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REPORT NO. 9/89

EL 51/86

Annual Report on Exploration Completed
in the Marrawah Area of North-Western Tasmania
to 15.6.89

Prepared for National Mineral Sands Pty. Ltd.

A. Dove
G. Lee
May, 1989

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S Y N O P S I S

1. AIM

To examine the Tasmanian north west coast in the Marrawah area 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 shortage of supply. Price rises combined with technological advances have given impetus to examination of areas previously considered to be unattractive.

3. SUMMARY AND CONCLUSIONS

- 3.1 EL 51/86 originally covered 145 Km² on the west coast of Tasmania between Marrawah and Woolnorth.
- 3.2 The licence was reduced to 63 Km² following exploration work carried out during the 12 months to 15.6.88.
- 3.3 Field investigations involving hand drilling were carried out near Marrawah, along 2 traverse lines, located north of the previously drilled M - Line 1.
- 3.4 At the time of writing samples from M - Line 3 and 4 were being assayed.
- 3.5 Mineralogical studies were completed on four samples from M - Line 1 and 2.

- 3.6 Rutile grades range from 3 to 4% of the total heavy mineral.
Zircon grades range from 4 to 6% of the total heavy mineral.
Leucoxene grades range from 7 to 11% of the total heavy mineral.
Monazite grades are < 1% of the total heavy mineral.

4. RECOMMENDATIONS

- 4.1 Further work should be directed at Marrawah, with one more traverse line located at the north end of Ann Bay, to fully delineate mineralization.
- 4.2 Laboratory and metallurgical testing to provide an indication of the recoverable minerals from the resource outlined by drilling.
- 4.3 Reduction of Licence to 18 km² upon renewal on the 15.6.89.

R E P O R T

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 Pty. Ltd.) on the north west coast of Tasmania along Ann Bay near Marrawah.

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.

A review of previous title holders reports has shown that their investigations have indicated in the order of 100,000 t of contained heavy mineral with various grades of rutile, zircon, leucoxene and cassiterite at Ann Bay near Marrawah.

Investigations carried out during the first year of exploration by the Company has confirmed the existence of significant heavy mineral concentrations in the southern end of the sand body at Ann Bay. No other heavy mineral concentration has been located within the exploration licence area, as a result the northern half of the area was relinquished during the past year.

Results of investigations carried out during the first year of the title are recorded in Peter H. Stitt & Associates Pty. Ltd. Report No. 10/88. This report details results obtained during the second year of the title.

6. TENEMENT INFORMATION

Exploration Licence 51/86 is held by National Mineral Sands Pty. Ltd. (formerly Butlers No. 27 Pty. Ltd.) and originally covered an area of 145 km² on the north west coast of Tasmania, see figure 1.

The area comprises 63 km² of private property, which includes the whole of the Marrawah-Woolnorth Point; Australian Heritage Act Registered Entry. Areas of 5.3 km² and 0.5 km² were excluded from the original application as they contained the Mt. Cameron West Aboriginal site and Commonwealth land respectively.

Following exploration work carried out during the 12 months to 15.6.88 the licence was reduced to 63 km². An area of 82 km² was relinquished by the company as it was deemed unprospective following the initial work. The relinquished area covers the land to the north of Australian Map Grid Line 5 480 000 mN.

7. FIELD INVESTIGATIONS

7.1 Survey

Drillholes were located on traverse lines generally orientated east-west and perpendicular to the coastline so as to cross any strandlines which may be present.

All traverse lines were surveyed by tape and compass. Drill hole collars have not yet been levelled. Cross sections have not been proposed for M-Line 3 and 4, since laboratory results are not currently to hand.

Holes were spaced 40m. apart, for M-Lines 3 and 4. Previous drilling on M-Line 0 was at 40m. hole spacing, while on the narrower dune section at M-Line 1 and 2, hole spacing was 20m. apart.

The location of the traverse lines is shown on Figure 2. The exploration was concentrated on evaluating the northern extension of mineral concentrations at Ann Bay near Marrawah, traverse lines were designated:

Marrawah (Ann Bay):	Line 3	M-Line 3
	Line 4	M-Line 4

7.2 Drilling

All drilling for the programme was by hand auger and hand operated cased sludging, using Dormer Engineering equipment. Holes were hand augered to water table using 50mm. diameter hand auger. When water table was reached 50mm. casing was inserted into the hole and the hole was advanced by sludging using a whistle top sludger on aluminium extension rods.

Drilling was completed at rock basement, pebbles or thick clay layer. Where there was no impediment to drilling, holes were terminated at 10m. depth, since hand drilling below this depth becomes increasingly slow.

Samples from the drilling were bagged at 2 metre intervals. Where samples were obtained by sludging they were weighed in the field to check on weight variation due to sand boiling into the casing.

The drilling was carried out using a field crew supplied by Moina Mining Industries. Two traverse lines, for a total of 24 drillholes, were drilled.

A brief descriptive log is prepared for each drillhole and where relevant includes heavy mineral assay data. The Marrawah borehole logs are in Appendix 1 of this report.

8. LABORATORY INVESTIGATIONS

At the time of writing, samples from M-Line 3 and 4 were in the process of being assayed for heavy minerals. All samples are being treated by R.H.F. Laboratories, Smithton, Tasmania, using the procedure outlined below.

1. Dry samples.
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 weight 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.

Once assaying has been completed the heavy minerals for each interval are bulked together to form composite samples for each drill hole. The composites then undergo mineralogical analysis, carried out 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 Isodynamic magnetic separator with forward slope
of 25° and side tilt of 18°.

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

The mineralogical analyses for composites of M-Line 1 and 2
presented in Appendix 2 of this report.

9. DISCUSSIONMarrawah (Ann Bay)

Originally traverse line M-Line 0 extending over 1240 metres, incorporating 34 drillholes, was drilled in the south of Ann Bay at Marrawah. Seven drillholes extending 200m. inland from high water mark showed heavy mineral grades of greater than 2%. The average grade over the 200m. area was 9.0%, using a 2% cut-off grade; and average depth of 3.0m. with intervals of sand containing grades up to 45.0 wt.%.

To delineate the extent of this mineralized zone two more traverse lines were drilled approximately 1 kilometre north and south of the original line. The northern traverse line M-Line 1 extended over 200 metres and good heavy mineral grades were found in all holes. The average grade is 4.9 wt.% heavy mineral, using 2% cut-off grade, with the average depth of approximately 6.0 metres. It should be noted that some holes were terminated at 10 metre depth with H.M. grades >2%, with sand still present below, so the thickness of the mineralized zone in these holes may be greater than 10m.

The traverse line M-Line 2, to the south of the original line, encountered basement at very shallow depths, hence the mineralized zone was very narrow and shallow. Heavy mineral grades were delineated over a length of 80m., however the average depth was only 1.9m. and the average grade was 4.2 wt.% using 2% cut-off grade.

Cross-sections of traverse lines 0, 1 and 2, showing heavy mineral grades, were shown as Figure 3, 4 and 5 respectively of Report 10/89 for the year ended 15.6.88.

As recorded in Report No. 10/88 mineralogical studies have been carried out on five (5) samples from Line-0. More recently four composite samples from M-Line 1 and 2 have had mineralogical analyses undertaken. As shown in Table 1 there are three (3) composites from M-Line 1 and one (1) from M-Line 2.

TABLE 1

Mineralogy of Heavy Mineral Composites
M-Lines 1 and 2 (1989)

Mineral	M-Line 1 (1) M-16,M-14	M-Line 1 (2) M-12,M-10, M-8,M-6,M-4	M-Line 1 (3) M-2,M-0, M(-2)E, M(-4)E	M-Line 2 (1) M-0,M-2,M-4, M-6,M-8,M-10
Magnetite	<1	<1	<1	<1
Ilmenite	23	22	24	24
Garnet	8	7	7	7
Tourmaline	12	10	11	7
Leucoxene	7	10	11	9
Rutile	3	4	3	3
Zircon	4	4	4	6
Carbonates	2	<1	-	<1
Quartz	<1	<1	2	1
Other Silicates	37	39	31	37
Monazite	<1	<1	<1	<1
Iron Oxides	1	<1	<1	1
Alumino Silicates	2	2	2	2
Pyrite	-	-	3	1
Spinel	1	2	2	2
%1.2A non mags	18.7	20.2	24.6	21.1

The results are not as encouraging as those from M-Line 0 (Table 2). The mineralogy for M-Line 1 and 2 shows the combined rutile, zircon and non magnetic leucoxene to be less than 20% of the total heavy mineral. These figures are less than was recovered from the shallow M-Line 0 individual drillhole heavy mineral samples examined. However these do not represent the full mineralised width on this line, and a composite of all mineralised drillholes on M-Line 0 may yield similar mineralogy to M-Line 1 and 2. The individual drillhole mineralogy results for M-Line 0 do reflect the point to point variation which can be expected to occur through this deposit.

TABLE 2
 Mineralogy of Heavy Mineral Concentrates
 (M-Line 0)

Mineral	M87W 0-2.9m.	M84W 0-3.0m.	M80W 0-3.0m.	M76W 0-3.0m.	Beach Sample *
Magnetite)					
Ilmenite)	29	51	40	32	15.7
Chromite)					19.9
Garnet	7	5	9	8	
Tourmaline	9	4	11	10	
Epidote	2	1	1	1	
Leucoxene	11	4	8	11	2.5
Rutile	8	8	4	5	6.1
Zircon	5	18	7	8	14.8
Shell	-	-	-	<1	
Quartz	<1	3	1	1	
Other Silicates	29	6	19	24	39.2
Cassiterite	ND	ND	ND	ND	
Monazite	1	1	1	<1	1.8
% 1.6A non- mags	20	30	19	25	25+

* Determination by Electron Microprobe
 + 1.2A non-mags

10. TRAVERSE LINE SUMMARIES

10.1 Marrowah Line 3

This line was located 1 kilometre north of M-Line 1, and traversed the coastal dune system. Nine (9) drillholes were completed for a total of 55.9 metres.

The traverse line was terminated to the east due to a swamp situated behind the coastal dunes.

Heavy mineral was visually noted in most sample intervals in grades of approximately 1%.

10.2 Marrowah Line 4

This traverse was located 1 kilometre to the north of M-Line 3, and traversed the coastal dune system. Fifteen holes were completed for a total of 104.75 metres.

As was the case with M-Line 3 the traverse line was terminated to the east due to a swamp situated behind the coastal dunes.

Heavy mineral was visually noted in a number of samples, with grades approximately 1%.

APPENDIX 1:

Marrawah Drillhole Logs

M-Line 3

M-Line 4

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-(4E)

METHOD : HAND

DRILL DATE: 4-4-89

018

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND , fine to medium grained, dark grey to brown, organic.			
2.0-4.0		SAND, fine to medium grained, brown. Clay rich.			
4.0-5.4		As Above. Grades to grey with abundant shell. Hit light grey clay. E.O.H. 5.4m. Clay.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

15

639019

CLIENT : NATIONAL MINERAL SANDS PTY LTD.

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-0

METHOD : HAND

DRILL DATE: 4.4.89

013

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, grey to dark grey, hit water table 1.3m. Started sludging.			
2.0-3.6		SAND, fine to medium grained, light grey to dark grey, hit indurated layer.			
		E.O.H. 3.6m Indurated.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

16

639020

CLIENT : NATIONAL MINERAL SANDS PTY LTD.

TITLE No. : E.L.51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A.DOVE

HOLE No. : M-4

METHOD : HAND

DRILL DATE: 4-4-89

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, grey-brown mottle. Hit water table 1.5m, started sludging. H.M. present.			
2.0-4.0		SAND, fine to medium grained, grey, organic, grades to light grey. Difficult to turn casing. E.O.H. 4.0m Jammed.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

020

17

639021

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-8

METHOD : HAND

DRILL DATE : 4-4-89

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium grained, amber, abundant fine shell.			
2.0-4.0		As Above.			
4.0-6.0		SAND, fine to medium grained, amber, grades to dark grey.			
6.0-8.0		SAND, fine to medium grained, grey. Grades to light grey then white. Hit water table 7.5m, started sludging.			
8.0-9.5		SAND, fine to medium grained, white. Hit indurated layer. Hard at base. E.O.H. 9.5m.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

021

18

639022

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-12

METHOD : HAND

DRILL DATE: 4-4-89

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine-medium grained, light grey grading to amber. H.M. >1%.			
2.0-4.0		SAND, fine - medium grained, amber. H.M. >1%.			
4.0-6.0		As Above. H.M. >1%.			
6.0-8.0		As Above. H.M. >1%.			
8.0-10.0		As Above. H.M. >1%.			

E.O.H. 10.0m.

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

012

19

639023

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-16

METHOD : HAND

DRILL DATE: 4-4-89

023

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine-medium grained, brown grading to amber.			
2.0-4.0		SAND, fine-medium grained, amber. H.M. 1%.			
4.0-6.0		As Above.			
6.0-8.0		As Above. H.M. 1%.			
8.0-10.0		As Above. H.M. >1%.			

E.O.H. 10.0m.

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

20

639024

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-20

METHOD : HAND

DRILL DATE: 6-4-89

014

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber. H.M. 1%.			
2.0-4.0		As Above.			
4.0-6.0		As Above.			
6.0-8.0		As Above.			
8.0-10.0		As Above.			

E.O.H. 10.0m.

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-24

METHOD : HAND

DRILL DATE: 6-4-89

025

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber. Hit Water Table. Grades to grey.			
2.0-2.4		SAND, fine to medium grained, grey. Hit rock. E.O.H. 2.4m. Rock.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 3

LOGGED BY : A. DOVE

HOLE No. : M-28

METHOD : HAND

DRILL DATE: 6-4-89

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-1.0		SAND, medium to coarse grained, amber. Hit rock. E.O.H. 1.0m. Rock.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

006

23

639027

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-4

METHOD : HAND

DRILL DATE: 8-4-89

027

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium grained, amber, abundant fine shell. Hit Water Table 0.5m, started sludging 1.0m. Grades to dark brown, silty, hit wood.			
2.0-2.15		SAND, fine to medium grained, dark brown, silty, hit indurated layer. E.O.H. 2.15m Indurated.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-8

METHOD : HAND

DRILL DATE: 8-4-89

008

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium grained, amber, abundant fine shell. H.M. present.			
2.0-4.0		As Above. H.M. present.			
4.0-6.0		As Above. H.M. present.			
6.0-8.0		As Above. H.M. present.			
8.0-10.0		As Above, hit Water Table at 9.6m, grades to grey. E.O.H. 10.0m.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

25

639029

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-12

METHOD : HAND

DRILL DATE: 8-4-89

023

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium grained, amber, abundant fine shell. Hit Water Table 1.5m, started sludging. Grades to grey. H.M. present.			
2.0-3.5		SAND, fine to medium grained, dark brown, silty, hit wood at 3.0m. Hit indurated layer at 3.5m. E.O.H. 3.5m Indurated.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-16

METHOD : HAND

DRILL DATE: 8-4-89

030

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+100um %	H.M. %
0-2.0		SAND, medium to coarse grained, amber, abundant fine shell. Hit Water table, started sludging. H.M. present.			
2.0-3.1		SAND, fine to medium grained, dark brown, silty. Hit indurated layer. E.O.H. 3.1m Indurated.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-20

METHOD : HAND

DRILL DATE: 8-4-89

031

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber, abundant fine shell. H.M. 1%.			
2.0-4.0		As Above. Hit Water Table. H.M. 1%.			
4.0-6.0		SAND, medium grained, light grey, abundant fine shell. Started sludging 4.5m, grades to dark brown silty, clay rich. Hit dark brown clay at base. E.O.H. 6.0m clay.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

28

639032

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-24

METHOD : HAND

DRILL DATE: 8-4-89

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium grained, amber, abundant fine shell. H.M. 1%.			
2.0-4.0		As Above. H.M. 1%.			
4.0-6.0		As Above. Hit Water Table 4.5m, started sludging 5.0m. Grades to grey, slightly indurated.			
6.0-8.0		SAND, fine to medium grained, dark brown, silty.			
8.0-10.0		As Above.			

E.O.H. 10.0m.

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

032

29

639033

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-28

METHOD : HAND

DRILL DATE: 7-4-89

033

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium to coarse grained, amber, abundant fine shell. Hit thin brown layer at 1.5m. H.M. 1%.			
2.0-4.0		SAND, medium grained, amber, abundant fine shell. Hit Water Table, started sludging. H.M. 1%.			
4.0-6.0		As Above, grades to grey then into brown, silty.			
6.0-6.5		As Above, hit hard indurated layer, couldn't penetrate. E.O.H. 6.5m Indurated.			

30

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

639034

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-32

METHOD : HAND

DRILL DATE: 7-4-89

034

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium grained, amber, abundant fine shell. H.M. >1%.			
2.0-4.0		As Above, Hit Water Table at 3.5m, started sludging. Grades to dark brown at base.			
4.0-6.0		SAND, fine to medium grained, brown, slightly indurated, silty.			
6.0-8.0		As Above, becoming slighty coarser with depth.			
8.0-10.0		As Above, very silty.			

E.O.H. 10.0m.

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

31

639035

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-36

METHOD : HAND

DRILL DATE: 7-4-89

032

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber, abundant fine shell. H.M. present.			
2.0-4.0		As Above. H.M. >1%.			
4.0-6.0		As Above. Hit Water Table at 5.3m, started sludging. Grades to dark grey.			
6.0-8.0		SAND, medium grained, light grey to white, grades to brown-grey at base.			
8.0-10.0		SAND, medium grained brown, slightly indurated, silty.			
		E.O.H. 10.0m.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

32

639036

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-40

METHOD : HAND

DRILL DATE: 7-4-89

000

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber, abundant fine shell. H.M.>1%.			
2.0-4.0		As Above. H.M.>1%.			
4.0-6.0		As Above. H.M.>1%.			
6.0-8.0		As Above, becomes coarser with depth, hit dark grey layer. H.M.>1%.			
8.0-10.0		SAND, medium to coarse grained, grey, abundant fine shell. Hit Water Table 8.5m, started sludging. Grades to brown-grey. E.O.H. 10.0m.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-44

METHOD : HAND

DRILL DATE: 7-4-89

037

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber, abundant fine shell. H.M. 1%			
2.0-4.0		As Above, grades to medium grained. H.M.>1%			
4.0-6.0		As Above, hit dark grey layer. H.M.>1%.			
6.0-8.0		SAND, medium grained, amber, abundant fine shell. H.M.>1%.			
8.0-10.0		SAND, fine to medium grained, light grey. Hit Water Table 8.3m. No mineral visible below water table. Started sludging, grades to brown-grey. E.O.H. 10.0m.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

34

639038

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-48

METHOD : HAND

DRILL DATE: 7-4-89

038

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber, abundant fine shell. H.M. 1%			
2.0-4.0		As Above. H.M. >1%.			
4.0-6.0		As Above, went through dark brown layer. H.M. >1%.			
6.0-8.0		SAND, medium to coarse grained, amber, abundant fine shell, orange at 7.7m. Hit Water Table, grades to grey.			
8.0-10.0		SAND, medium to coarse grained, grey, abundant fine shell. Started sludging, grades to brown. E.O.H. 10.0m.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

35

639039

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-52

METHOD : HAND

DRILL DATE: 7-4-89

039

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, fine to medium grained, amber, abundant fine shell. H.M. >1%.			
2.0-4.0		As Above. H.M. >1%.			
4.0-6.0		As Above. H.M. >1%			
6.0-8.0		As Above. Grades to coarse grained. H.M. >1%. H.M. rich at base.			
8.0-9.5		SAND, medium to coarse grained, amber. Hit dark brown layer at 8.9m. Some coarse shell. Hit water table at 9.0m. Grades to grey and dark grey. E.O.H. 9.5m. Too wet.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

36

639040

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-60

METHOD : HAND

DRILL DATE: 7-4-89

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-1.1		SAND, medium to coarse grained, amber, abundant fine shell. Hit Water Table 0.6m, started sludging. Hit rock. H.M. present. E.O.H. 1.1m. Rock.			
DOWN HOLE AVERAGE DEPTH & GRADE TO 1.5% CUTOFF					

040

37

639041

CLIENT : NATIONAL MINERAL SANDS PTY LTD

TITLE No. : EL 51/86

AREA : MARRAWAH

LINE No. : 4

LOGGED BY : A. DOVE

HOLE No. : M-56

METHOD : HAND

DRILL DATE: 7-4-89

INTERVAL (m)	DRY Wt. (kg)	DESCRIPTION	SLIMES %	+1000um %	H.M. %
0-2.0		SAND, medium to coarse grained, amber, abundant fine shell. H.M. present.			
2.0-2.4		As Above. Hit rock at water table. E.O.H. 2.4m. Rock.			

DOWN HOLE AVERAGE
DEPTH & GRADE TO 1.5% CUTOFF

011

APPENDIX 2:

Mineralogical Results

M-Line 1: M-16, M-14

M-Line 1: M-12, M-10, M-8, M-6, M-4

M-Line 1: M-2, M-0, M(-2)E, M(-4)E

M-Line 2: M-0, M-2, M-4, M-6, M-8, M-10

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 177

ATTENTION: MR. G.F. LEE

DATE. 3.5.89

SAMPLE DETAILS: ORDER NO. A 33, NMS EL 51/86

MARRAWAH HEAVY MINERALS

COMMENTS

1. Magnetic fractionation was at:

Hand magnetics

0.5A magnetics

0.9A magnetics

1.2A magnetics

1.2A non magnetics

Frantz Isodynamic Magnetic Separator, set at

Side slope 25°

Forward slope 18°

2. OTHER SILICATES: Olivine, pyroxene, epidote, mica, amphibole.

ILMENITE: May include some spinel.

3. All samples contain fine quartz, carbonate, ± pyrite.



J. McNulty

044

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

2A Railway Avenue
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CLIENT: PETER H. STITT & ASSOC. PTY LTD

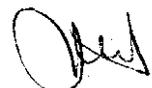
APS REPORT NO.: M 177

ATTENTION: MR G.F.LEE

DATE: 3.5.89

SAMPLE DETAILS: ORDER NO. A 33 NMS EL 51/86
MARRAWAH (LINE 1) (1) M-16, M-14

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
MONAZITE	<1	-	-	-	<1	-
ZIRCON	4	-	-	-	1	19
RUTILE	3	-	-	-	-	17
LEUCOXENE	7	-	-	-	-	41
LEUCOXENISED ILMENITE	2	-	-	4	25	-
ILMENITE	21	-	56	7	-	-
MAGNETITE	<1	100	-	-	-	-
IRON OXIDES	1	-	1	1	-	-
GARNET	8	-	22	2	4	-
TOURMALINE	12	-	2	21	25	1
ALUMINO SILICATES	2	-	-	-	-	8
OTHER SILICATES	37	-	17	64	45	-
SPINEL	1	-	2	1	-	-
PYRITE	-	-	-	-	-	-
QUARTZ	<1	-	-	-	-	2
CARBONATES	2	-	-	-	-	12
NO. OF POINTS	-	-	588	532	545	574
WEIGHT %	100	0.3	30.3	49.1	1.6	18.7



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Phone: (02) 516 4808

CLIENT: PETER H. STITT & ASSOC. PTY LTD

APS REPORT NO.: M 177

ATTENTION: MR G.F.LEE

DATE: 3.5.89

SAMPLE DETAILS: ORDER NO. A 33 NMS EL 51/86

MARRAWAH (LINE 1) (2) M-12, M-10, M-8 M-6, M-4.

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
MONAZITE	<1	-	-	-	<1	-
ZIRCON	4	-	-	-	<1	21
RUTILE	4	-	-	-	1	18
LEUCOXENE	10	-	-	-	-	47
LEUCOXENISED ILMENITE	2	-	-	3	24	-
ILMENITE	20	-	60	7	-	-
MAGNETITE	<1	100	-	-	-	-
IRON OXIDES	<1	-	<1	-	-	-
GARNET	7	-	24	1	4	-
TOURMALINE	10	-	<1	18	30	1
ALUMINO SILICATES	2	-	-	-	-	9
OTHER SILICATES	39	-	13	68	41	-
SPINEL	2	-	3	3	-	-
PYRITE	-	-	-	-	-	-
QUARTZ	<1	-	-	-	-	2
CARBONATES	<1	-	-	-	<1	2
NO. OF POINTS	-	-	581	573	583	569
WEIGHT %	100	0.3	26.7	50.7	2.1	20.2



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046

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CLIENT: PETER H. STITT & ASSOC. PTY LTD

APS REPORT NO.: M 177

ATTENTION: MR G.F.LEE

DATE: 3.5.89

SAMPLE DETAILS: ORDER NO. A 33 NMS EL 51/86

MURRAWAH (LINE 1) (3) M-2, M-0, M(-2)E, M(-4)E.

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
MONAZITE	<1	-	-	-	<1	-
ZIRCON	4	-	-	-	<1	17
RUTILE	3	-	-	-	<1	13
LEUCOXENE	11	-	-	-	-	45
LEUCOXENISED ILMENITE	3	-	-	5	19	-
ILMENITE	21	-	62	5	-	-
MAGNETITE	<1	100	-	-	-	-
IRON OXIDES	<1	-	<1	1	-	-
GARNET	7	-	21	1	3	-
TOURMALINE	11	-	2	24	26	<1
ALUMINO SILICATES	2	-	-	-	-	10
OTHER SILICATES	31	-	12	61	41	-
SPINEL	2	-	3	2	-	-
PYRITE	3	-	-	1	11	9
QUARTZ	2	-	-	-	-	6
CARBONATES	-	-	-	-	-	-
NO. OF POINTS	-	-	527	505	579	519
WEIGHT %	100	0.4	30.2	43.0	1.8	24.6



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APPLIED PETROGRAPHIC SERVICES

SPECIALIZING IN PETROGRAPHIC ANALYSIS OF GEOLOGICAL AND INDUSTRIAL SAMPLES

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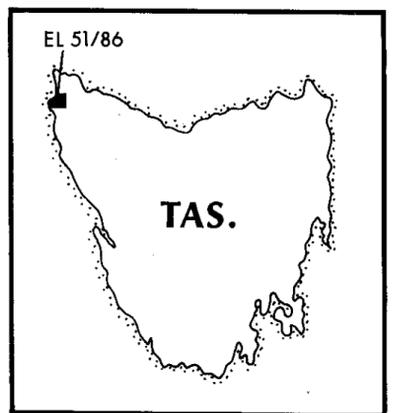
DATE: 3.5.89

SAMPLE DETAILS: ORDER NO. A 33 NMS EL 51/86

MURRAWAH (LINE 2) M-0, M-2, M-4, M-6, M-8, M-10.

	TOTAL	HAND MAG	0.5A MAG	0.9A MAG	1.2A MAG	1.2A NON MAG
MONAZITE	<1	-	-	-	<1	-
ZIRCON	6	-	-	-	<1	28
RUTILE	3	-	-	-	<1	16
LEUCOXENE	9	-	-	-	-	41
LEUCOXENISED ILMENITE	2	-	-	4	31	-
ILMENITE	22	-	62	5	-	-
MAGNETITE	<1	100	-	-	-	-
IRON OXIDES	1	-	1	1	-	-
GARNET	7	-	20	1	3	-
TOURMALINE	7	-	1	14	17	<1
ALUMINO SILICATES	2	-	-	-	-	37
OTHER SILICATES	37	-	13	72	46	-
SPINEL	2	-	3	3	<1	-
PYRITE	1	-	-	-	3	2
QUARTZ	1	-	-	-	-	5
CARBONATES	<1	-	-	-	-	1
NO. OF POINTS	-	-	509	504	512	539
WEIGHT %	100	0.4	31.9	45.0	1.6	21.1


J. McNulty



AMG REFERENCE POINTS ADDED

WOOLNORTH POINT
 AMG
 307060E
 5498040N

WOOLNORTH

Woolnorth Road

Smithton

STUDLAND BAY

LINE 1

LINE 2

EL 51/86

MOUNT CAMERON
 WEST
 ABORIGINAL SITE

Montagu

LINE 4

LINE 3

ANN BAY

LINE 1

LINE 0

Point

Green

MARRAWAH

AMG
 303 000E
 5467040N

N

8281

639049

NATIONAL MINERAL SANDS

EL 51/86

LOCATION MAP

Author: A.DOVE

Date: JUNE '89

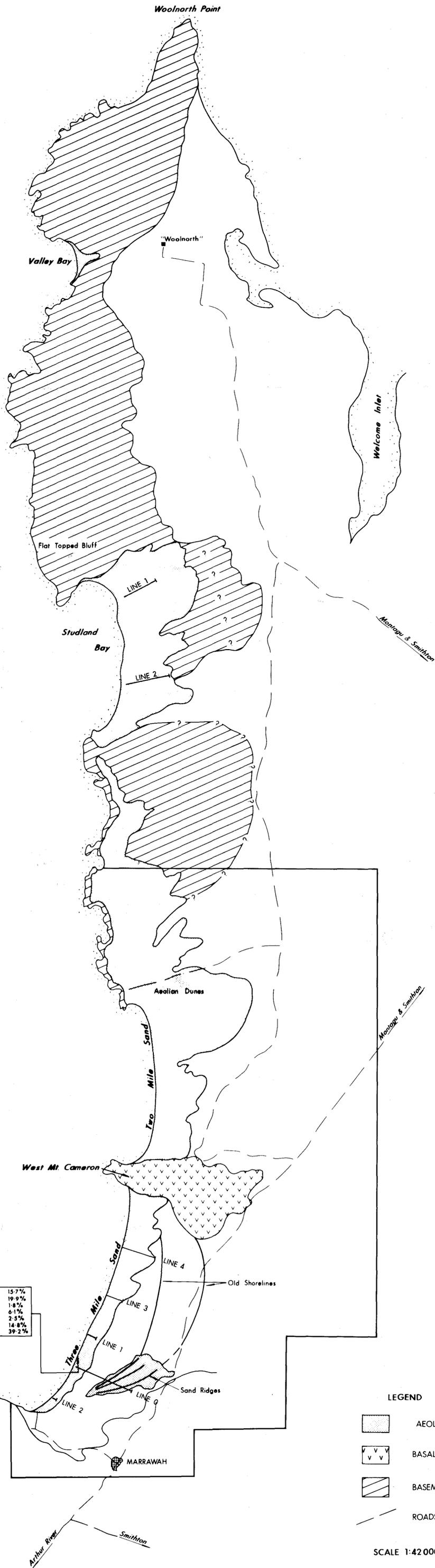
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5 cm

SCALE 1:50000

0 1 2 3 4 km.

SOUTHERN
OCEAN



LEGEND

- AEOLIAN DUNES
- BASALT
- BASEMENT ROCKS
- ROADS & TRACKS

SCALE 1:42 000



639050

NATIONAL MINERAL SANDS

EL 51/86 TASMANIA

AIR PHOTO INTERPRETATION
MARRAWAH TO WOOLNORTH

