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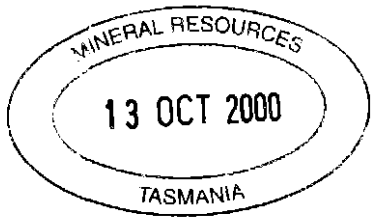

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Annual Report for Year Ending 4/10/2000 - EL's 22/1995, 18/1997 & 4/1999 - Sea Elephant Bay Project
Tasmanian Titanium Proprietary Limited*
Morrison, K.C. EL18/1997; EL22/1995

Tasmanian Titanium Pty. Ltd.

ELs 22/95, 18/97 & 4/99
Sea Elephant Bay Project

Annual Report for year ending 4/10/00

Ken Morrison
Consulting Geologist
4 October, 2000

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INTRODUCTION AND TENEMENT INFORMATION

This report reviews previous mineral sand exploration in Sea Elephant Bay, offshore from the known Naracoopa-Cowper Point deposits on the east coast of King Island (Figure 1).

Tasmanian Titanium Pty Ltd holds adjoining offshore Exploration Licences 22/95, 18/97 and 4/99 in Sea Elephant Bay and in recognition of the logic in conducting a single exploration program in Sea Elephant Bay, Mineral Resources Tasmania agreed to the Company's request that a joint reporting facility be applied to the project, with a combined EL Annual Report due on 4 October each year.

The three licences are now owned 100% by Tasmanian Titanium Pty Ltd but they have had a varied history. EL 22/95 (18 km^2) and EL 18/97 (47 km^2) were both granted to Australian Titanium Minerals Ltd, on the 4 October 1996 and 30 January 1998 respectively. EL 4/99 (3 km^2 in two parts) was granted to Lloyd Foyster on 23 July 1999. A restructuring of the ownership of all assets relating to the Naracoopa mineral sand project was necessary in 1999 and by January 2000, the project was reactivated by the newly formed private company, Tasmanian Titanium Pty Ltd. By 14 February 2000 all onshore and offshore tenements and applications were transferred across to Tasmanian Titanium and a new phase of exploration and mine feasibility work began on both the onshore project, based on the area around the identified Naracoopa resources, and the offshore greenfields exploration project in Sea Elephant Bay.

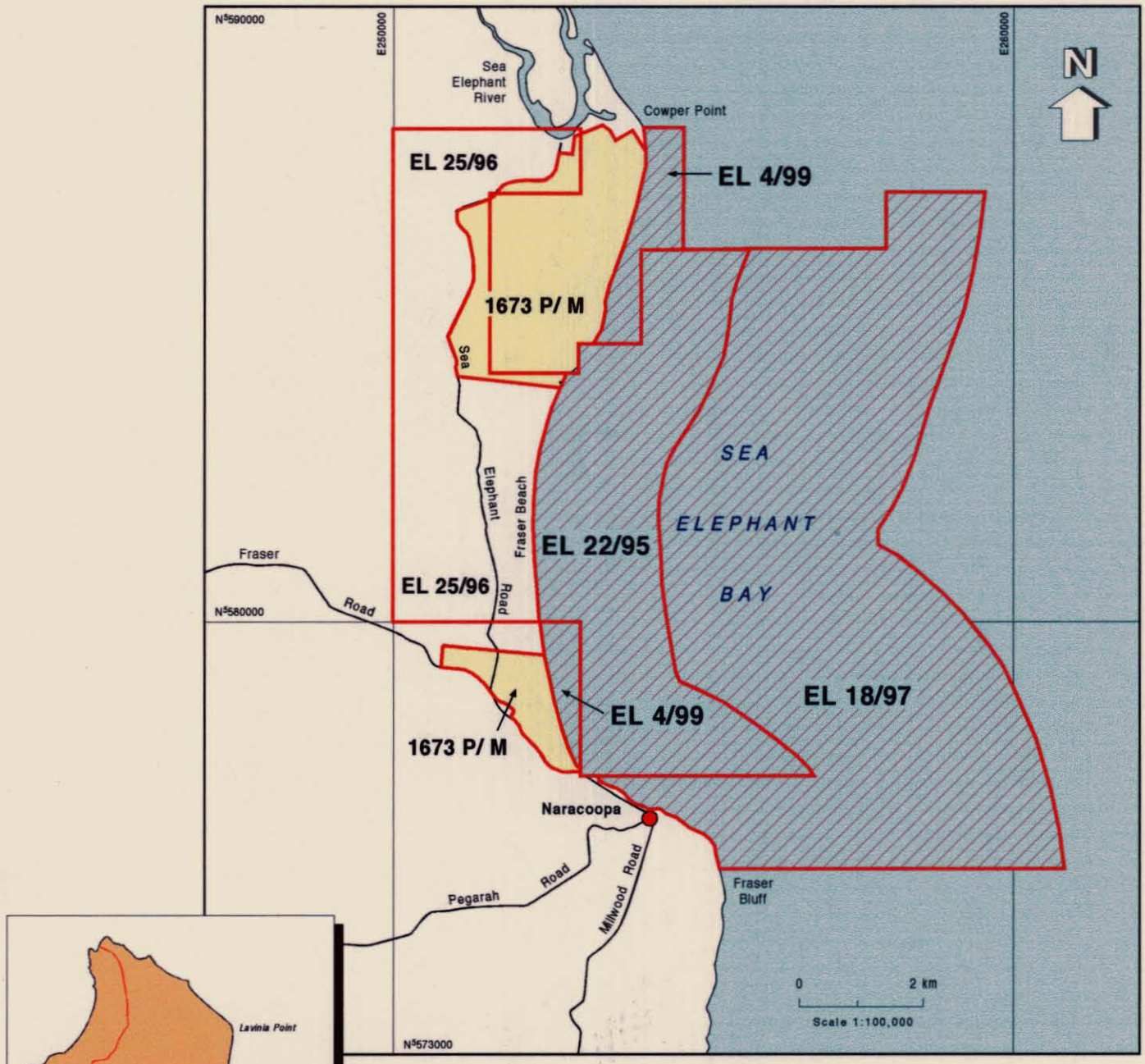
This report is the first combined EL report for the offshore tenements and includes some work done on the project prior to the corporate restructuring, which has not previously been submitted to Mineral Resources Tasmania for performance review on either the existing ELs or their predecessors; ELs 25/92 and 3/93, which were applied for by Australian Zircon Pty Ltd.

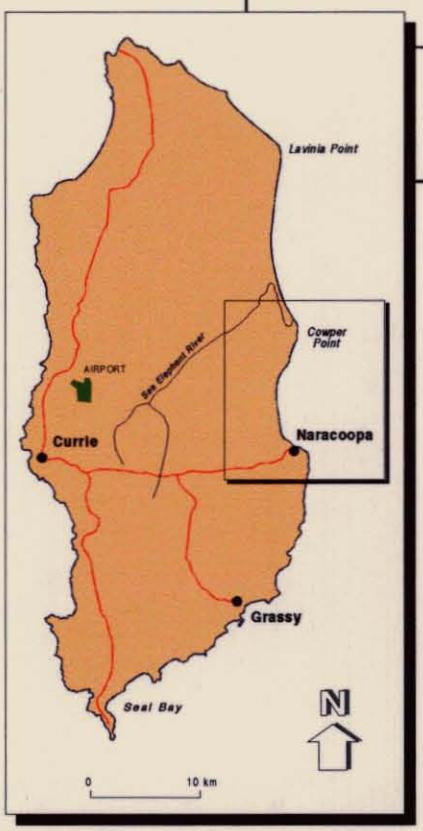
EXPLORATION AIMS

Quaternary marine transgression and regression phases, related to interglacial and glacial stages respectively, will have either preserved by burial or dispersed into younger marine sediments any beach strand mineral deposits which may have formed in the area now covered by Sea Elephant Bay.

The ages of the onshore strand and dune deposits of heavy mineral have not yet been established but there is evidence from recent work (Baker and Haworth, 2000 a & b) that sea level peaked at ~ 6000 years BP along much of the East Australian coast and that on the east coast of King Island sea level has fallen 0.5 metres in the past 2200 years (R. Haworth, pers comm, not yet published). If so the surficial offshore sands may be locally mineralised by wave, tidal and long shore current action reworking mineral derived from pre-existing onshore deposits, dispersed by transgressions since the last ice age. Such processes relate essentially to Holocene and present day geomorphology.

The aim of this project is to explore for both buried strand systems and surficial marine deposits using a combination of geophysics, sea bed sampling and drilling. The first





5 cm

Figure 1

TASMANIAN TITANIUM PTY. LTD.
EL's 22/95, 18/97 & 4/99 - Sea Elephant Bay
Location Map

Compiled: K.C.Morrison	Drawn: R.Carroll	Date: October 2000

step is to review all previous work, most of which has been of a reconnaissance nature but not yet fully analysed, as an adjunct to the more intensive onshore exploration and mine development activities currently being undertaken by the Company.

REVIEW OF PREVIOUS EXPLORATION

Records of placer mining and exploration in the Naracoopa area date back to 1905 when the British Flag Prospecting and Mining Syndicate NL separated approximately 5 tonnes of cassiterite and 1.5 oz gold from heavy mineral beach sands immediately north of the mouth of the Fraser River (Neale and Salway, 1975). Intermittent small scale tin mining and prospecting continued near the mouth of Fraser River until the first systematic rutile/zircon exploration drilling was conducted in 1952 by Mt Isa Mines, at Cowper Point (Neale and Salway, 1975).

Onshore exploration in the area lead to the commencement in 1969 of a dragline and truck mining operation and a full wet and dry rutile/zircon plant at Naracoopa. The operation ceased in 1977, after producing approximately 20,000 tonnes rutile and 23,000 tonnes zircon (Mineral Resources Tasmania figures in Dove and Lee, 1989).

Throughout that period, and through to the present, it has been apparent that conceptually the sediments beneath Sea Elephant Bay have at least as much potential as the onshore sands and several reconnaissance and regional scale marine science and sampling surveys have been conducted offshore since the mid 1960s.

1965-67 Ocean Mining AG

In 1965 Ocean Mining AG, a subsidiary of the USA offshore engineering and mining company, Ocean Science and Engineering Inc, acquired several large exploration tenements around offshore eastern Australia to explore for placer gold and tin and sea floor phosphate nodules.

During 1966 they completed a data acquisition program around King Island, comprising 267 line nautical miles of *Sparker* seismic reflection data, 310 nautical miles of sounding bathymetry and 28 shallow sub sea drill holes (Ocean Mining AG, 1965, 1966, 1967, - TCR 81-1617, -1618, -1619). Data within the area of the current Sea Elephant Bay project are shown on Plans 1-4.

In contrast to the general thin blanket of surficial sediment with patchy sea floor basement outcrop (Plan 2) there are underlying substantial, thicker sediment bodies with channel- and bar-like morphologies, as shown by the Total Sediment Isopach Map (Plan 3).

Eleven holes were drilled in or close to the current project area. Plan 4 shows that they are evenly spread across the area, achieved a maximum depth of 6.1 metres and a maximum heavy mineral content of only 0.9%.

1976 Amdex Mining Ltd

Amdex Mining was a subsidiary company of the joint venture operation at the

Naracoopa Mine, operated by Kibuka Mines Pty Ltd during the 1970s. A program of shallow drilling to test sub sea surficial sand immediately offshore from the mine was undertaken in 1976. Only a map showing the locations, depth and total heavy mineral grades of the 25 drill holes has been located in the MRT library (Neale, 1976 – TCR 76-1156). These results are also incorporated on to Plan 4 which shows a cluster of high grade results in the SW of the Amdex survey area.

No evidence has been found as to whether the shallow depths sampled (maximum depth 1.0 metres) were due to the drilling/sampling method or the presence of a hard horizon at shallow depth.

1992 Australian Zircon Pty Ltd

The company set out to reproduce, expand the area of and extend the depth penetration of the 1976 Amdex sampling. The program employed divers to operate manual sample pumps on the sea floor. The technique proved difficult and maximum penetration of 2 metres was achieved. Many sites in Sea Elephant Bay were tested in mid 1992 as sea conditions permitted, and the mineral content qualitatively examined. Five samples from sites with visually determined high grade heavy mineral (5A, 6A, 8, 10A, 11A, Appendix 1) were processed by Mineral Deposits Ltd. Only a letter from the laboratory, with the total heavy mineral assays for the five samples, has been located and these are reproduced on Plan 4.

1992 Coastal and Marine Geosciences

The consultants were employed by Australian Zircon in late 1992 primarily to test the depth capacity of a vibrocore drilling tool. The Coastal and Marine Geosciences Report (Appendix 1) confirms that a thin veneer of heavy mineral-enriched surficial sand exists at the southern end of Sea Elephant Bay, directly offshore from the abandoned Kibuka minesite. They suggest that on the basis of the sample and field observations, grade decreases seaward from about the 15 metre isobath.

The unconsolidated surficial sand layer, which the vibrocore tool was able to penetrate, was < 1 m in all 14 holes drilled (Appendix 1). No samples were assayed and the light weight aluminium tube tool proved inadequate for deeper sampling.

1997 AS James Pty Ltd

A 75 mm diameter rotary (with water) drill hole was completed from Naracoopa Jetty in February 1997, as part of the marine science component of a geotechnical investigation of the jetty area by Stephenson EMF Consultants.

The drill hole (BH-1) was terminated at 20.0 metres below sea floor and is the deepest hole to date in the project area.

The report and drill logs (Appendix 3) indicate major contacts at 2.4 and 11.8 metres, with silty sand and minor gravel down to 2.4 metres, a better sorted but more indurated sand from 2.4 to 11.8 metres, and stiff hard clay below 11.8 metres.

The drilling log and Standard Penetration Test data suggest an abrupt increase in

hardness at 8.5 metres, within a sand unit (?coffee rock) and change from hard sand to a softer clay-dominant sediment at 11.8 metres. The 11.8 metre contact is considered weathered basement by the author (although the logged descriptions appear dissimilar to the rocks outcropping on the shore).

1997 Mapping and Hydrographic Surveys Pty Ltd

A hydrographic survey comprising echo sounder bathymetry and a *Boomer* seismic survey were conducted at the southern end of Sea Elephant Bay in February 1997 (Report in Appendix 4).

Interpretation of the seismic data indicated a shallow sub planar reflector (R1) and a deeper steeply dipping reflector (R2). R2 was only visible near shore, as the seismic energy penetration achieved only 15 milliseconds two way time (estimated at 10-12 metres on the basis of a typical East Australian shallow marine velocity of 1.7 km/sec).

The R1 reflection probably correlates with the 2.4 metres below sea floor sediment boundary in BH-1 (drilled from Naracoopa Jetty, see Appendix 3), although just offshore from BH-1, R1 depths are picked at between 0-5 and 2.0 metres below sea floor.

The source of the steeply dipping R2 reflector is unclear. It could correspond to the top of the stiff clay unit reported at 11.8 metres in BH-1, but its steep dip and mapped form (Figure 4 in Appendix 4) suggest a seaward-dipping channel edge or a dipping bedrock surface on the sea ward side of a gutter into which BH-1 was drilled.

1997 Peter Stitt and Associates Pty Ltd

Australian Titanium Minerals Ltd engaged Stitt and Associates to conduct a survey-controlled reconnaissance sea floor sampling program in August 1997. Sixteen pump samples, three manual (sludge pump) drill holes and two grab samples were taken by divers along three ENE-WSW trending lines (Appendix 2, Plan 4). Sample sites were tied to the line survey by GPS and sample processing comprised; heavy liquid separation, magnetic fractionation and microscopic grain counting.

As with the previous surveys, sampling was restricted to the surface 2 metres and the report (Appendix 2) makes the point that any deeper, thick sand bodies which may exist, have not been sampled.

INTERPRETATION

Three categories of data useful for a comprehensive exploration program have been acquired by previous company exploration and marine surveys; bathymetry, seismic-derived sediment thickness and several generations of shallow sea floor drilling and sampling for mineralisation.

a) Bathymetry

Plan 1 shows that the water depth contours in Sea Elephant Bay essentially parallel the

coast out to a maximum depth of 25 metres near the eastern boundary of EL 18/97. Depth increases at a rate of about 7 m/km for the first 2 km offshore, then decreases to a rate of 2 m/km over the outer 5 km of the project area.

b) Sediment Thickness

Two seismic horizons were recognised by both the Ocean Mining and Mapping and Hydrographic Surveys work, indicating two distinct layers of sediment overlying either hard rock basement or an extensive induration layer. Proterozoic metasedimentary rocks outcrop along the shore SE of Fraser Beach but onshore exploration drilling in the northern (Cowper Point) area shows ?Devonian granodiorite and Tertiary sandy limestone basement in that area. It is also recognised from the onshore work that diagenetic humic and ferriginous cements can heavily lithify previously unconsolidated porous and permeable sands (coffee rock) to the extent that seismic velocity boundaries may occur within the sediments overlying basement. Again the onshore experience to date has been that some ore grade mineralisation may well be sterilised from practical mining availability due to diagenetic induration. Therefore the seismic stratigraphy is potentially more useful for exploration planning than the actual Cainozoic lithostratigraphy. The big limitation at present with the seismic data is the lack of drill hole depth control.

Plan 3 shows a total sediment thickness of about 8 metres at the position of the 1997 drill hole (BH-1) on Naracoopa Jetty, which could correlate with the 8.5 metre increase in hardness within the lower sand unit. This flags the possibility that the R2 reflector in the 1997 survey was due to intra sand induration rather than bedrock basement. Only drilling to basement in several locations can properly tie the seismic and litho stratigraphies.

A comparison of the sediment thicknesses on Plans 2 and 3 shows that the deeper sediment layer controls the morphology of the sub sea sediment and the surface layer of relatively less consolidated sediment is patchy, with a maximum thickness of 6 metres but non existent in several patches. Bedrock is apparently exposed on the sea floor in several places.

The prominent arcuate, linear belt of thick sediment in the south of Sea Elephant Bay (Plan 3) is suggestive of a buried sediment-filled channel, partly eroded and covered by a Holocene marine transgression. This feature could represent a higher energy ancestor of Fraser River, indicating a Quaternary shore position some 2 km further east than at present. Likewise the smaller lobes of thick sediment in the north of the project area could correlate with ancestors Sea Elephant River and Blowhole Creek. The large N-S trending sediment body into which the two northern lobes feed has the form of a barrier bar which may have migrated westward during transgression.

c) Mineralisation

Plan 4 shows that an offshore area of approximately 60 hectares envelopes 19 Amdex Mining holes which returned a mean heavy mineral grade of 5.3% to a depth of 0.75 m. The results suggest that the high grades are open at depth but are deteriorating both to the NE (further offshore) and up and down the coast from the 1100 metres long zone of high grades.

The three Stitt and Associates drill holes which returned the highest heavy mineral grades in that survey and the five Australian Zircon holes also fall in the same cluster of high grade sample points, which straddle the boundary between ELs 22/95 and 4/99 (Plan 4).

The heavy mineral fraction of a composite concentrate from the three Stitt and Associates drill holes comprised 16.7% rutile + zircon + leucoxene, suggesting that the surficial offshore mineral is derived mainly from eroded primary onshore deposits rather than mine tailings, which would be relatively depleted in ore minerals.

The patchy coverage of sample points elsewhere in the project area encountered no encouraging mineralisation and all sampling to date has been confined to the surficial sediment layer.

EXPENDITURE

Exploration in Sea Elephant Bay has been conducted since 1992 by Tasmanian Titanium Pty Ltd and related precursor companies; Australian Titanium Minerals Ltd and Australian Zircon Pty Ltd. Due to a complicated history of company restructuring, legal matters and inadequate tenement management by the latter companies, some reports on work completed and declarations of expenditures incurred have not been submitted to Mineral Resources Tasmania, as required under the normal quarterly and annual reporting procedures.

Tasmanian Titanium aims to sort through the history of exploration in Sea Elephant Bay and update the lodgment of outstanding technical reports and expenditure declarations, to enable progress with a sensible offshore program.

The present situation is that expenditure for the 1997 sea floor sampling program, conducted by Peter Stitt and Associates for $31,700, was declared at the time (against EL 22/95) but the report on this work has not previously been submitted to MRT. The consultants report is attached herein as Appendix 2.

A summary of the other outstanding offshore exploration and marine science projects and their costs is tabulated below.

Project	*Reference Report*	*Cost*
Australian Zircon – pump sampling	Appendix 1	$11,700.00
Coastal & Marine Geosciences – vibrocore sampling	Appendix 1	$15,200.00
AS James – rotary drilling	Appendix 3	$8,740.00
Mapping & Hydrographic Surveys – seismic, bathymetry surveys	Appendix 4	$12,459.00
		$48,099.00

On the basis that the current offshore tenements are combined into a single exploration program, the above expenditure has been allocated to the ELs on an area basis, as follows:-

EL 22/95	18 km^2	26.5%	$12,746.00
EL 18/97	47 km^2	69.1%	$33,236.00
EL 4/99	3 km^2	4.4%	$2,117.00
			$48,099.00

It is intended to continue allocating offshore exploration expenditure according to the above proportions.

CONCLUSIONS & FUTURE WORK

- The water depth, sea floor form and distribution of sub sea unconsolidated and semi consolidated sediments is sufficiently well indicated from previous work to enable direct exploration to proceed, without the need for more hydrographic data.

- The coverage and reliability of results from previous shallow drilling and other sea floor sampling is not yet adequate for reconnaissance level screening over all the project area, given especially that most sampling to date is confined to the upper 2 metres of sub sea sediment.

- Despite the shortcomings above, there is convincing evidence that an area of some 60 hectares, offshore from the southern end of Fraser Beach, contains surficial enrichment of total heavy mineral averaging approximately 5% and containing a high grade content of rutile/zircon/leucoxene which appears not to have been diluted by mine tailings. The thickness of this mineralisation has not yet been demonstrated but the high grade area is closed on all sides.

- The next phases of exploration should include trial boat-borne magnetics and radiometric surveys and the demonstration of a reliable, cost effective offshore drilling method with depth capacity to basement.

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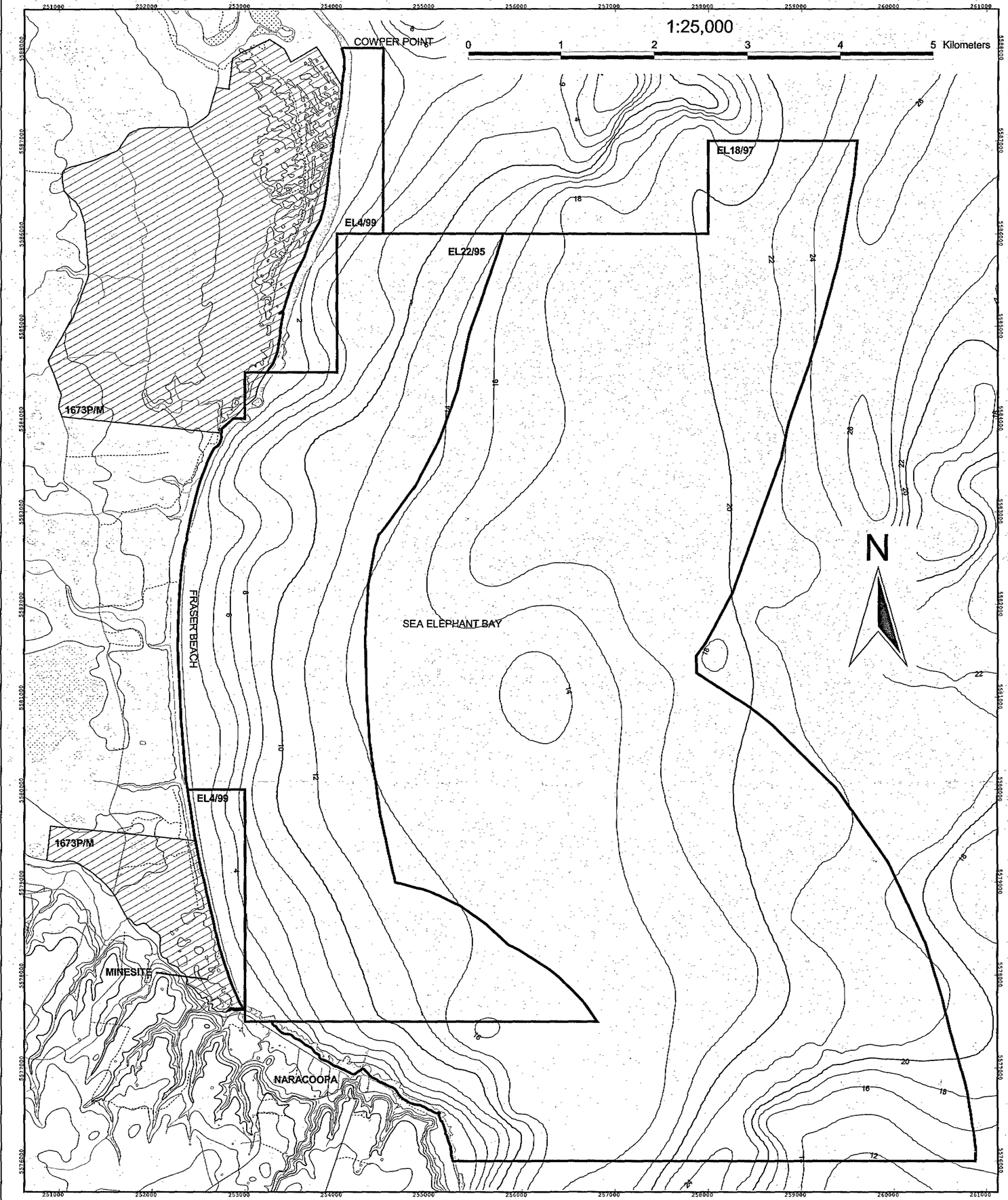
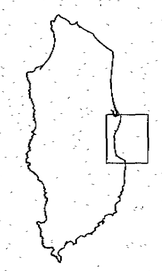


Bathymetry contours derived by rectifying, gridding and re-contouring the Bathymetry of King Island map compiled in 1966 by Ocean Mining A.G. from spot soundings and Admiralty Chart No. 404.

Contour Interval: 2 metres



King Island, Tasmania

Projection: UTM Zone 55
Datum: AGD66

Contour Interval: 10 metres

Topographic and hydrographic maps from Department of Environment and Land Management, Tasmania

Exploration Licence and Mining Lease maps from Mineral Resources Tasmania

Tasmanian Titanium Pty Ltd

ELs 22/95, 18/97 & 4/99 - Sea Elephant Bay

5 cm

Plan 1

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BATHYMETRY

Annual Report for Year Ending 4/10/2000 - EL's 22/1995, 18/1997 & 4/1999 - Sea Elephant Bay Project
Tasmanian Titanium Proprietary Limited*
Morrison, K.C. EL18/1997; EL22/1995

GIS by Volcanex International Pty Ltd | October 2000 | Compiled by K.C. Morrison Pty Ltd

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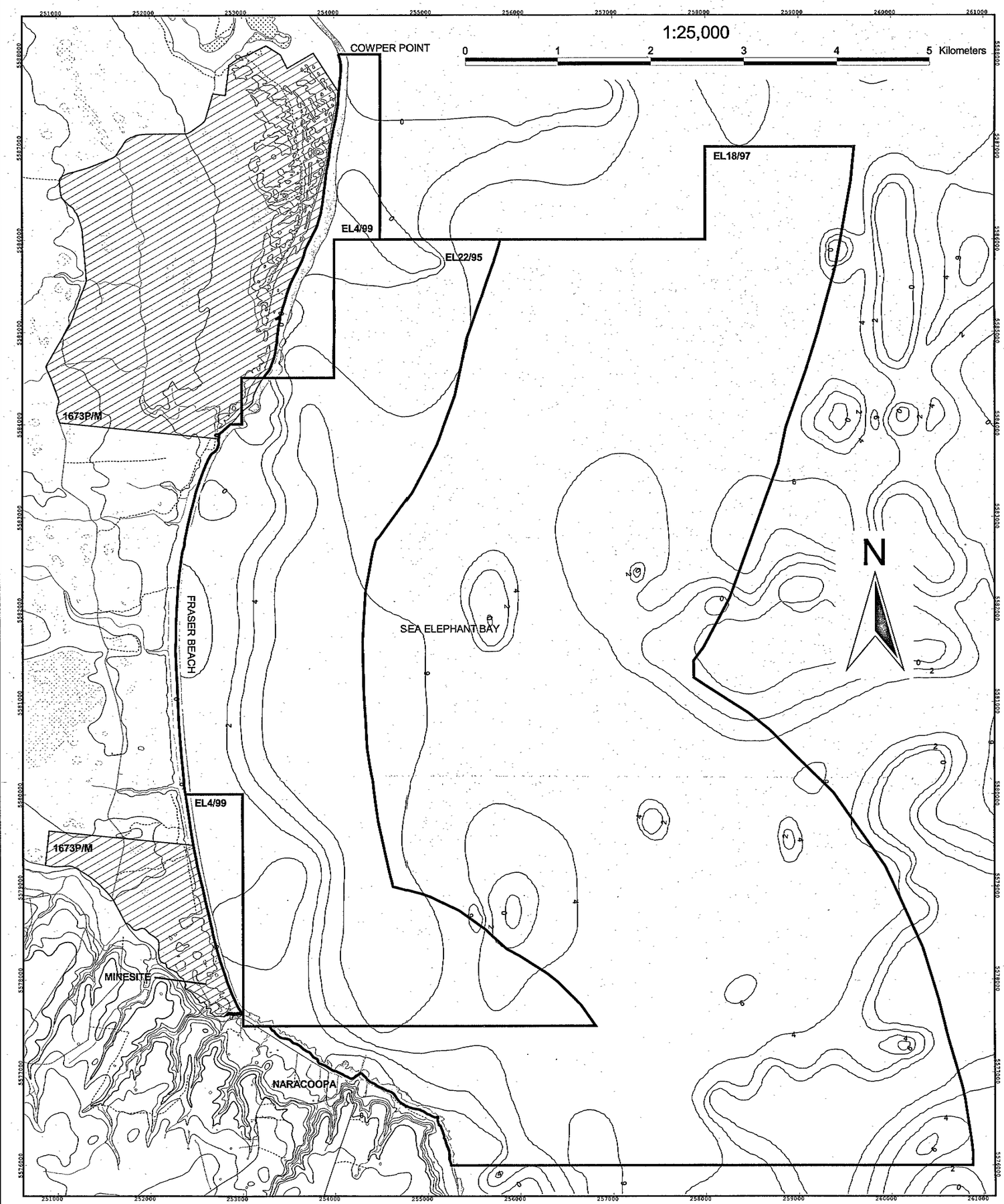
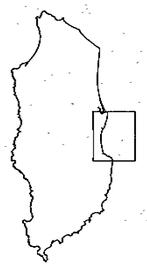


Surficial sediment isopachs derived by rectifying, gridding and re-contouring maps compiled in 1966 by Ocean Mining A.G. from marine seismic surveys.

Contour Interval: 2 metres



King Island, Tasmania

Projection: UTM Zone 55
Datum: AGD66

Contour Interval: 10 metres

Topographic and hydrographic maps from Department of Environment and Land Management, Tasmania

Exploration Licence and Mining Lease maps from Mineral Resources Tasmania

679013

Tasmanian Titanium Pty Ltd

ELs 22/95, 18/97 & 4/99 - Sea Elephant Ba

6 cm

Plan 2

SURFICIAL SEDIMENT ISOPACHS

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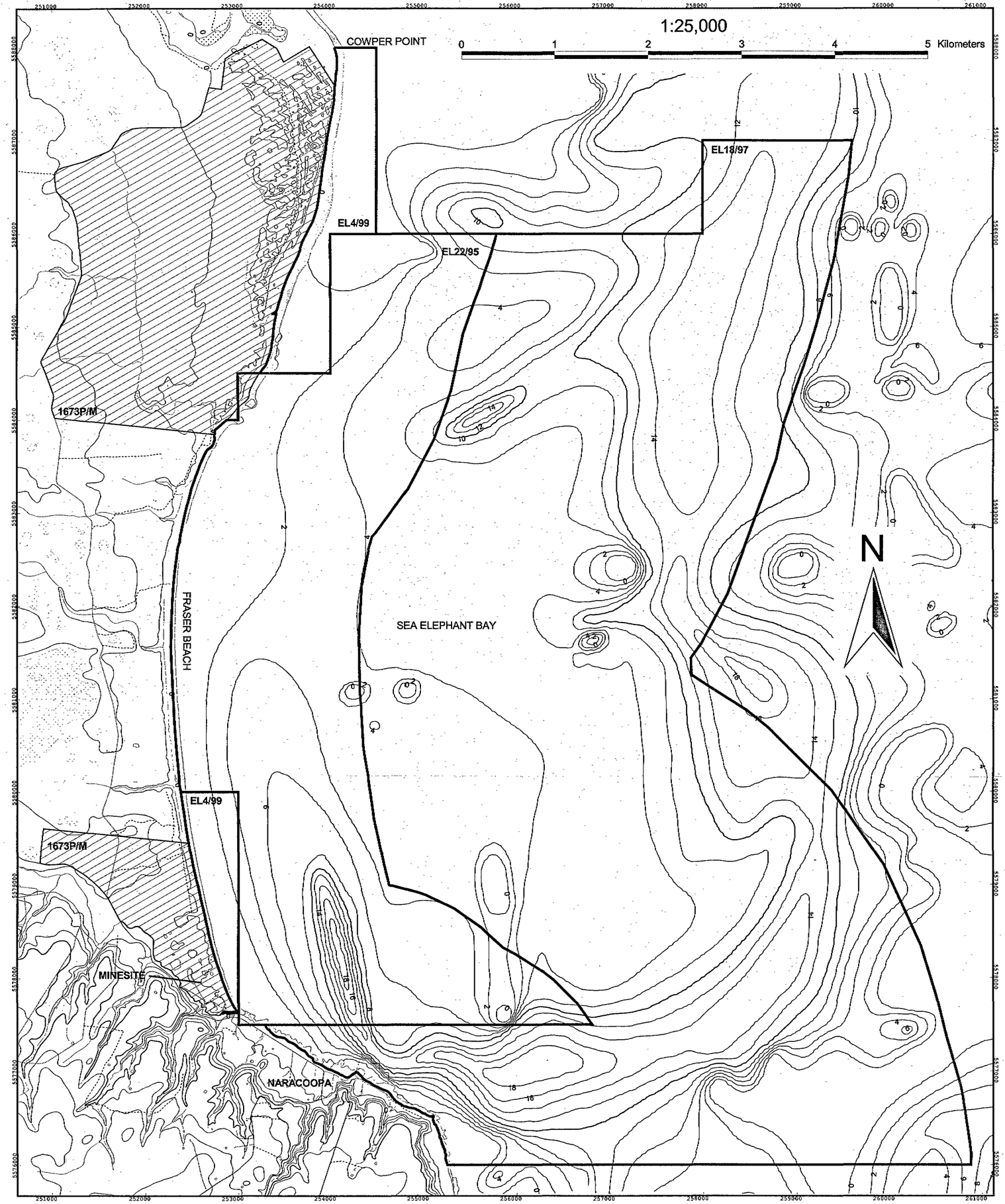
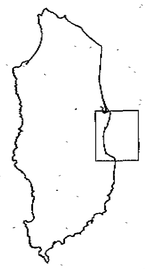
Annual Report for Year Ending 4/10/2000 - ELs 22/1995, 18/1997 & 4/1999 - Sea Elephant Bay Project
Tasmanian Titanium Proprietary Limited*
Morrison, K.C.
EL18/1997; EL22/1995



Total sediment isopachs derived by rectifying, gridding and re-contouring maps compiled in 1966 by Ocean Mining A.G. from marine seismic surveys.

Contour Interval: 2 metres



King Island, Tasmania

Projection: UTM Zone 55
Datum: AGD66

Contour Interval: 10 metres

Topographic and hydrographic maps from Department of Environment and Land Management, Tasmania

Exploration Licence and Mining Lease maps from Mineral Resources Tasmania

679015

Tasmanian Titanium Pty Ltd

ELs 22/95, 18/97 & 4/99 - Sea Elephant Bay

5 cm

Plan 3

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TOTAL SEDIMENT ISOPACHS

Annual Report for Year Ending 4/10/2000 - EL's 22/1995, 18/1997 & 4/1999 - Sea Elephant Bay Project
Tasmanian Titanium Proprietary Limited*
Morrison, K.C. EL18/1997; EL22/1995

GIS by Volcanex International Pty Ltd October 2000 Compiled by K.C. Morrison Pty Ltd

1:25,000

0 1 2 3 4 5 Kilometers

COWPER POINT

EL18/97

EL4/99

EL22/95

1673P/M

FRASER BEACH

SEA ELEPHANT BAY

EL4/99

1673P/M

MINESITE

NARACOOPA

See side map for more sample locations

N

2.7/0.9
1.2/0.9
5.2/0.01
3/0.1
3/0.2
1.5/0.3
4.3/0.9
4.9/0.01
0.7/0.6
/0.2
0.5/0.2
0.7/0.9
0.6/1.05
0.5/1.1
0.7/1
0.7/1.9
0.7/1.2
0.4/0.5
0.4/0.8
0.6/1
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5.5/0.1
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1.5/6.91
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0.7/5.25
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2/1.15
1.5/15.35
1.5/11.56
1.5/12.28
20/
6.1/0.1

253000 254000

0 0.2 0.4 0.6 0.8 1 Kilometers

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0.7/1.5
0.7/1
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1/7.3
0.6/4.6
0.7/3.5
0.8/2.2
0.7/2.3
EL22/95
0.7/2.1

Sample Locations

- 1997 Stitt & Associates Pty Ltd
- 1997 A.S. James Pty Ltd
- 1992 Australian Zircon Pty Ltd
- 1976 Amdex Mining Ltd
- 1965-67 Ocean Mining AG

Symbol numbers show "metres penetration" / "percent heavy minerals"

King Island, Tasmania

Projection: UTM Zone 55
Datum: AGD66

Contour Interval: 10 metres

Topographic and hydrographic maps from Department of Environment and Land Management, Tasmania

Exploration Licence and Mining Lease maps from Mineral Resources Tasmania

679014

Tasmanian Titanium Pty Ltd

ELs 22/95, 18/97 & 4/99 - Sea Elephant Bay

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5 cm

Plan 4

SAMPLE LOCATIONS, DEPTHS, GRADES

Annual Report for Year Ending 4/10/2000 - EL's 22/1995, 18/1997 & 4/1999 - Sea Elephant Bay Project
Tasmanian Titanium Proprietary Limited*
Morrison, K.C.
EL18/1997; EL22/1995

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679016

Appendix 1

679017

MINERAL DEPOSITS LIMITED
(INCORPORATED IN NEW SOUTH WALES)
81 ASHMORE ROAD, BUNDALL, QUEENSLAND AUSTRALIA 4217

July 24, 1992.

Mr. L. Foyster
40 Thompson Street
TWEED HEADS N.S.W. 2485

Dear Lloyd,

Sample Assessment

The results from the first stage of work on the mineral sand samples delivered to our laboratory on July 15, 1992, are now to hand.

According to your priorities, we have carried out:

i) Mineralogical assessment of the "Magnetics Stockpile" sample (item 1.1 of MDL letter of July 16, 1992).

ii) Size analyses, heavy mineral separation, and H.M. sizing for the 5 "Offshore Ocean" samples (item 2.1 of MDL letter of July 16, 1992).

iii) Mineralogical assessment of the composited H.M. fractions derived from the "Offshore Ocean" samples (item 2.2 of MDL letter July 16, 1992).

The results of this work are fully tabulated on the attached data sheets.

For the "Offshore Ocean" samples, the tabulated data relate to the samples after removal of coarse (+1mm) trash (shell fractions, etc.) for which the following mass distributions were recorded:

Sample			Weight Dist'n to +1mm (%)
No.	5A	250 E 500N	3.1
	6A	250 E 800 Line	4.9
No.	8	800 E 100N	10.6
	10A	400 E 100 N	9.6
	11A	500 E 200 N	-

For these samples also there was significant saline contamination (presumably from sea-water) which necessitated the samples to be thoroughly washed prior to processing.

The following additional comments are made:

Magnetics Stockpile

i) The material contains significant levels of ilmenite, rutile and zircon as potentially valuable mineral constituent minerals.

ii) The presence of altered ilmenite provides the potential to supplement an ilmenite product and to increase the TiO_2 content of such a product.

iii) Similarly, the presence of leucoxene and anatase can potentially increase the yield to a rutile product.

iv) Some of the zircon has inclusions.

v) There is a significant proportion of garnet (reporting in the "magnetic others" fraction).

vi) Although no chromite was observed, the assay of the 0.35 mag +4.05 s.g. fraction at 2.45% Cr_2O_3 indicates the presence of troublesome chrome-containing minerals.

vii) Particularly in view of vi), above, the value of any "ilmenite" product can only be established after extraction and characterisation by chemical assay and size analysis.

viii) Stainings are present on some of the mineral grains. However, these are believed to be readily removed by attritioning, after which the material should be reasonably easy separated as it is of a sizing that is amenable to conventional mineral sand dry separation processing.

Offshore Ocean

i) The H.M. content of the samples ranges from 6-15% +2.85 s.g. (bromoform).

ii) The sand is relatively fine (d_{50} = 120-160µm) and the H.M., although also rather fine (d_{50} = 90-100µm), is of size reasonably amenable to concentration by conventional gravity separation systems.

iii) There are significant ilmenite, zircon and rutile values in the heavy mineral suite, together with some monazite.

iv) The presence of altered ilmenite and leucoxene could potentially add to the yield of ilmenite and rutile respectively.

v) The mineral grains carry some surface staining and removal would be necessary prior to efficient drymilling.

vi) Chromite was identified in the "magnetic others" which largely comprised garnet. The 0.35 mag +4.05 s.g. fraction assayed 1.95% Cr_2O_3 confirming the presence of troublesome chromite.

vii) Pyrite is present at very low levels (approx. 0.1%) and may influence the sulphur content of any ilmenite and/or rutile product/s.

We are now proceeding with further work on the "Offshore Ocean" material with the objective of extracting mineral product fractions of ilmenite, rutile and zircon which will be subjected to full chemical and size analyses to assess their quality and potential marketability.

I trust this report meets your requirements. Further data will be reported as it comes to hand. In the meantime, please do not hesitate to call if you have any queries.

Yours faithfully,

ROGER RICHARDS
TECHNICAL SERVICES MANAGER

Att.

679020

MINERAL DEPOSITS LIMITED
TECHNICAL SERVICES DEPARTMENT

Client : **Mr L. Foyster**

Project : **Offshore Ocean**

Sample : **Magnetic Stockpile**

		% Wt	Mineral Distribution by Fraction													
Mags Fraction	S. G. Fraction	Distn to Fraction	H/S	Ilmenite	Altered Ilmenite	Monazite	Mag Others	Mag Rutile	Rutile	Mag Leucox	Leucox	Mag Zircon	Zircon	Anatase	N/Mag Others	Total
H/S		100.00	100.00													100.00
0.35 Mag	-4.05	33.36			60.10		49.70	0.20								100.00
	+4.05	66.64		53.10			45.90					1.00				100.00
	Sub-Tot	100.00		35.38	19.71		47.17	0.07		0.00		0.57		0.00		100.00
1.5a Mag	-4.05	64.16			31.30		68.60	0.10								100.00
	+4.05	35.84			72.70	Trace	25.80	0.90				0.60				100.00
	Sub-Tot	100.00			48.14	Trace	53.26	0.39		0.00		0.22				100.00
2.4a Mag	-4.05	77.59					67.80	0.50		30.00		0.10		1.60		100.00
	+4.05	22.41					10.20	25.70		37.40		25.70				100.00
	Sub-Tot	100.00					54.89	6.15		31.66		6.06		1.24		100.00
2.4a N/Mag	-4.05	22.22							10.50		27.40		1.30	8.00	50.00	100.00
	+4.05	77.78							47.30		2.40		49.40	0.40	0.50	100.00
	Sub-Tot	100.00							39.12		7.96		35.71	2.08	12.12	100.00

		% Wt	Total Mineral Distribution													
Mags Fraction	S. G. Fraction	Distn to Fraction	H/S	Ilmenite	Altered Ilmenite	Monazite	Mag Others	Mag Rutile	Rutile	Mag Leucox	Leucox	Mag Zircon	Zircon	Anatase	N/Mag Others	Total
H/S		0.85	0.85													0.85
0.35 Mag	-4.05	24.06			12.05		11.99	0.05		-		-		-		24.06
	+4.05	48.06		25.52			22.06	-		-		0.48		-		48.06
	Sub-Tot	72.12		25.52	12.05		34.02	0.05		-		0.48		-		72.12
1.5a Mag	-4.05	11.88			3.72		8.15	0.01		-						11.88
	+4.05	6.64			4.82	Trace	1.71	0.06		-		0.04				6.64
	Sub-Tot	18.52			8.54	-	9.86	0.07		-		0.04				18.52
2.4a Mag	-4.05	1.64					1.11	0.01		0.49		0.00		0.03		1.64
	+4.05	0.47					0.05	0.12		0.18		0.13		-		0.47
	Sub-Tot	2.11					1.16	0.13		0.67		0.13		0.03		2.11
2.4a N/Mag	-4.05	1.42							0.15		0.39		0.02	0.11	0.75	1.42
	+4.05	4.98							2.35		0.12		2.46	0.02	0.02	4.98
	Sub-Tot	6.40							2.50		0.51		2.46	0.13	0.78	6.40
HM Sample		100.00	0.85	25.52	20.60	Trace	45.04	0.25	2.50	0.67	0.51	0.65	2.48	0.16	0.78	100.00
Total Sample		97.31	0.83	24.83	20.04	Trace	43.83	0.24	2.44	0.65	0.50	0.63	2.41	0.16	0.75	97.31

Note: Grain counts shown as two decimal places for calculation purposes only

679021

MINERAL DEPOSITS LIMITED
TECHNICAL SERVICES DEPARTMENT

Client : Mr L. Foyster

Project : Offshore Ocean

Sample : Magnetic Stockpile

		% Wt	Mineral Distribution by Mineral												
Mags Fraction	S. G. Fraction	Distn to Fraction	H/S	Ilmenite	Altered Ilmenite	Monazite	Mag Others	Mag Rutile	Rutile	Mag Leucox	Leucox	Mag Zircon	Zircon	Anatase	N/Mag Others
H/S		0.65	100.00												
0.35 Mag	- 4.05	24.06			58.52		26.55	19.29		-		-			
	+ 4.05	48.06		100.00			48.96	-		-		74.18		-	
	Sub-Tot	72.12		100.00	58.52		75.53	19.29		-		74.13		-	
1.5a Mag	- 4.05	11.88			18.05		18.09	4.76		-					
	+ 4.05	8.64			23.42	-	3.80	23.94		-		8.14			
	Sub-Tot	18.52			41.48	-	21.90	28.70		-		8.14			
2.4a Mag	- 4.05	1.64					2.46	3.28		73.52		0.25			
	+ 4.05	0.47					0.11	48.73		26.48		19.48			
	Sub-Tot	2.11					2.57	52.01		100.00		19.73			
2.4a N/Mag	- 4.05	1.42							5.96		78.54		0.75		96.79
	+ 4.05	4.88							94.04		23.49		99.25		3.21
	Sub-Tot	6.40							100.00		100.00		100.00		100.00
HM Sample		100.00	100.00	100.00	100.00	-	100.00	100.00	100.00	100.00	100.00	100.00	100.00	-	100.00

Note: Grain counts shown as two decimal places for calculation purposes only

679022

MINERAL DEPOSITS LIMITED
TECHNICAL SERVICES DEPARTMENT

Client: Mr L. Foyster

Project: Offshore Ocean

Sample: Heavy Mineral Composites

Mags Fraction	S. G. Fraction	% Wt Distn to Fraction	Mineral Distribution by Fraction: H/S	Ilmenite	Altered Ilmenite	Monazite	Mag Others	Mag Rutile	Rutile	Mag Leucox	Leucox	Mag Zircon	Zircon	Pyrite	N/Mag Others	Total
H/S		100.00	100.00													100.00
0.3s Mag	- 4.05	58.00			59.50		38.10	0.20				2.20				100.00
	+ 4.05	42.00		68.00		Trace	3.30	0.20				8.50				100.00
	Sub-Tot	100.00		36.96	34.61	Trace	23.46	0.20		0.00		4.85				100.00
1.5s Mag	- 4.05	77.17			44.00		54.60	0.50				0.90				100.00
	+ 4.05	22.83			66.60	14.20	5.20	2.00				11.00				100.00
	Sub-Tot	100.00			49.18	3.24	43.55	0.84		0.00		3.21				100.00
2.4s Mag	- 4.05	69.47					54.00	0.50		45.20		0.30				100.00
	+ 4.05	30.53				22.80	2.10	24.70		29.40		21.20				100.00
	Sub-Tot	100.00				6.90	38.15	7.89		40.38		6.66				100.00
2.4s N/Mag	- 4.05	18.82							0.50		35.00		0.90	1.30	62.30	100.00
	+ 4.05	81.18							31.00		3.00		65.70		0.30	100.00
	Sub-Tot	100.00							25.28		9.02		53.51	0.24	11.97	100.00

Mags Fraction	S. G. Fraction	% Wt Distn to Fraction	Total Mineral Distribution: H/S	Ilmenite	Altered Ilmenite	Monazite	Mag Others	Mag Rutile	Rutile	Mag Leucox	Leucox	Mag Zircon	Zircon	Pyrite	N/Mag Others	Total
H/S		1.50	1.50													1.50
0.3s Mag	- 4.05	24.93			14.83		9.50	0.05		-		0.55				24.93
	+ 4.05	18.06		15.89			0.60	0.04		-		1.53				18.06
	Sub-Tot	42.99		15.89	14.83		10.09	0.09		-		2.08				42.99
1.5s Mag	- 4.05	10.80			4.66		5.79	0.05		-		0.10				10.60
	+ 4.05	3.14			2.09	0.45	0.18	0.08		-		0.34				3.14
	Sub-Tot	13.73			6.75	0.45	5.96	0.12		-		0.44				13.73
2.4s Mag	- 4.05	3.79					2.05	0.02		1.71		0.01				3.79
	+ 4.05	1.67				0.35	0.03	0.41		0.49		0.35				1.67
	Sub-Tot	5.46				0.38	2.08	0.43		2.20		0.36				5.46
2.4s N/Mag	- 4.05	6.84							0.03		2.39		0.06	0.09	4.26	6.84
	+ 4.05	29.49							9.14		0.88		19.37	-	0.09	29.49
	Sub-Tot	36.32							9.16		3.28		19.44	0.09	4.35	36.32
HM Sample		100.00	1.50	15.89	21.58	0.82	18.16	0.63	9.16	2.20	3.28	2.59	19.44	0.09	4.35	100.00

Note: Grain counts shown as two decimal places for calculation purposes only

MINERAL DEPOSITS LIMITED
TECHNICAL SERVICES DEPARTMENT

Client: **Mr L. Foyster**

Project: **Offshore Ocean**

Sample: **Heavy Mineral Composites**

		% Wt	Mineral Distribution by Mineral													
Mags Fraction	S. G. Fraction	Distn to Fraction	H/S	Ilmenite	Altered Ilmenite	Monazite	Mag Others	Mag Rutile	Rutile	Mag Leucox	Leucox	Mag Zircon	Zircon	Pyrite	N/Mag Others
H/B		1.50	100.00												
0.35 Mag	-4.05	24.93			66.73		52.32	7.59		-		18.99			
	+4.05	18.06		100.00			3.28	5.71		-		53.14			
	Sub-Tot	42.99		100.00	66.73		55.60	13.60		-		72.13			
1.5a Mag	-4.05	10.60			21.60		31.86	8.36		-		3.30			
	+4.05	3.14			9.67	54.18	1.07	9.92		-		11.94			
	Sub-Tot	13.73			31.27	54.18	32.94	18.30		-		15.24			
2.4a Mag	-4.05	3.78					11.27	5.00		77.77		0.39			
	+4.05	1.87				45.82	0.19	66.10		22.23		12.23			
	Sub-Tot	5.46				45.82	11.46	66.10		100.00		12.62			
2.4a N/Mag	-4.05	6.84							0.37		73.00		0.32	100.00	97.96
	+4.05	29.49							99.63		27.00		99.68		2.04
	Sub-Tot	36.32							100.00		100.00		100.00	100.00	100.00
HM Sample		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: Grain counts shown as two decimal places for calculation purposes only

679024

MINERAL DEPOSITS LIMITED
TECHNICAL SERVICES DEPARTMENT

Client: Mr L Foyster

Project: Offshore Ocean

Sizing Analysis

o 5A 250E 500N %HM = 6.91

Size (µm)	Feed Weight Distn %	Feed Cum. %Wt	H.M. Weight Distn %	H.M. Cum. %Wt
+250	3.28	3.28	0.57	0.57
250 +212	2.94	6.22	0.14	0.71
212 +180	6.42	12.64	0.57	1.27
180 +150	13.27	25.91	2.55	3.82
150 +125	51.08	76.98	6.93	10.75
125 +106	13.37	90.36	31.26	42.01
106 +90	6.36	96.72	27.72	69.73
-90 +75	2.55	99.27	21.07	90.81
-75 +63	0.65	99.91	7.78	98.59
-63	0.09	100.00	1.41	100.00
Total	100.00		100.00	

No 6A 250E 800 Line %HM = 6.47

Size (µm)	Feed Weight Distn %	Feed Cum. %Wt	H.M. Weight Distn %	H.M. Cum. %Wt
+250	10.74	10.74	2.45	2.45
-250 +212	3.72	14.46	0.72	3.17
-212 +180	7.99	22.45	1.01	4.18
-180 +150	13.81	36.27	3.17	7.35
-150 +125	44.43	80.69	6.05	13.40
-125 +106	10.93	91.62	26.22	39.63
-106 +90	4.92	96.54	31.27	70.89
-90 +75	2.45	98.99	17.29	88.18
-75 +63	0.84	99.84	9.08	97.26
-63	0.16	100.00	2.74	100.00
Total	100.00		100.00	

o 8 800E 100N %HM = 11.56

Size (µm)	Feed Weight Distn %	Feed Cum. %Wt	H.M. Weight Distn %	H.M. Cum. %Wt
+250	3.37	3.37	0.64	0.64
250 +212	1.37	4.73	0.24	0.88
212 +180	4.12	8.85	0.32	1.19
80 +150	8.72	17.57	0.96	2.15
50 +125	38.90	56.47	3.03	5.18
25 +106	21.38	77.85	20.46	25.64
106 +90	12.80	90.64	24.04	49.68
90 +75	5.96	96.61	27.23	76.91
75 +63	2.82	99.43	16.32	93.23
-63	0.57	100.00	6.77	100.00
Total	100.00		100.00	

No 10A 400E 100N %HM = 12.28

Size (µm)	Feed Weight Distn %	Feed Cum. %Wt	H.M. Weight Distn %	H.M. Cum. %Wt
+250	2.99	2.99	0.37	0.37
-250 +212	1.94	4.92	0.22	0.59
-212 +180	4.21	9.13	0.37	0.96
-180 +150	9.63	18.76	1.40	2.37
-150 +125	39.14	57.90	7.46	9.83
-125 +106	20.50	78.40	24.09	33.92
-106 +90	12.10	90.50	26.02	59.94
-90 +75	6.12	96.62	21.95	81.89
-75 +63	2.67	99.29	13.16	95.05
-63	0.71	100.00	4.95	100.00
Total	100.00		100.00	

) 11A 500E 200N %HM = 15.35

Size (µm)	Feed Weight Distn %	Feed Cum. %Wt	H.M. Weight Distn %	H.M. Cum. %Wt
+250	11.80	11.80	0.76	0.76
50 +212	4.85	16.64	0.28	1.04
12 +180	5.91	22.55	0.62	1.66
80 +150	9.62	32.17	2.84	4.50
50 +125	33.80	65.97	8.45	12.95
25 +106	16.17	82.14	31.09	44.04
06 +90	9.42	91.56	24.58	68.63
90 +75	5.81	97.37	18.14	86.77
75 +63	2.41	99.79	11.01	97.78
-63	0.21	100.00	2.22	100.00
Total	100.00		100.00	

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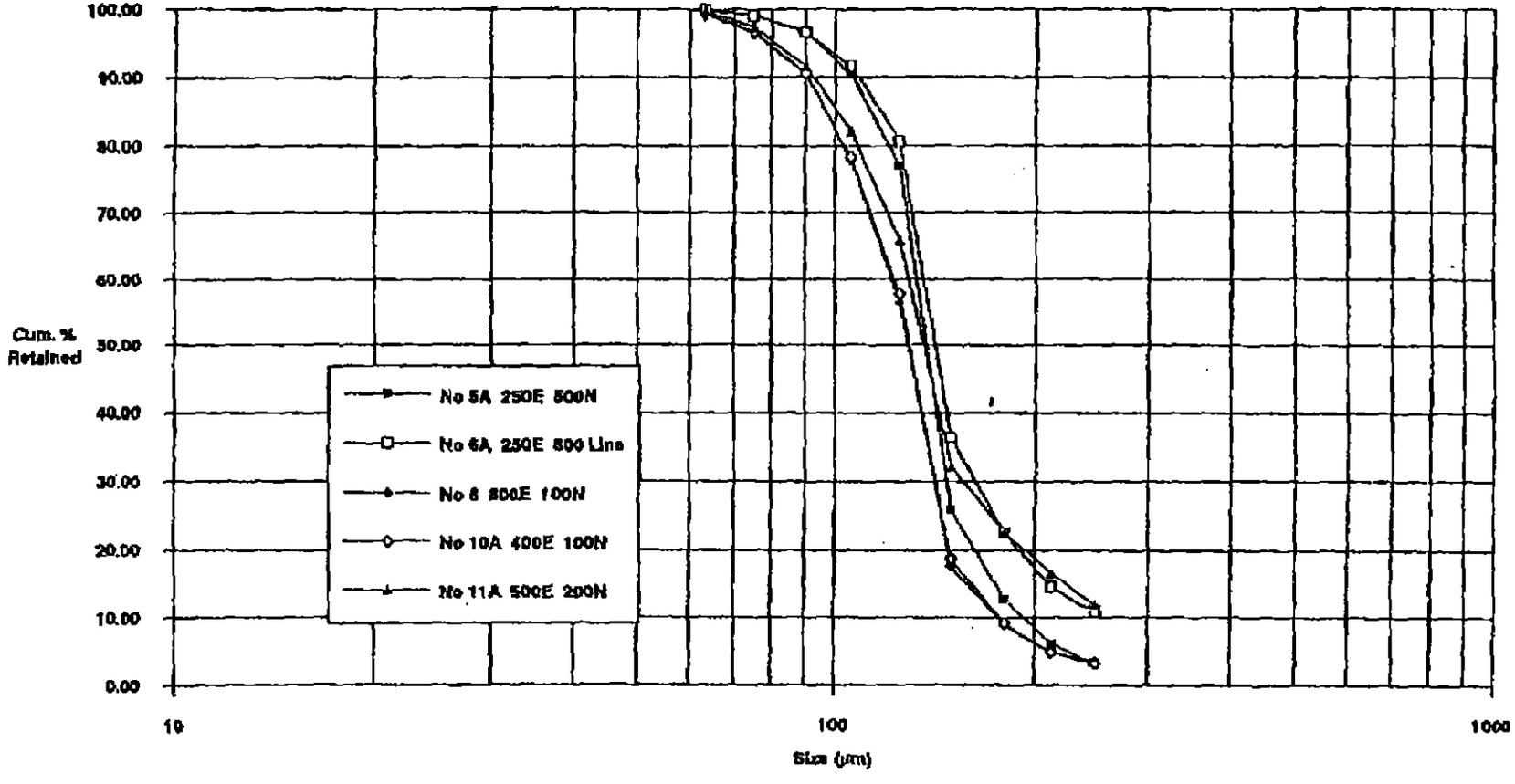
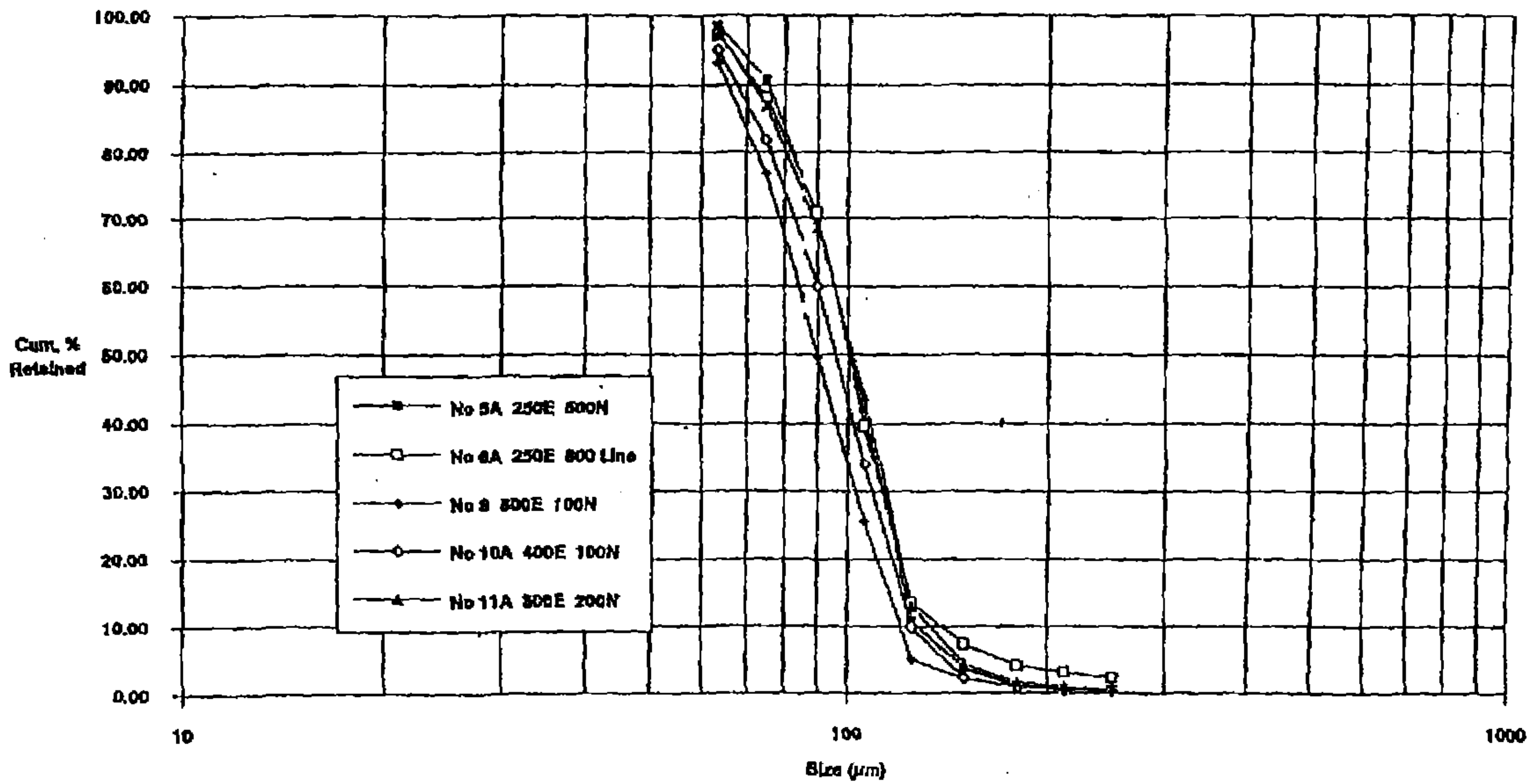
Offshore Ocean
Feed Sizing Analysis



Offshore Ocean
HM Sizing Analysis



MD Mintech

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KING ISLAND VIBROCORE DRILLING PROGRAM - SEA ELEPHANT BAY

A Summary Report Outlining The Results of a Scout Vibrocore Drilling Program in Sea Elephant Bay, King Island, Tasmania.

Report Prepared for Australian Zircon Pty. Ltd. by Coastal & Marine Geosciences (Geological Consultants), a division of Mining Tenement Management Pty. Ltd.
September, 1992.

SUMMARY

A total of 14 vibrocore holes were drilled by Coastal & Marine Geosciences at 13 sites offshore of Fraser Beach in Sea Elephant Bay on the east coast of King Island in September, 1992. The drilling intersected a relatively thin (less than 1m thick) sequence of clean marine sands (fine quartz sands with minor shell) containing relatively high proportions of heavy mineral in water depths of less than 15m at the southern end of Sea Elephant Bay. Within the resolution of the drill hole spacing, the alongshore extent of these sediments appears to be around 1km and related to the onshore occurrence of high grade mineral sand deposits. The offshore sediments are shallowly underlain by either estuarine clays, in the vicinity of the Fraser River entrance, or indurated sands to the north of here. The drilling also suggests that the proportion of heavy mineral in the marine sediments decreases seaward of the 15m isobath. Here, the sediments are underlain by coarse gravels (predominantly shell) which were not penetrated by the vibrocorer.

Recommendation is made for a systematic mapping of all relevant data (existing bathymetric and sedimentological data, heavy mineral grades and types etc.) to accurately establish the limits of the resource and likely tonnages of economic heavy mineral. Vibrocore samples should be submitted for heavy mineral analyses and incorporated with these data. If the review of the existing data suggests that further work is warranted, then serious consideration should be given to conducting a bathymetric, seismic and surface sediment survey over the area as a basis for any future offshore investigations.

SUMMARY

A total of 14 vibrocore holes were drilled by Coastal & Marine Geosciences at 13 sites offshore of Fraser Beach in Sea Elephant Bay on the east coast of King Island in September, 1992. The drilling intersected a relatively thin (less than 1m thick) sequence of clean marine sands (fine quartz sands with minor shell) containing relatively high proportions of heavy mineral in water depths of less than 15m at the southern end of Sea Elephant Bay. Within the resolution of the drill hole spacing, the alongshore extent of these sediments appears to be around 1km and related to the onshore occurrence of high grade mineral sand deposits. The offshore sediments are shallowly underlain by either estuarine clays, in the vicinity of the Fraser River entrance, or indurated sands to the north of here. The drilling also suggests that the proportion of heavy mineral in the marine sediments decreases seaward of the 15m isobath. Here, the sediments are underlain by coarse gravels (predominantly shell) which were not penetrated by the vibrocorer.

Recommendation is made for a systematic mapping of all relevant data (existing bathymetric and sedimentological data, heavy mineral grades and types etc.) to accurately establish the limits of the resource and likely tonnages of economic heavy mineral. Vibrocore samples should be submitted for heavy mineral analyses and incorporated with these data. If the review of the existing data suggests that further work is warranted, then serious consideration should be given to conducting a bathymetric, seismic and surface sediment survey over the area as a basis for any future offshore investigations.

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CONTENTS

1. STUDY BRIEF

In August, 1992, Coastal & Marine Geosciences (CMG) was approached by Australian Zircon Pty. Ltd. to conduct a scout vibrocore drilling program offshore of the east coast of King Island. It was requested that CMG, at the direction of Australian Zircon Pty. Ltd., drill a number of sites in Sea Elephant Bay for the purpose of establishing the thickness of a mineral sand deposit thought to occur offshore in the area.

King Island (39°55'S 144°00'E) is located in the western part of Bass Strait between the Australian mainland and Tasmania. A review of the geology of the island is contained in Jennings (1957 and 1959).

2. METHODS

Core samples of the sea bed in Sea Elephant Bay were collected using an electrically operated vibrocorer deployed from an 18m fishing vessel fitted with an A-frame and winch. The corer is capable of recovering core samples in unconsolidated sediment sequences to a depth of 6m below the sea bed in water depths of up to 200m.

Drill hole sites were selected by Australian Zircon Pty. Ltd. representatives onboard the vessel during the drilling program. Drill hole locations were fixed using the ship's GPS navigation system.

Drilling at each site typically involved three-point anchoring of the drill ship over the drill site, deployment of the corer over the stern of the vessel and lowering of the drill rig to the sea floor using the ship's main lifting winch. Once on the sea floor, the drill rig was activated and operated until refusal (no measurable penetration of the core barrel below the sea bed whilst drilling). The drill rig was winched back to the surface, brought inboard and the core sample recovered. Notes were made of core penetration and recovery and the core sample stored for logging at the end of each day. The majority of cores were retained in the aluminium core barrels - these were subsequently cut longitudinally to reveal the intact core sample. All cores were logged and representative samples from sediment units within the cores were sampled for future heavy mineral analyses. Where the core was particularly disturbed, the core sample was bulked and retained in a plastic sample bag.

3. RESULTS

A total of 14 holes were drilled at 13 sites within Sea Elephant Bay (Table 1). The sites ranged in water depth from 4.2m to 24.7m, with many being located inshore (less than 10m water depth) and adjacent to the old rutile-zircon mine at the southern end of Sea Elephant Bay. The maximum penetration achieved during the drilling was 2.2m below the sea bed at site KI#12, the deepest site drilled during the program. Relatively poor core recovery at a number of sites was due to the generally thin sequence of unconsolidated sediments which overlies older, more consolidated deposits.

In water depths of less than 15m the drilling intersected a relatively thin (less than 1m thick) clean sand sequence which contained high percentages of heavy mineral. This sequence, which presumably forms the shoreface sediments of Fraser Beach, thinly veneers a substrate of estuarine clays and indurated sands. Indurated sands crop out on the beach inshore of many of the drill sites. The alongshore extent of the highly mineralised shoreface sediments appears to be related to high grade mineral sands deposits onshore - where high grade deposits are no longer found onshore, the proportion of heavy mineral in the offshore sediments is relatively low. Inshore sites (KI#9 and 10) drilled to the north of the richest onshore deposits show a marked reduction in heavy mineral content.

Further offshore (water depths greater than 15m) the proportion of the heavy mineral in the marine sands appears to decrease. Here, the marine sands tend to become coarser and to contain variable amounts of shell gravel which is comprised of a mixture of reworked estuarine and marine molluscan fragments. At the deepest site (KI#12) the marine sands contain visible amounts of mud (less than 5%).

TABLE 1: KING ISLAND SCOUT VIBROCORE DRILLING PROGRAM

CORE LOCATIONS AND WATER DEPTHS

Core ID	Water Depth (Metres)	Lat.	Long.
KI#1a	6.0	39° 54.70'S	144° 06.75'E
KI#1b	6.0	39° 54.58'S	144° 06.75'E
KI#2	5.7	39° 54.58'S	144° 06.75'E
KI#3	6.0	39° 54.43'S	144° 06.75'E
KI#4	12.1	39° 54.43'S	144° 07.15'E
KI#5	16.3	39° 53.60'S	144° 08.49'E
KI#6	14.1	39° 54.58'S	144° 07.42'E
KI#7	6.7	39° 54.72'S	144° 06.61'E
KI#8	4.8	39° 54.59'S	144° 06.58'E
KI#9	4.2	39° 53.59'S	144° 06.41'E
KI#10	8.8	39° 53.89'S	144° 06.76'E
KI#11	14.8	39° 54.25'S	144° 07.60'E
KI#12	24.7	39° 52.48'S	144° 11.04'E
KI#13	16.1	39° 53.83'S	144° 07.91'E

Core locations based on GPS fixes. Water depths have been corrected for the draft of the drilling vessel but not for tides.

4. SUMMARY AND RECOMMENDATIONS

The scout drilling program conducted by Coastal & Marine Geosciences on behalf of Australian Zircon Pty. Ltd. in Sea Elephant Bay has indicated that a relatively thin (less than 1m thick) sequence of clean marine sands (fine quartz sands with minor shell) containing relatively high proportions of heavy mineral occurs in water depths of less than 15m at the southern end of Sea Elephant Bay. Within the resolution of the drill hole spacing, the alongshore extent of these sediment appears to be around 1km and linked to the onshore extent of high grade mineral sand deposits. The offshore sediments are shallowly underlain by either estuarine clays, in the vicinity of the Fraser River entrance, or indurated sands to the north of here. Indurated sands commonly crop out on Fraser Beach to the north of the river entrance.

Within the resolution of the drill hole spacing, the proportion of heavy mineral in the marine sediments appears to decrease seaward of the 15m isobath. Here, the sediments are underlain by coarse gravels (predominantly shell) which were not penetrated by the vibrocorer.

Although the extent of the mineralised sediment sequence offshore appears to be more limited and significantly thinner than first thought, the extraordinarily high proportion of (economic) heavy minerals warrants a systematic mapping of all relevant data (existing bathymetric and sedimentological data, heavy mineral grades and types etc.) to accurately establish the limits of the heavy mineral resource. Vibrocore samples should be submitted for heavy mineral analyses and incorporated with these data. With an estimate of the likely maximum thickness of the mineralised offshore sand sequence (vibrocore data) and information on the alongshore and offshore extent of the deposit (existing surface sediment samples), it should be possible to estimate likely tonnages of heavy mineral. The offshore data should also be considered in the light of the results of the onshore drilling which contains information on the types of older deposits, and their mineral grades, which may may occur offshore below the sand sequence encountered in the vibrocore drilling program.

If a review of the existing data suggests that further work is warranted, then serious consideration should be given to conducting a bathymetric and seismic survey over the area, followed by a surface sediment sampling program. The bathymetric and seismic survey would establish the distribution and thickness of unconsolidated sediments in Sea Elephant Bay, while the surface sediment sampling program would identify the major surficial marine sediment types, their distribution and mineral content. These data would provide a sound basis for a review of the existing information on the marine geology of the area and a context for future offshore investigations.

5. REFERENCES

Jennings, J.N., 1957, On the orientation of parabolic or U-dunes. The Geographical Union, v. 73, Part 4, p.474-480.

Jennings, J.N., 1958, The coastal geomorphology of King Island, Bass Strait, in relation to changes in the relative level of land and sea. Records of the Queen Victoria Museum, Launceston, New Series No. 11, 39p.

6. CORE LOGS

AREA AND CORE NUMBER: Sea Elephant Bay KI#1a
LOCATION: 39° 54.70'S 144° 06.75'E
WATER DEPTH: 6.0m (not corrected for tide)
PENETRATION: 0.30m
MEASURED RECOVERY: 0.29m
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Corer operated without tower, poor penetration.

INTERVAL (M)	CORE DESCRIPTION

0- 0.20m SAND: fawn grey grading to dark fawn grey at depth, well sorted, fine to medium grained quartz sand with approx. 5-10% shell as fine grained abraded fragments. Quartz grains are subangular to subrounded. Obvious heavy mineral. Clear contact to...

0.20-0.29m SANDY CLAY: dark grey sandy clay.

0.29-0.30m Core loss

Samples: KI#1a 0-0.29m

AREA AND CORE NUMBER: Sea Elephant Bay KI#1b
LOCATION: 39° 54.70'S 144° 06.75'E
WATER DEPTH: 6.0m (not corrected for tide)
PENETRATION: 1.62m
MEASURED RECOVERY: 1.15m
CORE CONDITION: Good.

COMMENTS: Second attempt at coring at site KI#1. Corer penetrated rapidly at first, then operated to refusal. Core loss of gravelly sandy sediment from base of core upon recovery.

INTERVAL (M) CORE DESCRIPTION

0- 0.08m SAND: dark grey to fawn, fine to medium grained, well sorted quartz sand with approx. 5-10% shell as fine grained abraded fragments. Quartz grains are subangular to subrounded. Obvious heavy mineral. Gravel sized fragments of iron pyrites (?) at sharp contact to...

0.08-1.00m CLAY - SANDY CLAY: dark grey with black organic staining, cohesive clay grading to a sandy clay below 0.63. Plant remains at contact at base of unit. 1.0m. Clear contact to...

1.00-1.15m SAND: dark brown-grey, slightly muddy, moderately well sorted coarse grained quartz sand with no obvious shell. Rounded lithic gravels (3cm max. length) at base of unit.

1.15-1.62 Core loss

Samples: KI#1b 0-0.08m
KI#1b 0.8-1.00m
KI#1b 1.0-1.15m

AREA AND CORE NUMBER: Sea Elephant Bay KI#2
LOCATION: 39° 54.58'S 144° 06.75'E
WATER DEPTH: 5.7m (not corrected for tide)
PENETRATION: 1.02m
MEASURED RECOVERY: 0.80m
CORE CONDITION: Poor.

COMMENTS: Corer penetrated very slowly. Core sample disturbed and bulked.

INTERVAL (M)	CORE DESCRIPTION

0- 0.80m SAND: fawn, well sorted fine grained quartz sand with less than 5% shell as fine grained abraded fragments. Many of the shell fragments are iron stained. Quartz grains are subangular to subrounded. Obvious heavy mineral.

0.80-1.02m Core loss.

Samples: KI#2 0-0.80m

AREA AND CORE NUMBER: Sea Elephant Bay KI#3
LOCATION: 39° 54.43'S 144° 06.75'E
WATER DEPTH: 6.0m (not corrected for tide)
PENETRATION: 0.38m
MEASURED RECOVERY: 0.29m
CORE CONDITION: Fair.

COMMENTS: Corer progressed slowly and operated to refusal. Core bit plugged with indurated sand on recovery. Core sample bulked.

INTERVAL (M) CORE DESCRIPTION

0- 0.12m SAND: fawn grey, well sorted fine grained quartz sand with approx. 5-10% shell as fine grained abraded fragments. Quartz grains are subangular to subrounded. Sharp contact to...

0.12-0.29m INDURATED SAND: dark brown, indurated, muddy, fine grained quartz sand.

0.29-0.38m Core loss

Samples: KI#3 0-0.12m
KI#3 0.12-0.29m

AREA AND CORE NUMBER: Sea Elephant Bay KI#4
LOCATION: 39° 54.43'S 144° 07.15'E
WATER DEPTH: 12.1m (not corrected for tide)
PENETRATION: 1.60m
MEASURED RECOVERY: 0.61m
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Loss of sediment from base of core upon recovery estimated to be approx. 1m.

INTERVAL (M) CORE DESCRIPTION

0- 0.20m GRAVELLY SAND: fawn grey, moderately well sorted, gravelly fine grained quartz sand with approx. 5% shell. Gravel component primarily comprised of reworked molluscan fragments and whole valves (estuarine sp. dominant - oyster). Quartz grains are subangular to subrounded. Obvious heavy mineral. Clear contact to...

0.20-0.61m SAND: pale grey to dark brown, slightly muddy, well sorted fine grained quartz sand. Trace shell. Thin layers of muddy indurated sand at base of core.

0.61-1.62 Core loss

Samples: KI#4 0-0.20m
KI#4 0.3-0.6m

AREA AND CORE NUMBER: Sea Elephant Bay KI#5
LOCATION: 39° 53.60'S 144° 08.49'E
WATER DEPTH: 16.3m (not corrected for tide)
PENETRATION: 1.65m
MEASURED RECOVERY: 0.70m
CORE CONDITION: Poor.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Core barrel bent on recovery. Loss of sediment from base of core upon recovery. Core sample bulked.

INTERVAL (M)	CORE DESCRIPTION

0- 0.70m GRAVELLY SAND: grey to dark grey, moderately well sorted, fine to medium grained quartz sand with approx. 20% shell, most as gravel sized fragments and whole molluscan valves.

0.70-1.65m Core loss

Samples: KI#5 0-0.70m

AREA AND CORE NUMBER: Sea Elephant Bay KI#6
LOCATION: 39° 54.58'S 144° 07.42'E
WATER DEPTH: 14.1m (not corrected for tide)
PENETRATION: 1.80m
MEASURED RECOVERY: 0.57m
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Core loss of sandy sediment from base of core upon recovery.

INTERVAL (M)	CORE DESCRIPTION

0- 0.10m SAND: dark fawn-grey, well sorted, fine grained quartz sand with approx. 5% shell as fine grained abraded fragments. Quartz grains are subangular. Obvious heavy mineral. Gravel sized mud oyster valve (8cm long axis) at clear contact to...

0.10-0.57m SAND: mottled dark orange-grey to light grey, well sorted fine grained quartz sand. Quartz grains subangular. No obvious shell below contact marked by oyster fragment and other shell gravel (marine mollusc species).

0.57-1.80m Core loss

Samples: KI#6 0-0.1m
KI#6 0.1-0.57m

AREA AND CORE NUMBER: Sea Elephant Bay KI#7
LOCATION: 39° 54.72'S 144° 06.61'E
WATER DEPTH: 6.7m (not corrected for tide)
PENETRATION: 1.40m
MEASURED RECOVERY: 0.90m
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Core barrel eventually snapped and barrel was recovered with chain strop. Loss of sandy sediment from base of core upon recovery.

INTERVAL (M) CORE DESCRIPTION

0- 0.52m SAND: fawn-grey, well sorted, fine grained quartz sand with approx. 5% shell as fine grained abraded fragments. Quartz grains are subangular to subrounded. Obvious heavy mineral which imparts an overall grey colour to core sample. Gravel sized shell fragments (molluscs) at clear contact to...

0.52-0.90m SAND - GRAVELLY SAND: dark grey, moderately well sorted, medium to coarse grained quartz sand which becomes coarser and contains more gravel (lithics and shell) towards base of core. Quartz grains range from subangular to subrounded. This unit contains, in general, less shell and apparently less heavy mineral than the overlying surficial unit.

0.90-1.40m Core loss

Samples: KI#7 0-0.52m
KI#7 0.52-0.90m

AREA AND CORE NUMBER: Sea Elephant Bay KI#8
LOCATION: 39° 54.59'S 144° 06.58'E
WATER DEPTH: 4.8m (not corrected for tide)
PENETRATION: 1.20m
MEASURED RECOVERY: 0.88m
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Loss of muddy sand from base of core upon recovery.

INTERVAL (M) CORE DESCRIPTION

0- 0.60m SAND: fawn-grey, well sorted, fine grained quartz sand with approx. 5% shell as fine grained abraded fragments. Quartz grains are subangular. Obvious heavy mineral, results in grey mottling towards base of unit. Gradational contact to...

0.60-0.80m SAND: pale grey, well sorted, fine to medium grained quartz sand. Quartz grains subangular. No obvious shell. Minor rounded lithic gravels (less than 1cm) and heavy mineral. Clear contact to...

0.80-0.88m MUDDY SAND: pale fawn grey, well sorted, slightly muddy quartz sand. Distinct white colour to mud fraction. Quartz grains subangular. Trace heavy mineral. No obvious shell.

0.88-1.20m Core loss.

Samples: KI#8 0-0.60m
KI#8 0.6-0.80m
KI#8 0.80-0.88m

AREA AND CORE NUMBER: Sea Elephant Bay KI#9
LOCATION: 39° 53.59'S 144° 06.41'E
WATER DEPTH: 4.2m (not corrected for tide)
PENETRATION: 1.00m
MEASURED RECOVERY: 0.56mm
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Core bit plugged with clayey, indurated sand, no core loss. Compaction of core would account, in part, for lower recovery. It is also likely that the plug of indurated sediment retained in the core bit prevented sediment entering the barrel whilst the corer continued to penetrate the lower part of the indurated sequence.

INTERVAL (M) CORE DESCRIPTION

0- 0.32m SAND: fawn brown, well sorted, fine grained quartz sand with approx. 5% shell as fine grained abraded fragments. Many of the shell fragments are iron stained. Quartz grains subangular. Gradual contact to...

0.32-0.36m GRAVELLY SAND: mottled, fawn-grey, moderately sorted fine to coarse grained gravelly sand. Quartz grains subangular to subrounded. Shell content approx. 10%. Gravels comprised of rounded lithic pebbles and shell fragments (marine species dominant). Sharp contact to...

0.36-0.52m INDURATED SAND: dark brown, muddy, well sorted fine grained sand with common mica. Distinct laminations.

Samples: KI#9 0-0.22m
KI#9 0.36-0.52m

AREA AND CORE NUMBER: Sea Elephant Bay KI#10
LOCATION: 39° 53.89'S 144° 06.76'E
WATER DEPTH: 8.8m (not corrected for tide)
PENETRATION: 0.90m
MEASURED RECOVERY: 0.74m
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Some loss of gravelly sandy sediment from base of core upon recovery.

INTERVAL (M)	CORE DESCRIPTION

0- 0.19m SAND: fawn grey to grey, well sorted, fine grained quartz sand with approx. 5% shell as fine grained abraded fragments. Quartz grains are subangular. Relatively low (approx. less than 5%) heavy mineral. Clear contact to...

0.19-0.62m GRAVELLY SAND: fawn, poor to moderately sorted, medium to very coarse grained quartz sand with common gravel up to 5cm in diameter. Shell approx. 20% of sample, mostly as gravel. Quartz subrounded. Gravel comprised primarily of shell fragments and whole molluscan valves (marine and estuarine species). Some heavy mineral, less than overlying unit.

0.62-0.90m Core loss

Samples: KI#10 0-0.19m
KI#1b 0.19-0.62m

AREA AND CORE NUMBER: Sea Elephant Bay KI#11
LOCATION: 39° 54.25'S 144° 07.60'E
WATER DEPTH: 14.8m (not corrected for tide)
PENETRATION: 1.80m
MEASURED RECOVERY: 0.60m
CORE CONDITION: Poor.

COMMENTS: Corer penetrated slowly until refusal, barrel almost snapped from head. Core disturbed and bulked sampled.

INTERVAL (M) CORE DESCRIPTION

0- 0.60m GRAVELLY SAND: grey, moderately well sorted fine grained quartz sand with shell gravel. Quartz grains subangular. Shell content approx. 5% as coarse to gravel sized molluscan fragments (marine species dominant). Low heavy mineral (less than 2%).

Samples: KI#11 0-0.60m

AREA AND CORE NUMBER: Sea Elephant Bay KI#12
LOCATION: 39° 52.48'S 144° 11.04'E
WATER DEPTH: 24.7m (not corrected for tide)
PENETRATION: 2.20m
MEASURED RECOVERY: 0.30m
CORE CONDITION: Poor.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Loss of sediment from bottom of core on recovery. Core sample bulked.

INTERVAL (M)	CORE DESCRIPTION
0- 0.30m	GRAVELLY SAND: fawn grey, moderately well sorted fine grained quartz sand with shell gravel (molluscs - marine species). Slightly muddy. Shell comprises approx. 5% of the sample and is typically iron stained, fragmented and abraded. Relatively minor amount of heavy mineral compared to inshore samples.
0.30-2.20m	Core loss.

Samples: KI#12 0-0.30m

AREA AND CORE NUMBER: Sea Elephant Bay KI#13
LOCATION: 39° 53.83'S 144° 07.91'E
WATER DEPTH: 16.1m (not corrected for tide)
PENETRATION: 1.60m
MEASURED RECOVERY: 0.50m
CORE CONDITION: Good.

COMMENTS: Corer penetrated rapidly at first, then operated to refusal. Loss of sediment from base of core upon recovery.

INTERVAL (M) CORE DESCRIPTION

0- 0.11m SAND: grey, well sorted, fine grained quartz sand with approx. 2-3% shell as fine grained abraded fragments. Quartz grains are subangular. Common fine grained heavy mineral. Gradual contact to...

0.11-0.25m GRAVELLY SAND: dark grey, moderately sorted, fine to very coarse grained quartz sand with approx. 10% shell as gravel sized molluscan (marine species) fragments and whole valves. Occasional rounded lithic gravels. Quartz grains range from subangular to rounded. Gradual contact to...

0.25-0.29 SAND: pale fawn-green, moderately well sorted, medium to very coarse grained sand. Quartz subangular to rounded. Trace shell. Sharp contact to...

0.29-0.40 CLAY: dark brown cohesive clay with minor grey mottling. Trace organics. Clear contact to...

0.40-0.50 MUDDY SAND: dark brown, muddy, well sorted fine grained sand. Trace fine grained shell fragments.

0.50-1.60 Core loss.

Samples: KI#13 0-0.11m
KI#13 0.11-0.25m
KI#13 0.25-0.29m
KI#13 0.29-0.40m

Appendix 2

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PETER H. STITT & ASSOCIATES PTY. LTD.

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MINING & GEOLOGICAL CONSULTANTS

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31st August 1999

Tasmanian Titanium Pty Ltd
C/-Peter Hopkins
2/222 Clarence St
Sydney NSW 2000

00_4498A

ATTENTION: Mr Lloyd Foyster

Offshore Investigations - King Island - EL22/1995

Peter H Stitt and Associates Proprietary Limited; Tasm
Lee, G. EL18/1997; EL22/1995

Dear Lloyd,

SUBJECT: King Island – Offshore Investigations

I am writing following my discussions with you and David earlier today.

Peter H Stitt and Associates Pty Ltd have previously undertaken mineral sands investigations on King Island for National Mineral Sands Pty Ltd, a subsidiary of North Broken Hill Peko Ltd. These investigations were carried out between 1987 and 1989 at Naracoopa and Cowper Point and included the preparation of resource estimates for the mineralisation at these locations.

Upon Australian Titanium Minerals Ltd acquiring the project and tenements in 1995 Peter H Stitt and Associates was engaged to advised on certain aspects of the resource including preparation of estimates at a lower cut-off grade. A short off-shore sampling programme was completed in July 1997.

Accompanying this letter is a number of documents:

1. Report No 11/89.
   Volume 1 Evaluation of Mineral Sand Resources at Cowper Point, King Island.
   May 1989

2. Report No 10/97
   Reconnaissance Investigations of Heavy Mineral Sands in sea Elephant Bay, King Island, EL 22/95
   August 1997

3. Technical Note No 4/96
   Heavy Mineral Sand Resources at 0.75% Cut-off Grade, Naracoopa and Cowper Point, King Island
   (Text only. Figures accompanying this Technical Note are marked up copies of Figure 3 from Report 11/89).

4. Technical Note No 6/98

Proposal for Further Drilling at Naracoopa, King Island
August 1998

When preparing the draft prospectus for ATM during early 1998 I was asked to prepare an indicative exploration programme and costs allowances. Part of this programme was for off-shore exploration in Sea Elephant Bay. That programme was:

Exploration investigations should be undertaken within the offshore Exploration Licences 22/95 and 18/97 located in Sea Elephant Bay. These investigations would include:

- *Geophysical surveys comprising echo sounding, sidescan sonar, and seismic reflection profiling together with grab sampling of the bottom sands.*
  Allow $150,000.

- *Further diver operated pump sampling.*
  Allow $50,000.

- *RC drilling of selected targets using either a rig on a jack-up platform or a submersible rig.*
  Allow $400,000.

- *Metallurgical testing, feasibility studies, reporting, and contingencies.*
  Allow $200,000.

Total allowance for the off-shore investigations was $800,000. Before undertaking any investigations these allowances would need to be revised and firm estimates based on a detailed work programme should be made.

I would recommend that the investigations be undertaken in the order listed above. You have indicated that trials with a magnetometer were encouraging. This could be included as part of the geophysical package in the first item listed above.

Further, I would strongly recommend that marine work be carried out during the more favourable weather. The advice of a local mariner should be sought as to the best period, but the winter should generally be avoided.

I would be pleased to provide further service from our company, when you require. To this end I have attached a copy of our current scale of fees.

Yours sincerely,

Graham Lee.

Graham Lee

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REPORT No. 10/97

RECONAISSANCE INVESTIGATION OF HEAVY MINERAL SANDS IN SEA ELEPHANT BAY KING ISLAND

EL 22/95

Report Prepared for Australian Titanium Minerals Ltd

Graham Lee
FAusIMM, MAIG

August 1997

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SYNOPSIS

1. AIM

To carry out an initial reconnaissance investigation of the sea-bed sands in Sea Elephant Bay off the east coast of King Island.

2. REASON

Heavy mineral sands occur on the eastern side of King Island at Naracoopa and Cowper Point. Australian Titanium Minerals Ltd hold title to these deposits and are seeking to find additional resources for mining. Off-shore sands in Sea Elephant Bay are one potential exploration target which have received little previous attention.

3. SUMMARY

3.1 Samples were collected from twenty-one sites; three drill holes, sixteen pump samples and two grab samples.

3.2 Sample positions were surveyed by theodolite (drill holes) or GPS (pump and grab samples).

3.3 Testing comprised heavy mineral separation, magnetic fractionation of the heavy minerals and mineralogical counts of the magnetic fractions.

3.4 Only surface sands were sampled at most sites. The results show:

* An enrichment of heavy mineral in the near beach zone.
* An enrichment of heavy mineral in the south-western corner of the bay.
* In the three drill holes, the heavy mineral grades decrease with depth.

3.5 The heavy mineral fractions were composited into "Sample A" (the three drill holes) and "Sample B" (all pump and drill holes). They were found to contain:

	SAMPLE A	**SAMPLE B**
	%	**%**
Weighted mean heavy mineral	12.1	1.5
Arithmetic mean heavy mineral	10.4	1.3
Rutile in heavy mineral	7.7	9.0
Zircon in heavy mineral	5.7	7.7
Ilmenite in heavy mineral	7.9	9.9
Altered ilmenite in heavy mineral	13.0	11.8
Leucoxene in heavy mineral	3.3	6.1

3.6 The mineralogy in the off-shore samples is similar to that previously found on-shore; rutile and zircon are 1-2% greater, and ilmenite 10% lower, in the off-shore samples.

3.7 Considering in situ grades, "Sample A" contains economic levels of rutile (0.80%) and zircon (0.59%), "Sample B" with 0.22% contained rutile and zircon is uneconomic.

3.8 The older and deeper sand bodies have not been sampled in the recent program.

3.9 There are three potential heavy mineral bearing targets:

* Recently reworked, unconsolidated surface sands.
* Older strand-line beach deposits.
* Marine deposits concentrated by currents.

4. RECOMMENDATIONS

4.1 Future drilling investigations need to be targeted at the potentially more prospective sand bodies within Sea Elephant Bay.

4.2 The use of geophysical methods (echo sounding, sidescan sonar, and seismic reflection profiling) together with grab sampling is recommended as a means of identifying future drilling targets.

4.3 Further diver operated pump sampling should precede drilling with a rig, to better determine the nature and mineral content of the surface sands.

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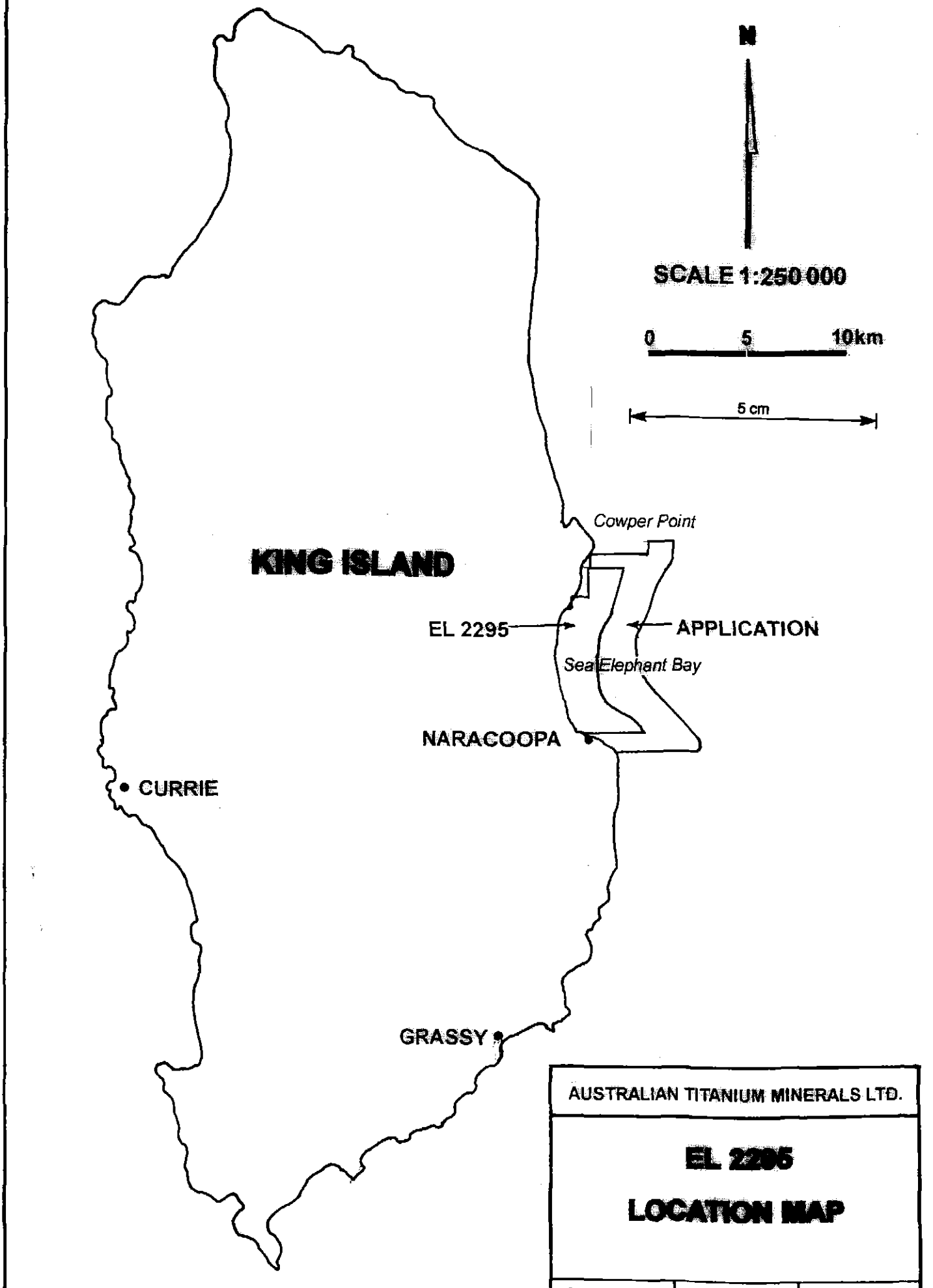


AUSTRALIAN TITANIUM MINERALS LTD.		
EL 2295		
LOCATION MAP		
Author G.Lee	Date: Sept. '97	DWG: 10.101

Prepared by P. H. Stitt & Associates

Fig. No.:1

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** D Line (100N), 500E

LOCATION: Approximately 200m off shore.
AMG 253135E, 5577933N

LODGED BY: Graham Lee **DATE DRILLED:** 12/7/97

METHOD: Hand sludged

Interval	Description	% Slime	%+2000um	%HM
0 - 0.75	Sand, medium grained well sorted, with fine shell. HM +5%. Brownish grey clay seams. 0.5 – 0.75m sand, coarse grained with pebbles to 4 mm and minor coarse shell. Brown clay seams. HM. 2 - 5%.	6.81	15.38	6.98
0.75 - 1.5	Sand coarse grained, pebbly (up to 20mm, angular meta-sediments. HM. 2 - 5% with more silicate HM than above. Carbonised plant and woody fragments with minor greyish brown silt.	4.59	19.28	7.84
1.5 - 1.85	As above.	9.22	28.78	5.77
	EOH 1.85m			
	Grade 0 to 1.85m			7.1

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** D Line (100N), 700E

LOCATION: 400m off shore
AMG 253337E, 5577936N

DATE DRILLED: 13/7/97

LODGED BY: Graham Lee

METHOD: Hand sludged

Interval	Description	% Slime	%+2000um	%HM
0 - 0.9	Sand, medium grained, well sorted, grey with gravel to 30mm, some rounded. HM. 2-5%. Sand and shell minor silt.	7.99	38.13	2.19
0.9 - 1.5	Sand, medium grained well sorted, white mica flakes, visibly little clay. HM approx 1%.	3.68	3.72	0.39
1.5 - 2.0	As above.	2.79	0	0.19
	EOH 2.0m			
	Grade 0 to 2.0m			1.15

CLIENT:	Australian Titanium Minerals	**TITLE NO:**	
AREA:	Sea Elephant Bay, King Island	**HOLE NO:**	D Line (100N), 3240E
LOCATION:	2500m off shore	**DATE DRILLED:**	16/7/97
LODGED BY:	Graham Lee	**METHOD:**	Pump sample

Interval	Description	% Slime	%+2000um	%HM
	Hard bottom on sounder, not sampled.			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** D Line (100N), 2740E

LOCATION: GPS 39° 54.63'S, 144° 08.20'E (2000m off shore) **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pump sample

Interval	Description	% Slime	%+2000um	%HM
0 - 0.3m	Sand, medium grained, some shell and dark brown organics. No visible HM. Hard at 0.3m. Sounder water depth 8.2 Fathoms. Diver's depth 14m.	1.24	0	0.49

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** D Line (100N), 2240E

LOCATION: GPS 39° 54.67'S, 144° 07.86'E 1500m off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pump sample

Interval	Description	% Slime	%+2000um	%HM
0 - 0.7m	Sand, medium grained, well sorted, pale brown. Minor shell and organics. HM 1 – 2%.7	1.70	0	1.31
	Water depth 8.0 Fathoms. Diver's depth 14m.			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** D Line (100N), 1740E

LOCATION: GPS 39° 54.70'S, 144° 07.52'E 1000m off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped sample

Interval	Description	% Slime	%+2000um	%HM
0 - 0.7m	Sand as for 2240E.	2.23	2.25	2.35

Water depth 7.1 Fathoms.
Diver's depth 10m.

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** D Line (100N), 1240E

LOCATION: GPS 39° 54.74'S, 144° 07.21'E 500m off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped sample

Interval	Description	% Slime	%+2000um	%HM
0 - 0.7m	As for 2240E. HM 2-5%.	2.28	0.43	5.25
	Water depth 5.6 Fathoms. Diver's depth 9m.			

679067

CLIENT:	Australian Titanium Minerals		**TITLE NO:**
AREA:	Sea Elephant Bay, King Island		**HOLE NO:** 1000N, 4200E
LOCATION:	GPS 39° 53.78'S, 144° 08.55'E	1.95 nautical miles off shore (3650m off shore)	**DATE DRILLED:** 16/7/97
LODGED BY:	Graham Lee		**METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
	Hard at 4200E, in 7.5 Fathoms of water, moved back to 1.95 nautical miles off shore, but retained bag labelled '4200E' for this position.			
0 - 0.5m	Sand, medium grained, pale grey and yellow layers. Shell and organics. HM 1-2% fine grained. Hard at 0.5m - rock? Water depth 7.8 Fathoms.	2.12	0.56	1.12

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 1000N, 3700E

LOCATION: GPS 39° 53.81'S, 144° 08.45'E 1.7 nautical miles off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0 - 0.7m	Sand, medium grained, pale grey overlying yellow. Well sorted, some shell and organics. HM +2%. Water depth 8.1 Fathoms.	2.16	0.46	1.00

69069

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 1000N, 3200E

LOCATION: GPS 39° 53.86'S, 144° 08.13'E 1.45 nautical miles off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0 - 0.7m	As for 3700E. HM +2%.	2.33	0.57	1.91
	8.1 Fathoms			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 1000N, 2700E

LOCATION: GPS 39° 53.96'S, 144° 07.87'E 1.2 nautical miles off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0 - 0.7m	As for 3700E. HM 2-5%. Coarser grained HM.	2.27	0.57	1.20
	7.4 Fathoms			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 1000N, 2200E

LOCATION: GPS 39° 54.04'S, 144° 07.56'E. 0.95 nautical mile off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0 - 0.4m	Sand medium grained, well sorted, yellow and pale greyish. Coarse shell at 0.4m. HM approx. 1%.	0.69	7.40	0.49
	Water depth 7.5 Fathoms			

CLIENT:	Australian Titanium Minerals		**TITLE NO:**	
AREA:	Sea Elephant Bay, King Island		**HOLE NO:**	1000N, 1700E
LOCATION:	GPS 39° 54.10'S, 144° 07.23'E	0.7 nautical mile off shore	**DATE DRILLED:**	16/7/97
LODGED BY:	Graham Lee		**METHOD:**	Pumped

Interval	Description	% Slime	%+2000um	%HM
0 - 0.4m	Sand medium grained, well sorted, pale grey, abundant coarse shell from top. HM approx 1%. Shell at 0.4m.	1.79	12.52	0.79
	Water depth 6.8 Fathoms.			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 1000N, 1200E

LOCATION: GPS 39° 54.16'S, 144° 06.95'E 0.46 nautical mile off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0 - 0.6m	Sand, fine medium, well sorted, with coarse and fine shell, pale and mid grey. HM 1-2%.	1.75	6.79	0.96
	Water depth 4.8 Fathoms.			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 1000N, 700E

LOCATION: GPS 39° 54.21'S, 144° 06.66'E 0.2 nautical mile off shore **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0 - 0.4m	Sand, medium grained with shell. Grey. HM 5%. Visible heavy mineral streaks on the surface of the sea bed. Coarse shell at 0.4m. Water depth 2.4 Fathoms.	2.08	1.14	3.69

CLIENT:	Australian Titanium Minerals		**TITLE NO:**
AREA:	Sea Elephant Bay, King Island		**HOLE NO:** 2000N, 3000E
LOCATION:	GPS 39° 53.34'S, 144° 08.21'E	1.5 nautical miles off shore.	
			DATE DRILLED: 16/7/97
LODGED BY:	Graham Lee		**METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
	All scallop shell.			
	- no sample -			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 2000N, 2500E

LOCATION: GPS 39° 53.42'S, 144° 07.78'E 1.25 nautical miles off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0-0.7m	Sand, medium grained, well sorted, pale grey, some shells.	1.83	3.03	0.64
	HM <1%.			
	Water depth 7.7 Fathoms			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 2000N, 2000E

LOCATION: GPS 39° 53.46'S, 144° 07.53'E 1.0 nautical mile off shore **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
	Coarse oyster and other whole shells in medium and coarse sands. Grab samples off bottom. HM <1%.	1.41	20.74	0.23
	Water depth 7.6 Fathoms			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 2000N, 1500E

LOCATION: GPS 39° 53.54'S, 144° 07.18'E 0.75 nautical mile off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0-0.5m	Sand, coarse grained with some shell fragments, pale orange. HM <1%	1.55	18.96	0.19
	Water depth 7.0 Fathoms.			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 2000N) 1000E

LOCATION: GPS 39° 53.62'S, 144° 06.92'E 0.5 nautical mile off shore **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0-0.6m	Sand, fine-medium grained, well sorted, grey, minor organics. Minor coarse and fine shell. HM 1-2%.	2.22	0.82	0.88
	Water depth 6.2 Fathoms			

CLIENT: Australian Titanium Minerals **TITLE NO:**

AREA: Sea Elephant Bay, King Island **HOLE NO:** 2000N, 500E

LOCATION: GPS 39° 53.70'S, 144° 06.62'E 0.25 nautical mile off shore. **DATE DRILLED:** 16/7/97

LODGED BY: Graham Lee **METHOD:** Pumped

Interval	Description	% Slime	%+2000um	%HM
0-0.6m	Sand, medium grained, well sorted, minor shell. Pale grey. HM +2%. Water depth 3.3 Fathoms.	2.30	3.09	1.05

Appendix 2: Results of heavy mineral Separations Carried Out by Readings Metallurgical Services

PETER STITT & ASSOCIATES DRILLING SAMPLES

SAMPLE NO	DRY SAMPLE WT.	%+2mm	% H/M IN -2mm FRACTION	% H/M IN ORIGINAL SAMPLE	% SLIMES IN -2mm FRACTION
D LINE					
(100N) 300E 0-1.0m	6961	3.48	28.89%	27.89%	1.10%
(100N) 300E 1.0-2.0m	6107	8.55	27.44%	25.09%	1.61%
(100N) 300E 2.0-3.0m	1833	1.58	17.58%	17.30%	16.24%
(100N) 500E 0-0.75m	2965	15.38	8.25%	6.98%	6.81%
(100N) 500E 0.75-1.5m	3615	19.28	9.72%	7.84%	4.59%
(100N) 500E 1.5-1.85m	1758	28.78	8.10%	5.77%	9.22%
(100N) 700E 0-0.9m	1765	38.13	3.55%	2.19%	7.99%
(100N) 700E 0.9-1.5m	4464	3.72	0.41%	0.39%	3.68%
(100N) 700E 1.5-2.0m	3124	0.00	0.19%	0.19%	2.79%
LINE D					
(100N) 2740E 0-0.3m	241	0.00	0.49%	0.49%	1.24%
(100N) 2240E 0-0.7m	1909	0.00	1.31%	1.31%	1.70%
(100N) 1740E 0-0.7m	1202	2.25	2.40%	2.35%	2.23%
(100N) 1240E 0-0.7m	704	0.43	5.27%	5.25%	2.28%
1000N 4200E 0-0.5m	1431	0.56	1.13%	1.12%	2.12%
1000N 3700E 0-0.7m	1509	0.46	1.00%	1.00%	2.16%
1000N 3200E 0-0.7m	2107	0.57	1.93%	1.91%	2.33%
1000N 2700E 0-0.7m	1401	0.57	1.20%	1.20%	2.27%
1000N 2200E 0-0.4m	3230	7.40	0.52%	0.49%	0.69%
1000N 1700E 0-0.4m	2803	12.52	0.91%	0.79%	1.79%
1000N 1200E 0-0.6m	2488	6.79	1.03%	0.96%	1.75%
1000N 700E 0-0.4m	2017	1.14	3.73%	3.69%	2.08%
2000N 2500E 0-0.7m	1586	3.03	0.66%	0.64%	1.83%
2000N 2000E	897	20.74	0.28%	0.23%	1.41%
2000N 2000E GRAB	1905	0.00	0.59%	0.59%	1.34%
2000N 1500E 0-0.5m	1155	18.96	0.24%	0.19%	1.55%
2000N 1000E 0-0.6m	1463	0.82	0.88%	0.88%	2.22%
2000N 500E 0-0.6m	1846	3.09	1.08%	1.05%	2.30%

Appendix 3: Results of Magnetic Fractionation Carried Out by Readings Metallurgical Services

H. T. READING PTY LTD

A.C.N. 000 233 296

679085

FACSIMILE TRANSMISSION

DATE: 21-8-97

ATTENTION: GRAHAM LEE

COMPANY:

FROM: TREVOR HESSING

FAX NUMBER:

OUR REF:

NO. OF PAGES:

Postal Address:
P O BOX 161
LISMORE NSW 2480
AUSTRALIA

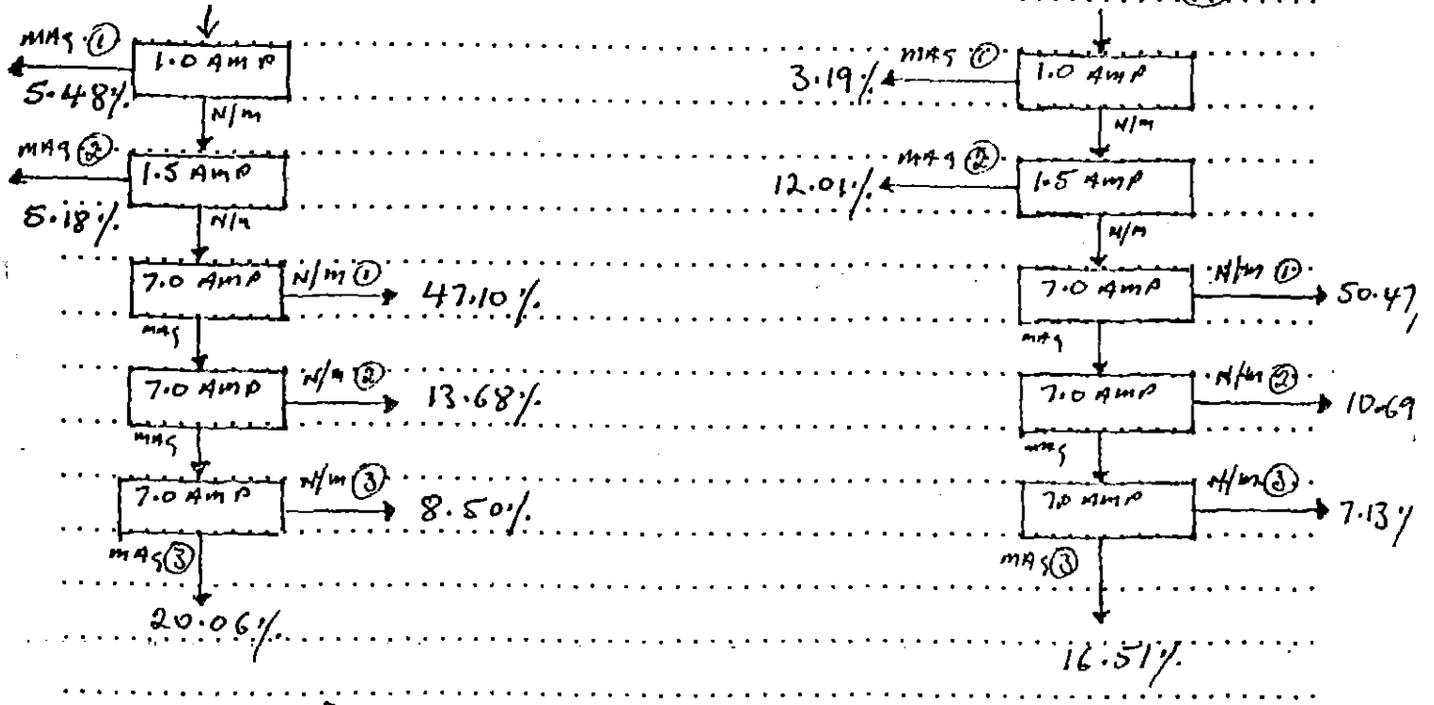
Street Address:
1 COOK STREET
LISMORE NSW 2480
AUSTRALIA

Email Address:
reading@nor.com.au

TELEPHONE: (+61 66) 217451
FACSIMILE: (+61 66) 219384

DEAR GRAHAM

PLEASE FIND ENCLOSED H/M FRACTION FROM SEMI-LIFT TESTS ON SAMPLES (A) 300£, 500£, 700£ (9) (B) REMAINING 18 SAMPLES AS PER YOUR FAX 19-8-97



REGARDS

TREVOR.

Appendix 4: Results of Mineralogical Point Counts Carried Out by Applied Petrographic Services

679087

Applied Petrographic Services	P.O.Box 257 Strawberry Hills 2012
2a Railway Avenue, Stanmore NSW 2048 Australia	Ph/Fax (02) 9516 4808

CLIENT: PETER H. STITT & ASSOCIATES P/L
5TH FLOOR, 32 YORK STREET
SYDNEY, NSW 2000

APS REPORT NO.: M 1006

DATE: 16.9.97

ATTENTION: GRAHAM LEE

SAMPLE DETAILS SAMPLE A - 300E, 500E, 700E

POINT COUNT OF GRAIN MOUNTS

Sample A fractions were significantly coarser grained than Sample B. In particular Sample A Non-mags 1 contained much coarse material which made it very difficult to prepare a grain mount. The +500μm was screened off - the weight % was 5%. This material consisted mainly of pyrite (some in composite particles with organics) and tourmaline, with minor garnet, andalusite/kyanite, and staurolite.

Results for the point counts are given as volume %.

MINERAL	"A" FRACTIONS			
	Mags 1+2	Mags 3	N/M 1	N/M 2+3
Xenotime	<1%			
Monazite	<1%	<1%	<1%	<1%
Zircon	<1%	<1%	12%	<1%
Red rutile			2%	
Black rutile			12%	5%
Leucoxene	<1%	<1%	6%	2%
Altered ilmenite		39%	2%	19%
Ilmenite	74%			
Garnet	21%	27%	3%	12%
Tourmaline	2%	22%	31%	42%
Other silicates*	3%	12%	19%	20%
Pyrite			5%	<1%
Others**	<1%	<1%	3%	<1%
+500μm(weight %)			5%	

*Andalusite/kyanite, pyroxene, amphibole, staurolite, epidote,
**Quartz, shell, iron oxides, spinel. Very rare corundum and ?cassiterite were detected.

J. McNULTY
PETROLOGIST

Applied Petrographic Services
2a Railway Avenue, Stanmore NSW 2048 Australia
P.O.Box 257
Strawberry Hills 2012
Ph/Fax (02) 9516 4808

CLIENT: PETER H. STITT & ASSOCIATES P/L
5TH FLOOR, 32 YORK STREET
SYDNEY, NSW 2000
APS REPORT NO.: M 1006
DATE: 16.9.97
ATTENTION: GRAHAM LEE
SAMPLE DETAILS SAMPLE B - REMAINING 18 SAMPLES

POINT COUNT OF GRAIN MOUNTS

Sample B Non-mag 1 contained much shell. After splitting the sample, half was weighed and the shell was removed by weak hydrochloric acid digestion and re-weighed. 83% (weight %) of sample remained after acid treatment.

Results for the point counts are given as volume %.

MINERAL	"B" FRACTIONS			
	Mags 1+2	Mags 3	N/M 1	N/M 2+3
Xenotime	<1%	<1%		<1%
Monazite	<1%	1%	1%	<1%
Zircon			15%	1%
Red rutile	<1%		4%	
Black rutile			12%	5%
Leucoxene	<1%	<1%	11%	3%
Altered ilmenite		45%	2%	19%
Ilmenite	65%			
Garnet	25%	31%	14%	29%
Tourmaline	1%	4%	6%	12%
Other silicates*	9%	17%	16%	31%
Pyrite			<1%	<1%
Others**	<1%	2%	2%	<1%
Shell (weight %)			17%	

*Andalusite/kyanite, pyroxene, amphibole, staurolite, epidote,
**Quartz, shell, iron oxides, spinel. Very rare corundum and ?cassiterite were detected.

J. McNULTY
PETROLOGIST

679089

Applied Petrographic Services	P.O.Box 257 Strawberry Hills 2012
2a Railway Avenue, Stanmore NSW 2048 Australia	Ph/Fax (02) 9516 4808

CLIENT: PETER H. STITT & ASSOCIATES P/L
5TH FLOOR, 32 YORK STREET
SYDNEY, NSW 2000

APS REPORT NO.: M 1006A

DATE: 19.9.97

ATTENTION: GRAHAM LEE

SAMPLE DETAILS SAMPLE A - 300E, 500E, 700E
SAMPLE B - REMAINING 18 SAMPLES

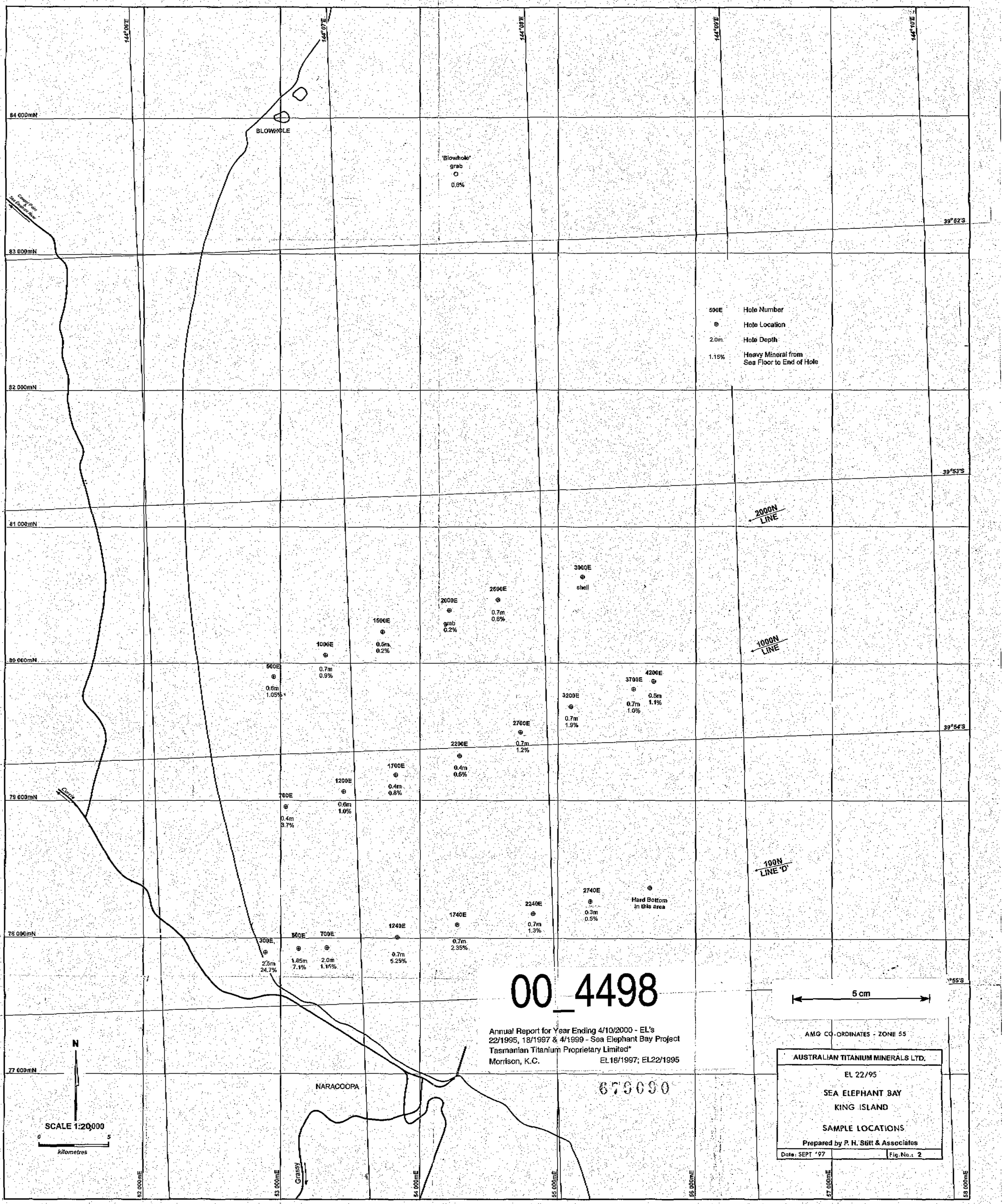
POINT COUNT RESULTS FOR XENOTIME & MONAZITE
U.V. LIGHT EXAMINATION FOR SCHEELITE

Results for the point counts are given as volume %. Where a mineral was observed but no points were actually counted, this is reported as 0/Total number of points.

MINERAL	"A" FRACTIONS			
	Mags 1+2	Mags 3	N/M 1	N/M 2+3
Xenotime	<1%	N.D.	N.D.	N.D.
Number of points	1/567			
Monazite	<1%	<1%	<1%	<1%
Number of points	1/567	0/549	0/584	0/522
Scheelite	Not tested	Not tested	N.D.	N.D.

MINERAL	"B" FRACTIONS			
	Mags 1+2	Mags 3	N/M 1	N/M 2+3
Xenotime	<1%	<1%	N.D.	<1%
Number of points	0/511	1/524		0/505
Monazite	<1%	1%	1%	<1%
Number of points	1/511	6/524	8/547	2/505
Scheelite	Not tested	Not tested	N.D.	N.D.

J. McNULTY
PETROLOGIST



00_4498

Annual Report for Year Ending 4/10/2000 - EL's 22/1995, 18/1997 & 4/1999 - Sea Elephant Bay Project
Tasmanian Titanium Proprietary Limited*
Morrison, K.C. EL18/1997; EL22/1995

6790090

Appendix 3

A.S.JAMES LTD.
A.C.N. 004 584 534
Geotechnical Engineers
SINCE 1963

15 Libbett Avenue
Clayton South Vic 3169
Tel: 9547 4811
Fax: 9547 5393

679092

1. INTRODUCTION

1.01 Investigation Requested By: The geotechnical investigation was commissioned by Mr Lyndon Stephenson of Stephenson EMF Consultants in correspondence with Reference 12736, dated December 11, 1996.

1.02 Purpose of Investigation: It is proposed by the Marine Board of King Island to upgrade and extend the existing jetty structure located at Naracoopa on the east coast of King Island and it was required to forecast foundation conditions and recommend design parameters for the proposed driven piles which will support the jetty extension.

At the time of preparing this report, other than that the Naracoopa Jetty is to be extended by approximately 140 metres out to sea and that the maximum working load for the proposed piles is to be in the order of 1500 kN, the precise details of the proposed extension and jetty upgrade were not known. It has therefore been assumed for the purpose of this report that no unusual loads or performance specifications apply.

1.03 Geology: The Geological Survey of Tasmania, 1:506,880 Series indicates the Naracoopa Jetty to be underlain by coastal sand deposits which are of the Quaternary age. At depth the sand deposits are known to be underlain by siltstone and sandstone deposits which are of the Precambrian age. The siltstone and sandstone deposits are known to extend to significant depths.

1.04 Field Methods: The borehole was constructed using a trailer mounted Gemco 210B drilling rig in conjunction with rotary wash boring methods which utilised both 90 and 120 millimetre diameter casing. A 75 millimetre diameter blade bit was used for the rotary was boring.

All soil types encountered in the borehole were logged in accordance with Australian Standard AS 1726 - 1993, "Geotechnical Site Investigations."

Standard penetration testing was carried out in both the granular deposits and in cohesive deposits which were too hard to be sampled using conventional undisturbed sampling techniques. All standard penetration tests were conducted in accordance with the test procedure outlined in Australian Standard 1289, "Methods of Testing Soils For Engineering Purposes," Test Method F3.1, June 1977.

2. RESULTS

2.01 Borehole Location: A single borehole was drilled through the deck of the existing jetty structure, some 10.0 metres from the eastern end of the jetty and some 2.5 metres from the northern side of the jetty.

2.02 Sub-Surface Soil Profile: The log of the borehole together with the results of the standard penetration testing carried out at 1.0 to 2.0 metre increments are given on Figures 1 and 2.

The drilling program completed showed the anticipated soil profile with the existing jetty structure being underlain by dense silty sand which contained occasional thin bands of gravel. Typically, the sand was of a medium grading. At a depth of approximately 2.4 metres below the sea bed, the silt and gravel content of the sand diminished, while the density of the sand increased markedly from dense to very dense.

The anticipated residual Precambrian clay was encountered beneath the sand deposits at a depth of approximately 11.80 metres below the sea bed. Typically, the clay was both silty and sandy, occasionally containing dense to very dense lenses of medium coarse clayey sand. For most part the residual clay was of a very stiff to hard consistency throughout, and with the exception of the presence of a minor amount of highly weathered siltstone within the clay at depths in excess of 16.6 metres, the residual clay persisted to the programmed termination depth of 20.0 metres below the sea bed.

3. RECOMMENDATIONS

3.01 Piled Footings: In view of the depth and density of the sand deposits underlying the existing jetty, it is advised that the use of the proposed driven steel piles represents a feasible method of support for the proposed jetty extension. It should be noted however, in dense sands, the vertical load carrying capacity of a pile is significantly increased by utilising the end bearing capacity of a closed end pile.

3.02 Vertical Pile Loads: Whilst it is recommended that piling contractors should make their own assessment of piling conditions based on the borehole and standard penetration test results, as a conservative guide, the following upper and lower bound side friction and end bearing capacities could be used for the preliminary proportioning of driven steel piles which have a rough surface:

- Ultimate Skin Friction - Lower bound = 8L kPa
  Upper bound = 19L kPa
  where L is the embedded length of the pile.
  (Note: The ultimate skin friction should not exceed 100 kPa)

- Ultimate Base Resistance - Lower bound = 1.8L MPa
  Upper bound = 2.3L MPa
  where L is the embedded length of the pile.
  (Note: The ultimate base resistance of a pile should not exceed 10 MPa)

3.03 Laterally Loaded Piles: The ultimate lateral resistance H_u of a free-head pile driven into the dense to very dense sand is given by the lesser of:

$$H_u = \frac{\gamma d L^3 \tan^2(\frac{1}{4}\pi + \frac{1}{2}\phi)}{2(e + L)}$$

and the value of H_u is given by the solution to the following equation:

$$H_u \left\{ e + 0.54 \sqrt{\left[\frac{H_u}{d\gamma \tan^2(45 + \frac{1}{2}\phi)} \right]} \right\} = M_y$$

where

e = Eccentricity of applied load above ground line
M_y = Yield moment of pile section
d = Pile diameter
L = Embedded length of pile
ϕ = Angle of internal friction of soil (Adopt $\phi = 44^0$)
γ = Bulk unit weight of soil (Adopt $\gamma = 21$ kN/m^3)

3.04 General: The above recommendations are based on the bore and test results together with experience of similar conditions and are expected to be typical of the area or areas being considered. Nevertheless, all work associated with the driving of the piles should be examined carefully and any unusual feature reported to us in order to determine whether any changes might be advisable.

T.J. Holt MIEAust CPEng EC-1022
A.S. JAMES PTY LTD

A.S. JAMES PTY. LTD.
Geotechnical Engineers

BORE NO: 1 (SHEET 1 OF 2)

679096

JOB NO: 81048 DATE: 06-Feb-97

Appoximate Height of Jetty Deck Above Sea Level = 4.8 metres (11.00am 3/2/97)

Appoximate Height of Jetty Deck Above Sea Bed = 12.8 metres

LOG OF BOREHOLE

Description		Depth (metre)		Sample or Test	Results
SAND	- Grey with Bands of Dark Grey - Silty - Occasional Gravelly Bands - Medium Grading - Wet - Dense	SM	0.00	+	All Depths Measured From Sea Bed N = 12 / 18 / 21
SAND	- Grey with Bands of Grey Brown & Dark Grey - Slightly Silty - Medium Grading - Wet - Dense	SP / SM	1.40	+	N = 12 / 15 / 22
SAND	- Grey & Light Grey with Occasional Grey Brown Bands - Medium Grading - Wet - Very Dense	SP	2.40	+ +	N = 17 / 27 / 35 N = 26 / 40 / 36
				+	N = 12 / 34 / 50
				+	N = 24 / 46 / 52
				+	N = 19 / 41 / 55
				+	N = 17 / 37 / 44
				+	N = 51 / 57 / 60
LOG OF BOREHOLE 1 CONTINUED ON FIGURE 2			10.00	+	N = 49 / 53 / 50

+ Standard Penetration Test - N blows/150mm, incr
I Undisturbed Sample - Diameter Stated
s Vane Shear Strength
p Pocket Penetrometer Resistance

c Apparent Cohesion
0 Friction Angle
P Wet Density
w Moisture Content

L.L. Liquid Limit
P.L. Plastic Limit
P.I. Plasticity Index
L.S Linear Shrinkage

FIGURE 1

A.S. JAMES PTY. LTD.

Geotechnical Engineers

LOCATION: NARAWOOPA JETTY, KING ISLAND, TASMANIA 679097

BORE NO: 1 (SHEET 2 OF 2)

JOB NO: 81048 DATE: 06-Feb-97

Appoximate Height of Jetty Deck Above Sea Level = 4.8 metres (11.00am 3/2/97)

Appoximate Height of Jetty Deck Above Sea Bed = 12.8 metres

LOG OF BOREHOLE

Description		Depth (metre)	Sample or Test	Results
SAND	- Grey & Light Grey with Occasional Grey Brown Bands - Medium Grading - Wet - Very Dense SP	10.00	+	N = 49 / 53 / 50
			+	N = 55 / 64 / 61
CLAY	- Grey, Light Brown & Red Brown - Sandy - Slightly Silty - Low Plasticity - Moist - Very Stiff to Hard CL	11.80	+	N = 9 / 21 / 39
			+	N = 19 / 48 / 59
CLAY	- Light Grey with Trace Yellow Brown - Lenses of Medium Coarse Clayey Sand - Low Plasticity - Moist, Hard CL	14.40		
CLAY	- Light Grey with Yellow Brown - Silty - Slightly Silty - Low Plasticity - Moist - Hard CL	15.40	+	N = 20 / 36 / 47
CLAY	- Light Grey with Yellow Brown - Silty - Sandy - Minor Highly Weathered Siltstone Content - Low Plasticity - Moist - Hard CL	16.60	+	N = 23 / 41 / 46
END OF BOREHOLE		20.00	+	N = 16 / 38 / 40

+ Standard Penetration Test - N blows/150mm, incr.
I Undisturbed Sample - Diameter Stated
s Vane Shear Strength
p Pocket Penetrometer Resistance

c Apparent Cohesion
0 Friction Angle
P Wet Density
w Moisture Content

L.L. Liquid Limit
P.L. Plastic Limit
P.I. Plasticity Index
L.S. Linear Shrinkage

FIGURE 2

A.S.JAMES PTY. LTD.
A.C.N. 004 584 534
Geotechnical Engineers
SINCE 1963

15 Libbett Avenue
Clayton South Vic 3169
Tel: 9547 4811
Fax: 9547 5393

679098

APPENDIX 1

BASIC DRILLING, SAMPLING & TESTING METHODS

---

1. DRILLING

a) Augering - Nominal 125mm dia. continuously flighted Augers used with Mechanical Rigs and 100mm Jarrett Augers in hand drilling.

b) Wash Boring - In conjunction with 75mm i.d. casing and employed when the bore may collapse or when ground water has to be controlled.

c) Core Drilling - Standard core barrels are NMLC triple tube face discharge cutting a nominal 50mm dia. core. Diamond set bits are normally used.

2. IN-SITU TESTING

a) Standard Penetration Test
- The number of blows of a 63.5kg drop weight falling 760mm required to drive a standard 50mm o.d. sampler through a distance of 300mm after an initial penetration of 150mm. Recorded in 150mm increments.

b) Vane Tests - Measures the in-situ shear strength of clays and silts by recording the torque required to cause a vane of cruciform section to shear the soil.

c) Dynamic Cone (325 sq. mm)
- Records the penetration resistance of a 325 sq. mm cross section 60° cone driven by a 9kg weight falling 510mm.

3. UNDISTURBED SAMPLERS

a) Plastic Lined Composite
- An open ended sampler wherein a 64mm dia. sample is retained in a removable clear plastic tube.

b) Shelby Tubes - Open ended thin wall steel tubes which are pushed or driven into the soil. The most common size is 38mm dia.

4. LABORATORY TESTING
- Carried out in accordance with A.S. 1289.

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APPENDIX 2

MAJOR DIVISIONS				GROUP SYMBOL	GRAPHIC SYMBOL	TYPICAL NAME	DESCRIPTIVE DATA
COARSE-GRAINED SOILS	More than 50% by dry mass, less than 60mm is greater than 0.06mm	GRAVELS	More than 50% of coarse grains are greater than 2.0mm	GW		Well graded gravels and gravel-sand mixtures, little or no fines	Give typical name, indicate approximate percentages of sand and gravel, maximum size, angularity, surface condition and hardness of the coarse grains, local or geological name and other pertinent descriptive information, symbols in parenthesis For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics EXAMPLE Silty Sand, gravelly, about 20% hard, angular gravel particles, 10mm maximum size, rounded and sub-angular sand grains coarse to fine, about 15% non-plastic fines with low dry strength, well compacted and moist in place, light brown alluvial sand (SM)
				GP		Poorly graded gravels and gravel-sand mixtures, little or no fines	
		GRAVELLY SOILS		GM		Silty gravels, gravel-sand-silt mixtures	
				GC		Clayey gravels gravel-sand-clay mixtures	
		SANDS	More than 50% of coarse grains are less than 2.0mm	SW		Well graded sands and gravelly sands, little or no fines	
				SP		Poorly graded sands and gravelly sands, little or no fines	
		SANDY SOILS		SM		Silty sand, sand-silt mixtures	
				SC		Clayey sands, sand-clay mixtures	
FINE-GRAINED SOILS	More than 50% by dry mass, less than 60mm is less than 0.06mm	Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, colour in wet condition, odour if any, local or geological name and other pertinent descriptive information, symbols in parenthesis For undisturbed soil add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions EXAMPLE Clayey Silt, brown, low plasticity, small percentage of fine sand, numerous vertical root-holes, firm and dry in place, till (ML)
				CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
				OL		Organic silts and organic silty clays of low plasticity	
		Liquid Limit more than 50%		MH		Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
				CH		Inorganic clays of high plasticity, fat clays	
				OH		Organic clays of medium to high plasticity	
				Pt		Peat muck and other highly organic soils	

NOTES:

1. The above table follows the original Unified Classification System (USBR Earth Manual) and ASTM D 2487 except that it adopts the particle size limits given in AS 1289 and other standards, viz:

Gravel	2 to 60 mm
Sand	0.06 to 2 mm
Silt and clay	< 0.06 mm

The system excludes the boulder and cobble fractions of the soil and classifies only the material less than 60 mm in size.

UNIFIED SOIL CLASSIFICATION SYSTEM (METRICATED)
DATA FOR DESCRIPTION, INDENTIFICATION AND CLASSIFICATION OF SOILS

Appendix 4

HYDROGRAPHIC SURVEY

FEBRUARY, 1997

MAPPING & HYDROGRAPHIC SURVEYS PTY LTD
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East Brisbane 4169
AUSTRALIA

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Fax : 61 7 3899 1515

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MALAYSIA

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Fax : 60 3 202 3489

CONTENTS

SURVEY REPORT

679103

1.0 INTRODUCTION

Mapping and Hydrographic Surveys Pty Ltd was commissioned to undertake a hydrographic investigation survey comprising bathymetry and marine seismic profiling of an area covering the proposed extension to the Naracoopa jetty to enable engineering design and an area covering the approaches to the jetty for the safe navigation of ships utilising the facility.

2.0 LOGISTICS

The survey was mobilised by road from MHS Brisbane office to Melbourne and by Bass Strait shipping service to King Island, delivering MHS vehicle heavily loaded with survey equipment to King Island.

A local 7 metre dive charter boat was engaged initially however weather conditions prevented access to the site from Grassey by sea and lack of facilities prevented safe launching and retrieval of the boat at Naracoopa at necessary timing.

Strong easterly weather conditions hampered the progress of the survey from arrival on King Island on 9 February until 24 February 1997 when the weather turned south westerly.

A local 14 metre fishing vessel had been arranged with a promise of a weather change and it was quickly mobilised on the morning of 24 February and was on site by 1200 hours the same day. Although the wind was south west at 25 knots, the site was then protected. The survey continued through the night in fear of a threatening wind shift back to the east and was completed by the following morning.

3.0 EQUIPMENT

Survey vessel -	Chartered 14 metre fishing vessel *PICIES*
Positioning System -	Sub metre Real Time Differential GPS - G12 Ashtech
Navigation System -	MHS in house developed *JANUS* dedicated precision navigation and data logging system providing line control and real time quality control of position and data logged.
Echo Sounder -	Raytheon DE719C precision survey sounder, calibrated by 'Bar

Check' prior to commencement of survey - accuracy + 0.05 metres.

Tide Gauge - Digital Yeokal Pressure Gauge. Damping by the mean of 15 readings over one minute - Recording period 10 minutes - accuracy 0.05 metres.

Marine Seismic - Scheidegg Research *BOOMER* catamaran powered by a modified EG & G 234 Energy Source - output 100 to 300 joules - firing rate 4 PPS from external trigger. Return signal received via an 11 element Hydrophone Array and recorded to an EPC 1600 line scan recorder using a 70 millisecond time base.

4.0 SURVEY DATUMS

4.1 Horizontal Datum

Horizontal Datum adopted for this survey is Australian Geodetic Datum 1966 (AGD66) Zone 55 - Australian Map Grid (AMG) based on the survey control permanent survey mark PSM 281/160 at the base of the Naracoopa Jetty with Co-Ordinates 254268.281 East and 5576981.339 North. Station summary for PSM 281/160 included as Appendix 1 to this report.

4.2 Vertical Datum

Vertical Datum adopted for this survey is Lowest Astronomical Tide (LAT) derived from fifteen days tidal observations at Naracoopa Jetty with analysis and comparison of data over the same period from standard tide gauge at Burnie Tasmania.

The analysis of the tidal data was undertaken by the National Tidal Facility (NTF), Flinders University Adelaide and their report is included as Appendix 2 to this report.

Adjusted values of tidal plains at Naracoopa based on LAT as Zero are -

HAT	MHWS	MHWN	MSL	MLWN	MLWS	LAT
2.51	1.98	1.71	1.23	0.76	0.48	00

It should be noted that the value of Australian Height Datum (AHD) on PSM 281/160 is stated as RL 4.96 where as the Mean Sea Level (MSL) reduced level of PSM 281/160 based on the 15 day tidal analysis is 4.63 - a difference of 0.33 metres.

AHD on King Island was established many years ago and it is not known what methods were used or to what degree of accuracy the transfer of AHD was measured.

5.0 BATHYMETRY

Bathymetry for navigation approaches was surveyed along pre-calculated parallel lines at 25 metre spacing over an area 750 metres either side of the jetty head and 750 metres seawards normal to the contour. Cross check lines were surveyed at 100 metre line spacing and agreement between primary lines and cross check lines is within specification.

Bathymetry and Marine Seismic Profiling for engineering design was surveyed along pre-calculated parallel lines at 10 metre spacing over an area 125 metres either side of the jetty head and 250 metres to seaward parallel to the contour. Cross check lines were surveyed at 50 metre spacing normal to the contour. Bathymetry over this area was carried out concurrently with Marine Seismic Profiling.

Due to the long preceding period of unworkable weather conditions the survey lines over this area were reduced from 5 metre line spacing to 10 metre spacing and work continued through the night.

6.0 PROCESSING

On return to MHS Brisbane Office the raw survey data was processed in the following manner:

Tidal data examined, edited where necessary and dispatched to the National Tidal Facility, Flinders University, Adelaide for Analysis.

Raw sounding data examined, edited where necessary and track plots and preliminary sounding plans produced on the arbitrary datum of the raw tide gauge data.

Track plots, preliminary sounding plans and raw data Seismic Records dispatched to Coffey Partners International Pty Ltd (CPI) Sydney Office for interpretation of seismic data.

On receipt of tidal analysis and report from NTF and seismic analysis from CPI, final plans produced on LAT.

The data is examined and edited through MHS *JANUS* software then processed through Civil CAD to produce final plans on A1 size stable film media.

With consideration to all variables such as limited tidal records for tidal analysis, accuracy specifications and resolution of echo sounder and tide gauge and sea and swell conditions at site

during the survey, it is anticipated a depth accuracy of + 0.2 metres has been achieved.

Delivered with this report are 2 copies of each of 3 plans together with DXF files of final drawings and ASCH files of reduced data on 3.5 inch diskette.

7.0 MARINE SEISMIC PROFILING

The seismic interpretation was carried out by Coffey Partners International Pty Ltd and information from their report is as follows :

Vessel track plots (figure 1), seismic Boomer chart records together with computer files of track plots and preliminary sounding plots were supplied by MHS with field annotations and instructions.

From the preliminary sounding plans, the sea floor is observed to dip to the north east of the site from a depth of approximately six metres to approximately thirteen metres below datum.

A borehole log from the borehole (BH) was also supplied by MHS. This hole was drilled and logged by A.S. James Pty Ltd. The location of the borehole was also supplied. The locations of the Boomer seismic survey lines and the borehole location are shown on Figure 1.

The marine seismic data supplied by MHS is considered to be of fair quality. This appears to be a result of dense acoustically hard near-surface sediments which have limited the penetration of the seismic energy into the sub-bottom.

Interpretation of the supplied Boomer data was undertaken in a number of stages in accordance with accepted practice. The first stage of data analysis was to clearly identify the sea floor reflector on the sections. The interpreted sub-bottom reflectors where then identified and marked directly on the records using colours for correlation. The general character of the Boomer records was one of a generally sub-planar reflector close to the sea floor underlain by a steeply dipping reflector nearer the shore. A well defined "bedrock" reflector was not evident. Sub-bottom penetration was typically less than 15 millisecs (two-way time) or about 10 to 12m.

The two-way travel times for the seismic energy from the sea floor to these underlying reflectors were tabulated from the records at close intervals and the times recorded against the position fix. An average seismic velocity of 1.7km/s for the sediments was used to convert the two-way travel times to sub-bottom depths in metres. This velocity is typically used for marine sediments along the eastern Australian coastline but has not been specifically determined for this site. These calculated depths were then used, to calculate the depth below sea floor of each of the interpreted reflectors. As noted above, only fair resolution of the sub-bottom was obtained from the Boomer seismic records down to approximately 10 to 15 millisecs two-way travel time. Below this point there is no signal level on the seismic record. One shallow sub-planar reflector

(R1) is generally identifiable over much of the area surveyed and an underlying weak steeply dipping reflector (R2) is also observable over part of the site.

The results of the interpretations from the Boomer survey and interpreted sections are discussed below :

The interpreted seismic sections along Lines 2, 3, 4 and 5 which extend approximately orthogonally to the shoreline in the region of the proposed jetty is shown in Figure 2.

The drilling of a borehole (BH1) through the deck of the existing jetty adjacent to the site has indicated the presence of dense silty sand sediments with thin banks of gravel to a depth of 2.4m, overlying a very dense sand unit. A very stiff to hard residual clay was encountered at a depth of approximately 11.8m below the sea floor. This depth is beyond the effective penetration of the seismic signal and hence is consistent with the seismic sections which do not indicate the presence of definite "hard" bedrock horizon.

From the above correlations of the drilling results with the identifiable seismic reflectors it appears that the R1 reflector approximately correlates with an increase in density within the unconsolidated sediments between dense sediments and underlying very dense sands. The weak steeply dipping R2 reflector identified may correlate approximately with a very dense sand layer. Otherwise internal reflectors are absent for the sub-bottom section indicting uniformity and an overall lack of layering.

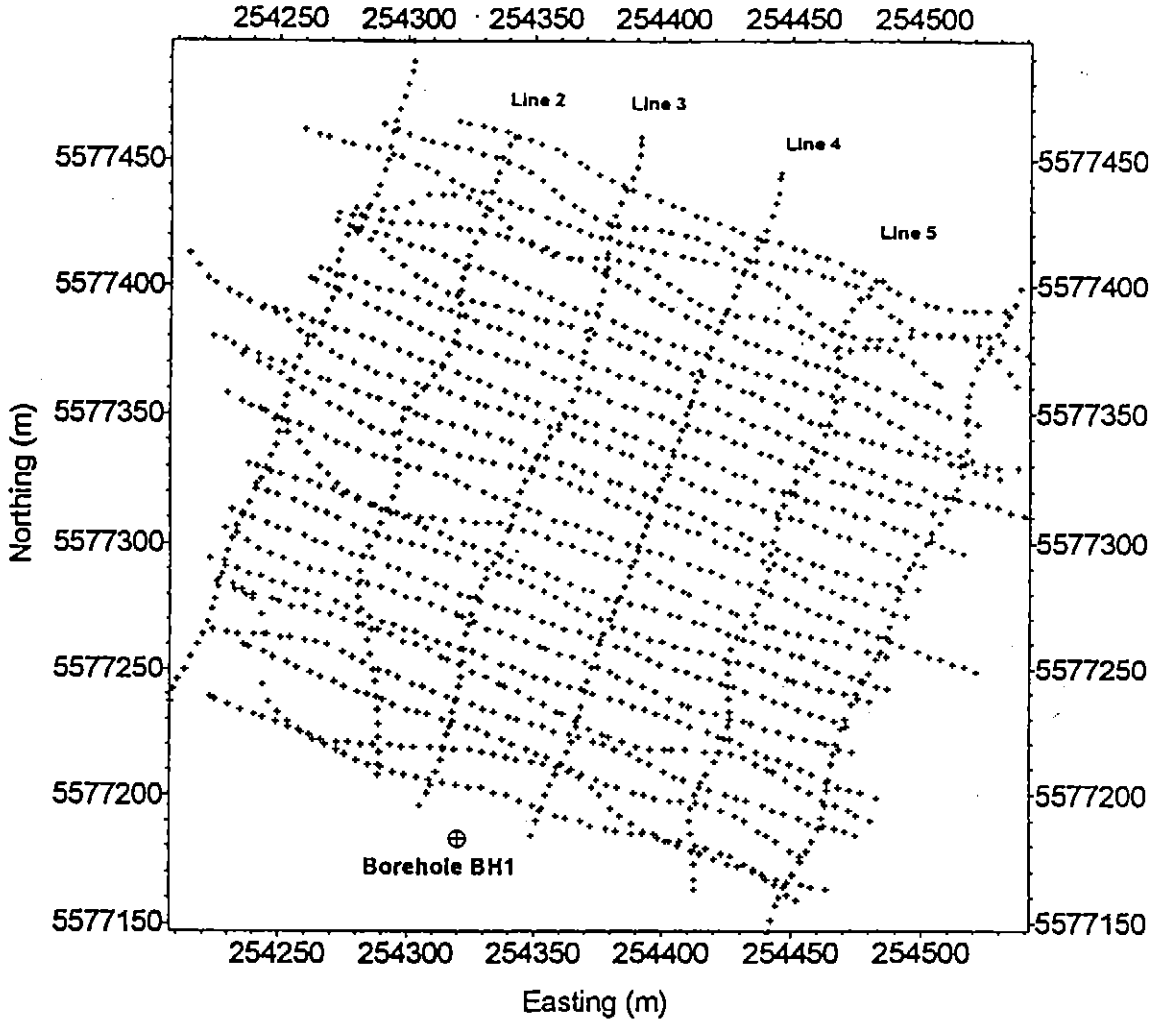
The interpreted sub-bottom depths to reflector R1 where identified are shown as a contoured plan map in Figure 3. The interpreted sub-bottom depth to reflector R2 where identified are shown as a contoured plan map in Figure 4.

7.2 CONCLUSIONS

The marine seismic reflection study within site has revealed an acoustically hard sea floor and two irregular sediment reflectors below the sea floor. The upper reflector R1 is sub-planar and is interpreted at depths between 0.5m and 2m below the sea floor. The lower reflector R2 dips steeply away from the shoreline and is generally not identifiable beyond about 10m depth.

Correlation with the available borehole which was located on the existing jetty adjacent to the survey area indicates that the two shallow reflectors identified may represent density interfaces within the dense sandy sediments which otherwise lack internal reflectors suggest relative uniformity.

The drilling in-shore of the marine seismic lines has indicated the presence of very stiff residual clay unit at a depth of 11.8m which is generally at depths beyond which reflectors are observable on the seismic records. This is consistent with the seismic sections which do not indicate the presence of a definite "hard" bedrock horizon within the depth of penetration of the seismic signal.



5 cm

Coffey Partners International Pty Ltd

Consulting Engineers, Managers, and Scientists
- Environment - Geotechnics - Mining - Water Resources

A.C.N. 033 692 019

drawn	PF
approved	
date	22 Apr 1997
scale	1:3000

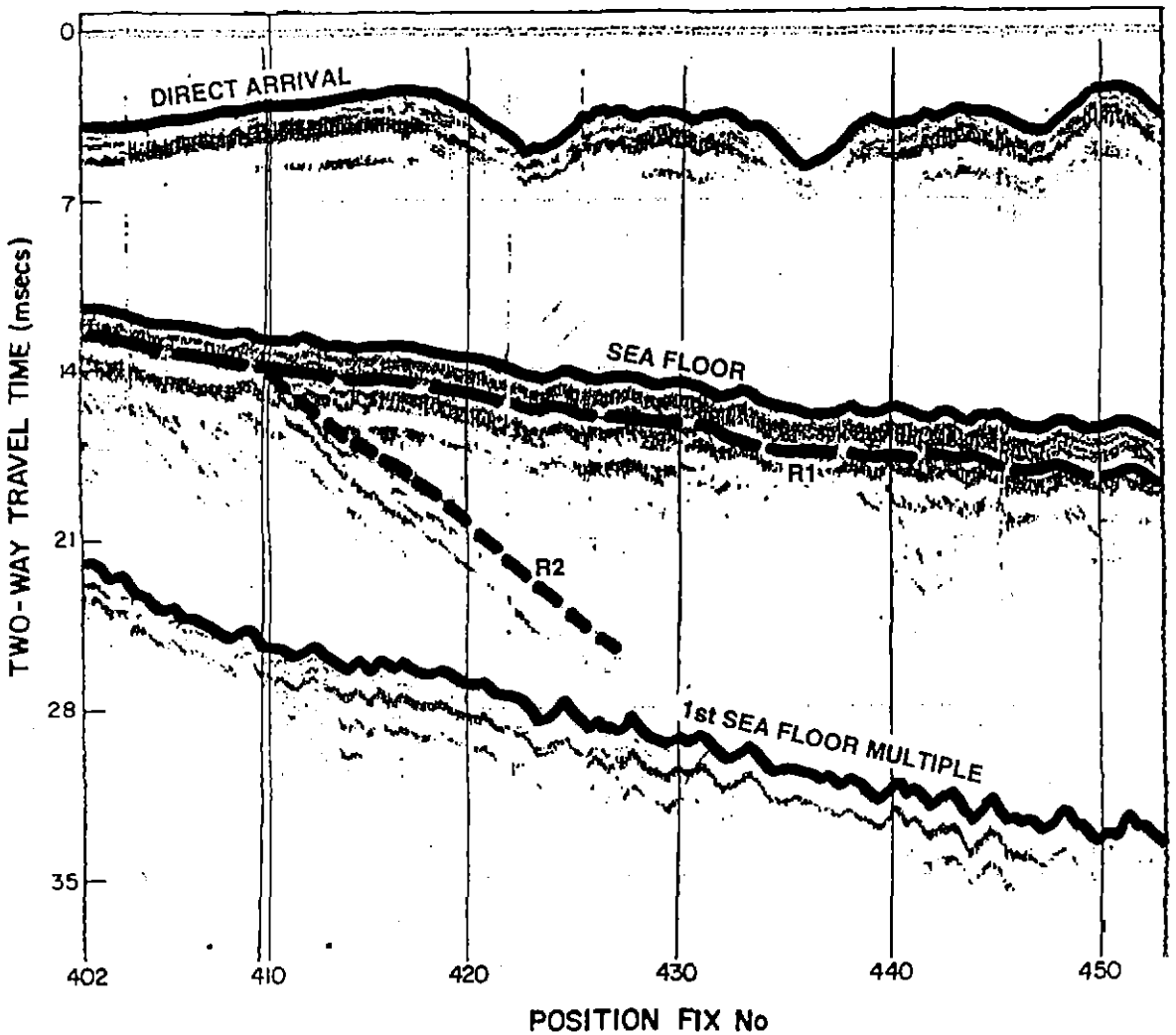
MAPPING & HYDROGRAPHIC SURVEYS
NARACOOPA JETTY, KING ISLAND
SEISMIC SURVEY
VESSEL TRACK PLOT

COFFEY

FIGURE 1

job no: GY589/1

LINE No. 2



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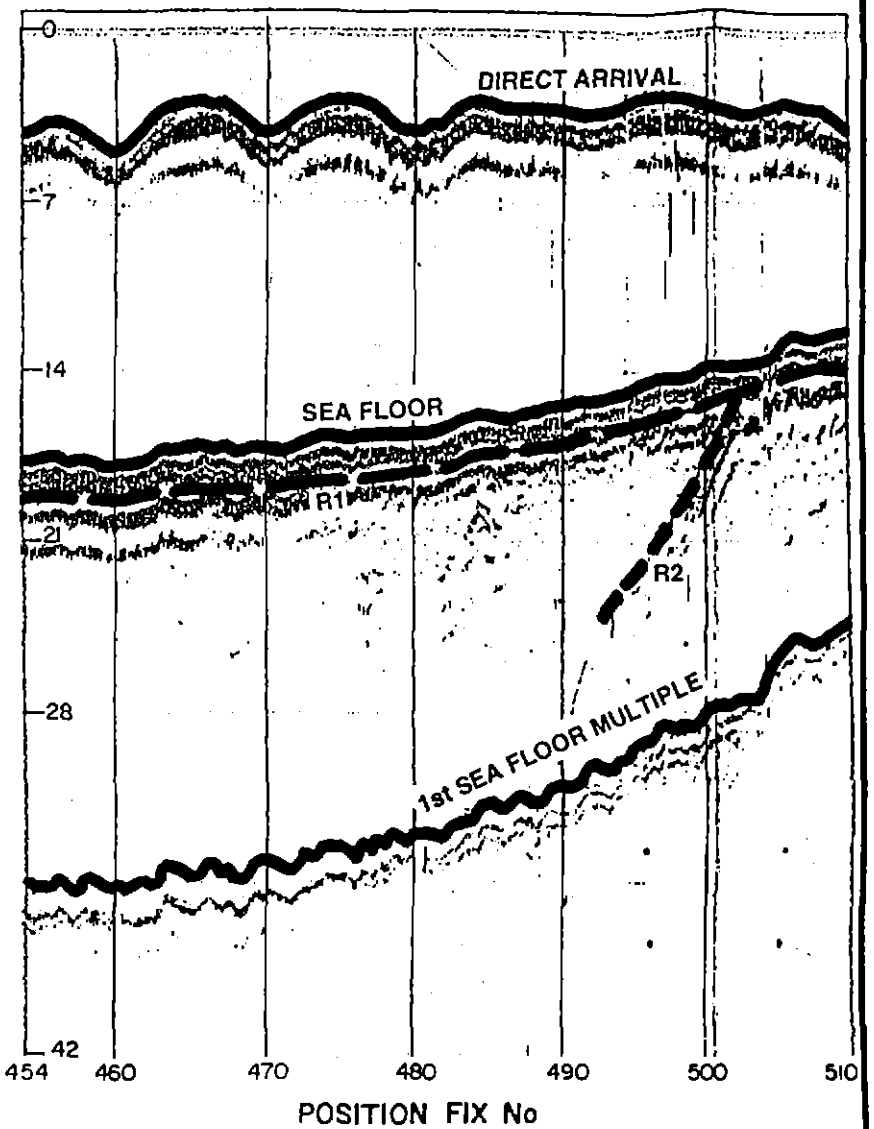
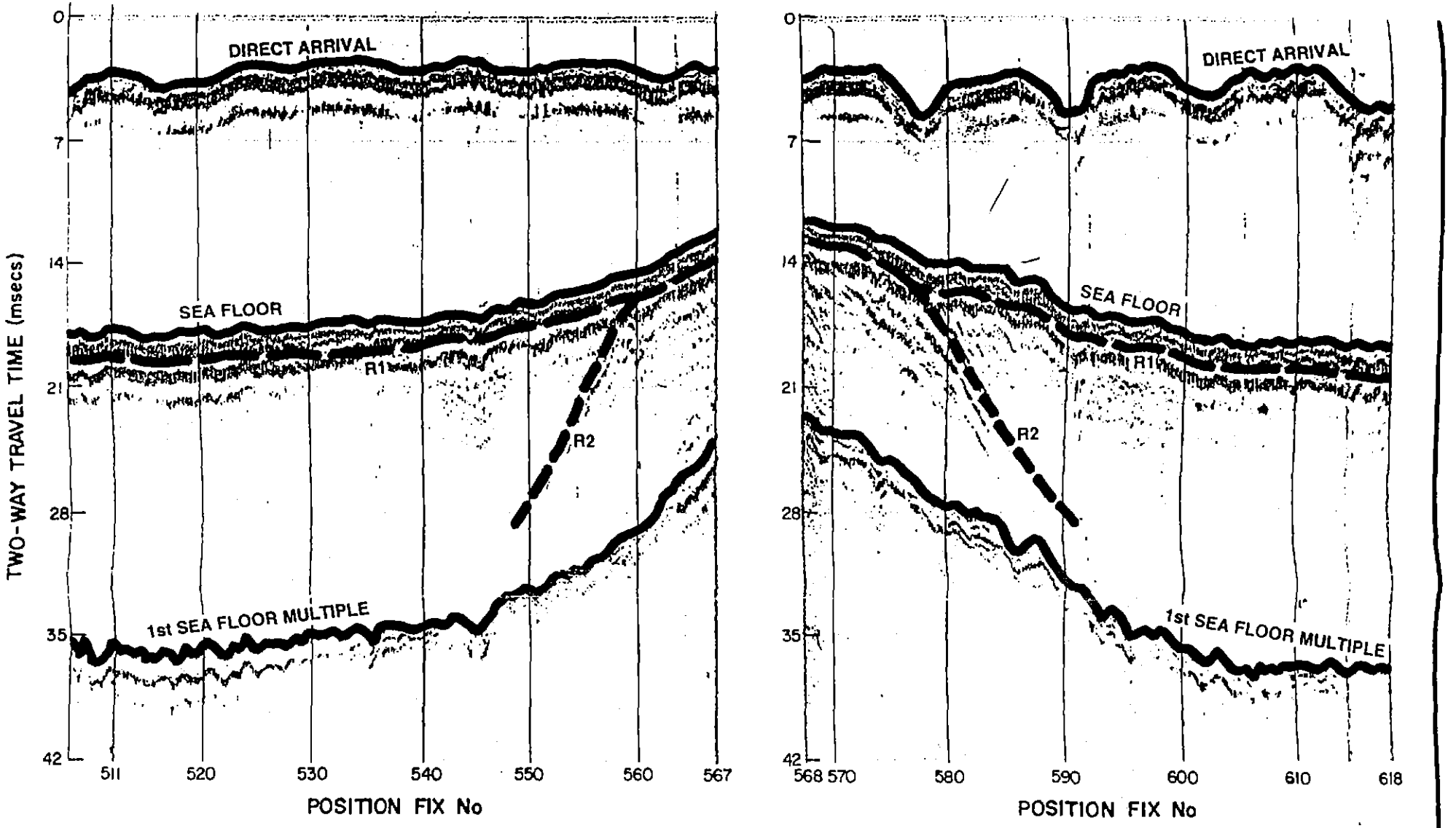


LINE No. 4

LINE No. 5

6791110



Coffey Partners International Pty Ltd Consulting Engineers in the geotechnical sciences
Incorporated in NSW

scale (metres)

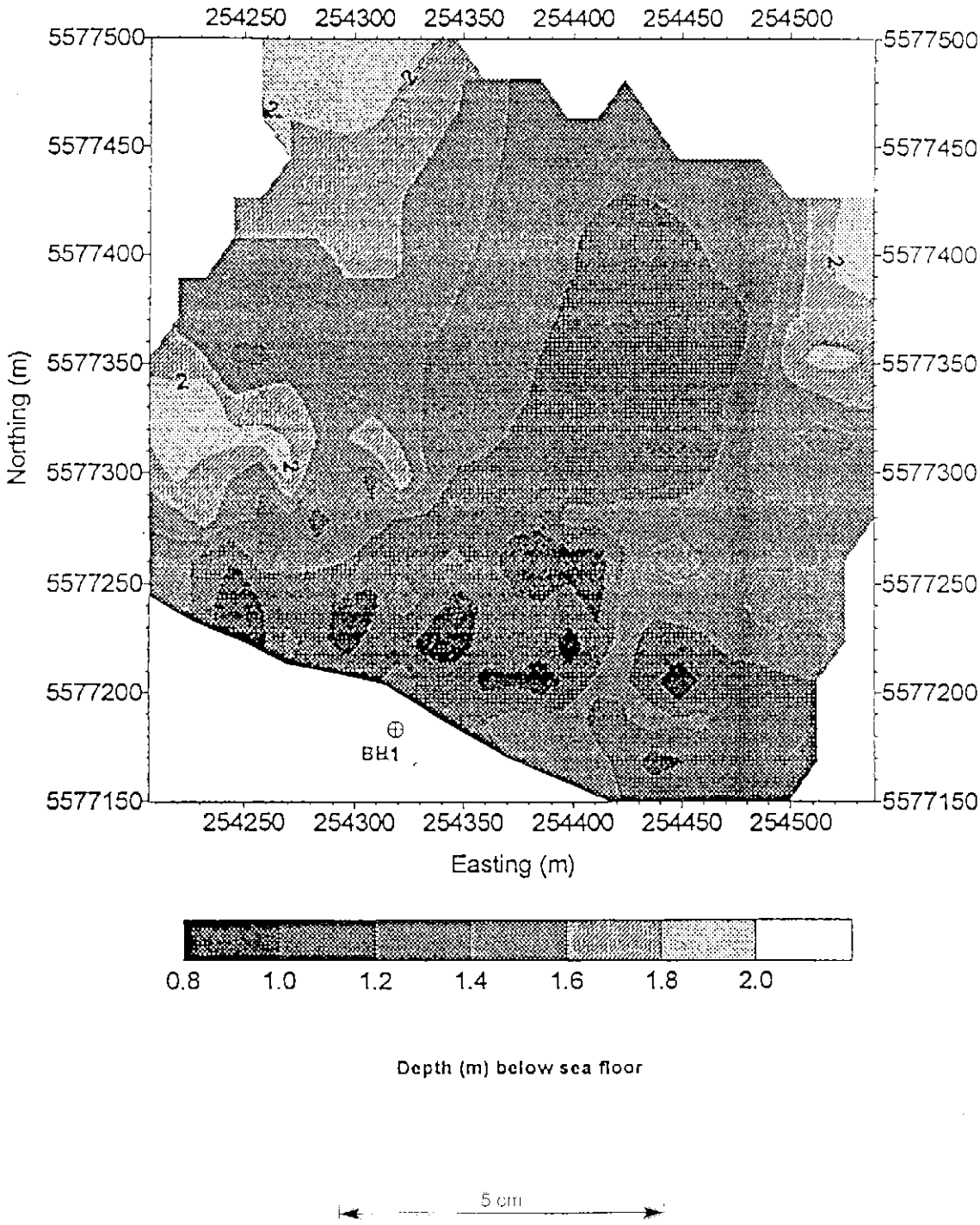
drawn	PF/SW
checked	P.F.
date	22.4.97.

MAPPING & HYDROGRAPHIC SURVEYS
NARACOOPA JETTY, KING ISLAND
SEISMIC SURVEY
INTERPRETED SEISMIC SECTIONS
LINES 2, 3, 4 & 5

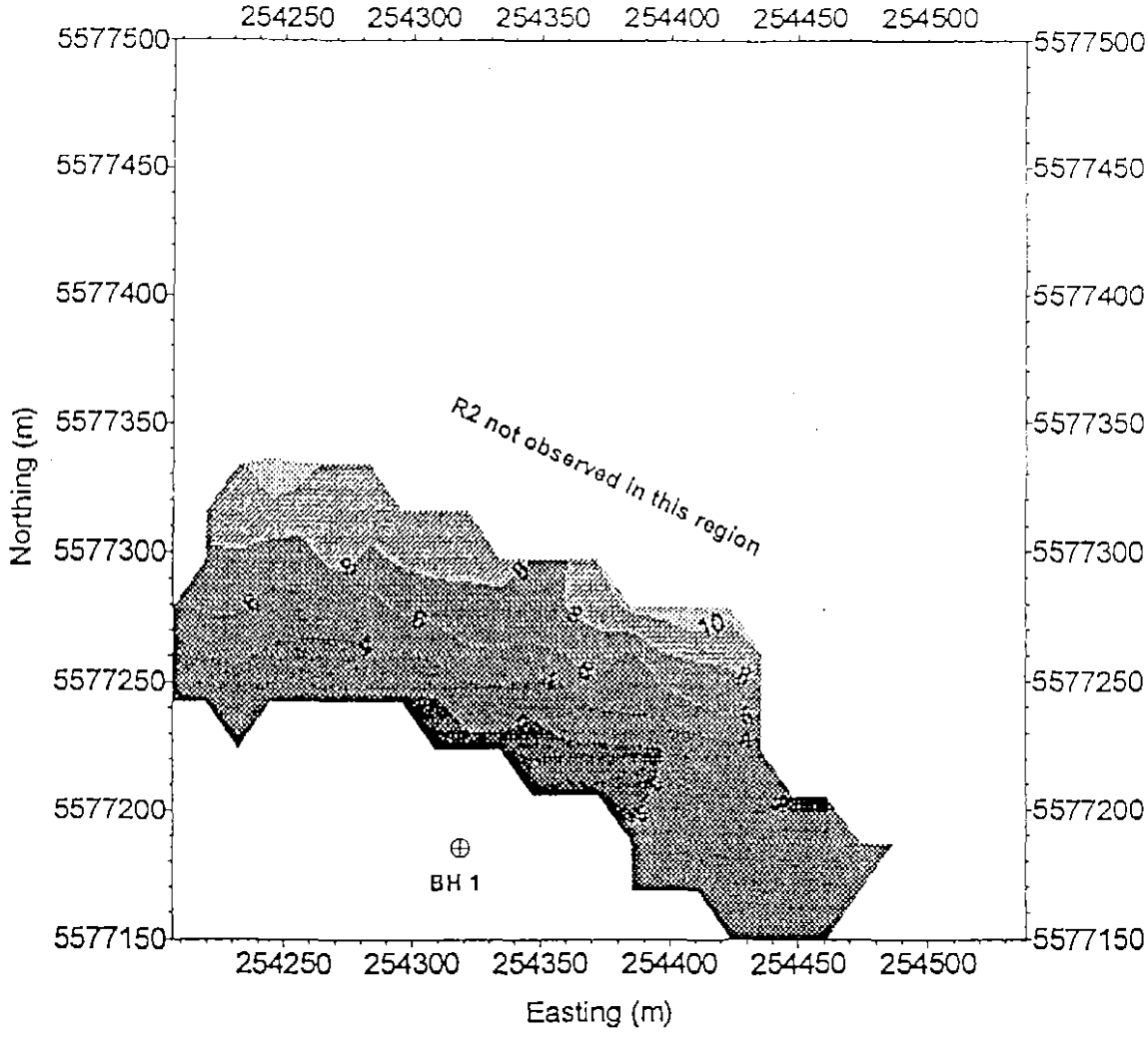
COFFEY

FIGURE 2

job no GY589/1



Coffey Partners International Pty Ltd		Consulting Engineers, Managers, and Scientists - Environment - Geotechnics - Mining - Water Resources A.C.N. 003 692 019		
drawn	PF	MAPPING & HYDROGRAPHIC SURVEYS NARACOOPA JETTY, KING ISLAND SEISMIC SURVEY DEPTH TO R1 REFLECTOR (m BELOW SEA FLOOR)	COFFEY	FIGURE 3
approved				
date	22 Apr 1997			
scale	1:3000			job no: GY589/1

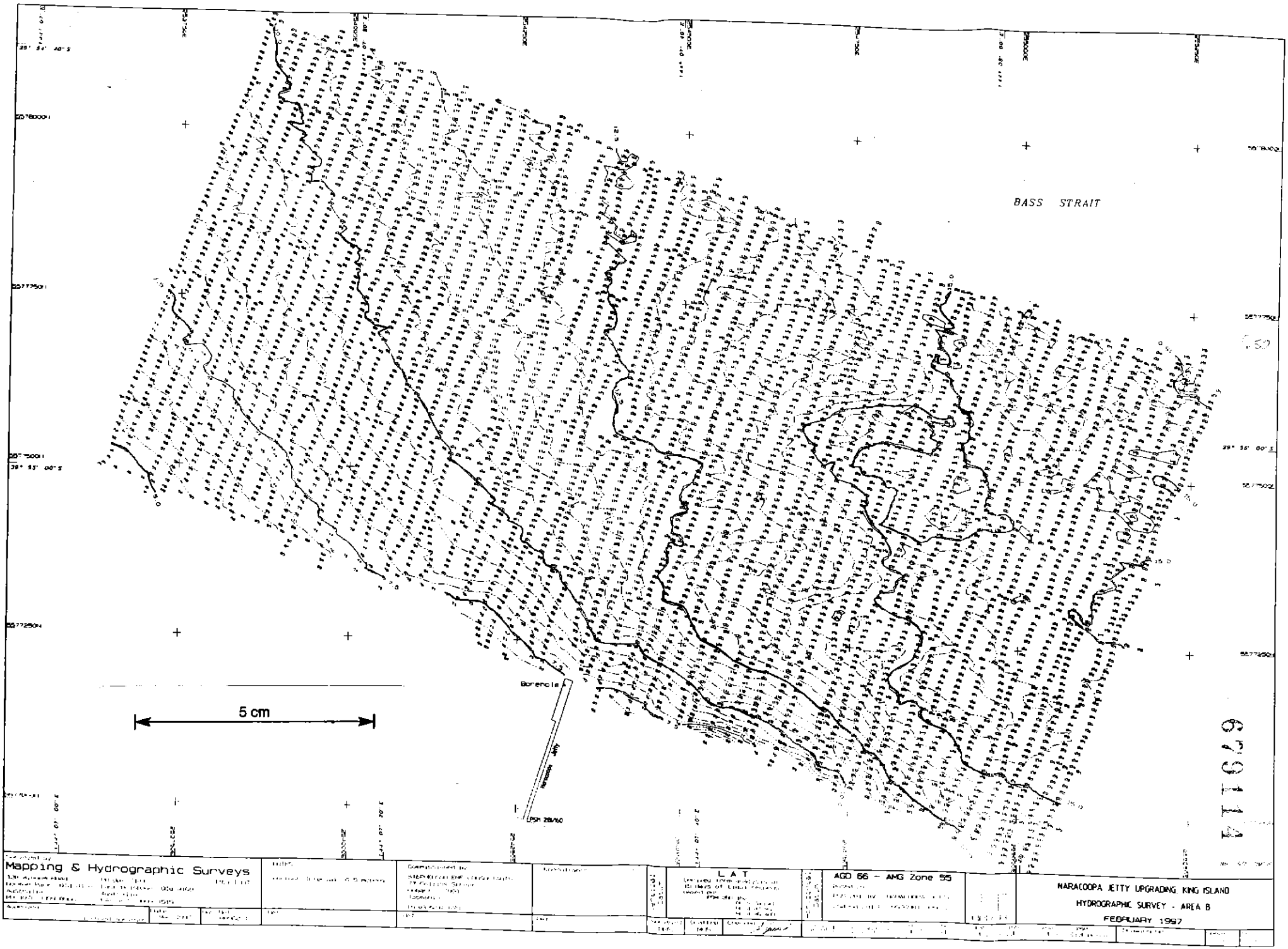


Coffey Partners International Pty Ltd	Consulting Engineers, Managers, and Scientists - Environment - Geotechnics - Mining - Water Resources	A.C.N. 003 602 019

drawn	PF	MAPPING & HYDROGRAPHIC SURVEYS NARACOOPA JETTY, KING ISLAND SEISMIC SURVEY DEPTH TO R2 REFLECTOR (m BELOW SEA FLOOR)	COFFEY	FIGURE 4
approved				
date	22 Apr 1997			
scale	1:3000			job no: GY589/1

APPENDIX 1

STATION SUMMARY PSM 281/160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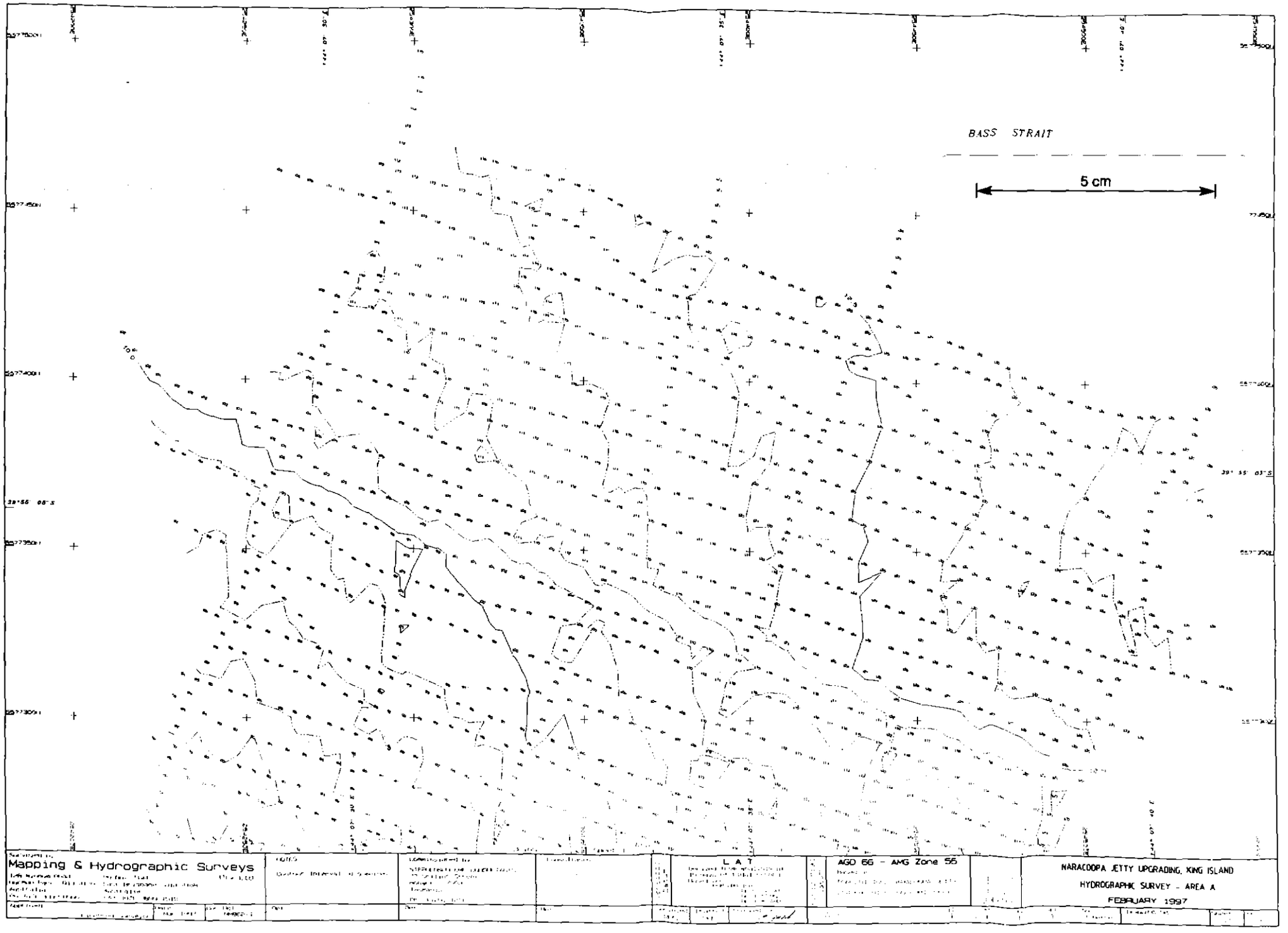
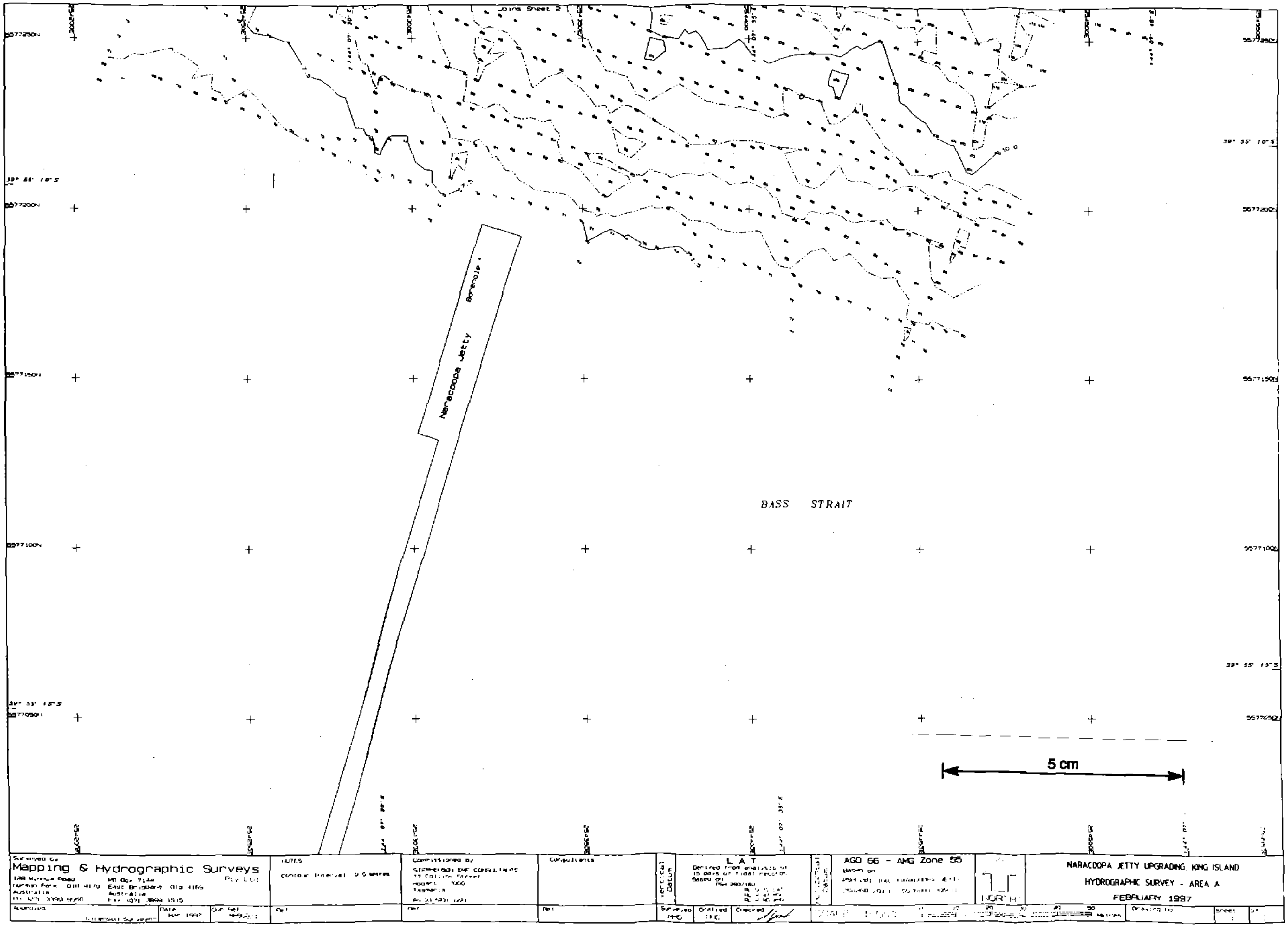
Borehole
5 cm
Mapping & Hydrographic Surveys
LAT
AGD 66 - AMG Zone 55
MARACOOPA JETTY UPGRADING, KING ISLAND
HYDROGRAPHIC SURVEY - AREA B
FEBRUARY 1997
ATT649


BASS STRAIT
5 cm
Mapping & Hydrographic Surveys
L A T
AGD 66 - AMG Zone 55
NARACOOPA JETTY UPGRADING, KING ISLAND
HYDROGRAPHIC SURVEY - AREA A
FEBRUARY 1997


Joins Sheet 2
Naracoopa Jetty
Borehole
BASS STRAIT
5 cm
Mapping & Hydrographic Surveys Pty Ltd
Contour interval 0.5 metres
Commissioned by
Consultants
Vertical Datum
L A T
Derived from analysis of 15 days of tidal records
AGD 66 - AMG Zone 55
NORTH
NARACOOPA JETTY UPGRADING KING ISLAND
HYDROGRAPHIC SURVEY - AREA A
FEBRUARY 1997
Surveyed
Drafted
Checked
Metres
Sheet