

HEAVY MINERAL BEACH SAND DEPOSIT

FRASER RIVER AREA,

NARACOOKA, K.I.

PRELIMINARY APPRAISAL OF VALUE

to

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from

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MICROFILMED

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HEAVY MINERAL BEACH SANDS, FRASER RIVER SECTION
KING ISLAND.

INTRODUCTION.

Test boring of the heavy mineral enrichment occurring in the sands adjacent to the beach in the vicinity of the Fraser River, Naracoopa, has been completed. A small area containing markedly rich values has been delineated. The concentration occurs on a low level terrace representing a stranded beach. There is no overburden. The rich strip averages 12 feet in depth, and two to three chains in width. It extends over a length of thirty-five chains. The area is easily accessible and for the greater part covered with grass tussocks and occasional low heath. This appraisal is attempted in order to determine whether the deposit could be profitably worked in the light of our present knowledge of mineral content and probable costs.

ESTIMATES OF QUANTITY AND GRADE.

Test boring has positively proved the existence of 168,000 cubic yards of sand having an average heavy mineral content of 41% by weight or 1460 lbs. of heavy mineral per cubic yard of sand, actually recoverable by gravity separation. Partly completed work by the C.S.I.R.O. Ore Dressing Laboratory at the University of Melbourne has been carried out on a composite sample of concentrate derived from the enriched sections of bores in test line No.1. The work done so far indicates the presence of rutile and zircon together with some tin and monazite and numerous other minerals. The sample subjected to testing represents a heavy mineral gravity concentrate amounting to 48.5% by weight or 1,850 lbs. per cubic yard of the original sand. Preliminary estimates by the C.S.I.R.O. indicate that 12.6% of the concentrate is rutile assaying 95% TiO_2 , 23% zircon, and with tin and monazite in small but undetermined amounts.

The percentages given are of the same order of magnitude as those derived by grain counting methods at Mt. Isa, on the same sample. The monazite sample has not yet been determined by the C.S.I.R.O., but it is unofficially stated at the laboratory that the monazite content is not likely to approach anything like 5%.

With our present knowledge of the composition of the sand, rutile must be considered to be the main constituent of economic

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importance, although the recovery of other minerals would undoubtedly contribute to the gross value of the concentrate. Until a good deal of further research work were carried out on the recoverable quantity of other economic minerals contained in the concentrate, a preliminary cost analysis should be based on the rutile content alone.

Assuming that the ratios of the minerals contained in a concentrate of the sand remain constant throughout the deposit it is fair to conclude that the rutile content is as follows:

| | | |
|---------------------------------------|---|------------------|
| Average heavy mineral content of sand | = | 41% by weight |
| or " " " " " " | = | 1460 lbs/cu. yd. |

Therefore,

| | | |
|------------|---|-----------------------------|
| 12% x 1460 | = | 175 lbs. Rutile/Cu. yd. |
| | = | 7.8 units of Rutile/Cu. yd. |

However it may be that the mineral ratios vary considerably throughout the deposit and for this reason more analytical work should be conducted on the samples by the C.S.I.R.O. At least a composite sample derived from all bores within the enriched area being discussed should be subjected to mineral recovery tests on a laboratory experimental scale. The exact price being paid for current production of rutile is difficult to determine. The greater part of the Australian production is sold by private treaty overseas. However the Mineral Economics Division of the Mineral Resources Bureau quotes recent returns of £55.0.0 to £65.0.0. per ton c.i.f. United Kingdom or £35.0.0. to £45.0.0. per ton f.o.b. Australian ports for a concentrate assaying 95% to 97% TiO_2 . Therefore for the purposes of estimation it is reasonable to assume a price of £40.0.0. per ton at Australian buyer's works or f.o.b. Australian ports.

Gross average value of rutile content of sand per cubic yard of original sand is derived as follows:-

| | | |
|---------------------------|---|-------------------------|
| £40 per ton | = | 8/- per unit TiO_2 |
| Therefore 7.8 units x 8/- | = | £3.2.4. per cubic yard. |

The extent to which the other economic minerals contained in the concentrate would contribute to the gross value per cubic yard of original sand is, as yet, unknown.

DISCUSSION ON MINING AND TREATMENT

Power is not available at Naracoopa, but the Tasmanian Hydro-Electric Commission can supply power at Currie, the principal town in King Island, sixteen miles from Naracoopa. Therefore the deposit would be mined and a heavy mineral concentrate recovered by gravity methods at Naracoopa. The concentrate would be transported to Currie for separation of the rutile and other minerals of economic value. Most of the weight of concentrate (except ilmenite) would ultimately be carried to Currie in any case for sale, so that no great freight disadvantage is brought about by treating the concentrate at Currie. There is a heavy consumption of power in treating mineral sand concentrates.

The surface of the deposit is on the average about 5 feet above high water mark. With the construction of rough sand levee banks the deposit could quite safely be worked to its seaward limits. There is no overburden and on an average the thickness of the deposit is 12 feet, but locally it extends to as deep as 18 feet. Subject to seasonal fluctuations the ground water table is encountered between 3 and 6 feet below the surface. Thus conditions are suitable for mining by a gravel pump or sand pump mounted on a small pontoon. The pump would elevate the sand to a mobile spiral concentrating plant situated on a higher terrace. Two stage concentration would probably produce a grade of concentrate suitable for transport to Currie for separation of the economic minerals.

The rate of mining would to a large extent be governed by the rate at which concentrate could reasonably be carted to Currie without the necessity for excessive stacking at Naracoopa.

A four-inch gravel pump is capable of delivering twelve cubic yards of solids per hour and if operated on one shift could mine approximately 90 cubic yards per day. A unit of this size would require only a small pontoon and could be handled by small hand winches.

When handling material of average grade at the above rate, approximately 60 tons of concentrate per day would be produced, constituting twelve loads which could be handled by three trucks each doing four round trips per day. The concentrating plant could consist of an agitator tank and a battery of

primary and secondary spiral concentrators and necessary pumps mounted on two four-wheeled rubber tyred trailers. Such a plant has recently been constructed for the use of Zircon Rutile Ltd. at Byron Bay. Power requirements would be about 50 Kva operating load and could be provided from a skid mounted diesel alternator of this capacity.

ESTIMATED OPERATING COSTS & LABOUR REQUIRED

Cost of Mining and Concentrating

| <u>Direct Labour.</u> | | <u>£. per week</u> |
|--|--------|--------------------|
| Mining, 2 men @ £14 per week | = | 28 |
| Concentrating and leading, 2 men @ £14 | = | 28 |
| Power, 1 man @ £14 per week | P.W. = | 14 |

Maintenance Labour.

| | | |
|----------------------------|---|----|
| Electrician @ £17 per week | = | 17 |
| Fitter @ £17 " " | = | 17 |
| Labourer @ £13 " " | = | 13 |

Supervision

| | | |
|-------------------------------|---|----|
| Plant Engineer @ £25 per week | = | 25 |
|-------------------------------|---|----|

Maintenance and General Stores

| | | |
|-----------------|----------------|-------------|
| Power | | |
| Fuel | £20 | |
| Maint. stores | 6 | |
| Oils and grease | <u>3</u> | 29 |
| Car Running | 200 miles/week | 10 |
| Contingencies | | <u>20</u> |
| | | <u>£226</u> |

| | | |
|------------------------|---|---------------|
| Yardage mined per week | = | 450 cu. yards |
| Cost per cubic yard | = | 10/- |

Cost of Carting Concentrate to Currie.

| | | |
|--|---|--------------------|
| Cartage on contract basis. Allow 1/6 per ton mile for leaded journey to Currie returning empty @ 1/- per mile, flat rate | = | 20/- |
| | | per cu. yd of sand |

Cost of Treatment for Extraction of Rutile etc.

It is practically impossible to arrive at this cost without considerably more data as regards both proposed method of extraction and process costs. Almost certainly the economic

minerals would be separated from a dried concentrate by magnetic and electrostatic methods.

Titanium and Zirconium Industries operating a separating plant on a pilot scale at Stradbroke Island treating approximately 2 tons of concentrate per hour, report costs up to £3. 5. 0 per ton of concentrate treated.

This figure when applied to sand with average heavy mineral content of 1460 lbs/cu. yd. gives 42/- per cu.yd. of sand mined.

Administration Cost.

| | <u>£. per week.</u> |
|-------------|---------------------|
| Manager | 30 |
| Accountant | 20 |
| Clerk | 15 |
| Storeman | 15 |
| Sundries | 20 |
| Head Office | <u>80</u> |
| | <u>£ 180</u> |

| | | |
|------------------------------------|---|-----------------|
| Yardage mined and treated per week | = | 8/- |
| = 450 cu. yards | = | per cu.yd.mined |

Estimated Total Operating Cost.

| | <u>Shillings</u> |
|-----------------------------|----------------------------|
| Mining and concentrating | 10. 0 |
| Cartage | 20. 0 |
| 9 Mineral extraction | 42. 0 |
| Administration | 8. 0 |
| Bagging rutile concentrate | <u>6. 3</u> |
| <u>Total operating cost</u> | 86. 3 |
| | per cu. yd. of sand mined. |

SUMMARY AND CONCLUSIONS.

Taking the rutile content of the sand alone

| | <u>Shillings</u> |
|---|------------------|
| Gross average recoverable value of rutile content per cu. yd. of original sand | = 62. 4 |
| Estimated operating cost to extract rutile content, exclusive of freight on concentrate from K.I. to mainland | = <u>85. 9</u> |
| Estimated operating loss | = <u>23. 5</u> |
| | per cu. yd. |

If rutile and zircon are considered as the marketable products contained in the deposit-

ShillingsRutile

12% of original sand:

| | | |
|--------------------------|---|--------------------|
| 7.8 units @ 8/- per unit | = | 62.4 per cu.yd. |
|--------------------------|---|--------------------|

Zircon

23% of original sand:

| | | |
|-------------------------|---|---------------|
| 15 units @ 2/- per unit | = | <u>30.0</u> " |
|-------------------------|---|---------------|

| | | |
|---|---|------|
| Gross average recoverable value of rutile and zircon content per cu. yd. of original sand | = | 92.4 |
|---|---|------|

| | | |
|---|---|--------------------|
| Estimated operating cost to extract rutile content, exclusive of freight on concentrate from King Island to mainland | = | 85.9 per cu.yd. |
|---|---|--------------------|

| | | |
|--|---|---------------|
| Additional cost to bag zircon concentrate | = | <u>12.0</u> " |
| | | <u>97.9</u> |

| | | |
|---|---|--------|
| Estimated operating cost to produce separate concentrates of rutile and zircon exclusive of shipping costs to mainland | = | 97.9 " |
| Estimated operating loss | = | 5.5 " |

It may therefore be concluded that unless considerable reduction could be achieved in the estimated operating costs under discussion for the rutile and zircon content alone.

However, a new perspective might be brought to bear on the matter if further analytical research proved the presence of tin and monazite values in recoverable quantities.

To round off the testing work the C.S.I.R.O. should be requested to conduct experimental tests for the recovery of tin, monazite, rutile and zircon from a composite sample to be made up of samples from all the bores embraced by the boundaries of the enrichment.

Melbourne,

26th September, 1952.

KING ISLAND SCHEELITE (1947) LIMITEDNovember, 1956.

MEMO TO - BOARD OF DIRECTORS.
SUBJECT - NARACOOPA BEACH SANDS.
REVIEW OF STATUS OF PROSPECT

1. LOCATION AND LEASE HOLDINGS:

The area containing heavy beach sands with which this report deals is situated on the East Coast of King Island running North from the mouth of the Fraser River, and lying between that river and the coast.

The original lease held by Gatenby & Patterson was the subject of an option that has now been exercised. Additional leases have been applied for, and also a water right on Fraser River.

The location and leases are shown on the accompanying maps which show also the location of Crown reserves for cable station and Naracoopa townsite.

2. EXPLORATION:

(1) The area was bored under the supervision of Dr. M.D. Garretty, for Mt. Isa Mines 1951-52, and the plans and results have been made available to us. The lines of bores were 5 chains apart, and the bores in each line $\frac{1}{2}$ chain apart.

(2) Part of the area was check bored by K.I.S. in 1955, and the samples sent to Zircon Rutile at Byron Bay for determination of mineral content.

The results of these bores checked within acceptable limits the results of the previous boring reported by Garretty.

(3) Further boring was done by K.I.S. in 1956, designed to cover any likely extension of the deposits indicated by the previous boring.

The determination of heavy mineral content of the samples from these borings was done in K.I.S. laboratory, and the proportions of the several minerals established by tests at Melbourne University and by R. K. Newman (Analytical Chemists, Sydney).

(4) A test pit was sunk to a depth of 22 ft. on the "Upper Terrace", and one to a depth of 13 ft. on the "Lower Terrace" at points shown on the boring plans.

3. RESULTS OF EXPLORATION:

The boring campaigns described above have delineated two deposits of interest. The principal one is that contained by the raised beach above high water mark of the present beach, and including portion of the present beach. It is designated in this report "Lower Terrace". It runs parallel to the strand for 45 chains, average width three chains, and average depth 12 ft. It is estimated to contain 348,000 tons of sand, average content of heavy minerals 38.2%.

The surface is covered by heath, rushes and some low scrub. There is no overburden, but a quantity, estimated at 100,000 tons, of sand requires to be removed from the bank behind the Lower Terrace.

A test pit sunk to 12 ft. on Lower Terrace showed a total in several seams of 2 ft. of indurated sand. This would not break down completely during mining and pumping, and some loss of material on account of screening out coarse lumps must be allowed.

Water table in the pit was at 5 ft. below surface. Below this it was necessary to drive spiling, but the make of water was not great, indicating that an excavation such as would be required in drag-line mining could be kept dry by pumping without much expense.

The subsidiary deposit, designated "Upper Terrace", is situated 10 chains back from the Lower Terrace, and runs roughly parallel to the latter for a length of 30 chains, average width 3 chains, average depth 16 ft. It is estimated to contain 428,000 tons of sand, of an average heavy mineral content 18.5%. Part of this deposit lies on Townsite reserve. The surface is covered with heavy scrub, and some swamp.

A test pit sunk to 22 ft. on this deposit showed that "coffee rock" (indurated sand) constituted a considerable proportion of the whole of the material in the pit. Water table was 20 ft. below the surface.

In the estimates given above of quantities of sand and content of heavy mineral, allowance has been made for batters to the excavation in barren or low-grade material.

4. LABORATORY TESTS OF MINERAL COMPOSITION

Various laboratory tests and studies have been made on several samples. Unfortunately, none are entirely complete and satisfactory, but there have been sufficient tests by different investigators to allow a conservative figure for rutile content of heavy mineral to be adopted.

| | | | | |
|------------------|--------------|---------|-------|--------|
| Garretty reports | 12.6% | Rutile, | 23% | Zircon |
| Zircon Rutile " | 14.6% | " | 19.8% | " |
| Carpco | approx. 12 % | " | 10 % | " |

all from samples of Lower Terrace material.

| | | | | |
|----------------------|-------|---------|-------|--------|
| R. K. Newman reports | 14.2% | Rutile, | 15% | Zircon |
| Melbourne University | 13 % | " | 11.5% | " |

from samples of Upper Terrace heavy mineral.

The results of the several tests are summarised in Appendix A. In calculating Rutile content, 12.5% has been adopted.

5. ORE RESERVES:

| <u>Location</u> | <u>Tons Sand</u> | <u>% Heavy Mineral</u> | <u>Tons Heavy Mineral</u> | <u>% Rutile</u> | <u>Tons Rutile</u> | <u>% Zircon</u> | <u>Tons Zircon</u> |
|----------------------|------------------|------------------------|---------------------------|-----------------|--------------------|-----------------|--------------------|
| <u>Lower Terrace</u> | 348,000 | 38.2 | 133,000 | 12.5 | 16,500 | 14 | 18,620 |
| <u>Less in Beach</u> | 43,000 | 19.0 | 8,200 | 12.5 | 1,025 | 14 | 1,148 |
| | <u>305,000</u> | | <u>124,800</u> | | <u>15,475</u> | | <u>17,472</u> |
| <u>Upper Terrace</u> | 428,000 | 18.5 | 79,000 | 12.5 | 9,800 | 14 | 11,060 |

6. RECOVERABLE RUTILE

From the data available, the above figures represent the total rutile and zircon in the deposits, the boundaries of which have been drawn at 15% heavy mineral.

No reliable figures are available for the recovery by mining, but it is certain that there will be some loss of mineral on the bottom of the excavations whether mining is by suction pump or by dragline. The latter lends itself to cleaner mining provided the excavation is reasonable dry. It is assumed that rutile delivered to the wet plant will be 80% of that estimated by boring. Wet and dry plant recovery is taken at 85.5%.

As noted in Para.3, some loss of mineral in coffee rock that does not break down, must be allowed. From observation, the loss is estimated at 8% for the Lower Terrace. In the Upper Terrace the quantity is such as to indicate that rolls or a hammer mill or some comparable machine would be required ahead of the wet mill.

The following calculations deal only with the Lower Terrace deposit. The lower grade and the presence of a considerable proportion of indurated material in the material from Upper Terrace, Lower Terrace alone. If this appears profitable, mining can be started there and further investigation into treatment of Upper Terrace material pursued during mining of the Lower Terrace.

The amount of rutile which can be recovered from the Lower Terrace is calculated as follows:-

The total quantity available has been reduced by the quantity lying to the seaward of high water mark, as this material may or may not be minable.

| <u>Tons Rutile estimated</u> | <u>Mining Recovery 80%</u> | <u>Less 8% loss in Indurated Sand</u> | <u>Rutile to Plant</u> | <u>Plant Recovery 85.5%</u> |
|------------------------------|----------------------------|---------------------------------------|------------------------|-----------------------------|
| <u>15475</u> | <u>12380</u> | <u>990</u> | <u>11390</u> | <u>9700 tons</u> |

7. ECONOMICS:

Considered on basis of 2,500 tons rutile annually, and

working only the high grade Lower Terrace deposit.

Estimate of Working Costs:

Detailed estimates are given in Appendix B.

Total Annual Expenditure

| | |
|---------------------------------------|----------|
| Mining, treatment, power | £81,990 |
| Freight & charges Naracoopa to F.O.B. | 24,125 |
| Grassy & Melbourne overheads | 2,500 |
| | <hr/> |
| | £108,615 |

On 2,500 tons £43.10.0 per ton

Capital Expenses:

| | |
|------------------------|------------------|
| As details Appendix G. | \$193,000 |
| On 9,700 tons rutile | £19.18.0 per ton |

Economic outcome:

Assuming that rutile production can be sold for an average price of £75 per ton net F.O.B. Melbourne:-

| | | | |
|---------------------|----------|---------|-----------|
| Sale price | - | per ton | £75. 0. 0 |
| Less - Working cost | £43.10.0 | per ton | |
| Capital cost | £19.18.0 | per ton | 63. 8. 0 |

Profit £11.12. 0

| | |
|----------------------------------|----------|
| £11.12.0 per ton on 9,700 tons = | £112,500 |
| Less Tax | 36,800 |

| | |
|--|--------|
| (20% Tax free 8/- per £1 on remainder) | |
| Profit after Tax | 75,700 |
| Average annual profit - over 5 years (1 yr. erection - 4 yrs. production) | 15,140 |
| Representing 8.0% per annum on capital investment of £193,000 | |

8. DISCUSSION AND CONCLUSIONS:

From the foregoing it appears that working of the Lower Terrace deposit for rutile only would pay for a plant costing £193,000 and return a modest profit. Whether the prospective profit is sufficiently attractive is a matter for decision.

With the plant paid for, there could be some further prospective profit (a) from Upper Terrace (b) from sale of zircon, should this appreciate in price.

By making use of plant which is, or will be, surplus to scheelite mining requirements, the capital expense could be reduced somewhat at the risk of less reliability and greater maintenance cost.

The estimates of capital expense and of working cost have not included any provision for housing or amenities, other than 3 houses at Naracoopa. The assumption is made that surplus accommodation will be available at Grassy and the men transported daily to the beach sand plant.

If this assumption does not hold, then both capital cost and working cost will be higher than estimated.

Summarising, the prospect is no bonanza, and planning, organisation and working will require to be sound to make a small profit.

IAN D. CAMERON
General Manager.

KING ISLAND SCHEELITE (1947) LIMITEDNARACOOPA BEACH SANDS - APPENDIX B.ESTIMATE OF OPERATING COSTS.LABOUR & SUPERVISION

| | | |
|-------------------|---|-------------|
| <u>Mining:</u> | 2 Truck Drivers @ £20.10.0 per week | £2,132 |
| | 1 Shovel Driver @ £22.10.0 " " | 1,170 |
| | 1 L-Hand & Bulldozer Driver | 1,500 |
| <u>Milling:</u> | 4 Crews of 2 Operators @ £27.0.0 | 11,232 |
| | 2 Maintenance Men @ £27.0.0 | 2,808 |
| | 2 Bagging Men @ £23.0.0 | 2,392 |
| | 1 Electrician | 1,500 |
| | 2 Extra Labourers @ £23.0.0 | 2,392 |
| | 1 Mill Superintendent | 2,500 |
| | 1 Record Clerk, Storeman, etc. @ £25.00 | 1,250 |
| | 1 Chemist | 1,500 |
| | 1 Sampler-Lab. Assistant | 1,250 |
| | | <hr/> |
| | Transport of Men | 31,626 |
| | | 3,978 |
| | | <hr/> |
| | Overhead on Wages (20%) | 35,604 |
| | | 7,121 |
| | | <hr/> |
| | | 42,725 |
| <u>Materials:</u> | Distillate | £2,000 |
| | Fuel Oil (Dryer) | |
| | 12 gal.per hr. x 600x13x1/6 | 7,020 |
| | Bags, 50,000 @ 3/- | 7,500 |
| | Lubricants | 500 |
| | Maintenance Materials | 4,000 |
| | Miscellaneous | 3,000 |
| | | 24,020 |
| <u>Power:</u> | | 15,245 |
| | Freight & Charges on Ship Melbourne | |
| | £9.13.0 per ton | 24,125 |
| | | <hr/> |
| | Total | £106,115 |
| | | <hr/> <hr/> |
| | 4 Drivers @ £27 | |
| | 1 Fitter @ £27 | £7,600 |
| | Overhead on Wages 20% | 1,520 |
| | 70,000 gals. Fuel @ 1/6 | 5,250 |
| | 750 " Lub.Oil@10/- | 375 |
| | Spare parts, tools, supplies | 500 |
| | | <hr/> |
| | | £15,245 |
| | | <hr/> |

KING ISLAND SCHEELITE (1947) LIMITEDNARACOOPA BEACH SANDS - APPENDIX C.PRELIMINARY ESTIMATE OF CAPITAL COST OF BEACH SAND PLANT:

Capacity:- 8 tons sand per hour to yield 50 tons Rutile per week of 7 days.

PRELIMINARY

| | | | | |
|------|---|-------------------------------|--------|---------|
| Item | 1 | Sampling & Testing | £1,000 | |
| | 2 | Engineering design & drawings | 2,500 | |
| | 3 | Laboratory Equipment | 2,300 | |
| | 4 | Laboratory Building & Office | 5,000 | |
| | 5 | Three Houses @ £3,600 | 10,800 | |
| | 6 | Two Motor Vehicles | 3,200 | |
| | 7 | Access Road - 20 chains | 1,000 | £25,800 |

TREATMENT PLANT

| | | | | |
|------|----|--|--------|---------|
| Item | 8 | Preparation of Mill Site | 500 | |
| | 9 | Mill Buildings, Foundations, etc. | 25,000 | |
| | 10 | Feed ramp, screen & tanks | 2,200 | |
| | 11 | 6 Wilfley Tables installed | 5,400 | |
| | 12 | Pumps, Distributors, Launderers, etc. | 2,000 | |
| | 13 | Filter, Dryer, Dust Collector, etc., installed | 13,000 | |
| | 14 | Vibrating Conveyor | 300 | |
| | 15 | Belt and Bucket Elevators (4) | 3,200 | |
| | 16 | Electrostatic Separators:- | | |
| | | 1 x 4 roll @ £4,443 | | |
| | | 1 x 2 roll @ 2,622 | | |
| | | 1 x Rectifier @ 556 | | |
| | | Installation 979 ... | 8,600 | |
| | 17 | Magnetic Separators:- | | |
| | | 2 x 4 roll @ £4,888 | | |
| | | Rectifier @ 500 | | |
| | | Installation 436 ... | 10,700 | |
| | 18 | Pipes, Launderers, etc. | 2,000 | |
| | 19 | Zircon Disposal Pump | 1,000 | |
| | 20 | Ilmenite Disposal Pump | 1,000 | |
| | 21 | Tailing Disposal | 1,500 | |
| | 22 | Bagging Bin & Elevator | 2,000 | |
| | 23 | Water Supply & Reticulation | 3,500 | £81,900 |

C/- Forward:

£107,700

- 2 -

B/Forward: £107.700

CONTINGENCIES

| | | | |
|---------|-------------------------------|-------|-------|
| Item 24 | Additional Magnetic Separator | 5,000 | |
| 25 | Attrition Machine | 3,000 | |
| 26 | 2 Wilfley Tables | 1,600 | 9,600 |

POWER SUPPLY

| | | | |
|---------|--|--|--------|
| Item 27 | Transformers, Poles, Wire, Distribution, Control Gear, Lighting, etc. Alternatively, Diesel sets to supply equivalent. | | 32,000 |
|---------|--|--|--------|

MINING

| | | | |
|---------|--|--------|-----------------|
| Item 28 | Dragline and $\frac{3}{4}$ cu. yard Bucket | 12,000 | |
| 29 | Two 5-ton Diesel Trucks | 6,000 | |
| | One D.6 Bulldozer | 8,000 | 26,000 |
| | | | 175,300 |
| 30 | Contingencies 10% | | 17,700 |
| | | | <u>£193,000</u> |

KING ISLAND SCHEELITE (1947) LIMITEDNARACOOPA BEACH SANDS - APPENDIX D.STATEMENT OF KNOWN TOTAL EXPENDITURE TO 27.10.56

| | | |
|---|-----------|----------------|
| Expenditure 1955 | | £709 |
| " to 29.9.56 | | £9,288 |
| Total to 29.9.56 (as per monthly statement) | | £9,997 |
| Add known expenses P/L 27.10.56 | | |
| Labour | £160. 0.0 | |
| Stores | 80. 0.0 | |
| Leases | 227.10.0 | |
| Travelling expenses | 124.10.0 | |
| Sampling pump | 28. 0.0 | 620 |
| Total known operating charges | | £10,616 |
| Purchase of house and land | | 2,661 |
| Option (Lease Patterson & Gatenby) | | 5,000 |
| and Extensions | | 1,000 |
| | | <u>£19,277</u> |

Add - Test work by Carpco & Melbourne University. £1,000

.R.L. Board consider that only a small plant, on the lines indicated by Mr. Miller, should be erected pending more mineral reserves being discovered, when planning for extension of the plant could be based on knowledge that at present is lacking.

Mr. Miller's estimates were based on 1,800 tons of rutile yearly, capital cost being stated at £80,000. Known rutile sand reserves being 12,000 tons.

It is considered the cost of rutile bagged and delivered store Melbourne, and then to steamer, would be around £40 to £45 per ton. Capital cost being taken at £100,000.

Estimated results on the above basis at various prices over a period of six years at 2,000 tons p.a. which would work out the present known rutile content, are:

| <u>Gross price per ton</u> | £60 | £70 | £80 | £90 |
|----------------------------|----------|---------|---------|---------|
| <u>Proceeds</u> | 120,000 | 140,000 | 160,000 | 180,000 |
| <u>Less Commission 5%</u> | 6,000 | 7,000 | 8,000 | 9,000 |
| <u>Costs at £40</u> | 114,000 | 133,000 | 152,000 | 171,000 |
| | 80,000 | 80,000 | 80,000 | 80,000 |
| <u>PROFIT:</u> | 34,000 | 53,000 | 72,000 | 91,000 |
| <u>Profit for 6 years</u> | | | | |
| <u>Capital Recouped -</u> | 204,000 | 318,000 | 432,000 | 546,000 |
| 1st year | 34,000 | 53,000 | 72,000 | 91,000 |
| 2nd " | 34,000 | 47,000 | 28,000 | 9,000 |
| 3rd " | 32,000 | | | |
| <u>Balance of Profit -</u> | | | | |
| 2nd Year | - | | | |
| 3rd " | 2,000 | ,000 | ,000 | ,000 |
| 4th "(| 34,000 | 53,000 | 72,000 | 91,000 |
| 5th " | 34,000 | 53,000 | 72,000 | 91,000 |
| 6th " | 34,000 | 53,000 | 72,000 | 91,000 |
| <u>Taxation -</u> | | | | |
| 2nd Year | | | | |
| 3rd " | 480 | | | |
| Each 4th to 6th | 9,270 | 14,590 | 19,910 | 25,230 |
| <u>Profit, less Tax -</u> | | | | |
| 1st Year | | | | |
| 2nd " | - | 4,560 | 31,930 | 59,290 |
| 3rd " | 1,520 | 38,410 | 52,090 | 65,770 |
| 4th " | 24,730 | 38,410 | 52,090 | 65,770 |
| 5th " | 24,730 | 38,410 | 52,090 | 65,770 |
| 6th " | 24,730 | 38,410 | 52,090 | 65,770 |
| <u>TOTAL:</u> | £ 75,710 | 158,200 | 240,290 | 322,370 |
| of which there is | | | | |
| <u>Tax Exempt</u> | 20,800 | 43,600 | 66,400 | 93,200 |

| <u>SUMMARY:</u> | | | | |
|---------------------------------|----------|---------|---------|---------|
| Capital Recouped | 100,000 | 100,000 | 100,000 | 100,000 |
| Taxation | 28,290 | 59,800 | 91,710 | 123,630 |
| Exempt Income | 20,800 | 43,600 | 66,400 | 93,200 |
| Taxable Income (if distributed) | 54,910 | 114,600 | 173,890 | 229,170 |
| <u>6 YEARS' PROFIT:</u> | £204,000 | 318,000 | 432,000 | 546,000 |

Over six years' capital should be repaid, in addition to which the remaining profits (after tax) would average over the six years:

| | | |
|----|-----|-------|
| at | £60 | 12½% |
| | £70 | 26.3% |
| | £80 | 40% |
| | £90 | 53,7% |

On the basis of a capital expenditure of £200,000 and output of 5,000 tons yearly, the known reserves would be worked out in 2.2 years. The results shown below are based on the same cost of £40 and a price of £80 less 5% commission.

| | |
|--------------------------------|------------------|
| Capital recouped | 200,000 |
| Taxation | 63,210 |
| Exempt Income | 46,400 |
| Taxable Income | <u>122,390</u> |
| <u>TOTAL PROFIT FOR PERIOD</u> | <u>£ 432,000</u> |

Over this short period, after repaying capital, the remaining profit would average 70.3% on capital outlay, compared with 40% on the smaller plant over six years.

WORKING AGREEMENT:

It is suggested that a neutral trade name be registered in the name of two or four nominees (equal from each company). An agreement be prepared stating the partners are nominees of the two companies, what its business is, how profits are shared, etc. and indemnifying such nominees from any liability.

The working of the deposits and plant to be undertaken by K.I.S., the selling and accounting for each received to be the responsibility of Z.R.L. The registered office of the partnership and where the accounting to be done, is to be decided.

NARACOOPA BEACH SANDS

1. CHECK BORING - REPORT
2. CHECK BORING RESULTS - TABLE (A)
3. CHECK BORING RESULTS - TABLE (B)
4. CHECK BORING RESULTS - TABLE (C)
5. CHECK BORING RESULTS - TABLE (D)
6. ESTIMATE OF MINERAL
FROM CHECK BORING - TABLE (E)
7. MINERAL COMPOSITION - TABLE (F)

1/11/55

CHECK BORINGGeneral

The samples of check boring carried out by King Island Scheelite Ltd. were received in good order on 5th October, 1955.

Each sample was dried, weighted and tabled on a Laboratory Wilfley Table. Percent mineral by weight is shown in Tables A, B, C and D, together with drill records. Weighted averages for each hole and line of bores are also shown.

Table E gives estimate of mineral on check boring results.

Detailed records of results of original boring are not available here, so it has not been possible to compare results. It is thought that these results are shown on plans at King Island Scheelite Ltd., and a comparison of actual results would be of interest.

Mineral Reserves

Dr. Garretty's report indicates 110,000 tons heavy mineral available in the area. The estimate of mineral made from the check bores (107,000 tons) can only be considered as approximate, but would indicate that Dr. Garretty's figure is substantially correct.

Rutile Content

Tests on mineral composition are shown in Table F and indicate an average Rutile content of 14.6%. Allowing for a recovery of 90%, this would mean 13.0% recoverable Rutile. C.S.I.R.O. tests suggest 12% and it is thought that this could be bettered.

Further recovery tests will be carried out in the next few weeks on the mineral when a test Electrostatic Separator arrives. Samples of the mineral have also been forwarded to Carpcoc, Jacksonville 6, Florida, U.S.A. for investigation.

State of Mineral

The mineral is all very discolored and tests are now being carried out with a Laboratory Wemco Attrition Machine in order to find the best method of cleaning mineral.

Tin Content.

Large samples of mineral from each line of bores were tabled carefully to try and find the tin content. However, except for Line, 1, the tin content was negligible.

It would appear that the tin would have no significant effect on the economics of the project.

(A)

NARACOOPA BEACH SANDS
CHECK BORING RESULTS

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | | Sample Percent Mineral by Weight | | Average Grade Hole. Percent Mineral by Weight |
|----------------------------|---------------|---------------|-----------------------|------------------|------------|---------------------------|----------------------------------|----------|---|
| <u>Line 1. Hole E. = 7</u> | | | | | | | | | |
| 0-6' | 6' | 4" | .860 | 164 | 3801 | Dark Brown Sand | 35.7 | 57.7 | |
| 6-12' | 6' | 2 7/8" | .246 | 91 | 3802 | Dark Brown & Black Sand | 53.8 | NOT | |
| 12-13'3" | 1'3" | " | .302 | 425 | 3803 | Dark Brown Sand & Pebbles | 35.3 | Correct. | |
| 13'3" | | | | | | Gravel Bottom | | | 43.8 |
| <u>Line 1. Hole B. = 4</u> | | | | | | | | | |
| 0-6' | 6' | 2 7/8" | .241 | 89 | 3804 | Dark Brown Sand | 25.0 | 28 | |
| 6-12' | 6' | 2 7/8" | .364 | 135 | 3805 | " " " | 32.3 | 58.9 | |
| 12-14'4" | 2'4" | 2 7/8" | .413 | 392 | 3806 | " " " | 28.4 | 51.5 | |
| 14'4" | | | | | | Hard Bottom (Boulder?) | | | 28.6 |
| <u>Line 1. Hole D. = 6</u> | | | | | | | | | |
| 0-6' | 6' | 2 7/8" | .241 | 89 | 3807 | Brown Sand | 51.0 | 54 | |
| 6-12' | 6' | 2 7/8" | .323 | 120 | 3808 | " " | 52.8 | 55 | |
| 12-13'3" | 1'3" | 2 7/8" | .174 | 310 | 3809 | " " | 61.0 | | |
| 13'3" | | | | | | Gravel Bottom | | | 52.8 |
| <u>Line 1. Hole F. = 8</u> | | | | | | | | | |
| 0-6' | 6' | 2 7/8" | .287 | 105 | 3810 | Brown Sand | 45.7 | 54 | |
| 6-12' | 6" | 2 7/8" | .369 | 135 | 3811 | " " | 58.0 | 57.9 | |
| 12' | (Chip Sample) | | | | 3818 | Gravel & Clay Bottom | | | 51.8 |

(A) Contd.

501022

010

NARACOOPA BEACH SANDSCHECK BORING RESULTS

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | | Sample Percent Mineral by Weight | Average Grade Hole. Percent Minera by Weight |
|------------------------------|---------------|---------------|-----------------------|------------------|------------|---|----------------------------------|--|
| <u>Line 1. Hole H. = 10</u> | | | | | | | | |
| 0-6' | 6' | 27/8" | .301 | 111 | 3812 | Brown Sand | 76.0 | 71 |
| 6-9'4" | 3'-4' | 27/8" | .261 | 174 | 3813 | | 76.0 | 47(6-12) |
| 9'4" | 10' | 8" | | | 3814 | Clay Bottom | | 76.0 |
| <u>Line 1. Hole J. = 12.</u> | | | | | | | | |
| 0-6' | 6' | 27/8" | .328 | 121 | 3815 | Brown Sand | 86.0 | 73 |
| 6-8'6" | 2'6" | 27/8" | .251 | 222 | 3816 | (Hard Brown Sand & Small Stones | 82.0 | 90. |
| 8'6"- | | | | | | | | |
| 11'9" | 3'3" | 27/8" | .538 | 365 | 3817 | (Cemented Brown Sand, Wood & (Small Stones. | 2.2 | |
| 11'9" | | | | | | Gravel Bottom | | 62.0 |

Average Depth 12.31'

Average Grade 50.8%

(B)

NARACOOPA BEACH SANDS

501023

045

CHECK BORING RESULTS

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | | Sample Percent Mineral by Weight | Average Grade Hole. Percent Minera by Weight |
|-------------------------|---------------|-------------------|-----------------------|------------------|------------|-------------------------|----------------------------------|--|
| <u>Line 3. Hole 8.</u> | | | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .233 | 86 | 3819 | Brown Sand | 19.5 17.4 | 20.4 |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .284 | 105 | 3820 | " " | 17.8 22.0 | |
| 12-13'7" | 1'7" | 2 $\frac{7}{8}$ " | .183 | 258 | 3821 | " " | 33.2 33.8 | |
| 13'7" | | | | | | Gravel Bottom | | |
| <u>Line 3. Hole 10.</u> | | | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .183 | 68 | 3822 | Brown Sand | 31.0 26.7 | 26.8 |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .330 | 122 | 3823 | " " | 30.0 30.2 | |
| 12-15'6" | 3'6" | 2 $\frac{7}{8}$ " | .223 | 142 | 3824 | Cement Bottom | 14.5 24.9 | |
| <u>Line 3. Hole 12.</u> | | | | | | | | |
| 0-4' | 4' | 4" | .331 | 95% | 3825 | Brown Sand | 28.5 36.4 | 30.5 |
| 4-8' | 4' | 2 $\frac{7}{8}$ " | .287 | 159 | 3826 | " " | 38.5 49.1 | |
| 8-12' | 4' | 2 $\frac{7}{8}$ " | .297 | 165 | 3827 | " " | 37.5 6.2 | |
| 12-14' | 2' | 2 $\frac{7}{8}$ " | .112 | 124 | 3828 | Light Brown Coarse Sand | 6.6 | |
| 14' | | | | | | Gravel Bottom | | |

(C)

NARACOOPA BEACH SANDS

501025

047

CHECK BORING RESULTS

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu. ft. | Core Recovered % | Sample No. | | Sample Percent Mineral by Weight | Average Grade Hole. Percent Mineral by Weight |
|---|---------------|---------------------------------|------------------------|------------------|------------|------------------------------------|----------------------------------|---|
| <u>Line 5. Hole 14</u> | | | | | | | | |
| 0-6' | 6' | 2 ⁷ / ₈ " | .219 | 81 | 3837 | Brown Sand | 43.0 | 44.6 0-6 |
| 6-7' | 1' | 2 ⁷ / ₈ " | .521 | 1158 | 3838 | " " | 76.0 | 40.4 6-12 |
| 7' | | | | | | Hard Brown Cement Bottom | | 2-7 12-15 47.6 |
| <u>Line 5. Hole 12</u> | | | | | | | | |
| 0-6' | 6' | 2 ⁷ / ₈ " | .243 | 90 | 3839 | Brown Sand | 48.0 | 39.0 6' |
| 6-11' | 5' | 2 ⁷ / ₈ " | .575 | 279 | 3840 | " " | 74.0 | 77.5 12' |
| 11' | | | | | | Gravel & Hard Brown Cement Bottom. | | 59.7 |
| <u>Line 5. Hole 10</u> | | | | | | | | |
| 0-6' | 6' | 2 ⁷ / ₈ " | .205 | 76 | 3841 | Brown Sand | 29.0 | 34 28.2 - 6' |
| 6-10'6" | 4'6" | 2 ⁷ / ₈ " | .599 | 295 | 2842 | " " | 44.0 | 72-64 71.2 12' |
| 10'6" | | | | | | Gravel Bottom | | 35.1 |
| <u>Line 5. Hole 4 (On Beach - Low Water).</u> | | | | | | | | |
| 0-5'6" | 5'6" | 2 ⁷ / ₈ " | .390 | 175 | 3843 | Brown Sand | 9.0 | 17.8 0-6 |
| 5'6" | | | | | | Gravel Bottom | | 11.3 6-12 9.0 |

(C) Contd.

9

NARACOOPA BEACH SANDS
CHECK BORING RESULTS

501026

048

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | | Sample Percent Mineral by Weight | Average Grade Hole. Percent Mineral by Weight |
|--|---------------|---------------|-----------------------|------------------|------------|----------------------------------|----------------------------------|---|
| <u>Line 5. Hole 6 - (On Beach - High Water).</u> | | | | | | | | |
| 0-6' | 6' | 27" | .195 | 72 | 3844 | Brown Sand | 15.5 | 23.8 6-6 |
| 6-10'6" | 4'6" | 28" | .341 | 168 | 3845 | " " | 16.5 | 11.9 6-12 |
| 10'6" - | | | Not | | | (Slurry-Strained through | | |
| 13'6" | 3' | 28" | Measured | | 3846 | (bag - not measured. | 9.7 | 14.6 |
| | | | | | | (Caught by tide - Not bottomed). | | |
| <u>Line 5. Hole 8.</u> | | | | | | | | |
| 0-6' | 6' | 27" | .229 | 85 | 3847 | Brown Sand | 18.5 | 22.6 6 |
| 6-12' | 6' | 28" | .375 | 139 | 3848 | Dark Brown Sand | 17.5 | 29.8 12 |
| 12-18' | 6' | 28" | .648 | 240 | 3849 | Light Brown Running Sand | 23.0 | |
| 18-21' | 3' | 28" | .585 | 433 | 3850 | " " " " | 16.0 | 26.6 18 |
| 21-23' | 2' | 28" | .078 | 87 | 3851 | Light Brown Clayey Sand | 5.0 | 5.5 23 |
| 23' | | | | | | Brown Clay Bottom | | 17.9 |

(D)
NARACOOPA BEACH SANDS
CHECK BORING RESULTS

501027

679

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | | Sample Percent Mineral by Weight | | Average Grade Hole. Percent Mineral by Weight |
|-------------------------|---------------|-------------------|-----------------------|------------------|------------|--------------------------|----------------------------------|------|---|
| <u>Line 7. Hole 10.</u> | | | | | | | | | |
| 0-6' | 6' | 27 ⁸ " | .355 | 131 | 3852 | Brown Sand | 20.0 | 19.4 | 6 |
| 6-11'6" | 5'6" | 27 ⁸ " | .457 | 205 | 3853 | " " | 14.5 | 18.4 | 12 |
| 11'6" | | | | | | Brown Cement Bottom | | 21.9 | 16 17.3 |
| <u>Line 7. Hole 12.</u> | | | | | | | | | |
| 0-6' | 6' | 27 ⁸ " | .193 | 71 | 3854 | Brown Sand | 11.6 | 11.4 | 6 |
| 6-12' | 6' | 27 ⁸ " | .375 | 138 | 3855 | " " | 39.5 | 44.5 | 12 |
| 12-13'6" | 1'6" | 27 ⁸ " | .167 | 249 | 3856 | " " | 42.0 | | |
| 13'6" | | | | | | Gravel Bottom | | | 27.5 |
| <u>Line 7. Hole 14.</u> | | | | | | | | | |
| 0-6' | 6' | 27 ⁸ " | .264 | 98 | 3857 | Brown Sand | 39.0 | 36.0 | |
| 6-8'6" | 2'6" | 27 ⁸ " | .386 | 343 | 3858 | " " | 89.0 | 79.2 | |
| 2'6" | | | | | | Hard Brown Cement Bottom | | | 54.2 |

(E)

501028

050

NARACOOPA BEACH SANDSESTIMATE OF MINERAL FROM CHECK BORING

| Line | Average Grade | | Average Depth | | Assumed Zone Influence | | Volume Area Bored Cu. Yards | Heavy Mineral in Area Tons | Percent Rutile in Mineral (Table Page) | Rutile Tons | Percent Tin in Mineral | Tin Tons |
|------|------------------------|---------------------------------|---------------|------|------------------------|----------------|-----------------------------------|-------------------------------------|--|-------------------|------------------------------|----------------|
| | % Mineral by Weight | Cwts. Min. per cubic yard | Feet | Yds. | Length Yards | Width Yards | | | | | | |
| 1 | 50.8 | 14.9 | 12.31 | 4.1 | 220 | 60 | 54,000 | 40,000 | 17.0 | 6,800 | 0.236 | 94 |
| 3 | 34.1 | 9.5 | 14.8 | 4.9 | 220 | 60 | 64,500 | 30,000 | 13.5 | 4,000 | 0.066 | 20 |
| 5 | 28.6 | 7.8 | 11.7 | 3.9 | 220 | 70 | 60,000 | 23,000 | 13.0 | 3,000 | 0.148 | 34 |
| 7 | 30.8 | 8.5 | 11.2 | 3.7 | 220 | 40 | 32,600 | 14,000 | 13.5 | 1,900 | 0.051 | 7 |
| | | | | | | | 211,100 | 107,000 | 14.6 | 15,700 | | 155 |

(F)

NARACOOPA BEACH SANDSMINERAL COMPOSITION

501029

051

- NOTE:
1. An average sample from each line of bores was magnetically separated in a Carpc Laboratory Magnetic Separator.
 2. Samples of uncleaned and cleaned (coating removed in weak caustic soda solution) mineral showed no difference in Magnetic Separator.

| Average Sample from | Magnetics - Percentage | | | | | Total Magnet-ics % | Non Magnet-ics % | Micro Count Non-Mags. | | | Analysis of Non-Magnetics | | Estimated Composition of Mineral | | | |
|---------------------|------------------------|------|------|------|------|--------------------|------------------|-----------------------|--------|--------|---------------------------|------|----------------------------------|--------|--------|-------|
| | 0 | 0.25 | 0.50 | 0.75 | 0.0 | | | Zircon | Rutile | Others | Magnetics | | Ilmenite | Rutile | Zircon | Other |
| | Amps | | | | Amps | | | | | | TiO ₂ | FeO | | | | |
| Line 1 | 7.5 | 21.5 | 21.0 | 5.5 | 3.0 | 58.5 | 41.5 | 22.25 | 20.35 | 1.4 | 42.5 | 0.45 | 57.0 | 17.0 | 24.0 | 2.0 |
| Line 3 | 7.5 | 24.5 | 20.5 | 9.5 | 6.0 | 68.0 | 32.0 | 15.1 | 15.5 | 1.4 | 41.2 | 0.73 | 67.0 | 13.5 | 17.5 | 2.0 |
| Line 5 | 4.0 | 12.0 | 29.0 | 16.0 | 8.0 | 69.0 | 31.0 | 12.6 | 15.2 | 1.2 | 41.25 | 0.96 | 68.5 | 13.0 | 16.5 | 2.0 |
| Line 7 | 4.5 | 20.0 | 19.0 | 17.0 | 5.5 | 66.0 | 34.0 | 17.0 | 15.7 | 1.3 | 42.75 | 0.67 | 66.5 | 13.5 | 18.0 | 2.0 |

MINERAL BEACH SANDS

KING ISLAND

FROM

Miller
16th February, 1955

MINERAL BEACH SANDSKING ISLANDIntroduction

Data for the following notes on the economic possibilities of the Mineral Sands on King Island, has been obtained from the following sources :

- (a) Report on Testing Fraser Beach Terrace, King Island.
by F. Blake - 7th March, 1929.
- (b) Heavy Mineral Beach Sand Deposit Fraser River Area.
Preliminary Appraisal of Value
by Dr. H. D. Garretty - 26th September, 1952.
- (c) C.S.I.R.O. Ore Dressing Report No. 478
"Concentration of Beach Sand Minerals from near
Point Cowper King Island"
by S. B. Hudson - May 1954.
- (d) Report and verbal information from A. Boggis
-
who inspected deposit - January 1955.

Mineral Reserves

From Dr. Garretty's report there is a proved reserve of 168,000 cubic yards having an average mineral content of 41% by weight or 1460 lbs/yard in the rich strip along the beach near the Fraser River.

This means 110,000 tons of heavy mineral is available. C.S.I.R.O. figures suggest 12% recovery of rutile which means there is approximately 13,000 tons of rutile in the area.

The area is apparently easily worked and is free from overburden. There is a good water supply available from the Fraser River and suitable plant sites are available.

Other areas in the district between the Fraser River and Sea Elephant River show mineral and it is possible that further reserves could be proved by a large scale drilling campaign. Mr. Boggis is of the opinion that there is considerable quantities of mineral in the area, although not high grade like the small Fraser River area.

The tin content of the Fraser River area is high (Report (a)) and if it could be recovered would form a significant proportion of the income. However, as recovery of tin from beach sands is difficult it is not proposed to take this possible income into account.

Method of Mining and Treatment.

General. As the proved area is relatively small it is proposed to estimate on a minimum throughput of 3 tons heavy mineral per hour. This is about the minimum size for an economic plant. A larger plant would not increase the capital cost greatly and would have somewhat lower costs than the following estimate.

64

It must be realized that the following estimates are approximate only as numerous assumptions have had to be made. Also the composition of the mineral is very different from the mineral on the east coast of Australia.

Mining. Mineral mined by small $\frac{3}{8}$ or $\frac{1}{2}$ yard dragline and carted by motor truck to tabling and separation plant near Fraser River.

(N.B. This method suggested as deposit is high grade, haulage distance short and preliminary upgrading by spirals is not necessary).

Tabling Plant. General flowsheet of tabling plant is shown in Sketch A. Four tables suggested and would give up to 4 tons per hour heavy mineral.

As tin content is high every effort is made to collect it, first by taking a topcut from each table and recleaning this concentrate on an unriffled curvilinear table. Also, it is suggested that the main mineral concentrate from the primary tables is put over corduroy strakes. Strake concentrate also being cleaned up on the curvilinear table.

Mineral Cleaning.

As the mineral is very dirty it will be necessary to clean the grains so that maximum recovery of Rutile can be obtained. In the C.S.I.R.O. investigations an acid wash was used, however it is thought that one or other of the following methods would be more satisfactory.

- (a) Cleaning by means of an Wenco Attrition Machine. These machines clean sand by the rubbing action of particle against particle in a high density pulp under controlled conditions of turbulence. As far as is known none of these machines have been tried in Australia, but from American literature it would appear that they would be very suitable. It would be necessary to run tests with a Laboratory model before a decision

could be made as to suitability.
(The approximate price for a
laboratory model in 1953 was £200
and they are obtainable through
"United Development Corporation,
188 George Street, Sydney")

- (b) Tests at Z.R.L. show that the mineral can be easily cleaned in a weak cold caustic soda solution. This may be a cheaper and easier method than the attrition machine or it may be possible to use both together.

Both methods of cleaning would need to be fully investigated as it is essential to have a clean mineral for E. S. Separation.

Mineral Separation.

Sketch (B) shows suggested type of plant. It has been assumed that neither the Zircon nor the Ilmenite will be saleable. (Z.R.L. assay of the Ilmenite was $5.8\% \text{Cr}_2\text{O}_3$).

After drying, the mineral is passed hot through the Electrostatic Machines, the Zircon being discarded. These machines adjusted so that as little as possible Rutile is lost in the discarded Zircon.

The R.I. portion then passed through low intensity Magnetic Separators to remove bulk of the Ilmenite, and then through a high intensity Induction Roll Separator.

The non-magnetics would then need to be passed through an E. S. Machine to remove any Zircon left by the primary E. S. Machines to produce final rutile. The tailings from this machine would contain some Rutile and would be returned as a middling to the head of the drier or mineral cleaning plant.

Costs.

Capital Cost. A plant of size suggested put up with entirely new equipment would cost approximately £80,000. This is only an estimate, but sufficiently accurate for present purposes.

Working Costs.

Plant Capacity 3 tons / hour

Plant run, say, 5 days / week i.e., 120 hours

Assume get 100 hours production

or 300 tons / week.

Assuming 12% recovery of Rutile

gives 36 tons Rutile / week.

Present price of Rutile, say, £48/10/- F.O.B. Melbourne.

Costs per ton to get Rutile to Melbourne.

| | |
|----------------------------------|----------|
| Bags and bagging labour | 3. 0. 0. |
| Freight and Handling to Currie | 1.10. 0. |
| Freight Currie to Melbourne | 4.13. 0. |
| Melbourne Charges (Storage etc.) | 1. 0. 0. |

£10. 3. 0.

Therefore Value Unbagged Rutile at Works

is £38. 7. 0.

On a production of 36 tons Rutile per week this gives an income of £1380.

Working Costs per Week.Mining. (460 c.yds/week reqd.)

3 yard dragline easily do this with
2 trucks, leaving spare time for
maintenance and time for trucks to
cart Rutile to Currie.

| | |
|------------------------------------|----|
| Dragline (Running and Maintenance) | 30 |
| Driver | 20 |
| 2/ 4 ton Trucks and Drivers | 90 |

Tabling.

| | |
|--------------------------|----|
| 3 Shifts. Labour (3 Men) | 60 |
| Maintenance and Repairs | 50 |

Cleaning Mineral.

(This is unknown factor allow 5/-
per ton mineral)

| | |
|--|----|
| | 75 |
|--|----|

Drying. (Oil and Maintenance) 150

Separation.

| | |
|-----------------|----|
| Labour (3 Men) | 60 |
| Maintenance | 30 |

Power.

Approx. 150 H.P. reqd.
Diesel Gen. Set - Fuel and Maintenance 150

| | |
|--------------------|----|
| Labour - 3 Drivers | 60 |
|--------------------|----|

(These men could probably run separation
plant but a total of three men per shift
would be necessary)

Extra Labour.

| | |
|------------------|----|
| 3 Spare Men | 60 |
| 1 Storeman/Clerk | 20 |
| Manager | 30 |
| Contingencies | 50 |

£935

Note: All labour has been averaged at £20 / week; this should
be sufficient to cover different classifications and Holiday Pay, etc.

Summary of Costs.

Taking the estimated running costs of £935 from the weekly income of £1380 gives a nett weekly income of £445, or £22,000 per year (50 weeks).

With a capital outlay of £80,000 and paying this back in, say, five (5) years at £16,000 per year, leaves an overall profit of £8000 per year.

Conclusions.

It would appear from the above estimates that there is a possibility of working the deposit at a small profit.

However, as the capital outlay is necessary large, and small factors such as, Rutile recovery, underestimation of working costs etc., could easily change the estimated small profit to a considerable loss; the only conclusion that can be drawn from the rough estimate given, is that the proposition is worthy of further detailed investigation.

Recommendations.

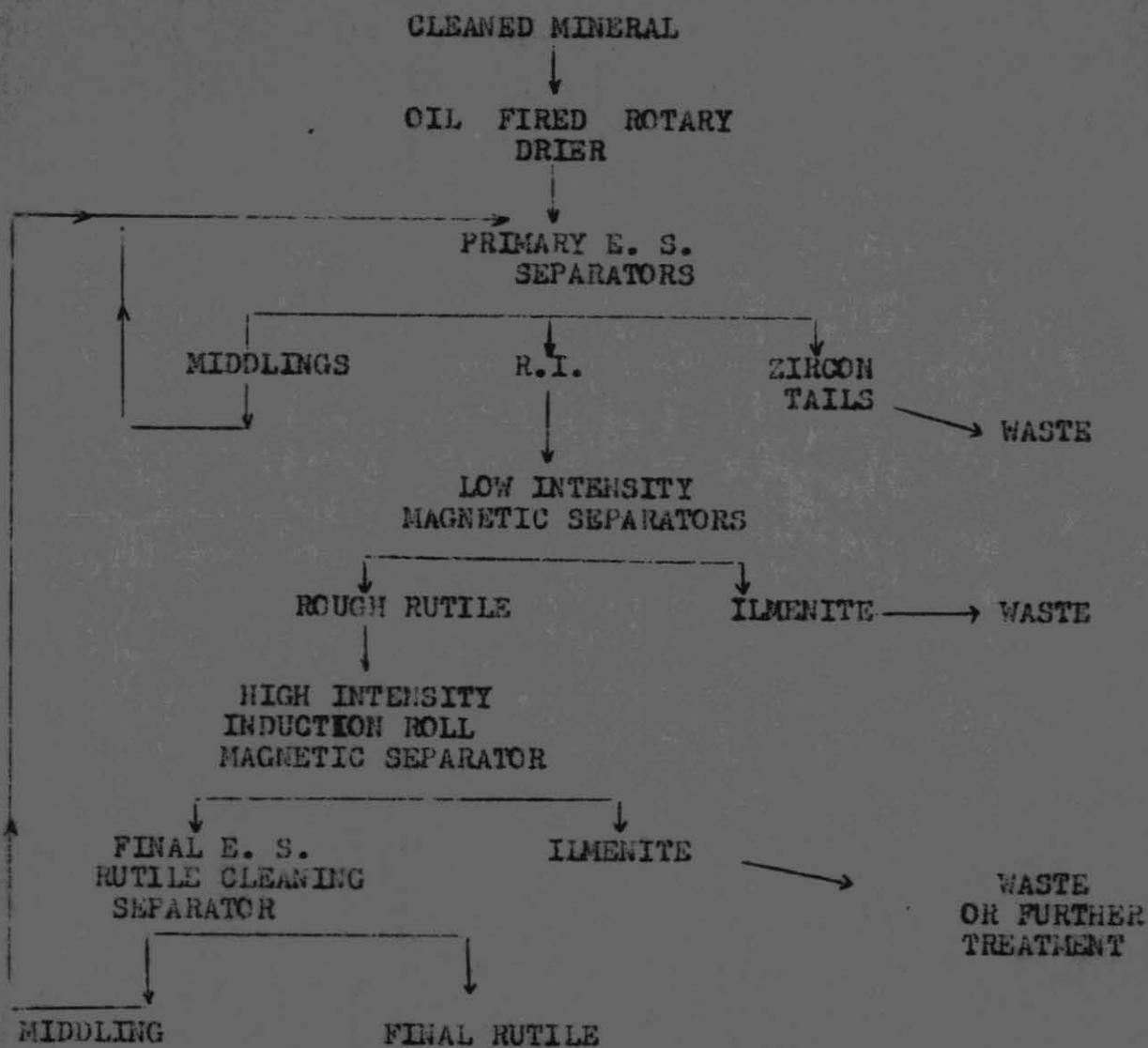
- (a) It is recommended that an option to purchase be obtained from the holders of the Fraser River area, also options on any other leases in the area.
- (b) If these options can be obtained at a reasonable figure, it is then recommended that comprehensive and accurate testing of large bulk samples from various parts of the lease to prove the quantity of saleable Rutile that can be recovered.

This testing would need to check recovery on the tables as Rutile being the lightest of the heavy mineral is easily lost. Also methods of cleaning the mineral would need investigation, both to design suitable plant and estimate cost of this process.

001

SKETCH B.

SEPARATION PLANT



JS:LJV.

PER AIRMAIL

1st September, 1955.

The Manager,
Zircon Rutile Ltd.,
BYRON BAY, N.S.W.

Dear Sir,

We enclose herewith boring records and plan of the check boring recently carried out on King Island beach sands in the Naracoopa area.

The samples, 65 in all, are packed in ten ore bags and branded :

"ZIRCON RUTILE, BYRON BAY, N.S.W."

These will be despatched per the s.s. "Loatta" expected sailing date from King Island being on or about the 2nd September, consigned to our shipping agents, Messrs. C. Stokes & Co. for transhipment to Sydney per boat, thence by rail to Byron Bay, N.S.W.

Yours faithfully,
KING ISLAND SCHEELITE (1947) LIMITED

A. J. STEEL,
Acting General Manager.

Encls.

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501040A

-1-

KING ISLAND SCHEELITE (1947) LIMITED

NARACOOPA BEACH SANDS

Holes on Line 1 have been identified as follows:-

| <u>Letter on Bore</u> <u>Samples 15-27/8/55</u> | <u>Number as Plan</u> <u>Oct. '52.</u> |
|--|---|
| B | 4 |
| D | 6 |
| E | 7 |
| F | 8 |
| H | 10 |
| J | 12 |

J. SAMUEL.

KING ISLAND SCHEELITE (1947) LIMITED

NARACOOPA BEACH SANDS

BORE SAMPLES 15/8/55 to 26/8/55.

LINE 1. HOLE "E".

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | |
|-------------------------|---------------|-------------------|-----------------------|------------------|------------|---------------------------|
| 0-6' | 6' | 4" | .860 | 164 | 3801 | Dark Brown Sand |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .246 | 91 | 3802 | Dark Brown & Black Sand |
| 12-13'3" | 1'3" | " | .302 | 425 | 3803 | Dark Brown Sand & Pebbles |
| 13'3" | | | | | | Gravel Bottom |
| <u>LINE 1. HOLE "B"</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .241 | 89 | 3804 | Dark Brown Sand |
| 6-12 | 6 | 2 $\frac{7}{8}$ " | .364 | 135 | 3805 | " " " |
| 12-14'4" | 2'4" | 2 $\frac{7}{8}$ " | .413 | 392 | 3806 | " " " |
| 14'4" | | | | | | Hard Bottom (Boulder?) |
| <u>LINE 1. HOLE "D"</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .241 | 89 | 3807 | Brown Sand |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .323 | 120 | 3808 | " " |
| 12-13'3" | 1'3" | 2 $\frac{7}{8}$ " | .174 | 310 | 3809 | " " |
| 13'3" | | | | | | Gravel Bottom |
| <u>LINE 1. HOLE "F"</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .287 | 105 | 3810 | Brown Sand |
| 6-12' | 6" | 2 $\frac{7}{8}$ " | .369 | 135 | 3811 | " " |
| 12' | | (Chip Sample) | | | 3818 | Gravel & Clay Bottom |

- 3 -

KING ISLAND SCHEELITE (1947) LIMITEDNARACOOPA LEACH SANDSBORE SAMPLES 15/8/55 to 26/8/55

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | |
|--|--------------------|-------------------|-----------------------|------------------|------------|---|
| <u>LINE 1, HOLE H.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .301 | 111 | 3812 | Brown Sand |
| 6-9' $\frac{1}{4}$ " | 3' $\frac{1}{4}$ ' | 2 $\frac{7}{8}$ " | .261 | 174 | 3813 | |
| 9' $\frac{1}{4}$ " | 10' | 8" | | | 3814 | Clay Bottom |
| <u>LINE 1, HOLE J.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .328 | 121 | 3815 | Brown Sand |
| 6-8' $\frac{1}{6}$ " | 2' $\frac{1}{6}$ " | 2 $\frac{7}{8}$ " | .251 | 222 | 3816 | (Hard Brown Sand & Small stones |
| 8' $\frac{1}{6}$ "-11' $\frac{1}{9}$ " | 3' $\frac{1}{3}$ " | 2 $\frac{7}{8}$ " | .538 | 365 | 3817 | (Cemented Brown Sand, Wood & Small Stones. |
| 11' $\frac{1}{9}$ " | | | | | | Gravel Bottom |
| <u>LINE 3, HOLE 8.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .233 | 86 | 3819 | Brown Sand |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .284 | 105 | 3820 | " " |
| 12-13' $\frac{1}{7}$ " | 1' $\frac{1}{7}$ " | 2 $\frac{7}{8}$ " | .183 | 258 | 3821 | " " |
| 13' $\frac{1}{7}$ " | | | | | | Gravel Bottom |
| <u>LINE 3, HOLE 10.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .183 | 68 | 3822 | Brown Sand |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .330 | 122 | 3823 | " " |
| 12-15' $\frac{1}{6}$ " | 3' $\frac{1}{6}$ " | 2 $\frac{7}{8}$ " | .223 | 142 | 3824 | Cement Bottom |

- 4 -

KING ISLAND SCHEELITE (1947) LIMITEDNAHACOOPA BEACH SANDSBORE SAMPLES 15/8/55 to 26/8/55.

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | |
|-------------------------|---------------|-------------------|-----------------------|------------------|------------|-------------------------|
| <u>LINE 3, HOLE 12.</u> | | | | | | |
| 0-4' | 4' | 4" | .331 | 95% | 3825 | Brown Sand |
| 4-8' | 4' | 2 $\frac{7}{8}$ " | .287 | 159 | 3826 | " " |
| 8-12' | 4' | 2 $\frac{7}{8}$ " | .297 | 165 | 3827 | " " |
| 12-14' | 2' | 2 $\frac{7}{8}$ " | .112 | 124 | 3828 | Light Brown Coarse Sand |
| 14' | | | | | | Gravel Bottom |
| <u>LINE 3, HOLE 14.</u> | | | | | | |
| 0-2.7' | 2.7' | 4" | .258 | 109 | 3829 | Brown Sand |
| 2.7-8' | 5.3' | 2 $\frac{7}{8}$ " | .200 | 84 | 3830 | " " |
| 8-12' | 4' | 2 $\frac{7}{8}$ " | .292 | 162 | 3831 | " " |
| 12-16' | 4' | 2 $\frac{7}{8}$ " | .195 | 108 | 3832 | Light Brown Coarse Sand |
| 16-20' | 4' | 2 $\frac{7}{8}$ " | .287 | 159 | 3833 | " " " " |
| 20-23' | 3' | 2 $\frac{7}{8}$ " | .195 | 144 | 3834 | " " " " |
| 23' | | | | | | Hard Brown Cement Botto |
| <u>LINE 3, HOLE 16.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .258 | 95 | 3835 | Brown Sand |
| 6-8' | 2' | 2 $\frac{7}{8}$ " | .341 | 378 | 3836 | Dark Brown Sand |
| 8' | | | | | | Hard Brown Cement Botto |
| <u>LINE 5, HOLE 14.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .219 | 81 | 3837 | Brown Sand |
| 6-7' | 1' | 2 $\frac{7}{8}$ " | .521 | 1158 | 3838 | " " |
| 7' | | | | | | Hard Brown Cement Btm. |

KING ISLAND SCHEELITE (1947) LIMITEDNARACOOPA BEACH SANDSBORE SAMPLES 15/8/55 to 26/8/55.

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | |
|--|---------------|-------------------|-----------------------|------------------|------------|--|
| <u>LINE 5, HOLE 12</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .243 | 90 | 3829 | Brown Sand |
| 6-11' | 5' | 2 $\frac{7}{8}$ " | .575 | 279 | 3840 | " " |
| 11' | | | | | | Gravel & Hard Brown Cement Bottom. |
| <u>LINE 5, HOLE 10.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .205 | 76 | 3841 | Brown Sand |
| 6-10'6" | 4'6" | 2 $\frac{7}{8}$ " | .599 | 295 | 3842 | " " |
| 10'6" | | | | | | Gravel Bottom |
| <u>LINE 5, HOLE 4 (On Beach - Low Water).</u> | | | | | | |
| 0-5'6" | 5'6" | 2 $\frac{7}{8}$ " | .390 | 175 | 3843 | Brown Sand |
| 5'6" | | | | | | Gravel Bottom |
| <u>LINE 5, HOLE 6 - (On Beach - High Water).</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .195 | 72 | 3844 | Brown Sand |
| 6-10'6" | 4'6" | 2 $\frac{7}{8}$ " | .341 | 168 | 3845 | " " |
| 10'6"-13'6" | 3' | 2 $\frac{7}{8}$ " | (Not measured) | | 3846 | (Slurry - Strained through bag - not measured. |
| (Caught by tide - Not bottomed). | | | | | | |
| <u>LINE 5, HOLE 8.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .229 | 85 | 3847 | Brown Sand. |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .375 | 139 | 3848 | Dark Brown Sand |
| 12-18' | 6' | 2 $\frac{7}{8}$ " | .648 | 240 | 3849 | Light Brown Running Sand |
| 18-21' | 3' | 2 $\frac{7}{8}$ " | .585 | 433 | 3850 | " " " " |
| 21-23' | 2' | 2 $\frac{7}{8}$ " | .078 | 87 | 3851 | Light Brown Clayey Sand |
| 23' | | | | | | Brown Clay Bottom. |

KING ISLAND SCHEELITE (1947) LIMITEDNARACOOPA BEACH SANDSBORE SAMPLES 15/8/55 to 26/8/55.

| Depth | Depth Sampled | Diam. of Shoe | Core Recovered cu.ft. | Core Recovered % | Sample No. | |
|-------------------------|---------------|-------------------|-----------------------|------------------|------------|--------------------------|
| <u>LINE 7, HOLE 10.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .355 | 131 | 3852 | Brown Sand |
| 6-11'6" | 5'6" | 2 $\frac{7}{8}$ " | .457 | 205 | 3853 | " " |
| 11'6" | | | | | | Brown Cement Bottom |
| <u>LINE 7, HOLE 12.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .193 | 71 | 3854 | Brown Sand |
| 6-12' | 6' | 2 $\frac{7}{8}$ " | .375 | 138 | 3855 | " " |
| 12-13'6" | 1'6" | 2 $\frac{7}{8}$ " | .167 | 249 | 3856 | " " |
| 13'6" | | | | | | Gravel Bottom |
| <u>LINE 7, HOLE 14.</u> | | | | | | |
| 0-6' | 6' | 2 $\frac{7}{8}$ " | .264 | 98 | 3857 | Brown Sand |
| 6-8'6" | 2'6" | 2 $\frac{7}{8}$ " | .386 | 343 | 3858 | " " |
| 2'6" | | | | | | Hard Brown Cement Bottom |

J. SAMUEL.
29/8/55.

8/15

069

REPORT ON EXAMINATION AND BORING
OF ALLUVIAL DEPOSITS AT FRASER BEACH TERRACE,
KING ISLAND.

PRELIMINARY STATEMENT.

In the year 1905 the British Flag Prospecting and Mining Syndicate No Liability applied for and were granted 6 reward claims for tin over an area of 125 acres. These leases were situated north of and adjacent to the mouth of the Fraser River.

The syndicate started mining operations on their south-eastern section with experimental plant in the following year, but suspended work after six months owing to the unsuitability of the concentrating machines and lack of funds. Four special concentrating tables capable of handling about one cubic yard per hour are said to have been constructed locally, a four horse-power portable steam engine for operating installed and a 3000 gallon capacity Worthington pump set up to provide a water supply.

For the operating period the mine manager reported excavating 1584 cubic yards of material and passing 366 cubic yards over the tables thereby producing 5 tons 10 cwt 2 grs 8 lbs of tin and 1 oz 13 dwts 14 grs of gold to a net value of £250.2.6.

The original leases expired in 1911 and since that date portion of the ground has been held under various names at different times but very little actual mining has been undertaken.

In 1925 an application was received from J. McK. Bowling to lease 76 acres under number 9620/M covering the old workings and this is held under mineral lease at the present time.

LOCATION AND ACCESS.

King Island is situated about 55 miles north-west of Tasmania at the western entrance to Bass Strait and is midway between the mainland of Australia and Tasmania. The island's greatest length is 40 miles in a meridional direction and its breadth at the widest part is 16 miles.

The property under examination is Crown Land and part

070

of the township reserve of Narracoopa. It is situated on the east coast of the island and immediately north of Fraser River mouth. Fraser jetty at Narracoopa settlement lies 1 mile to south-east and it is to this port that a steamer calls bi-weekly, in suitable weather, on its way between Tasmania and Melbourne and return.

A main road with an excellent surface for motor traffic connects Narracoopa settlement with the principal township, Currie, on the West Coast, and this road passes within a few chains of the property.

TOPOGRAPHY.

The principal topographical feature of the area is represented by a raised beach in the form of a terrace running parallel to and adjoining the present Fraser Beach on the inland side, the latter forming portion of Sea Elephant Bay.

The terrace which is 4 to 6 feet above high water mark is coincident in height with the sand dune at present forming behind the beach. The terrace surface is generally level although it is broken slightly by lagoons and depressions in lines parallel with the beach. The western edge of the terrace evidently represents a previous high water mark, and rising sharply to the west of this line are old sand dunes which increase in height in a northerly direction.

The crest of these old dunes stretches westerly with an undulating surface, extending for about a half mile from the old workings, but is much wider further north. A low coastal range rises steeply to some 200 feet from the western edge of the old sand blows. The drainage system, which is in a youthful stage, is represented by Fraser River and its tributaries. Evidence of a recent uplift is visible where the main stream is seen to be cutting into its old sediments and near the mouth has perpendicular banks up to 20 feet in height where it has corroded its bed down into Palaeozoic slates and quartzites.

071

There is some evidence that before the uplift occurred Fraser River had shifted its course a good deal in the vicinity of its mouth and had probably been working over its own flood plain.

As is so often the case with beach-line sand dune topography, lagoons have formed behind the present dunes near stream junctions with the sea. In the case of the smaller creeks sand banks debar direct flow over the beach, the water having recourse to seepage through the sand.

King Island as a whole has distinct features of an old peneplain which has been raised in recent times, thereby giving increased cutting power to the streams near the coast line.

GEOLOGY.

The geological structure of the island is somewhat difficult to fathom owing to a deep mantle of alluvium and detrital matter; few exposures of rocks in situ being the rule.

The number of rock types in the area under examination is small.

Palaeozoic slates and quartzites, similar in structure to the great series of Cambro-Ordovician sediments in Tasmania, are the bedrock. In the vicinity of Fraser River and beach these rocks are seen to be dipping to the south-west at from 25° to 35° . Along the shore some five chains south of Fraser River a dyke of Lamprophyre eighteen inches wide, probably representative of the Devonian intrusives, traverses the abovementioned rocks in a south west - north-east direction.

Tertiary limestones teeming with marine organisms outcrop with level bedding on the beach at the Blow-hole about 4½ miles north of Fraser River.

Old sand dunes west of Fraser Beach are composed of loosely aggregated ilmenitic sandstones of recent age underlying surface sand and in places resting on river clays and gravels, the

whole overlying Palaeozoic slates and quartzites. Belonging to the same period as the sandstones and overlying similar rocks are the black sands of Fraser Beach terrace, while of still more recent date is the sand dune at present forming behind Fraser Beach.

THE MINERAL DEPOSIT.

This occurs as portion of a very fine black sand forming Fraser Beach terrace, extending from Fraser River northerly for approximately 4 miles and having a width of from 2 to 3 chains.

The sand consists essentially of an intimate mixture of quartz, zircon and ilmenite, with some cassiterite and possibly a minute quantity of gold. This was distributed and deposited, prior to a recent uplift of the strand line, by means of ocean tides and currents after being carried in suspension by Fraser River to the sea from some point or points inland. The present source of the minerals may probably be looked for in the detrital and alluvial deposits in the watershed of Fraser River. The original source of the ilmenite will likely be in a gabbro reported to occur at no great distance to the south west, a hand specimen of which was viewed but of which no rocks were observed in place. The average depth of the deposit where tested was 10 feet, bottom coming closer to the surface at old high water mark and extending more deeply in a seaward direction. From surface down to approximately 2 feet the sand is of a greyish colour carrying a little ilmenite.

Below this mark the deposit becomes darkened in colour until at varying depths, usually from 4 to 6 feet from surface, a pan of lightly cemented sand containing much ilmenite comes in, sometimes for 2 to 3 feet in thickness. The cementing material is an oxide of iron evidently deposited by circulating waters and the whole may be easily pulverised by hand. Below the caked region sands are loose again in many places and bottom is usually small waterworn pebbles of slate and quartzite underlain by blue clay, being softened slate, which is here bedrock.

C-073

An analysis of a concentrate of black sand, from the old workings, determined by the Chief Government Chemist and Assayer, gave the following results:-

| | Per cent |
|---|----------|
| SiO ₂ (quartz) | 6.00 |
| Zircon, etc. | 21.95 |
| Fe ₂ O ₃ and FeO. | 31.95 |
| TiO ₂ . | 39.00 |
| CaO. | trace |
| MgO. | 0.56 |
| MnO. | 2.52 |
| SnO ₂ . | 0.25 |

101-53

WORKINGS.

The workings which were carried out by the British Flag Prospecting and Mining Syndicate are on the terrace 7 chains north of Fraser River and in the vicinity of old high water mark. They consist of ground paddocked out to about 10 feet in depth for a length of 2½ chains by approximately ½ a chain in width. The bottom is now water-logged and sand has fallen in from the sides to some extent. No trace of the plant used for this work is now visible.

Two years ago the syndicate now holding the lease installed a water pump on the bank of Fraser River at southern end of the terrace and constructed fluming to the old workings where a trial was made with a special type of sluice-box to concentrate the tin oxide content. Very little work was done and the experiment evidently proved a failure. The pump and fluming are still in place.

Much shaft and hole digging has been attained in the past in an attempt to prove the deposit. This method has apparently proved unsuccessful owing mainly to the fine nature of the sand which falls in under the treatment and does not give correct samplings throughout the depth. A number of bore holes have also been put down by former lessees, the method and results of which could not be ascertained, except that it is said that they were bored in 2 lines of alternate holes 200 yards apart.

074

BORING OPERATIONS.

Twenty four bore holes were sunk on the terrace, during boring operations for a distance of 30 chains over a width of approximately $\frac{3}{4}$ of a chain. Position of the bores are shown on the accompanying plan. The plant used was a small hand boring one consisting in the main of $3\frac{1}{2}$ inch casing with a $2\frac{1}{2}$ " clacker sand pump. Holes were dug out from surface in early every case to an average depth of 1'4" before commencing to bore for the purpose of missing fern shrub and other plant roots which penetrated to that depth. Casing was then placed in the hole and driven into the sand. At this stage water was poured into the casing followed by the pump which was then given an up and down vertical motion to secure suspension of sand in the water and the forcing of both into the pump through the clacker. Care was taken to see that the casing was at all times kept below the pump. After filling with sediment the pump was raised to surface, the material bagged and forwarded to the Government Laboratory for assay purposes. 93 sample bags constituting in the vicinity of 1 ton of material was in this day secured.

The following tabulated list shows results of the more valuable mineral contents of the holes as determined from the boring accomplished, together with assays and weights determined by the Chief Government Chemist and Assayer.

The results are exclusive of one to two feet of surface sand, not bored except in the two instances where boring commenced at surface.

| No. of bore hole. | Depth of bore hole. | Lbs. per cub. yd. of tin oxide. | Lbs. per cub. yd. Metallic Tin | Lbs. per cub. yd. Ilmenite. | Lbs. per cub. yd. Titanium Oxide. | Gold. | Metall. ic Tin Assay. % | Titanium Oxide % | Weight of Sediment in Lbs. | REMARKS. |
|-------------------|----------------------|---------------------------------|--------------------------------|-----------------------------|-----------------------------------|-------|-------------------------|------------------|----------------------------|---|
| 1 | 6'6" | Trace | Trace | 1531.2 | 701.5 | Nil | Trace | 19.0 | 48.0 | Hole dug out down to 2' from surface before starting boring to get below roots and vegetable matter. Bottom not reached owing to pump jamming and bore abandoned. |
| 2 | 7'3" | Trace | Trace | 1971.4 | 1039 | Nil | Trace | 23.0 | 65.5 | 2'9" taken out before boring commenced. Pump and casing jamed and hole abandoned. |
| 3 | 6'9" | 36 | 25.2 | 3415.3 | 1800 | Nil | 0.42 | 30.0 | 81.0 | Boring from surface. Water-worn pebbles struck and could not break through. Presumably bottom. |
| 4 | 10'2 $\frac{1}{2}$ " | 5.11 | 3.58 | 3110.6 | 1639.4 | Nil | 0.07 | 32.0 | 104.0 | Boring from surface. Bottomed on water-worn pebbles overlying slate. |
| 6 | 8'6" | Trace | Trace | 3986.6 | 2101.1 | Nil | Trace | 38.0 | 94.0 | Boring started 1'10" from surface. Bottomed on waterworn slate and quartzite pebbles underlain by blue clay. |
| 7 | 0'8" | 6.32 | 5.63 | 5318.3 | 2802.9 | Nil | 0.1 | 48.0 | 80.0 | Boring commenced 1'8" down from surface. Casing put straight into cemented ilmenite. Bottomed on clay shale with small pieces of carbonaceous shale. |
| 8 | 8'3" | 6.65 | 4.66 | 4346.8 | 2466.6 | Nil | 0.07 | 37.0 | 110.0 | 1'6" of sand taken out before boring. Bottomed on water worn pebbles and clay. |
| 9 | 6'7" | 3.18 | 2.23 | 3386.1 | 1784.6 | Nil | 0.05 | 40.0 | 58.0 | Boring started 1'6" from surface. Bottomed on water worn pebbles of slate and quartzite. |
| 10 | - | 2.75 | 1.93 | 2650.1 | 1396.7 | Nil | 0.05 | 36.0 | 71.0 | 10" taken out to allow casing to go down. Bottomed on hard boulder. |
| 11 | 6'9 $\frac{1}{2}$ " | 3.75 | 2.61 | 3766 | 1984.8 | Nil | 0.05 | 38.0 | 70.5 | 10" Excavated before boring. Bottomed on water-worn slate and quartzite pebbles. |

| No. of bore hole. | Depth of bore hole. | Lbs. per cub. yd. of tin oxide. | Lbs. per cub. yd. Metall. in Tin. | Lbs. per cub. yd. Ilmenite. | Lbs. per cub. yd. Titanium Oxide. | Gold. | Metall. in Tin Assay. % | Titanium Oxide % | Weight of Sediment in lbs. | REMARKS. |
|-------------------|---------------------|---------------------------------|-----------------------------------|-----------------------------|-----------------------------------|-------|-------------------------|------------------|----------------------------|--|
| 12 | 11'10" | Trace | Trace | 1506.7 | 794.1 | N11 | Trace | 23.0 | 81.5 | 11" Did not get to bottom, finished in coarse brown sand, 11" taken out before boring commenced. |
| 13 | 8'0" | N11 | N11 | 2357.5 | 1842.5 | N11 | N11 | 28.0 | 71.0 | Boring started 9" from surface. Bottomed on partly consolidated clay sand of a cream colour. |
| 14 | 8'6 1/2" | N11 | N11 | 1329.4 | 977.7 | N11 | N11 | 24.0 | 70.0 | Boring started 9" from surface. Not bottomed, still in black sand. Casing and rods jammed and hole abandoned. |
| 15 | 11'5" | N11 | N11 | 2127.5 | 1121.4 | N11 | N11 | 26.0 | 98.0 | Boring started 1'2" from surface. Bottomed on coarse brown quartz sand with small water-worn pebbles. |
| 16 | 11'1" | N11 | N11 | 2585 | 1362.4 | N11 | N11 | 30.0 | 101.5 | 1'2" of sand taken out before boring. Bottomed on water-worn pebbles of slate and quartzite. |
| 17 | 12'2" | N11 | N11 | 2654.7 | 1599.1 | N11 | N11 | 34.0 | 100.0 | Boring commenced 1'1" from surface. Bottomed on coarse brown sand and water-worn pebbles. |
| 18 | 8'8 1/2" | Trace | Trace | 3209.1 | 1691.3 | N11 | Trace | 36.0 | 77.0 | 1' of material taken out before boring. Bottomed on small water-worn pebbles of slate and quartzite. |
| 19 | 9'5" | 5.28 | 3.70 | 4020.4 | 2118.9 | N11 | 0.07 | 40.0 | 98.0 | Boring started 1'2" from surface. Water-worn pebbles struck, sediment seeping into casing and casing not going down so hole abandoned. |

920

501053

| No. of bore hole. | Depth of bore hole. | Lbs. per cub. yd. of tin oxide. | Lbs. per cub. yd. Metall. Fe Tin. | Lbs. per cub. yd. Ilmenite. | Lbs. per cub. yd. Titan. Alum Oxide. | Gold. | Metall. Tin Assay % | Titan. Alum Oxide % | Weight of Sediment in lbs. | REMARKS. |
|-------------------|---------------------|---------------------------------|-----------------------------------|-----------------------------|--------------------------------------|-------|---------------------|---------------------|----------------------------|---|
| 20 | 10'7" | 4.78 | 3.35 | 3087.8 | 1627.4 | N11 | 0.07 | 34.0 | 101.0 | Boring commenced 10" below surface. Bottomed on small water-worn pebbles of slate and quartzite. |
| 21 | 4'0" | 4.61 | 3.23 | 2652.6 | 1387.6 | N11 | 0.07 | 30.0 | 37.0 | Boring started 1'10" below surface. Casing dropped down into slurry, filled up and pump stuck so hole had to be abandoned. |
| 22 | 9'2" | 5.84 | 4.09 | 4985.9 | 2258.8 | N11 | 0.07 | 38.0 | 107.0 | 1'10" sand taken out before boring, bottomed on water-worn pebbles. |
| 23 | 7'6" | 3.75 | 2.63 | 3707.3 | 2001.3 | N11 | 0.05 | 38.0 | 79.0 | Boring started 1'2" from surface. Bottomed on blue clay (soft slate). Few pebbles above clay. |
| 24 | 11'5" | 4.07 | 2.85 | 2321.7 | 1223.6 | N11 | 0.07 | 30.0 | 93.0 | Boring commenced 1'3" below surface. Went down to end of available casing and did not bottom. Slurry coming in to hole abandoned. |

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The average contents of the bore holes have been calculated to be as follows:-

(This does not necessarily represent the value of the deposit)

| | |
|----------------|-----------------------------|
| Tin Oxide | 3.59 lbs. per cubic yard. |
| Titanium Oxide | 1514.4 lbs. per cubic yard. |

The above statement does not take into account an average of 1'4" of surface material which was not tested.

The contents of the bore holes were calculated from the weights and assay results (reported as metallic tin and titanium oxide) of the whole of the sediment taken from each bore. In converting the contents to tin oxide it was assumed that the percentage of tin in the oxide was 70%. The analysis shows that the ilmenite consists essentially of ferrous iron (31.95%) with small percentages of MnO (2.32%) and MgO (.36%) together with 38% TiO₂ therefore the theoretical content of TiO₂ (52.7%) in ilmenite was adopted in converting the titanium oxide to ilmenite. In working out the volume of sediment taken from the holes 3.176% was assumed as the diameter of the bore, this being the average between outside (3.478") and inside (2.875") diameters of the casing.

RESERVES.

The reserves of ore taken over the area bored and the average depth from surface to bottom, less the ground already worked, is calculated to be 36,000 cubic yards of sand.

A very much higher figure than this may be taken to represent the potential reserves, for the deposit generally appears to continue for at least a $\frac{1}{2}$ mile further in length and to extend across the terrace to the present beach, although apparently with not the same concentration of economic minerals, but no systematic tests have been applied over the whole area.

ILMENITE.

Ilmenite also known as menaccanite and titanite iron ore is a compound of titanium dioxide and oxide of iron FeO TiO₂, when pure it contains:-

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Ti 31.6%; Fe 36.8%; O₂ 31.6%; or TiO₂ 52.63%; FeO 47.37%; but small amounts of TiO₂ may be replaced by oxide of iron.

The physical properties of ilmenite are as follows:-

| | |
|--|------------------------------|
| Specific Gravity, | 4.5 to 5 |
| Hardness | 5 to 6 |
| Melting point | high |
| Lustre | Metallic to submetallic |
| Colour | iron black to brownish black |
| Transparency | opaque |
| Tenacity | brittle |
| Slightly magnetic, greatly increased by heating. | |

Up till recently ilmenite has been mainly used for manufacturing ferrotitanium and ferrocenon-titanium. Ferrotitanium is used in small quantities as a scavenger in making cast iron and steel.

Lately ilmenite has been used in the manufacture of a titanium oxide pigment. Pure Titanium-oxide when finely ground produces a white opaque powder of great hiding power. Its capacity is said to be about three times that of white lead and twice that of zinc oxide. It has been found that to precipitate titanium dioxide on barium sulphate or blanc fixe in the proportion of 25% TiO₂ and 75% base, a high grade white article was formed which had better pigmenting properties than the pure oxide and was more economical to produce. It is rather a singular fact that rutile, the natural mineral of titanium oxide, is not suitable for the manufacture of titanium pigments.

Tests executed on samples of titaniferous sands from Fraser Beach terrace in April of last year by the Acting Chief Government Chemist and Assayer go to prove that rutile does not exist in that deposit. The results of the tests and the methods used are outlined as follows:-

Results:

No. 1 Sample, crude sand, rutile nil,
No. 2 Sample, believed to have been through
magnetic separator, rutile nil.

Methods:

1. Separation by microscope followed by chemical tests.
2. Gravitation tests by immersion in cadmium borotungstate solution. Melting with mercurous nitrate and separation of various sections.

Ilmenite containing 52% - 60% TiO_2 according to grade and impurities and landed on the Atlantic seaboard of America was quoted in the Engineering and Mining Journal of 5.1.29 at 9½ to 11 dollars per gross ton. Likewise low grade domestic ilmenite embodying 32% to 35% TiO_2 was quoted at 7 to 8 dollars per gross ton.

Apparently there is no established market for ilmenite in Australia at the present time although it is understood that certain firms are investigating the possibilities for the manufacture of titanium products.

CONCLUSION.

Twenty four holes have been bored over a length of approximately 30 chains and a width of about ½ of a chain.

Statements have been made concerning the cassiterite and ilmenite contents of the bores. It has been shown that gold results were nil in each case.

As far as the area over which the boring extended is concerned, the results show that good percentages of tin oxide appear in 14 of the bores and that an unusually high concentration occurs at bores No. 3 and No. 5 on either side of the old workings.

Ilmenite values are shown to be high in almost every case although at either ends of the area proved the content is less than the more central portion.

The economic value of the deposit is closely connected with the successful separation and concentration of the valuable minerals contents and this aspect has been dealt with by J. B. Scott, State Mining Engineer, in his report in 1927 entitled

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"Black Sand Deposit, Fraser River, King Island", and also in a supplementary report in 1928.

The most important consideration next to solving the treatment problem is the establishment of a payable market for ilmenite in Australia.

(Sgd) F. BLAKE,

ASSISTANT GOVERNMENT GEOLOGIST.

HOBART,
7th March, 1929.

Can or see estimates

350 000 tons sand
= 280 000 cu yds.

Contractors 16500 ton Antilo.
Plus Proc. 9700 " " (59%)

Costs of year for 2500 ton Truck

| | | Cu yd. |
|-------------|----------|------------|
| Min. & Trac | 81,950 | 23.4 |
| Freight of | 24,125 - | 6.9 |
| Officer. | 2,500 | .7 |
| Cap. | 50,000 | 14.3 |
| | | <hr/> 49.3 |

| | |
|-------------------------|----------------|
| Value of Trucks at \$35 | = 24.2 / - |
| " Trucks | 11 |
| " " Costs @ \$1000 | <hr/> 36.2 / - |

Carroll

Working Cost / yd.

| | |
|------------|------------|
| Min. & Car | 10.0 |
| Cost | 20.0 |
| Ext. | 42.0 |
| Reloc. | 8.0 |
| Buy. | 6.3 |
| | <hr/> 86.3 |

Ryft. no allowance for Copy
charges or freight.

Est. 168 000 cu yds & reco

of 13 000 ton Trucks