DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE RAPPORT 2002/96

Heavy mineral enriched beach sands from King Island, Australia

Henriette Hansen

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND
MINISTRY OF THE ENVIRONMENT

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Contents

Yellow Rock River, King Island

Summary

It was possible to reproduce the initial finding of high-grade ilmenite in a sample received from Mineral Resources Tasmania. The ilmenite has approximately 59 wt. % TiO_2, and the TiO_2 in all Ti-bearing minerals is 67 wt. % on average. The grain size is fairly coarse with a mean median apparent grain diameter of 151 microns.

The reserves onshore are estimated to approximately 0.8 million tonnes of valuable heavy minerals (VHM), i.e., ilmenite, leucoxene, rutile and zircon, with an average grade of 2% VHM in the sand. Further reserves may be found offshore.

If more should be done on the King Island deposits, focus should be on the offshore potential. Further, provenance studies are of particular interest as the geographical extent of the source area of the high-grade ilmenite in King Island is fairly small.

Yellow Rock Beach, King Island

Introduction

Heavy mineral enriched sands were collected from the eastcoast of King Island, Australia, during April 2002 as part of the exploration campaign by GEUS on behalf of Dupont Inc.

A sample containing high-grade ilmenite from King Island was recieved from Mineral Resources Tasmania, Department of Infrastructure, Energy and Resources in 2001 (No. 2000115 in Appendix 3). As this sample was very promising, and because HH was in the area, it was decided to conduct a very limited field programme spring 2002.

In this report the sampling sites and analytical results are described, and a summary of previous investigations by the mining and geological consultant company Peter H. Stitt & Associates Pty. Ltd. and Gravcon Consultancy is given.

Figure 1: *Location of King Island.*

General Geology

King Island is situated in the Bass Strait between Australia and Tasmania (Fig. 1).

Rutile and zircon mining from beach sands in Sea Elephant Bay near Naracoopa (Fig. 2) was active from 1969 to 1977, and today mining and exploration licences are held by Tasmanian Titanium Pty Ltd. but no actual mining takes place at the moment. However, the deposits and heavy mineral tailings from the previous production has recently been evaluated for possible renewed activities by Peter H. Stitt & Associates Pty. Ltd. and Gravcon Consultancy (Appendix 1, 2).

Figure 2 : *King Island.*

The basement rocks in King Island consist of roughly north-south oriented parallel bands of rock suites (Fig. 3). Along the westcoast Precambrian granites dominates, further east it is Precambrian metamorphic rocks and near the eastcoast Precambrian orthoquartzites and mudstones occur. In the southeastern part of King Island Cambrian basic-intermediate volcanic and associated rocks are found, and intrusions of Devonian adamellite granites are present near Grassy and north of Cowper Point. Tertiary sandstone outcrops along the beach between Naracoopa and Cowper Point. Most of the island is covered by Pleistocene and recent superficial sand deposits younger than 1.5 m.y.

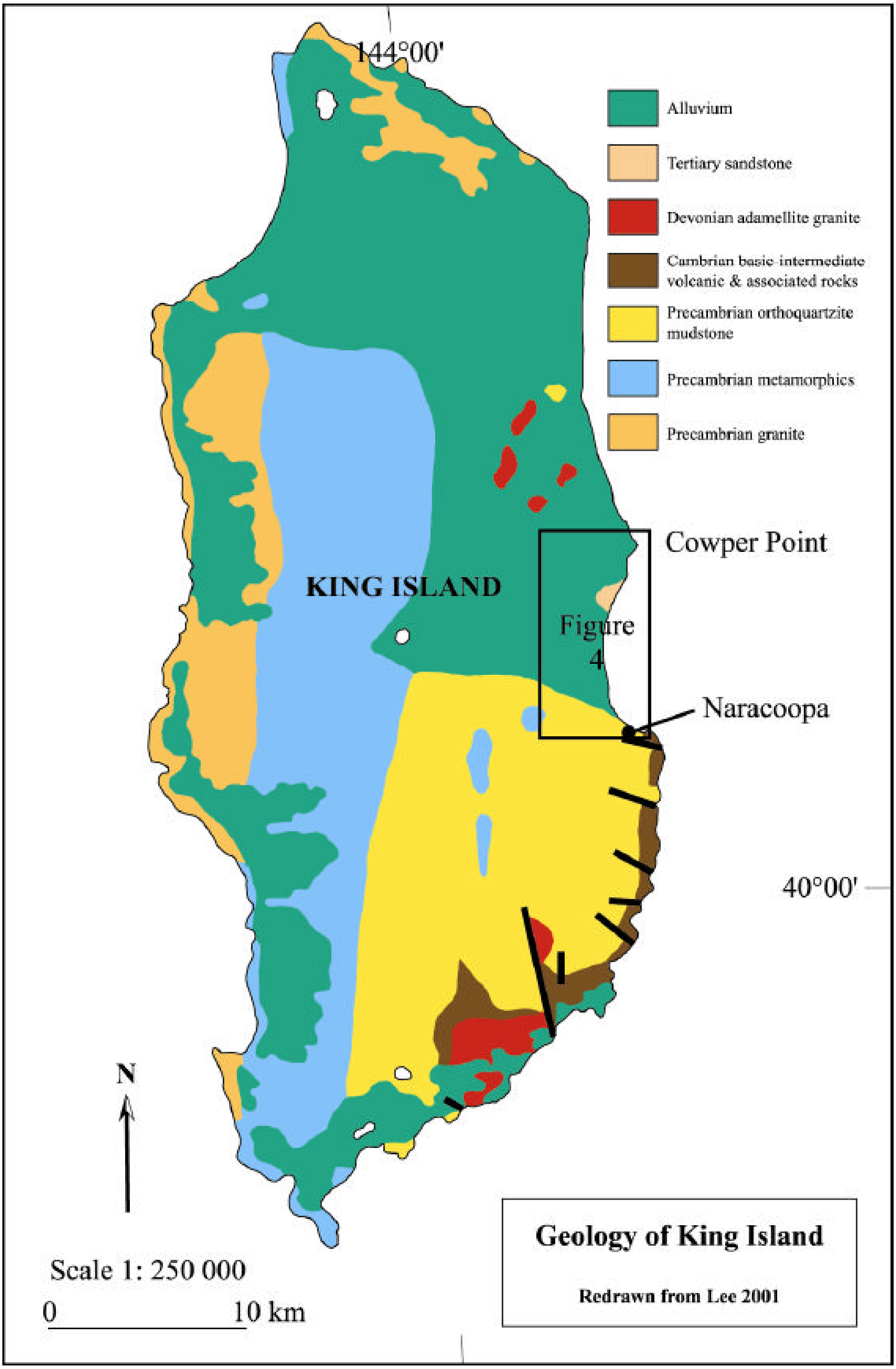

Figure 3: *Geology of King Island.*

Heavy mineral deposits in Sea Elephant Bay

The heavy mineral-enriched sand deposits at Naracoopa occur as three distinct bodies (Fig. 4):

Lanherne Beach (Fig. 5), the oldest and most elevated,

Milford Beach (Fig. 6), formed as a barrier along the coastal toe of Lanherne Beach, and

Sea Beach (Fig. 7), the youngest, present beach.

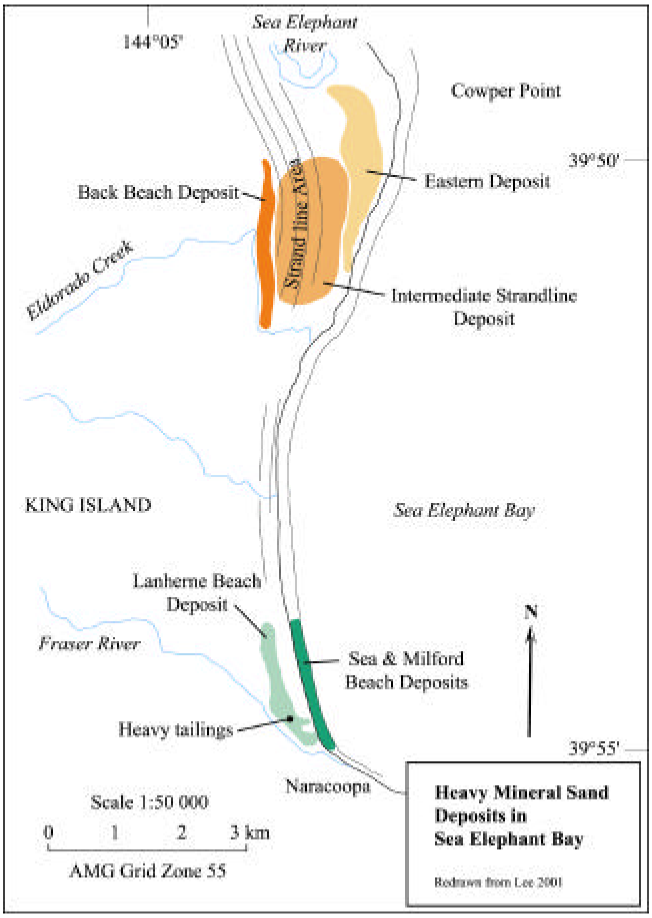

Figure 4: *Heavy mineral sand deposits in Sea Elephant Bay.*

The deposits are believed to have formed in a three-stage process:

1) transport of heavy minerals in suspension by the Fraser River and deposition by wave action near the old mouth of the river to form the Lanherne Beach,
2) down-cutting of the Fraser River as a result of successive regressions resulting in the reworking of some of the initial Lanherne Beach deposits to form the higher grade Milford Beach and Sea Beach deposits,
3) reworking of earlier strand lines to produce mineralised aeolian deposits overlying beach deposits.

Figure 5: *Lanherne Beach.*

The main minerals of economic interest are zircon, rutile and ilmenite with accessory tourmaline, garnet, staurolite, epidote, chromite, pyrite, corundum, scheelite, cassiterite, spinel and monazite, and most of them are considered derived from the Precambrian metamorphics and igneous intrusives in the river hinterlands. Chromite and ilmenite may have been derived from gabbroic intrusions.

Figure 6: *Milford Beach.*

Figure 7: *Sea beach, view towards the north with Cowper Point in the distance.*

Figure 8: *Mouth of Fraser River near Naracoopa. View towards the west.*

Collected samples

Eight samples (KI1-KI8) were collected from the magnetic heavy mineral tailings left over from the previous mining activity (Fig. 9, 10). Eleven samples (KI9-KI16, KI18-KI20) were collected from in situ beach sands near Naracoopa and one sample (KI-17) from a low-grade metamorphic mudstone near the mouth of Fraser River. Sample locations are given in Table 1.

Sample No.	Depth (cm)	Sample Type	Southing	Easting
KI-01	0-10	Tailings sand	39°54.521’	144°6.296’
KI-02	20-30	Tailings sand	39°54.521’	144°6.296’
KI-03	0-10	Tailings sand	39°54.493’	144°6.318’
KI-04	20-30	Tailings sand	39°54.514’	144°6.351’
KI-05	0-20	Tailings sand	39°54.502’	144°6.349’
KI-06	25-35	Tailings sand	39°54.492’	144°6.348’
KI-07	5-15	Tailings sand	39°54.461’	144°6.379’
KI-08	0-10	Tailings sand	39°54.478’	144°6.391’
KI-09	20-30	Beach sand	39°54.498’	144°6.514’
KI-10	10-20	Beach sand	39°54.498’	144°6.514’
KI-11	0-10	Beach sand	39°54.408’	144°6.496’
KI-12	5-15	Beach sand	39°54.412’	144°6.482’
KI-13	15-25	Beach sand	39°53.960’	144°6.380’
KI-14	0-10	Beach sand	39°53.960’	144°6.380’
KI-15	0-10	Beach sand	39°53.414’	144°6.292’
KI-16	10-20	Beach sand	39°53.642’	144°6.322’
KI-17		Rock	39°54.838’	144°6.690’
KI-18	0-5	Beach sand	39°54.813’	144°6.652’
KI-19	30-40	Beach sand	39°54.794’	144°6.644’
KI-20	10-20	Beach sand	39°54.687’	144°6.584’

Table 1: *Sample locations and sample types.*

Figure 9: *Site of old titanium plant at Naracoopa with the grass-covered magnetic stock pile tailings in the foreground.*

Figure 10: *Tailings sand.*

The beach sands were typically collected from c. 0.5 m deep profiles, and where possible, individual layers were sampled. The heavy mineral contents in the beach sands decrease with distance north of Naracoopa (Fig. 11-13).

Figure 11: *Profile in Sea Beach sand near Naracoopa.*

Figure 12: *Profile in Sea Beach sand c. 300 m north of Naracoopa.*

Figure 13: *Profile in Sea Beach sand c. 1 km north of Naracoopa.*

Approximately one kilometre north of Naracoopa black sandstone cemented by organic matter outcrop in the beach line. This rock is referred to as 'coffee rock' (Fig. 14) in local slang (see Appendix 1). The heavy mineral contents in the beach sand are very low at this location (Fig. 13).

Figure 14: *Sandstone outcrops on the beach in Sea Elephant Bay north of Naracoopa.*

A drilling and sampling project was performed in the magnetic stockpile tailings by Peter H. Stitt & Associates Pty. Ltd. (Lee 2001), and in some cases the samples collected in connection with the present project could be located with high precision relative to the location of the drill cores. The position of sample KI-01 (Fig. 15) is 1.5 m in direction 336° from the pole marked 450N/1840E, and sample KI-04 is located 0.5 m from the pole marked 450N/1920E.

Figure 15: *Pole marking a drill site in the magnetic tailings pile at Naracoopa, close to the position of samples KI-01 and KI-02. The GPS monitor on top of the pole is c. 12 cm long.*

Composition of the sand samples from King Island

The heavy mineral contents of the sand samples collected from King Island are shown in Table 2. Sand compositions obtained from Computer Controlled Scanning Electron Micro-probe analysis (CCSEM) are summarised in Table 3 and given in full in Appendix 3.

The data in Table 2 shows that in most cases more than 95 wt. % of the samples are in the grain size range between 0.045 and 0.71 mm. The percentage of heavy minerals in the 0.045-0.71 mm size fraction tends to be higher in the tailings samples (KI-01 to KI-09) than in the beach sand samples. This is the result of the sorting process that took place during extraction of the rutile concentrate at the time of mining actvities at Naracoopa.

Sample	Lab. No.	Material < 0.045 mm % of total wt.	Material > 0.71 mm % of total wt.	% HM 0.045-0.71 mm	% HM % of total wt.
KI-01	2000276	0.19	0.35	49.66	49.40
KI-02	2000277	0.33	0.13	47.82	47.59
KI-03	2000278	0.45	0.17	80.54	80.04
KI-04	2000279	1.17	1.57	33.64	32.72
KI-05	2000280	0.24	0.30	94.55	94.03
KI-06	2000281	0.45	0.21	98.11	97.46
KI-07	2000282	0.29	0.11	94.63	94.25
KI-08	2000283	0.18	0.15	94.38	94.06
KI-09	2000284	0.51	0.16	90.66	90.06
KI-10	2000285	0.78	1.02	45.22	44.40
KI-11	2000286	0.99	3.52	74.82	71.45
KI-12	2000287	0.47	0.12	94.50	93.94
KI-13	2000288	0.88	0.10	42.23	41.82
KI-14	2000289	0.77	0.04	8.87	8.80
KI-15	2000290	0.34	0.06	5.16	5.14
KI-16	2000291	1.36	0.13	32.88	32.39
KI-18	2000293	0.27	62.04	24.67	9.30
KI-19	2000294	0.10	1.03	50.60	50.03
KI-20	2000295	0.03	0.18	85.76	85.57

Table 2: *Heavy mineral (HM) contents of collected samples. Wt.: weight. The HM concentrates consist of grains with specific gravity higher than 2.8 g/cm^3.*

Sample	Ilmenite	Leucoxene	Rutile	Chromite	Garnet	Staurolite	Zircon	Silicate	Other
KI-02	28.2	4.5	7.3	2.9	15.4	6.3	12.3	16.2	6.9
KI-06	54.0	6.1	4.7	5.3	14.6	1.8	4.4	1.8	7.3
KI-08	61.7	4.6	3.8	5.4	10.4	2.0	4.8	1.8	5.5
KI-10	13.7	2.6	3.6	0.1	12.7	6.8	2.4	54.1	4.0
KI-13	12.3	3.9	3.6	0.1	12.6	1.0	1.9	59.6	5.3
KI-16	18.1	4.4	6.3	0.6	11.5	2.0	3.8	47.5	5.8
KI-19	26.7	4.8	13.2	0.9	14.8	4.9	11.7	18.2	4.8
Mean	30.7	4.4	6.1	2.2	13.1	3.5	5.9	28.5	5.7

Table 3: *Weight percents of selected minerals in heavy mineral concentrate estimated by CCSEM analysis.*

Table 3 shows that the concentrations of ilmenite and chromite are higher in the tailings samples than in the beach samples, and that the contents of silicates is higher in the beach sands than in the tailings samples. This is also due to the mineral separation process utilised during the rutile mining activities.

Sample	Mineral	TiO_2	Fe_2O_3	MnO	Cr_2O_3	SiO_2	Al_2O_3	MgO	CaO	ZrO_2
KI-02	Ilmenite	59.7	33.6	2.1	0.1	0.8	0.8	0.6	0.1	0.3
KI-06	Ilmenite	58.7	34.8	1.9	0.2	0.7	0.8	0.9	0.1	0.2
KI-08	Ilmenite	59.1	34.3	2.0	0.1	0.9	1.0	0.6	0.1	0.2
KI-10	Ilmenite	59.3	33.5	2.2	0.1	1.1	0.8	0.6	0.1	0.3
KI-13	Ilmenite	58.3	33.4	2.0	0.1	2.1	1.0	0.7	0.1	0.3
KI-16	Ilmenite	58.5	33.7	2.1	0.1	1.6	0.8	0.6	0.1	0.3
KI-19	Ilmenite	58.8	34.4	2.1	0.1	0.9	0.7	0.7	0.1	0.3
Mean	Ilmenite	58.9	34.0	2.1	0.1	1.2	0.8	0.7	0.1	0.3

Table 4: *Compositions of ilmenite from CCSEM analysis. Values are weight percent oxide.*

The TiO_2-contents of the ilmenite are 58-60 wt.% (Table 4), indicating some alteration. Leucoxene (Table 5) contains about 73-77 wt.% TiO_2, and has slightly elevated Al_2O_3 contents (1-2 wt. %) relative to ilmenite (≤ 1 wt.%). Leucoxene has lower MnO (c. 1 wt. %) than ilmenite (c. 2 wt. %), and there is a vague tendency for Cr_2O_3 to be higher in leucoxene (c. 0.2 wt. %) than in ilmenite (0.1 wt. %). The Mn distribution between ilmenite and leucoxene is most easily explained by the tendency for Mn to follow Fe in the alteration process.

Sample	Mineral	TiO_2	Fe_2O_3	MnO	Cr_2O_3	SiO_2	Al_2O_3	MgO	CaO	ZrO_2
KI-02	Leucoxene	75.7	14.9	0.8	0.3	3.3	2.2	0.2	0.2	0.3
KI-06	Leucoxene	72.8	21.8	1.0	0.1	0.9	1.5	0.1	0.1	0.2
KI-08	Leucoxene	74.5	19.4	1.3	0.2	0.8	1.8	0.2	0.1	0.2
KI-10	Leucoxene	75.2	19.0	1.0	0.2	0.6	1.4	0.3	0.3	0.2
KI-13	Leucoxene	75.7	14.5	0.8	0.2	4.3	1.6	0.4	0.3	0.3
KI-16	Leucoxene	77.2	16.2	0.9	0.1	1.5	1.3	0.3	0.3	0.4
KI-19	Leucoxene	75.0	16.3	1.1	0.3	1.3	1.5	0.3	0.3	1.1
Mean	Leucoxene	75.2	17.4	1.0	0.2	1.8	1.6	0.3	0.2	0.4

Table 5: *Compositions of leucoxene from CCSEM analysis. Values are weight percent oxide.*

Rutile contains 95-96 wt.% TiO_2 (Table 6), which is in good agreement with the 96.9 wt.% reported by the Gravcon Consultancy for a test rutile product manufactured from the magnetic tailings (see Appendix 2).

Sample	Mineral	TiO_2	Fe_2O_3	MnO	Cr_2O_3	SiO_2	Al_2O_3	MgO	CaO	ZrO_2
KI-02	Rutile	95.2	0.9	0.1	0.2	0.6	0.4	0.1	0.1	0.3
KI-06	Rutile	95.9	0.9	0.2	0.3	0.2	0.3	0.1	0.1	0.3
KI-08	Rutile	95.7	1.0	0.1	0.2	0.5	0.5	0.1	0.1	0.3
KI-10	Rutile	95.2	1.1	0.2	0.2	0.7	0.3	0.1	0.1	0.5
KI-13	Rutile	95.0	0.9	0.1	0.2	0.8	0.4	0.1	0.1	0.4
KI-16	Rutile	94.9	1.2	0.1	0.1	0.8	0.5	0.1	0.1	0.3
KI-19	Rutile	95.7	0.9	0.1	0.2	0.5	0.3	0.1	0.1	0.4
Mean	Rutile	95.4	1.0	0.1	0.2	0.6	0.4	0.1	0.1	0.4

Table 6: *Compositions of rutile from CCSEM analysis. Values are weight percent oxide.*

The average TiO_2-contents of the Ti-bearing minerals are summarised in Table 7 along with the median apparent grain diameter, which vary from c. 130 to c. 180 microns. The average concentrations of TiO2 in all Ti-bearing minerals vary from 62 to 72 wt. % with a mean value for all samples of 67.3 wt. %.

Sample	% TiO_2 In all Ti-minerals	% TiO_2 In all Ti-minerals excl. rutile	Median grain diameter Micron
KI-02	68.4	62.2	150
KI-06	62.9	60.3	180
KI-08	62.0	60.1	150
KI-10	68.4	62.3	170
KI-13	68.3	62.4	130
KI-16	69.6	62.4	130
KI-19	71.7	61.5	150
Mean	67.3	61.6	151

Table 7: *Average compositions of Ti-bearing minerals and their median apparent grain diameter.*

Resource estimates

Lee (2001) estimated the heavy mineral suite of the Lanherne Beach Deposit to consist of 7-8% rutile and 9% zircon, where the slimes content is 4.3% and the fraction >1mm is 1.2%. The Milford Beach Deposit was estimated to have a slimes content of 2.1%, a >1mm fraction of 0.4%, and 9-11% rutile and also 9-11% zircon. The Sea Beach is low in slimes (1.1%), has a >1mm fraction of 1.7%, and 7-8% rutile, 6-9% zircon and 1-2% leucoxene. Mineral resource estimates for the individual deposits are shown in Table 8. This also includes resource estimates for deposits at Cowper Point north of Naracoopa. The estimated heavy mineral contents in the various beach deposits (Table 8) are lower than the heavy mineral contents in samples KI-01 to KI-20 (Table 2). This is because heavy mineral enriched layers were sampled rather than a mixture of heavy mineral enriched layers and silicate enriched layers.

DEPOSIT			**TONNES**			
Naracoopa	**Sand**	**HM**	**Rutile**	**Zircon**	**Leucoxene**	**Ilmenite**
Lanherne Beach	6,130,000	190,000	13,800	17,100	8,800	59,000
Milford Beach	324,000	37,000	3,700	3,600	750	11,000
Sea Beach	195,000	34,000	2,600	2,600	500	11,000
Sand tailings	2,960,000	227,000	11,600	12,700	8,600	70,000
HM tailings	209,000	163,000	5,700	8,900	1,500	119,000
TOTAL	**9,818,000**	**651,000**	**37,400**	**44,900**	**21,150**	**270,000**
Cowper Point						
Back Beach	3,360,000	129,000	9,500	15,000	5,500	44,000
Eastern Deposit	22,400,000	574,000	35,600	43,000	33,700	195,000
Intermediate Strandlines	4,450,000	69,000	4,100	5,200	3,500	23,000
TOTAL	**30,210,000**	**772,000**	**49,200**	**63,200**	**42,700**	**262,000**
Combined	40,028,000	1,423,000	86,600	108,100	63,850	532,000

Table 8: *Mineral resource estimates, King Island. Cut-off grade 0.75% heavy mineral. Data from Lee (2001).*

In addition to the onshore deposits, there are considerable heavy mineral concentrations in some offshore sands. Offshore samples collected by P.H. Stitt & Associates Pty. Ltd. had heavy mineral contents varying between 0.19% and 27.9%, the highest contents obtained from the southwestern area of Sea Elephant Bay nearest to the shoreline.

Some parts of the onshore resources are presently excluded from mining because they are located too close to rivers and creeks, or are within the nature reserve and wildlife sanctuary in the northeastern part of King Island (Fig. 2). The most severe impact of these restrictions is on the resources of the Eastern Deposit at Cowper Point, where more than 50% of the deposit is sterilised from mining.

References

Lee, G. 2001: Heavy mineral dump resources. Naracoopa, King Island, Tasmania. Peter H. Stitt & Associates Pty. Ltd. Sydney, Australia, Report No. 1/2001 (Appendix 1).

Acknowledgements

The fieldwork in King Island was prepared with invaluable assistance from the chairman of Tasmanian Titanium Pty. Ltd. Peter Hopkins. In King Island Klaus and Inge Horn were generous and very helpful hosts. Birger Voigt made the CCSEM analyses, and Ingerlise Nørgaard did the heavy mineral separations. Lis Duegaard and Helle Zetterwall scanned figures and reports.

Calcified forest, Seal Rocks Nature Reserve, King Island

Appendix 1

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REPORT No 1/2001

HEAVY MINERAL DUMP RESOURCES NARACOOPA, KING ISLAND, TASMANIA

Including A Summary of All Identified Heavy Mineral Resources Within the Tasmanian Titanium Tenements

Report Prepared For Tasmanian Titanium Pty Ltd

Graham Lee
BSc, CPGeo, FAusIMM

January 2001

SYNOPSIS

1. AIM

To complete a detailed examination of the Heavy Tailings dump at Naracoopa, King Island, including the determination of resources and the recovery of approximately 1 tonne of sample for metallurgical treatment.

Also, to prepare a summary of the Identified heavy mineral sand resources contained within the Tasmanian Titanium Pty Ltd tenements on King Island.

2. REASON

Tasmanian Titanium Pty Ltd has acquired the King Island project and seeks to establish mining and processing operations to recover the Identified Mineral Resources. The plan is to commence operations by mining the Heavy Tailings and then moving into the other Naracoopa resources.

It was therefore necessary to obtain more detail about the distribution, quantity, and grade of the Heavy Tailings. It was also necessary to recover an approximate 1 tonne sample for metallurgical investigations.

3. SUMMARY and CONCLUSIONS

3.1 Mining between 1969 and 1977 resulted in the processing of 3,071,500 tonnes of sand. The Magnetic Tailings, comprising mostly ilmenite and garnet with lesser quantities of rutile and zircon, were stockpiled adjacent to the old processing plant.

3.2 A hand drilling programme which comprised 47 holes totalling 146.9m drilled on a 20m by 25m grid was completed to determine quantities and to sample the heavy tailings.

3.3 An approximate 1 tonne metallurgical sample was recovered from 15 of the holes totalling 53.35m of drill hole length. The heavy mineral grade for this sample is calculated to be 92.8%.

3.4 Samples from the heavy mineral rich intersection in each hole were tested to determine heavy mineral content and mineralogy using the same procedures used for the 1988 and 1989 investigations.

3.5 Resource estimates for the Heavy Tailings were prepared using the JORC Code a guide.

3.6 The Heavy Tailings Resources, reported as Measured Resources under the Code, are:

• Sand	=	209,000 tonnes	
• Heavy Mineral	=	163,000 tonnes	
• Rutile	=	5,700 tonnes	(2.74% in situ)
• Zircon	=	8,900 tonnes	(4.26% in situ)
• Leucoxene	=	1,500 tonnes	(0.74% in situ)

The Heavy Tailings resources cover an area of 2.9 hectares.

3.7 As a result of the drilling to define the extent and quantity of Heavy Tailings, the quantity of Sand Tailings was revised to account for material previously classified as Heavy Tailings, but which has now been demonstrated to be the lower grade Sand Tailings.

3.8 Zircon rich tailings were intersected in drill hole 1880E, 450N and were subsequently blocked out by drilling 15 holes on a 5m by 5m grid. The zircon rich tailings are estimated at 290 tonnes containing in the order of 190 tonnes of zircon rich heavy mineral, but since the samples collected from each hole comprised the full heavy mineral intersection and not just the zircon interval it is not possible to accurately quantify the contained zircon. The zircon tailings are included into the Heavy Tailings estimates and are NOT additional to the Heavy Tailings.

3.9 Total resources at both Naracoopa and Cowper Point applying a 1.5% heavy mineral cut-off are:

• Sand	=	25,000,000 tonnes
• Heavy Mineral	=	1,230,000 tonnes
• Rutile	=	74,000 tonnes
• Zircon	=	92,000 tonnes
• Leucoxene	=	53,000 tonnes
• Ilmenite	=	460,000 tonnes

These resources have been classified as Indicated Resources under the JORC Code, excepting the Heavy Tailings (Measured Resources) and all ilmenite (Inferred Resources).

3.10 Parts of the mineralised areas at Naracoopa (Lanherne Beach - Sand Tailings) and Cowper Point (Eastern Deposit) are either permanently or temporarily sterilised from mining. These resources amount to:

- Sand = 10,300,000 tonnes
- Heavy Mineral = 327,000 tonnes
- Rutile = 19,300 tonnes
- Zircon = 22,200 tonnes
- Leucoxene = 17,600 tonnes
- Ilmenite = 110,000 tonnes

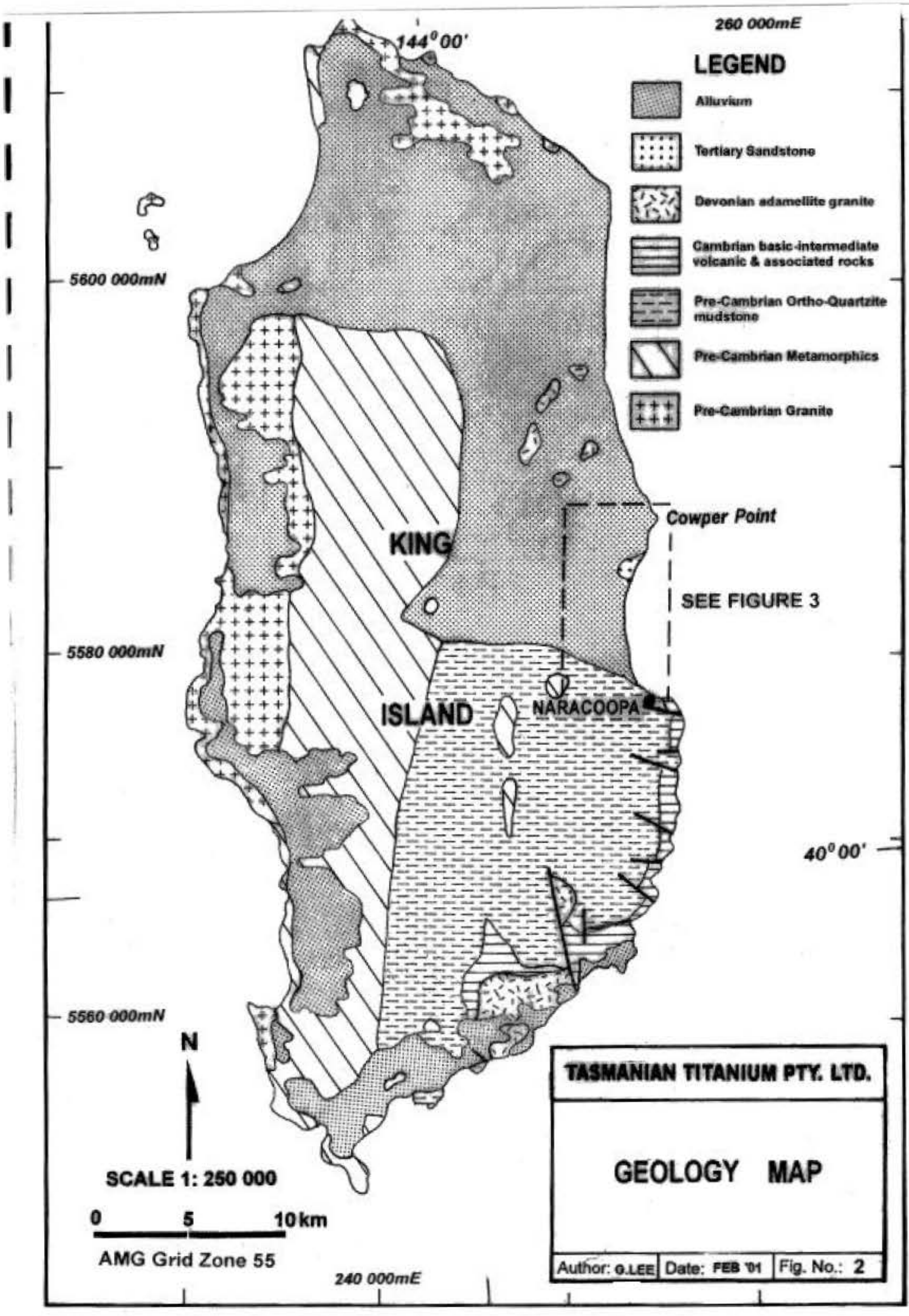
3.11 Thus the resources for which mining consent is presently provided and are therefore available for immediate mining, and from which the initial Reserves will come, are:

- Sand = 15,000,000 tonnes
- Heavy Mineral = 900,000 tonnes
- Rutile = 55,000 tonnes
- Zircon = 70,000 tonnes
- Leucoxene = 36,000 tonnes
- Ilmenite = 360,000 tonnes

4. RECOMMENDATIONS

Firstly, that the programme outlined under Section 10.5 "Future Work" of this report be progressively undertaken to allow the current Identified Resources to be categorised as Proved Reserves ahead of mining.

Secondly, to undertake exploration to determine if any other potentially mineable resources exist, either on King Island, or in the adjacent shallow waters.



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LEGEND
Alluvium
Tertiary Sandstone
Devonian adamellite granite
Cambrian basic-intermediate volcanic & associated rocks
Pre-Cambrian Ortho-Quartzite mudstone
Pre-Cambrian Metamorphics
Pre-Cambrian Granite
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KING
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ISLAND
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TASMANIAN TITANIUM PTY. LTD.
GEOLOGY MAP
SCALE 1: 250 000
0
5
10 km
AMG Grid Zone 55
240 000mE
Author: G.LEE
Date: FEB '01
Fig. No.: 2

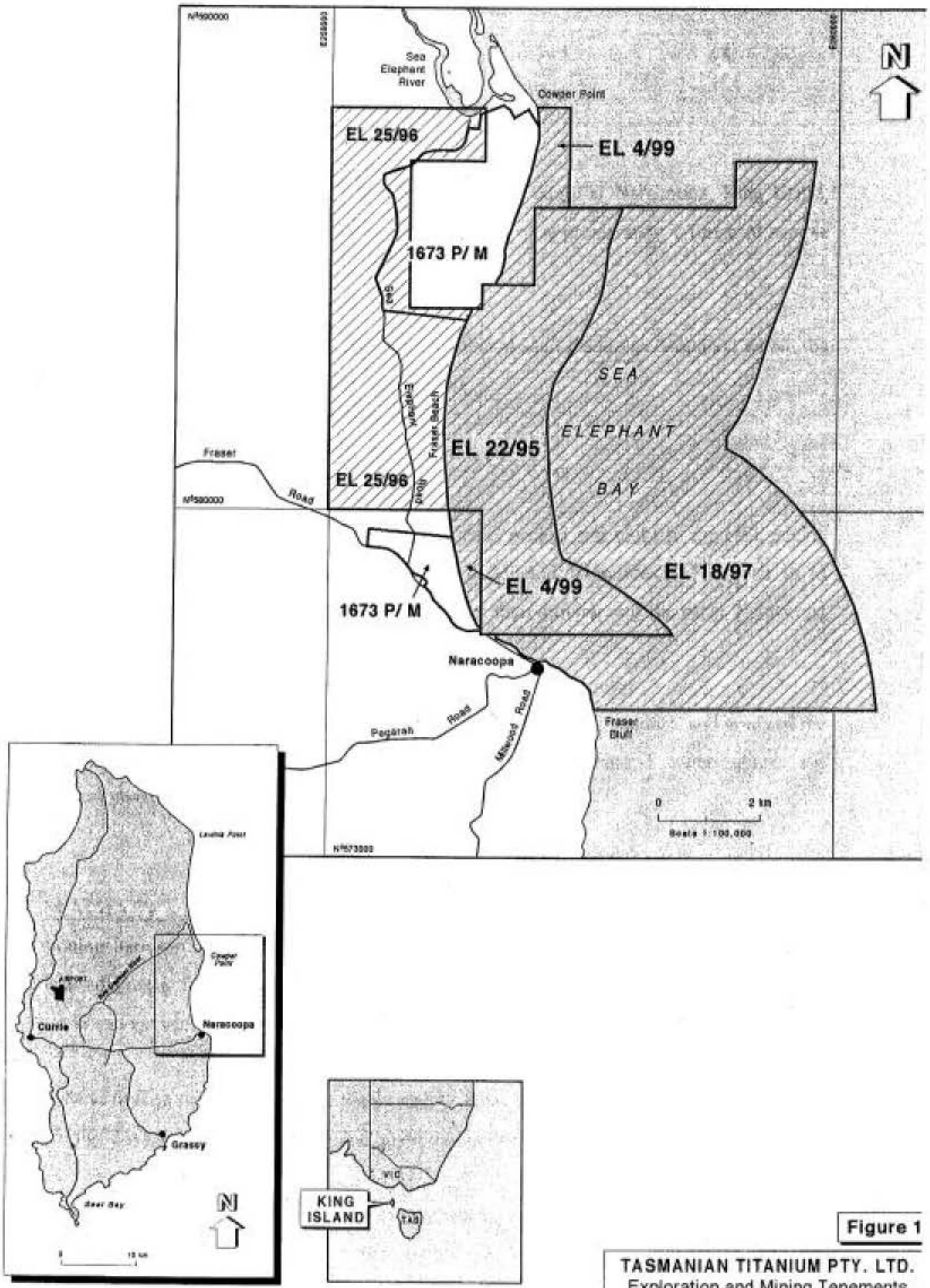
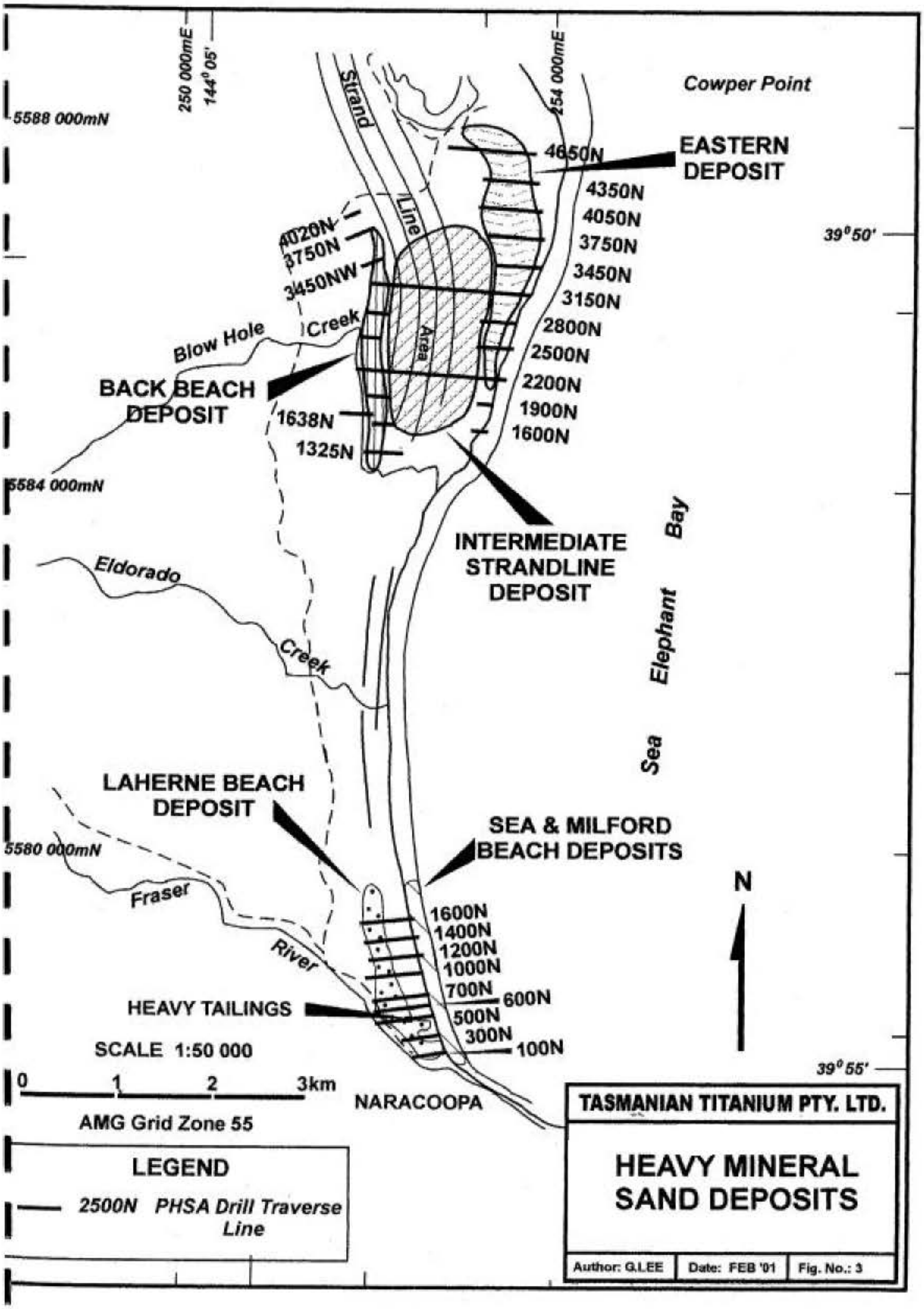


Figure 1

TASMANIAN TITANIUM PTY. LTD.
Exploration and Mining Tenements
Location Map

Compiled: K.C.Morrison	Drawn: R.Carroll	Date: March 2001



250 000mE
144° 05'
254 000mE
Cowper Point
5588 000mN
Strand
Line
Area
EASTERN
DEPOSIT
4650N
4350N
4050N
3750N
3450N
3150N
2800N
2500N
2200N
1900N
1600N
4020N
3750N
3450NW
39° 50'
Blow Hole
Creek
BACK BEACH
DEPOSIT
1638N
1325N
5584 000mN
INTERMEDIATE
STRANDLINE
DEPOSIT
Bay
Elephant
Sea
Eldorado
Creek
LAHERNE BEACH
DEPOSIT
SEA & MILFORD
BEACH DEPOSITS
5580 000mN
Fraser
River
N
1600N
1400N
1200N
1000N
700N
600N
500N
300N
100N
HEAVY TAILINGS
SCALE 1:50 000
0
1
2
3km
39° 55'
NARACOOPA
AMG Grid Zone 55
TASMANIAN TITANIUM PTY. LTD.
HEAVY MINERAL
SAND DEPOSITS
LEGEND
2500N PHSA Drill Traverse Line
Author: G.LEE
Date: FEB '01
Fig. No.: 3

7. GEOLOGY

The basement rocks of King Island consist of Pre-Cambrian (older than 600 million years) metamorphics, and Palaeozoic (225 to 570 million years) sediments and volcanics. Granitic rocks of two ages have intruded the above sequences; Devonian (345 to 395 million years) potassic granites confined to the west coast of the island, and Carboniferous (280 to 345 million years) granodiorites and adamellites confined mainly to the east coast of the island. Pleistocene and Recent (less than 1.5 million years) superficial sand deposits, as shown on Figure 2 cover the majority of the basement.

At Naracoopa these superficial sand deposits occur as three distinctly separate bodies shown on Figure 3 and named:

> **Lanherne Beach** – the oldest and most elevated,
> **Milford Beach** – formed as a barrier along the coastal toe of Lanherne Beach, and
> **Sea Beach** – the youngest and least elevated is the present beach.

Additional to these deposits at Naracoopa are both sand and heavy tailings resulting from the earlier mining operations. The location of the Heavy Tailings are also shown on Figure 3, while the sand tailings form the southern end of the Lanherne Beach shown on Figure 3.

North of Naracoopa, at Cowper Point, the deposits also shown on Figure 3 are named:

> **Back Beach** – the age equivalent of Lanherne Beach,
> **Intermediate Strand-lines** – lower elevation, younger eastern part of Back Beach, and
> **Eastern Deposit** – a younger strand line sequence with aeolian sand capping.

The heavy mineral deposits on the east coast of King Island are considered to have formed by:

- transport of heavy minerals in suspension by the Frazer and Sea Elephant Rivers and deposition by wave action near the (then) mouths of the rivers to form the Lanherne Beach and Back Beach deposits respectively;

- down cutting of the Frazer River as a result of successive lowerings of sea level resulting in the reworking of some of the initial Lanherne Beach deposits to form the higher-grade Milford Beach and Sea Beach deposits;

- reworking of earlier strand lines to produce the aeolian deposits; which now comprise mineralised beach deposits overlain by mineralised aeolian dunes.

The main minerals of economic interest are zircon (zirconium silicate, $ZrSiO_4$, a non-magnetic mineral), rutile (titanium oxide, TiO_2, a non-magnetic mineral) and ilmenite (iron-titanium oxide, $FeTiO_3$, a slightly magnetic mineral). The ilmenite on eastern King Island has relatively high chromium content and is sometimes partially leucoxene; a lower-iron and higher titanium altered ilmenite. Accessory minerals include: tourmaline, garnet, and staurolite, while trace amounts of epidote, chromite, pyrite, corundum, scheelite, cassiterite, spinel and monazite are also present.

All heavy minerals, with the exception of chromite and, to some extent, ilmenite, are believed to have been derived from Pre-Cambrian metamorphics and igneous intrusives which form the hinterland for the two river systems. Chromite and most of the ilmenite have probably been derived from gabbroic outcrops.

The mineral sand deposits occurring within the TTPL holdings are described in the following sections and are shown on Figure 3.

7.1 Lanherne Beach Deposit

The Lanherne Beach deposit was formed by strong wave action, as is evident by cross bedding and the well stratified nature of the deposit. Lanherne Beach sand, is partially indurated with iron and/or organic deposits, has layers of coarse sand with gravel and has a higher slimes content than other deposits (except Back Beach). Occurring within this semi-consolidated sand are compact cemented bands of iron and organic-rich material. Old soil horizons and pebble layers are observed in both natural and artificial exposures, indicating a vertical accumulation of, probably, three separate beaches. To the north of approximately the 800N grid line (Figure 3), the deposit splits into two separate bodies with slightly differing mineralogy.

The heavy mineral suite contains 7-8% rutile and approximately 9% zircon. The slimes content is 4.3%, while the coarse (+1.0mm) fraction is 1.2%.

7.2 Milford Beach Deposit

The Milford Beach deposit is considered by PHSA to be the accreting storm barrier to the present day Sea Beach. It is approximately 30m wide, but tends to be wider to the north. The sand is typically clean, well sorted, with a low slimes content of 2.1% and a low coarse

(+1.0mm) fraction of 0.4%. The heavy mineral suite contains higher rutile and zircon values (each 9-11%) than does the adjacent Sea Beach. The content of leucoxene is low.

7.3 Sea Beach Deposit

Sea Beach is the present day beach and contains visible concentration of heavy minerals, some of which is high grade. The beach represents a narrow strip, approximately 30m wide. Since this is an active area, it is a resource which has potential to replenish with time; indeed replenishment is evident since cessation of mining operations in 1977. The sand is typically clean, being low in slimes (1.1%), but with a moderate coarse (+1.0mm) component (1.7%). The heavy mineral suite contains 7-8% rutile and 6-9% zircon. Leucoxene, at 1-2%, is lower than for the older Lanherne Beach deposit.

After storms have stripped back the Sea Beach, older indurated sands are exposed. These are probably of similar age to Lanherne Beach.

7.4 Sand Tailings

Sand tailings from the operations of Naracoopa Rutile Ltd and Kibuka Mines Pty Ltd were placed into the mined southern half of Lanherne Beach. For the most part, this material is tailings from the richer parts of the Lanherne Beach deposit which was mined by Kibuka Mines. Although the material is tailings, it does contain a significant heavy mineral content including rutile and zircon, and in some areas, it overlies previously unmined sand with appreciable mineral contents. Overall, Lanherne Beach Resources comprise approximately 50% virgin mineralisation and 50% sand tailings.

Typically, sand tailings have lower slime and coarse (+1.0mm) fraction contents than virgin Lanherne Beach sand, being 2.5% and 0.9% respectively. The heavy mineral suite consistently contains approximately 5-6% each of rutile and zircon and does not show the variations that the raw sand does.

7.5 Heavy Mineral Tailings

Heavy Tailings from the Naracoopa Rutile/Kibuka Mines operations occur in a restricted area in the vicinity of line 500N (Figure 3), partly as buried material and partly as a surface dump. The tailings contain mainly magnetic heavy minerals principally ilmenite and garnet, but include rutile (4%), zircon (4-5%) and leucoxene (1-2%).

The Heavy Tailings have recently been further investigated by drilling on a close spaced grid. The details of this recent investigation, and the results, are recorded in Section 8 of this report.

7.6 Back Beach Deposit

The Back Beach deposit at Cowper Point (Figure3), is the northern time equivalent of Lanherne Beach and overlies an older Tertiary calcareous sandstone. It comprises moderately well sorted sand with, particularly along the western flank, a coarse basal deposit and dark grey carbonaceous clay which underlies the sands. Most of the deposit is indurated with accumulated dark brown organic cement, similar to Lanherne Beach. The coarse fraction (+2mm) is 2.0% and slimes content is variable mostly ranging from 2 to 20%.

The heavy mineral suite contains 7-8% rutile and approximately 12% zircon. The zircon content decreases from south to north. Within the deposit, there is a higher-grade strand of mineralisation running along the western flank which probably represents a single storm event. At a 5% heavy mineral cut-off, this concentration contains 19% of the raw sand and 52% of the heavy mineral.

7.7 Eastern Deposit

The Eastern Deposit (Figure 3) comprises a moderately well sorted beach sequence overlain by a well-sorted aeolian dune. For the most part, the sand is very clean with little matrix. Shell content is variable. Pebbles and shells with coarse sand occur near the base in places, but the average +2mm content is 0.2%; while slimes content is low being generally less than 1%. The western part of the Eastern Deposit overlies organically cemented sands similar to those of Back Beach.

The aeolian dune sands of the Eastern Deposit range upwards to in excess of 30m thick. South of Cowper Point, the mineralised beach and aeolian sands extend to the modern coastline, while to the north of Cowper Point, a younger, weakly-mineralised sequence of beach and dune sands has built up on the coastal side of the Eastern Deposit.

The heavy mineral suite contains approximately 6% rutile and approximately 8% zircon. Within this deposit, there is a higher-grade section on the western flank, which, at a 3% heavy mineral cut-off, contains 38% of the total raw sand and, 51% of the total heavy minerals. The location of this higher-grade portion might pose fewer problems for mining and rehabilitation than some of the higher and steeper topography of areas to the east.

7.8 Intermediate Strandlines Between Back Beach and Eastern Deposit

A series of beach strand-line deposits resting directly on Tertiary sandstone occur between the Back Beach and Eastern Deposit (Figure 3). These beach deposits typically fine upwards and often contain a basal gravel and/or coarse shell layer. Along the eastern side, aeolian dune sands overlie these strand-line deposits. Like the Back Beach deposit they are indurated. They are younger than the Back Beach, and have lower surface elevation and grade than either the Back Beach or Eastern Deposit. Using a 1.5% heavy mineral cut-off the mineralisation is too fragmented to form mineable blocks, but at a lower cut-off grade (say 0.75% or 1.0%) there is potential to mine the whole of this intermediate strandline area.

Only limited mineralogy investigations have been completed on the heavy minerals contained within these strandlines. Overall the mineralogy is expected to remain generally consistent with the adjoining Back Beach and Eastern Deposits.

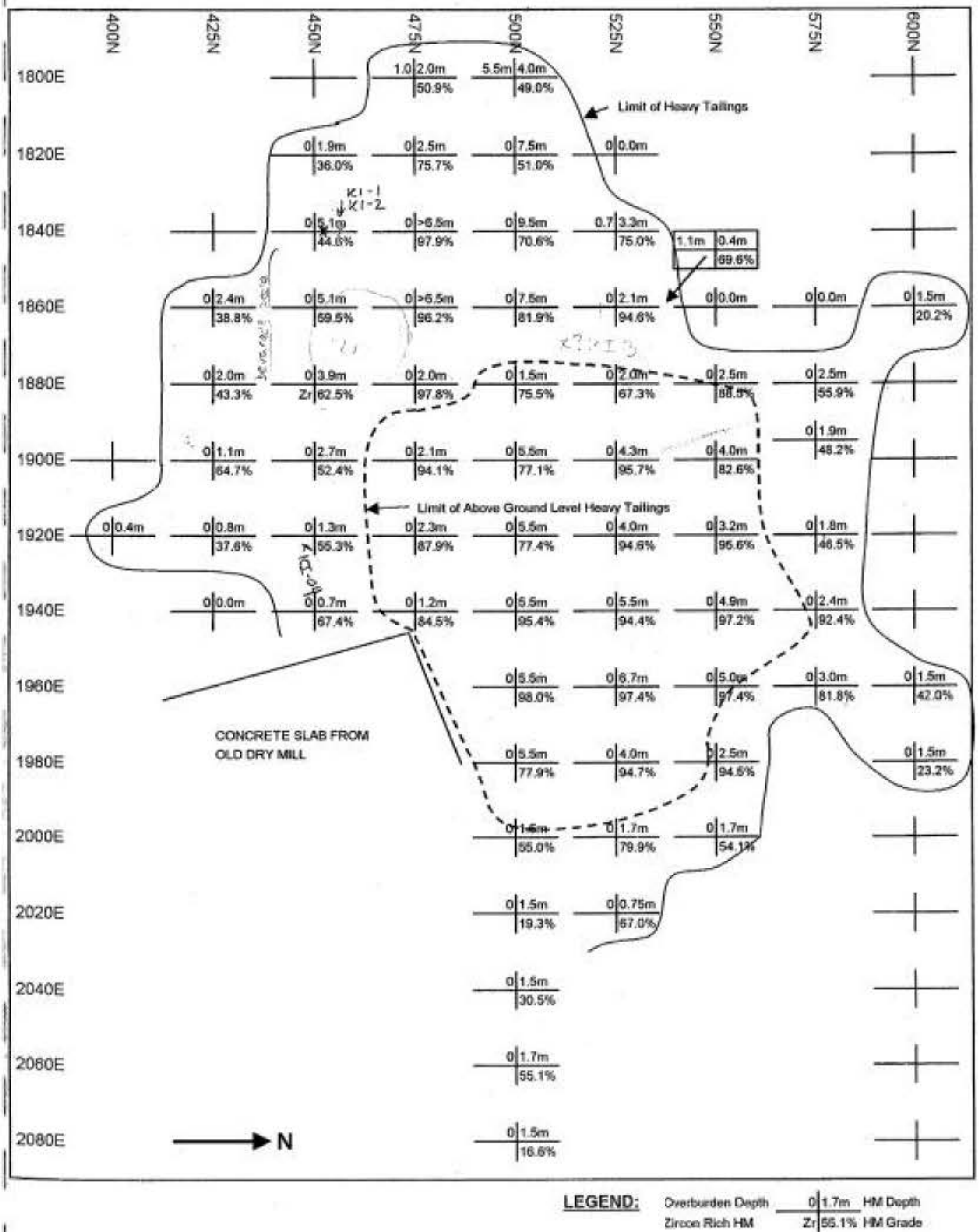


FIGURE 4
HEAVY MINERAL TAILINGS DUMP DRILL HOLE PLAN

R2000-01 FIG 4.xls FIG 4

TABLE 2
MINERAL RESOURCE ESTIMATES, EAST KING ISLAND. CUT-OFF GRADE 1.5% HEAVY MINERAL

DEPOSIT	CATEGORY	IN SITU MINERAL CONTENT (%)					TONNES					
		HM	Rutile	Zircon	Leucoxene	Ilmenite	Sand	HM	Rutile	Zircon	Leucoxene	Ilmenite*
NARACOOPA												
Lanherne Beach (Raw)	Indicated	5.0	0.36	0.44	0.24		2,790,000	140,000	10,100	12,200	6,700	43,000
Milford Beach	Indicated	11.5	1.17	1.12	0.23		324,000	37,000	3,800	3,600	700	11,000
Sea Beach	Indicated	17.7	1.32	1.38	0.27		196,000	35,000	2,600	2,700	500	11,000
Sand tailings	Indicated	7.7	0.39	0.43	0.29		2,960,000	227,000	11,600	12,700	8,600	70,000
HM Tailings	Measured	78.0	2.74	4.26	0.74		209,000	163,000	5,700	8,900	1,500	119,000
TOTAL	**Measured & Indicated**	**9.3**	**0.52**	**0.62**	**0.28**	**3.9**	**6,479,000**	**602,000**	**33,800**	**40,100**	**18,000**	**254,000**
COWPER POINT												
Back Beach	Indicated	5.1	0.39	0.62	0.22		2,150,000	110,000	8,400	13,300	4,800	37,000
Eastern Deposit	Indicated	3.1	0.19	0.24	0.19		16,400,000	514,000	31,900	38,800	30,600	175,000
TOTAL	**Indicated**	**3.4**	**0.22**	**0.28**	**0.19**	**1.1**	**18,550,000**	**624,000**	**40,300**	**52,100**	**35,400**	**212,000**
COMBINED		**4.9**	**0.30**	**0.37**	**0.21**		**25,029,000**	**1,226,000**	**74,100**	**92,200**	**53,400**	**466,000**
ROUNDED							**25,000,000**	**1,230,000**	**74,000**	**92,000**	**53,000**	**470,000**

* Ilmenite quantities based on the following average values: Naracoopa 31% of total heavy mineral suite. Heavy Tailings 73% of total heavy mineral, magnetic leucoxenised ilmenite is included as ilmenite. Cowper Point 34% of total heavy mineral suite. All Ilmenite quantities are **INFERRED RESOURCES.**

Leucoxene shown in the above Table is non-magnetic leucoxene.

TABLE 3
MINERAL RESOURCE ESTIMATES, EAST KING ISLAND. CUT-OFF GRADE 0.75% HEAVY MINERAL

DEPOSIT	CATEGORY	IN SITU MINERAL CONTENT (%)					TONNES					
		HM	Rutile	Zircon	Leucoxene	Ilmenite	Sand	HM	Rutile	Zircon	Leucoxene	Ilmenite *
NARACOOPA												
Lanherne Beach	Indicated	3.1	0.23	0.28	0.14		6,130,000	190,000	13,800	17,100	8,800	59,000
Milford Beach	Indicated	11.3	1.17	1.14	0.23		324,000	37,000	3,700	3,600	750	11,000
Sea Beach	Indicated	17.5	1.32	1.35	0.26		195,000	34,000	2,600	2,600	500	11,000
Sand Tailings	Indicated	7.7	0.39	0.43	0.29		2,960,000	227,000	11,600	12,700	8,600	70,000
HM Tailings	Measured	78.0	2.74	4.26	0.74		209,000	163,000	5,700	8,900	1,500	119,000
TOTAL	**Measured & Indicated**	**7.2**	**0.38**	**0.46**	**0.22**	**2.8**	**9,818,000**	**651,000**	**37,400**	**44,900**	**21,150**	**270,000**
COWPER POINT												
Back Beach	Indicated	3.85	0.28	0.44	0.16		3,360,000	129,000	9,500	15,000	5,500	44,000
Eastern Deposit	Indicated	2.56	0.16	0.19	0.15		22,400,000	574,000	35,600	43,000	33,700	195,000
Intermediate Strandlines	Inferred	1.55	#	#	#		4,450,000	69,000	4,100	5,200	3,500	23,000
TOTAL	**Indicated**	**2.39**	**0.16**	**0.21**	**0.14**	**0.9**	**30,210,000**	**772,000**	**49,200**	**63,200**	**42,700**	**262,000**
COMBINED		**3.5**	**0.22**	**0.27**	**0.16**	**1.3**	**40,028,000**	**1,423,000**	**86,600**	**108,100**	**63,850**	**532,000**
ROUNDED							**40,000,000**	**1,400,000**	**86,000**	**108,000**	**62,000**	**530,000**

There is no direct mineralogy data for the drill holes in this part of the resource. It has been assumed that the heavy mineral suite remains consistent with the adjoining deposits to the east and west: ie rutile = 6%, zircon = 7.5%, leucoxene = 5%, ilmenite + leucoxenised ilmenite = 34% of the heavy mineral suite.

* Ilmenite quantities based on the following average values: Naracoopa 31% of total heavy mineral suite. Heavy Tailings 73% of total heavy mineral, magnetic leucoxenised ilmenite is included as ilmenite. Cowper Point 34% of total heavy mineral suite. All Ilmenite quantities are **INFERRED RESOURCES.**
Leucoxene shown in the above Table is non-magnetic leucoxene.

9.4 Results of Onshore Resources Estimates

The results of the 1988 and 1989 PHSA Resource estimates are presented in Tables 2 and 3 for 1.5% and 0.75% heavy mineral cut-off grades. In rounded terms, the total Resources are:

Cut-Off Grade	**1.5%**	**0.75%**
Raw sand	25 million tonnes	40 million tonnes containing,
Heavy mineral	1.23 million tonnes	1.4 million tonnes
Rutile	74,000 tonnes	86,000 tonnes
Zircon	92,000 tonnes	108,000 tonnes
Leucoxene	53,000 tonnes	62,000 tonnes
Ilmenite	470,000 tonnes	530,000 tonnes.

The western portions of the Back Beach and the Eastern Deposit contain higher-grade sections. Mineral Resource estimates, at 3% heavy mineral cut-off grade, for Eastern Deposit and, 5% heavy mineral cut-off grade, for Back Beach are set out in Section 10.3. They give information on the potential to mine higher-grade sections of the deposit during early years of operation or during periods of lower mineral prices.

9.5 Resources For Which Mining Consent Is Presently Available

Estimates have been prepared which quantify that part of the Identified Resource at 1.5% heavy mineral cut-off occurring within the area of the granted mining lease, where the attached conditions allow mining to take place; ie omitting that part of the resource occurring within the Mining Exclusion Zone at Cowper Point and along the Fraser River at Naracoopa.

The Mining Exclusion Zone at Cowper Point is set aside to assist with the protection of the orange bellied parrot. It is shown on Attachment 1 to the Permit Conditions – Environmental; issued by the Department of Primary Industries, Water and Environment, Tasmania under the Environmental Management and Pollution Control Act 1994. Whether this area can be mined at some later time will depend largely on the demonstration of successful rehabilitation elsewhere within the mining lease, and an assessment of the impact mining operations may have on the habitat of this parrot. The impact of the exclusion zone is to sterilise, at least temporarily, a large part of the Eastern Deposit.

At Naracoopa, mining is not permitted within 45m of the Fraser River mid stream under Condition 31 of the Permit Conditions – Environmental; issued by the Department of Primary

Industries, Water and Environment, Tasmania under the Environmental Management and Pollution Control Act 1994. A small part of the resource (mostly Sand Tailings) is sterilised as a result of this condition.

There are other parts of the resource affected by Permit Conditions, which require the consent of the minister, eg Condition 34, mining within 30m of Blowhole Creek. For the purpose of these estimates it has been assumed that the required consent will be forthcoming when it is sought. Failure to obtain consent would result in the sterilisation of an additional part of the Identified Resource.

Table 4 summarises that part of the total Identified Resource, which is immediately available for mining under the conditions attached to the Mining Leases. When all of the above listed factors have been dealt with, a Reserve estimate will be established. However, Table 4 by virtue of excluding that part of the resource occurring within the Mining Exclusion Zone and along Fraser River, is a first step to establishing a Reserve estimate.

TABLE 4

ESTIMATED RESOURCES WITHIN PRESENTLY MINEABLE AREAS OF THE MINING LEASE

Cut-off Grade 1.5% Heavy Mineral

DEPOSIT	(%)	TONNES					
	HM	Sand	HM	Rutile	Zircon	Leucoxene	Ilmenite
NARACOOPA							
Lanherne Beach (Raw)	5.0	2,790,000	140,000	10,100	12,200	6,700	43,000
Milford Beach	11.5	324,000	37,000	3,800	3,600	700	11,000
Sea Beach	17.7	196,000	35,000	2,600	2,700	500	11,000
Sand tailings	7.6	2,890,000	218,000	11,200	12,200	8,300	68,000
HM Tailings	78.0	209,000	163,000	5,700	8,900	1,500	119,000
TOTAL	**9.3**	**6,410,000**	**593,000**	**33,400**	**39,600**	**17,700**	**252,000**
COWPER POINT							
Back Beach	5.1	2,150,000	110,000	8,400	13,300	4,800	37,000
Eastern Deposit	3.2	6,190,000	196,000	13,000	17,100	13,300	67,000
TOTAL	**3.4**	**8,340,000**	**306,000**	**21,400**	**30,400**	**18,100**	**104,000**
COMBINED	**4.9**	**14,750,000**	**899,000**	**54,800**	**70,000**	**35,800**	**356,000**
ROUNDED		**15,000,000**	**900,000**	**55,000**	**70,000**	**36,000**	**360,000**

9.6 Exploration Results Offshore

Heavy mineral content of the 21 sites sampled offshore ranged from 27.9% to 0.19%. The highest-grade samples were those obtained from nearest to the shoreline in the south-western corner of Sea Elephant Bay. Heavy minerals contents ranging from 1% up to 5.25% were found in 8 of the 16 sites located more than 700m from the shore.

Mineralogy was determined on two composites of the heavy mineral fractions being:

SAMPLE A	the 3 hand drilled holes, and
SAMPLE B	the 16 pumped samples.

Details of the calculated average heavy mineral grades and the mineralogy are set out in Table 5 below.

TABLE 5

RESULTS OF TEST EVALUATION OF COMPOSITE HEAVY MINERAL SAMPLES

COMPONENT	COMPOSITE SAMPLE A	COMPOSITE SAMPLE B	MINERALS	% in RAW SAND SAMPLE A	% in RAW SAND SAMPLE B
CALCULATED % HEAVY MINERAL					
Weighted mean for drilled interval	**12.1**	**1.5**			
Arithmetic mean	**10.4**	**1.3**			
MINERAL TOTALS % IN HEAVY MINERAL SUITE					
	7.7	9.0	Rutile	0.80	0.12
	5.7	7.7	Zircon	0.59	0.10
	7.9	9.9	Ilmenite	0.82	0.13
	13.0	11.8	Altered Ilmenite	1.35	0.16
	3.3	6.1	Leucoxene	0.34	0.08
	0.02	1.03	Monazite	0.002	0.014
	0.06	0.03	Xenotime	0.006	0.0004
	11.7	21.2	Garnet	1.22	0.28
	50.8	33.7	Others	5.29	0.45
TOTAL HEAVY MINERAL	**100.0**	**100.0**		**10.41**	**1.34**

TABLE 6

IDENTIFIED RESOURCES AVAILABLE FOR MINING AND EXCLUDED FROM MINING

Cut-off 1.5% Heavy Mineral

	TOTAL IDENTIFIED RESOURCE (t)	RESOURCE AVAILABLE FOR MINING (t)	RESOURCE EXCLUDED FROM MINING (t)
NARACOOPA			
Sand (t)	6,480,000	6,410,000	68,000
Heavy Mineral (t)	602,000	593,000	9,000
Rutile (t)	33,800	33,400	400
Zircon (t)	40,100	39,600	500
Leucoxene (t)	18,000	17,700	300
Ilmenite (t)	254,000	252,000	2000
COWPER POINT			
Sand (t)	18,550,000	8,340,000	10,210,000
Heavy Mineral (t)	624,000	306,000	318,000
Rutile (t)	40,300	21,400	18,900
Zircon (t)	52,100	30,400	21,700
Leucoxene (t)	35,400	18,100	17,300
Ilmenite (t)	212,000	104,000	108,000
TOTAL (rounded values)			
Sand (t)	25,030,000	14,750,000	10,280,000
Heavy Mineral (t)	1,226,000	899,000	327,000
Rutile (t)	74,100	54,800	19,300
Zircon (t)	92,200	70,000	22,200
Leucoxene (t)	53,400	35,800	17,600
Ilmenite (t)	466,000	356,000	110,000

10.3 Mining

With regard to extraction of the Identified Resource some issues that need to be considered are mentioned below.

Clay underlying the sand deposits at Naracoopa will form a natural base for mining where heavy mineral grades persist to this depth. The clay is not flat lying; rising to an elevation of +15m above AHD, and this may present some difficulty if a dredge operation is envisaged.

Appendix 2

P.A & V.B. BUTLER
TRADING AS

GRAVCON CONSULTANCY

ABN 73 965 973 078

TASMANIAN TITANIUM PTY LTD

KING ISLAND MINERAL SANDS PROJECT

PROJECT OVERVIEW

July 2001

5 NORMANBY ST
ROBINA
QLD 4226

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TABLE OF CONTENTS

1. INTRODUCTION

At the request of the Chairman of Tasmanian Titanium Pty Ltd Gravcon Consultancy has been asked to generate a review of the current status of the development of the King Island mineral sands project. This document is being produced almost exactly 12 months from the date of a similar document generated by Gravcon Consultancy.

The scope of this report was to present a summary of –

- Current reserve status
- Planned development strategy
- Plant flowsheet
- Dry Mill Processing
- Product specifications and recoveries
- Capital and Operating costs
- Further Developments

The purpose of this report is to provide an update to shareholders and presentation to potential financiers / investors.

2. SUMMARY

2.1 Reserve Status

Last November (2000) further drilling was completed on the "Magnetic Tailings Stockpile" allowing the upgrading of this resource status to a "Measured" resource.

Drilling along the Sea Beach was also conducted but due to the unstable nature of this resource no definition could be applied.

Following this additional drilling Geologist Graham Lee of Peter Stitt & Associates generated an updated report titled " Heavy Mineral Dump Resources, Naracoopa, King Island, Tasmania including summary of all identified heavy mineral resources within the Tasmanian Titanium tenements".

The reported measured resource of the Magnetic Tailings Stockpile is now defined as-

- Sand 209,000 tonnes
- Heavy Mineral 163,000 tonnes
- Rutile 5,700 tonnes
- Zircon 8,900 tonnes
- Leucoxene 1,500 tonnes

2.2. Planned Development Strategy

The planned development strategy is for the initial processing of the Magnetic Tailings Stockpile and the high grade Sea Beach sands.

This allows generation of a significant return on funds for minimal capital and operating expense due to the both minimal operating expense involved in mining, rehabilitation and transportation costs and minimal capital expenditure requirements for the processing of this high grade ore.

The Magnetic Tailings Stockpile is located immediately around the planned processing plant site (former site of operations) and covers a surface area on only 29000m^2 with direct mining from the resource into the feed bin by front-end loader.

The process plant is located approximately 400 metres from the midpoint of the Sea Beach deposit that runs 800 meters from the mouth of the Fraser River to a section of outcropping coffee rock along the beachfront. It is planned that this resource is mined at opportune times (ie following upgrading by wave action) on a section-by-section basis using either front-end loaders or excavators into trucks for transport to the plant.

The current model for the first year's production is for co-processing of both the Magnetics Stockpile and 50,000 tonnes of ore from the Sea Beach resource.

Subsequent production would be derived from the commissioning of a wet gravity upgrading plant to process ore from the lower grade resources supplemented by further ore from the Sea Beach.

2.3. Plant Flowsheet

During drilling of the samples, to confirm the resource estimate for the Magnetic Tailings Stockpile, a representative bulk sample (approx 1 tonne) was accumulated and used for simulation of the proposed flowsheet in the production of a Rutile / Zircon concentrate.

This testwork showed that the flowsheet achieved or bettered both final product grade (ie 85% Rutile and Zircon) and mineral recoveries.

Subsequent processing of these products indicated that the levels of tin in the final Rutile products were in excess of satisfactory levels. This necessitates the inclusion of an additional stage into the original flowsheet.

2.4 Dry Mill Processing

TTPL has in place an advanced arrangement with Mineral Deposits Ltd for the processing and marketing of the King Island concentrates.

The bulk R / Z concentrate, generated from the assessment of the process plant flowsheet, was subjected to a simulation of the Mineral Deposits Ltd, Hawkes Nest dry mill flowsheet.

From this simulation final products of both Rutile and Zircon where generated that met both typical product grades and or exceeded predicted recovery estimates.

Samples of these products have been distributed to potential buyers around the world for assessment.

The zircon has reportedly been well accepted by most potential clients.

The Rutile has two negative characteristics that impact on marketability. These are the levels of tin present and the fine sizing. The tin levels can be readily reduced by the introduction of an additional stage into the King Island process plant ie wet shaking table to reject the high specific gravity tin mineral present.

However the sizing of the mineral cannot be countered, as it is what nature provided.

If the sizing factor limits marketability of the King Island product an option is for a change of focus for the marketing away from the pigment market and into the welding rod market where sizing, and tin, is not an issue.

2.5 Product Grades and Recoveries ,

The following tables present the grades and sizings of the final products and mineral recoveries generated from the testwork.

2.5.1 Product Assays

Rutile Product

	TiO_2 %	ZrO_2 %	Fe_2O_3 %	Al_2O_3 %	SiO_2 %	SnO_2 %	S %	As ppm
Rutile	96.9	0.44	0.51	0.12	0.45	0.090	0.003	10

As stated previously the only assay of concern is the levels of tin (Sn). At 900ppm this four times the typical limit for the pigment market. This value is higher than expected due to an error during the testwork ie only one of the three streams that make up this product was processed to remove the tin.

Despite this it is recommended that an additional stage of wet tabling is installed to maximise tin rejection and ensure tin levels are within market expectations.

Zircon Product

	ZrO_2 %	TiO_2 %	Fe_2O_3 %	Al_2O_3 %	SiO_2 %	U ppm	Th ppm
Zircon	66.2	0.08	0.065	0.42	32.6	147	245

These grades place this product as "Premium" Zircon grade.

2.5.2 Product Sizings

Weight %

Fraction	Rutile Wgt %	Zircon Wgt %	Rutile Cum Wgt % Retained	Zircon Cum Wgt % Retained
+212μm	1.82	3.16	1.82	3.16
+180μm	5.94	6.66	7.76	9.83
+150μm	18.77	9.63	26.53	19.46
+125μm	42.04	21.71	68.58	41.17
+106μm	23.78	27.70	92.35	68.87
+90μm	6.74	23.29	99.09	92.15
+75μm	0.78	7.28	99.86	99.43
+63μm	0.12	0.50	99.98	99.94
-63μm	0.02	0.06	100.00	100.00
Total	100.00	100.00		

Comments, ex the Manager Marketing MDL, are that the zircon sizing is not an issue however the Rutile sizing has generated comments of concern ex a number of potential buyers.

2.5.3. Product Recoveries

Mineral recoveries to the final RZ Concentrate achieved by the simulation of the King Island concentrate upgrade plant were -

- Zircon - 97.22%
- Rutile - 94.38%
- Leucoxene - 60.43%

Mineral recoveries to final products achieved by the simulation of the MDL Hawkes Nest dry mill were –

- Zircon - 90.70
- Rutile - 93.01%
- Leucoxene - 62.86%

Note the leucoxene figure quoted here is a recovery of mineral to the final rutile product. It should also be noted that due to the definitions used during processing and analysis this material is predominantly misreported rutile rather than true leucoxene. This is evidenced by the high TiO2 levels reported in the rutile product.

The total recoveries achieved through both stages of processing were -

- 88.24% of the Zircon to the final Zircon Product
- 37.98% of the Leucoxene to the final Rutile product
- 87.79% of the Rutile to the final Rutile product.

With the addition of the recovered Leucoxene to the Rutile product this gave an effective Rutile recovery of 103.5%.

2.6. Capital and Operating costs

A number of estimates of the capital and operating costs for the processing of the Magnetic Tails and Sea Beach reserves have been presented.

Gravcon Consultancy has done a broad estimate (±20%) of the capital costs based simply on experience to derive a figure of approximately $1.5 million. Operating costs have been estimated at $85/ tonne R/Z Concentrate.

Foyster Holdings has sought and received a BOOT (ie Build, Own, Operate, Transfer) arrangement with MD Mineral Technologies Pty Ltd. Under this agreement MDmt builds the plant, operates and manages it for eight months and then transfers it to TTPL.

The terms of this agreement is for TTPL to pay MDmt $185/ tonne for operating costs (payable on a monthly basis) and $2.4 million capital costs Payable on handover of the plant after the eight months). It should be noted that funding of the capital costs are built into these expenses somewhere.

It is the author's opinion that these figures are grossly over inflated with the operating costs particularly of concern. The basis for this concern is illustrated in later sections.

Estimated annual R/Z Concentrate to be produced is 21,600 tonnes. Using this figure the difference in operating costs for the first eight months is equivalent to $1.62 million.

For the scale of this operation this $1.62 million difference represents a significant impact on investor returns.

2.7 Future Developments

The next stage of the project development is the completion of a bankable feasibility study for presentation to potential avenues of funding. The Peter Stitt & Associates Pty Ltd (PSA) group has been nominated to complete this study on behalf of TTPL.

To compile this feasibility the following investigations / studies still need to be completed or updated -

- Engineering drawings and Capital costs
- Confirmation of Operating Costs
- Transport arrangements.
- Cash flow analysis

These studies in combination with the PSA geological report, hydrogeology report (John McCambridge (SMPF)) and GC metallurgical report should provide sufficient information with which to approach various funding groups for finance to progress the project.

It is hoped this stage of the project will provide sufficient funds to repay all debt and provide funds towards development of subsequent project development into the lower grade areas. Development of this future expansion will need to be commenced early into the first year of production to ensure the continuance of operation of the Concentrate Upgrade Plant and cash flows.

3. Reserve Status

In November 2000 a further drilling programme was conducted to upgrade the resource definition of the Magnetic Tailings Stockpile. Prior to this the resource estimate was based on two assessments ie. –

- Ex Peter Stitt & Assoc Pty Ltd (PSA) based on two traverse lines at 500 & 600 North and at 20 metre intervals.
- Ex Cable Sands (WA) Pty Ltd based on a closer drill spacing but did not fully estimate the extents of the resource or the zircon and rutile contents.

In the November drilling programme the resource was completed to the extent of the resource and in all but three holes to the base of the deposit. Each hole was assayed for heavy mineral content and then composited into common areas for determination of mineral contents.

Graham Lee (Geologist) of PSA generated a report outlining the results of this drilling programme and a review of all drilling conducted on the tenements held by TTPL. This report is titled

Report No. 1/2001
Heavy Mineral Dump Resources
Naracoopa, King Island, Tasmania
Including summary of all identified Heavy Mineral Resources
Within the Tasmanian Titanium Tenements

The results of the drilling of Magnetic Tailings Stockpile were

➢ Sand	209,000 tonnes
➢ Heavy Mineral	163,000 tonnes
➢ Rutile	5,700 tonnes
➢ Zircon	8,900 tonnes
➢ Leucoxene	1,500 tonnes

These values are within the range of the results from the previous assessments.

The table below was extracted from the above report covering the known resources within the onshore tenements held by TTPL. These figures assume a cut off grade of 1.5%.

Deposit	Category	Sand (000)	HM (000)	Rutile (000)	Zircon (000)	Leucoxene (000)	Ilmenite (000)
Naracoopa							
Lanherne Beach	Indicated	2,790	140	10,1	12,2	6,7	43
Milford Beach	Indicated	324	37	3,8	3,6	,7	11
Sea Beach	Indicated	196	35	2,6	2,7	,5	11
Sand Tailings	Indicated	2,960	227	11,6	12,7	8,6	70
Mag Tails	Measured	209	163	5,7	8,9	1,5	119
Total		6,479	602	33,8	40,1	18	254
Cowper Point							
Back Beach	Indicated	2,150	110	8,4	13,3	4,8	37
Eastern Deposit	Indicated	16,400	514	31,9	38,8	30,6	175
Total		18,550	624	40,3	52,1	35,4	212
Combined		25,029	1,226	74,1	92,2	53,4	466

Note – The Sea Beach data is very dependent upon the status of the beach profile. During the drilling program in November the % HM was approx 60% versus the levels detailed above of <20%. This resource is also expected to be self-replenishing from the strands that are located off shore from this beach.

4. Planned Development Strategy

The plan is to develop the King Island project in two stages.

Stage 1 involves the processing of the entire Magnetic Tailings Stockpile and as much of the Sea Beach resources as possible. This will only require the Concentrate Upgrade Plant (CUP) to generate the R/Z Concentrate.

Stage 2 involves the processing of the low grade areas and requires the construction of additional wet gravity concentration plants to provide feed of a suitable grade for the operation of the CUP.

The basis of this strategy is to begin operations at a minimal capital cost (ie CUP only) and on ore that has the lowest operating costs ie practically no mining, transport or rehabilitation costs.

These low costs are derived due to the location of the

- Magnetic Tails Stockpile - within a distance of 5 and 150 metres from the feed bin for the CUP capable of being simply mined by a Front End Loader direct to the plant

  - Total surface area of the stockpile being only 2.9 hectares with the excavated area being used for tails storage and requiring rehab only on completion of the project

- Sea Beach Resource - This plant is located approx 400metres from the center of the Sea Beach resource, which runs for 800 metres from the mouth of the Fraser River to an outcrop of coffee rock along the tidal beach zone. Mining will involve the use of either Front End Loader or Excavator direct into trucks for transfer to a stockpile near the CUP feed bin. Due the closeness of the plant haul distances will be less than 2km per cycle.

- The only costs for rehabilitation will be in the return of tails to the beach to replace the sand removed

This strategy will minimize the requirements for project funding to meet initial demands for capital and operating costs until the first revenue is received. It is envisaged that the first sale of final product will not occur until 12 months after startup of the operation.

This first year's income should allow predominantly self-funding of development of stage 2 of the project.

5. CUP FLOWSHEET

During drilling of the samples, to confirm the resource estimate for the Magnetic Tailings Stockpile, a representative bulk sample (approx 1 tonne) was accumulated and used for simulation of the proposed flowsheet in the production of a Rutile / Zircon concentrate.

The outcomes of this testwork is presented in a report by Gravcon Consultancy titled –

Metallurgical Assessment of King Island Resources
- Magnetic Tailings Stockpile
- Sea Beach
- Zircon Rich Stockpile

February 2001

In summary this testwork proved that the proposed flowsheet was capable of achieving the targeted product grades and recoveries. From the subsequent dry mill processing the issue of tin content in the final rutile product proved of concern with an assay of approximately four times the market limits.

In the processing of the bulk sample the removal of the tin was not completed. This was attempted at a later stage and in error only one of the three product streams were subjected to this rejection stage. Despite this it is recommended that an additional stage of separation, to remove the tin, be installed to guarantee suitable levels are achieved in the final product.

This change has only a minor affect on capital cost but is critical to final product market acceptance.

The mineral distribution to each of the circuit products is presented in the following table

Product Stream	Weight %	Ilmenite	Alt Ilm	Leucox	Rutile	Zircon	Oth HM	Free Qtz
Oversize	0.24	0.00	0.00	0.00	0.00	0.00	0.00	3.90
WHIMS Mag 1	74.52	95.54	88.57	0.00	0.00	0.00	72.06	0.00
WHIMS Mag 2	7.08	4.11	9.01	0.00	0.00	0.00	13.32	0.00
Gravity Tail	10.10	0.35	0.87	39.57	5.62	2.78	10.74	95.46
Gravity Conc	8.06	0.00	1.55	**60.43**	**94.38**	**97.22**	3.89	0.64
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The recoveries of rutile, leucoxene and zircon achieved by the CUP were -

- Zircon - 97.22%
- Rutile - 94.38%
- Leucoxene - 60.43%

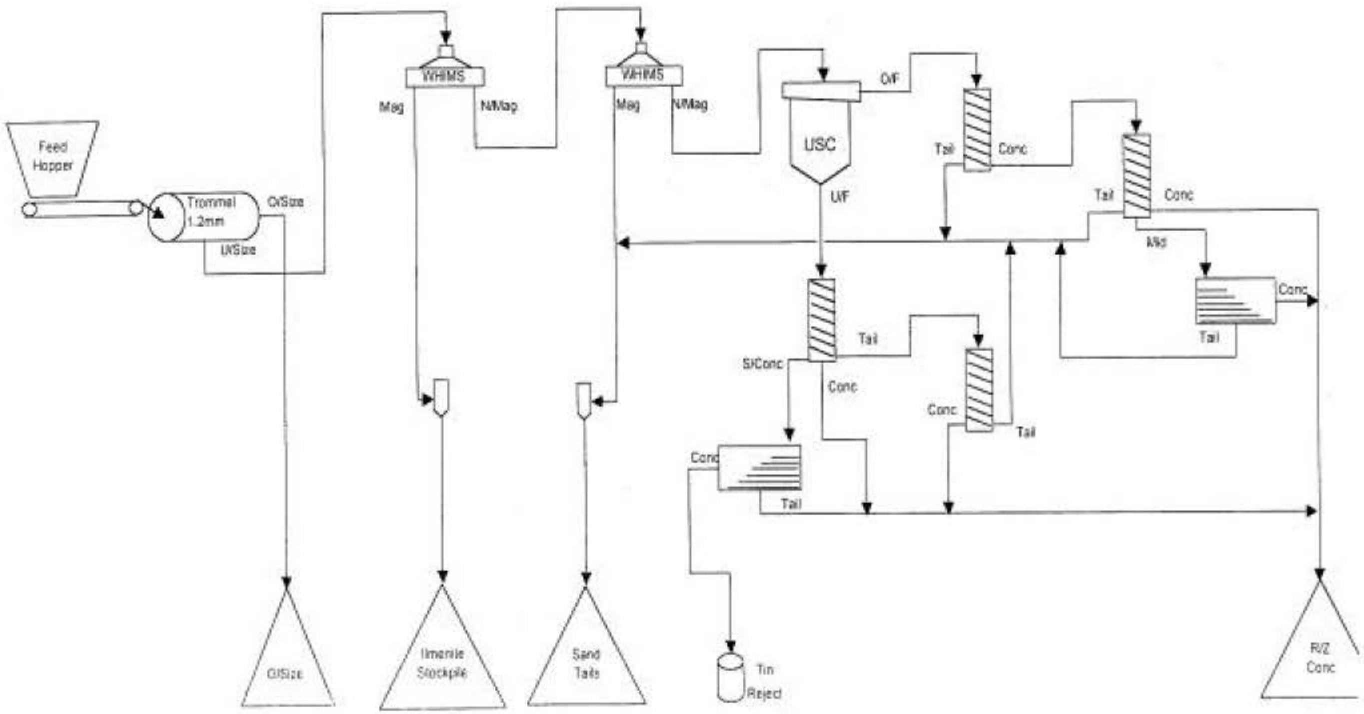
The grade of the R/Z Concentrate just failed to meet the specification of 85% rutile/ leucoxene and zircon at 81.97%. With circuit optimisation the targeted specification should be achievable. The main contaminant is "Other HM" which is predominantly alumina silicates which should be readily reduced with optimisation of operational setting ie on the WHIMS and spirals.

Product Stream	Weight %	Ilmenite	Alt Ilm	Leucox	Rutile	Zircon	Oth HM	Free Qtz
Oversize	0.24	0.00	0.00	0.00	0.00	0.00	0.00	100.00
WHIMS Mag 1	74.52	53.66	16.50	0.00	0.00	0.00	29.84	0.00
WHIMS Mag 2	7.08	24.30	17.66	0.00	0.00	0.00	58.04	0.00
ravity Tail	10.10	1.46	1.20	3.97	1.41	1.02	32.81	58.13
Gravity Conc	8.06	0.01	2.67	**7.60**	**29.70**	**44.67**	14.88	0.49
Total	100.00	41.86	13.88	1.01	2.54	3.70	30.86	6.15

The updated flowsheet recommended for the CUP is presented on the following page.

Tasmanian Titanium Pty Ltd

King Island Project -Concentrate Upgrade Plant Conceptual Flowsheet



6. Dry Mill Processing

It is planned that the R/Z Concentrate produced from the CUP on King Island will be toll processed at the MDL Hawkes Nest dry mill.

The R/Z Concentrate generated from the processing of the bulk sample was subjected to a simulation of the MDL Hawkes Nest Dry Mill to assess the plants ability to process the King Island mineral.

The testwork aimed to closely follow that of the MDL circuit to allow confidence in the ability of the plant to achieve the level of product quality and mineral recovery.

The outcomes of this testwork provide considerable confidence that the Hawkes Nest plant is capable of meeting the required product specifications and recovery of Rutile and Zircon.

In the production of the final Zircon and Rutile no assays were conducted until the processing was completed. All the separation assessments were completed simply by eye yet both products met the market specifications.

A number of splits of the final products have been distributed to a potential buyers of the King island products. The response to the Zircon product is very positive. However a number of buyers have expressed a concern regards the Rutile products tin level and relatively fine sizing of the Rutile.

The tables below detail the assays of the Rutile and Zircon products achieved.

Rutile Product

	TiO_2 %	ZrO_2 %	Fe_2O_3 %	Al_2O_3 %	SiO_2 %	SnO_2 %	S %	As ppm
Rutile	96.9	0.44	0.51	0.12	0.45	0.090	0.003	10

As stated previously the only assay of concern is the levels of tin (Sn). At 900ppm this four times the typical limit for the pigment market. This value is higher than expected due to an error during the testwork ie only one of the three streams that make up this product was processed to remove the tin.

Despite this it is recommended that an additional stage of wet tabling be installed to maximise tin rejection and ensure tin levels are within market expectations.

Zircon Product

	ZrO_2 %	TiO_2 %	Fe_2O_3 %	Al_2O_3 %	SiO_2 %	U ppm	Th ppm
Zircon	66.2	0.08	0.065	0.42	32.6	147	245

These grades place this product as "Premium" Zircon grade.

The sizings of the products are detailed below. The sizing of the Rutile has been flagged as an issue to MDL marketing with the focus of selling the product into the pigment market. If suitable marketing options cannot be sourced from this sector of the rutile market there is an alternative by placement into the welding electrode market.

Weight %

Fraction	Rutile Wgt %	Zircon Wgt %	Rutile Cum Wgt % Retained	Zircon Cum Wgt % Retained
+212μm	1.82	3.16	1.82	3.16
+180μm	5.94	6.66	7.76	9.83
+150μm	18.77	9.63	26.53	19.46
+125μm	42.04	21.71	68.58	41.17
+106μm	23.78	27.70	92.35	68.87
+90μm	6.74	23.29	99.09	92.15
+75μm	0.78	7.28	99.86	99.43
+63μm	0.12	0.50	99.98	99.94
-63μm	0.02	0.06	100.00	100.00
Total	100.00	100.00		

Mineral recoveries to final products achieved by the simulation of the MDL Hawkes Nest dry mill were –

- Zircon - 90.70%
- Rutile - 93.01%
- Leucoxene - 62.86%

Note the leucoxene figure quoted here is a recovery of mineral to the final rutile product. It should also be noted that due to the definitions used during processing and analysis this material is predominantly misreported rutile rather than true leucoxene. This is evidenced by the high TiO_2 levels reported in the rutile product.

The total recoveries achieved through both stages of processing ie CUP and Dry Mill were -

- 88.24% of the Zircon to the final Zircon Product
- 37.98% of the Leucoxene to the final Rutile product
- 87.79% of the Rutile to the final Rutile product.

With the addition of the recovered Leucoxene to the Rutile product this gave an effective Rutile recovery of 103.5%.

7. Capital and Operating Costs

7.1 Gravcon Cost Estimate

Over the following pages are tables defining capital and operating cost estimates generated over the last twelve months of the project by Gravcon Consultancy.

The Capex is based purely on experience and without the generation of any drawings and assumes the use of some secondhand units that are readily available. This figure is estimated to have an accuracy of ±20%.

This estimate assumes that the local authority will be unable to supply power (as previously advised). Hence this price includes the purchase of a suitable gensets system. It may be preferable to either lease these sets or obtain a supply contract.

The table on the next page presents a breakdown of the cost estimates used to derive a **Capital cost figure of $1,500,000**

This capital and the following operating expenditure figures have been generated for indicative comparisons. Both sets of figures will be fully investigated with back up of design drawings, engineering estimates and detailed operating cost quotations within the scope of the bankable feasibility study.

Item	Cost	Notes,
ROM Bin	30,000	40 tonne, to give approx 1 hour run time
Belt Feeder	20,000	From bin and subsequent conveying / elevating to trommel
Scalping Trommel	15,000	Scalping only at ~8mm, located above screen abd fed from belt
Vib Screen	25,000	Vibrating screen at 0.85mm.
Sump / pump 1	15,000	4/3 pump, 20kW drive, $12m^3$ sump
Drum Magnet	20,000	Secondhand unit
Sump / pump 2	15,000	4/3 pump, 20kW drive, $12m^3$ sump
Whims wide	175,000	Secondhand unit from Readings
Ilmenite sump/pump/cyclone	18,000	4/3 pump, 15kW drive, $12m^3$ sump, cyclone and tower
Sump pump 3	10,000	3/2 pump, 15kW drive, $8m^3$ sump
Whims narrow	-	Owned
Sump pump 4	10,000	3/2 pump, 10kW drive, $6m^3$ sump
USC	18,000	1.5m diameter
Sump pump 5	8,000	2/1.5 pump, 3.5kW drive, $2m^3$ sump
U/f Spirals	10,000	1 x twin start 7 turn HG10
U/f Table	10,000	ex Index
Sump pump 6	8,000	2/1.5 pump, 3.5kW drive,$3m^3$ sump
O/f primary spirals	13,000	1 x triple start 7 turn MG4
Sump pump 7	8,000	2/1.5 pump, 3.5kW drive,$3m^3$ sump
O/f cleaner spirals	10,000	1 x twin start 7 turn HG10
O/f table	10,000	Ex Index
Plant water pump	20,000	4/3 pump, 15kw drive and pipe line 300 metres, pit
USC water	7,500	Header tank $2m^3$, 2/1.5 pump and 2kw drive
Floor sump pump	5,000	3/2 pump and 5kW drive
Sand Tails sump/pump/cyclone	20,000	4/3 pump, 15kw drive, pipe line 300 metres and cyclone tower
RZ sump/pump/cyclone	30,000	4/3 pump, 15kw drive, pipe line 200 metres
Bore pump and genset	35,000	4" bore, 30Kv genset and 20m pipeline
Electrics	150,000	including belt weigher head feed, RZ mass flow meter, MCC
Lighting	15,000	
Drying shed	25,000	To hold ~1-1,200 tonne,
Main building	100,000	Fully clad, including concrete floor
Store stock / spares	50,000	
Workshop tools	20,000	
Control room	8,000	
Lab	5,000	
Ablutions block	15,000	Including septic
Office	15,000	
Design	80,000	
Transport	100,000	
Genset + emergency set	50,000	Includes a tank farm for fuel
Construction	100,000	
Total	**1,398,500**	

The Opex assumes the following operating parameters –

- 7 days per week operation
- 3 panel roster with three operators per panel
- Other Full Time staff include General Manager, Operations Manager / Metallurgist, Maintenance Fitter
- Part time employees include Secretary and Nurseryman
- Fuel costs with Primary Producers rebated to 65 cents

Summary of Operating Costs - Year 1 (Magnetic Tails & Tidal Beach only)

Cost Centre	Total		$/ tonne	
Administration	$	195,200	$	9.04
Salaries	$	875,000	$	40.51
Services	$	397,430	$	18.40
Maintenance	$	201,015	$	9.31
Other	$	90,000	$	4.17
Total	$	1,758,645	$	81.42

The table below is a summary of the individual costing estimates/ breakdowns.

Assuming the production of RZ Concentrate to be 21,600 tonnes the cost per tonne equates to $81.42.

Allowing for contingencies budgeted operating costs are presented as **$85 per tonne**.

The breakdowns in each of the above listed cost centers are presented on the following pages.

Foyster Holdings has sought and received a quotation for a BOOT arrangement from MD mineral technologies Pty Ltd (MDmt) for the initial development of the King Island project.

A BOOT arrangement (ie Build, Own, Operate, Transfer) involves MDmt

- Building and owning the plant on King Island
- Operating / managing all aspects of plant operation / production at a rate **of $185 per tonne of product**

- Transferring the plant and operation to TTPL control after a period of eight months for a **Capital payment of $2.4 million.**

Administration - 1st Year Only

King Island Office Costs		
Communcations	$	4,800
Postage, couriers etc	$	1,000
Stationary	$	2,000
Consultants	$	40,000
Head Office Costs		
Legal Fees	$	25,000
Accounting fees	$	25,000
Insurances - buildings, plant and equipment	$	35,000
Bank Charges & Govt Levies	$	2,400
Travel costs and directors expenses	$	60,000
Total	$	195,200

Salaries - Year 1 Only

Position	Numbers	Package level		Totals	
General Manager	1	$	140,000	$	140,000
Metallurgist	1	$	75,000	$	75,000
Operators	9	$	62,000	$	558,000
Fitter	1	$	62,000	$	62,000
Clerk (part time)	1	$	25,000	$	25,000
Nurseryman (part time)	1	$	15,000	$	15,000
Total	14			$	875,000

Services - Year 1 only

	Units	Cost	Consumption rate		Cost $/a
Loader Fuel	litres	$ 0.65	250 / day		$ 42,250
Genset Fuel	litres	$ 0.65	50 / hour		$ 280,800
Light Vehicle Fuel	litres	$ 1.20	10 / day		$ 4,380
Lab Consumables					$ 5,000
Assays					$ 5,000
Loader Lease					$ 50,000
Equipment hire					$ 10,000
Total					$ 397,430

Maintenance costs

Item	Capital cost	Mtce factor		Nett $/annum
Plant	1500000	12.5%		$ 150,000
Buildings	200000	5.0%		$ 10,000
Light Vehicles	75000	7.5%		$ 5,625
Mobile Equipment	150000	12.5%		$ 18,750
External Labour	12 hours/week @ $40/hr			$ 16,640
Grease, oils				$ 5,000
Other consumables				$ 10,000
Total				$ 201,015

Other Costs - 1st Year Only

Item		
Tenement costs	- Lease of motel	$ 60,000
	- Lease of dam	$ 25,000
	- Tenement costs	$ 5,000
Total		$ 90,000

Comparison of these costs between Gravcon and MDmt display a significant variance. This variance has a major affect on the profitability of the project.

Source	Capital Expense	Operating Expense[#1]
Gravcon Consultancy	$ 1,500,000	$1,377,000
MD mineral technologies [#2]	$ 2,400,000	$ 2,977,000

#1 Operating expenses for 8 months only

#2 MDmt costs include a charge for financing costs for capital through to repayment after eight months and one month's production payment but does not include costs for leases or TTPL head office costs.

At a total difference of $ 2,500,000 less an allowance for the built in finance cost for the CAPEX until transfer, the cost of accepting this BOOT arrangement has a very significant affect on profitability of the King Island Project. The figures estimated by Gravcon Consultancy will be firmed up by the bankable feasibility to be completed by Peter Stitt & Assoc Pty Ltd.

Neither Gravcon Consultancy nor TTPL directors have been able to review the details or breakdown of these quotes to consider the credibility or profit margins of the MDmt estimates. Comparison with industry standards indicates the quoted prices are well above those that would be expected to be achievable.

8. Further Developments

The next stage of the project development is the completion of a bankable feasibility study for presentation to potential avenues of funding.

The Peter Stitt & Associates Pty Ltd (PSA) group has been nominated to complete this study on behalf of TTPL. This group has already has had a considerable exposure to this project through its involvement in a number of exploration programmes over twenty years. It is also a well respected and recognized "Industry Specialist" for the development of bankable feasibility studies.

To compile this feasibility the following investigations / studies still need to be completed or updated -

- Engineering drawings and Capital costs
- Confirmation of Operating Costs
- Transport arrangements.
- Cash flow analysis

These studies in combination with the PSA geological report, hydrogeology report (John McCambridge (SMPF)) and GC metallurgical report should provide sufficient information with which to approach various funding groups for finance to progress the project.

The investigation that will take the largest amount of time will be the finalizing of the transport arrangements. While the shipping and transportation costs post King Island can be readily reconfirmed the costs involved in storage and loading from Grassie harbour is far from being resolved.

An informal discussion with King Island Port Authority in November 2000 yielded an estimate well above those previously developed and needs to be vigorously reviewed by an industry specialist. To the authors knowledge no further discussion re the portrayed estimate has been pursued since. It is proposed that a shipping consultant INCOL Pty Ltd is commissioned to progress all transport / shipping and demurrage discussion for incorporation into the bankable feasibility study.

More recently two TTPL directors have had discussions with a member of the Tasmanian Business Development Corporation who has indicated that a more amicable agreement can be negotiated.

Completion of this bankable feasibility study is critical to the future development of this project.

A successful outcome will place TTPL in a solid position to secure either project finance or increase project value for an equity sale.

It is hoped this stage of the project will provide sufficient funds to repay all debt and provide funds towards development of subsequent project development into the lower grade areas. Development of this future expansion will need to be commenced early into the first year of production to ensure the continuance of operation of the Concentrate Upgrade Plant and cash flows.

One significant revenue source not considered in the financial models developed to date are the potential returns that may be derived from the stockpiled ilmenite generated from the CUP. It is predicted that the first twelve months of operation will generate approximately 125,000 tonnes of ilmenite contained in a feedstock of 150,000 tonnes.

The King Island Ilmenite has a level of Chromite that makes it unacceptable to the general market. This places it in an identical situation to the Ilmenite to be generated from the numerous Murray Basin projects. Using a number of different technologies it is possible to remove the level of chrome contamination to an acceptable level. For the level of production, expected from the King island resource, it is not feasible to fund the necessary capital to build the plant to achieve this process.

A number of Murray Basin producers are in a similar situation regards the scale of production. Because of this there are a number of operators considering construction of a Toll Processing facility with the most likely site of this plant being Portland, Victoria. Any sale of ilmenite will significantly enhance project returns as they will require no additional expenditure of capital and will significantly add to volume through the port facility leading to lower the demurrage charges levied by King Island Port Authority.

Appendix 3

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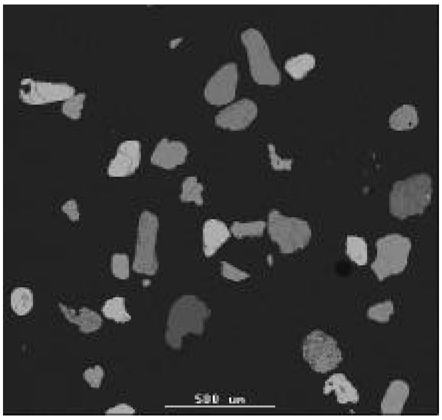

Sample Name:	Naracoopa deposit	No. of frames analysed:	89
Lab. Name:	2000115	No. of particles analysed:	1498
Date:	22-01-2002	Heavy minerals in raw sand (%):	90,15
Submitter:	DuPont/GEUS		
Country:	King Island/Tasmania	Comments:	
Analyzed by:	BV		
Acc. Voltage/Magnification: 17kV/50x			
Guard region:	250 µm		
Sieve:	100 µm^2		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	59,1	34,5	1,8	0,1	0,7	0,7	0,7	0,1	0,3	98,2
Leucoxene	74,0	18,9	1,3	0,2	1,6	1,3	0,2	0,2	0,3	97,9
Rutile	95,7	0,7	0,1	0,2	0,4	0,3	0,1	0,1	0,4	98,0
Ti magnetite	41,9	47,2	1,4	0,2	2,6	1,0	2,4	0,3	1,0	98,1
Magnetite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Chromite	1,0	24,8	1,5	47,7	0,9	13,4	7,2	0,1	0,4	97,2
Pyrite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Monazite	0,0	0,9	0,0	0,0	2,8	0,6	0,1	1,1	2,4	8,0
Y-phosphate	0,0	0,6	0,0	0,0	1,7	0,2	0,2	1,3	1,1	5,1
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	0,2	30,3	8,5	0,1	36,5	19,3	1,3	1,5	0,3	98,1
Kya/Sill	0,1	0,6	0,1	0,2	42,9	53,2	0,1	0,0	0,2	97,5
Staurolite	0,7	14,9	0,3	0,1	32,1	48,2	1,4	0,1	0,3	98,1
Zircon	0,2	0,3	0,1	0,1	29,5	0,0	0,1	0,1	63,6	94,3
Silicate	0,8	11,3	1,6	0,2	48,7	27,6	2,1	4,3	0,3	96,9
Unclassified	6,1	13,3	3,0	2,7	16,2	20,7	2,4	2,9	17,2	84,6

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	36,2	5,3	21,0	2,8	7,0	23,4	0,3	4,1	100,0

Normalised average contents of the valuable Ti-containing minerals:				
Average content	Category			
	Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	60,2	75,6	97,7	42,7
Fe_2O_3 wt%	35,2	19,3	0,7	48,1
MnO wt%	1,8	1,3	0,1	1,4
Cr_2O_3 wt%	0,1	0,2	0,2	0,2
SiO_2 wt%	0,7	1,6	0,4	2,7
Al_2O_3 wt%	0,7	1,4	0,3	1,0
MgO wt%	0,7	0,2	0,1	2,5
CaO wt%	0,1	0,2	0,1	0,3
ZrO_2 wt%	0,3	0,3	0,4	1,1
Total	100,0	100,0	100,0	100,0

Average TiO_2 content of all the TiO_2 minerals:	72,7
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	61,0
Valuable heavy minerals in raw sand:	75,25

Weight percent on a mineral basis:		
Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	30,2	27,3
Leucoxene	4,4	4,0
Rutile	17,5	15,8
Ti magnetite	2,3	2,1
Magnetite	0,0	0,0
Chromite	3,0	2,7
Pyrite	0,0	0,0
Phosphate	0,0	0,0
Monazite	0,4	0,3
Y-phosphate	0,4	0,3
Sphene	0,0	0,0
Garnet	5,8	5,3
Kya/Sill	0,2	0,2
Staurolite	3,4	3,1
Zircon	19,5	17,6
Silicate	10,5	19,3
Unclassified	2,3	2,1
Total	100,0	100,0

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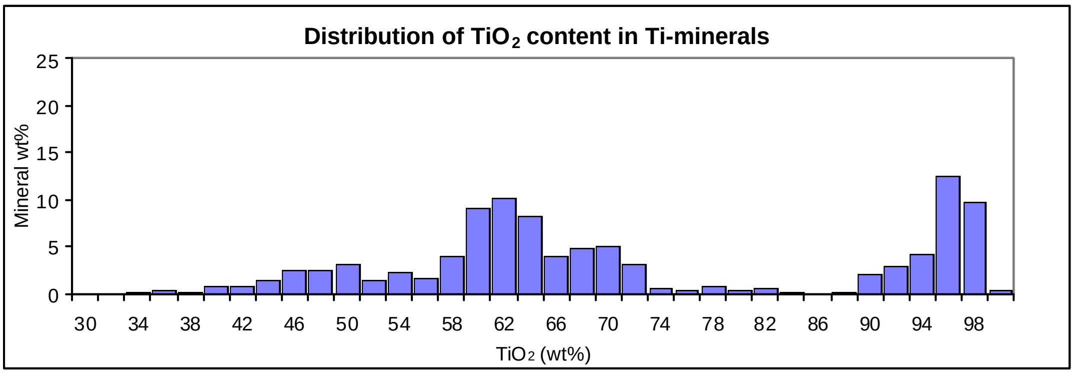
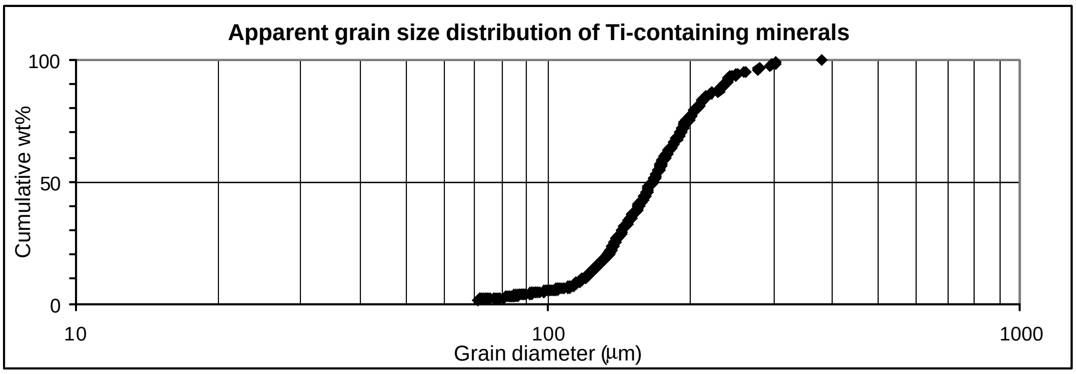
Lab. Name:	2000115	Analyzed by:	BV
Submitter:	DuPont/GEUS	Acc. Voltage	17kV
Date:	22-01-2002		





Average grain parameters						
Category	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm^2)	Total grains
Ilmenite	1,5	1,7	558	209	16316	435
Leucoxene	1,5	1,7	619	230	20705	50
Rutile	1,5	1,7	547	202	16209	228
Ti magnetite	1,5	1,7	481	177	12179	42
Magnetite	0,0	0,0	0	0	0	0
Chromite	1,4	1,7	516	192	15139	41
Pyrite	0,0	0,0	0	0	0	0
Phosphate	0,0	0,0	0	0	0	0
Monazite	1,5	1,6	435	156	9658	8
Y-phosphate	1,4	1,6	420	150	9251	8
Sphene	0,0	0,0	0	0	0	0
Garnet	1,5	1,9	582	229	17911	86
Kya/Sill	1,8	2,2	743	294	23578	3
Staurolite	1,5	2,0	783	312	28922	33
Zircon	1,5	1,6	475	170	12881	344
Silicate	1,5	1,9	766	301	30380	138
Unclassified	1,4	1,6	384	152	11383	79

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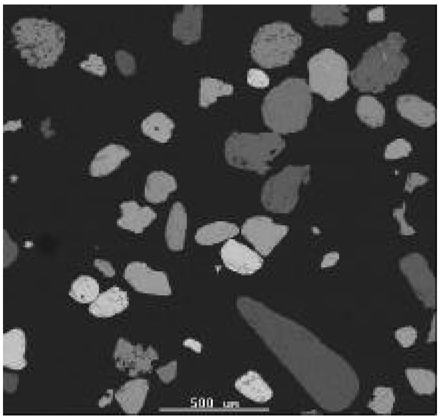
GEUS



Sample Name:	KI-02	No. of frames analysed:	64
Lab. Name:	2000277	No. of particles analysed:	1225
Date:	17-10-2002	Heavy minerals in raw sand (%):	47,59
Submitter:	DuPont/GEUS		
Country:	King Island/Tasmania	Comments:	
Analyzed by:	bv		
Acc. Voltage/Magnification: 17kV/50x			
Guard region:	300 μm		
Sieve:	100 μm^2		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	59,7	33,6	2,1	0,1	0,8	0,8	0,6	0,1	0,3	98,3
Leucoxene	75,7	14,9	0,8	0,3	3,3	2,2	0,2	0,2	0,3	97,8
Rutile	95,2	0,9	0,1	0,2	0,6	0,4	0,1	0,1	0,3	98,1
Ti magnetite	41,1	47,4	1,1	0,2	3,1	1,6	2,1	0,1	1,3	98,2
Magnetite	0,6	70,8	0,2	0,2	9,0	7,4	0,7	0,3	0,5	89,6
Chromite	1,1	25,2	0,8	45,6	0,8	15,5	8,0	0,2	0,5	97,6
Pyrite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Phosphate	1,3	2,6	0,0	0,0	0,0	43,9	0,3	2,9	0,0	51,1
Monazite	0,0	0,4	0,0	0,0	3,6	0,7	0,1	1,6	3,5	9,9
Y-phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	0,3	25,1	8,1	0,1	37,8	18,5	1,1	6,2	0,6	97,9
Kya/Sill	0,2	0,8	0,1	0,3	42,3	53,9	0,1	0,2	0,2	98,2
Staurolite	0,7	15,4	0,3	0,1	31,8	48,1	1,4	0,1	0,2	98,1
Zircon	0,2	0,4	0,2	0,2	29,4	0,1	0,1	0,1	64,8	95,4
Silicate	0,8	8,5	0,5	0,1	52,6	29,9	2,9	1,3	0,3	96,8
Unclassified	5,9	15,0	2,5	4,4	14,4	25,8	5,2	0,9	12,8	86,8

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	36,8	5,8	9,5	1,7	20,1	16,0	1,9	8,2	100,0

Normalised average contents of the valuable Ti-containing minerals:				
Average content	Category			
	Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	60,7	77,4	97,1	41,9
Fe_2O_3 wt%	34,2	15,2	0,9	48,3
MnO wt%	2,2	0,8	0,1	1,2
Cr_2O_3 wt%	0,1	0,3	0,2	0,2
SiO_2 wt%	0,8	3,4	0,7	3,2
Al_2O_3 wt%	0,9	2,3	0,5	1,7
MgO wt%	0,6	0,2	0,1	2,2
CaO wt%	0,1	0,2	0,1	0,1
ZrO_2 wt%	0,3	0,3	0,3	1,3
Total	100,0	100,0	100,0	100,0

Weight percent on a mineral basis:		
Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	28,2	13,4
Leucoxene	4,5	2,1
Rutile	7,3	3,5
Ti magnetite	1,3	0,6
Magnetite	0,7	0,4
Chromite	2,9	1,4
Pyrite	0,0	0,0
Phosphate	0,4	0,2
Monazite	0,5	0,3
Y-phosphate	0,0	0,0
Sphene	0,0	0,0
Garnet	15,4	7,3
Kya/Sill	1,4	0,7
Staurolite	6,3	3,0
Zircon	12,3	5,8
Silicate	16,2	60,1
Unclassified	2,6	1,2
Total	100,0	100,0

Average TiO_2 content of all the TiO_2 minerals:	68,4
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	62,2
Valuable heavy minerals in raw sand:	36,51

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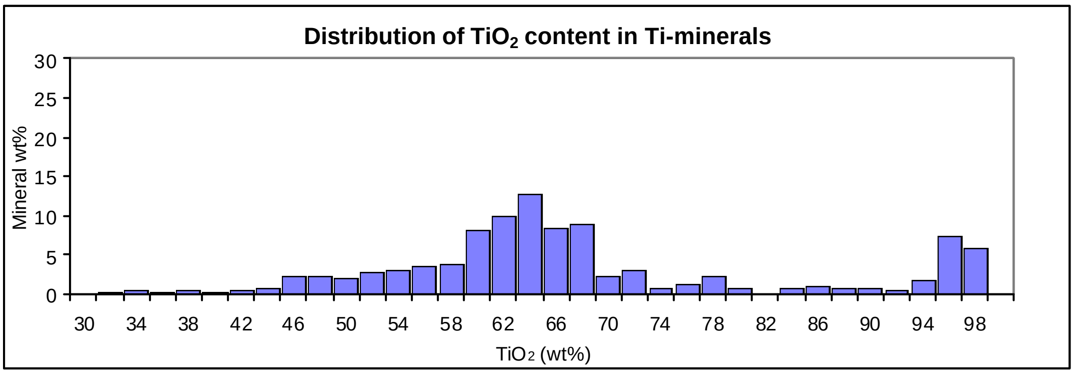
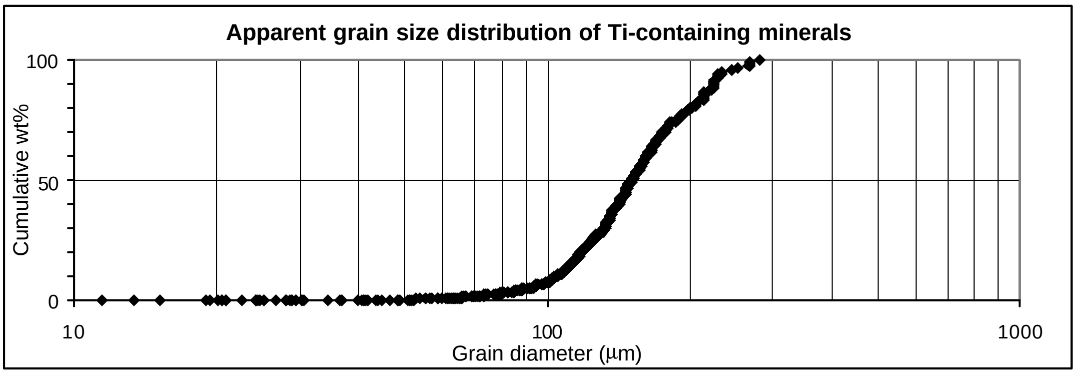
Lab. Name:	2000277	Analyzed by:	bv
Submitter:	DuPont/GEUS	Acc. Voltage	17kV
Date:	17-10-2002		





Category	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm²)	Total grains
	Average grain parameters					
Ilmenite	1,5	1,7	511	191	13782	383
Leucoxene	1,5	1,6	565	209	18498	45
Rutile	1,5	1,7	489	184	12384	99
Ti magnetite	1,6	1,8	470	178	10516	22
Magnetite	1,3	1,5	594	214	24226	5
Chromite	1,4	1,7	495	185	15381	31
Pyrite	0,0	0,0	0	0	0	0
Phosphate	1,9	1,5	1080	364	63965	1
Monazite	1,9	1,8	484	184	11108	8
Y-phosphate	0,0	0,0	0	0	0	0
Sphene	0,0	0,0	0	0	0	0
Garnet	1,5	2,0	647	262	20795	156
Kya/Sill	1,6	2,1	924	371	37326	10
Staurolite	1,6	2,1	779	319	26230	53
Zircon	1,4	1,7	454	166	11454	194
Silicate	1,5	1,9	754	300	29505	174
Unclassified	1,5	2,0	589	247	18146	44

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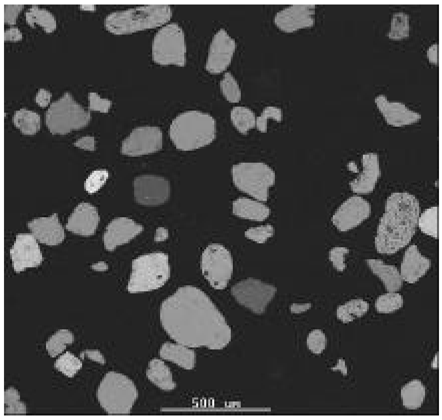

Sample Name:	KI-06	No. of frames analysed:	34
Lab. Name:	2000281	No. of particles analysed:	559
Date:	17-10-2002	Heavy minerals in raw sand (%):	97,46
Submitter:	DuPont/GEUS	Comments:	
Country:	King Island /Tasmania		
Analyzed by:	BV		
Acc. Voltage/Magnification: 17kV/50x			
Guard region:	300 µm		
Sieve:	100 µm^2		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	58,7	34,8	1,9	0,2	0,7	0,8	0,9	0,1	0,2	98,4
Leucoxene	72,8	21,8	1,0	0,1	0,9	1,5	0,1	0,1	0,2	98,5
Rutile	95,9	0,9	0,2	0,3	0,2	0,3	0,1	0,1	0,3	98,2
Ti magnetite	41,3	46,5	2,1	0,1	4,7	1,3	2,2	0,1	0,2	98,6
Magnetite	1,0	65,2	0,0	0,0	3,8	19,9	0,7	1,2	0,0	91,8
Chromite	2,1	26,8	1,1	43,6	0,4	15,6	8,3	0,1	0,2	98,3
Pyrite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Monazite	0,0	0,7	0,0	0,0	3,3	0,5	0,2	2,0	3,6	10,3
Y-phosphate	0,2	1,0	0,1	0,1	0,3	0,7	0,1	0,3	2,5	5,2
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	0,3	30,0	9,4	0,1	36,6	18,2	1,2	2,5	0,2	98,4
Kya/Sill	0,1	0,7	0,0	0,1	43,1	53,6	0,1	0,0	0,0	97,7
Staurolite	0,7	14,7	0,3	0,1	31,6	48,4	1,4	0,1	0,3	97,5
Zircon	0,4	0,5	0,2	0,2	29,3	0,0	0,1	0,3	64,7	95,6
Silicate	2,3	15,4	1,3	1,3	40,0	33,3	2,7	0,8	0,1	97,2
Unclassified	8,0	26,0	3,7	5,8	15,0	25,6	3,4	0,6	6,8	94,9

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	60,8	6,9	5,4	3,2	16,5	5,0	0,2	2,1	100,0

Normalised average contents of the valuable Ti-containing minerals:				
Average content	Category			
	Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	59,7	73,9	97,7	41,9
Fe_2O_3 wt%	35,4	22,1	0,9	47,2
MnO wt%	2,0	1,0	0,2	2,2
Cr_2O_3 wt%	0,2	0,1	0,3	0,1
SiO_2 wt%	0,7	0,9	0,3	4,7
Al_2O_3 wt%	0,9	1,5	0,3	1,3
MgO wt%	0,9	0,1	0,1	2,2
CaO wt%	0,1	0,1	0,1	0,1
ZrO_2 wt%	0,2	0,2	0,3	0,2
Total	100,0	100,0	100,0	100,0

Average TiO_2 content of all the TiO_2 minerals:	62,9
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	60,3
Valuable heavy minerals in raw sand:	86,44

Weight percent on a mineral basis:		
Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	54,0	52,6
Leucoxene	6,1	6,0
Rutile	4,7	4,6
Ti magnetite	2,9	2,8
Magnetite	0,0	0,0
Chromite	5,3	5,2
Pyrite	0,0	0,0
Phosphate	0,0	0,0
Monazite	0,6	0,6
Y-phosphate	1,3	1,2
Sphene	0,0	0,0
Garnet	14,6	14,2
Kya/Sill	0,1	0,1
Staurolite	1,8	1,8
Zircon	4,4	4,3
Silicate	1,8	4,3
Unclassified	2,3	2,3
Total	100,0	100,0

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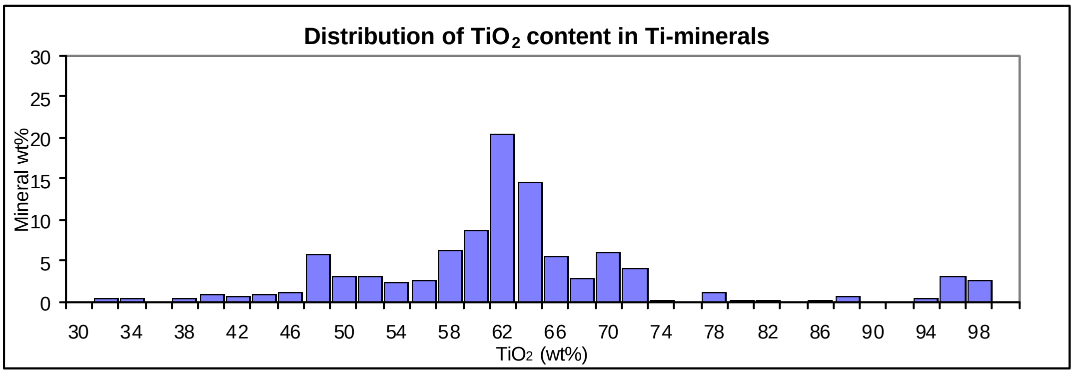
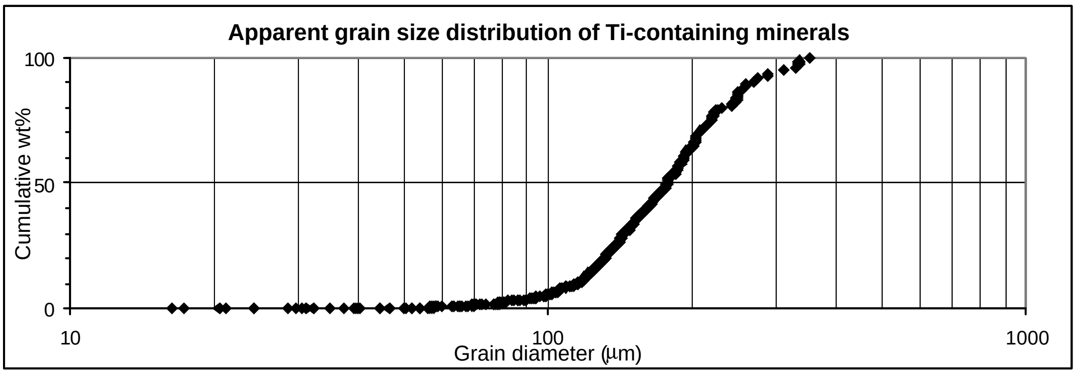
Lab. Name:	2000281	Analyzed by:	BV
Submitter:	DuPont/GEUS	Acc. Voltage	17kV
Date:	17-10-2002		





Category	Average grain parameters					Total grains
	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm^2)	
Ilmenite	1,5	1,7	579	217	17542	314
Leucoxene	1,4	1,8	742	283	27140	23
Rutile	1,5	1,7	517	192	14547	30
Ti magnetite	1,6	1,7	480	180	12042	23
Magnetite	1,3	0,9	42	17	156	1
Chromite	1,4	1,7	632	236	20029	24
Pyrite	0,0	0,0	0	0	0	0
Phosphate	0,0	0,0	0	0	0	0
Monazite	1,3	1,5	437	152	10967	5
Y-phosphate	1,7	1,7	579	214	16763	7
Sphene	0,0	0,0	0	0	0	0
Garnet	1,4	2,0	824	328	31037	54
Kya/Sill	1,1	1,4	594	191	20254	1
Staurolite	1,7	1,9	587	234	17113	13
Zircon	1,3	1,6	529	194	15593	28
Silicate	1,3	1,6	602	224	23605	13
Unclassified	1,4	1,8	519	209	17277	23

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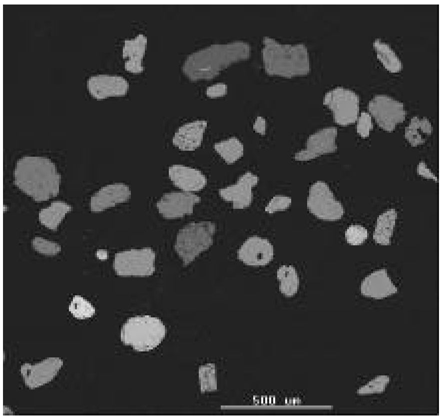
GEUS



Sample Name:	KI-08	No. of frames analysed:	62
Lab. Name:	2000283	No. of particles analysed:	1137
Date:	17-10-2002	Heavy minerals in raw sand (%):	94,06
Submitter:	DuPont/GEUS	Comments:	
Country:	King Island/Tasmania		
Analyzed by:	BV		
Acc. Voltage/Magnification: 17kV/50x			
Guard region:	250 µm		
Sieve:	100 µm^2		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	59,1	34,3	2,0	0,1	0,9	1,0	0,6	0,1	0,2	98,4
Leucoxene	74,5	19,4	1,3	0,2	0,8	1,8	0,2	0,1	0,2	98,4
Rutile	95,7	1,0	0,1	0,2	0,5	0,5	0,1	0,1	0,3	98,4
Ti magnetite	41,9	48,2	1,6	0,6	2,1	1,3	2,5	0,1	0,2	98,5
Magnetite	1,2	75,1	0,4	1,2	2,4	14,0	0,0	0,3	0,5	95,1
Chromite	1,0	24,9	0,8	50,5	0,7	12,6	7,7	0,1	0,2	98,4
Pyrite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Monazite	0,0	0,3	0,0	0,0	2,3	0,3	0,0	2,3	2,8	8,1
Y-phosphate	0,0	1,1	0,0	0,0	1,4	0,3	1,1	2,4	4,6	10,9
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	0,3	27,4	9,9	0,1	37,3	18,4	1,3	3,1	0,3	98,1
Kya/Sill	0,4	0,6	0,0	0,3	42,9	53,4	0,1	0,1	0,2	98,0
Staurolite	0,6	16,1	0,2	0,2	31,0	48,5	1,3	0,1	0,1	98,2
Zircon	0,2	0,5	0,2	0,1	29,4	0,1	0,1	0,1	65,0	95,7
Silicate	1,2	14,0	2,0	0,3	42,1	33,7	2,4	1,0	0,2	96,9
Unclassified	2,5	13,3	2,6	5,7	8,1	40,3	5,0	4,4	1,0	82,8

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	67,5	5,0	4,2	4,3	11,4	5,2	0,1	2,2	100,0

Normalised average contents of the valuable Ti-containing minerals:				
Average content	Category			
	Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	60,1	75,6	97,3	42,5
Fe_2O_3 wt%	34,8	19,7	1,0	48,9
MnO wt%	2,1	1,3	0,1	1,6
Cr_2O_3 wt%	0,1	0,2	0,2	0,6
SiO_2 wt%	0,9	0,8	0,5	2,1
Al_2O_3 wt%	1,0	1,8	0,5	1,3
MgO wt%	0,7	0,2	0,1	2,6
CaO wt%	0,1	0,1	0,1	0,1
ZrO_2 wt%	0,2	0,2	0,3	0,2
Total	100,0	100,0	100,0	100,0

Average TiO_2 content of all the TiO_2 minerals:	62,0
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	60,1
Valuable heavy minerals in raw sand:	86,02

Weight percent on a mineral basis:		
Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	61,7	58,1
Leucoxene	4,6	4,3
Rutile	3,8	3,6
Ti magnetite	3,9	3,7
Magnetite	0,0	0,0
Chromite	5,4	5,1
Pyrite	0,0	0,0
Phosphate	0,0	0,0
Monazite	0,3	0,3
Y-phosphate	0,1	0,1
Sphene	0,0	0,0
Garnet	10,4	9,8
Kya/Sill	0,1	0,1
Staurolite	2,0	1,9
Zircon	4,8	4,5
Silicate	1,8	7,7
Unclassified	0,9	0,9
Total	100,0	100,0

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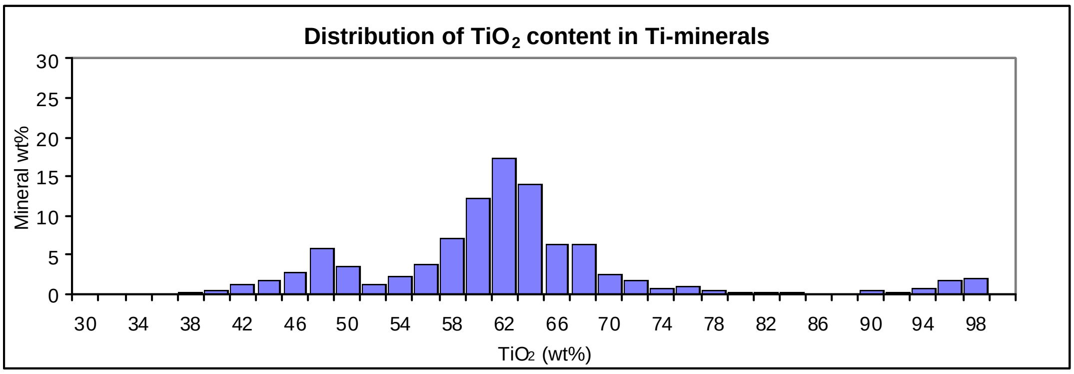
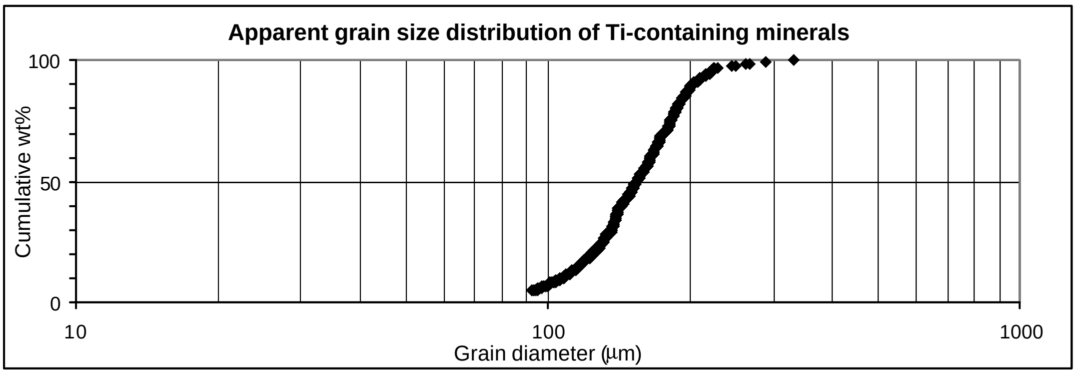
Lab. Name:	2000283	Analyzed by:	BV
Submitter:	DuPont/GEUS	Acc. Voltage	17kV
Date:	17-10-2002		





Category	Average grain parameters					Total grains
	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm^2)	
Ilmenite	1,5	1,7	536	200	14807	667
Leucoxene	1,6	1,7	585	218	17431	42
Rutile	1,5	1,8	482	183	11388	48
Ti magnetite	1,4	1,7	474	179	11397	52
Magnetite	1,3	1,4	143	48	1136	1
Chromite	1,4	1,7	526	197	14177	54
Pyrite	0,0	0,0	0	0	0	0
Phosphate	0,0	0,0	0	0	0	0
Monazite	1,5	1,8	335	126	5470	7
Y-phosphate	1,4	1,3	338	99	6934	2
Sphene	0,0	0,0	0	0	0	0
Garnet	1,5	2,0	556	221	14802	127
Kya/Sill	1,8	2,6	579	241	12441	2
Staurolite	1,6	1,9	708	279	25861	15
Zircon	1,4	1,5	408	143	10156	73
Silicate	1,4	1,9	573	226	17204	29
Unclassified	1,2	1,6	407	154	13699	18

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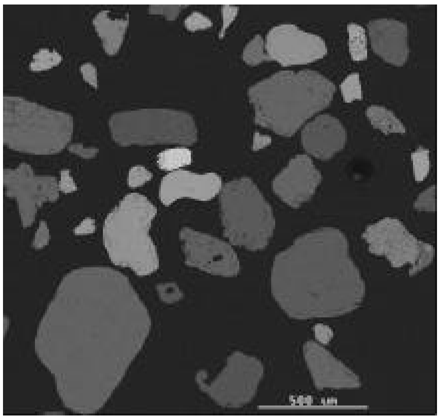
G E U S



Sample Name:	KI-10	No. of frames analysed:	75
Lab. Name:	2000285	No. of particles analysed:	772
Date:	24-10-2002	Heavy minerals in raw sand (%):	44,40
Submitter:	DuPont/GEUS		
Country:	King Island/Tasmania	Comments:	
Analyzed by:	BV		
Acc. Voltage/Magnification:	17kV/50x		
Guard region:	350 µm		
Sieve:	100 µm^2		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	59,3	33,5	2,2	0,1	1,1	0,8	0,6	0,1	0,3	98,2
Leucoxene	75,2	19,0	1,0	0,2	0,6	1,4	0,3	0,3	0,2	98,1
Rutile	95,2	1,1	0,2	0,2	0,7	0,3	0,1	0,1	0,5	98,4
Ti magnetite	41,4	44,7	1,2	0,1	6,3	2,0	1,7	0,8	0,0	98,2
Magnetite	0,4	79,3	0,0	0,2	2,5	12,5	1,4	0,3	0,2	96,8
Chromite	0,3	21,3	0,6	47,1	0,4	19,3	8,5	0,1	0,0	97,7
Pyrite	0,0	44,3	0,0	0,0	0,1	0,0	0,2	0,2	0,0	44,7
Phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Monazite	0,0	0,3	0,0	0,0	3,1	0,6	0,0	1,8	1,7	7,6
Y-phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	0,3	24,6	3,8	0,2	38,1	19,2	1,2	10,3	0,2	97,9
Kya/Sill	0,2	0,7	0,1	0,1	42,4	53,8	0,0	0,1	0,3	97,8
Staurolite	0,9	16,4	0,2	0,1	31,6	47,8	1,4	0,1	0,2	98,6
Zircon	0,2	0,5	0,1	0,2	29,5	0,0	0,1	0,1	65,3	96,0
Silicate	1,0	11,4	0,3	0,1	45,3	33,1	3,7	1,6	0,3	96,7
Unclassified	3,7	14,4	2,1	2,0	14,7	22,8	6,8	23,3	2,9	92,7

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	31,6	6,0	8,2	1,3	29,4	5,4	2,2	15,8	100,0

Normalised average contents of the valuable Ti-containing minerals:				
Average content	Category			
	Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	60,4	76,7	96,8	42,1
Fe_2O_3 wt%	34,2	19,4	1,1	45,5
MnO wt%	2,2	1,0	0,2	1,2
Cr_2O_3 wt%	0,1	0,2	0,2	0,1
SiO_2 wt%	1,2	0,6	0,7	6,4
Al_2O_3 wt%	0,8	1,4	0,3	2,0
MgO wt%	0,6	0,4	0,1	1,8
CaO wt%	0,1	0,3	0,1	0,9
ZrO_2 wt%	0,3	0,2	0,5	0,0
Total	100,0	100,0	100,0	100,0

Average TiO_2 content of all the TiO_2 minerals:	68,4
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	62,3
Valuable heavy minerals in raw sand:	19,22

Weight percent on a mineral basis:		
Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	13,7	6,1
Leucoxene	2,6	1,2
Rutile	3,6	1,6
Ti magnetite	0,6	0,3
Magnetite	0,5	0,2
Chromite	0,1	0,0
Pyrite	0,2	0,1
Phosphate	0,0	0,0
Monazite	0,0	0,0
Y-phosphate	0,0	0,0
Sphene	0,0	0,0
Garnet	12,7	5,6
Kya/Sill	1,0	0,4
Staurolite	6,8	3,0
Zircon	2,4	1,0
Silicate	54,1	79,6
Unclassified	1,8	0,8
Total	100,0	100,0

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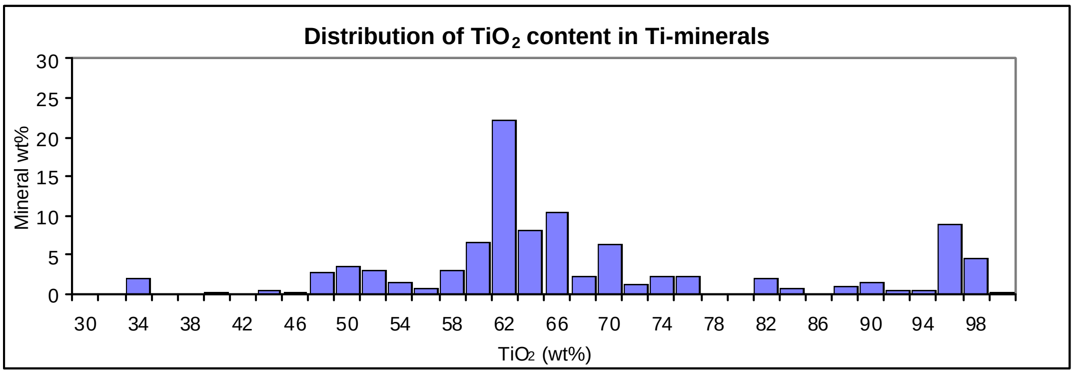
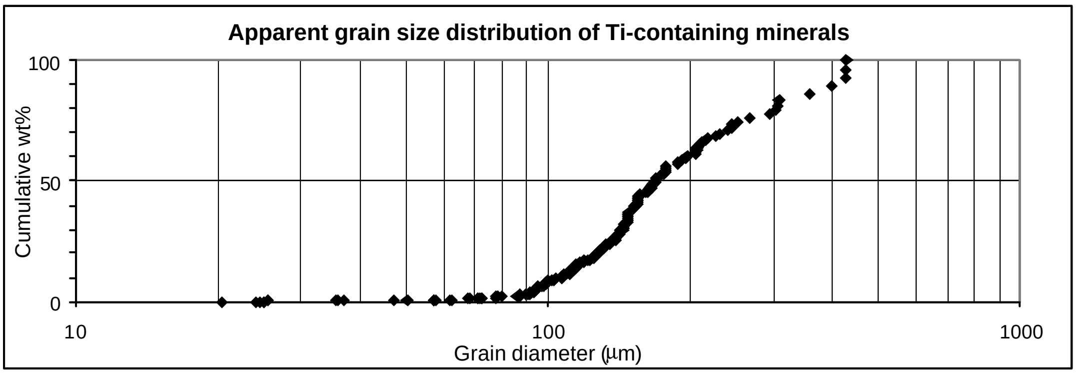
Lab. Name:	2000285	Analyzed by:	BV
Submitter:	DuPont/GEUS	Acc. Voltage	17kV
Date:	24-10-2002		





Average grain parameters						
Category	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm²)	Total grains
Ilmenite	1,6	1,8	608	236	18761	142
Leucoxene	1,5	1,6	593	216	22166	23
Rutile	1,5	1,7	498	184	13015	48
Ti magnetite	1,5	1,9	675	275	21019	5
Magnetite	1,6	1,9	809	296	43845	2
Chromite	1,5	1,7	331	125	5078	2
Pyrite	2,5	2,2	1029	423	38740	1
Phosphate	0,0	0,0	0	0	0	0
Monazite	1,4	1,4	215	72	2545	2
Y-phosphate	0,0	0,0	0	0	0	0
Sphene	0,0	0,0	0	0	0	0
Garnet	1,5	2,2	802	330	29661	94
Kya/Sill	1,7	2,3	910	377	32463	8
Staurolite	1,6	2,2	983	410	41561	38
Zircon	1,4	1,5	418	147	10082	44
Silicate	1,5	1,9	1052	417	54070	331
Unclassified	1,5	1,7	509	206	18440	32

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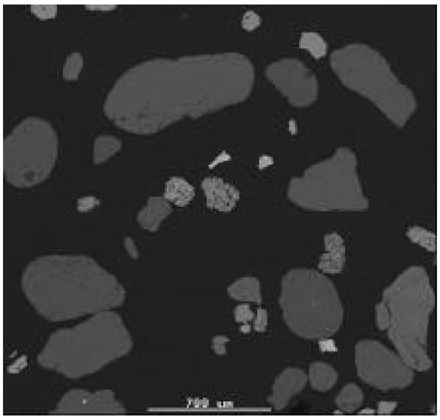

Sample Name:	KI-13	No. of frames analysed:	49
Lab. Name:	2000288	No. of particles analysed:	890
Date:	16-10-2002	Heavy minerals in raw sand (%):	41,82
Submitter:	DuPont/GEUS	Comments:	
Country:	King Island/Tasmania		
Analyzed by:	BV		
Acc. Voltage/Magnification: 17kV/40x			
Guard region:	450 µm		
Sieve:	100 µm²		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	58,3	33,4	2,0	0,1	2,1	1,0	0,7	0,1	0,3	98,1
Leucoxene	75,7	14,5	0,8	0,2	4,3	1,6	0,4	0,3	0,3	98,0
Rutile	95,0	0,9	0,1	0,2	0,8	0,4	0,1	0,1	0,4	98,0
Ti magnetite	41,9	44,4	1,2	0,1	6,1	1,1	2,1	0,2	1,0	98,1
Magnetite	0,0	89,1	0,0	0,2	3,8	3,2	1,2	0,2	0,1	97,9
Chromite	0,1	19,1	0,3	46,9	0,3	20,3	11,2	0,1	0,0	98,3
Pyrite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Monazite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Y-phosphate	0,6	0,8	0,0	0,0	0,0	0,7	0,0	0,2	2,3	4,6
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	1,1	19,7	3,0	0,3	38,7	18,5	1,7	14,3	0,8	98,0
Kya/Sill	0,5	0,2	0,2	0,2	42,7	53,8	0,0	0,1	0,3	98,0
Staurolite	0,6	15,3	0,2	0,1	33,4	46,9	1,3	0,1	0,3	98,0
Zircon	0,4	0,4	0,1	0,2	29,3	0,1	0,1	0,2	64,0	95,0
Silicate	0,8	10,1	0,2	0,2	51,1	27,4	4,3	2,4	0,2	96,7
Unclassified	8,8	17,9	1,6	0,5	21,5	16,9	1,2	6,6	10,2	85,2

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	32,6	10,3	9,4	3,0	33,3	5,1	3,6	2,7	100,0

Normalised average contents of the valuable Ti-containing minerals:				
Average content	Category			
	Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	59,5	77,3	96,9	42,7
Fe_2O_3 wt%	34,1	14,8	0,9	45,3
MnO wt%	2,0	0,8	0,1	1,2
Cr_2O_3 wt%	0,2	0,2	0,2	0,1
SiO_2 wt%	2,1	4,4	0,8	6,2
Al_2O_3 wt%	1,0	1,6	0,4	1,1
MgO wt%	0,7	0,4	0,1	2,2
CaO wt%	0,1	0,3	0,1	0,2
ZrO_2 wt%	0,3	0,3	0,4	1,0
Total	100,0	100,0	100,0	100,0

Average TiO_2 content of all the TiO_2 minerals:	68,3
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	62,4
Valuable heavy minerals in raw sand:	15,81

Weight percent on a mineral basis:		
Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	12,3	5,1
Leucoxene	3,9	1,6
Rutile	3,6	1,5
Ti magnetite	1,1	0,5
Magnetite	1,0	0,4
Chromite	0,1	0,1
Pyrite	0,0	0,0
Phosphate	0,0	0,0
Monazite	0,0	0,0
Y-phosphate	0,0	0,0
Sphene	0,0	0,0
Garnet	12,6	5,3
Kya/Sill	1,4	0,6
Staurolite	1,0	0,4
Zircon	1,9	0,8
Silicate	59,6	83,1
Unclassified	1,4	0,6
Total	100,0	100,0

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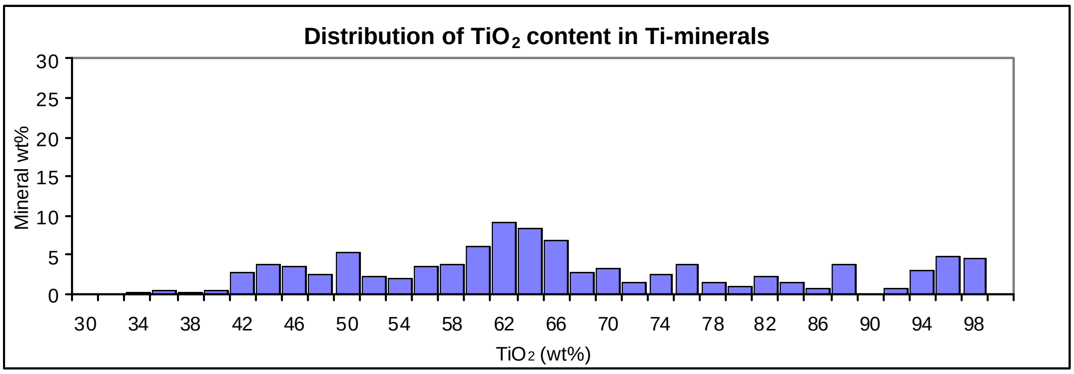
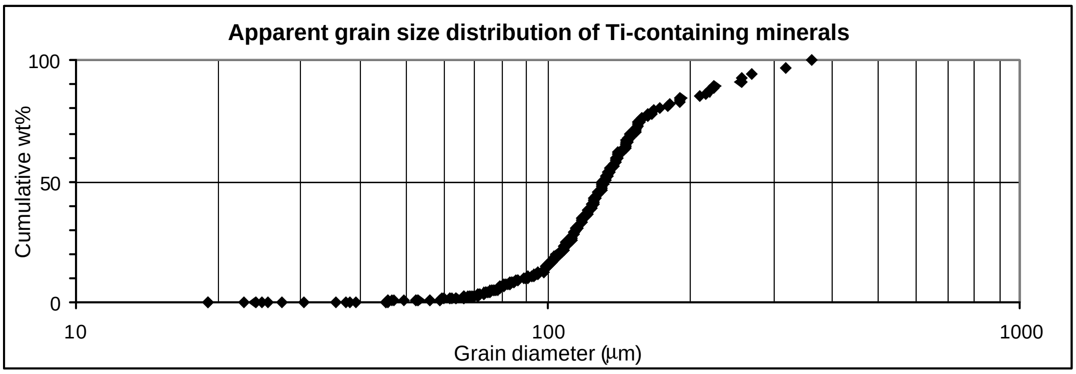
Lab. Name:	2000288	Analyzed by:	BV
Submitter:	DuPont/GEUS	Acc. Voltage	17kV
Date:	16-10-2002		





Category	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm^2)	Total grains
	Average grain parameters					
Ilmenite	1,6	1,7	453	168	10925	185
Leucoxene	1,6	1,7	545	203	16424	39
Rutile	1,5	1,7	424	158	9584	55
Ti magnetite	1,5	1,7	400	148	7702	23
Magnetite	1,5	2,5	1471	624	73904	2
Chromite	1,4	1,5	448	157	10771	2
Pyrite	0,0	0,0	0	0	0	0
Phosphate	0,0	0,0	0	0	0	0
Monazite	0,0	0,0	0	0	0	0
Y-phosphate	1,2	1,3	182	55	1984	1
Sphene	0,0	0,0	0	0	0	0
Garnet	1,5	2,1	759	311	27340	85
Kya/Sill	2,4	2,3	1112	460	44424	7
Staurolite	1,5	2,2	606	254	16374	12
Zircon	1,4	1,5	350	119	7072	43
Silicate	1,5	1,9	897	353	41017	405
Unclassified	1,3	1,7	428	175	12519	31

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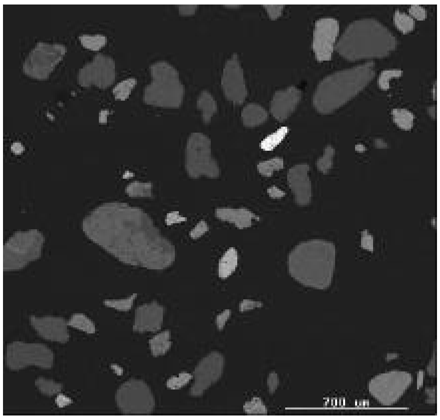


Sample Name:	KI-16	No. of frames analysed:	37
Lab. Name:	2000291	No. of particles analysed:	849
Date:	17-10-2002	Heavy minerals in raw sand (%):	32,39
Submitter:	DuPont/GEUS	Comments:	
Country:	King Island/Tasmania		
Analyzed by:	BV		
Acc. Voltage/Magnification:	17kV/40x		
Guard region:	450 µm		
Sieve:	100 µm²		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	58,5	33,7	2,1	0,1	1,6	0,8	0,6	0,1	0,3	97,9
Leucoxene	77,2	16,2	0,9	0,1	1,5	1,3	0,3	0,3	0,4	98,1
Rutile	94,9	1,2	0,1	0,1	0,8	0,5	0,1	0,1	0,3	98,1
Ti magnetite	42,5	43,9	2,0	0,1	3,4	0,6	1,8	0,2	2,4	96,8
Magnetite	0,4	81,9	0,2	0,3	6,0	7,5	1,1	0,0	0,3	97,8
Chromite	2,2	23,6	0,6	54,2	0,4	8,3	7,7	0,1	0,4	97,6
Pyrite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Monazite	0,0	0,3	0,0	0,0	1,9	0,0	0,2	2,7	3,7	8,8
Y-phosphate	0,0	0,6	0,0	0,0	4,1	0,0	0,0	2,6	6,3	13,6
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	0,5	21,1	3,2	0,2	38,9	18,8	1,9	13,4	0,3	98,2
Kya/Sill	0,0	0,3	0,5	0,1	42,4	53,7	0,0	0,0	0,3	97,5
Staurolite	0,7	16,5	0,2	0,2	31,3	47,9	1,2	0,1	0,2	98,2
Zircon	0,3	0,4	0,2	0,2	29,5	0,0	0,1	0,1	64,7	95,4
Silicate	0,7	8,6	0,2	0,1	58,3	22,3	4,1	2,2	0,2	96,8
Unclassified	12,3	9,1	0,5	0,4	38,3	10,4	1,3	11,4	7,3	90,9

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	37,6	9,2	13,0	2,8	23,9	7,9	1,2	4,2	100,0

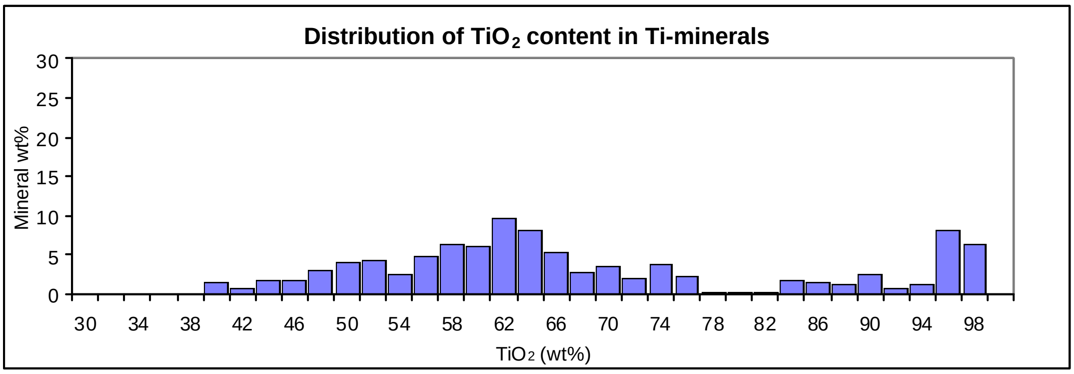
Normalised average contents of the valuable Ti-containing minerals:				
Average content	Category			
	Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	59,8	78,6	96,8	43,9
Fe_2O_3 wt%	34,4	16,5	1,2	45,3
MnO wt%	2,1	0,9	0,1	2,0
Cr_2O_3 wt%	0,1	0,1	0,1	0,1
SiO_2 wt%	1,6	1,5	0,8	3,5
Al_2O_3 wt%	0,8	1,4	0,5	0,6
MgO wt%	0,6	0,3	0,1	1,9
CaO wt%	0,1	0,3	0,1	0,2
ZrO_2 wt%	0,3	0,4	0,3	2,5
Total	100,0	100,0	100,0	100,0

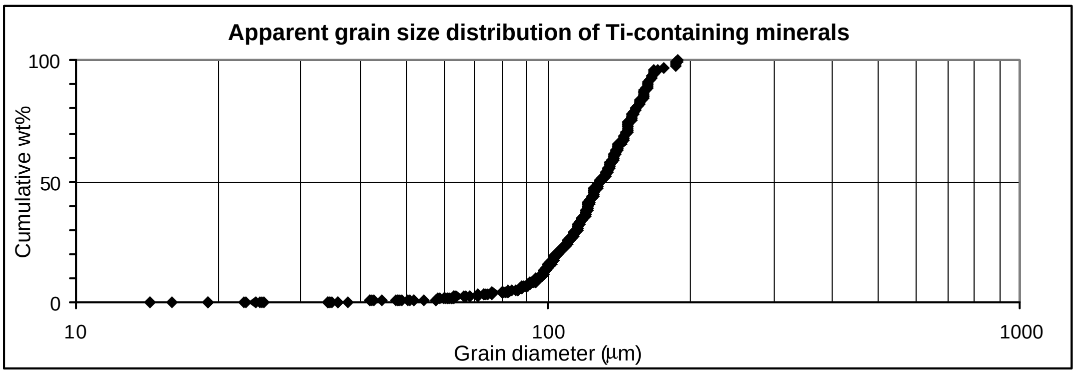
Average TiO_2 content of all the TiO_2 minerals:	69,6
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	62,4
Valuable heavy minerals in raw sand:	15,55

Weight percent on a mineral basis:		
Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	18,1	5,9
Leucoxene	4,4	1,4
Rutile	6,3	2,0
Ti magnetite	1,3	0,4
Magnetite	0,7	0,2
Chromite	0,6	0,2
Pyrite	0,0	0,0
Phosphate	0,0	0,0
Monazite	0,3	0,1
Y-phosphate	0,1	0,0
Sphene	0,0	0,0
Garnet	11,5	3,7
Kya/Sill	0,6	0,2
Staurolite	2,0	0,7
Zircon	3,8	1,2
Silicate	47,5	83,0
Unclassified	2,8	0,9
Total	100,0	100,0

Geological Survey of Denmark and Greenland
Øster Voldgade 10, DK-1350 Copenhagen K
Ph.: +45 38142000, Fax: +45 38142050

Lab. Name:	2000291	Analyzed by:	BV
Submitter:	DuPont/GEUS	Acc. Voltage	17kV
Date:	17-10-2002		





Average grain parameters							
Category	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm^2)	Total grains
Ilmenite	1,5	1,6	421	154	9610	239
Leucoxene	1,5	1,7	533	198	14083	40
Rutile	1,5	1,7	471	178	10856	66
Ti magnetite	1,4	1,7	437	165	9425	17
Magnetite	1,9	1,8	676	246	25438	3
Chromite	1,3	1,5	321	111	5981	11
Pyrite	0,0	0,0	0	0	0	0
Phosphate	0,0	0,0	0	0	0	0
Monazite	2,6	1,7	444	165	9423	4
Y-phosphate	1,5	1,4	375	118	8196	1
Sphene	0,0	0,0	0	0	0	0
Garnet	1,6	2,0	702	284	26072	63
Kya/Sill	1,3	1,6	559	211	20903	5
Staurolite	1,4	2,0	653	262	18019	17
Zircon	1,5	1,5	361	126	7224	65
Silicate	1,5	1,9	808	319	33928	302
Unclassified	1,8	2,2	951	401	37682	16

GEUS

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Sample Name:	KI-19	No. of frames analysed:	64
Lab. Name:	2000294	No. of particles analysed:	1069
Date:	16-10-2002	Heavy minerals in raw sand (%):	50,03
Submitter:	DuPont/GEUS		
Country:	King Island/Tasmania	Comments:	
Analyzed by:	BV		
Acc. Voltage/Magnification: 17kV/50x			
Guard region:	300 µm		
Sieve:	100 µm²		

	Average content									
Category	TiO_2 wt%	Fe_2O_3 wt%	MnO wt%	Cr_2O_3 wt%	SiO_2 wt%	Al_2O_3 wt%	MgO wt%	CaO wt%	ZrO_2 wt%	Total
Ilmenite	58,8	34,4	2,1	0,1	0,9	0,7	0,7	0,1	0,3	98,1
Leucoxene	75,0	16,3	1,1	0,3	1,3	1,5	0,3	0,3	1,1	97,2
Rutile	95,7	0,9	0,1	0,2	0,5	0,3	0,1	0,1	0,4	98,2
Ti magnetite	43,1	47,1	1,5	0,1	2,7	1,0	1,9	0,2	0,4	98,1
Magnetite	0,3	74,6	0,5	0,2	4,7	15,0	0,9	0,3	0,4	96,9
Chromite	0,5	21,8	0,7	54,0	0,4	11,8	9,2	0,1	0,2	98,6
Pyrite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Phosphate	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Monazite	0,0	5,7	0,0	0,0	2,0	0,3	0,3	0,7	1,4	10,4
Y-phosphate	0,0	0,0	0,0	0,0	0,0	0,6	0,0	0,2	5,3	6,1
Sphene	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Garnet	0,3	28,1	8,1	0,1	37,4	18,5	1,2	4,1	0,2	98,0
Kya/Sill	0,1	0,3	0,3	0,1	42,5	54,1	0,0	0,0	0,1	97,6
Staurolite	0,8	15,9	0,2	0,1	31,2	48,7	1,3	0,1	0,3	98,5
Zircon	0,2	0,4	0,2	0,2	29,5	0,0	0,1	0,1	64,9	95,5
Silicate	1,4	8,2	0,2	0,2	55,8	24,2	3,7	3,0	0,3	97,0
Unclassified	9,4	14,8	1,2	1,9	13,7	22,3	4,5	0,3	19,1	87,3

Valuable heavy minerals									
Category	Ilmenite	Leucoxene	Rutile	Ti magnetite	Garnet	Zircon	Kya/Sill	Staurolite	Total
wt %	34,1	6,2	16,9	2,5	19,0	15,0	0,0	6,3	100,0

Normalised average contents of the valuable Ti-containing minerals:

Average content	Category: Ilmenite	Leucoxene	Rutile	Ti magnetite
TiO_2 wt%	60,0	77,2	97,5	44,0
Fe_2O_3 wt%	35,0	16,8	0,9	48,0
MnO wt%	2,1	1,2	0,1	1,6
Cr_2O_3 wt%	0,1	0,3	0,2	0,1
SiO_2 wt%	0,9	1,3	0,5	2,7
Al_2O_3 wt%	0,7	1,6	0,3	1,0
MgO wt%	0,7	0,3	0,1	2,0
CaO wt%	0,2	0,3	0,1	0,2
ZrO_2 wt%	0,3	1,1	0,4	0,4
Total	100,0	100,0	100,0	100,0

Average TiO_2 content of all the TiO_2 minerals:	71,7
Average TiO_2 content of all the TiO_2 minerals excl. rutile:	61,5
Valuable heavy minerals in raw sand:	39,10

Weight percent on a mineral basis:

Category	Heavy mineral concentrate wt %	Raw sand wt %
Ilmenite	26,7	13,4
Leucoxene	4,8	2,4
Rutile	13,2	6,6
Ti magnetite	1,9	1,0
Magnetite	0,8	0,4
Chromite	0,9	0,4
Pyrite	0,0	0,0
Phosphate	0,0	0,0
Monazite	0,0	0,0
Y-phosphate	0,0	0,0
Sphene	0,0	0,0
Garnet	14,8	7,4
Kya/Sill	0,0	0,0
Staurolite	4,9	2,5
Zircon	11,7	5,8
Silicate	18,2	59,1
Unclassified	1,9	1,0
Total	100,0	100,0

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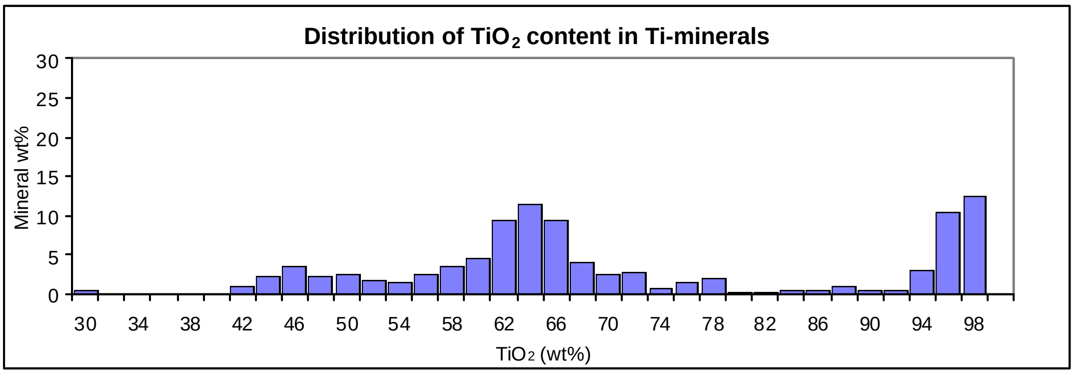
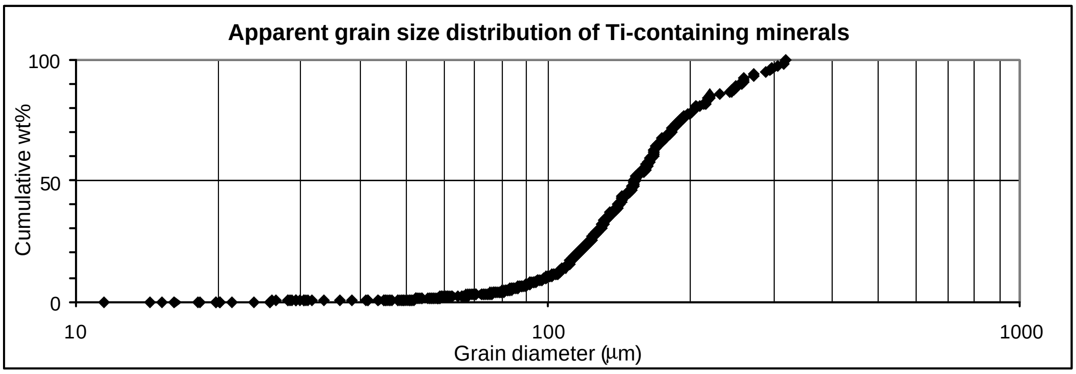
Date:	16-10-2002		





	Average grain parameters					
Category	Aspect ratio	Circularity	Perimeter (µm)	Length (µm)	Area (µm²)	Total grains
Ilmenite	1,5	1,7	473	176	12784	345
Leucoxene	1,5	1,8	596	227	18511	43
Rutile	1,6	1,8	512	193	13578	145
Ti magnetite	1,5	1,9	426	164	8804	34
Magnetite	1,5	1,9	564	219	16333	7
Chromite	1,4	1,6	414	154	9170	14
Pyrite	0,0	0,0	0	0	0	0
Phosphate	0,0	0,0	0	0	0	0
Monazite	1,2	1,3	137	38	1184	2
Y-phosphate	1,1	1,9	276	109	3152	1
Sphene	0,0	0,0	0	0	0	0
Garnet	1,4	2,1	692	282	23385	118
Kya/Sill	1,6	1,3	100	37	641	5
Staurolite	1,6	2,2	859	358	31210	31
Zircon	1,4	1,6	483	175	12805	146
Silicate	1,4	2,0	789	317	33815	151
Unclassified	1,5	2,1	658	280	19664	27