

PETER H. STITT & ASSOCIATES PTY. LTD.
MINING AND GEOLOGICAL CONSULTANTS

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E.L. 49/86

Relinquishment Report on Exploration Completed in the
Pieman River-Sandy Cape Area, West Coast, Tasmania

Prepared for National Mineral Sands Pty. Ltd.

AMG REFERENCE POINTS ADDED

A. Dove
December, 1988

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DISTRIBUTION LIST

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File

02

CONTENTS
S Y N O P S I S

	Page
1. AIM	1
2. REASON	1
3. SUMMARY & CONCLUSIONS	1
4. RECOMMENDATION	2
R E P O R T	
5. INTRODUCTION	3
6. TENEMENT INFORMATION	5
7. AERIAL PHOTOGRAPHY INTERPRETATION	6
8. FIELD INVESTIGATIONS	7
8.1 Survey	7
8.2 Drilling	7
8.3 Traverse Line Summaries	8
9. LABORATORY INVESTIGATION	9
10. DISCUSSION	11
11. APPENDIX	14

SYNOPSIS

1. AIM

To examine the Tasmanian west coast between Ahrberg Bay and Sandy Cape for economic heavy mineral sand occurrences.

2. REASON

Recent increases in the price of mineral sand commodities, particularly rutile and zircon, has been caused by shortages of supply. Price rises combined with technological advances has given impetus to examination of areas previously considered to be unattractive.

3. SUMMARY & CONCLUSIONS

3.1 EL 49/86 covers 127 km² of the Tasmanian west coast between Ahrberg Bay and Sandy Cape.

3.2 A study of aerial photographs covering the licence area was completed.

3.3 Initially five scout hand auger holes were drilled to water table giving mineralogical results for the heavy mineral suite of: rutile 1%, zircon <1%, leucoxene 2%, monazite <1%.

3.4 Additional field investigations concentrated on hand augering and hand operated cased sludging 27 drill holes along two traverse lines, to sample below water table.

3.5 Heavy mineral contents ranged between 0.33 and 4.89%.

3.6 The greatest concentrations of mineral occur at depths below water table along Line 2.

3.7 Four composite samples, 2 from Line 1 and 2 from Line 2 were examined for

04
economic minerals.

3.8 The economic mineral suite present was very low ranging up to 1% rutile, 2% zircon, 5% leucoxene and 1% monazite; as shown in Appendix 1.

4. RECOMMENDATION

Results obtained from exploration of Ahrberg Bay have indicated that no further work is warranted. The area of the licence between Sandy Cape and the Pieman River would require significantly higher concentrations of heavy minerals than has been indicated to date in adjoining areas, to be economically viable. It is recommended that this exploration licence be relinquished and that future efforts be concentrated on other more attractive targets.

REPORT

05
5. INTRODUCTION

A programme of exploration was carried out by Peter H. Stitt & Associates on behalf of National Mineral Sands Pty. Ltd. (formerly Butlers No. 27) on the west coast of Tasmania in the Ahrberg Bay area.

Exploration was directed at testing the coastal sands for heavy mineral sand deposits, containing economic minerals; particularly rutile, leucoxene, ilmenite (TiO_2 raw materials), zircon and monazite. In addition exploration was to be carried out in order to recognise any other detrital minerals if they occurred in economic quantities.

During the past 3 years the world market has been dominated by a short fall in supply to meet the demand, particularly for TiO_2 pigment minerals, zircon and rare earth heavy minerals. As a consequence the price for these minerals has risen to historically high levels. Predictions for the future supply and price of titanium and zirconium raw materials is one of buoyancy.

Recent advances in technology and understanding of heavy mineral deposits has caused a re-evaluation of prospective areas. Chief points of advancement are:

- Lower grade deposits are now economic.
- Exploration methods have been developed particularly with regard to quantitative assessment of low grade areas.
- Mineralogical determinations have seen the employment of the scanning electron microscope to identify minerals difficult to optically identify; particularly distinguishing black rutile from other black opaque minerals and identification of rare earth element minerals.
- Mining technology has advanced, for example in dredging and dredge cutters, to lower costs and to make difficult areas now mineable.
- Metallurgical treatment has seen the development of new spirals with higher throughput and suited to lower grade ore. Magnetic separators are now

capable of more finely tuned separations to upgrade ilmenite and chromite products which have been rejected in the past.

- Overall efficiency of the industry has advanced in order to meet market requirements.

07
6. TENEMENT INFORMATION

Exploration Licence 49/86 was held by National Mineral Sands Pty. Ltd. It covered an area of 129 square kilometres on the west coast of Tasmania between Ahrberg Bay and sandy Cape (Figure 1).

The area comprised:

93 km² Arthur River Protected Area

6 km² Private Property

4 km² State Forest

26 km² Crown Land

The area included Interview Rock Art and part of Norfolk Range; Australian Heritage Act Registered Entries.

The area excluded 1 km² Pieman River State Reserve. Also excluded was 18 km² of non-titled land, that was EL 64/83 held by Abignano Constructions Pty. Ltd., but had since been relinquished.

08

7. AERIAL PHOTOGRAPHY INTERPRETATION

Aerial photography interpretation using the most recently available black and white photography from the Tasmanian department of Lands was carried out over the EL. Details are as follows:

Scale: 1:42,000

Date: 6.11.84

Run: 14 Nos 124-128

Run: 15 Nos 118-121

Run: 16 Nos. 21-23

Run: 17 Nos 24-26

Run: 18 Nos 79-81

Run: 19 Nos. 83-86

An interpretation map showed sufficient geographic features to enable location using the 1:100,000 topographic series. Distortion between photographs created some problems in preparing composites and is reflected by variation in the angle and length of some tenement boundaries. The following points are noteworthy:

- . Sand deposits within this EL are aeolian dunes which are generally lightly to non-vegetated, and for the most part are therefore mobile.
- . The geomorphology at the coastline indicates that strandline development for the most part is unlikely, with the exception of small areas in the north end of Ahrberg Bay and the mouth of the Pieman River.
- . It is possible that the aeolian dunes overlie older beach deposits, which may contain strandlines with heavy mineral concentration.

09
8. FIELD INVESTIGATIONS

8.1 Survey

Initially five (5) scout hand auger holes were located on the southern end of the Ahrberg Bay beach. These holes were preliminary reconnaissance holes drilled to water table, and since heavy mineral grades were increasing with depth it was considered necessary to follow up with additional drill holes penetrating beneath the water table.

Two lines of holes were then located:

- . across the north end of Ahrberg Bay beach, 560m. long.
- . across the south end of Ahrberg Bay beach, 360m. long.

Each line commenced at high water mark and proceeded in a direction generally at right angles to the coastline, towards the east.

All drill holes were surveyed by tape, compass and abney hand level. Holes were spaced 40m. apart along each line, with two (2) additional holes 100m. apart on the eastern end of Line 1.

8.2 Drilling

All drilling in the programme was by hand augering and hand operated cased sludging. The drilling was carried out using a Tasmanian field crew, with a total of 27 holes and 105.65m. drilled for 64 samples.

Samples were collected at 1 or 2 metre intervals and bagged. The hand sludged samples were weighed in the field so that the drilling crew could maintain a check on weight variation per metre drilled and take steps to remain within acceptable limits.

Holes were drilled to a maximum depth of 10 metres, however most holes finished shallower, due to basement, either rock or clay, with occasional

drilling difficulties preventing further progress.

8.3 Traverse Line Summaries

Line 1 (north end)

Twelve (12) holes were drilled for a total of 36.9m. All holes were terminated before 10m. depth as clay, basement or wood was encountered.

A number of holes contained visible heavy mineral concentrations.

Line 2 (south end)

Ten (10) holes were drilled for a total of 54.15m. A number of holes on this line reached the planned total depth of 10m. with the rest encountering basement rock, clay \pm gravel or wood at the end of the hole. A number of holes contained visible heavy mineral concentrations.

11
9. LABORATORY INVESTIGATION

Those samples that were assayed for heavy minerals were treated by either the Tasmanian Mines Department, Metallurgical Laboratories, Launceston, or RHF Laboratories in Smithton using the procedure outlined below:

1. Dry samples as received.
2. Weigh and record weight.
3. Screen on a coarse sieve (say 2 mm.) to break up agglomerated lumps.
4. Riffle split approximately 100 gm working sample.
5. Re-pack balance of sample.
6. Weigh working sample.
7. Screen on 600 micron sieve (or coarser sieve as directed) and weigh plus 600 micron fraction.
8. Using TBE, separate heavy minerals.
9. Dry and weigh heavy minerals.
10. Calculate heavy minerals as a percentage of the sample weighed in Step 6 above.
11. Package heavies for despatch.

The heavy minerals from the 5 scout holes AB1 to AB5 were bulked together to form one composite sample. Mineralogical analysis was carried out on this composite sample by Applied Petrographic Services, Sydney, N.S.W.

The method adopted for mineralogical study was:

1. Magnetically separate the heavy concentrate into:
 - . hand magnetics
 - . 0.5 amp Frantz magnetics
 - . 1.0 amp Frantz magnetics
 - . 1.6 amp Frantz magnetics
 - . 1.6 amp Frantz non-magnetics

using a Frantz magnetic separator with forward slope of 20° and side tilt of 12.5° .

2. Weigh each magnetic fraction.
3. Optically identify mineral grains and point count a minimum 400 points for each magnetic fraction.

Mineralogical analysis on an additional four composite samples were also carried out by Applied Petrographic Services, Sydney, N.S.W., on heavy mineral samples obtained in the subsequent drilling programme. The method for the study was the same as above, except that the Frantz magnetic separator had a forward slope of 25° and a side slope of 18° .

The detailed mineralogical analyses for the above composites are presented in Appendix 1 of this report.

10. DISCUSSION

Heavy mineral separations were originally carried out on the initial five drillholes from the southern end of Ahrberg Bay resulting in contents between 0.3 and 1.3 wt.%. The heavy minerals obtained from the five drillholes were subsequently bulked together for mineralogical examination.

The economic minerals noted amongst the heavy mineral suite were:

Zircon	<1%
Rutile	1%
Leucoxene	2%
Monazite	<1%

All other minerals in the sample were of no economic interest.

It should be pointed out however, that these samples were obtained from above the water table. The mineralogy it was thought may be considerably different for those heavy mineral concentrations occurring at depths below which hand augering was able to penetrate, since strandline deposits may be encountered.

A subsequent drilling programme involved both hand augering and hand cased sludging for depths below water table. Heavy mineral separations were carried out on all samples from Line 1 and Line 2.

Line 1 (situated at the northern end of Ahrberg Bay) had an average heavy mineral content of 0.9 wt.%. Generally the top two metres contained the greatest heavy mineral grades, ranging up to 2.35 wt.%, with the remaining intervals ranging up to 1.21 wt.%.

The opposite is the case for Line 2 (southern end of Ahrberg Bay), not only was the depth of the holes greater, but the heavy mineral grades were generally greater than 1 wt.%, with the intervals above water table ranging up to 1.31 wt.% and those below water table ranging up to 4.89 wt.%.

Mineralogical examination was carried out on four composite samples, two from Line 1 and two from Line 2. A comparison of the economic minerals is shown below.

Line Holes	1 AB0 to AB16 Western End of Line	1 AB20 to AB56 Eastern End of Line	2 AB4 to AB20 Western End of Line	2 AB24 to AB36 Eastern End of Line
Zircon	2	1	<1	1
Rutile	1	1	<1	<1
Leucoxene	3	5	1	2
Monazite	<1	<1	<1	1

Monazite levels in samples from Line 2 are higher than is generally encountered and significantly above those encountered elsewhere in Ahrberg Bay. Magnetic separation has concentrated the monazite into the 1.2 Amp magnetic fraction where it comprises 37% and 28% of the total fraction. However, the 1.2 Amp magnetics comprise only a minor part of the total heavy mineral suite and thus monazite is only about 1% of the total heavy minerals. Detailed results for monazite are included in Appendix 1.

The mineralogy for all samples examined was very similar. While total heavy mineral content for some holes was significant, the mineralogy reflected only low levels of economic minerals. For the most part the heavy mineral suite comprised heavy silicate minerals of no value.

The area of the exploration licence between Sandy Cape (in the north) and the Pieman River (in the south) is a remote coastal strip, lacking infrastructure and only accessible with difficulty. To be considered economically interesting the heavy mineral grades would need to be higher than those indicated anywhere else along the Tasmanian west coast to date. Furthermore the

mineralogy of the heavy suite would require higher levels of rutile, zircon, leucoxene and monazite or other economic minerals than has been shown to exist in the Ahrberg Bay area.

Results obtained to date have indicated that the licence should be relinquished and that future efforts be concentrated on other more attractive targets.

18

11. APPENDIX

Appendix 1 - Mineralogical Results

APPLIED PETROGRAPHIC SERVICES

SPECIALIZING IN PETROGRAPHIC ANALYSIS OF GEOLOGICAL AND INDUSTRIAL SAMPLES

P.O. Box 257
Strawberry Hills
Sydney, N.S.W. 2012

2A RAILWAY AVENUE
STANMORE
SYDNEY, N.S.W. 2048

Phone: (02) 516 4808

CLIENT: PETER H. STITT & ASSOC. PTY LTD

APS REPORT NO.: M 122

ATTENTION: ANDREW DOVE

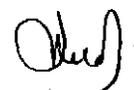
DATE: 5.12.88

SAMPLE DETAILS: AHRBERG BAY (LINE 1) (1) AB-0; AB-4; AB-8; AB-16.

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
ZIRCON	2	-	-	-	-	14
RUTILE	1	-	-	-	-	9
LEUCOXENE	3	-	-	-	12	29
LEUCOXENISED ILMENITE	1	-	-	2	4	-
ILMENITE	20	-	53	11	-	-
MAGNETITE	1	90	-	-	-	-
GARNET	7	-	23	2	1	-
SPINEL	4	-	5	4	-	-
IRON OXIDES	1	10	2	1	1	-
TOURMALINE	10	-	1	14	27	3
MAFICS*	45	-	16	66	10	-
ALUMINO-SILICATES	2	-	-	-	19	17
PYRITE	1	-	-	-	26	9
SHELL	-	-	-	-	-	-
CORUNDUM	<1	-	-	-	-	1
QUARTZ	2	-	-	-	-	18
MONAZITE	<1	-	-	-	<1	-

*Mafics: Mainly olivine, with some pyroxene, amphibole, epidote, chlorite.

POINTS COUNTED	-	-	544	549	524	589
WEIGHT	9.1005g	0.0462g	2.2027g	5.7295g	0.1151g	1.0070g
WEIGHT %	100%	0.5%	24.2%	63.0%	1.3%	11.0%


J. McNULTY

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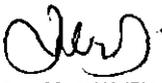
DATE: 5.12.88

SAMPLE DETAILS: AHRBERG BAY (LINE 1) (2) AB-20; AB-24; AB-28; AB-32;
AB-36; AB-46; AB-56.

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
ZIRCON	1	-	-	-	-	9
RUTILE	1	-	-	-	-	6
LEUCOXENE	5	-	-	-	-	39
LEUCOXENISED ILMENITE	2	-	-	2	20	-
ILMENITE	10	-	38	6	-	-
MAGNETITE	1	90	-	-	-	-
GARNET	8	-	22	6	2	-
SPINEL	5	-	12	4	<1	-
IRON OXIDES	1	10	2	1	<1	-
TOURMALINE	18	-	3	23	39	2
MAFICS*	45	-	23	58	13	-
ALUMINO-SILICATES	2	-	-	-	19	19
PYRITE	1	-	-	-	7	12
SHELL	-	-	-	-	-	-
CORUNDUM	<1	-	-	-	-	<1
QUARTZ	2	-	-	-	-	13
MONAZITE	<1	-	-	-	<1	-

*Mafics: Mainly olivine, with some pyroxene, amphibole, epidote, chlorite.

POINTS COUNTED	-	-	538	578	500	559
WEIGHT	7.5674g	0.0457g	1.1247g	5.4354g	0.0691g	0.8925g
WEIGHT %	100%	0.6%	14.9%	71.8%	0.9%	11.8%


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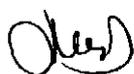
DATE: 5.12.88

SAMPLE DETAILS: AHRBERG BAY (LINE 2) (1) AB-4; AB-8; AB-12; AB-16; AB-20.

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
ZIRCON	< 1	-	-	-	-	6
RUTILE	< 1	-	-	-	-	7
LEUCOXENE	1	-	-	-	-	21
LEUCOXENISED ILMENITE	< 1	-	-	-	7	-
ILMENITE	15	-	44	9	-	-
MAGNETITE	< 1	90	-	-	-	-
GARNET	8	-	25	4	-	-
SPINEL	4	-	11	3	-	-
IRON OXIDES	3	10	3	3	-	-
TOURMALINE	11	-	< 1	14	14	2
MAFICS*	53	-	17	67	26	-
ALUMINO-SILICATES	2	-	-	-	15	19
PYRITE	< 1	-	-	-	1	3
SHELL	< 1	-	-	-	-	1
CORUNDUM	-	-	-	-	-	-
QUARTZ	3	-	-	-	-	41
MONAZITE	< 1	-	-	-	37	-

*Mafics: Mainly olivine, with some pyroxene, amphibole, epidote, chlorite.

POINTS COUNTED	-	-	601	512	516	508
WEIGHT	16.9821g	0.0369g	3.3072g	12.3362g	0.1830g	1.1188g
WEIGHT %	100%	0.2%	19.5%	72.6%	1.1%	6.6%



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20

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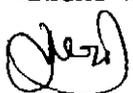
DATE: 5.12.88

SAMPLE DETAILS: AHRBERG BAY (LINE 2) (2) AB-24; AB-28; AB-32; AB-36.

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
ZIRCON	1	-	-	-	-	12
RUTILE	<1	-	-	-	-	6
LEUCOXENE	2	-	-	-	-	41
LEUCOXENISED ILMENITE	<1	-	-	-	11	-
ILMENITE	8	-	54	7	-	-
MAGNETITE	<1	85	-	-	-	-
GARNET	7	-	26	7	5	-
SPINEL	1	-	4	1	-	-
IRON OXIDES	1	5	2	1	-	-
TOURMALINE	19	-	1	20	20	2
MAFICS*	58	10	13	64	17	-
ALUMINO-SILICATES	2	-	-	-	18	32
PYRITE	<1	-	-	-	<1	1
SHELL	<1	-	-	-	1	<1
CORUNDUM	-	-	-	-	-	-
QUARTZ	<1	-	-	-	-	6
MONAZITE	1	-	-	-	28	<1

*Mafics: Mainly olivine, with some pyroxene, amphibole, epidote, chlorite.

POINTS COUNTED	-	-	521	517	506	541
WEIGHT	8.7010g	0.0244g	0.3026g	7.7428g	.1602g	0.4710g
WEIGHT %	100%	0.3%	3.5%	89.0%	1.8%	5.4%


J. McNULTY

Kenneth Bay

Sandy Cape
AMS
5411900N
311700E

EL 49/86

Non Titled Land
Originally
EL 64/83
Held by
Abignano Constructions P/L.

Interview River

Rupert Point

Pieman River

Pieman Head

Hardwicke Bay

Conical Rocks Point

AMG REFERENCE POINTS ADDED

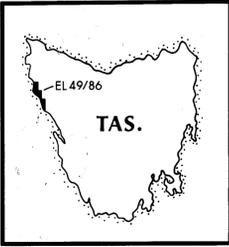
Ahrberg Bay

5 cm

SCALE 1:50 000

0 1 2 3 4 km

LOCATION MAP

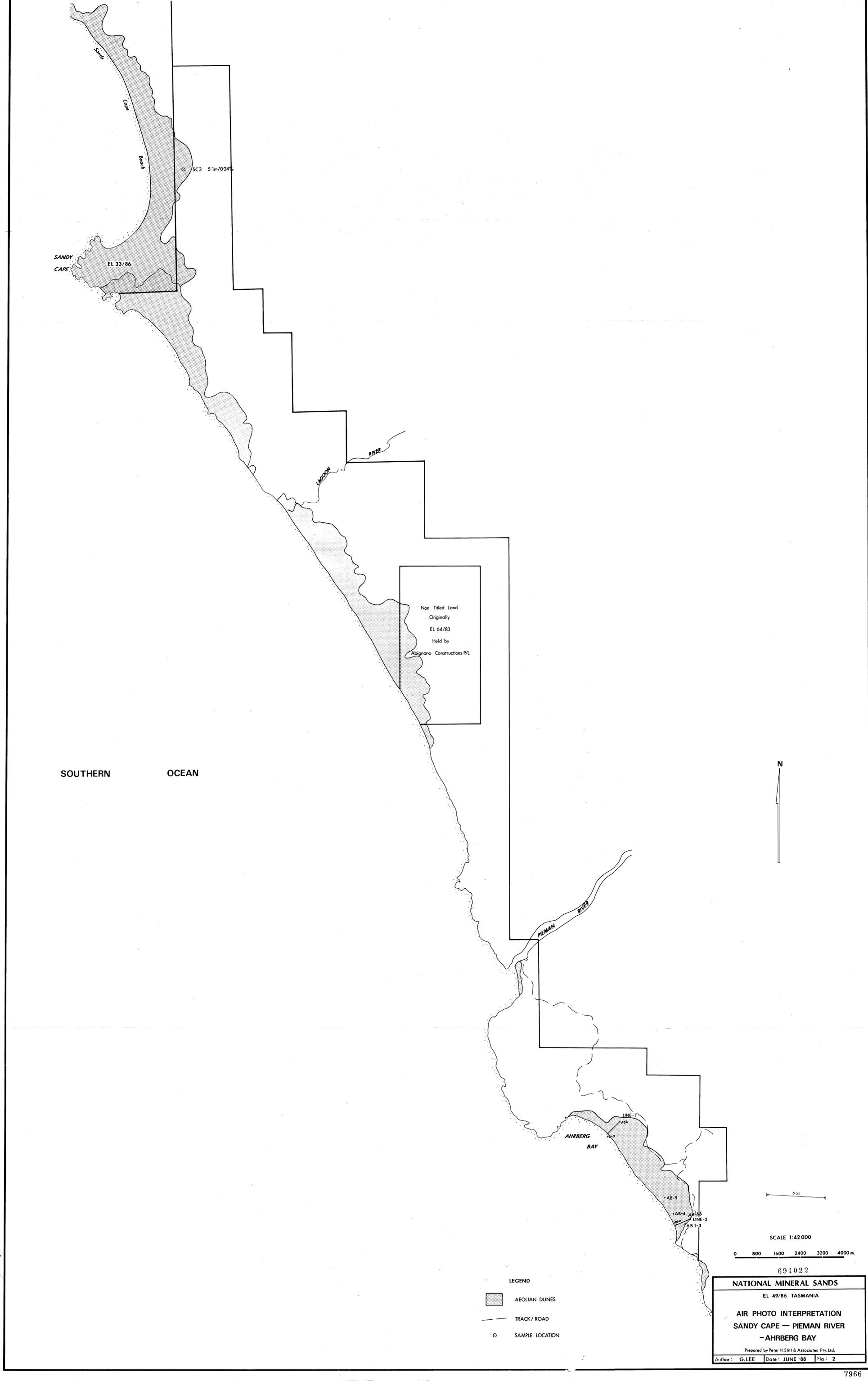


89-2905



NATIONAL MINERAL SANDS
EL 49/86
LOCATION MAP
Author: A.DOVE Date: JUNE '88 Fig.No: 1

691021



SANDY CAPE
EL 33/86

SC3 5.1m/024

LAGOON RIVER

Non Titled Land
Originally
EL 64/83
Held by
Abignano Constructions P/L

SOUTHERN OCEAN



PIEMAN RIVER

AHRBERG BAY

LINE-1

AB-5

AB-4

AB-3

LINE-2



SCALE 1:42 000

691022

- LEGEND
-  AEOLIAN DUNES
 -  TRACK / ROAD
 -  SAMPLE LOCATION

NATIONAL MINERAL SANDS
EL 49/86 TASMANIA
AIR PHOTO INTERPRETATION
SANDY CAPE — PIEMAN RIVER
— AHRBERG BAY
Prepared by Peter H. Stitt & Associates Pty. Ltd.
Author: G. LEE Date: JUNE '88 Fig: 2