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INVESTIGATION OF BEACH SANDS FROM EAST COAST.

KING ISLAND.

(INTERIM REPORT).

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INVESTIGATION OF BEACH SANDS FROM EAST COAST,KING ISLAND.

(INTERIM REPORT).

SUMMARY:

Laboratory assessments have been carried out on 100 beach sand samples from 40 drill holes received from the scout drilling programme undertaken by Messrs. Quest Exploration Pty. Ltd. on the East Coast of King Island, Tasmania. Additional samples are under examination.

The laboratory work has included the determination of heavy mineral content in all samples and the supplementary determination of rutile and zircon in a selection of samples. The presence of other valuable minerals viz. monazite and cassiterite, has been noted.

Area A, the large prospecting area north of the Sea Elephant River, shows a progressive mean level of 0.528% heavy mineral. Area B, at the mouth of the Sea Elephant River, shows a progressive mean level of 1.83% heavy mineral, while Area C, south of the Sea Elephant River shows a mean of 1.10% heavy mineral.

One portion of Area B, extending over a length of 30 chains parallel to the coast, shows significantly higher than average heavy mineral with values falling in the range 2.0 to 5.5%.

The content of rutile plus zircon falls in the range 13.6% to 20.2% of the heavy mineral. Zircon at 5 to 8% of heavy mineral is generally less abundant than rutile.

Monazite and cassiterite have been found in some samples.

CONCLUSIONS:

Completion of the present programme of laboratory assessments to include all samples obtained from drilling is necessary before making a final analysis of the results of the scout drilling programme.

Additional assessments of monazite and cassiterite in the samples on hand are required. Also it would be useful to make an assessment of quantity and grade of recoverable ilmenite.

RECOMMENDATIONS.

- a. That the present laboratory programme be continued to include all samples on hand from the drilling programme.
- b. That additional monazite and cassiterite determinations be made.
- c. That an assessment of quantity and grade of recoverable ilmenite be made.

INTRODUCTION:

Interest in the utilisation of beach sands from the East Coast of King Island has extended over at least 35 years. Production of 550 tons of ilmenite concentrate at Narracoopa in 1933 has been reported (1) but there is no other recorded commercial production, although an indicated reserve of about 45,000 tons of ilmenite is available at Narracoopa (2).

Investigational work on the nature and extent of the beach sand deposits includes work by Stillwell in 1942 (3) who recognised ilmenite, zircon, cassiterite, monazite and rutile in concentrates from the Fraser River area. Subsequently investigational work by Mount Isa Mines Ltd. resulted in the reporting of laboratory work on material from the Fraser River/Point Cowper area (4,5). This latter work indicated the mineral distribution of the heavy mineral concentrate used for laboratory work to be as set out in Table 1, after table and magnetic separations.

TABLE 1: MINERAL DISTRIBUTION IN HEAVY MINERAL CONCENTRATE, FRASER RIVER, KING ISLAND (MT. ISA MINES LTD).

Separated Fraction	Per Cent of Sample
Table Tailing and Middling	17.2
Magnetic Fraction (46.7% TiO <sub>2</sub> )	49.5
Rutile Concentrate (94.9% TiO <sub>2</sub> )	12.6
Zircon Concentrate:	19.4
Other	1.3

Source: C.S.I.R.O. Ore Dressing Report No.478, 1954.

The C.S.I.R.O. investigation (5) also indicated the presence of ferriferous rutile which would report to the magnetic fraction in a commercial separation and hence would be lost to the rutile concentrate. Minerographic work (6) confirmed the presence of ferriferous rutile which possibly occurs as intimate mixtures of ilmenite and rutile (7). It was noted also that the zircon present was stained and made an effective electrostatic separation of rutile and zircon difficult without cleaning. Washing with hydrochloric acid gave a substantially improved separation. Cassiterite was found to be present and the head sample assayed 0.04% Sn while monazite was present to the extent of 0.08% of the head sample.

Further work in the Fraser River area carried out by King Island Scheelite (1947) Ltd. in 1955 lead to additional laboratory investigations (8). This laboratory work gave the mineral assemblage as shown in Table 2.

TABLE 2: MINERAL ASSEMBLAGE IN HEAVY MINERAL CONCENTRATE, FRASER RIVER, KING ISLAND (KING ISLAND SCHEELITE(1947)LTD).

Separated Fraction	Per Cent of Sample
Quartz	17
Tourmaline, Garnet and other weakly Magnetics	20
Ilmenite, Leucocene and magnetic rutile	38
Recoverable Zircon	12
Recoverable Rutile	13

Source: C.S.I.R.O. Ore Dressing Report No. 550 1957.

INTRODUCTION: cont

The data given in Tables 1 and 2 indicates beach sands in the vicinity of the Fraser River may contain rutile and zircon ratios in the range 1: 1.1 to 1: 1.5.

Confirmation of the need for cleaning to give a satisfactory zircon concentrate was given from work on the King Island Scheelite sample and it was indicated that attrition cleaning in water would result in an adequate rutile/zircon separation (8).

The presence of significant <sup>? chromium</sup> chromite has been noted in samples from the Fraser River area with indications of Cr<sub>2</sub>O<sub>3</sub> levels in ilmenite concentrates exceeding 1% (8) or substantially in excess of current commercial grades.

The present field investigation is being carried out in the vicinity of and north of the Sea Elephant River which is about five miles north of the Fraser River area. Although some earlier field work has covered the area under investigation no reports of mineral assemblage are available.

LABORATORY INVESTIGATIONS:

Laboratory work designed to assess total heavy mineral content plus rutile, zircon and other valuable minerals in samples from the King Island field programme was carried out in the C.S.I.R.O. Ore Dressing Laboratories, Melbourne, by Mr. J.A. Thomas, Chemical Engineer.

Drill hole samples were passed to the laboratory without treatment, other than quartering. Individual samples, generally representing 5 foot drill hole intervals, weighed about 2000 grams (4½ lbs). Samples as received were dried and split into two equal fractions, one fraction being used for heavy mineral determination and the other retained.

a. Heavy Mineral Determinations.- Samples for heavy mineral determination, normally about 1000 grams each, were tabled and the table concentrate, representing about 20% of the sample dried and quartered. One quarter fraction was passed to sink/float separation using tetrabromoethane (S.G. 2.95) and total heavy minerals determined.

The results, from determinations completed to 8/3/67, are set out in Table 4 in the Appendix. A summary of the results to date is given in Table 3 below.

TABLE 3: SUMMARY OF HEAVY MINERAL CONTENTS,  
QUEST EXPLORATION PTY. LTD.

Field Area	Heavy Mineral Content (Per Cent)		Remarks
	Range	Mean	
A	0.122 - 1.14	0.528	Coast north of Sea Elephant River.
B	0.418 - 5.49	1.83	North and South Banks Sea Elephant River.
C	0.571 - 1.97	1.10	South of Sea Elephant River

LABORATORY INVESTIGATIONS: cont

The results to date show some heavy mineral in all areas. A significantly higher than average heavy mineral content is shown in holes 18, 22, 23, 25, 26 and 28 over a distance of about 30 chains at the mouth of the Sea Elephant river. Heavy mineral contents in this latter area fall generally in the range 2.0 to 5.5% with drill samples available from depths up to about 10 ft. only.

During table concentration of the samples organics and soil fines present in the sample are discarded. In some cases, particularly in those samples from the 0 - 5 footage interval the loss in weight from organics and soil is considerable. Data indicating the extent of this loss is set out in Table 7 of the appendix. It will be seen that losses range from 14% to 38% of dry sample weight.

b. Rutile/Zircon Determinations - Rutile/Zircon contents of the samples were determined by magnetic separation of heavy mineral fractions or table concentrates followed by spectrographic analysis of the non-magnetic fractions.

Details of the results of rutile and zircon assessments are given in Table 5 of the Appendix. It will be seen that rutile plus zircon contents fall in the range 13.6% to 20.2% of the heavy mineral.

The relative proportions of rutile and zircon present show that zircon is significantly less abundant than rutile.

In one series of experiments to check whether abnormal amounts of rutile and zircon were reporting to the magnetic fraction a group of samples were separated on the Rapid magnetic separator both in the "as received" state and after leaching with hydrochloric acid. The results are shown in Table 6 of the Appendix.

It will be apparent that hydrochloric acid leaching has no significant effect on the quantity of non-magnetics separated from the heavy mineral concentrates.

An incidental effect noted during the leaching experiment was a weight loss of the sample amounting to about 3 - 4%. Since leaching was accompanied by some CO<sub>2</sub> emission it is presumed that the weight loss represents decomposition of carbonates present.

c. Other Valuable Minerals - Examination of samples for valuable minerals other than rutile and zircon is incomplete but both monazite and cassiterite have been noted.

No determinations of recoverable ilmenite, or of grade, have been made as yet.

REFERENCE:

1. Dunkin, H.H. Ore Dressing Methods in Australia and Adjacent Territories, Fifth Empire Mining and Metallurgical Congress, 1953, p.230.
2. McLeod, I.R. Australian Mineral Industry: The Mineral Deposits. Bureau of Mineral Resources, Bulletin No. 72, 1965, p. 630.
3. Stillwell, F.L. C.S.I.R.O. Mineragraphic Investigations Report No. 264, 1942.
4. Edwards, A.B. C.S.I.R.O. Mineragraphic Investigations Report No. 496, 1952.
5. Hudson, S.B. Concentration of Beach Sands from near Point Cowper, King Island, Tasmania. C.S.I.R.O. Ore Dressing Investigations Report No. 478, 1954.
6. Edwards, A.B. C.S.I.R.O. Mineragraphic Investigations Report No. 519, 1952.
7. Edwards, A.B. Textures of the Ore Minerals and their Significance. Aust. I.M.M., Melbourne, 1954, p.62.

HEAVY MINERAL DETERMINATION ON KING ISLAND.BEACH SAND SAMPLES.TABLE 4: ASSESSMENTS OF TOTAL HEAVY MINERALS, PER CENT  
OF DRY SOIL FREE SAMPLE.

HOLE NO.	DEPTH INTERVAL (FEET).					
	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30
1	0.456					
2	1.18					
3	0.758					
4	2.22					
5	1.60					
6	3.15	3.18	1.49			
7	1.71					
8	1.07					
9	0.81					
10	0.418					
11	3.23					
12	2.32					
13	2.01					
14	2.36					
15	0.536					
16	1.81					
17	1.23					
18	3.95	2.74				
19	1.23					
20	1.75					
21	2.41	0.945				
22	2.66	2.61				
23	3.20	1.91	1.27			
24	0.569	0.640	0.476	0.552	0.611	
25	4.60	2.32				
26	3.62	2.36	2.18	1.08		
27	0.530	0.578	0.525			
28		5.49				
33	1.13	0.743	0.816	0.571	0.726	
34	1.37	1.03	1.38	1.19	0.945	
40	0.814	1.12	1.97	0.916	1.29	
41	1.30	0.878	1.62			
56	0.455	0.489	0.323	0.371	0.244	0.419
57	0.484	0.520	0.556	0.701		
58	0.507	1.09				
59	0.348	0.515	0.449	0.281	0.268	0.396
60	1.14	0.951	0.579	0.834	0.963	0.426
61	0.686					
62	0.122	0.163	0.185	0.186	0.256	0.242
63	0.204	0.230	0.346	0.486	0.908	1.73

TABLE 5: ASSESSMENTS OF RUTILE AND ZIRCON CONTENT  
BY CHEMICAL ANALYSIS OF MAGNETIC SEPARATOR PRODUCTS.

Sample No.	Heavy Mineral % of sample.	RUTILE.		ZIRCON		RUTILE + ZIRCON		REMARKS.
		% of sample	% of H.M.	% of sample	% of H.M.	% of sample	% of H.M.	
2	1.18	0.111	9.4	0.060	5.1	0.171	14.5	Samples 2, 4 & 5 were heavy fractions from Holes 2, 4 & 5 after heavy liquid separation subjected to magnetic separation on a Frantz high intensity separator.
4	2.22	0.219	9.9	0.134	6.0	0.353	15.9	
5	1.60	0.153	9.6	0.079	4.9	0.232	14.5	
1 - 5	1.28	0.154	12.1	0.09	7.0	0.244	19.1	Sample 1-5 was a Composite table concentrate from Holes 1,2,3,4,&5 subjected to magnetic separation on a Rapid magnetic separator.
25	3.54	0.373	10.5	0.247	7.0	0.620	17.5	Samples 25,26,34,40 & 41 were composite samples resulting from miting footage samples from each of holes 25,26,34,40 & 41. Table concentrates from each composite were separated on a Rapid magnetic separator. In determining Rutile & Zircon contents from analyses for TiO <sub>2</sub> and ZrO <sub>2</sub> in the non-magnetic fractions Rutile was assumed to be 96.4% TiO <sub>2</sub> and Zircon 66% ZrO <sub>2</sub> .
26	2.31	0.208	9.0	0.106	4.6	0.314	13.6	
34	1.18	0.118	10.0	0.069	5.9	0.187	15.9	
40	1.23	0.130	10.6	0.093	7.5	0.223	18.1	
41	1.30	0.160	12.3	0.102	7.9	0.262	20.2	

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TABLE 6: RESULTS OF ACID CLEANING EXPERIMENTS.

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SAMPLE NO.	MAGNETIC FRACTION		NON-MAGNETIC FRACTION		Loss of Weight %
	Before Cleaning	After Cleaning	Before Cleaning	After Cleaning	
1-5	23.7 gms	23.6 gms	60.0 gms	52.1 gms	9.6
25	29.8 "	32.1 "	147.6 "	140.0 "	3.0
26	37.5 "	46.9 "	265.9 "	248.5 "	2.7
34	15.4 "	16.2 "	125.6 "	119.0 "	4.1
40	17.1 "	21.0 "	221.4 "	209.4 "	3.4
41	9.3 "	10.3 "	96.7 "	92.2 "	3.4

NOTE: Acid cleaning of table concentrates from holes 1 - 5 (composite sample), 25, 26, 34, 40 and 41 to check the possibility that some rutile and/or zircon was sufficiently coated to report to the magnetic fraction. Cleaning was carried out by agitating in 10% HCl for 20 minutes.

TABLE 7: ORGANIC AND SOIL CONTENT OF SOME SAND SAMPLES.

HOLE NO.	FOOTAGE INTERVAL	ORGANIC AND SOIL CONTENT % DRY SAMPLE
33	0 - 5	22.3
56	0 - 5	13.9
57	0 - 5	23.0
58	0 - 5	38.0
59	0 - 5	30.0
60	0 - 5	30.6