts per day, 5 days per week to produce 140 tons Rutile and 70 tons Zircon per week for a total of a further 10,000 tons Rutile.

Manning schedules for this programme are given in Table No. 1.

ESTIMATED OPERATING COSTS

Mine operating costs have been estimated for the proposed programme using the budget estimates given by Naracoopa Rutile Limited for 1972 where applicable. Other costs are based on our experience in the industry.

These costs are detailed in Table No. 2 (a), (b), (c) and (d).

ECONOMIC EVALUATION

Assets and Liabilities of Naracoopa Rutile Ltd.

Current assest and liabilities as shown in the unaudited balance sheet of 28th December, 1971, are accepted as correct. It is understood that the stock figure of $434,616 includes a shipment of rutile at market value for which documents have not yet been negotiated, but for which full payment is expected. (APPENDIX B & C)

A loan from New Mount Costigan Mines of $233,705 shown as a deferred liability in the Company's balance sheet, is understood to rank equally with other creditors behind the A.N.Z. bank.

Current assets and liabilities are as shown below:-

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	$A	
Current Assets		
Cash	467	
Debtors	2,848	
Stock	434,616	
		437,931
Current Liabilities		
A.N.Z. Bank Overdraft and Bill	266,406	
Creditors	42,234	
Derby & Co.	95,306	
Provision for Expenses	76,937	
Loan - New Mount Costigan Mines	233,705	
		714,588
Net Working Capital		(276,657)

Following examination of the Company's facilities on King Island, the fixed assets have been written down to values below the balance sheet entries. Leases and mining tenements, exploration and development expenses and investments have been written off. Plant is assessed at $100,000, and houses and land at $50,000.

	$A	
Fixed Assets		
Plant	100,000	
Houses and Land	50,000	
		150,000

Production, Profits and Cash Flow - Comments Relating to Table No. 3

Production - It is assumed the mining plant could be re-located and commissioned during May, and commence production in June. It would take some time to order and install the attritioner and other equipment for the mill, which is assumed to commence operation as from August. Thus it is envisaged to build a stock pile of concentrate for the mill ahead of operations, and thus ensure adequate feed to the wet and dry plants.

Allowing one month for the mill to achieve production at the target rate of 10,000 tons rutile per annum, the first phase would run through to end August, 1973. The plant would then operate on the second phase mining the sand left adjacent to the rougher plant. This is assumed to occur in February, 1975, by which time 10,000 tons rutile will have been recovered in the second phase, and 20,000 tons overall. Production beyond this point may be possible, but is considered doubtful in view of the deteriorating grade.

Sales - Rutile - For the purpose of this evaluation, quite optimistic assumptions have been made as to sales of rutile. It is assumed that 7500 tons of rutile is shipped in each of 1972/3 and 1973/4, with the balance of 5000 tons shipped in 1974/5. Moreover it is assumed that Naracoopa's existing contracts will remain valid, even though the Company will be unable (in our view) to produce the contracted tonnage in time to meet specified shipment times. This is an important assumption, and is made to show Naracoopa's prospects in the best possible light. While it is impossible to forecast the future price of rutile with much certainty, it is felt that if Naracoopa lost these contracts and were forced to sell on the open market, the revenue received would be less than now assumed. Average sale prices of $A135, 130 and 130 per long ton F.O.B. are assumed for the three years in which shipments are made.

Zircon - It is assumed that Naracoopa succeeds in selling all its zircon at the minimum export price for East Coast zircon of $A34 per long ton F.O.B. in bulk. This may also prove to be an optimistic assumption, as with zircon in oversupply, the suspect quality of the Naracoopa product would place it at a competitive disadvantage.

Operating Costs - Plant operating costs are taken from Table No. 2. In addition Head Office costs are assessed as $3000 per month from the commencement of operations in May, 1972. From these figures, aggregate cash costs have been obtained for each fiscal year. These costs are on the basis of 1972 costs in the industry, and in Table No. 3 have been escalated at 6% p.a. for subsequent years in recognition of the increasing costs of labour and materials.

Derby & Co. Commission - In order to preserve the existing contracts, it appears that Derby's agency agreement must remain in force. The precise commission to be paid is subject to some negotiation. For this evaluation a commission equivalent to 6.6% of revenue has been used, which is as per 1971 budget. It is considered that even after payment of this commission the effective price of minerals to Naracoopa is higher than could be achieved on the open market. (APPENDIX D, E)

Tax Calculation

Expenditure on new equipment is claimed in the year of expenditure under Division 10. This, together with accumulated tax losses amounting to some $600,000, ensures that Naracoopa Rutile will pay no tax during the remaining life of the operation.

Cash Flow

In order to acquire Naracoopa Rutile and re-establish the Company on a production basis, it is first of all necessary to repay outstanding liabilities, represented by a net working capital of -$277,000 (see page 12). Other cash commitments include $300,000 for new plant and equipment (see page 10) of which $250,000 would be spent in 1971/72 and the balance at the beginning of 1972/73.

Further finance would be needed to cover the costs of operations up to the time of receiving cash flow from sales. This is conservatively shown as $200,000, but could be much higher in practice. This working capital would be recovered in full in the final year of operation, on receipt of payment for the final shipment.

The cash flow from operations is represented by the profit before redemption and tax, i.e. revenue less cash costs.

The other cash flow item is salvage value of fixed plant and equipment. This is estimated at $100,000 in 1975/76 values out of the $300,000 expended on new plant and equipment, and a maximum $150,000 in 1975/76 values for the fixed plant, equipment, houses and land presently owned by the Company.

Using a discounting factor of 10%, the net present value of the Company is calculated to be minus $159,000. We repeat that this analysis is based on our most optimistic assumptions as to sales. Moreover no allowance has been made for any cost of acquiring the shares of the Company (which at say 10¢ for ordinary shares and 20¢ per preference share would amount to $282,285), nor of costs incurred or authorised by the Receiver.

TABLE NO. 1

MANNING SCHEDULE

	1st Phase	2nd Phase
Mining & Rougher Plant		
Bulldozer and Loader Operators	4	8
Plant Operators	2	4
Leading Hand - ½ x 4	2	2
Field Services	4	5
	12	19
Wet & Dry Plants		
Plant Operators	8	6
Leading Hand - ½ x 4	2	2
Labourers	1	-
Mechanical Equipment Operators	2	2
	13	10
Engineering Services		
Leading Hand	1	1
Mechanical	3	3
Electrical	1	1
Labourers	1	1
	6	6
Administration & Laboratory		
Supervision	3	3
Office	2	2
Laboratory	3	3
Cooks	2	2
	10	10
TOTAL	41	45

TABLE NO. 2(a)

SUMMARY OF OPERATING COSTS

(12 month basis)

	1st Phase	2nd Phase
	$	$
Mining and Rougher (Table No. 2(b))	263,560	421,660
Separation Costs (Table No. 2(c))	258,550	201,270
Administration & Overheads (Table No. 2(d))	110,150	110,150
Product Despatch (Table No. 2(d))	115,000	80,500
	$747,260	$813,580
Cash Cost Rutile per ton	$ 74.73	$ 116.22
	(10,000 Tons)	(7,000 Tons)
Cash Cost Zircon per ton	$ 11.50	$ 11.50
	(2,600 Tons)	(3,640 Tons)

TABLE NO. 2(b)

MINING & ROUGHER PLANT COSTS

(12 month basis)

	1st Phase	2nd Phase
	$	$
Mining		
Earth Moving	116,740	184,080
Engineering Services	8,800	13,200
Labour and Oncost	30,052	60,700
	$155,592	$257,980
	(407,830 tons @38.2¢/ton)	(1,050,000 tons @ 24.6¢/ton)
Rougher		
Labour and Oncost	18,240	33,830
Engineering Services	12,500	18,700
Stores and Services	16,100	25,600
Power	6,100	13,150
Replacements	12,200	19,500
	$65,140	$110,780
Field Services		
Labour and Oncost (Mechanical Equipment in mining costs)	17,830	28,900
Contingencies	25,000	25,000
TOTAL	$263,560	$421,660

TABLE NO. 2(c)

WET & DRY PLANTS COSTS

(12 month basis)

	1st Phase	2nd Phase
	$	$
Labour and Oncost	77,550	53,570
Engineering Services	21,600	16,000
Stores @ 1,900 P.P.	24,700	18,600
Attritioning @ 1.50/Ton @ 50% R.Z.	30,000	14,000
Power	35,000	21,800
Replacements	7,800	4,500
Mechanical Equipment @ 50 hours	18,720	14,100
Fuel	18,200	13,700
Contingencies	25,000	25,000
TOTAL	$258,550	$201,270

TABLE NO. 2(d)

ADMINISTRATION & LABORATORY COSTS

(12 month basis)

Mine Administration (Including Cooks)	$ 97,150
Laboratory	$ 13,000
	$110,150 (Both Years)

Product Handling

As per Budget $11.50/Ton

	1st Phase	2nd Phase
	$	$
Rutile (10,000 / 7,000)	$115,000	$ 80,500
Zircon (2,600 / 3,640)	$ 29,900	$ 41,860

TABLE NO. 3

NARACOOPA RUTILE LTD. - PRODUCTION, PROFITS AND CASH FLOW

	1971/2	1972/3	1973/4	1974/5	1975/6
Production - Rutile		8334	7496	4170	
- Zircon		2167	3474	2159	
Sales - Rutile		7500	7500	5000	
- Zircon		1500	3500	2800	
Stocks - Rutile		834	830	-	
- Zircon		667	641	-	
Sales Price - Rutile ($A per ton F.O.B.)		135	130	130	
- Zircon ($A per ton F.O.B.)		34	34	34	
Revenue ($,000) - Rutile		1013	975	650	
- Zircon		51	119	95	
Total Revenue ($,000)		1064	1094	745	
Operating Costs ($,000) escalated @ 6% p.a.	68	784	963	553	
Derby Commission		71	72	31	
Total Cash Costs ($,000)	68	855	1035	584	
Profit before Redemption and Tax	(68)	209	59	161	
TAX CALCULATION ($,000)					
Profit before redemption and tax	(68)	209	59	161	
Sales of assets					250
Tax losses C/F	(600)	(918)	(759)	(700)	(539)
Division 10 Claim	(250)	(50)			
Taxable Income	(918)	(759)	(700)	(539)	(289)
Tax Payable	-	-	-	-	-
CASH FLOW ($,000)					
Net Working Capital of Company	(277)				
Re-establishment Cost - fixed capital	(250)	(50)			100
- working capital	(200)			200	
Profit before redemption and tax	(68)	209	59	161	
Tax paid	-	-	-	-	
Salvage value of existing fixed assets					150
Total Cash Flow	(795)	159	59	361	250
Discounted @ 10% p.a.	(795)	145	49	271	171

Net Present Value ($159,000)

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FIGURE 1.

LOOKING NORTH FROM DAM ON FRASER RIVER

Fresh Water Dam & Pumping Station

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FIGURE 2.

GENERAL VIEW OF ROUGHER PLANT & MINING OPERATIONS

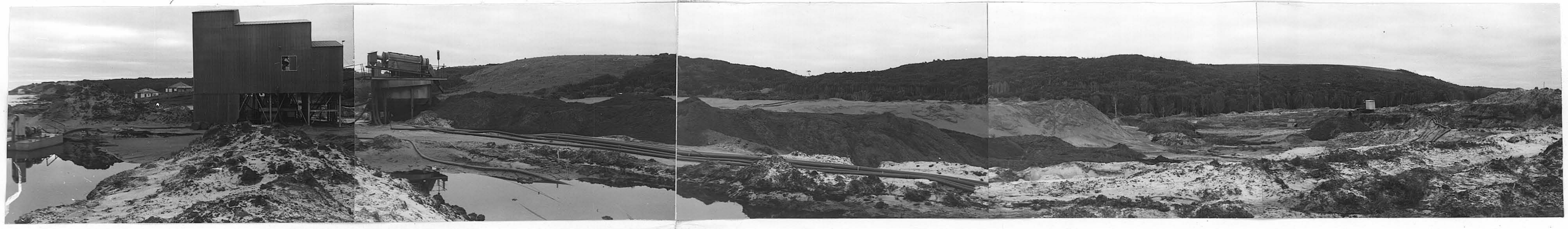
Naracoopa Village

Rougher Plant

Secondary Trommel
& Surge Bin

Stacked Tailings (note trommel oversize behind pipe lines)

Primary Grizzly, Trommel
and Pulping Bin.
(Present Mining Area
between this and
Fraser River at tree-line)



Water Pond &
Pick-up Pump

Approximately 600 ft.

FIGURE 3.

GENERAL VIEW OF SEPARATION PLANT & SERVICES

Road Hopper for Mineral Concentrate

Rougher Concentrate Stockpile

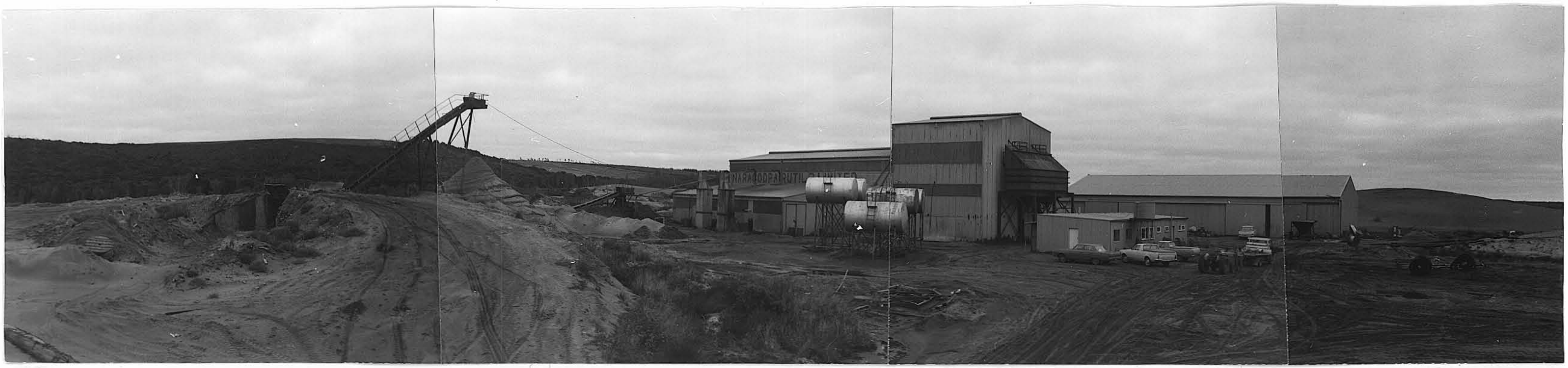
Wet Plant Feeder & Trash Screen

Wet Plant

Dry Plant

Product Bins

Product Storage & Vehicle Shed



Power House & Oil Storage

Office

026

APPENDIX A

775027

GEOPEKO LIMITED

KING ISLAND

REPORT ON THE ORE RESOURCE AND EXPLORATION AREAS OF NARACOOPA RUTILE LIMITED

By

J.J. GRESHAM AND M.J. DANIELSON

KING ISLAND FEBRUARY, 1972

CONTENTS

1. SUMMARY

(i) The major ore resources held by Naracoopa Rutile Ltd consist of three beach deposits in the immediate plant area and a dune deposit approximately 5 miles north of the mine at Cowper Point.

(ii) The ore resource of the Sea and Milford beach area is 107,000 tons with 22.48% heavy mineral containing 2,920 tons recoverable rutile and 2,760 tons recoverable zircon. This figure is derived from the original Kenneth Mc Mahon and Partners Pty Ltd report and was not recalculated or verified.

(iii) The ore resource of the Lanherne Beach deposit is 1,815,600 tons (using 1.4 tons/cubic yard) with 13.01% heavy mineral. No figures for the recoverable rutile and zircon could be computed as figures of the rutile-zircon content of the H.M. were not available. From the original ore reserves computation the deposit would contain approximately 25,000 tons recoverable rutile and 11,000 tons recoverable zircon.

(iv) The Lanherne beach deposit consists of iron stained and organic stained sand with well defined horizons of compact indurated iron, organic rich material.

(v) Ore reserves of the Cowper Point area are 10,618,500 tons containing 3.58% H.M. (using 1.5% H.M. cut-off and 1.25 tons/cubic yard). Again no figures of rutile-zircon content were available but recoverable rutile is reputed to be of the order of 15,000 tons.

(vi) Exploration outside the Mine area and Cowper Point area has met with limited success. However the limited amount of exploration work carried out to date and the rather haphazard approach used does not preclude the locating of further areas of significant heavy mineral concentration within the Exploration Licences held by Naracoopa Rutile Limited. However the potential for locating further large deposits within these areas appears limited.

(vii) Exploration Licence 13/66 covers the western contact of the Grassy Granite and this area must be considered prospective for scheelite mineralisation.

M.J. Danielson
GEOLOGIST

J.J. Gresham
SENIOR GEOLOGIST

2. INTRODUCTION

Over the weekend of February, 19-20, 1972, Mr. J.J. Gresham and Mr. M.J. Danielson, geologists of Geopeko Limited, inspected the mining and geological records of Naracoopa Rutile Ltd (Receiver Appointed). The intention was to verify if possible the ore reserves as quoted by Naracoopa Rutile Ltd and to examine the potential for increasing these reserves, both in the immediate Naracoopa area and in the outlying prospects under investigation by the Company.

The reassessment of the ore reserves and the examination of the exploration programme was severely restricted by the inavailability of information. It would appear that a more complete set of records would be available at Naracoopa Rutile Ltd's Sydney Office.

Heavy mineral grade calculations for all deposits were apparently derived from a combination of Gemco and hand augering. No records were on hand to compare the reliability of either method.

In the recalculation of the ore reserves it was not possible to calculate tons of recoverable rutile and zircon, as the assay records showing the breakdown of the heavy mineral content into rutile and zircon were not available. Apparently the ratio of R/Z to heavy mineral content varies markedly from section to section in the deposits in the plant area.

The major ore resources consist of three beaches in the immediate plant area and a dune deposit approximately 5 miles north of the mine at Cowper Point.

3. NARACOOPA PLANT AREA

(a) Sea and Milford Beaches

The major part of these deposits has already been mined out. As the remainder only represents a very minor part of the overall resource no attempt was made to verify the ore reserves and the figures presented below are taken from Naracoopa Rutile Ltd records.

SECTION	TONS SAND	% H.M	RUTILE TONS RECOVERED	ZIRCON TONS RECOVERED
0-24	Mined Out			
24-29	27,100	34.9	1,150	1,160
29-33	33,000	27.6	1,110	1,040
33-35	15,000	16.5	300	250
*35-37	14,000	11.7	190	170
*37-39	12,000	9.0	130	110
*39-41	6,000	5.4	40	30
	107,100	22.48	2,920	2,760

* Project Reserves.

In addition to the above reserves some regeneration would have taken place on section 0-24 but the amount of heavy mineral involved would be difficult to assess.

(b) Lanherne Beach

This resource represents the major deposit in the immediate Naracoopa Plant area and an ore reserve calculation was carried out to compare with Naracoopa Rutile Ltd records. The original ore reserve calculation was conducted by Kenneth Mc Mahon and Partners Pty Ltd on information derived from a drilling pattern carried out on sections 400 feet apart. Since that original calculation a considerable amount of drilling has been done on intermediate sections but as this was not available to us the reassessment of the ore reserves was by necessity done using the original information available to Kenneth Mc Mahon and Partners Pty Ltd. Mr. B. Osborn, Mine Manager, Naracoopa Rutile Ltd stated that the close spaced drilling substaniated the original drilling.

Naracoopa Rutile Ltd's driller, Mr. B. Evans who was responsible for the drilling and plotting of results was at the time away from the island and unable to be contacted.

Current mining operations on this deposit have extended to Line 12 and only limited residual reserves would occur between sections 1 to 12 and these were not considered in the ore reserve assessment.

Naracoopa Rutile Ltd records indicated that the reserves remaining in this deposit are as follows:

SECTION	TONS SAND	% H.M.	RUTILE TONS RECOVERED	ZIRCON TONS RECOVERED
0-12	Mined Out			
12-16	347,000	26.46	11,982	3,590
16-20	388,000	10.40	4,975	1,989
20-24	626,000	9.70	5,684	3,716
24-29	350,000	6.16	1,863	1,155
29-33	127,000	8.54	1,152	922
33-37	45,000	4.67	223	178
	1,883,000	12.07	25,879	11,550

Note: The tonnage factor used in the calculation of these reserves is unknown.

The reassessment indicated reserves as follows:

SECTION	TONS SAND 1.40 TONS/CU. YD	TONS SAND 1.25 TONS/CU.YD	%.H.M
0-12	Mined Out		
12-16	335,700	299,800	25.71
16-20	413,100	368,800	12.13
20-24	528,300	471,700	11.15
24-28½	357,800	319,500	6.76
28½-33	147,500	131,700	10.03
33-37	33,200	29,600	6.10
	1,815,600	1,621,100	13.01

The reassessment was calculated from ore outlines drawn to a 4% H.M cut off.

No attempt was made to calculate an ore reserve using a 1.5% H.M. cut-off however a study of the major sections indicated that reserves may have been increased in the following way:

Section 14 and 18	The ore outline could be extended approximately 200' to the east.
Section 22	Ore outline could be extended approximately 5 feet in depth.
Section 26	Ore outline could be extended approximately 15 feet in depth.
Section 31	Ore outline could be extended approximately 10 feet in depth.

There appeared to be a fairly distinct natural cut-off at around 4% H.M. content.

In addition to the reserves of the Sea, Milford and Lanherne Beaches there is an indeterminant amount of tailings which, because of the high grade of the original material worked and inefficiencies in the treatment plant may be retreatable. These were not considered in ore reserves.

(c) Nature of the Ore Deposits

The Sea and Milford Beach deposits consist of fresh sand that is not iron stained or stained with organic material. Wave action is actively regenerating these deposits and deposition of rich mineral sand is still taking place.

The Lanherne deposit was formed by strong wave action as is evidenced by the cross-bedded and well stratified nature of the deposit. The significant feature of the Lanherne beach deposit is that all the sand is iron stained and occurring within the semiconsolidated sand are compact indurated bands of iron, organic rich material. These are more predominant in the central richest section of the deposit.

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4. COWPER POINT

In plan this is a boomerang shaped orebody with a strike length of approximately 10,000 feet reaching a maximum width of approximately 3,000 feet near the centre and thinning out to extinction on the ends. The orebody occupies the high wind blown dune area and the young strand lines to the east of the dunes.

Drilling of this resource has been carried out on 100 foot centres on section lines 1,000 feet apart. It could not be ascertained whether or not any attempt has been made to close up this original drilling pattern.

The original ore reserve calculation was carried out by Kenneth Mc Mahon and Partners Pty Ltd and although the report was not available the resource was apparently calculated at 11 million tons averaging 3.24% H.M. (K. Wright personal communication).

The reassessment of the ore reserve was conducted using a 1.5% H.M. cut off and a tonnage factor of 1.25 tons/cubic yard.

The details of the calculation were as follows:

SECTION	TONS SAND	% H.M.
90 N	162,000	2.30
100 N	401,200	2.25
110 N	678,600	3.48
120 N	1,129,100	3.07
120 NA	1,414,000	4.08
120 NB	1,975,100	3.94
120 NC	841,500	5.26
130 N	1,422,000	3.80
140 N	1,229,900	3.55
150 N	880,000	2.37
160 N	485,100	2.29
	10,618,500	3.58

A brief inspection of the assay cross sections indicated that this deposit would be very difficult to high grade to fit ore outlines of + 4% H.M. The central and western parts of 120 NA and 120 NB showed the best continuity of + 4% H.M. grade material.

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A significant feature of the drilling carried out over this deposit was that the majority of holes terminated at the water table and were still in material of similar grade to that recorded throughout the holes. Potential therefore exists for an increase in tonnage of this deposit if material below the water table is considered minable.

South to section 120 NB the orebody is terminated in the east by the coastline, however north of this section the foredunes become sub-grade (see plan attached).

5. EXPLORATION

Naracoopa Rutile Ltd currently hold two Exploration Licences on King Island. These are E.L. 9/69 situated on the central eastern portion of the island and E.L. 13/66 in the south-east corner of the Island. Records of exploration carried out were poor and only a limited assessment could be made. Exploration has largely been orientated toward the location of other heavy mineral deposits.

(a) Exploration Licence 9/69

(i) Mine Area

Exploration in the mine area has consisted of closing up the drill spacing on the original grid and drilling to the north to test for continuation of the ore deposits. Drilling on lines to the north of the mine area, 41 and 51, have met with limited success although patchy areas of heavy mineral concentration have been recorded. Lack of drilling plans and results made this work difficult to assess.

(ii) Area Between Mine Area and Cowper Point - Carmel Farm

This coastal strip of young strand lines and area of sand deposition inland between the Mine Area and Cowper Point is known as the Carmel Farm area. Drilling on wide spaced lines (+ 1000 feet) along the beach north of the Mine Area to Cowper Point has been carried out to examine for any continuation between the two deposits. Apparently this programme has met with limited success and the potential for mineable resources of heavy mineral along the beach between the Mine Area and Cowper Point mus be considered low.

Additional exploration has been conducted in an area inland from the beach. A number of Gemco logs were studied, again without the aid of a drilling plan, and the impression gained was that the majority of holes bottomed in water at a depth of generally less than 8 feet and the grade was generally less than 4% H.M. Mr. B. Osborn was of the opinion that this portion of the Carmel Farm area contained 15,000 tons of recoverable rutile although much more information would need to be sighted to substantiate this figure.

(iii) Cowper Point Area

There is no record of any recent drilling having been carried out in the original area defined by the Mc Mahon survey. Again no drilling plans could be obtained. According to Mr. Osborn extensive drilling has been carried out just to the south of Sea Elephant River and north of sub grade area defined in the Mc Mahon survey. Assays have indicated a resource of + 6% H.M. However no tonnage was mentioned for this area and no records sighted so this area must be treated with caution. The lower relief in this area makes the tonnage potential rather limited unless there are considerable reserves below sea level.

Other exploration has been carried out in this area but no records were available but it appears as though work to date has met with limited success.

(b) Exploration Licence 13/66

Exploration in this area has again been concentrated on the search for heavy mineral deposits, largely in the Big Lake Area. There are a series of strand lines and dune deposits in this area. Little information could be gained on this work although some isolated values have been recorded but it was apparent that little encouragement has been given from results so far. Inspection of drilling logs showed some limited intersection in some holes (5') gave values as high as 8% H.M. Mr. Osborn stated that some unknown heavy mineral had been discovered and samples had been submitted for mineragraphic examination.

This Exploration Licence also covers the western contact of the Grassy Granite and Mine Series Rocks are known to occur in the area. This area must be considered prospective for scheelite mineralisation and has been sought after by King Island Scheelite Limited. Naracoopa Rutile Ltd were apparently initiating a search for scheelite in this area and Mc Phar Geophysics had read the area with magnetics but no results of this work were available.

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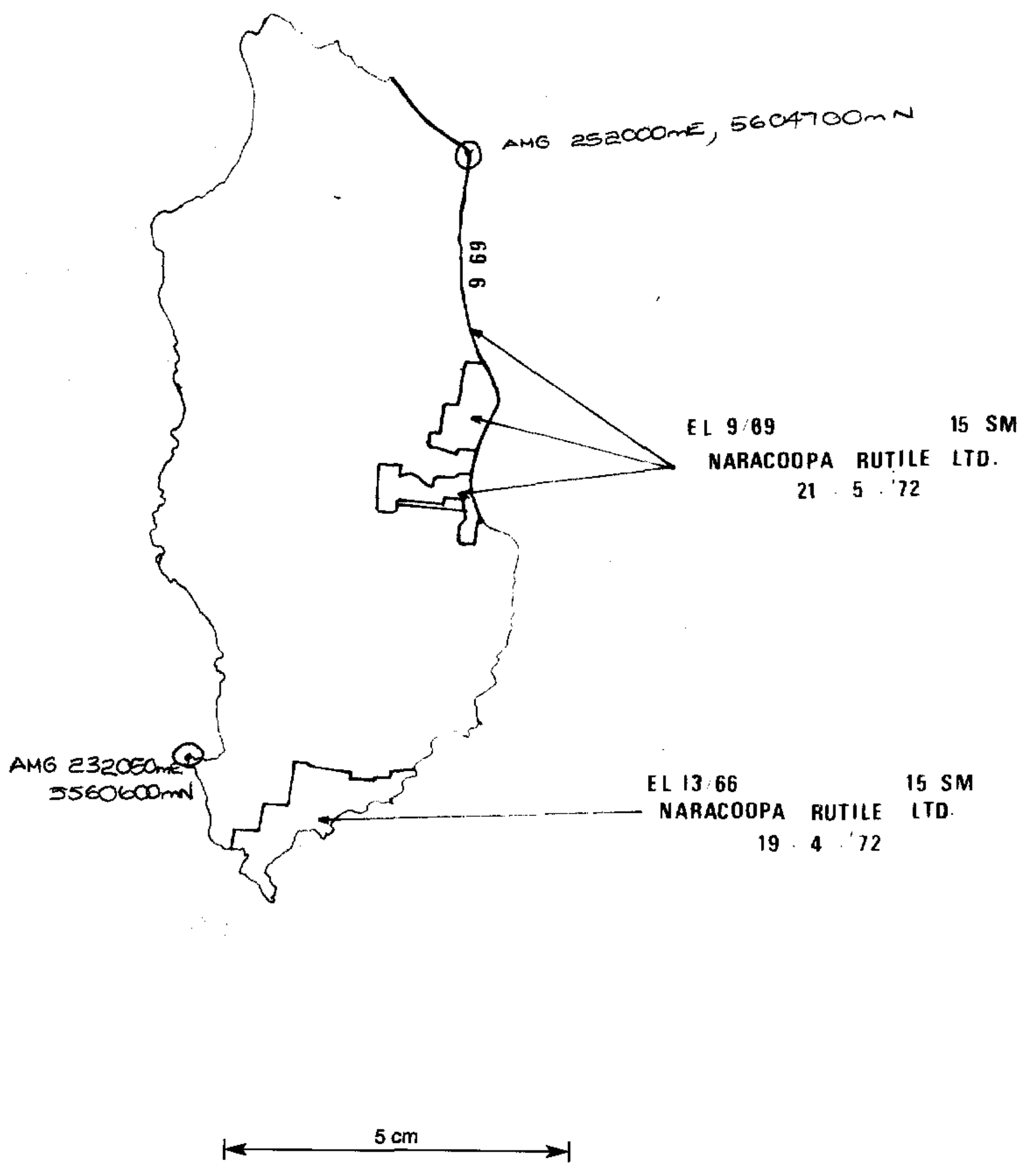
ISG COORDINATES
REFER REPORT 70-0676



AMG REFERENCE POINTS ADDED

GEOPEKO LIMITED
KING ISLAND GROUP

SCALE: 1 : 500 000

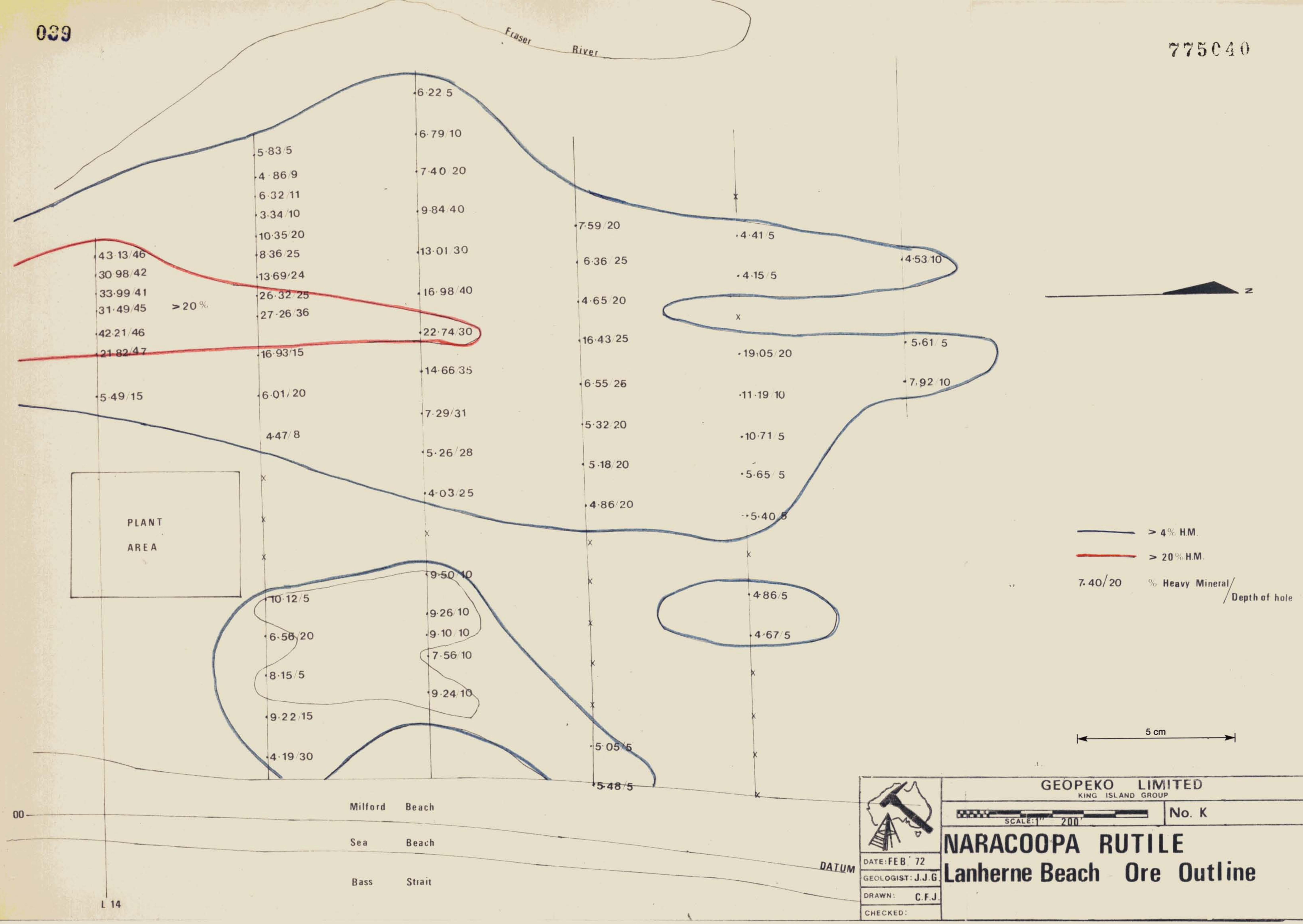
No. K

DATE: FEB '72
GEOLOGIST: J.J.G.
DRAWN: C.F.J.
CHECKED

EXPLORATION LICENSES Currently held by Naracoopa Rutile Ltd.

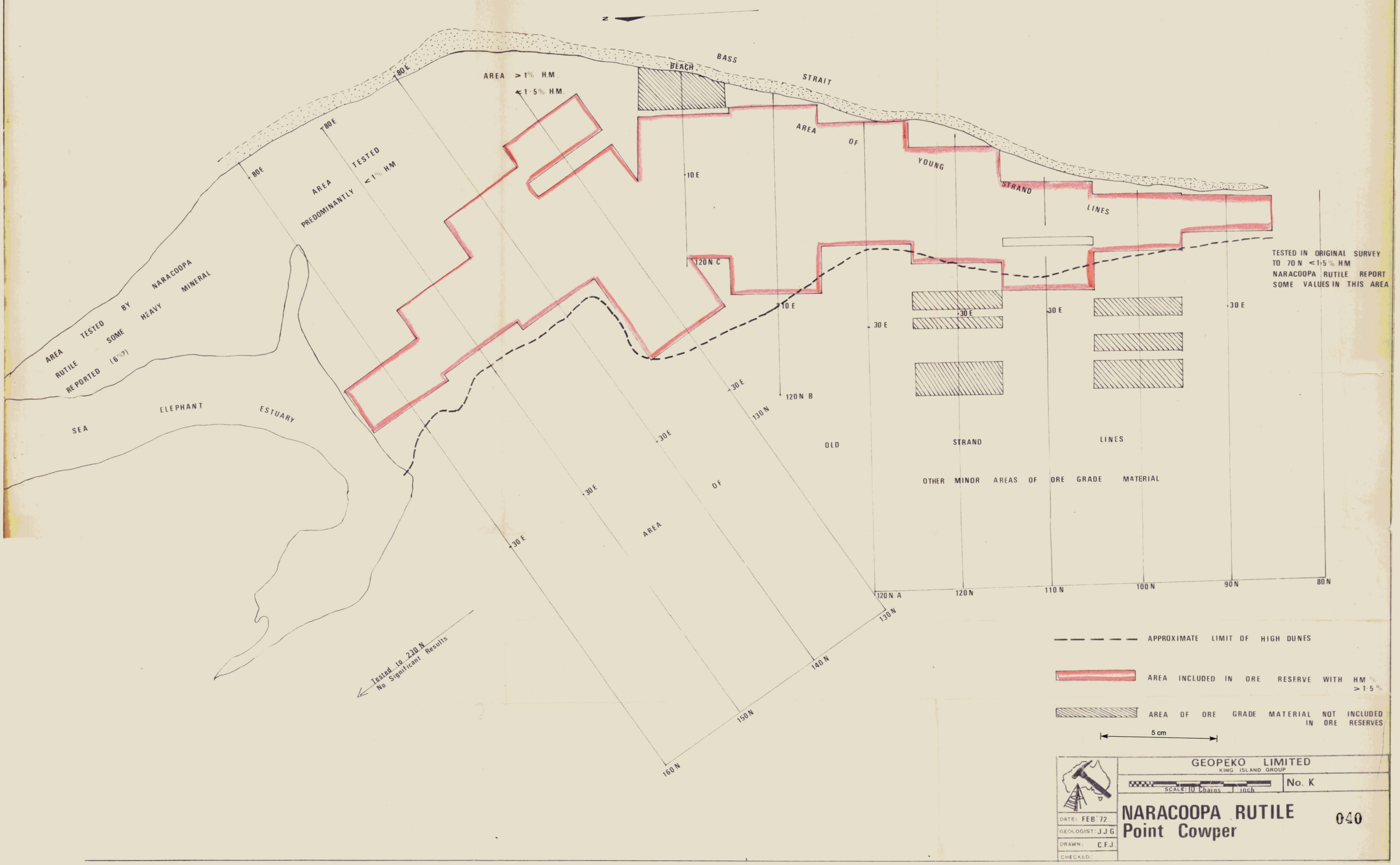
039

775040



Fraser River
6·22/5
6·79/10
7·40/20
9·84/40
13·01/30
16·98/40
22·74/30
14·66/35
7·29/31
5·26/28
4·03/25
5·83/5
4·86/9
6·32/11
3·34/10
10·35/20
8·36/25
13·69/24
26·32/25
27·26/36
16·93/15
6·01/20
4·47/8
43·13/46
30·98/42
33·99/41
31·49/45
42·21/46
21·82/47
5·49/15
> 20 %
7·59/20
6·36/25
4·65/20
16·43/25
6·55/26
5·32/20
5·18/20
4·86/20
4·41/5
4·15/5
19·05/20
11·19/10
10·71/5
5·65/5
5·40/5
4·53/10
5·61/5
7·92/10
PLANT AREA
9·50/10
10·12/5
9·26/10
9·10/10
6·56/20
7·56/10
8·15/5
9·24/10
9·22/15
4·19/30
5·05/5
5·48/5
4·86/5
4·67/5
N
> 4% H.M.
> 20% H.M.
7·40/20 % Heavy Mineral/Depth of hole
5 cm
Milford Beach
Sea Beach
Bass Strait
00
L 14
DATUM
GEOPEKO LIMITED
KING ISLAND GROUP
SCALE: 1" = 200'
No. K
NARACOOPA RUTILE
Lanherne Beach Ore Outline
DATE: FEB.'72
GEOLOGIST: J.J.G.
DRAWN: C.F.J.
CHECKED:

775041



N
BASS STRAIT
BEACH
AREA >1% H.M.
<1·5% H.M.
AREA OF YOUNG STRAND LINES
AREA TESTED
AREA PREDOMINANTLY <1% H.M.
AREA TESTED BY NARACOOPA RUTILE SOME HEAVY MINERAL REPORTED (6%?)
SEA ELEPHANT ESTUARY
OLD STRAND LINES
AREA OF
OTHER MINOR AREAS OF ORE GRADE MATERIAL
TESTED IN ORIGINAL SURVEY TO 70 N <1·5% HM
NARACOOPA RUTILE REPORT SOME VALUES IN THIS AREA
Tested to 230 N No Significant Results
80 E
10 E
30 E
120 N C
120 N B
120 N A
160 N
150 N
140 N
130 N
120 N
110 N
100 N
90 N
80 N
APPROXIMATE LIMIT OF HIGH DUNES
AREA INCLUDED IN ORE RESERVE WITH HM % >1·5%
AREA OF ORE GRADE MATERIAL NOT INCLUDED IN ORE RESERVES
5 cm
GEOPEKO LIMITED
KING ISLAND GROUP
SCALE: 10 Chains 1 inch
No. K
NARACOOPA RUTILE
Point Cowper
DATE: FEB. 72
GEOLOGIST: J.J.G.
DRAWN: C.F.J.
CHECKED:

040

NARACOOPA RUTILE LIMITED

BALANCE SHEET AS AT 28TH DECEMBER, 1971

ISSUED CAPITAL		
2,252,850 Ordinary Shares of 50¢ each fully paid		1,126,425
285,000 9% Preference Shares of $1 each fully paid		285,000
		1,411,425
REVENUE RESERVES		
Unappropriated profits		69,415
SHARE CAPITAL AND RESERVES		$1,480,840
Represented by:		
CURRENT ASSETS		
Cash on hand and at bank	467	
Debtors and prepayments	2,848	
Stocks on hand	434,616	
		437,931
Less:		
CURRENT LIABILITIES		
Bank Overdraft	206,406	
Trade Creditors	42,234	
Derby & Co. (Australia) Pty. Ltd.	95,306	
Provision for Expenses	76,937	
Bills Payable	60,000	
		480,883
WORKING CAPITAL		(42,952)
DEFERRED LIABILITIES		(233,705)
		(276,657)
Add:		
FIXED ASSETS	1,393,031	
Less Depreciation	409,876	
	983,155	
Staff Houses and Land	101,463	
Leases and Mining Tenements	611,827	
		1,696,445
Exploration and Development Expense		60,846
INVESTMENTS		206

NARACOOPA RUTILE LIMITED

PROFIT AND LOSS ACCOUNT

PERIOD ENDED 28TH DECEMBER, 1971

	THIS PERIOD		YEAR TO DATE	
	Actual	Budget	Actual	Budget
REVENUE:				
Est. Value of Production	35,113	114,410	910,248	1,406,140
Sales/Assay Adjustments	415	3,430	(8,495)	42,180
	$34,698	$110,980	$918,743	$1,363,960
LESS COSTS:				
Mine Costs	57,952	47,597	656,416	621,101
H.O. Administration	5,694	6,370	73,005	82,810
Interest	2,917	2,370	32,730	30,810
Selling Expenses	1,775	7,820	47,627	92,880
Depreciation	14,919	13,410	168,028	174,330
	$83,257	$77,567	$977,806	$1,001,931
Operating Profit (Loss)	($48,559)	$33,413	($59,063)	$362,029
Add: Loss on Disposal of Assets			14,700	
Less: Adjustments related to last year's sales			9,051	
Net (loss) for year to date			(64,712)	
Balance B/F 1st January, 1971.			134,127	
ACCUMULATED PROFITS TO DATE			69,415	

PER TON OF CONCENTRATES:

Production	Tons	265	1,240	10,591	14,120
Revenue	$	130.94	89.50	86.75	77.79
Costs	$	314.18	62.55	92.32	59.05
Profits (Loss)		(183.24)	26.95	(5.57)	18.74

FOUNDED 1797

DERBY & CO. LTD.

MOOR HOUSE
LONDON WALL
LONDON E.C.2

TELEPHONE 01-638 2878
TELEX 22357-9
CABLES PLATIVET LONDON EC2

KJW:SS

Naracoopa Rutile Limited,
291, George Street,
Sydney,
Australia.

17th June, 1970.

Memorandum of Sale No.8SO[illegible]9801.

Within the terms of our Agency Agreement dated the 7th November, 1968 we hereby confirm having effected the following sale :-

Quantity : About 10,000 (ten thousand) long tons, (5% more or le

Description : East Australian Rutile Sand minimum 95% TiO_2. 100% of the material to be below Tyler 20 mesh and 70% below Tyler 60 mesh.

Price : Australian $134 (one hundred and thirty four Australi dollars) per ton of 1016 kilos FOB and stowed Australia main port. Sellers have the right to deliver FOB and stowed Tasmanian port in which case any freight differential is for Sellers account.

Time of Delivery : To be made available for shipment as follows :

5,000 tons during second half 1971
5,000 tons during second half 1972

Terms of Payment : Prompt nett cash against shipping documents.

Buyer/Consumer : Farben Fabriken Bayer A.G., Leverkusen, West Germany.

DERBY & COMPANY LIMITED,

Accepted: R.K. ....

20.10.70

MARACOOPA [illegible] (Receiver Appointed)

944

APPENDIX E

775045

FOUNDED 1797

DERBY & CO. LTD.

MOOR HOUSE
LONDON WALL
LONDON EC2Y [illegible]

TELEPHONE 333 [illegible]
TELEX 8831[illegible]
CABLES PLATIVET LONDON [illegible]

KJW:SS

Maracoopa Rutile Sand, 45
291, George Street,
Sydney,
Australia.

21st April, 1971.

Memorandum of Sale - Our Ref: 8P203701.

Within the terms of our Agency Agreement we confirm having SOLD the following quantities of Rutile and against which you will supply material :

Quality : Rutile Sand produced by yourselves with minimum 96% TiO_2 maximum 1% each ZrO_2 and Fe_2O_3.

Quantity: In total 7,250 (seven thousand two hundred and fifty) long tons.

Time of Delivery: 1,500 (one thousand five hundred) tons during 1972
3,750 (three thousand seven hundred and fifty) tons during 1973.
2,000 (two thousand) tons during 1974.
Exact date of shipment of the foregoing quantities to be mutually agreed between ourselves at a later date.

Sales Price. To customers/end Users (equivalent to) A$140.00 (one hundred and forty Australian dollars) per [illegible] ton nett weight FOB and packed main Australi[illegible] (i.e. A$137.00 (one hundred and thirty se[illegible] dollars) per long ton FOB and stowed in bulk main Australian port.

Notional Allocation: It is agreed that the above quantities be allocated agai[illegible] the following sales:

5,250 tons delivery 1972/73 to F.R.E.S.A. (France): Murex (U.K.): CIG Melbourne
2,000 tons delivery 1974 to F.R.E.S.A. (France).

Terms of Payment : As per Agency Agreement dated 7th November, 1968.

DERBY & COMPANY LIMITED.

Accepted by Maracoopa Rutile Sand..........................

Date..... 1/5/71 ....

045

72-854 CONFIDENTIAL

775046

APPENDIX F

NARACOOPA RUTILE LIMITED

AIDE-MEMOIRE REGARDING MINERAL SANDS PRODUCERS

APPENDIX F

PEKO-WALLSEND LTD.

CONFIDENTIAL

NARACOOPA RUTILE LIMITED

AIDE-MEMOIRE REGARDING MINERAL SANDS PRODUCERS

The marketable products of Naracoopa Rutile Limited are rutile and zircon, and perhaps in some measure, ilmenite. The salient features of these products are stated as follows:-

RUTILE

The market for rutile falls into three broad categories:-

1. the titanium pigment industry, manufactured under the so called chlorination process,
2. the welding rod industry, as a coating, and
3. the titanium metal industry.

This company's estimates of the consumption for 1971 and the projected consumption for 1972, 1973 and 1974 are as follow:-

	Capacity	1971	1972	1973	1974
Pigment	338,000	165,000	175,000	183,000	205,000
Welding rods	130,000	125,000	125,000	125,000	125,000
Metal	45,000	15,000	15,000	20,000	25,000
Totals (tons)	513,000	305,000	315,000	328,000	355,000

The significant determinant of markets for rutile is the titanium pigment industry through the chlorination process.

From the above statement it will be seen that there is an installed pigment producing capacity of 338,000 tons and it is in this area that the present weakness of rutile demand lies.

Initially there was great enthusiasm for the production of pigment via the chloride route at the time when rutile prices were of the order of $80 per ton. Undisciplined growth of manufacturing capacity based on this price premise so raised the demand for rutile that resources which previously had been considered uneconomic were pressed into production as the rutile price was forced up by a demand in excess of then producing capacity.

Included in such production was the Naracoopa rutile resource.

The chlorination pigment industry however was in direct economic competition with pigment produced by the previously accepted process, the sulphate process, which used sulphuric acid and ilmenite as raw materials. Historically the chloride route users had been looking to cheaper rutile from the Pittsburgh Plate Glass-British Titan Products operation at Sierra Leone, and when this failed the burden of supply fell to Australia to carry with consequent further upward pressure on prices which led to rutile prices in the pigment industry of the order of $140 per ton.

For some time the chloride route pigment producers were able to carry these larger prices because concurrently the pigment producer had parallel cheap long term contracts against which to average out his purchase price, so that up to around June of last year his average purchase price was of the order of $100 per ton f.o.b. Australia. With the running out of the older contracts and the dependence on current supply and demand prices a substantial change is taking place.

Firstly we note hereunder the moving annual average of bulk rutile prices f.o.b. Australia to the U.S.A. for 18 months to November 1971 as follows:-

	1970 $	1971 $
January		88.10
February		88.35
March		88.95
April		89.82
May		90.27
June	81.74	94.36
July	82.54	96.44
August	83.24	96.84
September	83.85	99.36
October	84.80	101.94
November	86.04	102.20
December	86.89	

At the outset the chloride process produced a pigment somewhat superior to that of the sulphate process, but this advantage of the chloride process has been largely eroded by technical improvements in the sulphate process and the position now exists that with the economic downturn in the U.S.A. there is at least 100,000 tons of excess installed pigment capacity and with lower pigment prices the chloride route users of rutile are and have been losing money on this process. The effect of this has been two producers, Pittsburgh

Plate Glass and NL Industries, have abandoned the process, with a reduction in demand of at least 50,000 tons between them and it is well known that Cabot Titania has been for sale for several years and is expected to discontinue production with a loss of a further 30,000 tons per annum of market, whilst the English consumers via the chloride route, Laporte Industries and British Titan Products, are each running at no more than one half of their rated capacity and are experiencing technical and economic problems.

In these circumstances therefore it is our considered and firm view that there will be no further rutile pigment production capacity installed in the world before 1977 and the only hope for the chloride route is that a beneficiated ilmenite can be produced at a price which makes it economically competitive with the ilmenite-sulphate route to pigment.

The chloride route has a substantial advantage over the sulphate route in its better pollution characteristics, but this at the present stage of anti-pollution legislation is not sufficient to bridge the quite considerable cost gap which arises through present excessive rutile prices.

The production of rutile in Australia (the principal supplier of rutile) has over the past five years been as follows:-

1967	265,514 long tons
1968	290,154 long tons
1969	356,339 long tons
1970	365,009 long tons
1971	365,407 long tons

and during this time the excess production over consumption has resulted in stocks being held:-

1. in the hands of end users
2. in the hands of merchants
3. in bulk store in Australia awaiting bulk shipment

to the extent that there could well be currently 50-75,000 tons of stock in excess of nearby requirements.

It is in this atmosphere that one must view the increasing margin between productive capacity in Australia and market capacity and through that understand that a collapse in price which did not appear imminent last year has now emerged to the point where merchants who are holding stocks or contracts to acquire production are now prepared to cut their losses and rutile prices as low as little more than $100 per ton are negotiable. At these prices in our calculations there are few Australian producers who can continue to produce over the total range of their production.

Our estimates of the rutile cost of production of the major Australian producers during the year to 30th June 1971 are set out below. These costs are calculated after allowing for estimated zircon sales at current levels.

Producer	Net cash cost of production (net of Zr. credit)	Add depreciation	Total cost of production
	$	$	$
Cudgen RZ	85	24	109
Consolidated Rutile	50	22	72
Associated Minerals	72	14	86
Mineral Deposits	87	19	106
R.Z.M.	76	21	97

From the above it can be seen that there is a crisis in the Australian rutile industry which we as a company have recognised for some time and which the industry has now recognised and in respect of which it is arranging industry discussions this week.

Quite clearly Australia must reduce its production and those companies which are capable of producing material from lower cost resources will be able to remain in business whilst those who have higher cost resources will have the very unpleasant decision to make of continuing production at a loss, and in some cases a cash loss, or discontinuing production entirely.

ZIRCON

The co-product zircon had had a remarkable growth history. Around 1960 there existed a considerable stockpile of zircon in Australia from past rutile mining. At this time the advantages of zircon in the steel foundry industry became apparent and a demand was generated under which the price of zircon increased from around $20 per ton to at one stage $45 per ton, whilst the consumption rose from around 60,000 t.p.a. to almost 400,000 t.p.a.

At this point (1970) two events began to operate against zircon:-

1. the downturn in the capital goods industry with consequent reductions in steel castings, and

2. the considerable increases in production of zircon in the United States which apart from Australia historically has produced the major portion of the world's zircon (approximately 80,000 tons per annum) which increased in that country to approximately 140,000 tons per annum.

Faced with this situation, the Australian industry sought support from the Commonwealth government which considered the matter and established a minimum export price of $34 per ton, whilst at the same time the industry itself arranged a stockpile finance scheme to carry then an overstock of zircon sand.

The Commonwealth minimum export price has in fact worked well, but zircon stocks have increased in the country, some of which are under the stockpile finance scheme.

Clearly rutile production must reduce in Australia and this will to some extent ameliorate the zircon over supply position as zircon is produced broadly speaking as a co-product on a 1 ton zircon for 1 ton rutile ratio. In our opinion it is doubtful that the reduced supply of zircon through the reduced rutile production will result in sufficiently higher prices on a world basis to raise the minimum export price of $34 per ton for zircon.

ILMENITE

Ilmenite is the material used in the sulphate pigment process and is available basically from three sources:-

1. ilmenite sands,
2. rock ilmenite,
3. ilmenite slags.

The decision of any particular sulphate user is broadly one of economic cost of the raw material having regard to landed cost into his plant and differential treatment costs.

The prime material is ilmenitessand of a high grade such as is produced in Western Australia.

At the present state of the pigment industry however it is not possible for the Western Australian producers to find markets for the whole of their production at their asking price of around $12 per ton f.o.b. Bunbury and it would be folly to assume that with the disadvantages of production at King Island that the Naracoopa ilmenites could have any nearby economic use.