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EL 652 AND EL 853

ORROROO AND EURELIA

PROGRESS AND TECHNICAL REPORTS FOR THE PERIOD 24/6/80 TO 19/7/82

Submitted by

Stockdale Prospecting Ltd
1982

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PRIMARY INDUSTRIES AND RESOURCES SA

CONTENTS ENVELOPE 3891

TENEMENT: E.L. 652 & 853

TENEMENT HOLDER: Stockdale Prospecting Limited

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE NUMBER 652: ORRORO0
FIRST QUARTERLY REPORT
PERIOD ENDING 23RD SEPTEMBER, 1980

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STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE NUMBER 652: ORRORO
FIRST QUARTERLY REPORT
PERIOD ENDING 23RD SEPTEMBER, 1980

1. INTRODUCTION

Exploration Licence 393 held by Stockdale Prospecting Limited until March 21st, 1980 was renewed in toto as Exploration Licence Number 652 (Map 1). This report therefore describes an ongoing programme from EL 393 and, for background information, the reader is referred to the eight quarterly reports submitted for Exploration Licence Number 393.

During the report period ground magnetometer grids were sited over the aeromagnetic anomalies, bulk sampling of anomalous drainages was undertaken, while auger drilling and costeaning defined kimberlitic body K8. The presence of this body had been suspected for some time, but it had not been precisely located. The body has been designated I54-1, K8.

2. FIELD WORK

2.1 Aeromagnetic Survey Data (Map 2)

Ground magnetic surveys were conducted over all of the aeromagnetic anomalies located by the airborne survey conducted late in 1979. Problems were encountered when it was noted that some of the anomalies coincided with cultural features and could well have been the result of man's developments. These were still checked as precisely as possible.

On completion of the ground magnetometer work each anomaly was contoured (Figures 1 - 12) and the plans sent to the consultant geophysicist in South Africa to be studied. The conclusions arrived at were that only two of the 21 anomalies should be tested by drilling (Anomalies 4/1 and 5/1).

This will be arranged for the next report period.

2.2 Bel Forest (Map 3)

Further sampling in the vicinity of the elusive K11 body has again failed to delimit the kimberlitic body that is evidently present. 34 loam line samples were collected and treated in this attempt supported by open traverse ground magnetometer work.

To the west of Bel Forest Homestead and north of the body K7 a spread of indicator minerals indicated the possible presence of a further kimberlitic body on the interfluve between Bel Forest Creek and the Chimney Ruin area. To ascertain the validity of this thought, 45 stream and gully samples were collected and treated.

2.3 Carrieton (Maps 4a, 4b)

Follow-up sampling of anomalous areas south and south-west of Carrieton was completed during the quarter. 15 stream and gully samples were collected and treated. The intrusive discovered during the last report period did not release kimberlitic indicators.

2.4 Follow up of K8 (Map 5)

The assumption made in the last quarterly report proved correct. The 25m grid, sited during the last quarter, delineated the source area sufficiently to allow costeaning to reveal that K8 is a small vein of kimberlite no more than 25cm wide. A bulk sample of the source rock and its confining sediments was collected and treated.

2.5 Bulk Sampling (Map 6)

The Heavy Media Separation plant continued operation at Orroroo treating bulk samples from anomalous drainage in the Carrieton area and from the Kimberlite K8. 7 bulk samples amounting to 290^3m were collected and treated. Eighty (80) cubic metres of this was collected from the dykes K12/13 to extract diamonds for more detailed study.

Samples were as follows :

K8	:	L9958	$10m^3$
K12/13	:	L9959	$80m^3$
Pekina Ck	:	L9960	$40m^3$
Tributary of Pekina Ck	:	L9961	$40m^3$
Pekina Ck	:	L9962	$40m^3$
Ivy Glen Ck	:	L9963	$40m^3$
Bel Forest Ck	:	L9964	$40m^3$
			$290m^3$

3. Results Received

Results have been received for the majority of the stream and loam sampling conducted in the Carrieton/Bel Forest areas and in the Bel Forest area a further source rock could be located during future work. Overall the results to date have not been encouraging.

Results of the bulk samples were as follows :

SAMPLE NUMBER	LOCATION	NUMBER	WEIGHT (ct)
L9934	Kimberlite (K7)	23	0.2207
L9935	Bel Forest Ck		
L9936	Kimberlite (K4)	5	0.0138
L9937	Kimberlite (K2)	4	0.0093
L9938	Stream below Chimney Ruin		
L9939	Stream below K2		
L9941	Kimberlite (K9)	1	0.0065
L9942	Pekina Creek		
L9943	Oladdie Creek		
L9944	Pekina Creek		
L9946	Kimberlite (K12)	3	0.0463
L9947	Kimberlite (K12)	1	0.0003
L9948	Kimberlite (K12)	3	0.0096
L9949	Kimberlite (K12)		
L9950	Kimberlite (K12)	2	0.0434
L9951	Kimberlite (K13)	6	0.0831
L9952	Kimberlite (K13)	5	0.0489
L9953	Kimberlite (K13)		
	Total	55	0.4819

A total of 55 diamonds were recovered from the various kimberlites bulk sampled giving 0.4819 cts. of weight.

4. Summary of Prospecting Data

Stream samples : 60
Loam samples : 34
Magnetometer stations : 2330
Bulk samples : collected : 7 ($290m^3$)
: treated : 7 ($290m^3$)
Sources disclosed : I54-1,K8

5. Future Programme

Disclosure of the kimberlite body at K11 will be attempted while the anomalies east of Ivy Glen and west of Bel Forest Homestead will be followed up. The two most promising aeromagnetic anomalies will be drilled.

As one of the aeromagnetic anomalies to be drilled coincides with the Rhonda Mine north-east of Carrieton, this area will also be investigated for base metal deposits.

6. Staff

The staff employed within the Exploration Licence during the report period were as follows :

Classification	Average No. Employed
Geologists	1
Field hands	4
Treatment plant supervisor	1
Treatment plant operators	2
Consultants :geophysicist	3 man days
:petrologist	2 man days

Assistance was given by the Exploration Manager and Regional Geologist while the project was supported by the facilities of our office and laboratory in Melbourne. Specialist laboratory services were provided by our laboratory in Johannesburg.

7. Expenditure

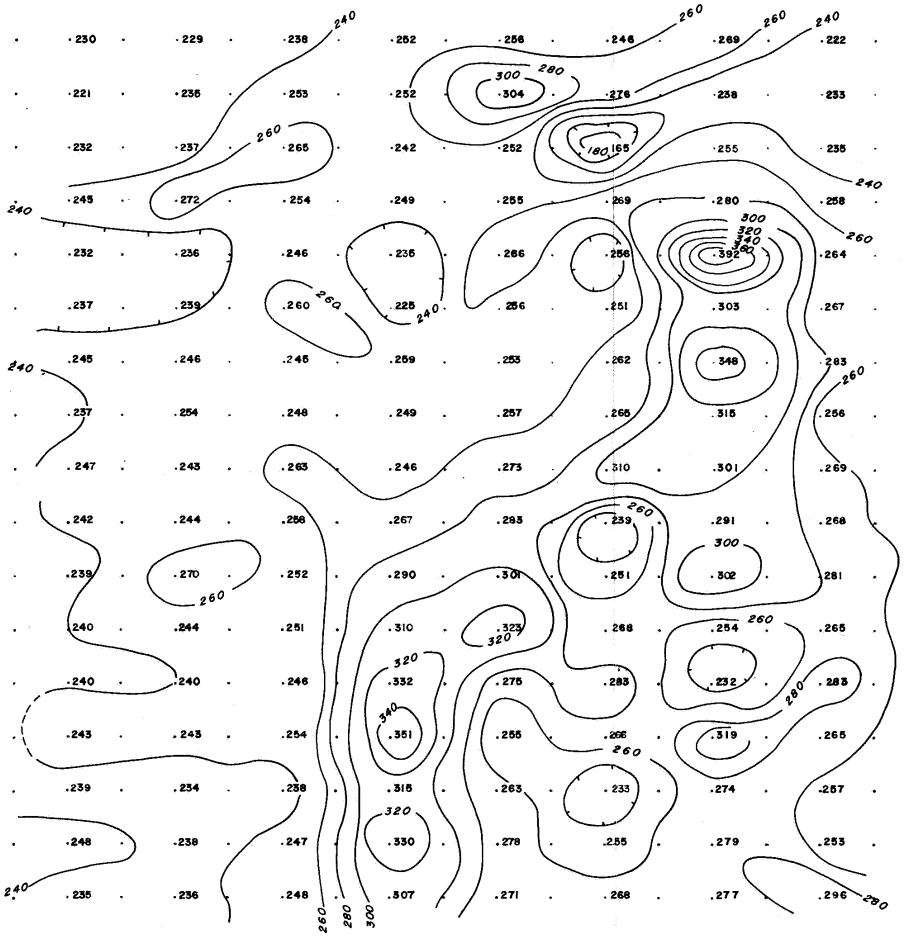
Expenditure for the period was as follows :

Management/Office Services	$ 1,591
Field staff - Technical	996
- Other	615
General Field Expenses	648
Transport -Ground	244
Sample Handling - Preparation	2,569
- Examination	3,431
Equipment Amortisation	351
Specialist Services - Geophysical	4,149
- Bulk sampling	20,300
- Petrological	500
TOTAL FOR THIS PERIOD	$ 35,394

Melbourne
October, 1980

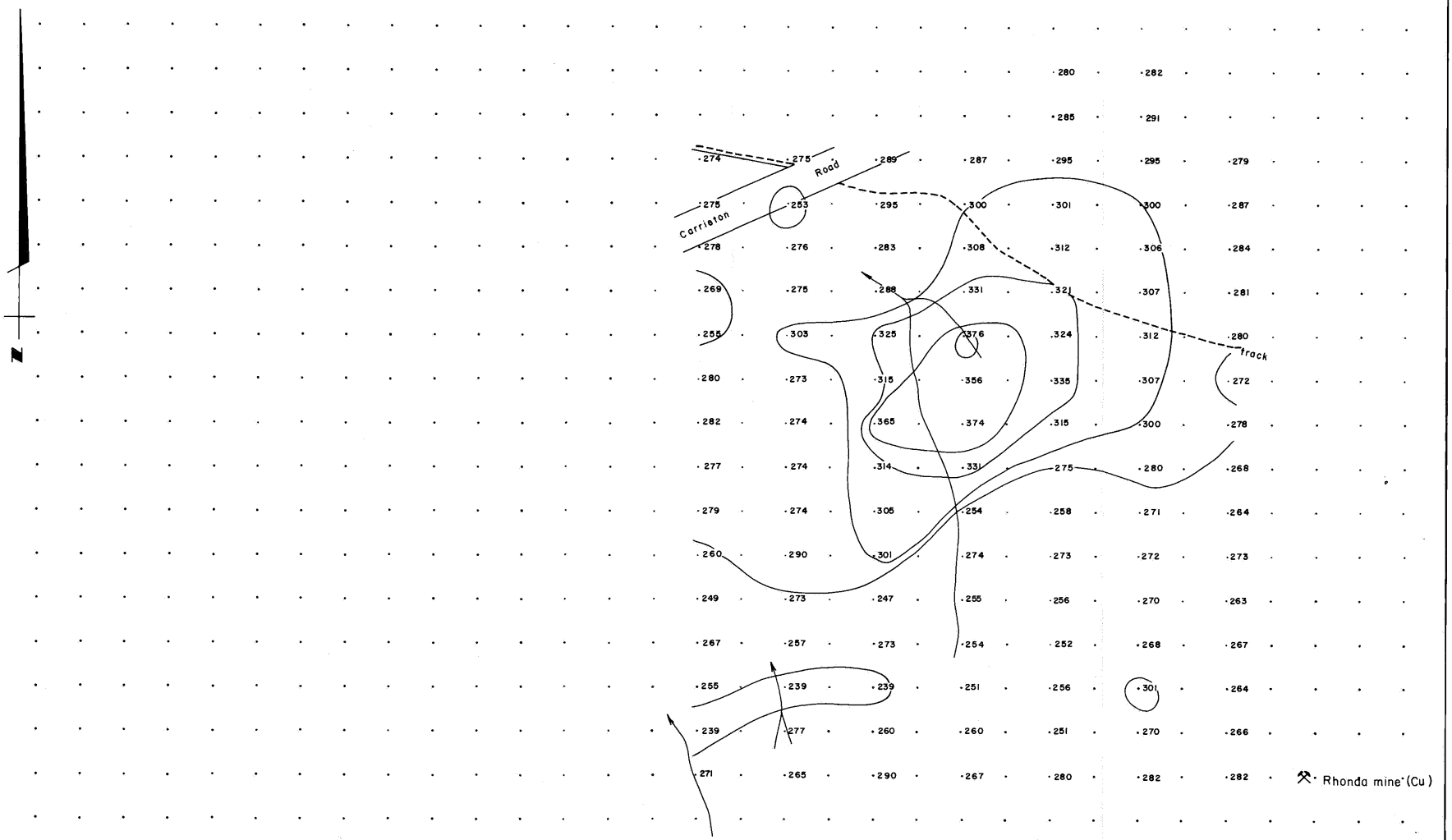
K.J. STRACKE
Exploration Manager

PRJ:bs



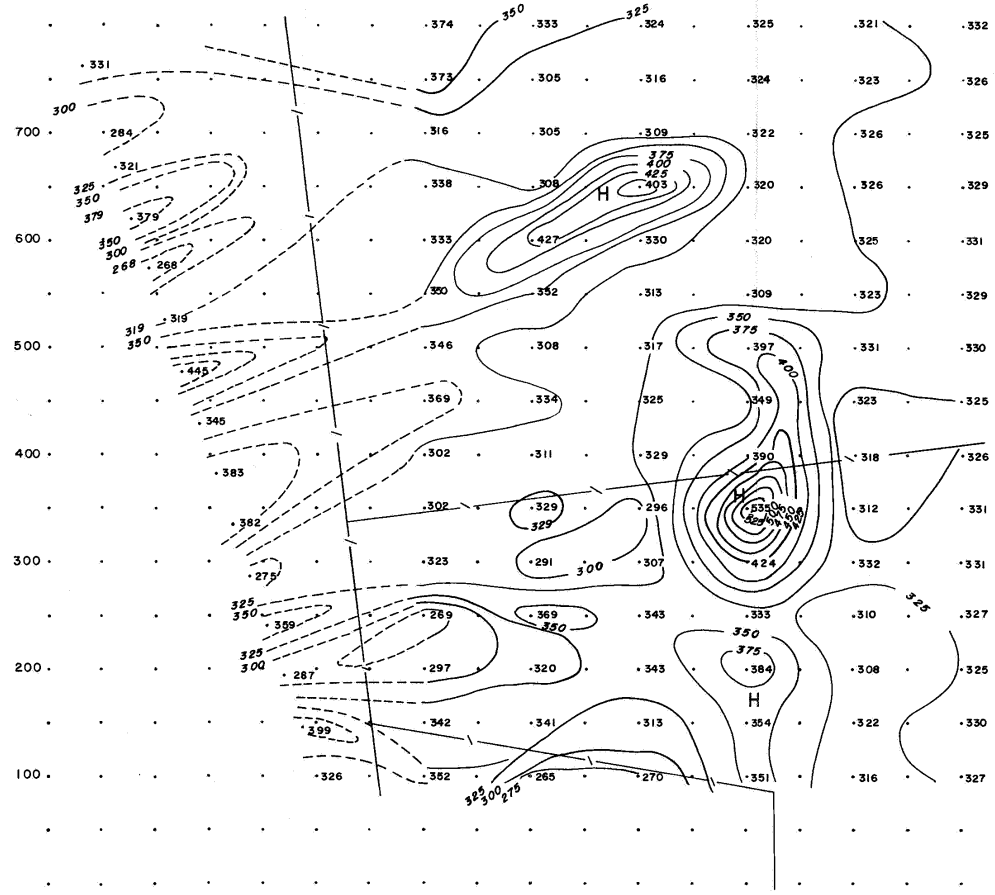
MAGNETOMETRIC SURVEY	LOCATION:	Carrieton NW		REF	2/2
CONTOUR INTERVAL: 20 Gamma		STATION INTERVAL: 50m		SCALE	1:5000
OPERATOR: NPB & JB		GEOLOGIST: PRD, DAF & NPB		DATE	20·9·80 SEL 1010n

Fig 1



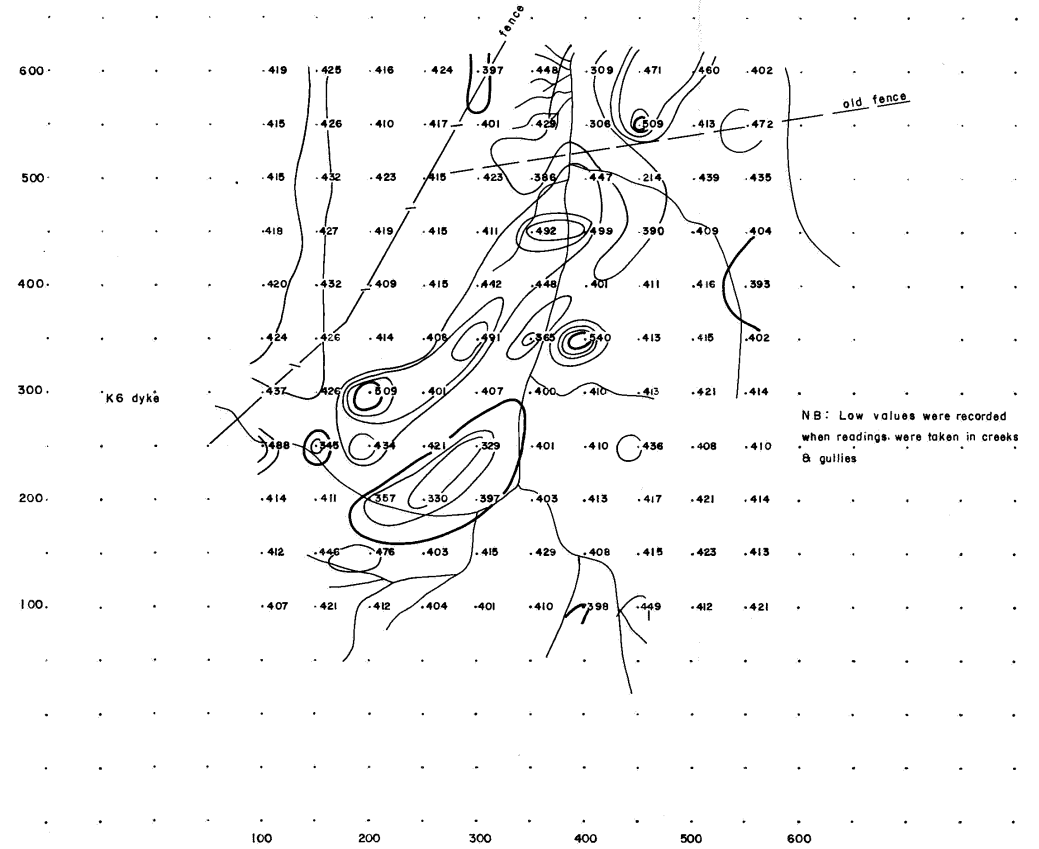
MAGNETOMETRIC SURVEY	LOCATION: EL 652 Orroroo			REF	4/1
CONTOUR INTERVAL: 25 gammas		STATION INTERVAL: 100 x 50m		SCALE	1 : 5,000
OPERATOR: PRD		GEOLOGIST: PRD, NPB		DATE	12.9.80 SEL 1010c

Fig 2



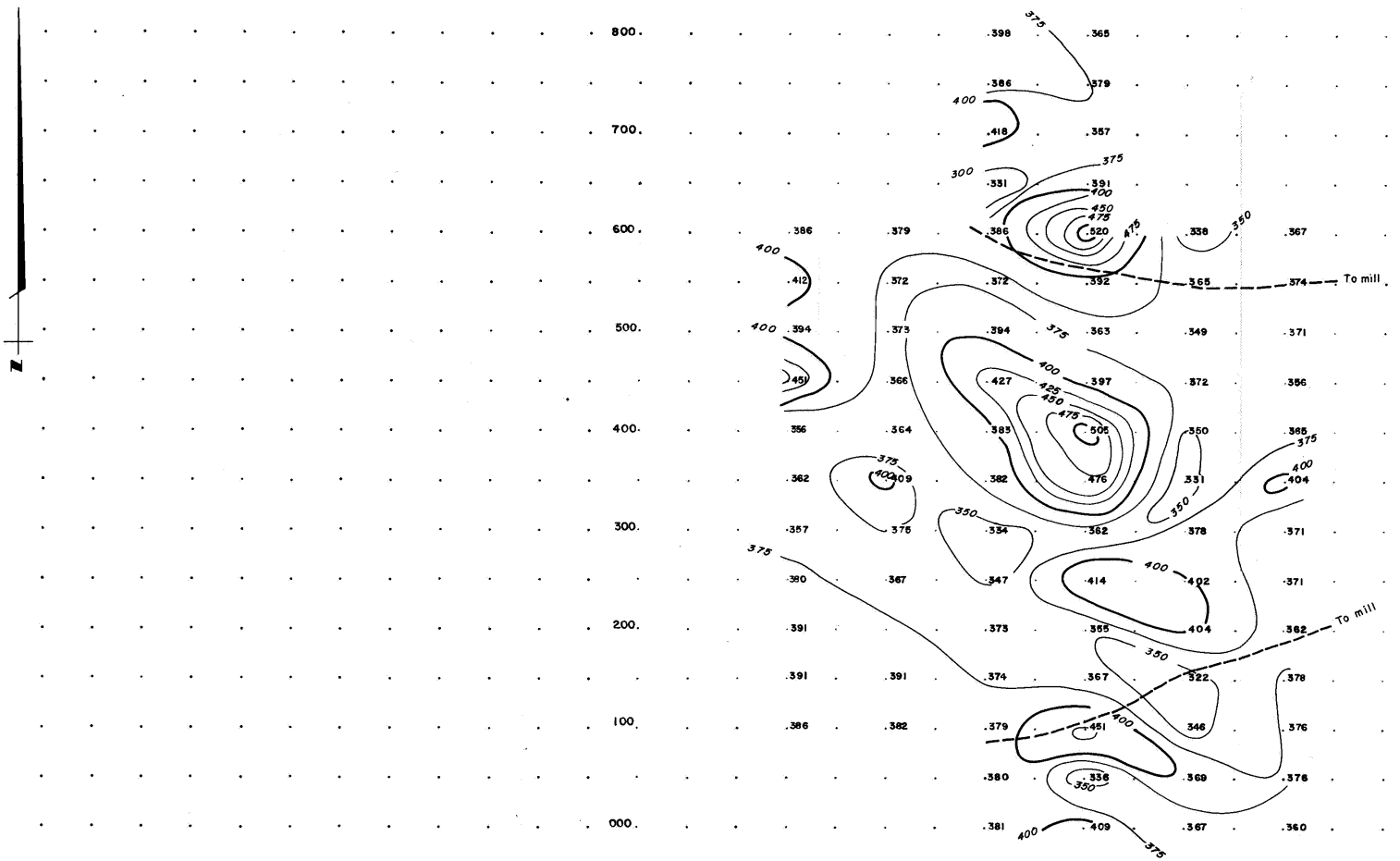
MAGNETOMETRIC SURVEY	LOCATION: Orroroo			REF: 5/1	
CONTOUR INTERVAL: 25 gamma		STATION INTERVAL: 50m		SCALE: 1:5000	
OPERATOR: PRD & BJM		GEOLOGIST: PRD		DATE: 11.9.80	SEL 1010d

Fig 3



MAGNETOMETRIC SURVEY	LOCATION	Orroroo		REF	6/1
CONTOUR INTERVAL	25 Gamma	STATION INTERVAL	50m	SCALE	1:5,000
OPERATOR	PRD	GEOLOGIST	NPB	DATE	5·9·80 SEL 1010 e

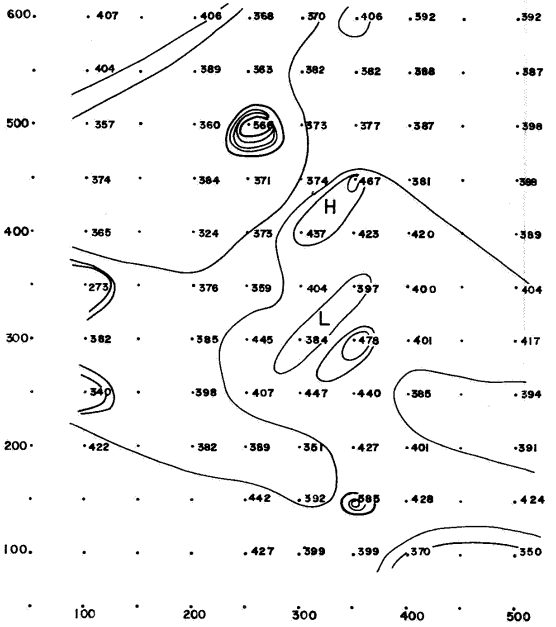
Fig 4



Track ————

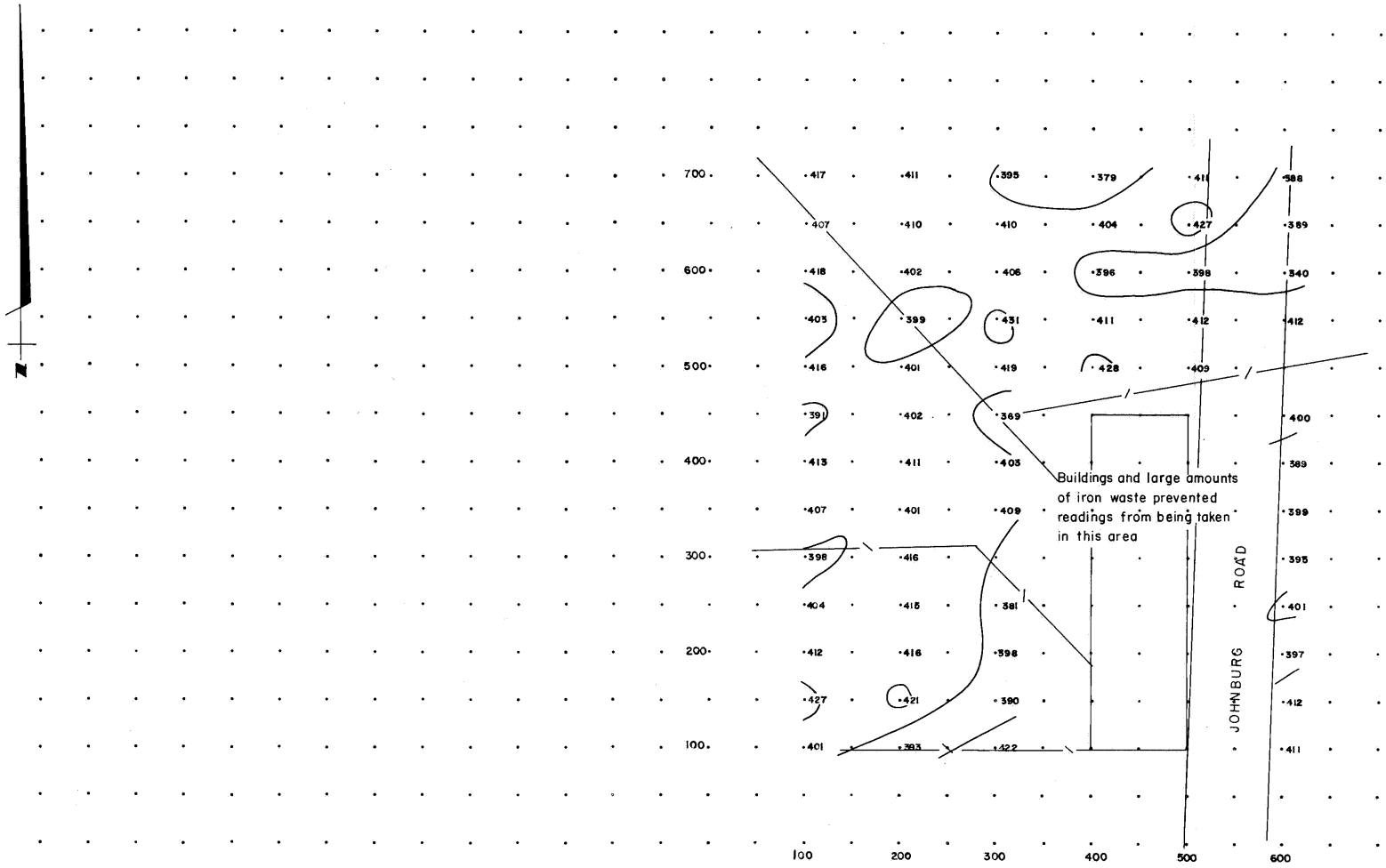
MAGNETOMETRIC SURVEY	STATION	Orroroo		REF	9/1
CONTOUR INTERVAL	25 Gamma	STATION INTERVAL	50 m	SCALE	1:5,000
OPERATOR	PRD & BJM	GEOLOGIST	PRD	DATE	17·9·80 SEL 1010f

Fig 5



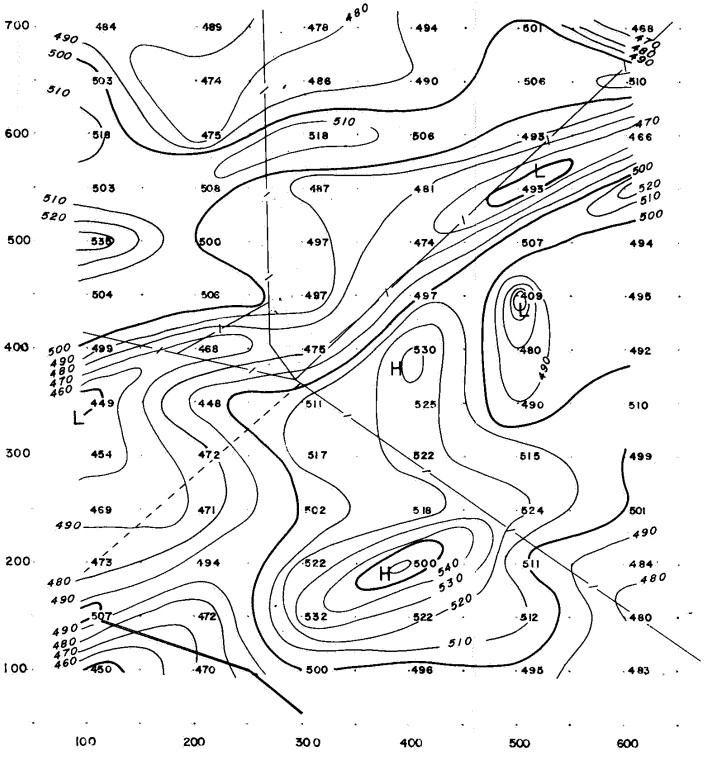
MAGNETOMETRIC SURVEY	LOCATION:	EL 652 Orroroo		REF:	10/1
CONTOUR INTERVAL: 25 Gamma		STATION INTERVAL: 50 m		SCALE:	1:5,000
OPERATOR: NPB & BJM		GEOLOGIST: NPB		DATE:	17·9·80 SEL 1010 g

Fig 6



MAGNETOMETRIC SURVEY	LOCATION:	EL 652 Orroroo		REF:	10/2
CONTOUR INTERVAL: 20 Gamma			STATION INTERVAL: 100 x 50 m	SCALE:	1: 5,000
OPERATOR: NPB			GEOLOGIST: NPB	DATE	19-9-80 SEL1010 h

Fig 7



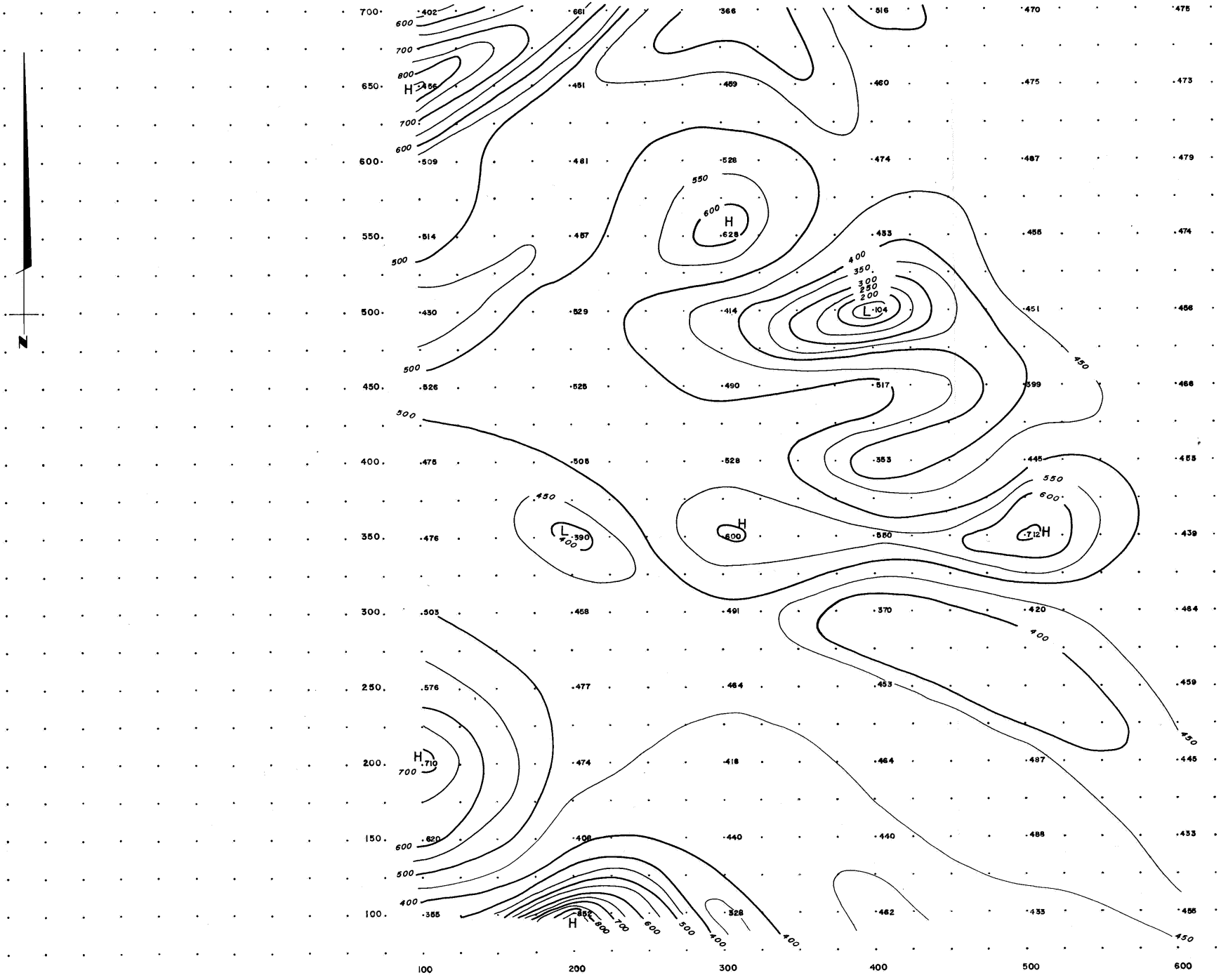
Fences ——/——
Track – – – – – –
Drain ——————

MAGNETOMETRIC SURVEY — Orroroo — 12/1

10 Gamma — 50m — 1:5,000

NPB — PRB — 4-9-80 — SEL 1010 i

Fig 8

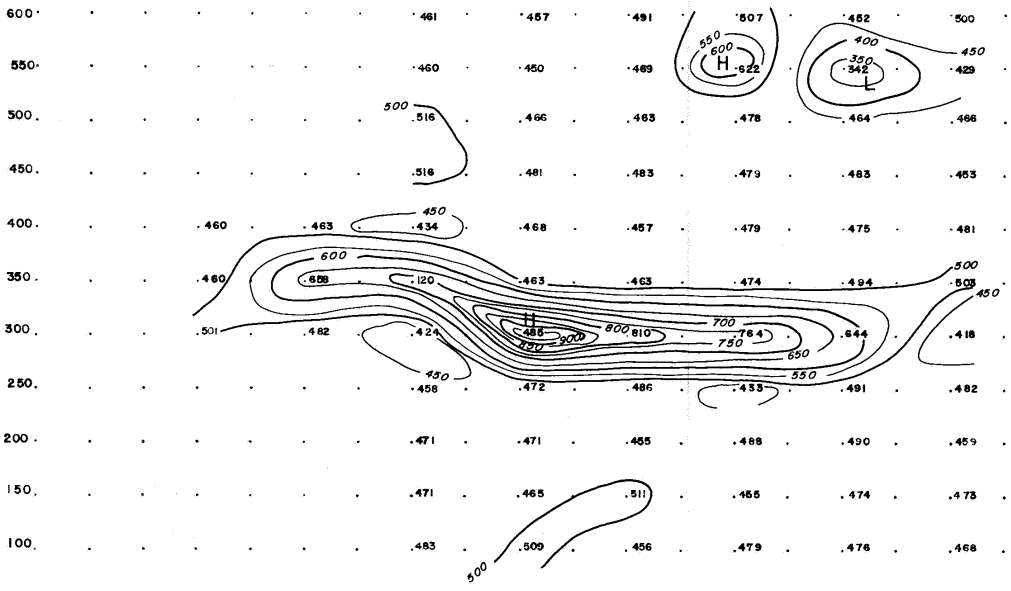


MAGNETOMETRIC SURVEY	LOCATION:	Orroroo		REF	12/2
CONTOUR INTERVAL	50 Gamma	STATION INTERVAL	50 m	SCALE	1: 2,500
OPERATOR	PRD	GEOLOGIST	PRD	DATE	27·9·80 SEL 1010 j

Fig 9

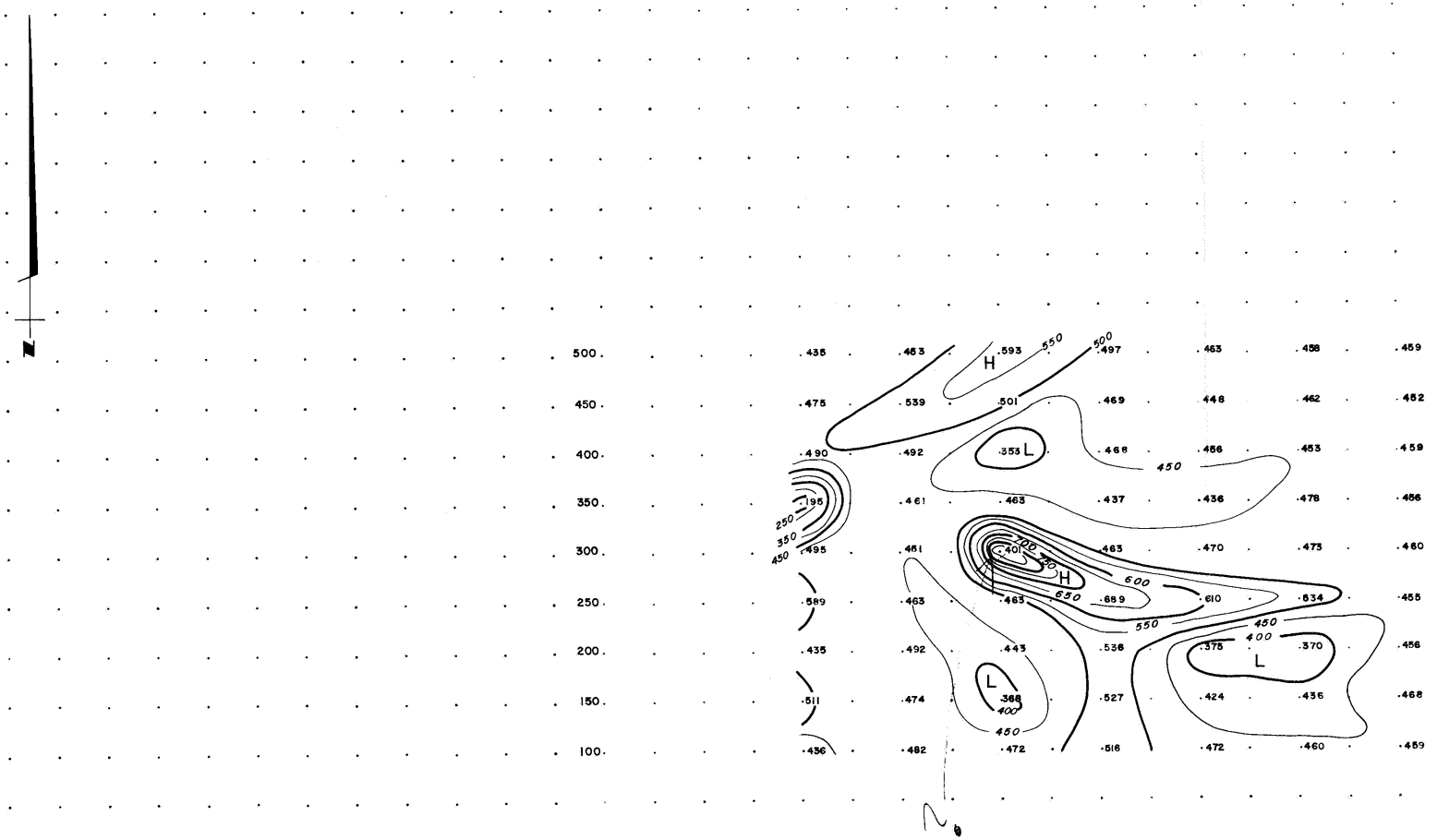
MAGNETOMETRIC SURVEY		ATION	Orroroo	REF	Anomoly 12/3
CONTOUR INTERVAL	25 Gamma	STATION INTERVAL	50 m	SCALE	1 : 2,500
OPERATOR	DJ	GEOLOGIST	PD	DATE	25 · 2 · 80 SEL 1010 k

Fig 10



MAGNETOMETRIC SURVEY	LOCATION	ORRORoo		REF	12/5
CONTOUR INTERVAL	50gammas	STATION INTERVAL	50m	SCALE	1 : 2,500
OPERATOR	PRJ	GEOLOGIST	PRD	DATE	28.2.80 SEL 1010 m

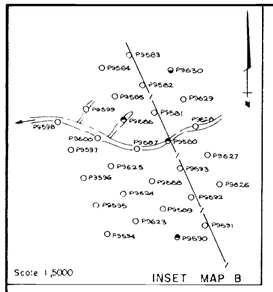
Fig 12

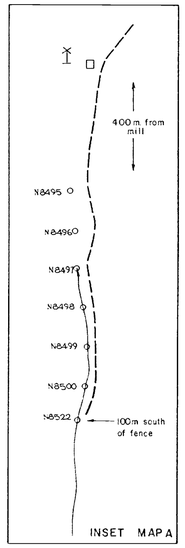


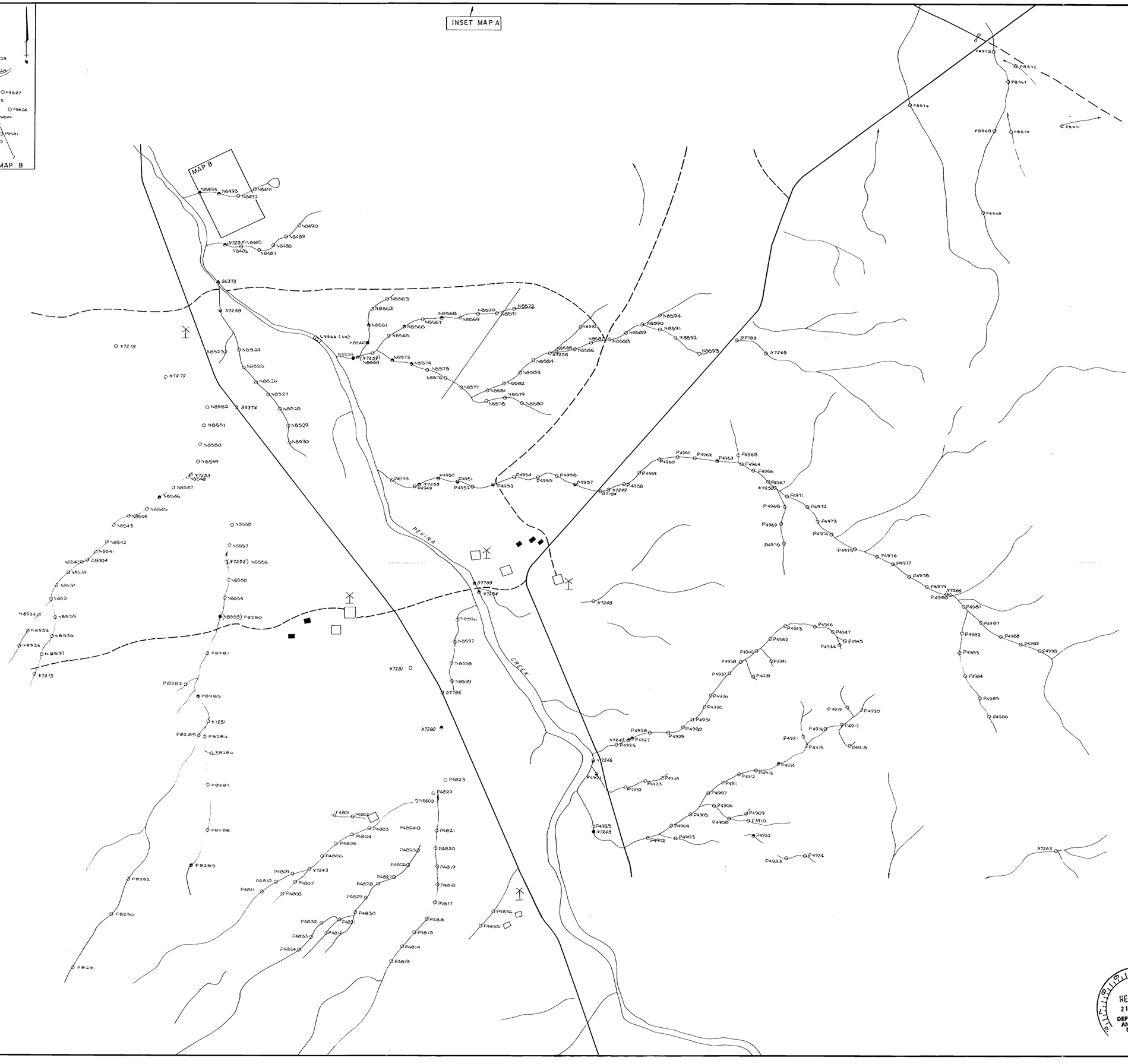
MAGNETOMETRIC SURVEY	LOCATION	Orroroo		REF	12/4
CONTOUR INTERVAL	50 Gamma	STATION INTERVAL	50 m	SCALE	1:5,000
OPERATOR	D J	GEOLOGIST	P R D	DATE	26·9·80 SEL 1010 L

Fig 11

INSET MAP A







MAY 1980
P9580 - 9600
P9623 - 9630

APRIL, 1980
P8567 - 8574

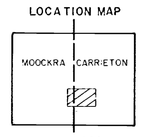
MARCH, 1980
P8280 - 8292

DECEMBER, 1979
N8485 - 8500
N8522 - 8600
P4800 - 4836

DEC. 1979
L9944

OCTOBER 1979
P4901 - P4990

LOCATION MAP



1 : 50,000

500 400 300 200 100 0 500
METRES

3891-1 Map 4a

STOCKDALE PROSPECTING LIMITED

CARRIETON WEST PROJECT

SAMPLE LOCATIONS

Compiled	Drawn	Date	Scale	SEL
T.R.F	MAK	OCT '79	1:10,000	875

INSET

SCALE 1:1,000

DEC. 1979
P4837 - P4950
P4991 - P5000

FEB. 1980
P8009 - 8020
P8023 - 8026
P8034 - 8042

APRIL 1980
P9501 - 9579

MAY 1980
P8054 - 8057

Proven kimberlite
Probable kimberlite
Costean
Bulk sample

SCALE 1:10,000

LOCATION MAP

CAHNIETON
MOOCKHA
OHNOHOO
WILLOWIE

1:50,000

Map 3

STOCKDALE PROSPECTING LIMITED

ORROROO 154-1

WESTERN EURELIA PROVINCE

Compiled NPB | Drawn JLM | Date May 1979 | Scale 1:10,000 | SEL 809

3891-2

EL 486

EL (393) 652

X 1/1

X 2/4

X 2/1

X 2/2

X 4/1

X 2/3

X 5/1

X 9/1

X 10/1

X 10/2

X 6/1

X 6/2

X 6/3

X 6/4

X 7/1

X 8/1

X 8/2

X 8/3

X 12/1

X 12/2

X 12/3

X 12/4

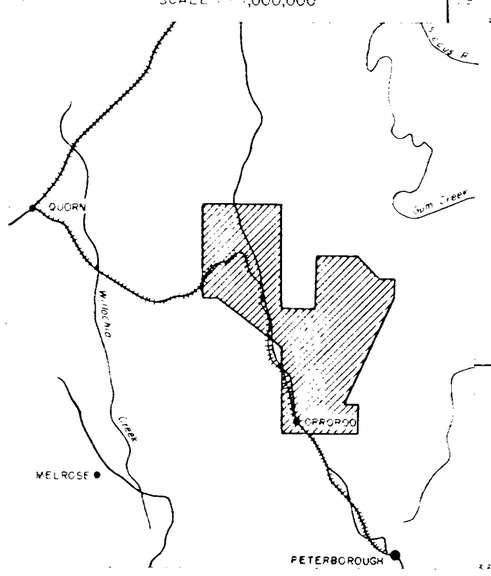
X 12/5

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP

SCALE 1:1,000,000



5/1 Anomaly Number

Contour interval 2·5 gammas

Map shows mag. anomalies selected by E.Kostlin, February, 1980

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3891-3 Map 2

STOCKDALE PROSPECTING LIMITED

ORRORO0 154-1

ISOMAGNETIC CONTOUR MAP

AIRBORNE SURVEY – GEOTERREX OCT.'79

Compiled	Drawn	Date	Scale	
EOK	JLM	Feb. 1980	1:100,000	SEL 937

32° 30'
32° 45'
138° 50'
32° 25'
138° 45'
32° 22'
138° 35'
138° 30'
138° 29'
138° 28'
32° 27'
32° 29'
32° 36'
138° 27'
SOU
BLACK ROCK
OLADDIN PLAIN
RANGES
WALLOWAY PLAIN
SOUTH LINDERS
Orroroo
SEL 767
SEL 768
SEL 875
SEL 929
SEL 949
SEL 735
SEL 768
SEL 809
SEL 791
SEL 816
SEL 791/4
SEL 791 (621)
SEL 2341
SEL 727
SEL 925
SEL 732
SEL 733
K1
K2
K3
K4
K5
K6
K7
K8
K9
K10
K11
K12
K13
ΔK12
SCALE 1:100 000
METRES 1000
0
1
2
3
4
5
6
7
8
9
10 KILOMETRES
N

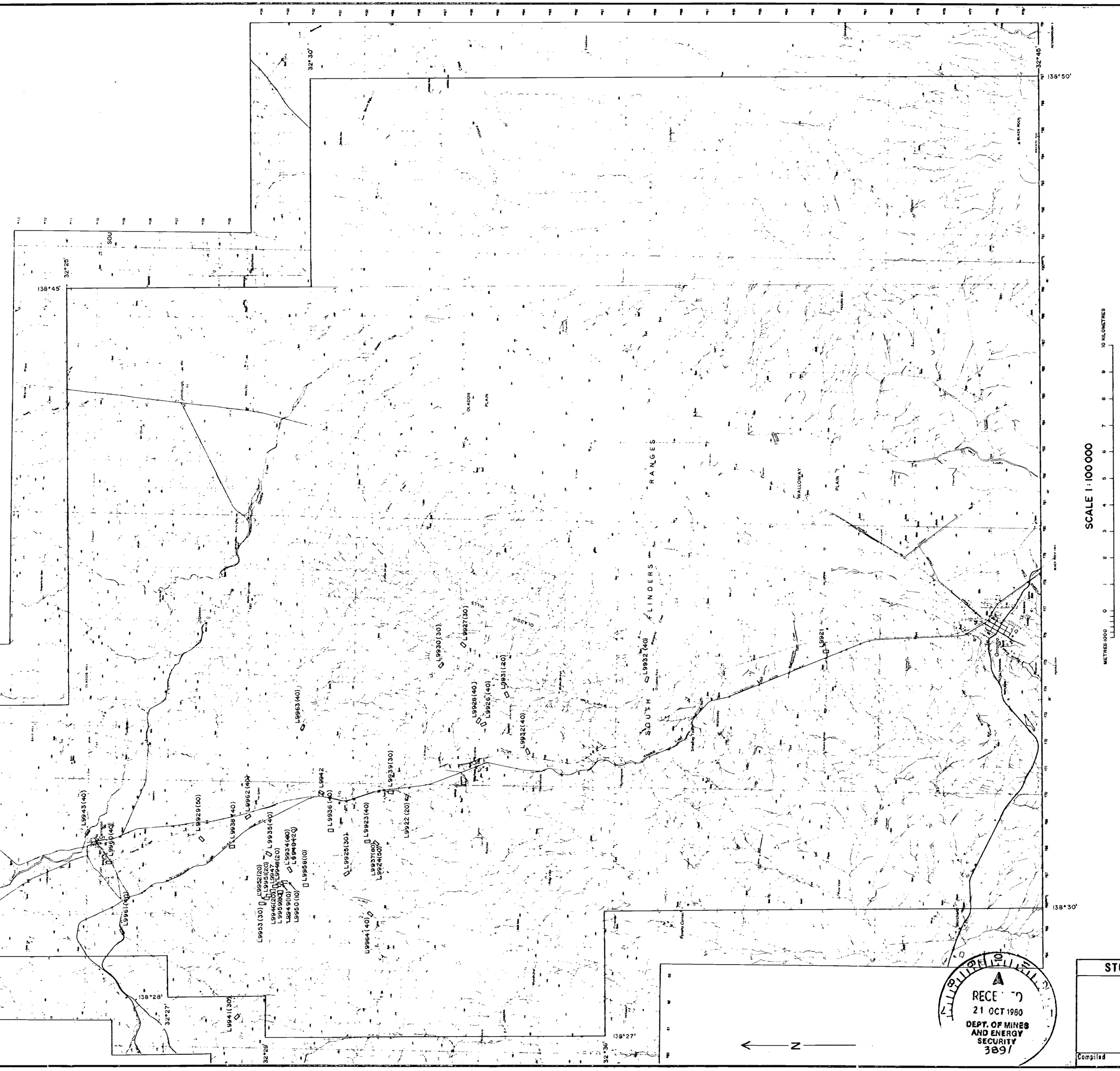
21 OCT 1980
DEPT. OF MINES AND ENERGY SECURITY
3891

3891-4 Map 1

STOCKDALE PROSPECTING LIMITED

ORRORO EXPLORATION LICENCE & SEL OUTLINES

DRAWN	COMPILED	SCALE	
JLM	JJ	1:100,000	SEL 731



3891-S Map 6

STOCKDALE PROSPECTING LIMITED

EL 652

BULK SAMPLES

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21 OCT 1980
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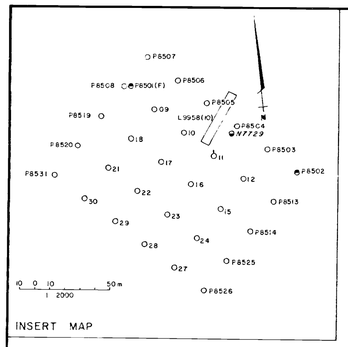
Compiled	Drawn MAK	Date SEPT. 80	Scale 1:100,000	SEL 1049

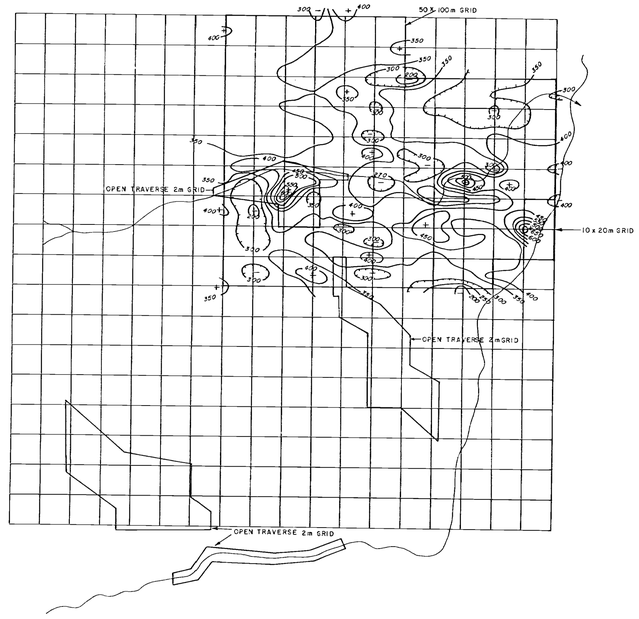


INSERT MAP

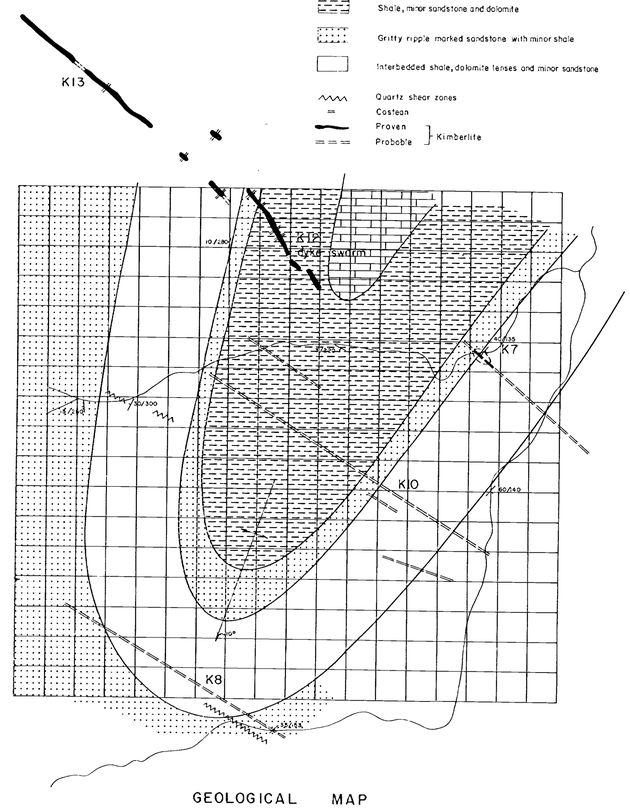
◊ L9959(80)
34 diamonds

2/.08
1/.497
1/.450
1/.0365
1/.0320
1/.0243
1/.0238
1/.0215
1/.0143
1/.0140
1/.0137
1/.0130
1/.0118
1/.0093
1/.0090
2/.0066
1/.0065
1/.0064
1/.0059
1/.0057
1/.0056
1/.0045
1/.0041
1/.0036
1/.0028
1/.0021
1/.0020
1/.0017
1/.0012
1/.00015
1/.00010
1/.00004

SAMPLE LOCATION MAP



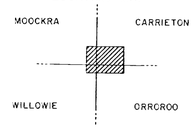
MAGNETOMETER MAP



GEOLOGICAL MAP

Feb. 1979	N7524 – 7526
	N7694 – 7800
	N8001 – 8100
March 1979	N8101 – 8120
April 1979	N8345 – 8379
	N8390 – 8394
Feb 1980	P8501 – 8531
	L9946 – 9953 (bulk samples)
	L9958 – 9959 (bulk)
Sept. 1980	S3001 – 3004, S3196 – 3200 } DH 333/3

LOCATION MAP



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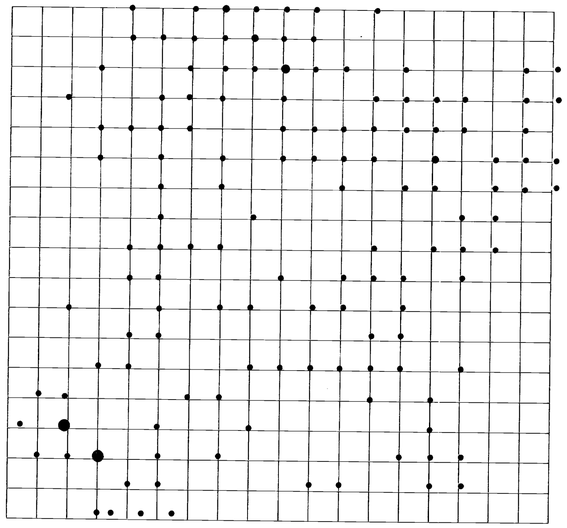
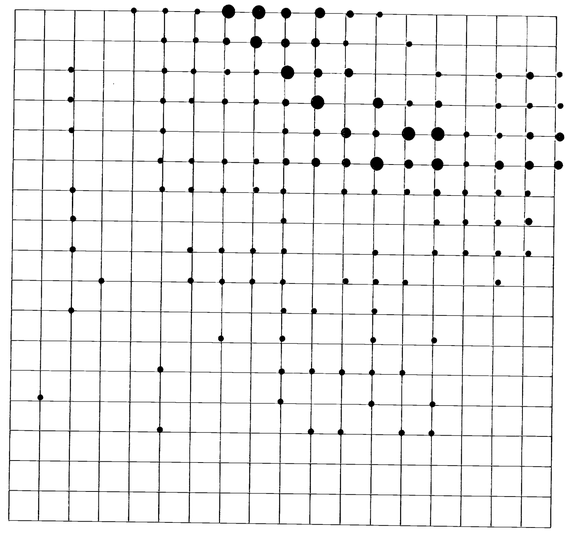


GARNET ANOMALY MAP

+60 41-60 21-40 11-20 6-10 1-5

Grain count



ILMENITE ANOMALY MAP

metres 100 0 100 200 300 400 500 metres

SCALE 1:10,000

MAP 3

STOCKDALE PROSPECTING LIMITED

ORROROO 154-1

BEL FOREST WEST

Compiled NPB	Drawn JLM	Date (revised) NOV'80	Scale 1:10,000	SEL 821

Carrieton
Pekina Creek
PETERBOROUGH
Ruins
Ruin
Rodeo
Oval
Shed
Cemetery
SEL 949
JANUARY 1980
P4851 - 4900
P8001 - 8008
FEBRUARY 1980
P8021 - 8022
P8027 - 8033
P8043 - 8053
P8278 - 8279
MAY, 1980
P8058 - 8064
LOCATION MAP
MOOCKRA
CARRIETON
1: 50,000
KILOMETRES
Map 4 b
STOCKDALE PROSPECTING LIMITED
ORROROO 154-1
CARRIETON SAMPLING
Compiled DAF
Drawn MAK
Date MAR. '80
Scale 1:10,000
SEL 929
RECEIVED
21 OCT 1980
DEPT. OF MINES AND ENERGY
SECURITY
3891

3891-7

STOCKDALE PROSPECTING LIMITED
EXPLORATION LICENCE NUMBER 652
SECOND QUARTERLY REPORT TO THE 23RD DECEMBER, 1980

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STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE NUMBER 652 : ORRORO0

SECOND QUARTERLY REPORT PERIOD ENDING 23RD. DECEMBER 1980.

1.0 INTRODUCTION

This report covers diamond and base metal exploration within Exploration Licence Number 652 : ORRORO0 in the period from September 24th 1980 to December 23rd 1980. (Map 1)

2.0 DIAMOND EXPLORATION

2.1 EXPLORATION PROGRESS

The only diamond prospecting done during the report period was drilling over magnetic anomalies at Bel Forest, an anomaly detected during ground magnetometer work, and at Ivy Glen, an anomaly disclosed from the aeromagnetic survey conducted late in 1979. Drill hole locations are shown on Map 2.

Bel Forest Anomaly

A ground magnetic feature was detected during the magnetometer survey in the area of I54-1/K7, K12 & K13 (Map 3). The anomaly trends en echelon with the K7, K12 & K13 bodies but has neither surface expression nor kimberlite indicator halo. It was considered plausible that the anomaly was a pipe which may not have reached the surface.

Drill hole DH 333/3 sited on the south bank of Bel Forest Creek, intersected light-coloured shale, in part indurated/siliceous. Magnetic susceptibilites of 0.7×10^{-3} emu (3 m), 1.5×10^{-3} emu (6 m) and 0.1×10^{-3} (9 m) were recorded. At 26 m the hole was abandoned due to lost circulation.

Triplicate samples were collected at 3 m intervals: one for heavy mineral analysis, one for possible geochemical analysis and one for SADME use. Results are not yet available.

Ivy Glen Anomaly

The feature to be drilled was selected by our consultant geophysicist from the airborne magnetic survey flown late in 1979 (Figure 1). A ground magnetometer survey was undertaken to locate the anomaly and aid in the selection of drill sites. (Figure 2).

The first drill hole (DH 333/4) was positioned at the centre of the anomaly and the second hole (DH 333/5) some 50 m south. Both holes intersected the Upper Proterozoic mudstone-shale sequence with little change for the full length of the holes. The magnetic susceptibility of all dusts and chips was continuously registered and samples collected every 3 m. Both holes reached 60 m.

DH 333/4 intersected only one section of interest, at 25 m, where the susceptibility was 0.6 x 10^{-3} emu. Drill chips from this depth contained considerable quartz fragments and are thought to contain fine base metal mineralization.

DH 333/5 intersected nothing of interest lithologically and no apparent cause for any magnetic response was detected.

Three samples were collected at every 3 m giving a total of 40 samples for heavy mineral examination and 40 each for base metals, if required, and SADME requirements. Results are not yet available.

2.2 RESULTS RECEIVED

Results were received for the seven bulk samples collected and treated during the last report period. Five of the bulk samples (L9960-L9964) sited in drainages and L9958, extracted from the kimberlite vein designated I54-1/K8, proved to be barren. However, sample L9959 from the dyke swarm I54-1/K12 & K13 produced 34 diamonds weighing 0.5435ct, and ranging in weight from 0.0004 ct. to 0.08 ct.

2.3 FUTURE PROGRAMME

Although it is unlikely that a diamond deposit of economic proportions exists within EL 652, the diamondiferous nature of the bodies disclosed there warrants further detailed petrological research in 1981.

Also, the spread of indicators suggests there are more kimberlite bodies yet to be found.

2.4 STAFF

The staff employed were as follows:-

Geologists	1
Field Hands	2
Drilling Contractors	2

2.6 EXPENDITURE

Expenditure for the period on diamond exploration was as follows:-

Management/Office Services	$ 834
Field Staff - Technical	527
- Other	325
General Field Expenses	343
Transport - Ground	129
Sample Handling - Preparation	1,339
- Examination	1,788
Equipment Amortisation	186
Specialist Services - Drilling	4,105
TOTAL FOR THIS PERIOD	$ 9,576
Total previously reported	$35,394
TOTAL DIAMOND EXPENDITURE TO DATE	$44,970

3.0 BASE METAL EXPLORATION

3.1 INTRODUCTION

Copper mineralisation at the old 'Rhonda' mine in Exploration Licence 652 appears to be associated with aeromagnetic anomaly 4/1 (Figure 3). Soil sampling and ground magnetics were followed by two percussion holes to investigate the source fo the magnetic anomaly.

3.2 WORK DONE

Gridding

Using the Rhonda shaft as datum with co-ordinates 5000E, 5000N, a grid at 100 m spacing was established on a magnetic north bearing from 4600N to 5800N and easterly from 4300E to 5500E.

Soil Sampling

C zone samples were collected at 100 m stations, sieved to -80 mesh and submitted for analysis for the elements Cu, Pb, Zn and Mn by AAS after perchloric acid digestion.

Magnetics

Magnetometer readings were recorded at 50 m intervals along the lines. Intermediate readings at 10 m intervals were recorded as follows:

LINE	FROM	TO
4400E	5150N	5550N
4500E	5200N	5600N
4600E	5250N	5650N
4700E	5300N	5700N
4800E	5350N	5750N
4900E	5400N	5800N

Drilling

The co-ordinates of drillholes DH 333/1, DH 333/2 are approximately at 4650E, 5200N and 4750E, 5800N. They were completed at 79 m and 81 m respectively.

3.3 RESULTS

Geochemistry

Assay results are plotted on Maps 4 - 7. Copper and manganese results are summarised in Figures 4 and 5 respectively.

Magnetics

Magnetic readings are plotted on Map 8 and summarised in Figure 6.

Drilling

Copies of the drill logs are attached.

Chip samples were analysed by semi-quantitative emission spectrography for Ba, Co, Mn, Mo, Ni, V, W, Ti, Nb, Cr, Ag, As, Bi, Cu, Sb, Sn, Zn, Pb, Cd, Ge and by AAS for Au. Copies for the assay results are enclosed. (Appendix 2)

3.4 DISCUSSION OF RESULTS

The magnetic response was due to magnetite associated with vein quartz material. No mineralisation of economic significance was intersected.

3.5 RECOMMENDATIONS

No further work should be done.

3.6 EXPENDITURE

A total of $10,686 was expended on base metal exploration as follows:

Geologist time and living expenses	$ 7,945
Operating costs	1,266
Management overheads	1,474
	$10,686

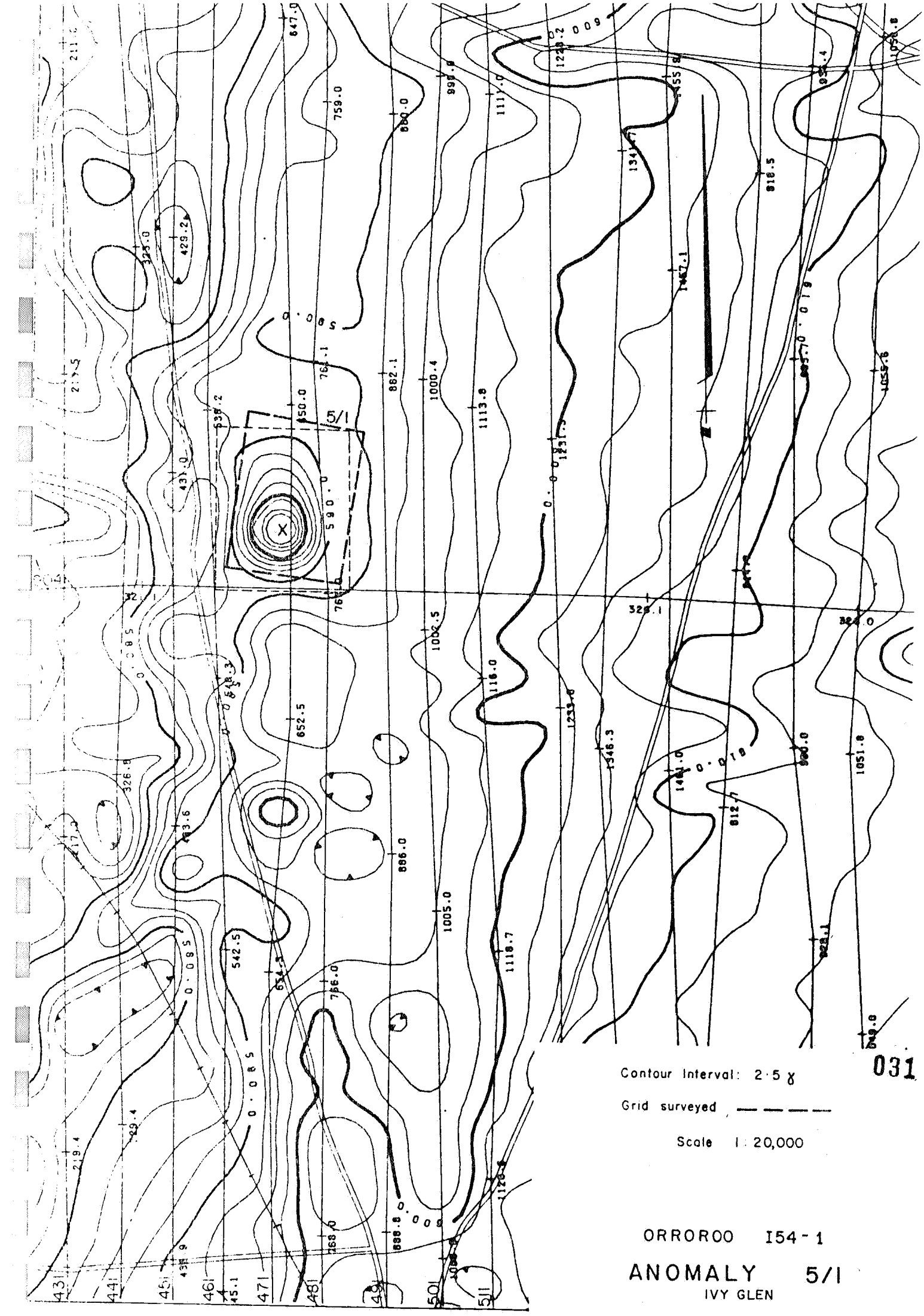
4.0 **EXPENDITURE**

Diamond Exploration Expenditure to Date	$44,970
Base Metal Exploration Expenditure	$10,686
TOTAL EXPENDITURE TO DATE	$55,656

MELBOURNE
January, 1980

K.J. STRACKE
Exploration Manager

PRJ/ALC:bs

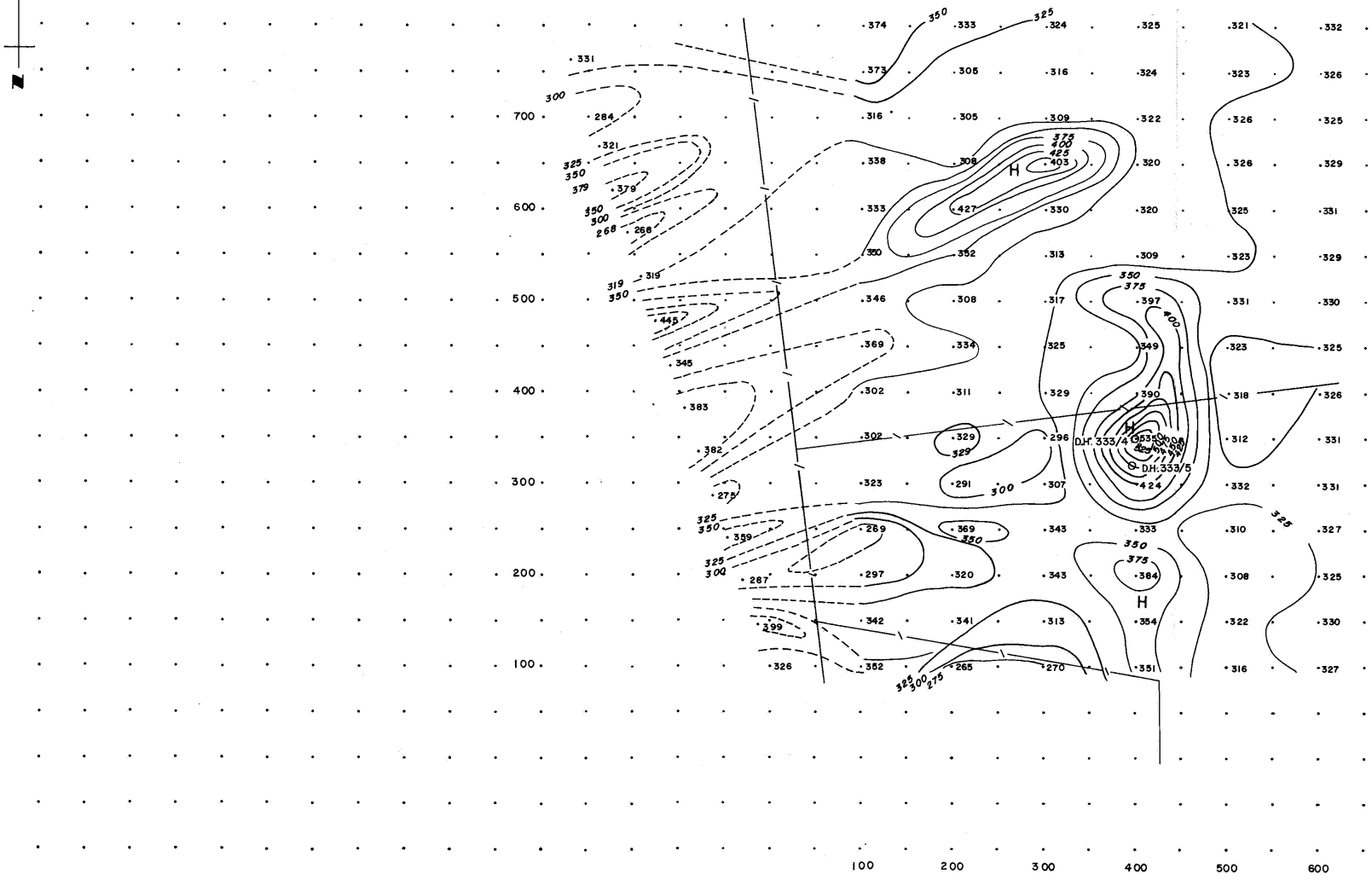


ORRORoo I54-1

ANOMALY 5/1

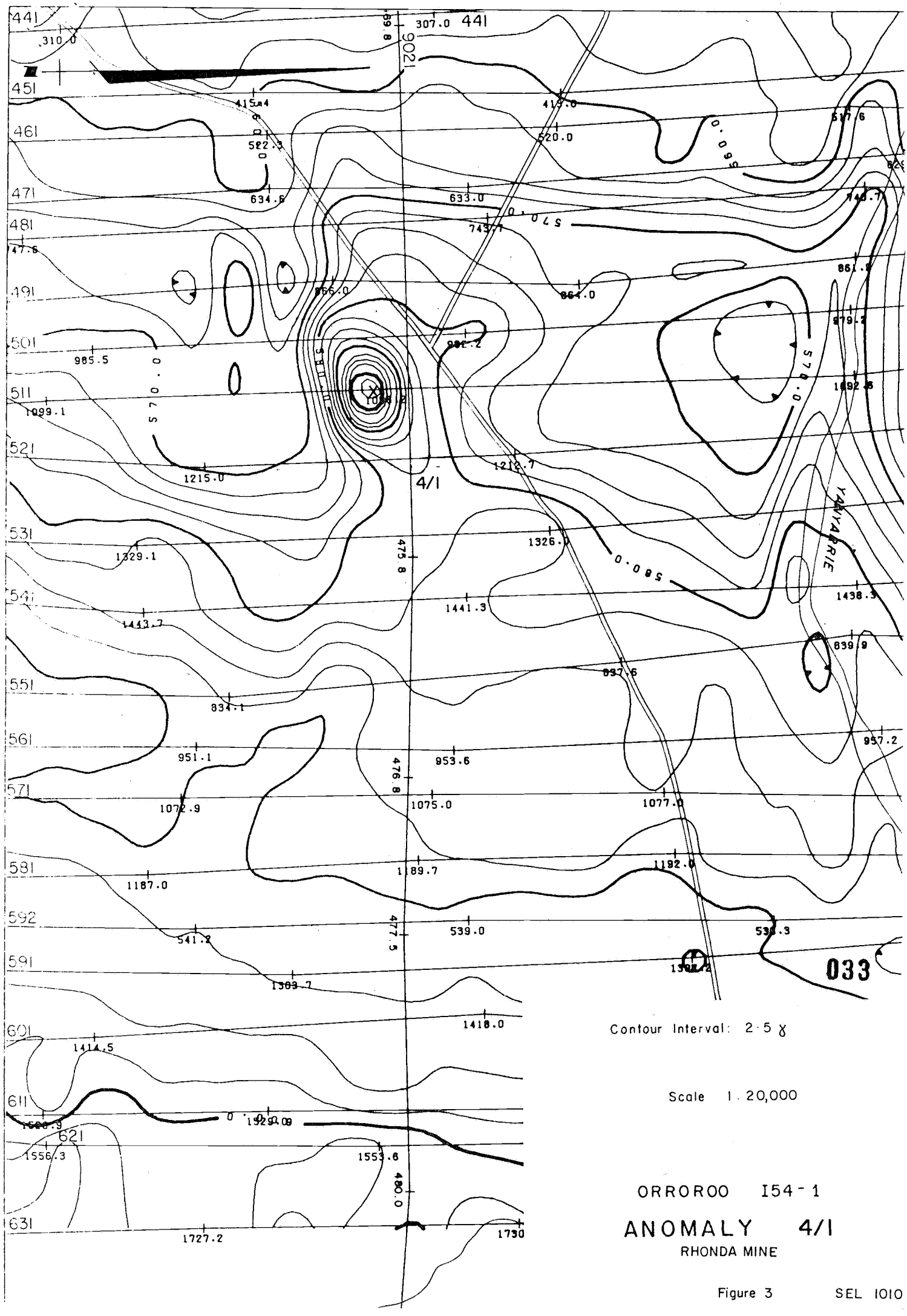
IVY GLEN

Figure 1 SEL 1010d



MAGNETOMETRIC SURVEY	LOCATION: Orroroo		REF: 5/1
CONTOUR INTERVAL: 25 gamma	STATION INTERVAL: 50m		SCALE: 1:5000
OPERATOR: PRD & BJM	GEOLOGIST: PRD		DATE: 27.10.80 SEL 10IOD

Figure 2



Contour Interval: 2·5 γ

Scale 1. 20,000

ORRORO I54-1

ANOMALY 4/1

RHONDA MINE

Figure 3 SEL 1010 c

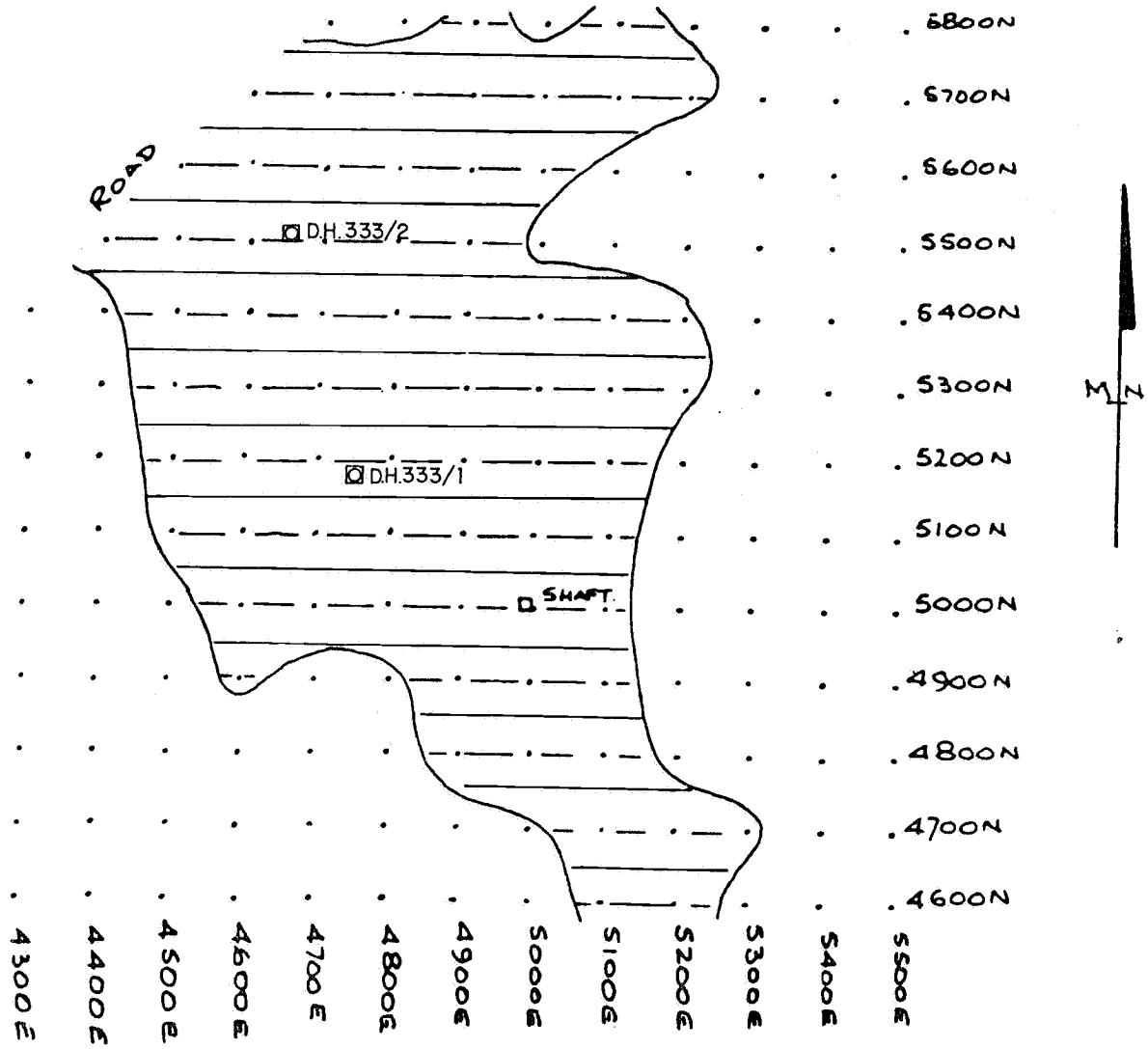


Figure 4

STOCKDALE PROSPECTING LIMITED

ORRORO0 154-1
E.L. 652
Rhonda Grid
COPPER IN SOIL
>34 ppm Cu in soil

Compiled AAA	Drawn AAA/CJM	Date JAN. '81	Scale 1:10,000	SEL 1083a

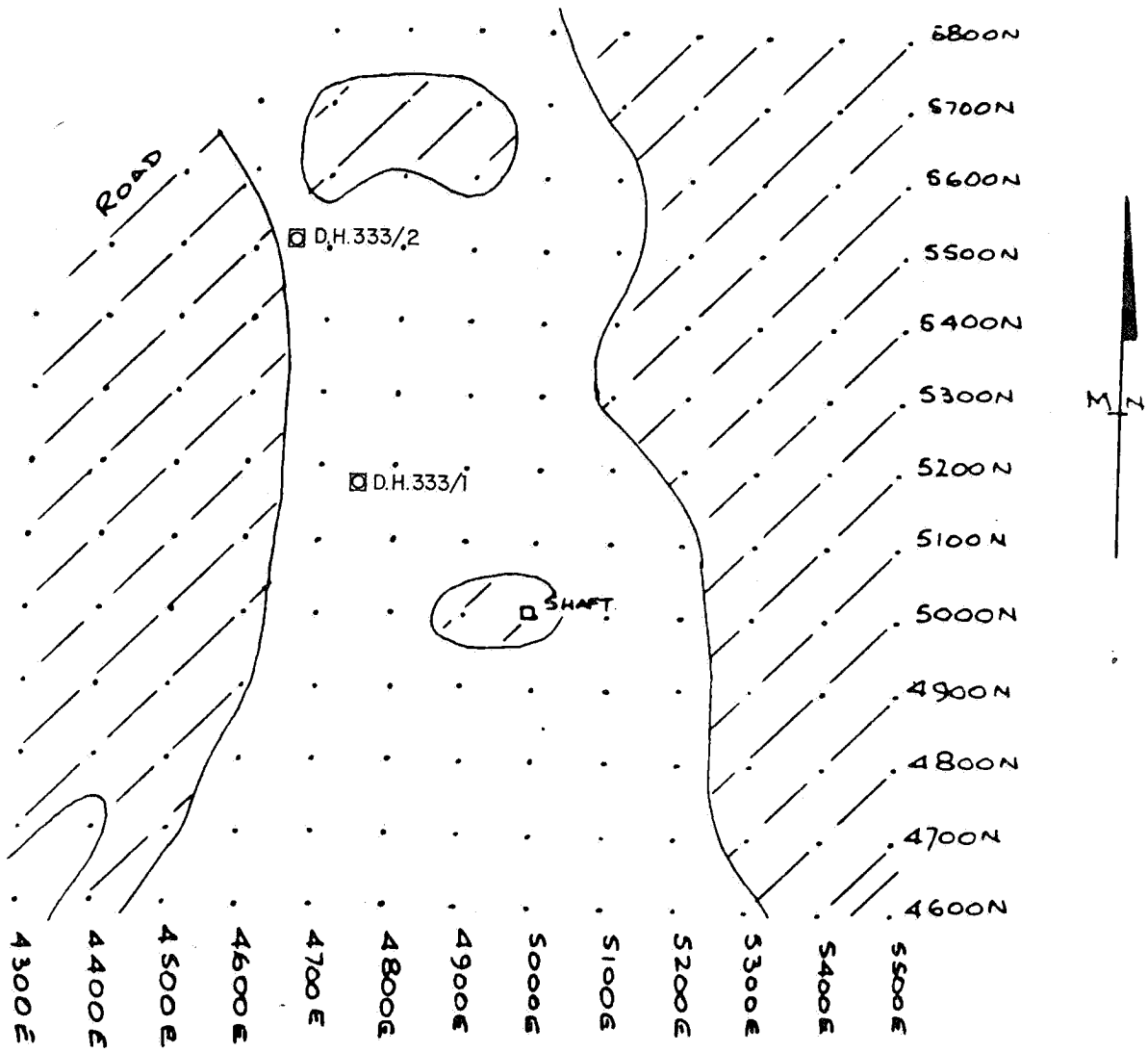


Figure 5

STOCKDALE PROSPECTING LIMITED

ORROROO I54-1
E.L.652
Rhonda Grid
MANGANESE IN SOIL
>400 ppm Mn in soil

Compiled AAA	Drawn AAA/CJM	Date JAN. '81	Scale 1:10,000	SEL 1083 b

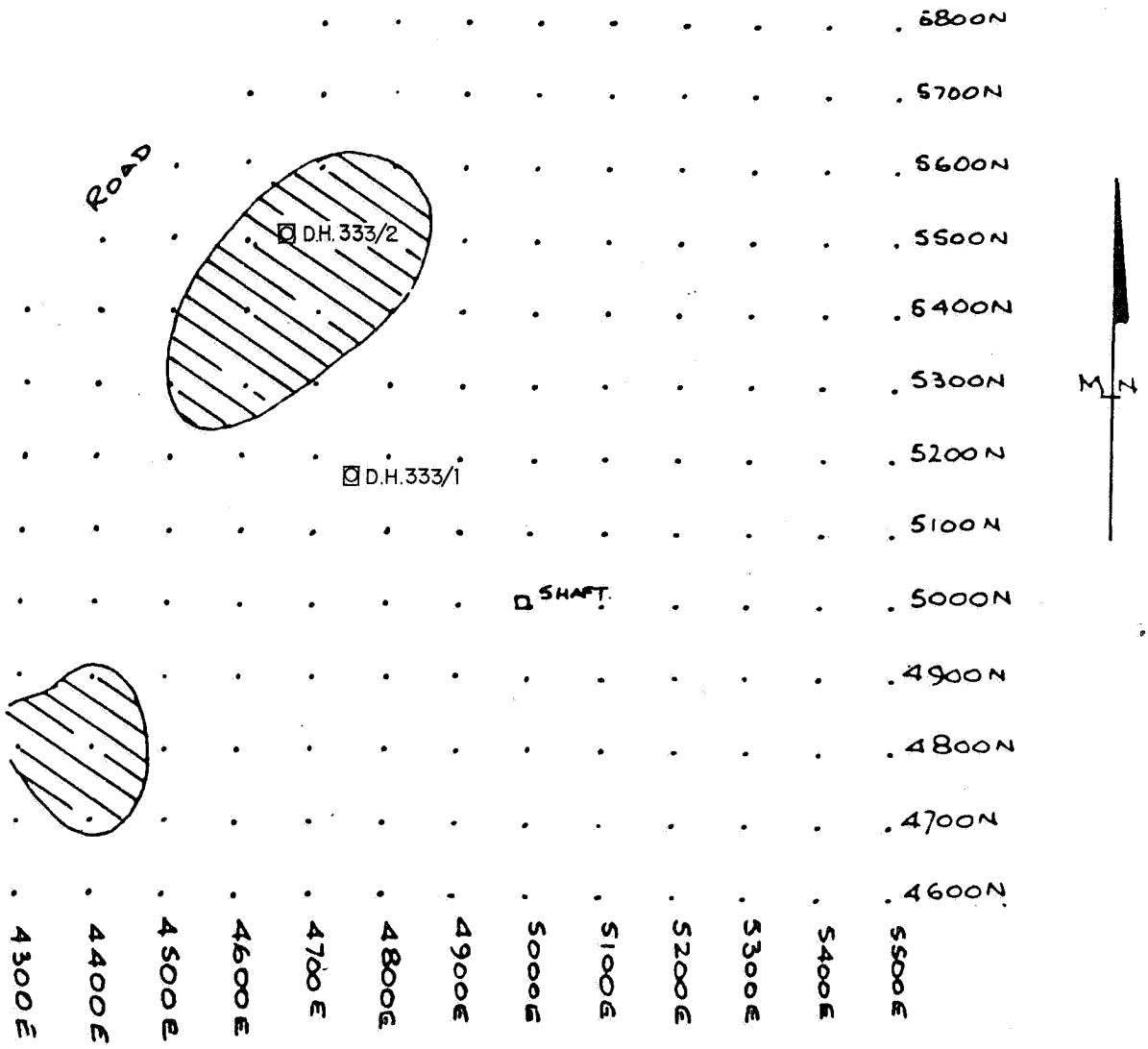


Figure 6

STOCKDALE PROSPECTING LIMITED				
ORROROO 154-1 E.L. 652 Rhonda Grid MAGNETIC ANOMALIES >58300 nT				
Compiled AAA	Drawn AAA/CJM	Date JAN. '81	Scale 1:10,000	SEL 1083c

APPENDIX 1

STOCKDALE PROSPECTING LIMITED

DRILL HOLE LOG SUMMARY

Hole No.	Depth	Page No.	Sample Nos.	Area
DH 333/1	79m	1	S3141 - S3168	Rhonda
DH 333/2	81	2	S3169 - S3195	Rhonda
DH 333/3	26	3	S3196 - S3200, S3001 - S3004	Bel Forest
DH 333/4	58	4	S3121 - S3140	Ivy Glen
DH 333/5	59	6	S3101 - S3120	Ivy Glen

DRILLHOLE LOG U36

Summary Sheet

PROJECT	RHONDA MINE	AREA	CARRIETON NORTH
CO-ORDS		DEC[LN] VERT AZIMUTH RL	
DRILLHOLE TY			
DH No.	333/1		
DATE COMMENCED	8/9/80	DATE COMPLETED	
DRILLED BY	NORTHBRIDGE	DRILL RIG	
Non Coring to:		HQ Core to:	
NQ Core to:		BQ Core to:	EOH

SURVEY DATA Instrument:

DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH	DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH

SECTION	DEPTH m	LOG SUMMARY	SAMPLING NO	RESULTS/COMMENTS
	0	calcite nodules and fragments in soil	S3141	
		weathered shales/ mudstones		
		0 - 2 iron stained and indurated		
	4	light yellow dusts, soft shale/ mudstone		
	12	grey - khaki green thinly laminated shales (some iron stained laminae)		
	16	light brown soft shales/ mudstones		
		@24 darker grey shales carbonaceous finely disseminated pyrite		
		@27 more indurated		
	30	shale - dark grey		
		light grey - brown shales		
		@31 - 34		
	34	@35 becoming darker grey		
		minor pyrite water @37m		
		dark grey shales - pyrite		
		@43 water K=0.0 - 0.2		
		@47 - 50		
		Very wet sample qtz chips and oxidised slates, water course or shear zone		
	50	Finely laminated black slates, indurated. Associated qtz venation. Disseminated pyrite and stringers parallel to bedding.		
		Oxidised material due to water courses or fault zone /shears?		
	58	Qtz vein , ¼'' - ½" chips containing pyrite strongly disseminated blebs and stringers in black slates		
	60	Black slates finely laminated disseminated sulphides		
		pyrite		
		@67 qtz veins material oxidised slates on water course?		
	79	disseminated sulphides	S3168	
		E.O.H.		

SEL 103

Scale: Geologist: T.Ingham Date:

STOCKDALE PROSPECTING LIMITED

DRILLHOLE LOG

039

Summary Sheet

PROJECT	RHONDA MINE	AREA	CARRIETON NORTH	DRILLHOLE TYP
CO-ORDS	DEC[LN]	AZIMUTH	RL	DH No. 333/2
DATE COMMENCED		DATE COMPLETED	DRILLED BY NORTHBRIDGE	DRILL RIG SCHRAMM
Non Coring to:		HQ Core to:	NQ Core to:	BQ Core to: EOH

SURVEY DATA Instrument:

DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH	DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH

SECTION	DEPTH m	LOG SUMMARY	SAMPLING NO	RESULTS COMMENTS
	0	red clays and bleached - weathered shales K=00-0.1	S3169	
	1	yellowish dusts/chips		
		yellow/khaki coloured shales/ mudstones, finely laminated		
		@6m black slate horizon- pyritic		
	14	dark grey/green shales		
	16	more indurated and darker shales		
	23	darker slates/ mudstones minor pyrite disseminated throughout		
		very finely disseminated pyrite restricted to discrete laminae		
		@30m - ground		
		water table - wet hole from here		
	70	black pyrite slates		
		minor qtz-small vein?		
	72	shales light grey/green very hard slightly more pyrite than black slate previously		
	73	Indurated shales a light grey/green colour disseminated pyrite (fine)		
		plus coarse pyrite associated with qtz vein		
		@74 - 75m		
		@75m fine magnetite in qtz. 3.1) 2.3)		
	76	@76m finely laminated shale, pale grey/green indurated/ silicified qtz vein fragments		
		and calcite crystals. Finely disseminated and coarse granular magnetite associated with qtz vein		
		@79 fine grey/green shale very hard, minor pyrite (could be contamination from upper parts of the DH)		
			S3195	
	81	E.O.H.		

SEL 103

Scale: Geologist: T. Ingham Date:

STOCKDALE PROSPECTING LIMITED

DRILLHOLE LOG

040

Summary Sheet

PROJECT BEL FOREST WEST	AREA CARRIETON SOUTH MAG ANOMALY NEAR K7		DRILLHOLE TYP PDH
CO-ORDS	DEC[LN]	AZIMUTH	RL	DH No. 333/3
DATE COMMENCED	DATE COMPLETED	DRILLED BY NORTHBRIDGE	DRILL RIG SCHRAMM
Non Coring to:	HQ Core to:	NQ Core to:	BQ Core to: EOH

SURVEY DATA Instrument:

DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH	DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH

SECTION	DEPTH m	LOG SUMMARY	SAMPLING NO	RESULTS/COMMENTS
	0	orange brown, oxidised shales/ mudstones Fe rich?	S3196	
		0 - 3m light brown clays K=0.7	S3200	
	7	Fine light grey dusts containing some black mineral - unknown? Minor fragments of indurated dark grey slate. @6m K=1.5 @9m K=0.1 - 25m		
	16	dark grey intensely indurated slates, very hard - siliceous? (Hammering fairly slow).		
	24	dark grey indurated slates/ mudstones. Losing air circulation, very little sample return. @26 no sample return - pulled rods broken ground - no air return	S3001-S3004	
	26	pulled off hole		
		E.O.H.		

SEL 103

Scale: Geologist: T. Ingham Date:

STOCKDALE PROSPECTING LIMITED

DRILLHOLE LOG 041

Summary Sheet

PROJECT	IVY GLEN	AREA	CARRIETON SOUTH
DRILLHOLE TY	SCHRAMM P.H		
CO-ORDS	DEC LN	VERT	AZIMUTH
RL	DH No. 333/4		
DATE COMMENCED	5/9/80	DATE COMPLETED	
DRILLED BY	NORTHBRIDGE	DRILL RIG	SCHRAMM
Non Coring to:		HQ Core to:	
NQ Core to:		BQ Core to:	EOH

SURVEY DATA Instrument:

DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH	DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH

SECTION	DEPTH m	LOG SUMMARY		SAMPLING NO	RESULTS/COMMENTS
	0	red/brown surface clays		S3121	
	0.5	silcrete and above	(0.3 high of 0.6)		
	1.5	soft grey clay and above			
	2.0	no silcrete	(0.2)	22	
	6.0	Hammer starts			
	7.0		(0.1)	23	
	8.0	yellow fines and soft grey clays			
	10.0	yellow fines only	(0.2)	24	
	11	paler			
	12	yellow/brown fines and s.gr.clay			
	13	pale yellow fines and s.gr.clay	(0.1)	25	
	14	redder fines, less s.gr.clay			
	15	fine 20# qtz grains and as above (light grey)			
	16	fine 20# qtz grains (light grey) some +20# a little conc.	(0.1)	26	
	18	as above and some yellow clay fines			
	19	as above but with grey clay fines	(0.1)	27	
	20	as '18'			
	21	less qtz, more yellow fines, yellower			
	22	above and fine coarse laterite	(0.2)	28	
	23	qtz grains, yellow fines red/brown clay nods.			
	24	as above and grey clay nods and grey clay/qtz nods and silcrete and pale green clay nodules			
	25	qtz grains coarse latterite coarse qtz. red/brown clay nods	(0.1)	S3129	
	26	yellow fines, coarse lat yellow red/brown banded seds.			
	27	yellow fines with few +12#, yellow clay nods			
	28	as above	(0.1)	30	
	31	yellow/green fines thinly banded sed. nods.		31	
	33	yellow/grey fines and sed nods (yellow, charcoal)			

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Scale: Geologist: T. Ingham Date:

DRILLHOLE LOG

042

Summary Sheet

PROJECT	AREA ORRORO0	DRILLHOLE TYPE SCHRAMM
CO-ORDS	DEC^{LN} AZIMUTH RL	DH No. 333/4 (cont.)
DATE COMMENCED 5/9/80	DATE COMPLETED	DRILLED BY / DRILL RIG
Non Coring to:	HQ Core to: NQ Core to: BQ Core to: EOH	

SURVEY DATA Instrument:

DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH	DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH

SECTION	DEPTH	LOG SUMMARY		SAMPLING NO	RESULTS/COMMENTS
	34	grey fines and as '33'	(0)	32	
	35	yellow/green fines and as above			
	37		(0.1)	33	
	39	more grey than '35'			
	40	greyer again	(0.1)	34	
	41	grey/green fines and sed rods			
	43	yellow/green fines i.e. mud 'cause we've hit H2O again	(0.1)	35	
	46	grey mud lots of water, little gr	(0.1)	36	
	49	more gravs and less and hard yellow sed	(0.1)	37	
	52	mud is yellower	(0.2)	38	
	53	mud - grey again			
	55	as above	(0)	39	
	58	dark grey mud - much less yellow sed nods.	(0)	40	

SEL 10

Scale: Geologist: Date:

STOCKDALE PROSPECTING LIMITED

DRILLHOLE LOG

043

Summary Sheet

PROJECT	AREA ORRORO	DRILLHOLE TYPE SCHRAMM
CO-ORDS	DEC^{LN} AZIMUTH RL	DH No. 333/5
DATE COMMENCED 4/9/80	DATE COMPLETED 5/9/80	DRILLED BY / DRILL RIG
Non Coring to:	HQ Core to: NQ Core to:	BQ Core to: EOH

SURVEY DATA Instrument:

DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH	DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH

SECTION	DEPTH m	LOG SUMMARY		SAMPLING NO	RESULTS/COMMENTS
	0	red/brown surface clays	(0.4)	S3101	
	1.5	silcrete			
	4.0	red/brown clay	(0.2)	02	
	5.0	soft grey clay			
	7.0	soft grey clay and silcrete	(0.2)	03	
	8.0	very fine banded (grey/yell/br) sediments			
	9.0	yellow fines and red/br clays	(0.1)	04	
	10.0	more intense yellow fines			
	12.5	grey fines	(0.1)	05	
	14.5	yellow fines			
	16.0	grey fines	(0.2)	06	
	17.0	grey/red fines			
	19.5	yellow fines & yell. coated soft grey clay nodules; red/brown nodules and blue/grey grains, minor qtz. and mica	(0.3)	07	
	21.5	red/brown and qtz grains	(0.2)	08	
	22.0	as above but more qtz			
	25.0	as above with major qtz	(0-0.6)	09	
	26.0	fine qtz and very yellow fines and green/grey clay			
	27.0	yellow fines and hard yellow/br sed. nodules			
	28.0	slightly paler	(0)	10	
	29.0	as above and some hard grey seds			
	30.0	as above and more fines			
	31.0	as above	(0)	11	
	32	as above and more red/brown nods			
	34	grey fines and grey sed. nods and water	(0)	12	
	35	mainly +12# and much water			
	37	yellow/grey mud with +12# & water	(0)	13	
	40	as S3113	(0)	S3114	
	43	" "	(0)	S3115	
	46	lot more gravels of full size range and water	(0.1)	16	

SEL 1038

Scale: Geologist: T. Ingham Date:

STOCKDALE PROSPECTING LIMITED

DRILLHOLE LOG

044

Summary Sheet

PROJECT	AREA ORRORO	DRILLHOLE TYP SCHRAM
CO-ORDS	DEC[LN] AZIMUTH RL	DH No. 333/5 (cont)
DATE COMMENCED	DATE COMPLETED	DRILLED BY / DRILL RIG
Non Coring to:	HQ Core to: NQ Core to: BQ Core to: EOH	

SURVEY DATA Instrument:

DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH	DEPTH	DECLINATION Uncorr	DECLINATION Corr	AZIMUTH

SECTION	DEPTH	LOG SUMMARY		SAMPLING NO	RESULTS/COMMENTS
	50	mud grey in colour +12# red/brown exterior, grey interior, some all grey	(0.2)	S3117	
	53	lot more +12# red/brown exterior grey interior than S3117, also some calcrete (0.2) (high of 0.8)		18	
	55	as above but no vis. calcrete	(0.2)	19	
	59	as above and some calcrete	(0.3)	20	

SEL 103

Scale: Geologist: Date:

APPENDIX 2

The Australian
neral Development
Laboratories

gton Street, Frewville,
South Australia 5063
one Adelaide 79 1662
Telex AA 82520

Please address all
correspondence to
Box 114 Eastwood
SA 5063
In reply quote

amdel 3/244/1/0 - AC 1408/81

NATA CERTIFICATE

27 October 1980

The Manager
Australian Anglo American Ltd
581 Little Collins Street
MELBOURNE VIC 3000

Attention: Mr M P Everett

REPORT AC 1408/81

YOUR REFERENCE: Order No 5346

IDENTIFICATION: As listed

DATE RECEIVED: 12 September 1980

Enquiries quoting AC 1408/81 to the Manager please.

D.K. Rowley
Manager
Analytical Chemistry Division

for Norton Jackson
Managing Director

dam

Osman Place
Thebarton S A
Telephone 43 8053
Laboratory Perth

APPENDIX 2

amdel

Analysis code C3/3 Report AC 1408/81 Page 1

NATA Certificate Order 5546 Results in ppm

Sample DH333/2	Au
70-71	0.02
72	<0.01
73	0.02
74	0.01
75	0.02
76	0.02
77	0.02
78	0.01
79	0.01
80	0.03
80-81	0.04
Detn limit	(0.01)

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES 047 APPENDIX 2

REPORT AN 1405/51

x = not detected at the limits quoted.
Results in ppm unless otherwise stated. Detection limits in brackets.

Sample No.	Ba (200)	Co (5)	Mn (10)	Mo (3)	Ni (5)	V (10)	W (50)	Ti (100)	Nb (20)
DH 333/2									
70-71	1500	10	3100	X	30	1100	X	5000	
71-72	3100	5	3100	X	10	710	X	3000	
72-73	1500	10	3100	X	30	1100	X	5000	
73-74	3100	30	3100	X	30	810	X	5000	
74-75	1500	30	7100	X	30	1100	X	5000	
75-76	7100	50	5100	X	30	1100	X	7000	
76-77	1500	30	5100	X	30	810	X	5000	
77-78	1500	30	3100	X	30	1100	X	5000	
78-79	3100	10	2100	X	20	810	X	3000	
79-80	1500	20	3100	X	30	810	X	5000	
80-81	7100	20	2100	X	30	810	X	7000	

REPORT AN 1405/81

x = not detected at the limits quoted.
Results in ppm unless otherwise stated. Detection limits in brackets.

Sample No.	Cr (20)	Ag (0·1)	As (50)	Bi (1)	Cu (1)	Sb (30)	Sn (1)	Zn (20)	Pb (1)
DH 333/2 170-71	610	x	x	x	1510	x	1	x	
71-72	310	x	x	x	2010	x	1	x	
72-73	610	x	x	x	1010	x	1	x	
73-74	610	x	x	x	710	x	1	x	
74-75	610	x	x	x	1010	x	1	x	
75-76	610	x	x	x	510	x	1	x	
76-77	610	x	x	x	510	x	x	x	
77-78	610	x	x	x	710	x	1	x	
78-79	510	x	x	x	510	x	1	x	
79-80	610	x	x	x	210	x	1	x	
80-81	610	x	x	x	210	x	1	x	

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REPORT AN 1408/81

x = not detected at the limits quoted.

Results in ppm unless otherwise stated. Detection limits in brackets.

Sample No.	Cd (3)	Ge (1)							
DH 333/2 70-71	x	x							
71-72	x	x							
72-73	x	x							
73-74	x	x							
74-75	x	x							
75-76	x	x							
76-77	x	x							
77-78	x	x							
78-79	x	x							
79-80	x	x							
80-81	x	x							

SCALE 1:100000

10 KILOMETRES

METRES 1000

138°50'

138°45'

138°35'

138°30'

138°29'

138°28'

138°27'

32°30'

32°25'

32°22'

32°27'

32°29'

32°36'

SOUTH FLINDERS RANGES

OLADDIN PLAIN

WALLOWAY PLAIN

BLACK ROCK

SEL 732

SEL 733

SEL 875

SEL 929

SEL 949

SEL 809

SEL 735

SEL 768

SEL 816

SEL 756

SEL 794

SEL 793/4

SEL 793 (GEL)

SEL 727

SEL 767

SEL 768

SEL 925

K1

K2

K3

K5

K6

K7

K8

K9

K10

ΔK12

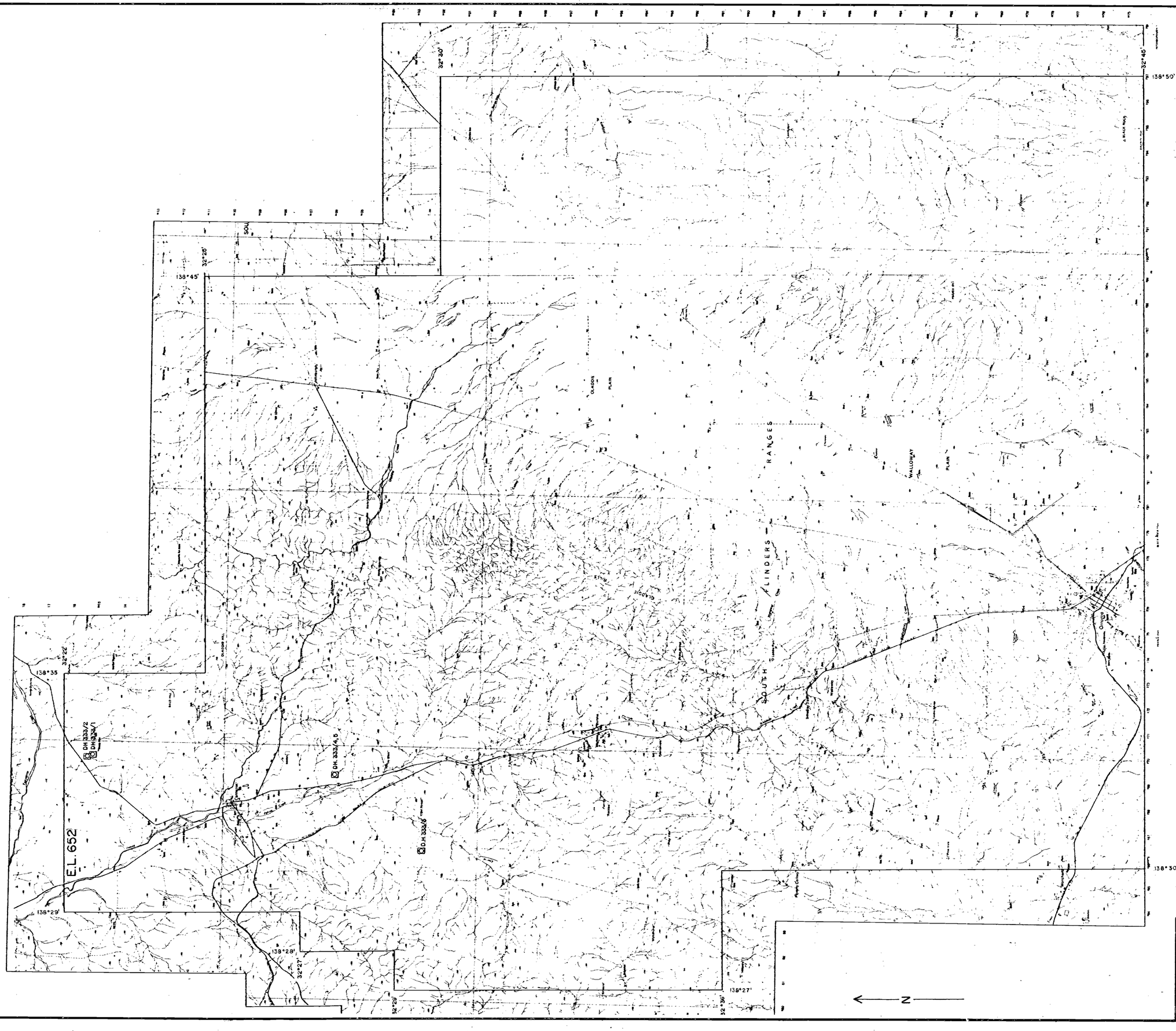
N

3891-4 Map 1

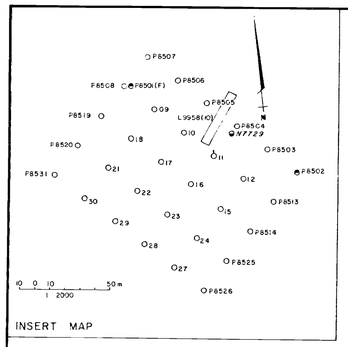
STOCKDALE PROSPECTING LIMITED

ORRORO EXPLORATION LICENCE & SEL OUTLINES

DRAWN	COMPILED	SCALE	
JLM	JJ	1:100,000	SEL 731


32°30'
32°25'
32°22'
32°29'
32°27'
32°36'
138°45'
138°50'
138°35'
138°30'
138°29'
138°27'
SOUTH FLINDERS RANGES
GLADES PLAIN
WALLOWAY PLAIN
E.L. 652
DH 333/2
DH 333/1
DH 333/4,5
D.H. 333/6
Omaru
Scale 1:100,000
KMS. 1 0 1 2 3 4 5 6 7 8 9 10 KMS.
SEPT. 1980
S 3001 – S 3004 (DH 333/3, part of)
S 3101 – S 3120 (DH 333/5)
S 3121 – S 3140 (DH 333/4)
S 3141 – S 3168 (DH 333/1)
S 3169 – S 3195 (DH 333/2)
S 3196 – S 3200 (DH 333/3, part of)
(Total 104)
RECEIVED
21 JAN 1981
DEPT. OF MINES AND ENERGY SECURITY
3891
MAP 2
STOCKDALE PROSPECTING LIMITED
I 54-1 ORROROO
E.L. 652
DRILL HOLE LOCATIONS
Compiled TJI
Drawn MAK
Date DEC. '80
Scale 1:100,000
SEL 1082

3891-8

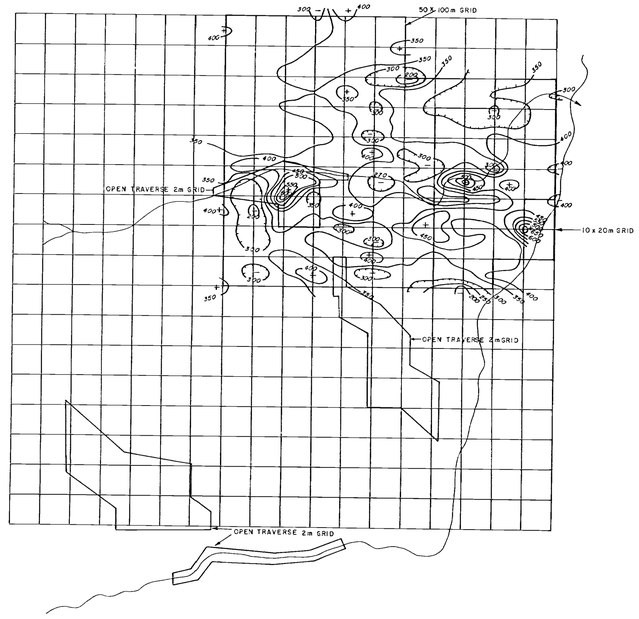


INSERT MAP

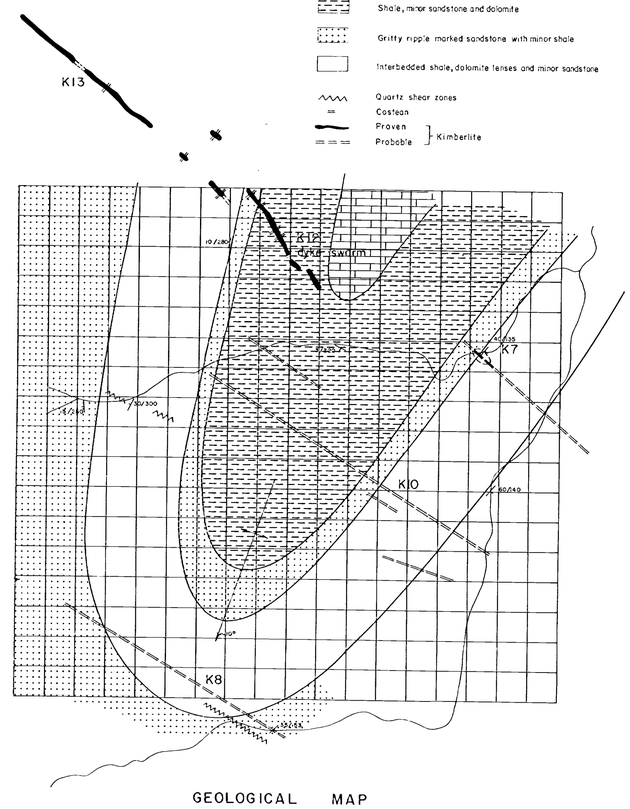
◊ L9959(80)
34 diamonds

2/.08
1/.497
1/.450
1/.0365
1/.0320
1/.0243
1/.0238
1/.0215
1/.0143
1/.0140
1/.0137
1/.0130
1/.0118
1/.0093
1/.0090
2/.0066
1/.0065
1/.0064
1/.0059
1/.0057
1/.0056
1/.0045
1/.0041
1/.0036
1/.0028
1/.0021
1/.0020
1/.0017
1/.0012
1/.00015
1/.00010
1/.00004

SAMPLE LOCATION MAP



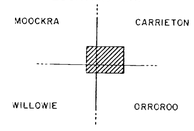
MAGNETOMETER MAP



GEOLOGICAL MAP

Feb. 1979	N7524 – 7526
	N7694 – 7800
	N8001 – 8100
March 1979	N8101 – 8120
April 1979	N8345 – 8379
	N8390 – 8394
Feb 1980	P8501 – 8531
	L9946 – 9953 (bulk samples)
	L9958 – 9959 (bulk)
Sept. 1980	S3001 – 3004, S3196 – 3200 } DH 333/3

LOCATION MAP



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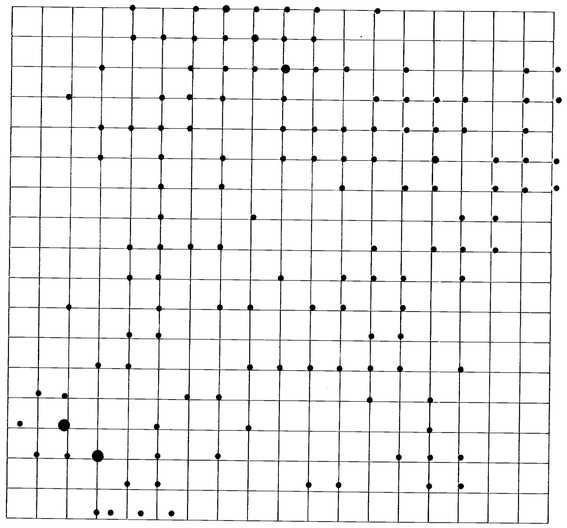
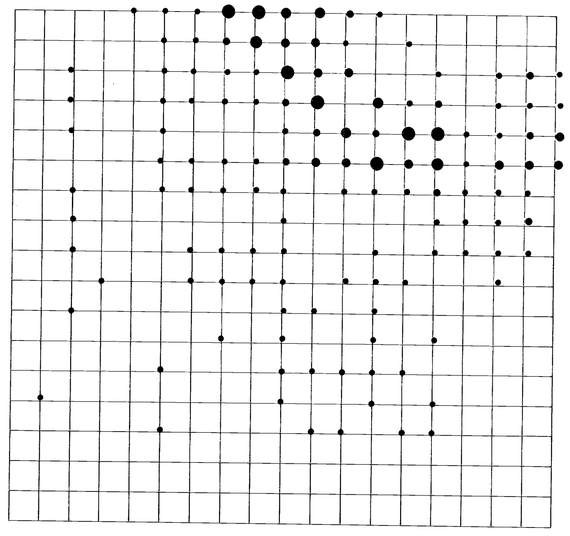


GARNET ANOMALY MAP

+60 41-60 21-40 11-20 6-10 1-5

Grain count



ILMENITE ANOMALY MAP

metres 100 0 100 200 300 400 500 metres

SCALE 1:10,000

MAP 3

STOCKDALE PROSPECTING LIMITED

ORROROO 154-1

BEL FOREST WEST

Compiled NPB	Drawn JLM	Date (revised) NOV'80	Scale 1:10,000	SEL 821

4300E	4400E	4500E	4600E	4700E	4800E	4900E	5000E	5100E	5200E	5300E	5400E	5500E	
				31	27	37	33	36	29	21	25	24	
			56	245	36	49	40	34	35	22	27	23	5700N
		94	59	64	52	55	36	32	25	28	22	21	5600N
	108	35	52	79	101	85	28	27	29	27	24	19	5500N
32	33	41	31	72	76	45	41	37	34	26	27	28	5400N
31	30	37	34	74	65	92	29	52	36	23	23	25	5300N
28	28	34	33	68	62	65	43	89	32	27	23	24	5200N
30	30	43	36	63	67	100	63	112	31	30	32	23	5100N
34	24	29	64	59	153	94	RHONDDA SHAFT 200	38	28	36	22	25	5000N
31	28	30	45	30	33	70	39	35	26	33	29	19	4900N
25	34	26	31	31	29	36	48	50	33	29	27	22	4800N
23	21	24	35	22	30	24	24	40	38	40	27	23	4700N
25	24	33	28	30	29	22	23	37	47	27	21	19	4600N

0 100 200m

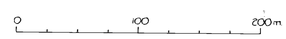
MAP 4

AUSTRALIAN ANGLO AMERICAN LTD

PROJECT	RHONDDA PROSPECT		
AREA	EL 652 - SOUTH AUSTRALIA		
DATA	RHONDDA GRID SOIL GEOCHEMISTRY-Cu ppm		
COMPILED	DBO	SCALE	1:2500
DRAWN	HD 7/80	REF No	STH-8-1
AMENDED			

3891-9

4300E	4400E	4500E	4600E	4700E	4800E	4900E	5000E	5100E	5200E	5300E	5400E	5500E	
				9	9	8	12	14	14	13	13	12	5800N
			11	10	10	10	8	9	18	12	14	12	5700N
		13	11	7	7	9	4	8	11	12	15	14	5600N
	14	12	13	10	8	8	5	8	12	15	14	13	5500N
15	11	11	10	10	11	9	8	12	13	13	19	13	5400N
14	12	14	12	10	9	10	9	11	14	13	16	12	5300N
11	15	14	12	11	11	11	8	10	11	13	14	15	5200N
13	13	15	14	11	11	13	14	8	9	13	15	14	5100N
14	12	12	11	12	22	11	RHONDDA SHAFT 11	11	11	11	12	13	5000N
12	13	14	12	13	8	10	11	11	10	11	12	14	4900N
13	14	12	11	10	13	10	9	10	11	10	12	13	4800N
11	9	10	13	9	11	10	9	10	12	12	13	14	4700N
12	14	11	14	9	9	11	8	9	11	13	11	11	4600E



MAP 5

AUSTRALIAN ANGLO AMERICAN LTD			
PROJECT	RHONDDA PROSPECT		
AREA	EL 652 - SOUTH AUSTRALIA		
DATA	RHONDDA GRID SOIL GEOCHEMISTRY- Pb ppm		
COMPILED	DBO	SCALE	1:2500
DRAWN	HD 7/80	REF No	STH-8-2
AMENDED			

3891-10

4300E	4400E	4500E	4600E	4700E	4800E	4900E	5000E	5100E	5200E	5300E	5400E	5500E	
				57	51	50	48	56	63	54	60	65	5800N
			48	49	53	59	55	67	71	49	67	58	5700N
		69	48	50	53	63	57	62	45	57	53	52	5600N
	63	65	55	52	48	59	51	56	50	52	59	60	5500N
53	53	61	48	51	51	55	58	55	62	53	73	67	5400N
52	51	60	55	55	55	60	52	56	57	50	56	57	5300N
49	54	60	53	63	63	66	54	71	56	46	55	58	5200N
52	59	64	57	56	61	59	58	70	70	54	58	60	5100N
59	47	48	63	54	79	55	RHONDDA SHAFT 123	69	69	68	43	63	5000N
62	54	48	51	49	51	53	45	91	82	53	57	57	4900N
53	65	42	47	55	50	50	47	55	61	46	54	57	4800N
46	39	41	53	43	54	51	43	45	53	62	52	51	4700N
61	59	52	45	42	51	47	45	57	57	75	43	44	4600E

MAP 6

AUSTRALIAN ANGLO AMERICAN LTD			
PROJECT	RHONDDA PROSPECT		
AREA	EL 652 - SOUTH AUSTRALIA		
DATA	RHONDDA GRID SOIL GEOCHEMISTRY- Zn ppm		
COMPILED	DBO	SCALE	1:2500
DRAWN	HD 7/80		
AMENDED		REF No	STH-8-3

3891-1

4300E	4400E	4500E	4600E	4700E	4800E	4900E	5000E	5100E	5200E	5300E	5400E	5500E	
				330	285	385	360	660	600	465	550	435	5800N
			320	415	430	440	325	485	375	400	485	350	5700N
		440	385	420	290	445	285	390	440	390	435	420	5600N
	475	475	610	350	240	290	190	300	460	400	460	400	5500N
370	515	460	505	290	335	185	340	425	535	480	485	410	5400N
450	455	470	420	330	285	245	275	520	590	340	410	500	5300N
470	430	480	490	320	290	290	250	365	495	600	370	520	5200N
465	470	485	470	275	350	310	255	280	350	565	485	395	5100N
530	435	365	445	255	300	550	RHONDDA SHAFT 850	325	290	435	455	445	5000N
400	530	480	505	360	230	190	230	330	325	435	480	345	4900N
425	630	520	310	380	290	200	230	310	310	440	450	430	4800N
420	380	445	310	240	330	160	235	300	325	420	480	515	4700N
300	440	325	270	365	295	255	200	285	330	280	480	480	4600E

0 100 200m

MAP 7

AUSTRALIAN ANGLO AMERICAN LTD

PROJECT	RHONDDA PROSPECT		
AREA	EL 652 - SOUTH AUSTRALIA		
DATA	RHONDDA GRID SOIL GEOCHEMISTRY- Mn ppm		
COMPILED	DBQ	SCALE	1:2500
DRAWN	HD 7/80	REF No	STH-8-4
AMENDED			

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3891-12

4300E	4400E	4500E	4600E	4700E	4800E	4900E	5000E	5100E	5200E	5300E	5400E	5500E	
				268	275	260	276	266	257	300	280	318	5800N
						271							
						272							
						282							
						279							
				278	279	268	270	282	246	287	160	171	
					277	273							
					281	280							
					282	279							
					286	276							
			235	282	280	281	278	254	244	258	104	185	5700N
				286	288	282							
				286	284	284							
				289	282	231							
				290	282	232							
			279	295	286	283	277	267	283	267	271	282	
			285	296	290	288							
			282	299	290	281							
			279	299	286	286							
			273	305	287	283							
		241	305	306	294	281	271	245	268	263	239	272	5600N
		269	283	306	304	281							
		283	291	306	303	280							
		310	289	306	301	281							
		310	291	309	303	284							
		315	320	312	305	283	274	281	290	288	279	285	
		323	310	313	304	284							
		303	288	313	306	286							
		298	292	317	307	287							
		315	330	316	313	286							
	234	290	323	329	309	289	274	252	275	256	262	256	5500N
	273	288	326	332	317	285							
	281	303	314	337	304	288							
	281	303	316	329	312	287							
	282	297	335	344	310	286							
	280	298	353	342	320	278	276	258	265	259	120	277	
	280	288	369	350	307	288							
	281	289	369	335	316	283							
	281	295	378	349	308	284							
288	298	298	368	384	309	285	280	265	259	291	308	209	5400N
	272	272	380	355	306								
	294	237	372	357	307								
	287	313	374	359	324								
	276	307	369	363	289								
290	287	309	364	358	298								
	283	313	359	390	300	281	271	261	258	313	285	251	
	284	316	380	334									
	288	317	343	332									
	270	305	325	317									
	273	316	321	295									
235	261	289	336	289	276	272	265	270	262	260	243	288	5300N
	270	300	343										
	267	301	312										
	283	300	314										
	278	313	314										
217	272	291	302	260	276	265	269	264	263	271	159	284	
	275	282											
	256	286											
	264	299											
	279	297											
267	271	291	281	262	264	262	256	259	255	275	139	278	5200N
	291	282											
	277	285											
	285												
268	286	157	214	247	260	259	264	267	257	302	181	281	
255	250	251	236	250	261	262	268	265	260	275	307	280	5100N
265	279	262	249	257	259	263	272	262	256	261	275	340	
282	281	254	257	264	267	269	RHONDRA SHAFT 265	262	262	262	297	289	5000N
234	279	280	257	265	270	264	265	241	256	257	250	309	
282	300	288	264	267	272	286	257	258	264	266	281	312	4900N
314	304	268	271	275	280	268	261	263	296	292	289	323	
313	347	291	272	258	278	277	260	265	271	268	258	187	4800N
291	330	281	265	268	267	264	262	265	266	261	300	223	
290	308	262	268	264	271	263	270	268	295	277	281	293	4700N
270	269	268	279	274	272	265	254	261	272	264	290	238	
265	272	261	266	267	267	257	267	268	249	267	293	345	4600E

Results measured in nT and prefixed "58"

0 100 200m

MAP 8

AUSTRALIAN ANGLO AMERICAN LTD			
PROJECT	RHONDDA PROSPECT		
AREA	EL 652 - SOUTH AUSTRALIA		
DATA	RHONDDA GRID MAGNETICS		
COMPILED	DBO	SCALE	1:2500
DRAWN	HD 7/80	REF No	STH-8-5
AMENDED			

3891-13

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE NUMBER 652 : ORRORO0

THIRD QUARTERLY REPORT TO THE 23RD MARCH, 1981.

CONTENTS

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE NUMBER 652 : ORRoROO

3RD QUARTERLY REPORT TO 23RD MARCH, 1981.

1. INTRODUCTION

No base metal exploration was undertaken during the report period so this report deals only with the diamond exploration programme. Expenditure on base metal exploration remains unchanged.

2. EXPLORATION PROGRESS

No diamond prospecting was undertaken during the report period which included the Christmas holidays, a time when many of Stockdale Prospecting Ltd's staff were on annual leave. Results were received for samples collected from the drill holes at Bel Forest and Ivy Glen. Based on results received to date from throughout the licence area, it is planned to reduce the area under licence and retain only the area proved to contain kimberlitic rocks.

3. RESULTS RECEIVED

Samples of the drill hole returns collected during the last quarter were processed and examined during the present report period. The Bel Forest drill hole proved to be barren of kimberlitic indicators, but the Ivy Glen drill holes produced seven samples which contained kimberlitic indicators. The indicators are typical of kimberlitic grains extracted from the previously located bodies K5, K6 and K2 which feed their detritus into Pekina Creek. The drill holes cut through the alluvial deposits in the Pekina Creek flood plain at Ivy Glen, which explains the presence of the indicators. There is no evidence to support the thought that the magnetic anomaly at Ivy Glen is a kimberlite.

4. FUTURE PROGRAMME

It is proposed to drill into the largest kimberlite body, K7, to acquire fresh rock samples for petrological research. Other bodies may similarly be examined.

The greater part of the Orroroo and Carrieton West exploration licences will be relinquished but undiscovered source rocks believed to exist in the area retained, will be sought by recently recruited geologists during training exercises.

5. STAFF

The Orroroo project is controlled by the Regional Geologist now located in Whyalla, supervised by the Exploration Manager and supported by the facilities of our office and laboratory in Melbourne.

6. EXPENDITURE

Expenditure for the laboratory treatment was included in the previous report.

Expenditure for the period was as follows:

Management/Office Services	$350
Field Staff : Technical	$400
TOTAL FOR THIS PERIOD	$750
Diamond Exploration Expenditure Previously Reported	$44,970
TOTAL DIAMOND EXPENDITURE TO DATE	$45,720
Base Metal Exploration Expenditure Previously Reported	$10,686
TOTAL EXPENDITURE TO DATE	$56,486

P.R.JONES
27th March, 1981.
Whyalla

K.J. STRACKE
Exploration Manager

PRJ/kss

Distribution: SADM, PRJ, IC.

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE 853: ORRORO0

FIRST QUARTERLY REPORT TO 19TH OCTOBER 1981

STOCKDALE
PROSPECTING
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Incorporated in the State of Victoria

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Telephone (03) 241 7522
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Project Name: ORRoROO

Title: EXPLORATION LICENCE 853
FIRST QUARTERLY REPORT TO 19TH OCTOBER, 1981

Author/s: H.R. ROBISON
F.W. ARNOTT

Project Leader: R.V. DANCHIN

Keywords: KIMBERLITE, GEOPHYSICS, GEOCHEMISTRY, DRILLING

1 : 250,000 Sheet Name/s & No/s.: ORRoROO, SI 54-1

Text Pages No.: 4

Plan Nos.: figures - 9

Table Nos.: maps - 4

Appendices:

Date: OCTOBER, 1981

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FIGURES (At Rear of Text)

MAPS

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE 853 : ORRORO0

FIRST QUARTERLY REPORT TO 19TH OCTOBER, 1981

1. INTRODUCTION

Exploration Licence 853, which covers an area of 180 square kilometres in the Eurelia area (Map 1), was granted on July 20, 1981. The licence area covers those parts of Exploration Licences 486 (Carrieton West) and 652 (Orroroo), previously held by Stockdale Prospecting Limited, which were not relinquished in March 1981.

This report covers exploration activity within the licence area from the relinquishment of Licences 486 and 652, until October 19th, 1981, the end of the First Quarter for EL 853.

2. PROSPECTING PROGRESS

2.1. Geochemical Exploration

A geochemical sampling orientation programme was conducted over Kimberlite K7 (Burton, 1981). This body is located at 32° 39'E, 138° 31'S, and has approximate dimensions of 40 m x 15 m.

Two 1 km traverses were extended through the centre point of the body, and a total of 86 geochemical soil samples were collected from along the traverses. Each sample was taken from a depth of 15 cm and was dry sieved to provide 100 grams of -80 mesh material. The samples were collected at 10 m intervals over the intrusion, then at 20 m intervals, and finally at 50 m intervals towards the ends of the traverses (Map 2).

A mature stream cuts the northern edge of the body and flows east to join Pekina Creek which flows north to Carrieton. 71 samples of active stream sediment were collected from these drainages at 200 m intervals over distances of 1 km upstream and 10 km downstream of the intrusion (Map 3). Because of wet conditions, most of these stream samples were forwarded to the Whyalla Treatment Plant for drying and sieving to give 100g of -80 mesh sample.

A 10 kg sample (P3005(R), Map 2) of inclusion-free kimberlite was collected from the stream exposure for reference purposes, and was forwarded to the Melbourne Laboratory for crushing and preparation.

All -80 mesh prepared samples were shipped to the Group's Research Laboratories in Johannesburg for automatic 36 element x-ray fluorescence analysis.

Results are awaited and will be reported next quarter.

2.2. Ground Geophysics

Ground VLF and total field magnetic data were obtained along eight profiles over the kimberlitic bodies K1, K2 (2 profiles), K4, K7, K12 and K13 (2 profiles). The location of the profiles, approximate for K1 and K12, are indicated on Map 4.

The magnetic observations were made at approximately 1.7 metre intervals (2 paces) along the VLF profiles for all except K7 (Figs 1 - 4, 7 - 9). At K7 the magnetic profile was 10 m SE of the VLF profile and parallel to it with an equivalent zero point (Figs 5 & 6). In most instances the profiles were too short to obtain complete definition of the magnetic anomalies particularly as they had large amplitudes, typically 100 to 500 nT peak to peak for the larger bodies. The most subdued and lowest amplitude (8nT) anomaly was over K1. This was because of the very narrow width of this body and its location in magnetic shales. Elsewhere the country rock consisting of sandstones and argillaceous sediments did not influence the magnetic profiles. Therefore, by assuming a predominantly induced magnetic component, the centre of the intrusives, the northerly dipping attitude of K2 and K13 and the near vertical attitude of the other bodies can be clearly defined.

The VLF surveys were approximately perpendicular to the long axis of the kimberlites while maintaining a NNE - SSW orientation. Using the North West Cape transmitter a Geonics EM16 provided a dip angle and quadrature value at approximately 1.7 metre intervals. These percentage readings have been plotted coincident with the magnetic data (Figs 1 - 9).

The field data shows a varied response. Over K2, K7 and K13 (Profile 2) a distinctive conductive zone is observed, while over K1, K4, K12 and K13 (Profile 1) no discernable cross-overs are evident above the noise level.

2.3. Drilling

The combined VLF and magnetic data was used to locate a drill hole that would intersect fresh material in K7. Three vertical holes were drilled, the third hole obtaining hard kimberlite.

The location of holes are shown on Map 4.
A brief description of each hole is as follows:

Hole	Percussion	Core	Brief Description
DH R1	0 - 59 m	59 - 60 m	overburden/soil 0 - 3 m weathered kimberlite 3 - 55 m quartzite (country rock) 55 - 60 m
DH R2	0 - 45 m	NIL	overburden/soil 0 - 3 m weathered kimberlite 3 - 40 m quartzite (country rock) 40 - 45 m

DH R3	0 - 60 m	60 - 62 m	overburden/soil 0 - 3 m soft weathered kimberlite 3 - 57 m hard kimberlite 57 - 62 m

A down hole logger was used to obtain resistivity, self potential, total count radiation, and density. These results were noisey and no unusual variations were observed. The density was relatively uniform, however no absolute calibration was available to give the true density. For the kimberlite the gamma radiation showed an increase of 7 c.p.s above the county rock down the hole. Susceptibilities were measured and were variable in the range of 600 to 3000 x 10^{-6} cgs units.

3. EXPENDITURE

Expenditure of $13,828 for the period has been allocated as follows:

Management/Office Services	$ 727
Field Staff : Technical	1948
: Other	966
General Field Expenses	468
Transport : Ground	498
Sample Handling	1157
Equipment Amortisation	970
Specialist Services:	
Photogeology	728
Geophysics	1099
Drilling	5131
Total For This Period	$13828

4. FUTURE PROGRAMME

Compilation, assessment and interpretation of outstanding results will be undertaken prior to formulation of the next phase of work. Reprocessing of aeromagnetic data for "depth to basement" modelling is being considered.

K.J. STRACKE
Exploration Manager

H.R. Robison
Whyalla
28.10.81

F.W. Arnott
Melbourne
13.11.81

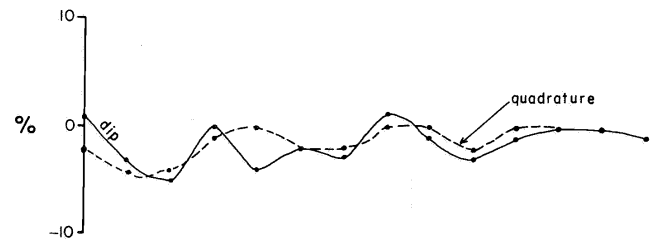
:bs

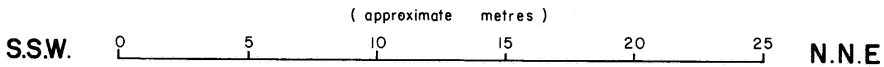
Distribution: SADME, HRR, FWA, IC.

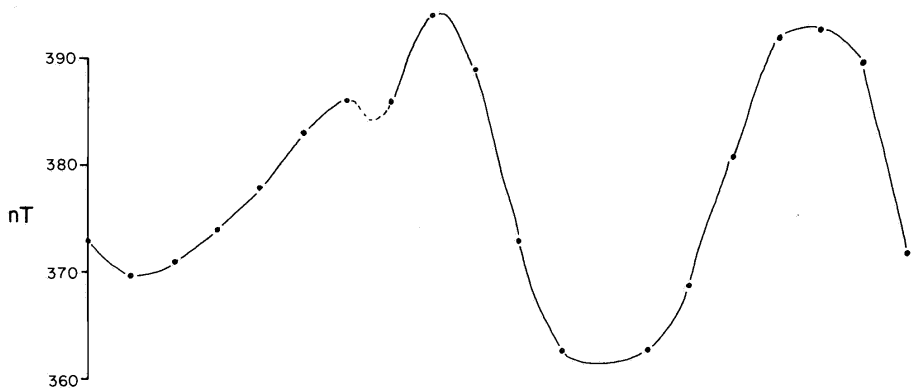
REFERENCES

BURTON, P.E. 1981. A note on the collection of geochemical orientation samples over kimberlite at Carrieton, South Australia. Internal Company Report.

V.L.F. PROFILE







MAGNETIC PROFILE

FIG. 1

See SEL 1309 for Location map – MAP 4

STOCKDALE PROSPECTING LIMITED

I 54-1 E.L. 853

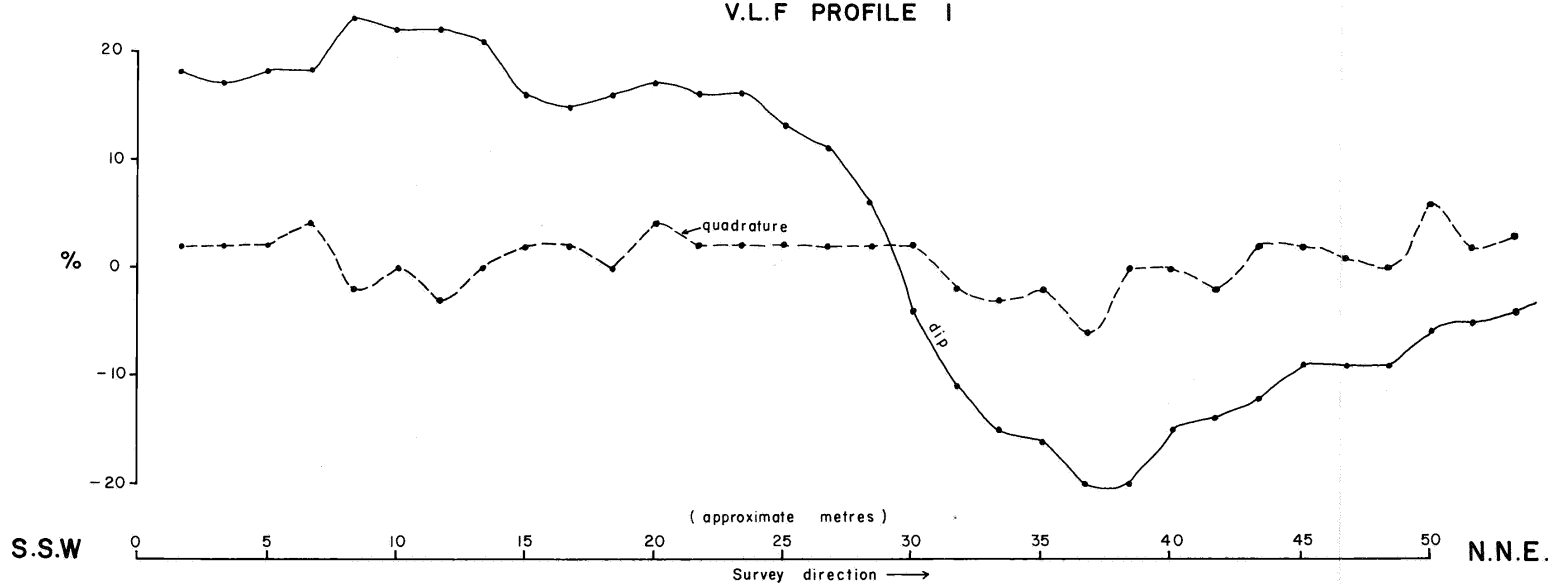
ORRORO K I

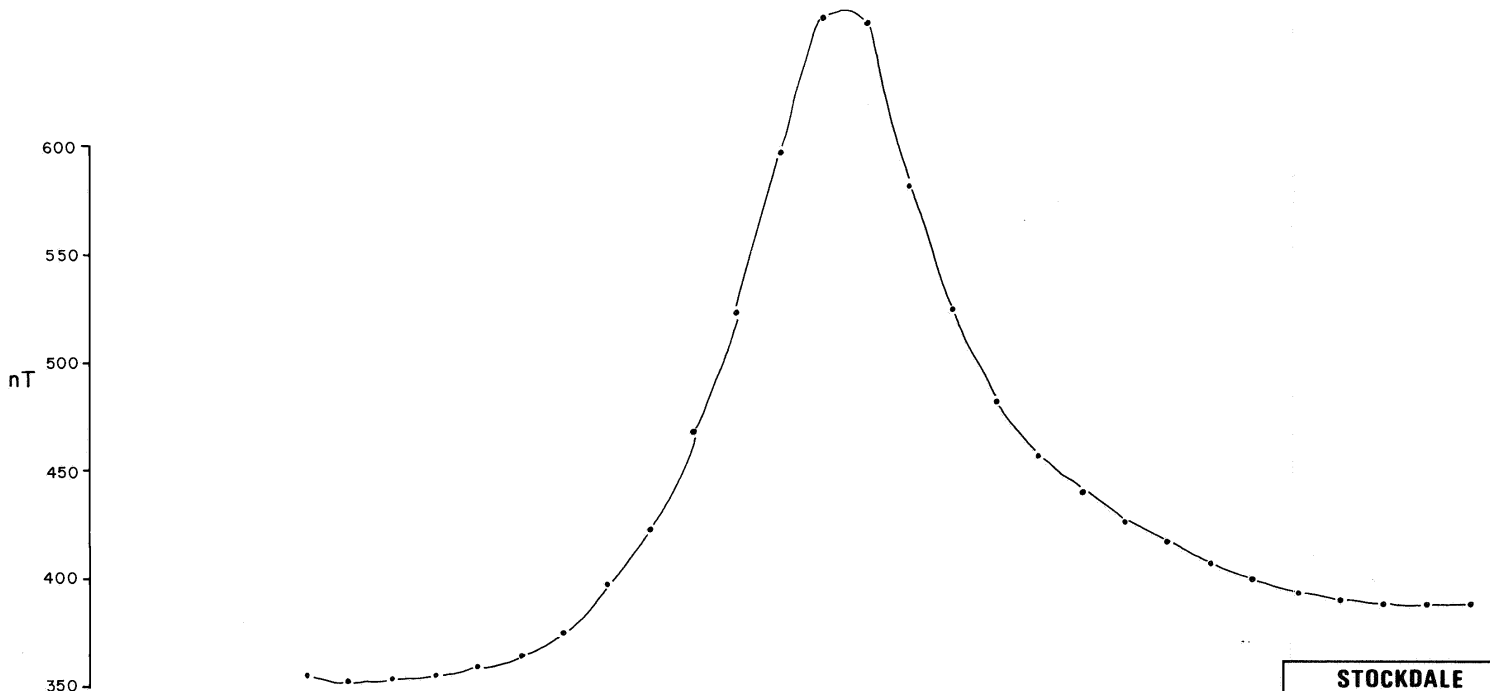
V.L.F and MAGNETIC PROFILES

Compiled F.W.A	Drawn A.D.S	Date NOV '81	Scale ——	SEL 1310

062

V.L.F PROFILE 1





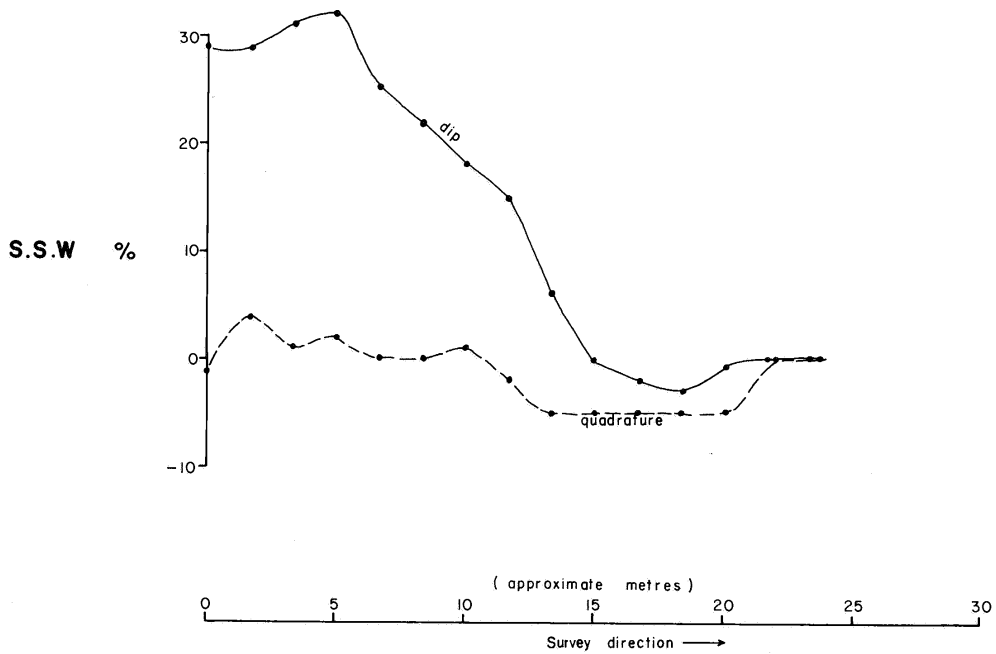
MAGNETIC PROFILE 1

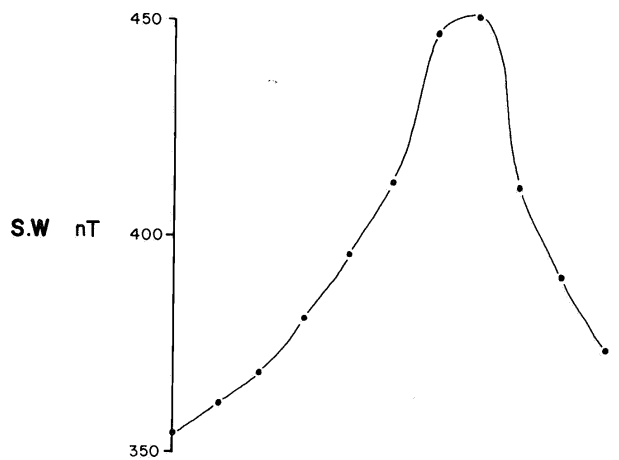
FIG. 2

See SEL 1309 for Location map - MAP 4
See SEL 1312 for Profiles - No. 2 FIG. 3

STOCKDALE PROSPECTING LIMITED				
154-1 E.L. 853				
ORRORO K2				
V.L.F and MAGNETIC PROFILES NO. 1				
Compiled F.W.A	Drawn A.D.S	Date NOV '81	Scale ——	SEL 1311

V.L.F PROFILE 2





MAGNETIC PROFILE 2

See SEL 1309 for Location map – MAP 4
See SEL 1311 for Profiles – No. 1 FIG. 2

FIG 3

STOCKDALE PROSPECTING LIMITED

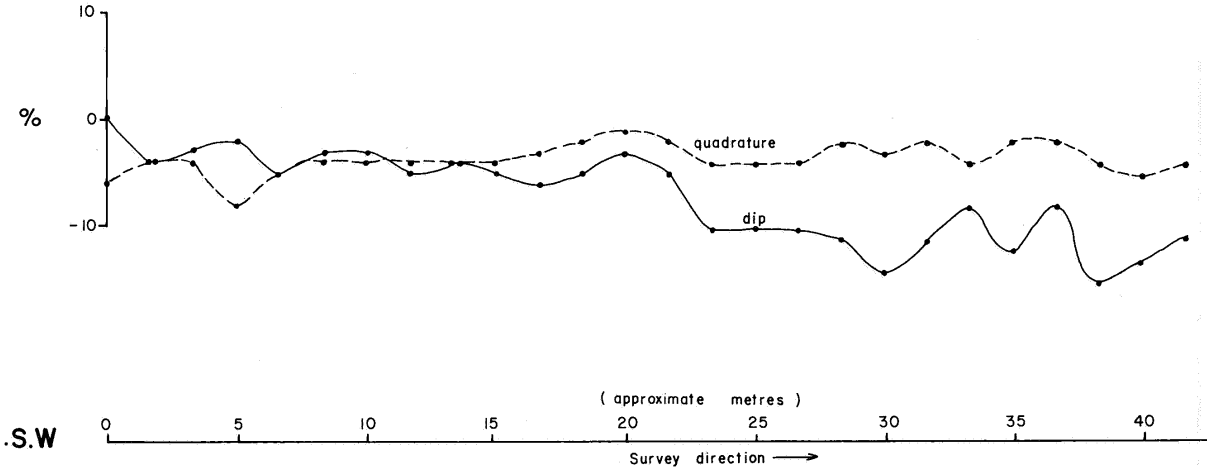
I54-1 E.L. 853

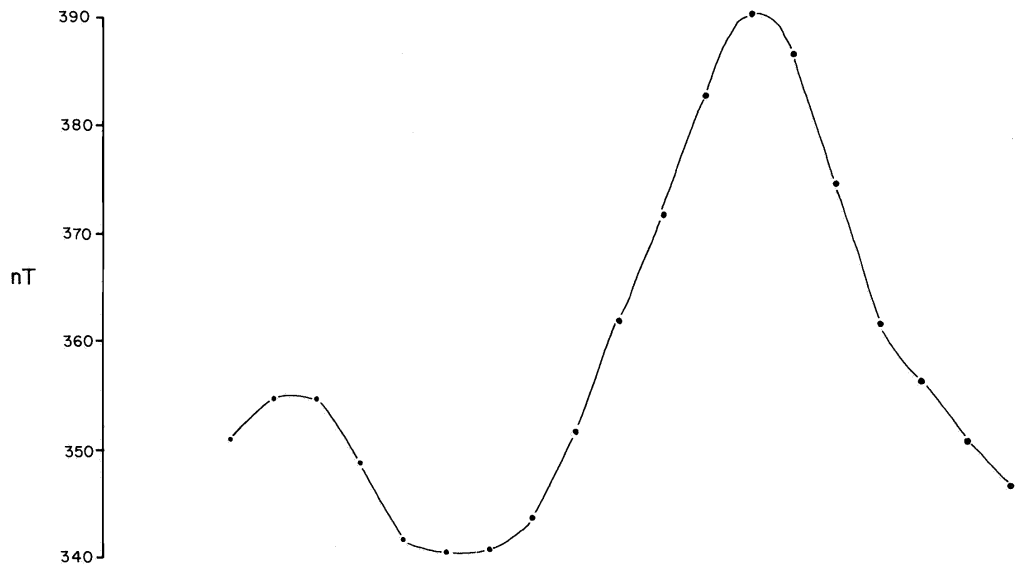
ORRORO K2

V.L.F and MAGNETIC PROFILES NO. 2

Compiled F.W.A	Drawn A.D.S	Date NOV '81	Scale —	SEL 1312

V.L.F PROFILE





MAGNETIC PROFILE

FIG. 4

STOCKDALE PROSPECTING LIMITED

I54-1 E.L. 853

ORRoROO K4

V.L.F and MAGNETIC PROFILES

See SEL 1309 for Location map - MAP 4

Compiled F.W.A	Drawn A.D.S	Date NOV '81	Scale ——	SEL 1313

V.L.F PROFILE

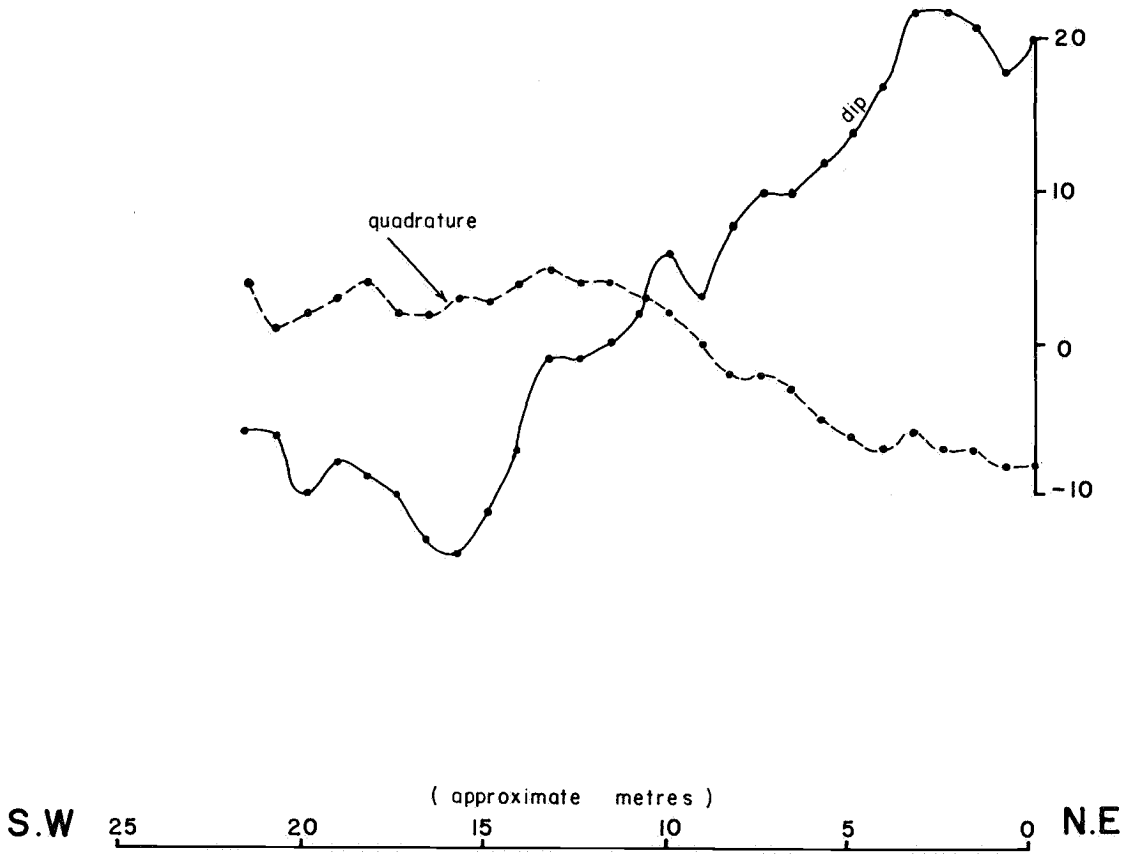


FIG. 5

STOCKDALE PROSPECTING LIMITED	
I54-I E.L. 853 ORRORO0 K7 V.L.F PROFILE	Compiled F.W.A Drawn A.D.S Date NOV '81 Scale — Revised SEL 1314

See SEL 1309 for Location map - MAP 4
See SEL 1315 for magnetic profile-FIG. 6

MAGNETIC PROFILE

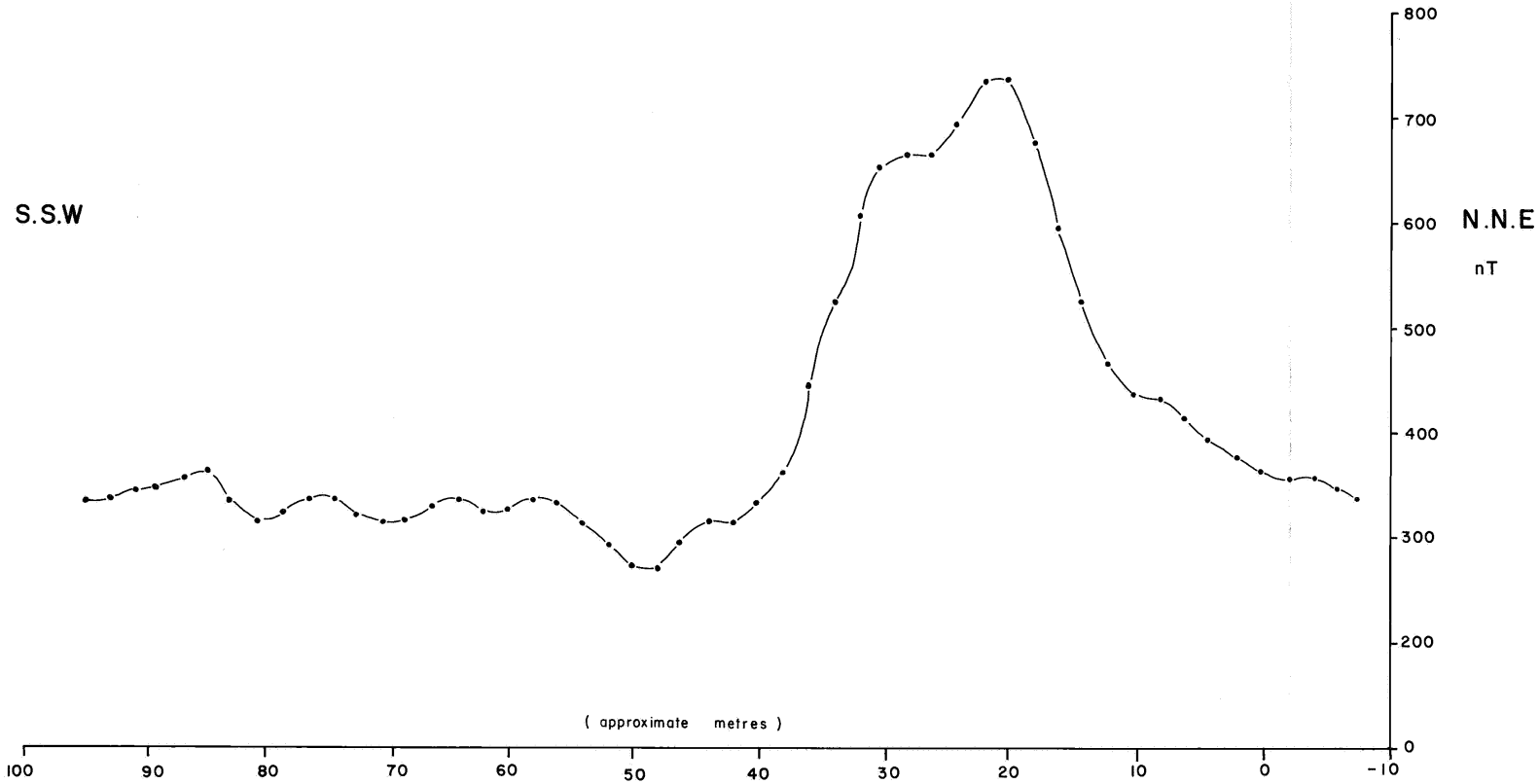


FIG. 6

See SEL 1309 for Location map - MAP 4
See SEL 1314 for V.L.F. profile - FIG. 5

STOCKDALE PROSPECTING LIMITED

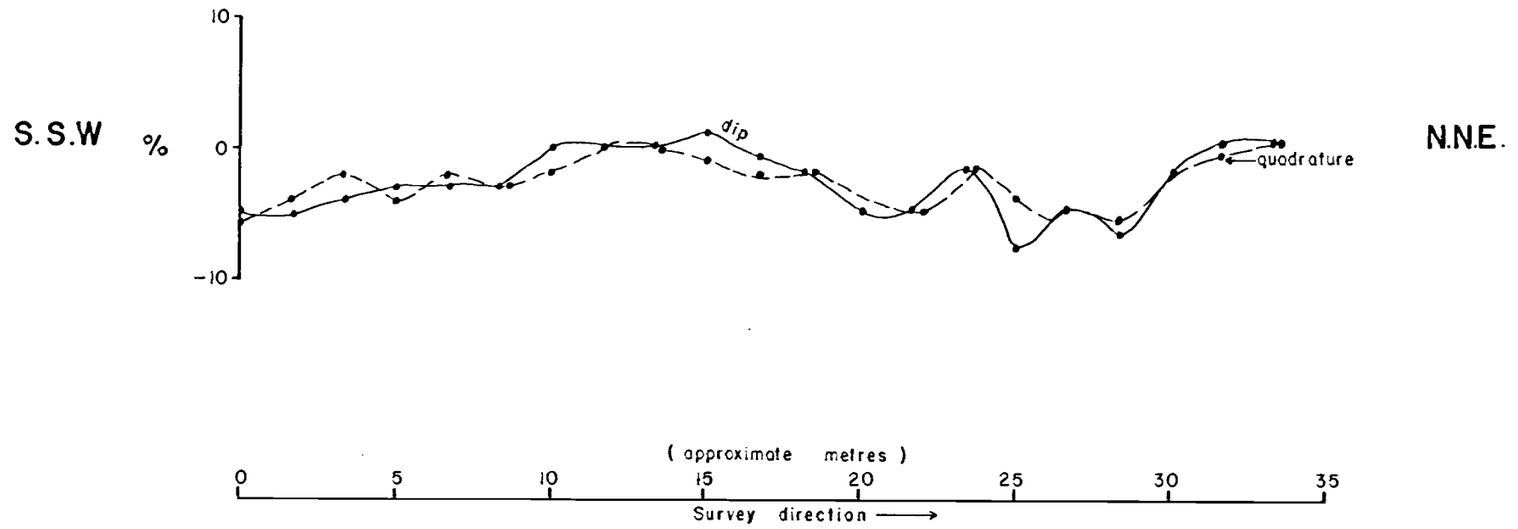
I54-1 E.L. 853

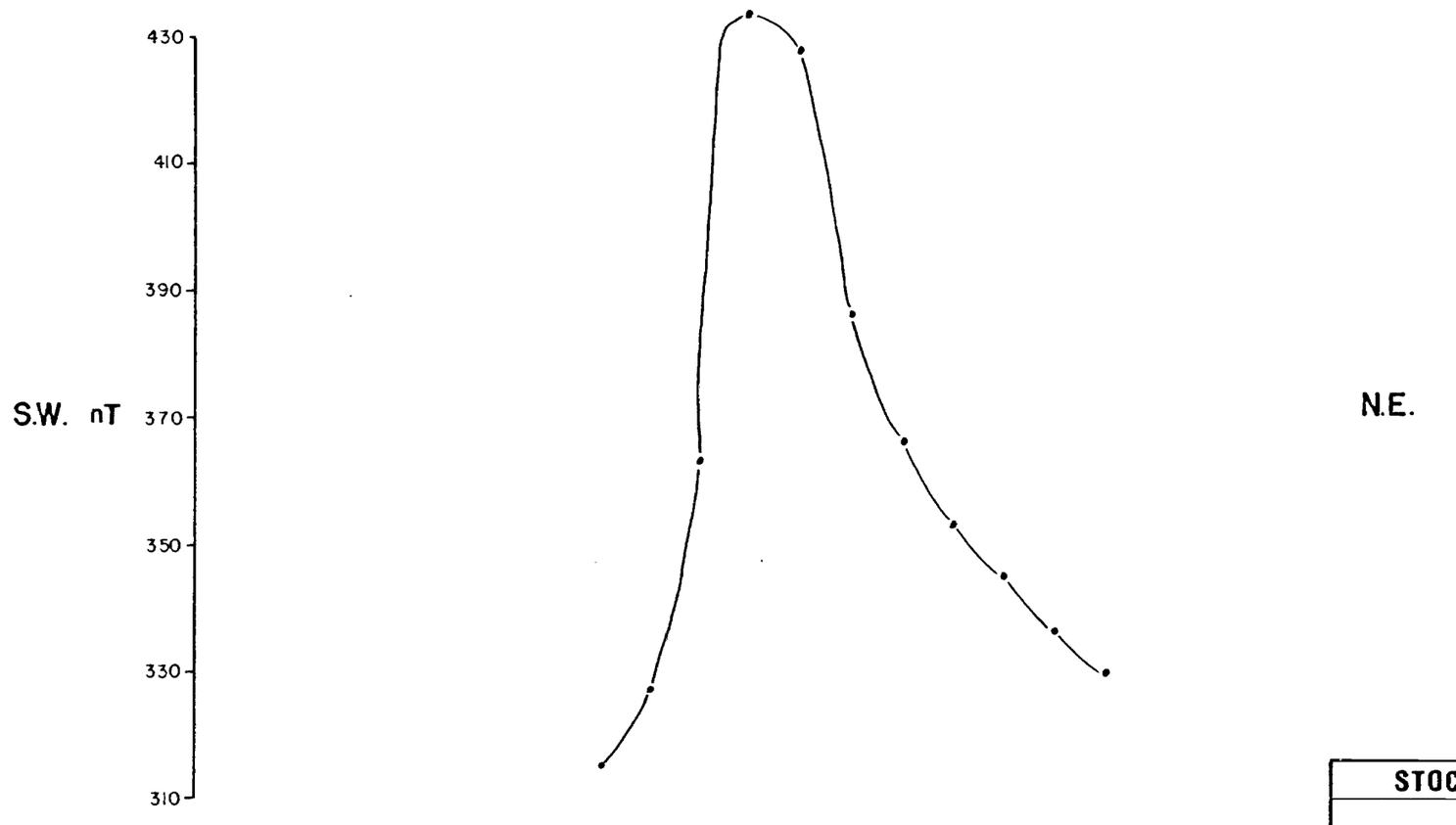
ORRoROO K7

MAGNETIC PROFILE

Compiled F.W.A	Drawn A.D.S	Date NOV '81	Scale ——	SEL 1315

V.L.F PROFILE





MAGNETIC PROFILE

FIG. 7

STOCKDALE PROSPECTING LIMITED

I54-I E.L. 853

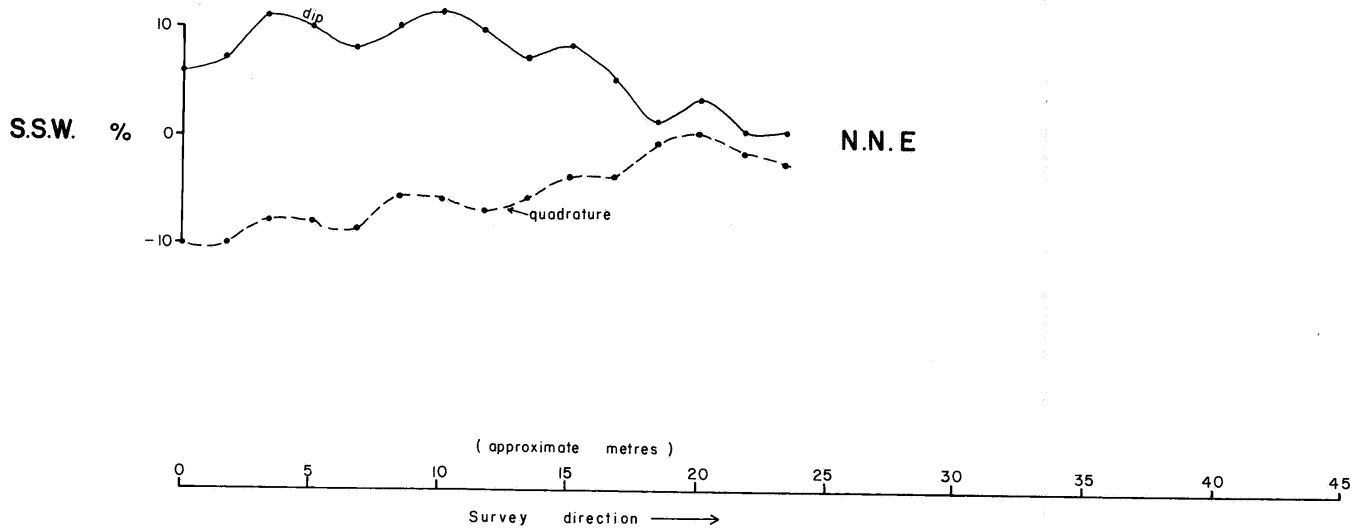
ORRoROO K12

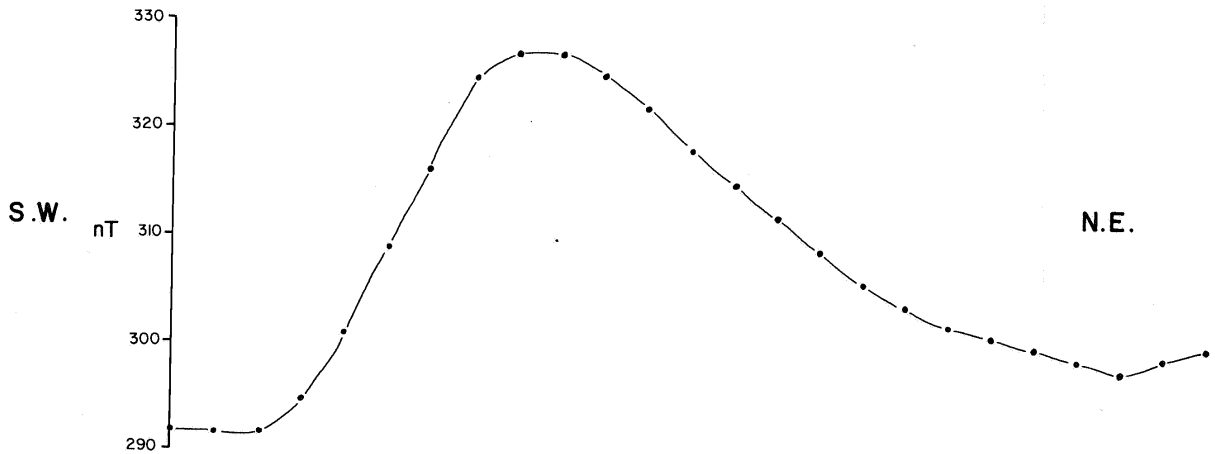
V.L.F and MAGNETIC PROFILES

See SEL 1309 for Location map MAP 4

Compiled F.W.A.	Drawn A.D.S	Date NOV '81	Scale ——	SEL 1316

V.L.F. PROFILE 1





MAGNETIC PROFILE 1

FIG. 8

See SEL 1309 for Location map - MAP 4
See SEL 1318 for Profiles No. 2 - FIG. 9

STOCKDALE PROSPECTING LIMITED

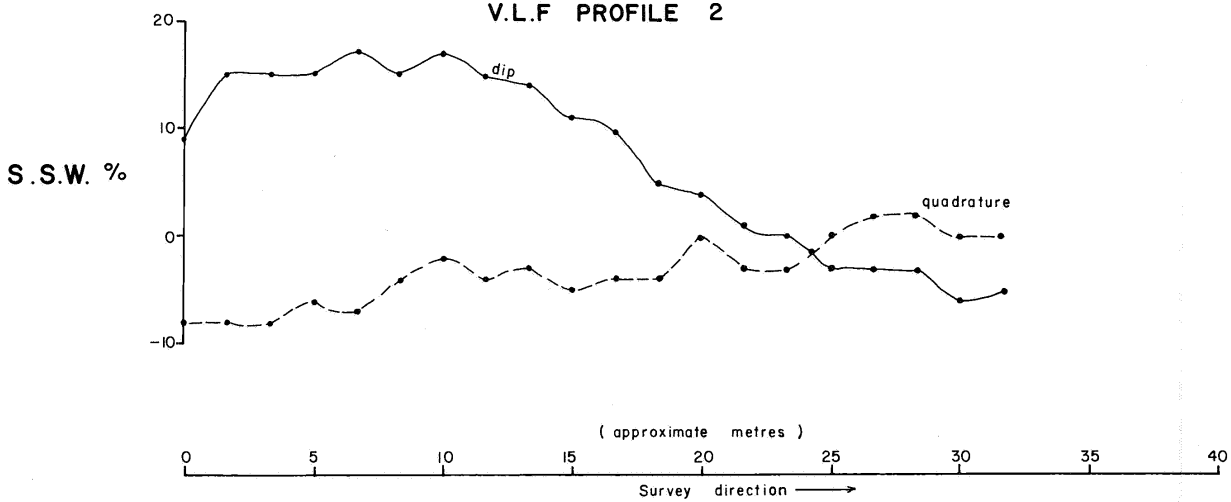
I54-1 E.L. 853

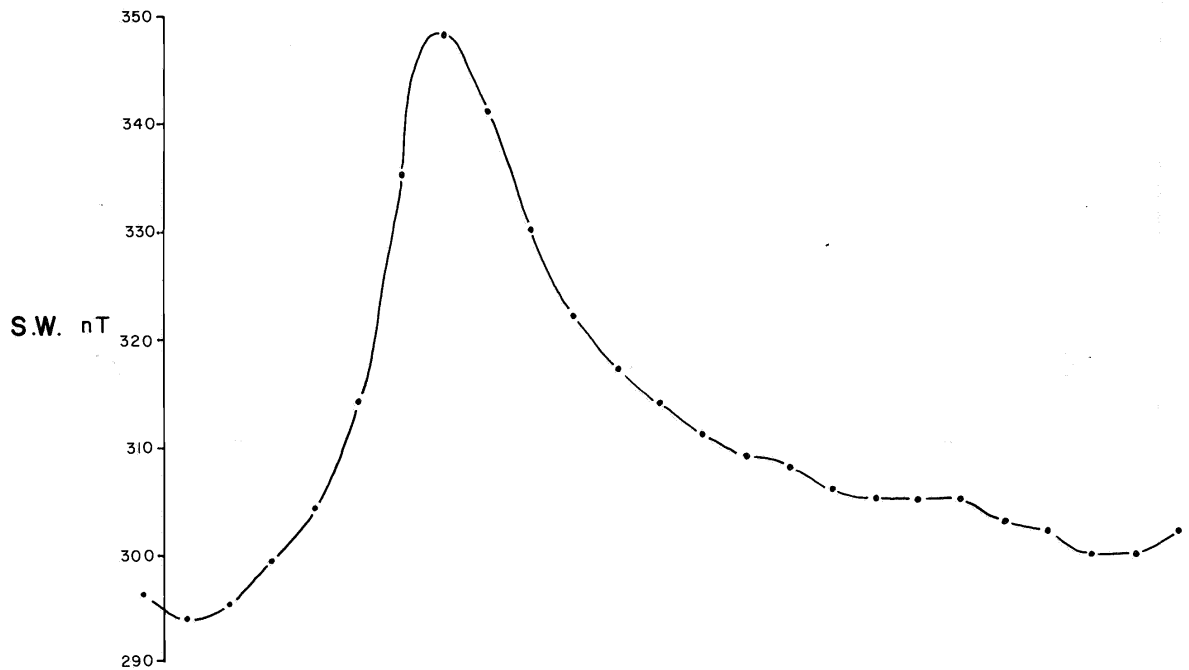
ORRoROO K13

V.L.F and MAGNETIC PROFILES NO. 1

Compiled F.W.A	Drawn A.D.S	Date NOV '81	Scale ___	SEL 1317

V.L.F PROFILE 2





MAGNETIC PROFILE 2

See SEL 1309 for Location map - MAP 4
See SEL 1317 for Profiles No.1 - FIG. 8

FIG. 9

STOCKDALE PROSPECTING LIMITED

I 54-1 E.L. 853

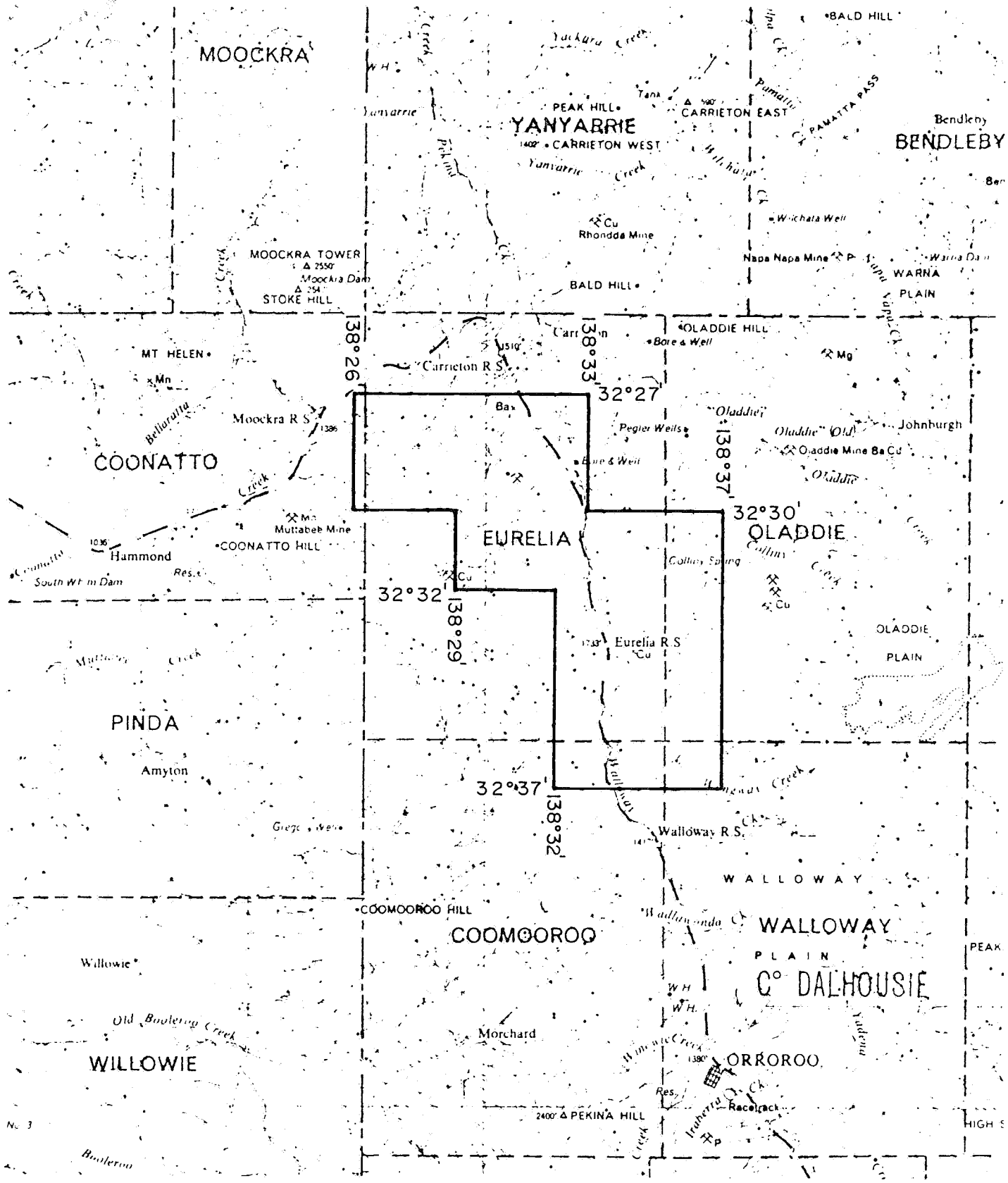
ORRORO K13

V.L.F and MAGNETIC PROFILES NO. 2

Compiled F.W.A	Drawn A.D.S	Date NOV '81	Scale ——	SEL 1318

MAP 1

SCHEDULE A



SCALE 1:250,000

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

APPLICANT: STOCKDALE PROSPECTING LIMITED

DM: 177/81 AREA: 180 square kilometres

1:250000 PLANS: ORRoROO

LOCALITY: EURELIA AREA - Approx 20km N. of Orroroo

DATE GRANTED: DATE EXPIRED: EL No: 853

K4
Profile I - Refer SEL 1313 FIG. 4

K 1 - 2.8kms. from K4
(see inset map)

K2
Refer SEL 1311 - Profile 1 FIG. 2
Profile 2 - Refer SEL 1312 FIG. 3

BEL FOREST

FIG. 5
VLF Profile - Refer SEL 1314
Mag Profile - Refer SEL 1315 FIG. 6

K7
DHR1
DHR2
DHR3

K12
Profile I - Refer SEL 1316 FIG. 7
Approx position

FIG. 9 (Refer SEL 1318)
K13
- Profile 1
Profile 2 - (Refer SEL 1317) FIG. 8

32°29'
32°30'
32°31'
138°31'
138°32'
138°33'

• DH R1 Drill hole (research), 1981
Outline of kimberlite - K7(inferred)

0 10 30 METRES

INSET MAP SHOWING 'K1' LOCATION
N
K4 2.8km
Approx. position
K1
Profile 1 - Refer SEL 1310 FIG. 1
SCALE 1:10000

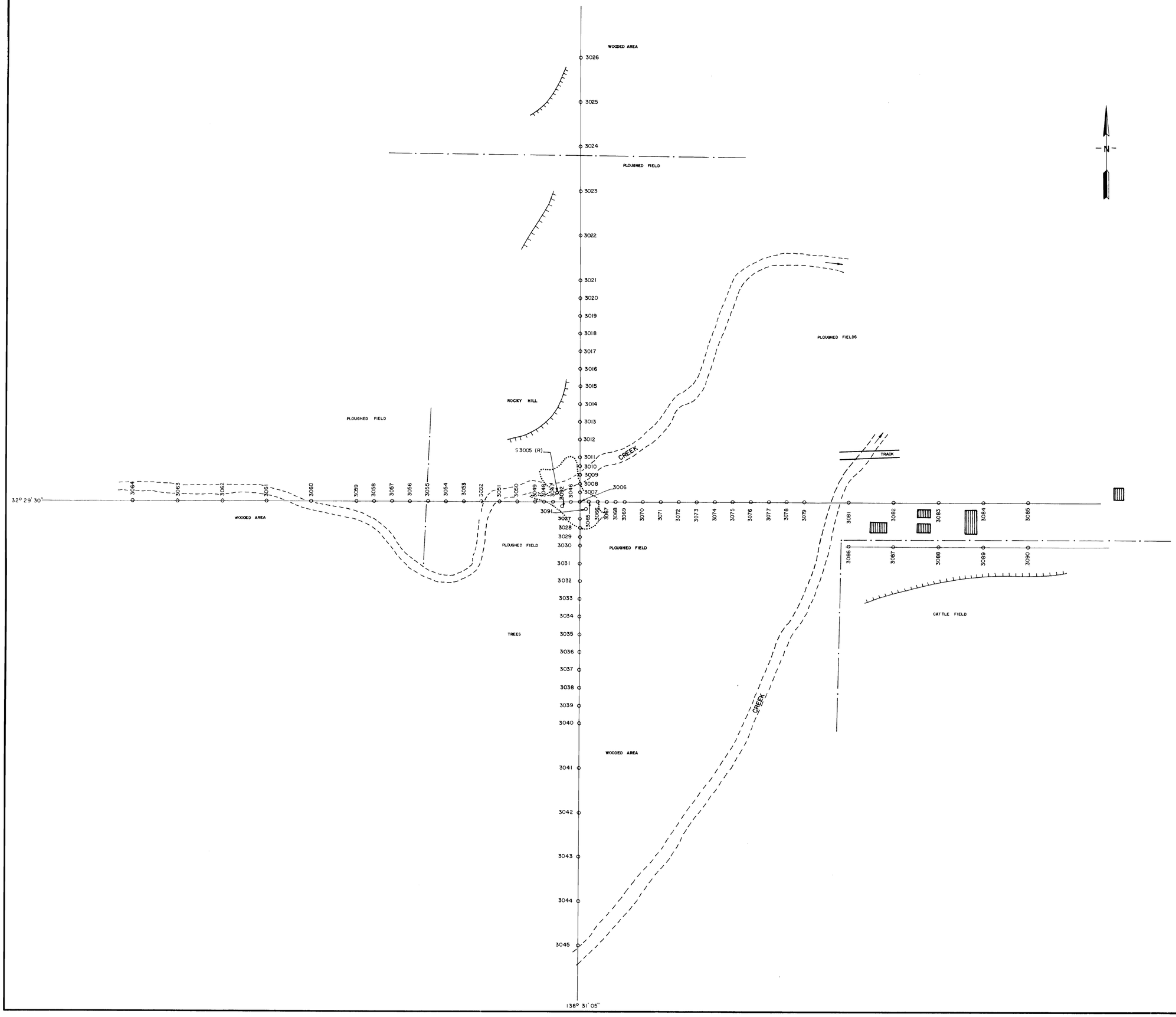
3891-15 MAP 4

STOCKDALE PROSPECTING LIMITED

154-1 E.L. 853 ORRORO0

LOCATION MAP SHOWING POSITIONS OF K1, K2, K7, K12, & K13 VLF AND MAGNETIC PROFILES

Compiled	Drawn MAK	Date NOV. '81	Scale 1: 10,000	SEL 1309



LEGEND

- BUILDING.
- FENCE.
- BREAK OF SLOPE.
- OUTLINE OF KIMBERLITE K7 (INFERRED)
- o 3092 — SAMPLE LOCATION. (SOIL)
- o 3005 (R) — SAMPLE LOCATION (ROCK)

N

NOTES

ALL SAMPLES HAVE PREFIX (S)

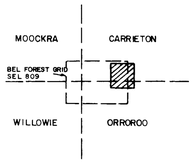
NO SAMPLE NUMBER 3080

SAMPLED IN JULY 1981

S3005 — 3079

S3081 — 3092

(TOTAL - 87).



1: 50 000

LOCATION DIAGRAM

PART ORRORoo 154-I 1: 250000 SHT.

See SEL 1225 for location of K7 within E.L 853

See SEL 1227 for continental location within Australia.

50 0 50 100 150 METRES

3891-14 MAP 2

STOCKDALE PROSPECTING LIMITED	
E.L. 853 ORRORoo I54-I K7 GEOCHEMICAL SURVEY SOIL SAMPLING	Compiled P. BURTON Drawn A.T.H. Date 23/7/81 Scale 1:2000 Revised 6/11/81 SEL 1226

BALD HILL

Carrieton

Pekina Creek

Pekina Creek

Landing Bridge

Cemetery

"Ivy Glen"

"Bel Forest"

PETERBOROUGH — QUORN RAILWAY (Gauge 1.07 m)

EL 853

See SEL 1226 for detail geochem sampling

1:250,000 SHT LOCATION

WOOCKRA | CARRIETON

WILLOWIE 1:50,000 SHEETS | ORRORoo

ORRORoo 154-I

AUGUST 1981

SAMPLES P3901 - 3971 (geochem)

(Total 71)

500 0 1000 METRES

See SEL 1226 for K7 detailed geochemical soil sampling

See SEL 1227 for continental location within Australia.

N.B. FOR OTHER SAMPLING SEE SEL 809.

3891-16 MAP 3

STOCKDALE PROSPECTING LIMITED

E.L. 853

ORRORoo 154-I

GEOCHEMICAL STREAM SAMPLING

(Showing K7 location)

Compiled	Drawn	Date	Scale	
P. Burton	M.A.K.	NOV '81	1: 20,000	SEL 1225

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE 853: ORRORO0

SECOND QUARTERLY REPORT TO 19TH JANUARY 1982

STOCKDALE
PROSPECTING
LIMITED
Incorporated in the State of Victoria

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Project Name: ORROROO

Title: EXPLORATION LICENCE 853
SECOND QUARTERLY REPORT TO 19TH JANUARY, 1982

Author/s: R.V. DANCHIN

Keywords: KIMBERLITE, GEOPHYSICS, GEOCHEMISTRY, DRILLING

1 : 250,000 Sheet Name/s & No/s.: ORROROO, SI 54-1

Text Pages No.: 5

Plan Nos.: Figures - 13

Table Nos.:

Appendices:

Date: February, 1982

Distribution: SADME, RVD, IC

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FIGURES (At Rear of Text)

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE 853 : ORRoROO

SECOND QUARTERLY REPORT TO 19TH JANUARY, 1982

1. INTRODUCTION

Exploration Licence 853, which covers an area of 180 square kilometres in the Eurelia area (Figure 1), was granted on July 20, 1981. The licence area covers those parts of Exploration Licences 486 (Carrieton West) and 652 (Orroroo), previously held by Stockdale Prospecting Limited, which were not relinquished in March 1981.

This report covers exploration activity within the licence area from October 20th, 1981, to the end of the Second Quarter on January 19th, 1982.

2. PROSPECTING PROGRESS

2.1. Geochemical Exploration

2.1.1 Introduction

A geochemical sampling orientation programme has been conducted over Kimberlite K7 on "Bel Forest" station near Carrieton. This body, which is of the order of 40 m x 15 m is located at 32° 39'E, 138° 31'S,. The kimberlite occurs in agricultural land and discussions with the land owner regarding the farm history revealed that the field enclosing K7 has been ploughed since 1952, but was probably not brought into use until 1966. When in use the field is crop rotated on a three year basis. The area on the northern side of the creek was first ploughed in 1978. The streams have run fairly infrequently in the past and have not run since 1976. The area surrounding K7 has low relief and it therefore seems probable that normal geochemical dispersion prevailed until 1957 when the area began to be farmed.

The main creek, Pekina Creek, is relatively undisturbed around K7. However, towards Carrieton recent disturbance is noticeable: gravel has been removed for road grading; dams built; and new tracks cross-cut the creek, all potentially serving to contaminate the surrounding sediment.

It should also be borne in mind that other kimberlitic intrusions occur fairly close by (Figure 2).

2.1.2 Sampling

The survey consisted of three stages:

a) Sampling of kimberlite
b) Soil sampling
c) Stream sampling

Sampling of Kimberlite

A 10 kg sample of inclusion-free weathered kimberlite (S3005) was collected from the stream outcrop for major and trace element analysis as a geochemical reference. Results are shown in Figure 3.

Soil Sampling

Two 1 km traverses were extended through the centre point of the body, and a total of 86 geochemical soil samples were collected from along the traverses. Each sample was taken from a depth of 15 cm below the surface, and was dry sieved through a plastic 80# screen to provide 100 grams of -80 mesh material. The samples were collected at 10 m intervals over the intrusion, then at 20 m intervals, and finally at 50 m intervals towards the ends of the traverses (See Map 2, 1st Quarterly Report).

Stream Sampling

A mature stream cuts the northern edge of the body and flows east then north to Carrieton. Samples were taken 1 km upstream and 10 km downstream of the intrusion at 200 m intervals.

Most of these stream samples (total 71) were taken wet and were later dried and sieved.

Difficulties were encountered approximately 3 km south of Carrieton. Here the stream had dried out due to recent disturbance over an area of approximately 60 m. Some poorly defined small channels (grass covered) were delineated and sampling was continued along these until the main creek reappeared.

It should be noted again that K7 is not the only kimberlite occurring within the catchment of the drainage, and that the other bodies present will also exert an influence on the geochemical dispersion pattern observed (Figure 2).

2.1.3 Geochemical Analysis

The -80# fractions of the samples were analysed in Johannesburg at the Anglo American Research Laboratories using an ARL 72000 S automated x-ray fluorescence spectrometer. A total of 36 trace, minor and major elements were determined as follows:-

U, Th, Bi, Pb, W, Ta, Ba, Te, Sb, Sn, Mo, Nb, Zr, Y, Sr, Rb, Se, As, Zn, Cu, Ni, Co, Fe, Mn, Cr, V, Ti, Ca, K, S, P, Si, Al, Mg, Na and F.

Due to the nature of the analytical method and the configuration of the instrument in question, sensitivity, accuracy and precision vary substantially from element to element.

The anlaytical data were therefore examined to determine which elements were most useful from a kimberlite prospecting point of view. Chromium, for example, which is normally a sensitive indicator in kimberlite surveys, could not be used in this instance as the sensitivity parameters for this element were inadequate.

2.1.4 Results

Soil Samples

Nickel (Fig. 4)

The N - S traverse shows a sharp but small increase over the kimberlite with a peak of 34 ppm. Values continued to be relatively high to the south.

The E - W traverse shows a very sharp increase over the kimberlite, with a peak of 270 ppm (slightly west of centre), with generally low irregular values to the west and east of the kimberlite.

Niobium (Fig. 5)

The N - S traverse shows fairly high values around the kimberlite with a gradual increase from the north. There is a slight increase over the kimberlite with a peak of 17 ppm. Relatively high values continue to the south.

The W - E traverse shows generally low values with a sharp increase over the kimberlite, with a 80 ppm peak slighly west of centre.

Strontium (Fig. 6)

The N - S traverse shows generally low values to the south of the kimberlite with a slight increase over the body (105 ppm peak). A high peak of 625 ppm occurs on the N side. This peak may be explained by concentration due to ploughing or by the presence of another kimberlite, K12 occurring to the north.

The W - E traverse shows high irregular concentrations to the west with a dramatic increase to 300 ppm on the western edge of the kimberlite.

Barium (Fig. 7)

The N - S traverse shows a very irregular pattern with sharp negative and positive values.

The W - E traverse shows negative values to the west with a definite low over the kimberlite. Higher, less irregular values occur to the east.

The high and irregular values may suggest Ba rich bed rocks, serving to mask the high Ba content of the kimberlite.

Stream Samples

Nb (Figure 8), Sr (Figure 9), Ba (Figure 10) all show definite highs around K7, and along the creek in the vicinity of other known kimberlites.

Ni shows high values near K7 but the other kimberlites are not significantly defined (Fig. 11).

2.1.5 Conclusions

1. Four principle elements Ni Nb, Sr. Ba were found to be effective in delineating K7 in both soil and stream samples.

2. Soil Samples. Nb, Ni, Sr gave anomalous readings over K7. Ba gave irregular readings, but this may be a reflection of the surrounding sediments (Fig. 12 & 13).

   Stream Samples: Nb, Ni, Sr, Ba all gave anomalous high readings clearly delineating K7. Other kimberlites were also picked out.

3. For this particular exercise the results have shown that indications of kimberlite can be located by geochemical methods. This, combined with the speed of collection, and the cheap analysing cost per sample, suggests that geochemistry may have a part to play in regional or follow-up sampling programmes.

2.2 Ground Geophysics

No further ground geophysical surveys were undertaken. Results of surveys previously undertaken and reported in the First Quarterly Report are being studied in conjunction with data from similar surveys in other areas.

2.3 Drilling

No further drilling was undertaken. Core previously obtained has been submitted for analysis and examination but no results have been obtained.

3. EXPENDITURE

Expenditure of $ 1,813 for the period has been allocated as follows:

Field Staff : Technical	$ 650
Sample Analysis	$ 896
Specialist Services:	
Geophysics	$ 176
Drafting	$ 91
Total For This Period	$ 1,813
Total Previously Reported	$ 13 828
Total Expenditure to Date	$ 15,641

4. FUTURE PROGRAMME

Compilation, assessment and interpretation of outstanding results will be undertaken prior to formulation of the next phase of work

R.V. Danchin
MELBOURNE
4th February, 1982

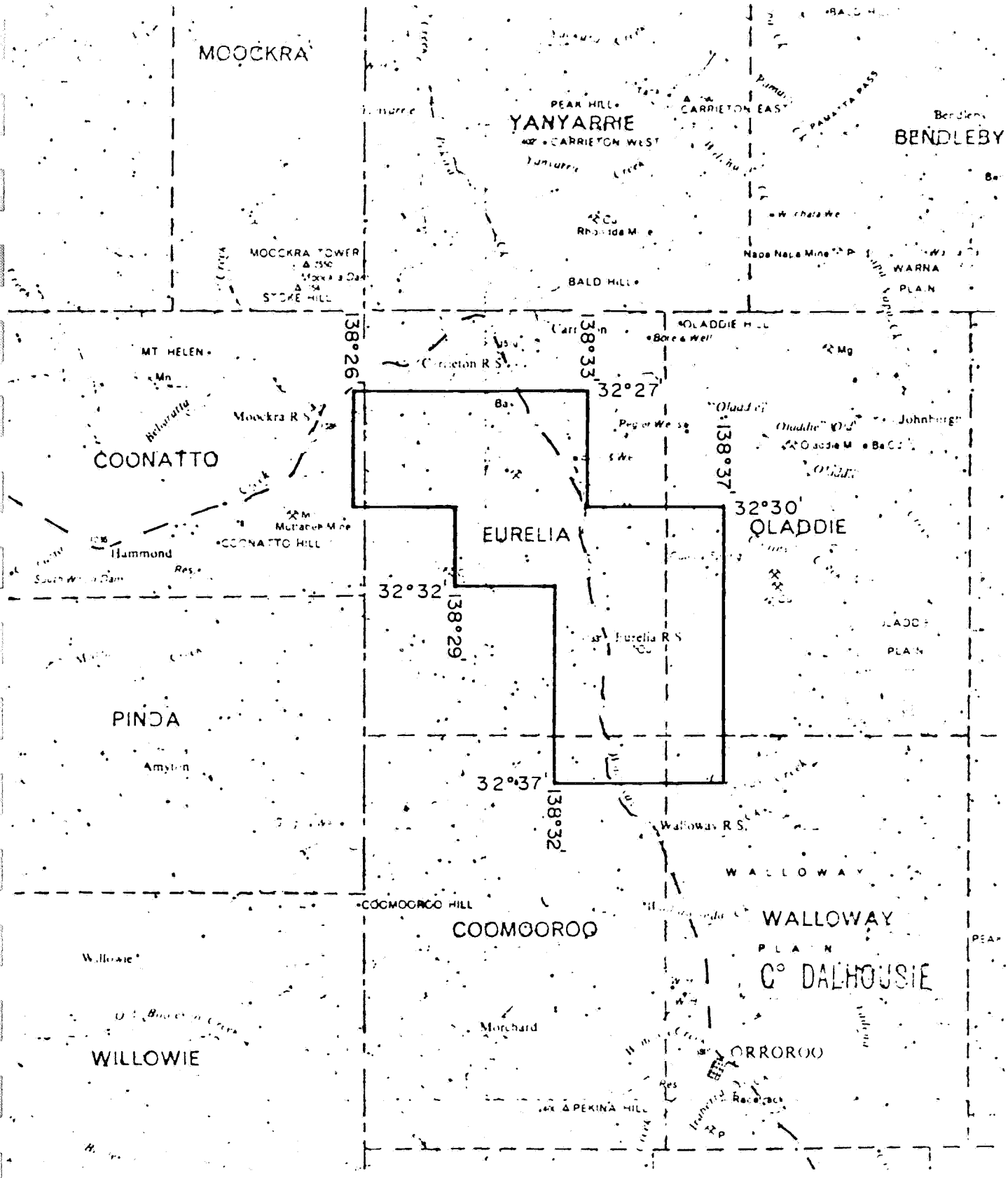
K.J. STRACKE
Exploration Manager

:bsrvdl

Distribution: SADME, RVD, IC.

079

SCHEDULE A



SCALE 1:250,000

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

APPLICANT: STOCKDALE PROSPECTING LIMITED

DM: 177/81 AREA: 180 square kilometres

1:250,000 PLANS: ORRORO0

LOCALITY: EURELIA AREA - Approx 20km N. of Orroroo

DATE GRANTED: DATE EXPIRED: EL No: 853

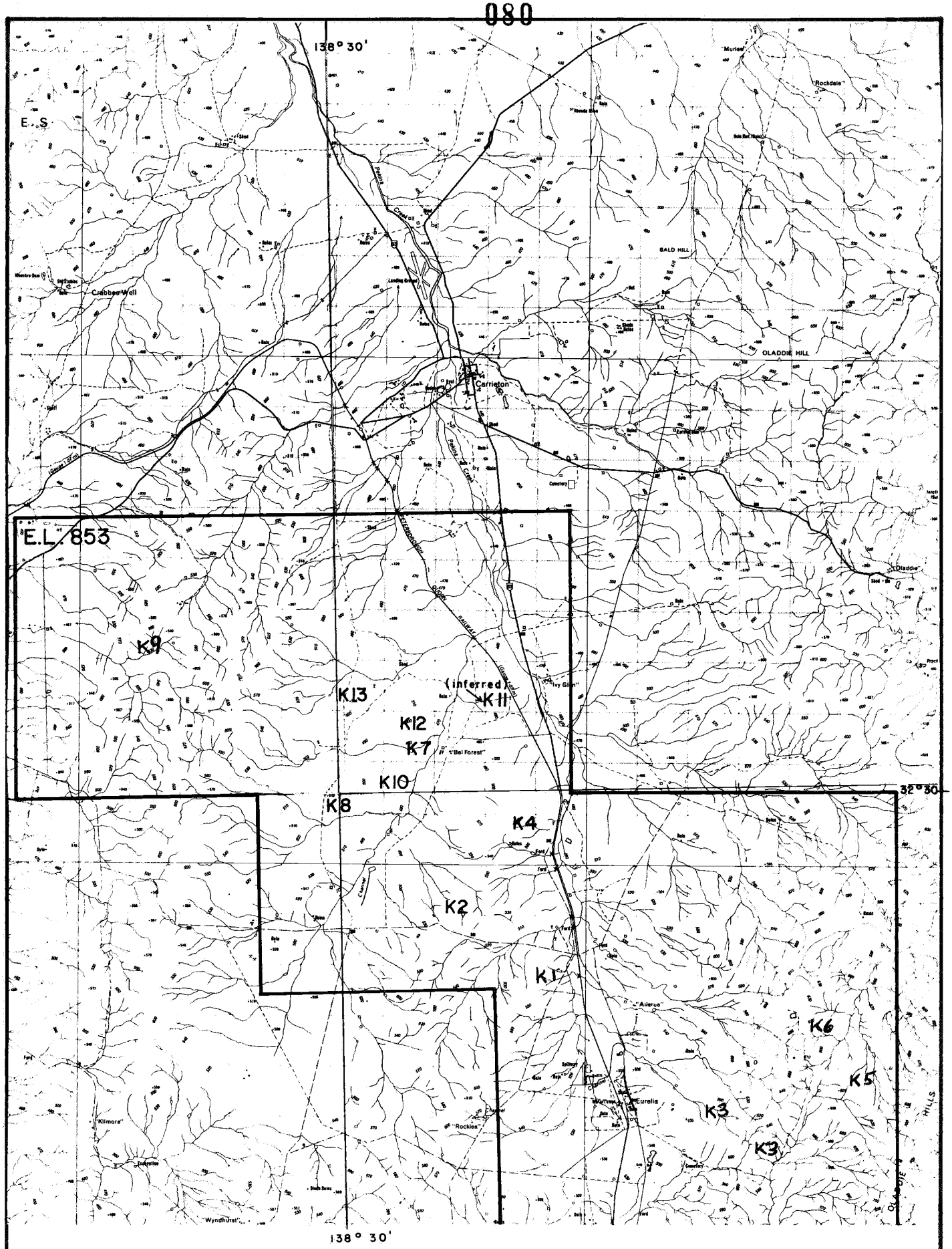


Fig 2

K2 Kimberlite body

BASED ON SEL 731

STOCKDALE PROSPECTING LIMITED

ORRORO I54-1

CARRIETON KIMBERLITE LOCATION MAP

Compiled	
Drawn	A.D.S
Date	JAN '82
Scale	1:100,000
Revised	
	SEL 731 A

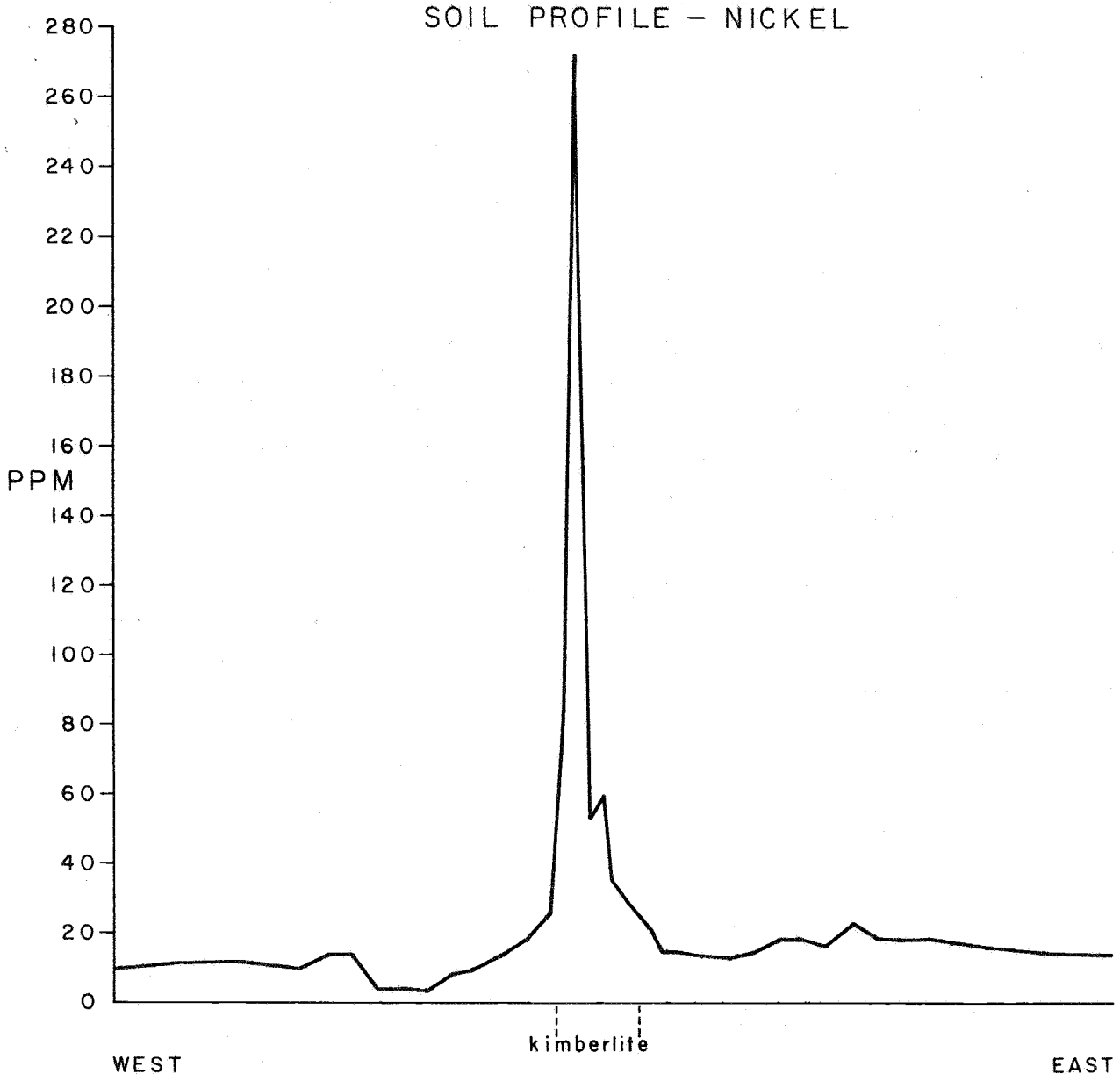
COMPOSITION OF SAMPLE S3005, WEATHERED KIMBERLITE, K7, ORRORoo (ppm)

Ni	Cu	Zn	Pb	Co	Mo
969	70	59	29	56	<1
S	As	Se	Sb	Bi	Fe
<0·1	23	<2	<4	<2	75
Mn	Cr	TiO_2	V_2O_3	Sr	Ba
0·2	0·3	2·2	0·5	407	2573
U_3O_8	ThO_2	Na	Sn	WO_3	Ta_2O_5
2	48	0·2	<4	<4	<4
Nb_2O_5	Zr	Rb	Y	P_2O_5	K
293	169	80	23	0·4	0·7
Ca	Te	F	SiO_2	Al_2O_3	Mg
10·9	<4	0·6	27·5	5·5	9·1

Fig 3

S.P.L.	
Compiled	PE B
Drawn	MAK
Date	DEC.'81
Scale	
Revised	
SEL 1352	

SOIL PROFILE – NICKEL



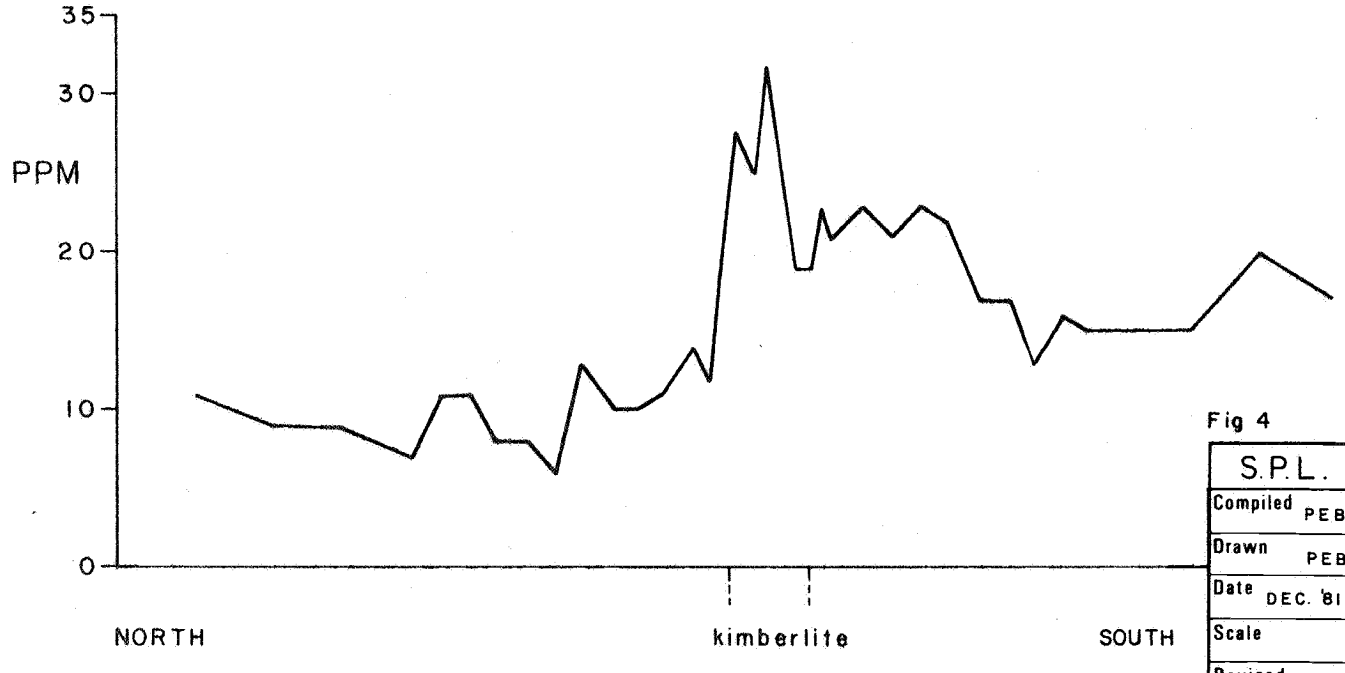
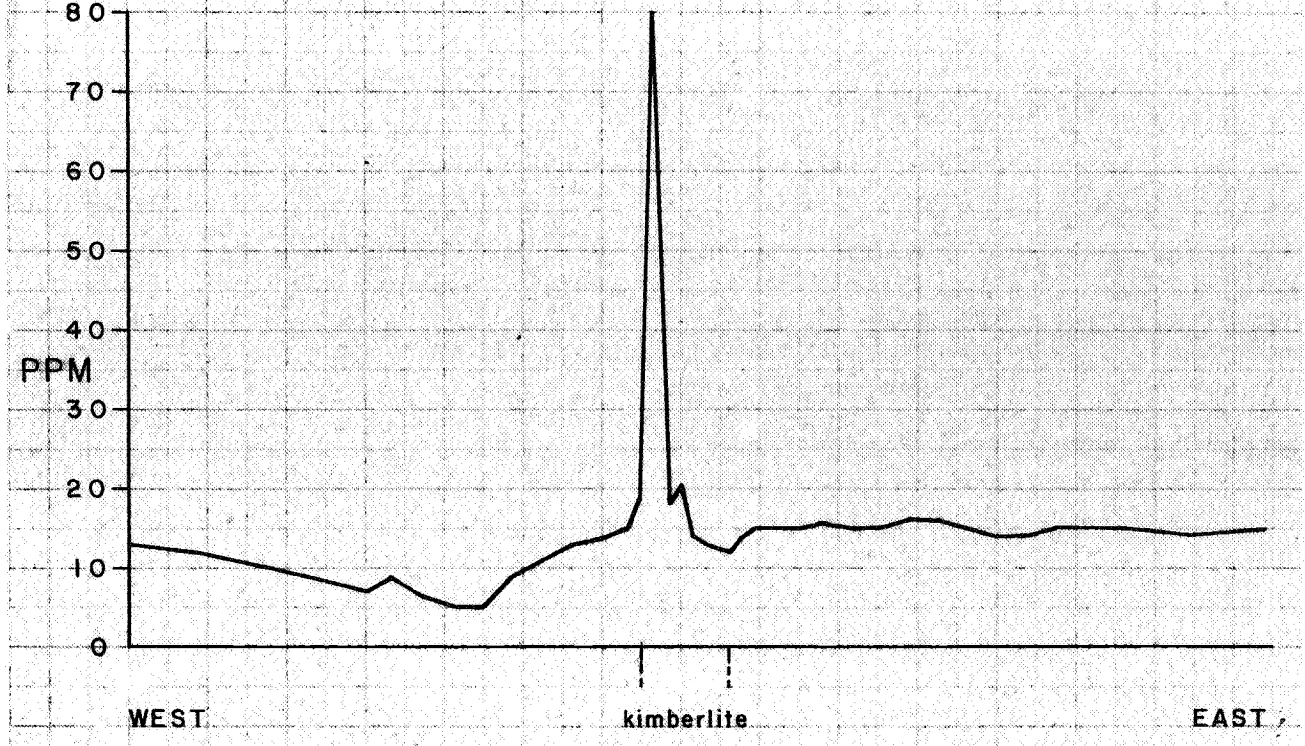


Fig 4

S.P.L.	
Compiled	PEB
Drawn	PEB
Date	DEC. '81
Scale	
Revised	
SEL 1350b	

SOIL PROFILE – NIOBIUM



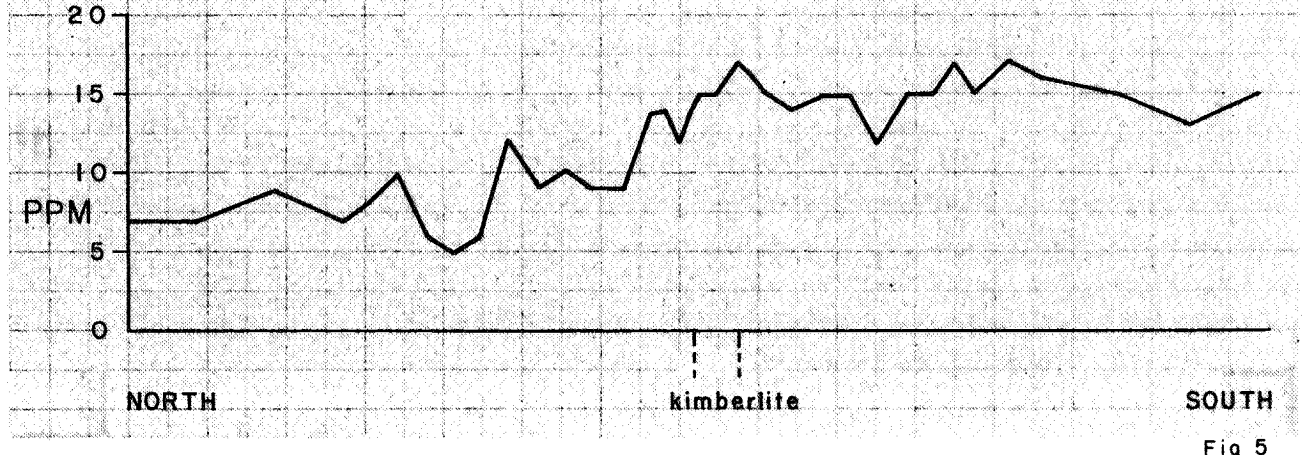


Fig 5

S.P.L.	
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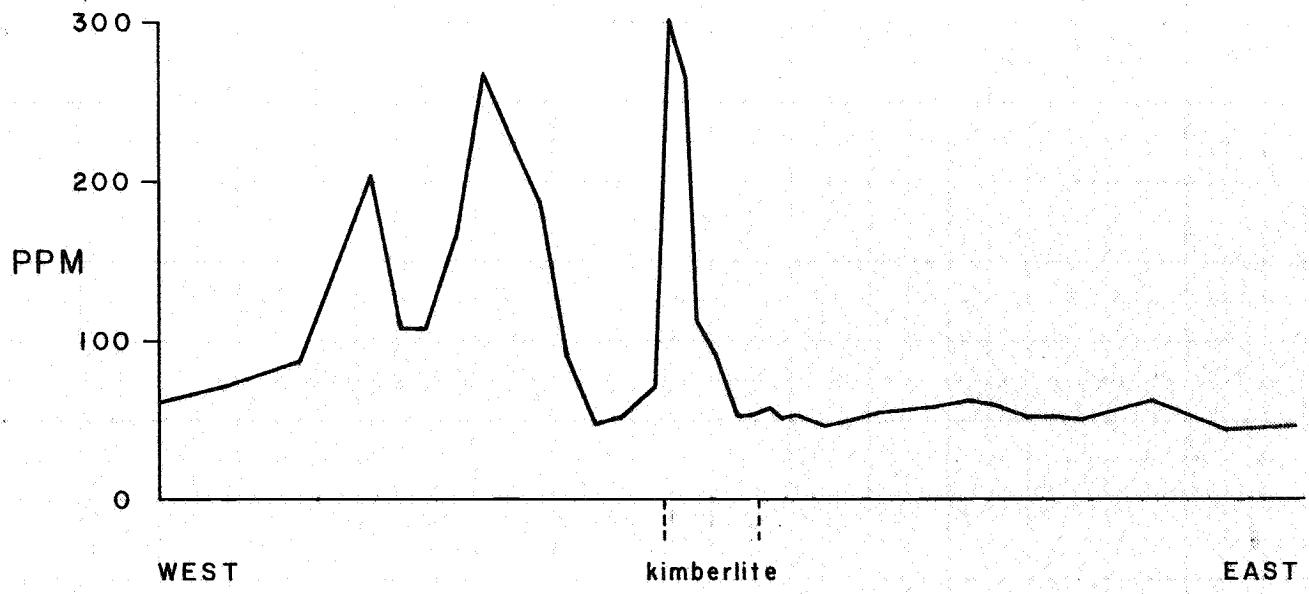
Drawn	PEB
Date	DEC. '81
Scale	
Revised	
SEL 1350 d	

SOIL PROFILE - STRONTIUM



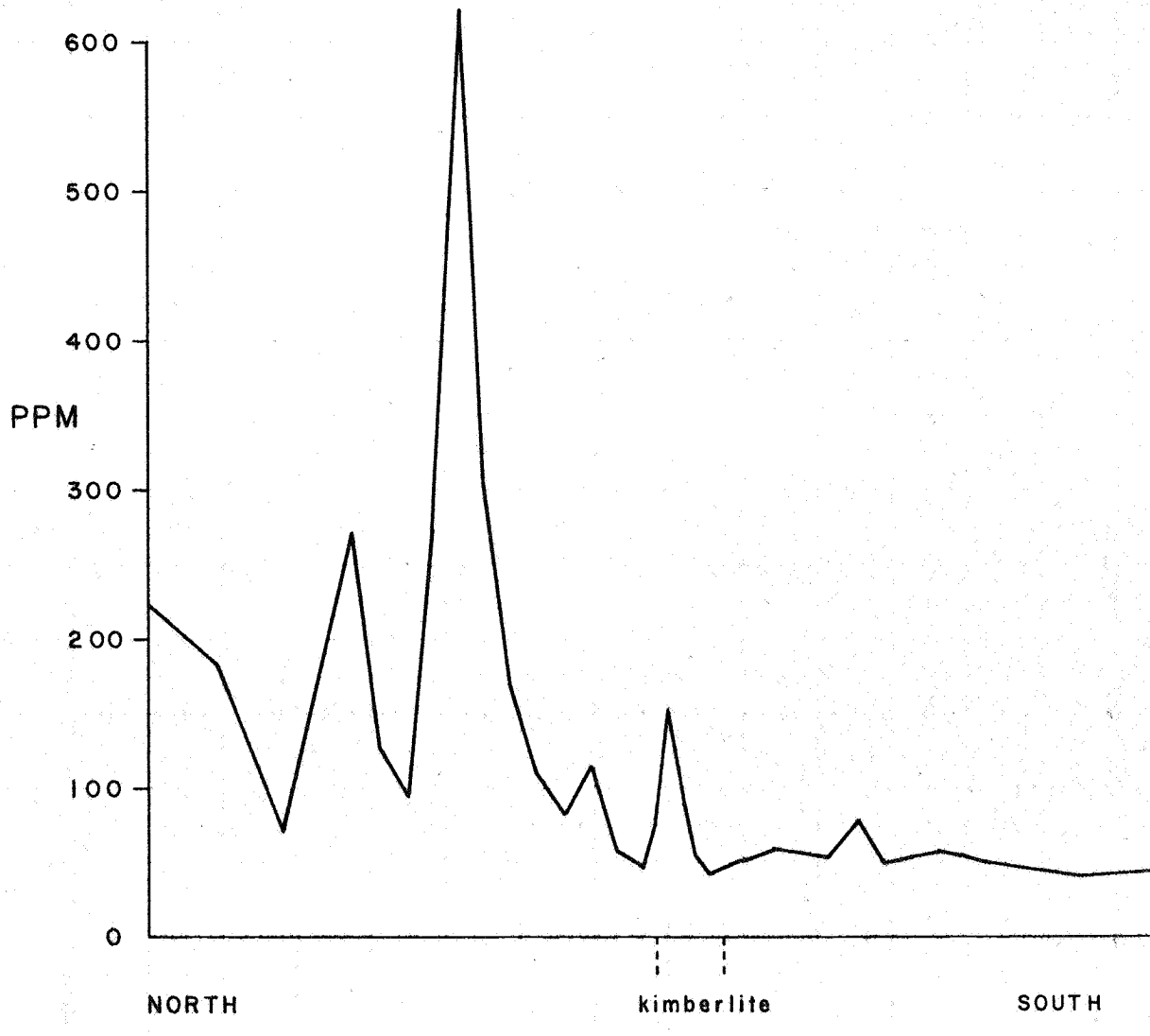
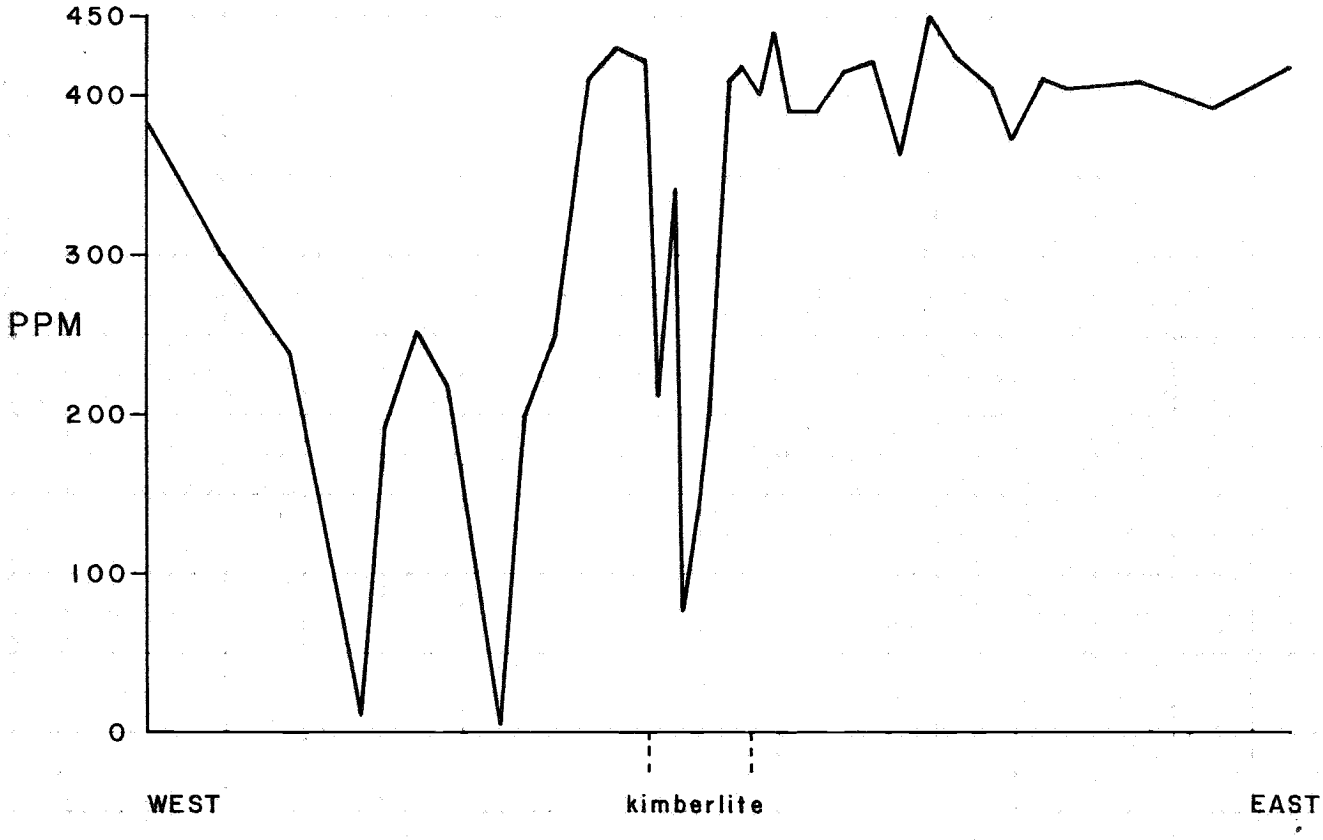


Fig 6

S.P.L.	
Compiled	PEB
Drawn	PEB
Date	DEC. '81
Scale	
Revised	
SEL 1350e	

SOIL PROFILE - BARIUM

085



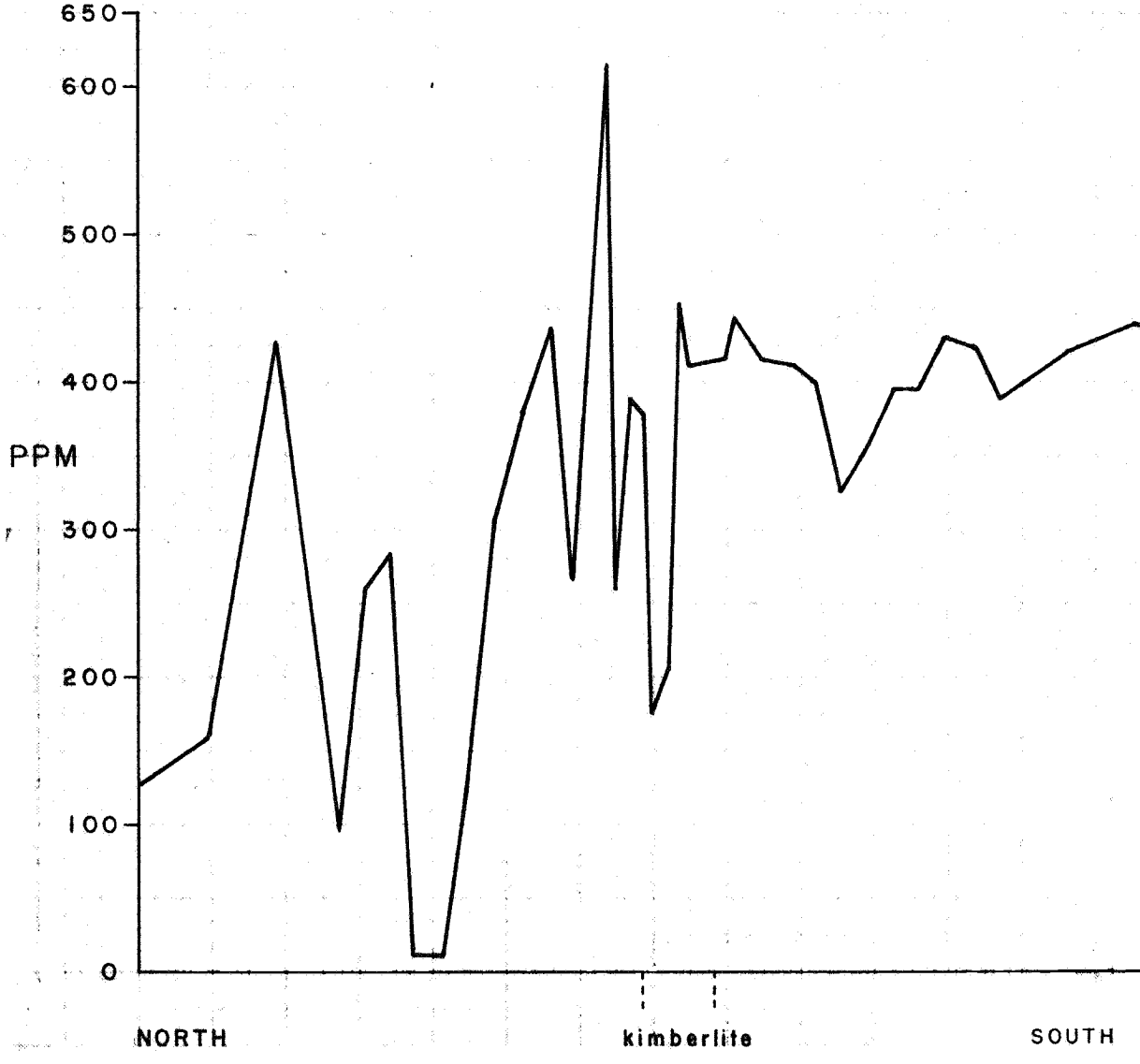


Fig 7

S.P.L.	
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Drawn	PEB
Date	DEC.'81
Scale	
Revised	
SEL 1350f	

086

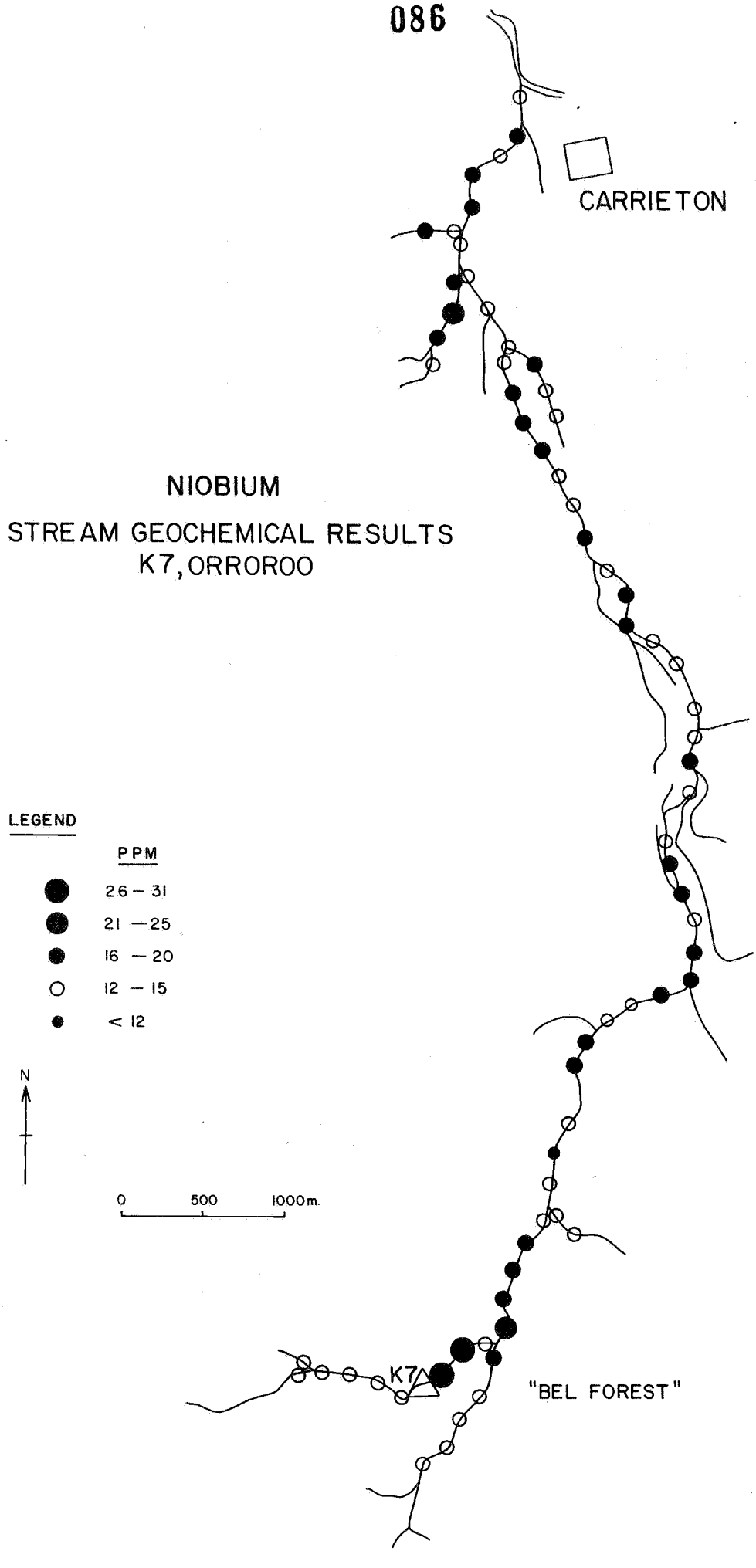
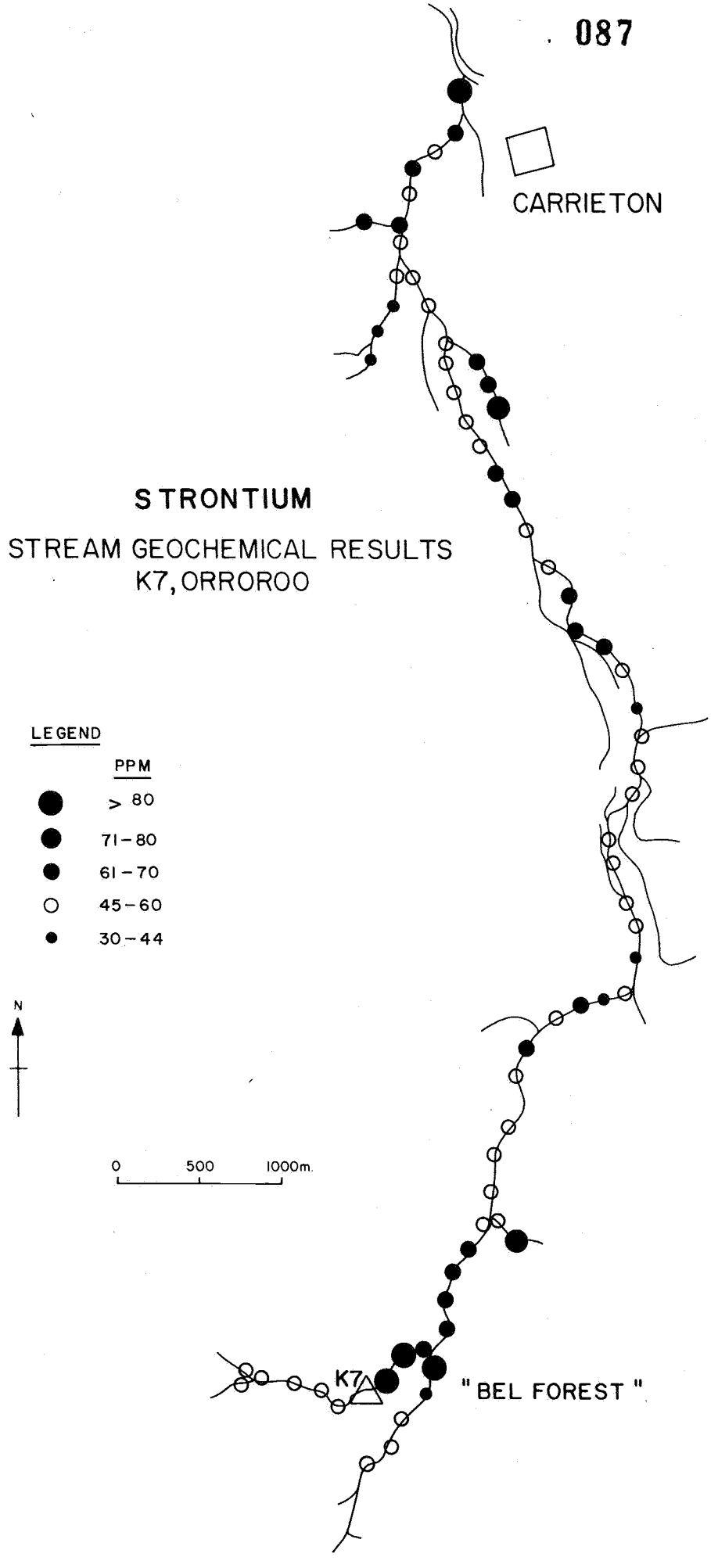


Fig 8

S.P.L.	
Compiled	PEB
Drawn	CJM
Date	DEC.'81
Scale	
Revised	
SEL 1351c	



STRONTIUM

STREAM GEOCHEMICAL RESULTS
K7, ORROROO

LEGEND

PPM	
●	> 80
●	71 – 80
●	61 – 70
○	45 – 60
•	30 – 44

N

0 500 1000m.

Fig 9

S.P.L.	
Compiled	PEB
Drawn	CJM
Date	DEC. '81
Scale	
Revised	
SEL	1351a

088

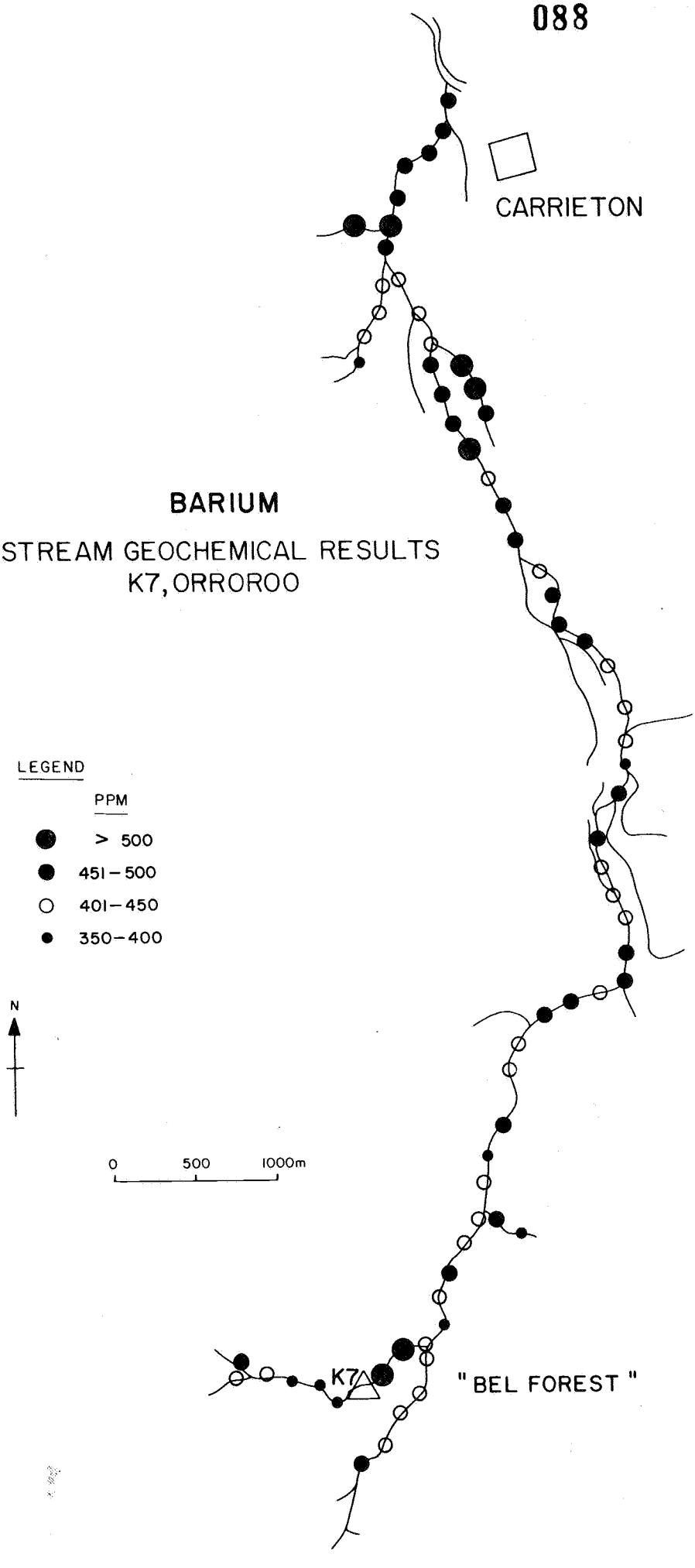


Fig 10

S.P.L.	
Compiled	PEB
Drawn	CJM
Date	DEC. '81
Scale	
Revised	
SEL 1351d	

089

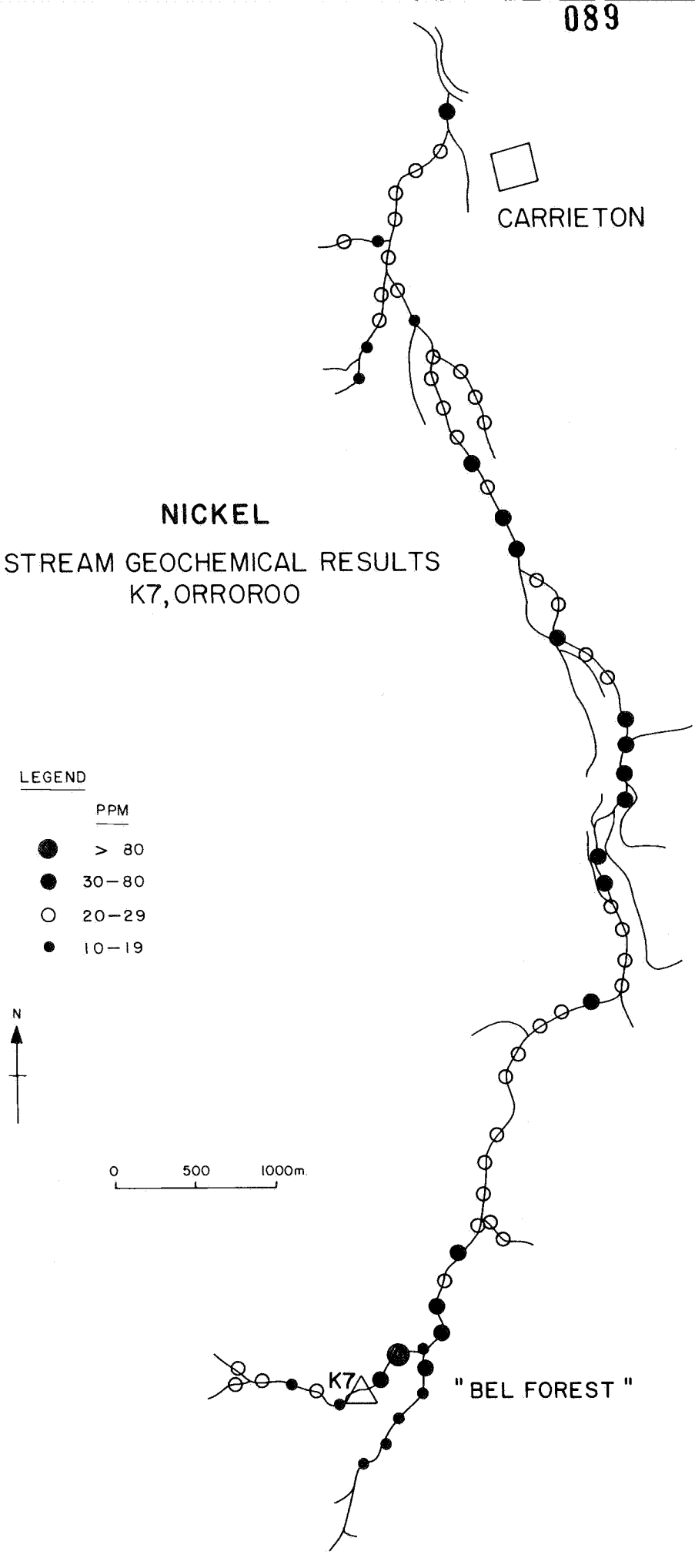


Fig 11

S.P.L.	
Compiled	PEB
Drawn	CJM
Date	DEC'81
Scale	
Revised	
SEL 1351 b	

GEOCHEMICAL SOIL PROFILE NORTH-SOUTH
K7 – ORRORO0 S.A.

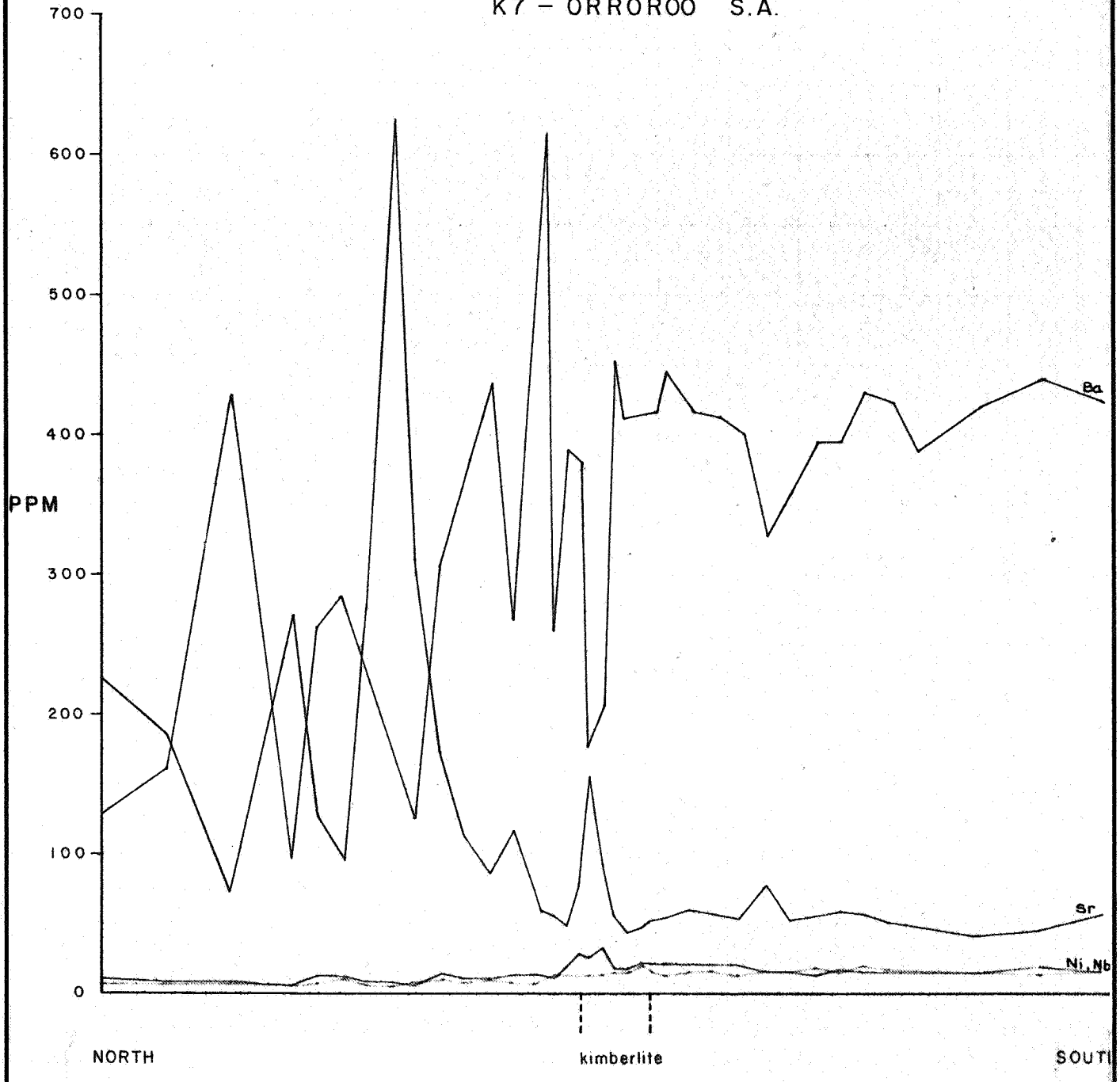


Fig 12

S.P.L.	
Compiled	PEB
Drawn	PEB
Date	DEC.'81
Scale	
Revised	
SEL 1350c	

GEOCHEMICAL SOIL PROFILE WEST - EAST
K7 — ORROROO S.A.

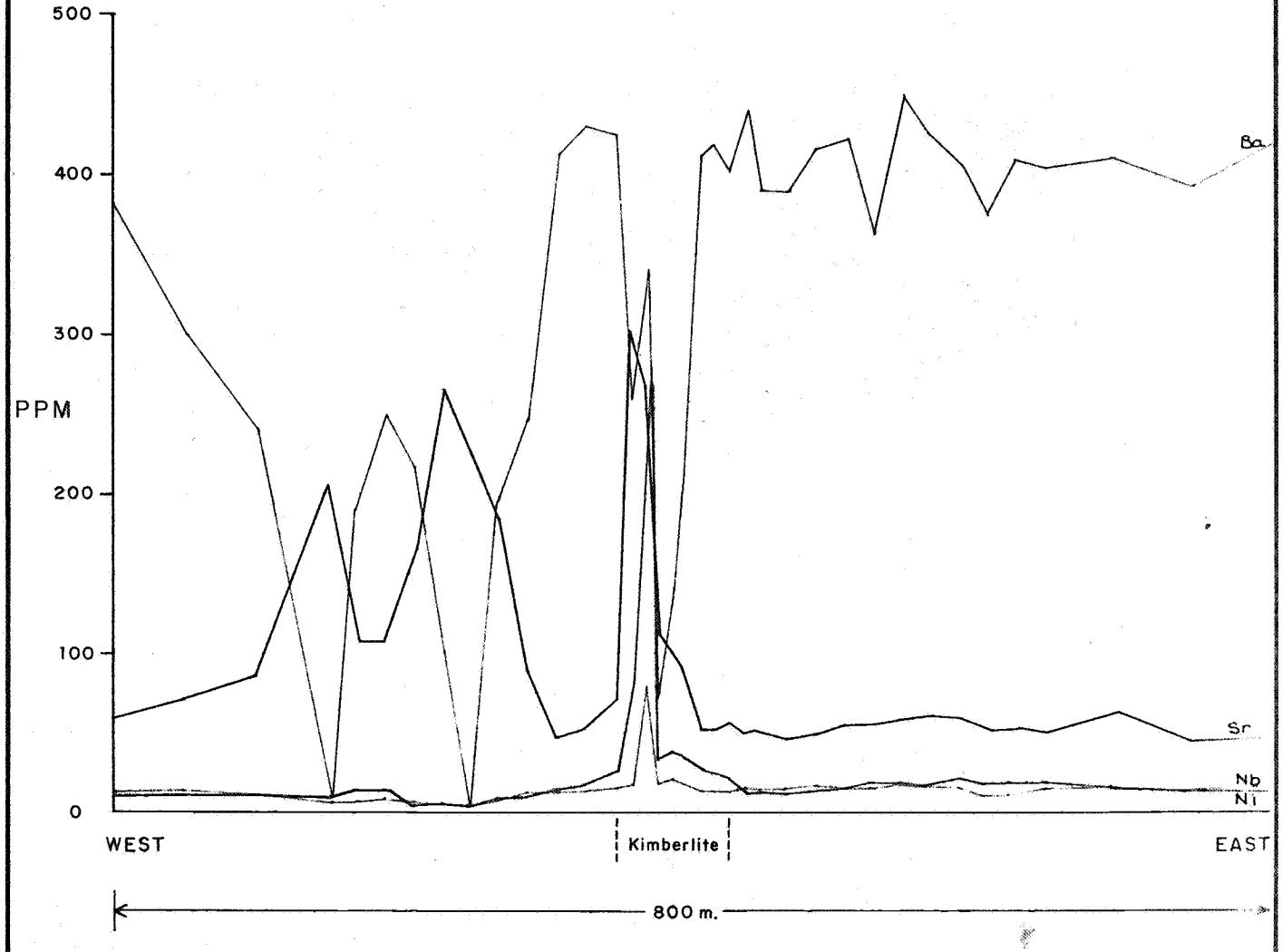


Fig 13

S.P.L.	
Compiled	PEB
Drawn	PEB
Date	DEC. '81
Scale	
Revised	
SEL	1350a

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE 853 : ORRORO0

THIRD QUARTERLY REPORT TO 19TH APRIL, 1982

CONTENTS

FIGURE

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE 853 : ORRORO0

THIRD QUARTERLY REPORT TO 19TH APRIL, 1982

1. INTRODUCTION

Exploration Licence 853, which covers an area of 180 square kilometres in the Eurelia area (Figure 1), was granted on July 20, 1981. The licence area covers those parts of Exploration Licences 486 (Carrieton West) and 652 (Orroroo), previously held by Stockdale Prospecting Limited, which were not relinquished in March, 1981.

This report covers work done within the licence area from 20th January, 1982 to the end of the Third Quarter on 19th April, 1982.

2. WORK DONE

2.1 Ground Geophysics

No further ground geophysical surveys were undertaken.

2.2 Drilling

No further drilling was undertaken.

2.3 Diamond Morphology and Inclusion Study

A total of 140 diamonds from the Orroroo kimberlites, in the size range 0.1 and 0.0001 carats, have been examined and details of their shape, colour, crystallography, surface textures and inclusion content have been recorded. The morphological data are currently being compared to diamond populations from other (African) sources and classified using similar criteria (See J.W. Harris et. al., Physics and Chemistry of the Earth, Volume 9; Editors Ahrens et. al., 1975, Pergamon Press).

Mineral inclusions were extracted from three of the Orroroo diamonds and analysed in the electron microprobe. One of these was shown to be a moderately iron rich enstatite fairly similar in composition to enstatites from other diamonds. The remaining two grains were found to be magnesio-wustite (MgO 76 wt. %; FeO 22 wt %). Prior to this discovery magnesio-wustite had only been recorded from one other locality and the primary origin of the mineral was considered doubtful. In the case of the Orroroo diamonds the inclusions are undoubtedly primary and, as such, constitute a significant discovery since they extend the geochemical possibilities for diamond genesis in the upper mantle. Work is continuing on these aspects.

3. EXPENDITURE

Expenditure of $6,340 for the period has been allocated as follows:

Management/Office Services	$ 380
Staff : Technical	485
Specialist Services :	
Consultant	5475
Total for this period	6340
Total previously reported	15641
Total expenditure to date	$21981

4. FUTURE PROGRAMME

The studies reported here will be continued during the next quarter.

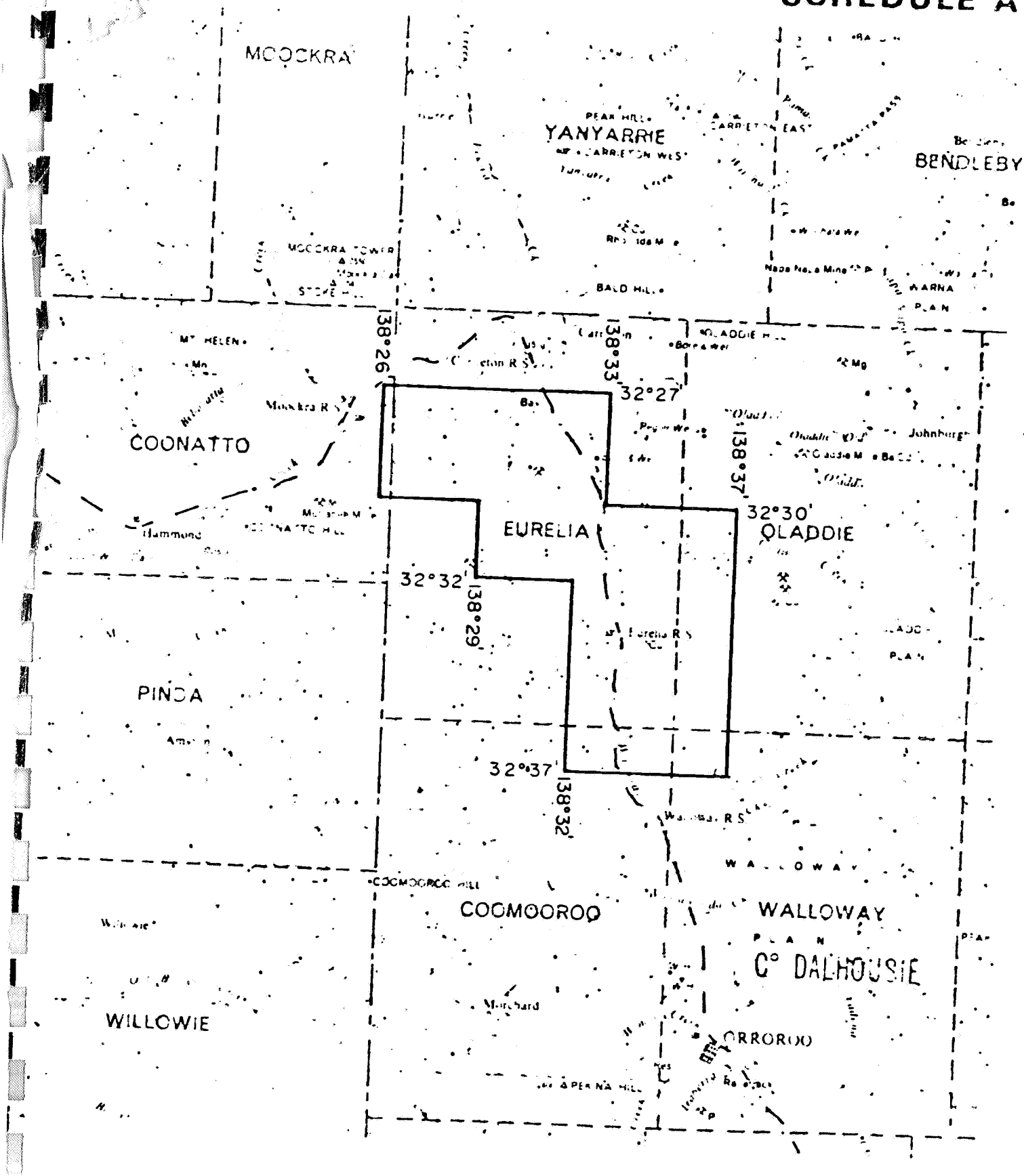
R.V. DANCHIN
Melbourne,
11th May, 1982

K.J. STRACKE
Exploration Manager

:bsrvd2

Distribution: SADME, IC.

SCHEDULE A



APPLICANT STOCKDALE PROSPECTING LIMITED

M 177/81 AREA 180 square kilometres

1 250000 PLANS ORRORDO

LOCALITY EURELIA AREA - Approx 20km N. of Orroroo

Env. 3891

0097

OPEN FILE

STOCKDALE
PROSPECTING
LIMITED
Incorporated in the State of Victoria

Registered Office
581 Little Collins Street
Melbourne Victoria 3000

60 Wilson Street
South Yarra Victoria 3141
Australia
Telephone (03) 241 7522
Telegraphic Address Stodal 30728
Telex Stodal AA39546

20th August, 1982

Director General,
Department of Mines and Energy,
P.O. Box 151,
EASTWOOD S.A. 5063

Dear Sir,

Herewith I enclose the fourth quarterly report on work carried out under Exploration Licence No. 853 to 19th July, 1982.

Please advise if you have any further requirements in this matter.

Yours faithfully,

Alan Cawsey.

A.L. CAWSEY,
Administrative Geologist

bs:dmsal

Enc.

STOCKDALE PROSPECTING LIMITED

EXPLORATION LICENCE 853 : ORRoROO

FOURTH QUARTERLY REPORT TO 19TH JULY, 1982

STOCKDALE PROSPECTING LIMITED
Incorporated in the State of Victoria

Registered Office
581 Little Collins Street
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60 Wilson Street
South Yarra Victoria 3141
Australia
Telephone (03) 241 7522
Telex Stodal AA39546

0099

Project Name: ORROROO

Title: FOURTH QUARTERLY REPORT TO 19TH JULY, 1982
EXPLORATION LICENCE 853 : ORROROO

Author/s: B.H. SCOTT, A.L. CAWSEY

Keywords: KIMBERLITE PETROLOGY, KIMBERLITE GEOCHEMISTRY

1 : 250,000 Sheet Name/s & No/s.:

ORROROO, SH 54-01

Text Pages No.: 3

Plan Nos.:

Table Nos.:

Appendices:

Date: JULY, 1982

Distribution: SADME, HRR, IC.

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0100

FIGURE

STOCKDALE PROSPECTING LIMITED

0101

EXPLORATION LICENCE 853 : ORRoroo

FOURTH QUARTERLY REPORT TO 19TH JULY, 1982

1. INTRODUCTION

Exploration Licence No. 853, which covers an area of 180 square kilometres in the Eurelia area (Figure 1), was granted on 20th July, 1981. The licence area covers those parts of Exploration Licences 486 (Carrieton West) and 652 (Orroroo), previously held by Stockdale Prospecting Limited, which were not relinquished in March, 1981.

This report covers work done within the licence area from 20th April, 1982 to the end of the Fourth Quarter on 19th July, 1982.

2. WORK DONE

2.1 Ground Geophysics

No further ground geophysical surveys were undertaken.

2.2 Drilling

No further drilling was undertaken.

2.3 Petrology/Chemistry

Diamond-drill core was obtained from one of the intrusions (K 7) in the Orroroo kimberlite province, during 1981 from a depth of about 60 metres.

All the samples previously examined have been taken from near surface and petrographic examinations have shown that these samples have been substantially altered with many of the primary features masked. The core sample therefore constitutes one of the more important samples recovered from this area. The fresh nature of this sample makes it particularly suitable for detailed groundmass mineral chemistry and whole-rock geochemistry studies.

Drill core was obtained from 60.0 to 61.35 metres from a vertical hole drilled into a small blow on the K7 intrusion. A detailed petrographic examination was undertaken on the core. Polished slabs of the core show that the rock has an extremely inequigranular texture with olivine macrocrysts

reaching 2 cm in size. Numerous secondary cross-cutting veins are also present.

Microscopically the rock can be seen to be composed of two generations of olivine and its pseudomorphs which are characteristic of kimberlites set in a finer grained groundmass. The groundmass is composed of phlogopite, primary carbonate, perovskite, opaque spinels, serpentine, apatite and clinopyroxene (in decreasing order of abundance). The phlogopite is rimmed by tetraferriphlogopite. The alteration of the kimberlite varies within the core and it is manifested particularly in the olivine pseudomorphs. In parts olivine is replaced by the typical serpentine and some clay minerals while in other parts it is replaced by a mixture of serpentine and fine black material which is considered to be graphite (after Pasteris, 1981).

It can be concluded that this core sample from K7 in the Orroroo Province is a hypabyssal, calcite, phlogopite kimberlite. The results of this investigation show that the interpretation of the near surface altered samples of Orroroo kimberlites was correct and therefore that most of the examined Orroroo kimberlites are petrographically very similar.

A detailed study of the kimberlite matrix mineral chemistry and whole-rock geochemistry is almost complete and shows that the geochemistry of the K7 occurrence is absolutely characteristic of kimberlites. The data obtained during this study is being compiled in the form of a paper which will be presented at the Third International Kimberlite Conference in France in September, 1982, and will be included in the Proceedings Volume. A copy of this paper will be forwarded as soon as it is in final format.

REFERENCE Pasteris, J.D. 1981; Occurrence of graphite in serpentinised olivines in kimberlite. Geology 9, 356 - 359.

3. EXPENDITURE

Expenditure of $ 5,769 for the period has been allocated as follows:

Management/Office Services	$ 228
Staff : Technical	$ 291
Specialist Services :	
Consultant	$ 5,250
Total for the period	$ 5,769
Total previously reported	$21,981
Total expenditure to date	$27,750

4. FUTURE PROGRAMME

The paper on the Orroroo kimberlite province being prepared for presentation at the Third International Kimberlite Conference will be completed and forwarded as an addendum to this report.

Although additional kimberlitic bodies could be discovered by further exploration of this licence area it is considered that they would be small, thin dykes with no economic diamond potential.

Renewal of the licence will not be sought.

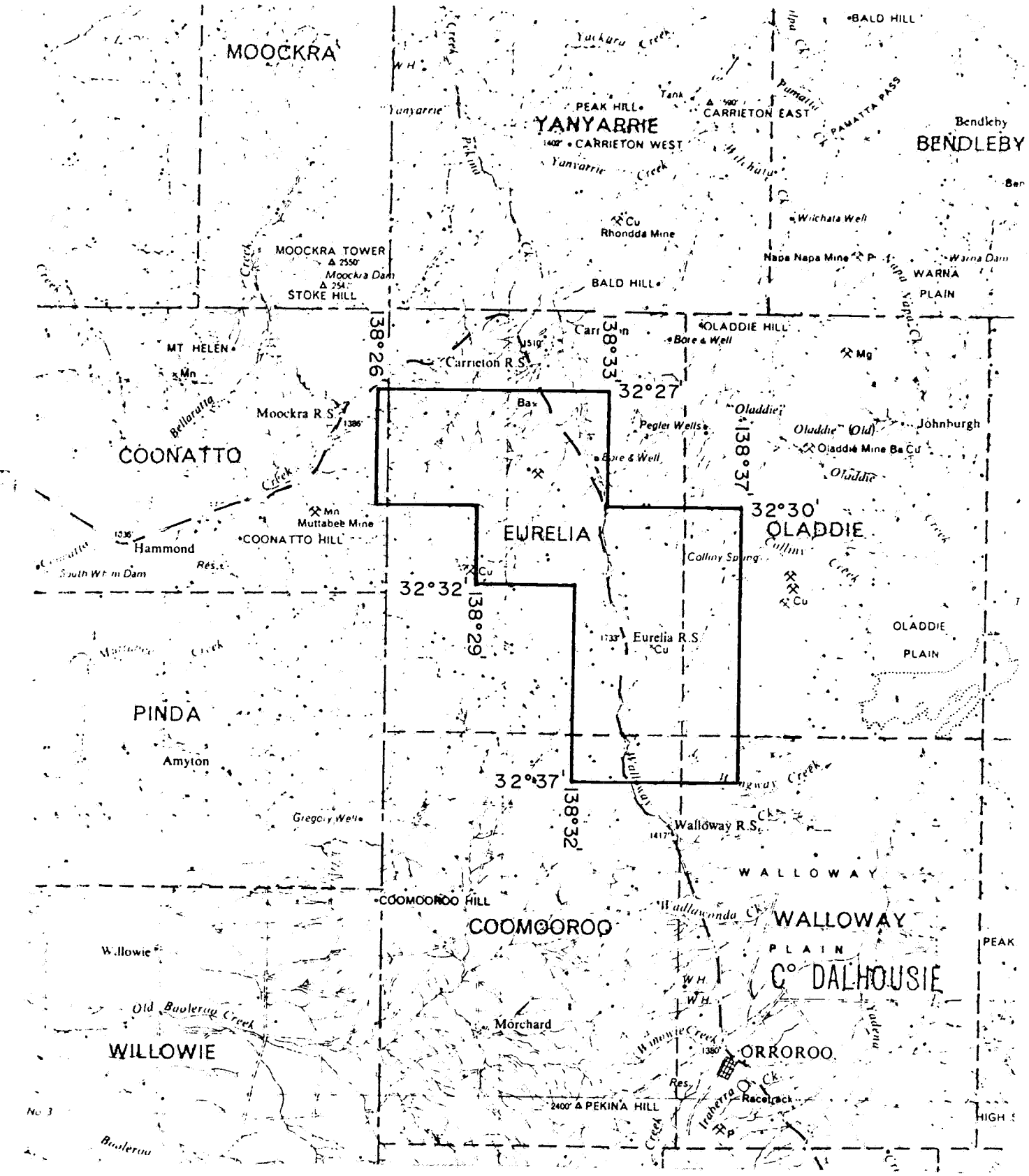
A.L. CAWSEY,
B.H. SCOTT,
Melbourne

K.J. STRACKE
Exploration Manager

July, 1982

bs:BHS1

MAP 1 0104 **SCHEDULE A**



SCALE 1:250,000

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

APPLICANT: STOCKDALE PROSPECTING LIMITED

DM: 177/81 AREA: 180 square kilometres

1:250000 PLANS: ORRORROO

LOCALITY: EURELIA AREA - Approx 20km N. of Orroroo

DATE GRANTED: DATE EXPIRED: EL No: 853

KIMBERLITES NEAR ORROROO, SOUTH AUSTRALIA

B.H. Scott Smith*, R.V. Danchin+, J.W. Harris°

and K.J. Stracke+

Copy of final draft of paper submitted for publication in the Proceedings of the Third International Kimberlite Conference, Clairmont Ferrand, France, September, 1982

Report No SSP-82-6

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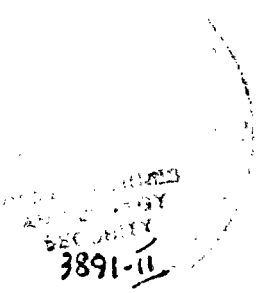
Vancouver, B.C., Canada, V6E J357

+ Stockdale Prospecting Limited, 60 Wilson Street,
South Yarra, 3141, Victoria, Australia

° Department of Applied Geology, James Weir Building,
University of Strathclyde, 75 Montrose Street, Glasgow
G1 1XJ, Scotland

31st August, 1982



STOCKDALE
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South Yarra Victoria 3141
Australia
Telephone (03) 241 7522
Telegraphic Address Stolex 30728
Telex Stodal AA39546

Project Name: ORRORO0 - EXPLORATION LICENCE 853, (OVER PARTS OF ELS 652, 486, 393)

Title: KIMBERLITES NEAR ORRORO0, SOUTH AUSTRALIA

Author/s: B.H. SCOTT-SMITH, R.V. DANCHIN, J.W. HARRIS, K.J. STRACKE

Keywords: KIMBERLITE, DIAMOND, INDICATOR MINERALS

1 : 250,000 Sheet Name/s & No/s.: ORRORO0 SI 54- 1

Text Pages No.: 26

Plan Nos.: 10

Table Nos.: 15

Appendices: -

Plate Nos: 5

Date: 31st August, 1982

Distribution:

KIMBERLITES NEAR ORROROO, SOUTH AUSTRALIA

B.H.Scott Smith*, R.V. Danchin+, J.W. Harris°

and K.J. Stracke+

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Vancouver, B.C., Canada V6E J357

\+ Stockdale Prospecting Limited, 60 Wilson Street,
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° Department of Applied Geology, James Weir Building
University of Strathclyde, 75 Montrose Street, Glasgow,
G1 1XJ, Scotland

ABSTRACT

A suite of Jurassic kimberlite dykes occur near Orroroo, South Australia. They range in thickness from a few millimetres to 30 metres. The intrusions are all extensively altered at surface but a few of them are petrographically similar and have been identified as altered phlogopite-bearing kimberlites. Fresh core from one of the dykes at 60 metres depth has been classified as a hypabyssal, calcite, phlogopite kimberlite. Mineral chemistry of olivine and groundmass phlogopite with tetraferriphlogopite rims, serpentine, perovskite, spinel and clinopyroxene are characteristic of kimberlites. Whole-rock geochemistry of this dyke is also typical of equivalent mineralogical varieties of kimberlite, particularly those found in the type area, near Kimberley, South Africa.

Ultramafic xenoliths appear to be very rare and only a few small fragments composed of garnet, spinel, clinopyroxene and possibly orthopyroxene were found in one concentrate. Garnet, ilmenite, diopside and spinel macrocrysts were also recovered from concentrates and their chemistry is discussed.

Diamonds recovered from the kimberlites are classified according to shape and colour. Enstatite and magnesio-wustite occur as inclusions in the diamonds. The confirmation here for the first time of magnesio-wustite as a syngenetic inclusion in diamond places important constraints on the depth of origin of these diamonds and suggests that at least some diamond originates at great depth in the mantle.

The kimberlite dykes can be divided into three main geographic groups each falling on a different, but sub-parallel, strike line. Variations in the abundances and chemistry of heavy minerals and in diamond content correlate with this grouping. Together with the observed petrographic features, these variations suggest that the dykes were intruded as three quite separate pulses.

INTRODUCTION

Numerous kimberlites occur in the area north of Orroroo, South Australia and this paper describes the exploration sampling, geology, petrography, mineralogy and geochemistry of these kimberlites.

The kimberlites occur in an area in the vicinity of Eurelia (138°33'E/32°37'S) approximately 20 km NNW of Orroroo in South Australia. The location of the intrusions is given in Figure 1.

Ferguson et al. (1979) referred to the presence of kimberlitic dykes west of Eurelia, but this paper is the first detailed study of these kimberlites.

EXPLORATION SAMPLING

During a heavy mineral sampling programme in 1968 kimberlitic indicator minerals were recovered from three stream samples in the area north of Orroroo. Later that year the occurrence of kimberlitic indicator minerals was confirmed and additional positive sample sites found. Subsequent sampling centred around Eurelia was encouraging but no further work was done until Stockdale Prospecting Limited secured the exploration rights in 1978. Further detailed sampling disclosed the occurrence of a kimberlitic dyke swarm (as shown in Figure 1).

From subsequent detailed sampling it could be inferred that the kimberlites could be subdivided into three main groups on probable heavy mineral content as follows:

Group 1 - K1, K2, K3, K8, K9 with abundant garnet and rare ilmenite.
Group 2 - K5 and K6 with abundant ilmenite and rare garnet.
Group 3 - K4, K7, K12, K13 with mixed garnet and ilmenite.

The K10 and K11 bodies are both kimberlite occurrences which were inferred from heavy mineral sampling but not actually located or

sampled and will therefore not be included in any of the following discussions. K10 appears to contain mixed garnet and ilmenite as indicator minerals.

GEOLOGY

The Orroroo kimberlites intrude Adelaidean System sediments of the River Wakefield and Belair Sub-Groups of the Burra and Umberatana Groups, two of the lowermost groups of the Adelaidean. The sediments, which include siltstones, quartzites and dolomites, have been folded into broad open synclines and laterally compressed and faulted anticlines (Binks 1968). The kimberlite dyke swarm is situated in the "elbow" of the prominent trend curve in the Adelaidean from N to NE and the dyke swarm trend more or less follows the bisectrix of this elbow. Diapir breccias with carbonate matrices occur at Carrieton, Oladdie and west of Walloway. Basins of younger sedimentation include the Oladdie-Walloway basin which is reported to contain Tertiary coal seams.

The structural setting of kimberlitic rocks in southeastern Australia has been discussed on a regional scale by Stracke et al. (1979).

FIELD RELATIONS

Although numerous kimberlite intrusions have been located, field evidence suggests that more dykes are probably present. Exposed and inferred kimberlite intrusions are shown in Figure 1.

Each dyke displays a fairly constant width over the stretches examined but they peter out rapidly toward their extremities. The widest dyke measures about 1.5 metres but most are approximately 1 metre, although apophyses of only a few millimetres also occur. In one instance, on K7, a fissure enlargement to 30m (0.2 hectares) was encountered. Most of the dykes appear to be several hundred metres long, and one can be followed for approximately 1 km. From the geographic distribution and field relations it would seem that they probably occur in an en

echelon style of intrusion. Although many of the numbered kimberlite occurrences (Figure 1) comprise a single dyke it appears from the inferred occurrences (e.g. K2) that some may in fact comprise several sub-parallel dykes concentrated in a narrow zone.

From the strike and geographic distribution of the dykes illustrated in Figure 1 it appears that they can be divided into three groups:

Group 1 - K1, K2, K3, K8, K9
Group 2 - K5, K6
Group 3 - K4, K7, K12, K13

The individual occurrences of Groups 1 and 3 fall on different but sub parallel strike lines. Group 2 (K5 and K6) are geographically separate. K6 has a different strike direction from the other dykes in this swarm. This grouping is consistent with that suggested by the differences in garnet and ilmenite content inferred from the exploration data.

AGE

Two Pb/U age determinations for zircons from kimberlites K3 and K5 both give an age of 170 my (L.T. Black pers. comm.; R.T. Pidgeon pers. comm.). This shows that at least the Group 1 and Group 2 dykes are of a similar age. It is interesting to note that the age of some other kimberlitic intrusives which occur in the same area are 172 my (Stracke et al., 1979).

PETROGRAPHY

At surface the kimberlites are heavily altered which unfortunately precludes a complete petrographic analysis of this kimberlite province. Extremely fresh material was only obtained from a depth of 60.0 to 61.4 metres from a single vertical borehole drilled into the fissure enlargement of the K7 intrusion.

The core displays a well developed inequigranular texture comprising numerous anhedral olivine macrocrysts up to 1.5 cm in size set in a finer grained matrix. A few xenoliths of sedimentary material (presumably locally derived country rock) are included in the kimberlite. These xenoliths usually have a distinctive concentrically zoned appearance which results from alteration caused by the relatively hot kimberlite magma. Microscopically the dyke has two generations of olivine comprising numerous anhedral macrocrysts (Plate 1) and small (<1 mm) euhedral phenocrysts (Plate 2) which are diagnostic of kimberlite (Clement et al. 1977). Smaller grains which are totally altered but have the euhedral shapes typical of olivine also occur. It is possible that these grains are groundmass monticellite pseudomorphs. If so they are coarser grained than those typically found in kimberlites and the association with groundmass clinopyroxene, albeit in accessory amounts, would be unusual. It therefore seems more likely that they represent olivine pseudomorphs.

A conspicuous feature of the core is the variation in alteration of the olivine. The olivines, particularly the smaller grains, are often partially or totally altered to pale green serpentine. More extensive serpentinisation of olivine occurs within alteration haloes around sedimentary xenoliths and this alteration is considered to result from the exhalation of water from the xenoliths after incorporation into the kimberlitic magma. The serpentine pseudomorphing the olivine is sometimes also replaced by brown, fine-grained clay minerals, probably as a result of secondary weathering.

In some parts of the core the alteration is rather different in character. In these areas the olivine pseudomorphs show a full range of alteration, and vary from those composed of pale green serpentine through to those which are totally opaque (Plate 3). In this latter variety variable amounts of extremely fine-grained opaque material occur within the olivine pseudomorph. This material appears to be similar to that described by Pasteris (1981) who concluded that it was graphite. At Orroroo none of the reflected light properties of graphite were observed but Pasteris (1981) notes that only careful multi-stage polishing prevents stripping off all the small graphite flakes. The opaque material at Orroroo is certainly not magnetite. Unfortunately no reason for the distribution of the different types of alteration, which are conspicuous in hand specimen, could be ascertained from the available samples.

The groundmass is relatively coarse-grained and is uniform within the core. The constituent minerals are phlogopite, carbonate, serpentine, perovskite, spinel, apatite and clinopyroxene. A modal analysis is given in Table 1.

The phlogopite occurs as lath-like crystals (up to 1 mm in length) which are pleochroic from pale brown to colourless (Plate 4). Numerous small crystals also occur (Plate 5). In certain areas the phlogopite may have a rim which has reverse pleochroism from colourless to a deeper, brighter orange-brown colour than the core (Plate 5). In most instances this rim has a very sharp contact with the core which usually also has an euhedral shape. This suggests that the rim is an overgrowth rather than a reaction rim. The optics and mode of occurrence of the rim suggest that it is a mineral which has been referred to as tetraferriphlogopite (Rimskaya-Korsokova and Sokolova 1976). The phlogopite may enclose other groundmass minerals.

Perovskite occurs throughout the groundmass as subhedral mottled-brown crystals which are generally less than 0.05 mm in size (Plates 4 and 5). Opaque oxide minerals which have a similar grain size to the perovskite also occur but are less abundant. Some spinels have an

atoll-type structure and the occasional crystal has a core of translucent, brown spinel which is probably chromite. Apatite and clinopyroxene are minor constituents of the rock but are consistently present. Apatite occurs as slender lath-like crystals while clinopyroxene occurs as subhedral stubby laths or as microlites.

Late crystallising minerals are carbonate and serpentine. The carbonate is a major constituent of the rock (Table 1). It occurs as clear (up to 0.75 mm) euhedral, interlocking crystals which are interstitial to, and sometimes enclosing, the other groundmass minerals. The mode of occurrence of the carbonate suggests that it is a primary groundmass mineral. Pale green, cryptocrystalline serpentine also occurs as irregular interstitial patches.

A few areas composed of carbonate, phlogopite and clinopyroxene with totally different textures probably represent kimberlitised xenoliths. In these instances the effect of the hot kimberlite magma has altered the xenolith beyond recognition and much of the xenolith has been replaced by minerals which have crystallised from a modified kimberlitic magma. This phenomenon is similar to that described by Scott Smith et al. (in press).

It can be concluded from the petrographic examination of the drill core that the K7 intrusion is a kimberlite (after Clement et al. 1977). The dyke is classified as a hypabyssal, calcite, phlogopite kimberlite (after Skinner and Clement 1979, Clement and Skinner 1979).

In contrast to the fresh core material, the main mineral constituents of surface samples of many of the Orroroo kimberlites are typically clay minerals, dolomite, serpentine and chlorite. The alteration of these kimberlites can be attributed to the following processes:

i) Weathering to clay minerals which simple x-ray diffraction determinations suggest belong to the smectite group.
ii) carbonatisation resulting in the replacement of primary minerals by fine-grained dolomite.

iii) alteration of groundmass phlogopite to chlorite.

iv) intrusion by often abundant secondary, cross cutting veins which are mostly composed of carbonate.

In spite of the extensive alteration, the macroscopic inequigranular texture characteristic of kimberlites is frequently evident in the weathered material, and the two generations of olivine diagnostic of kimberlites can often be discerned in thin section. Primary groundmass constituents including phlogopite, spinel, fresh or probable altered perovskite, serpentine, calcite and apatite are sometimes present. It is interesting to note that sugary fine-grained dolomite can sometimes be seen to replace relatively coarse-grained primary calcite as well as other primary groundmass constituents. Alteration is, however, unfortunately too extensive to allow definitive classification of these rocks. It is probable, however, that samples from K2 and K4 are similar in mineralogy and texture to the K7 core. The implication of this is that the host kimberlites in the Group 1 and 3 intrusions are extremely similar. The habit of the phlogopite may be different in the Group 2 dykes. The phlogopite in K6 appears to occur as equant plates rather than lath-like crystals. Also evident in thin section is a variation in indicator mineral content with garnet macrocrysts observed in K2 of Group 1 contrasting with abundant ilmenite observed in K5 and K6 of Group 2.

KIMBERLITE MATRIX MINERAL CHEMISTRY

This section of the paper discusses the mineral chemistry of the constituent minerals of the kimberlite (sensu stricto). Most analyses are from sample K7900A, the freshest part of the drill core. Some data were also obtained for sample K7900B where many of the olivines have been pseudomorphed by serpentine and possible graphite. Sample K7900 forms the 60.45 to 60.6 metre section of the core from the K7 body.

All analyses were obtained using polished thin sections and the ARL SEMQ electron microprobe at the Anglo American Research Laboratories

in Johannesburg. Count rates for fluorine are inherently low so the detection limit for F is ±0.2 wt % and the error on any determination is 0.47 wt % at the 95% confidence level. For minerals which are unstable under the electron beam a defocussed beam was used for the analyses (excitation area - ±30 micron). Selected mineral analyses are given in Tables 2 to 6.

Olivine: Serpentinisation of olivine makes some analyses difficult, particularly of the smaller grains and crystal edges. Most analyses of rims were obtained within 50 micron of the edge unless otherwise stated. The compositions of the olivines are illustrated in Figure 2, while selected analyses are given in Table 2.

Analysed anhedral macrocrysts ranged in size from 1 to 6.5 mm and the total range of Mg/(Mg + Fe) ratios fall between 0.893 and 0.922. Three phenocrysts have compositions similar to the macrocrysts while one with Mg/(Mg+Fe) of 0.894/0.893 (centre/edge) is more iron-rich. This total range in compositions is typical of kimberlitic olivines (e.g. Boyd and Clement 1977).

Some zoning was detected in most of the analysed grains. Figure 3 illustrates chemical variation within one macrocryst and one phenocryst, and the analyses are given in Table 2. It can be seen that the zoning is confined to the outer 150 micron of the crystal and similar zoning in the very outer margins (less than 150 micron) has previously been noted in kimberlitic olivines by Boyd and Clement (1977). It can be seen from Figure 2 that the compositions of most crystal edges are close to Mg/(Mg+Fe) = 0.910. Those higher than 0.920 represent analyses from ±150 rather than ±20 micron from the edge (Figure 3). All analysed phenocrysts are normally zoned while both normal and reverse zoning occurs at the margins of the macrocrysts. NiO contents vary between 0.28 and 0.40 wt %. This variation does not appear to have any relationship to MgO or crystal size.

Olivine pseudomorphs: As discussed in the petrography section the olivine pseudomorphs are composed of different alteration products and

representative compositions are given in Table 3. The olivine in sample K7900A has been replaced by serpentines with high FeO contents and similar Fe-rich serpentines pseudomorphing olivine in kimberlites have been noted by Mitchell (1978). Further weathering of the serpentine appears to produce Mg-Fe clay which, from its composition, appears probabaly to be a saponite- type clay mineral.

The olivines in sample K7900B have similarly been replaced by Fe-rich serpentine (81-911, 82-54, Table 3). Areas which incorporate high concentrations of the fine, black material making the pseudomorph opaque have a similar composition (analyses 81-909, 82-54, 82-55, Table 3) to the areas of clear serpentine. The implications of these results support the possibility that the black material may be graphite (after Pasteris 1981) and certainly show that this material is not magnetite.

Phlogopite: Analyses of the centres and edges of the normally pleochroic cores of phlogopite grains are given in Table 4. In parts these phlogopites are mantled by tetraferriphlogopite (Plate 5) and analyses of such mantles are also given in Table 4. An analysis of an edge of a phlogopite core would be taken from just inside the mantle.

The normally pleochroic cores are compositionally zoned with decreasing TiO_2, BaO and to a lesser extent Al_2O_3 contents and increasing Mg/(Mg+Fe) atomic ratios toward the edge. These cores contain no Cr_2O_3 and very low concentrations of Na_2O. They do however, contain high contents of BaO (up to 3.85 wt %) which decrease towards the margins. BaO is not often included in microprobe analyses but Mitchell (1981) noted BaO contents in phlogopites from the Western Australian lamproites where the concentrations were rather lower than those presently under discussion. In addition the Orroroo phlogopites also contain significant amounts of fluorine. The K_2O contents are sometimes lower than expected, and in our experience this reflects slight alteration and loss of potassium during analysis despite the use of a defocussed beam.

The compositions of the phlogopites are plotted in Figures 4 and 5 in terms of TiO_2 versus Mg/(Mg+Fe) and Al_2O_3 values respectively. From both figures the compositional zoning is evident. Figure 4 also shows that these phlogopites are similar in composition to phlogopites from most other kimberlites in terms of TiO_2 contents and Mg/(Mg+Fe) atomic ratios. Figure 5, however, shows that the Orroroo phlogopites are somewhat more aluminium-rich than phlogopites analysed from other kimberlites with similar TiO_2 contents.

The reversely pleochroic mantles have very different compositions from their cores (Table 4 and Figure 4) and mica with this composition has previously been referred to as tetraferriphlogopite (Rimskaya-Korsokova and Sokolova, 1976). Compared with the cores, the mantles have high FeO, and extremely low Al_2O_3 and no TiO_2, and these features are diagnostic of tetraferriphlogopite. In addition the Orroroo phlogopite mantles contain higher MnO, lower F and no BaO relative to the core. Mantles of a similar composition have been found in other kimberlites (Emeleus and Andrews 1975, Scott 1981).

The sharp change in optics and composition over the core to mantle boundary of the phlogopites would suggest an hiatus in the crystallisation of the phlogopite during which the composition or some other condition within the magma must have changed substantially before the final crystallisation from a now Al-depleted residual liquid.

Carbonate: Five analyses of the carbonate showed that it is in fact calcite with no detectable FeO or MgO. Strontium was sought in one instance and 0.55 wt % SrO was detected. The presence of SrO further supports the textural evidence which indicates that the calcite is a primary groundmass mineral.

Perovskite: Representative analyses of groundmass perovskite are given in Table 4. They all have fairly uniform compositions and the low totals are presumed to be due to the presence of rare earth elements (Boctor and Boyd 1979). The compositions in general, and specifically

the FeO contents, are similar to perovskites from other kimberlites (e.g. Mitchell 1972).

Spinel: Opaque oxide minerals are another important groundmass mineral at Orroroo and selected analyses are given in Table 5. The spinels have a wide range of compositions including rare translucent aluminous grains, a few ragged looking magnetites, and more common euhedral to subhedral Ti-Mg chromites. These compositions are similar to those found in other kimberlites (e.g. Shee 1979).

Serpentine: Analyses of groundmass serpentine are given in Table 5. The composition of the groundmass serpentine differs from that pseudomorphing olivine notably in AlO_3 content. The higher Mg/(Mg+Fe) atomic ratios of the serpentine of the olivine pseudomorphs may be related to the original olivine composition. The high FeO content of groundmass serpentine is common in kimberlites (e.g. Mitchell 1978, Scott 1981). The high Al_2O_3 contents are, however, unusual. These may result from substitution of Al into the serpentine lattice which is not regarded as a common phenomenon, or alternatively the cryptocrystalline groundmass serpentine might actually represent a mixture of two or more minerals.

Apatite: Two analyses of groundmass apatites are given in Table 4. The relatively high SiO_2 contents probably indicate that the grains are too small for accurate analysis. The notable features of the apatite are the high F ($\pm$3 wt %) and SrO_2 ($\pm$0.6 wt %) contents.

Clinopyroxene: Representative analyses of the accessory groundmass clinopyroxenes are given in Table 6. The compositions of the clinopyroxenes are fairly uniform and are illustrated in terms of a Ca-Mg-Fe atomic proportion plot in Figure 6 from which it can be seen that the compositions of the clinopyroxenes are generally similar to those from other kimberlites although a few more magnesian varieties are present. Crystals of clinopyroxene which occur in the halo around an altered xenolith (e.g. analysis 82-33, Table 6) are different in composition in that they have higher Al_2O_3 contents. The processes

producing this difference in composition have been interpreted by Scott Smith et al. (in press) as resulting from the interaction between xenoliths and the hot kimberlitic magma. The reaction between the xenolith and the magma firstly causes the alteration of the xenolith, often beyond recognition, and this in turn modifies the composition of the magma in the vicinity of the xenolith. Hence minerals crystallising in this area have different compositions from those found in the rest of the groundmass which presumably crystallised from unmodified magma. The differences in compositions of the clinopyroxenes show that the final liquid was enriched in alumina by reaction with xenoliths. This Al-enrichment may explain the unusually high Al_2O_3 contents of the late-stage, groundmass serpentine. The Al-enrichment of the late-stage residual fluids in this instance must post-date the crystallisation of the Al-depleted tetraferriphlogopite. These features illustrate the complex nature of the crystallisation history of kimberlites.

HEAVY MINERAL CONCENTRATES AND MINERAL CHEMISTRY

This section discusses the abundance of the indicator minerals, in particular garnet and ilmenite, and to a lesser extent chrome diopside and chrome spinel, which are found in the different kimberlites within the Orroroo Province. The geochemistry of these minerals is then discussed. As observed in hand specimen and thin section, most of these minerals are probably macrocrysts (after Clement et al. 1977) but a few crushed megacrysts or discrete nodules (greater than 1 cm as described by Nixon and Boyd 1973) could also be included, although none were observed in the kimberlite.

The indicator minerals recovered during prospecting (see Exploration Sampling) strongly suggested that the three sub-groups of kimberlites within the Orroroo Province have different indicator mineral contents. Examination of heavy mineral concentrates produced by bromoforming crushed kimberlite rock samples confirmed this as shown below:

i) Group 1 - contains rare ilmenite, abundant garnet, abundant

chromite and some chrome diopside.

ii) Group 2 - contains abundant ilmenite, minor garnet, rare chromite and some chrome diopside.

iii) Group 3 - contains abundant garnet and ilmenite and no chrome diopside or chromite.

Several hundred selected grains from each of these concentrates were analysed using the ARL SEMQ electron microprobe at the Anglo American Research Laboratories in Johannesburg and the results are summarised in Tables 7, 8, 9 and 10.

Garnet: Over one hundred grains have been analysed from each of the kimberlite bodies K1, K2, K3, K4, K7, K9, K12 and K13 (Groups 1 and 3). Selected analyses are given in Table 7 and it can be seen from these data that the garnets exhibit a wide range in composition particularly with respect to Cr_2O_3, FeO and TiO_2. An example of this compositional range is illustrated in Figure 7. Garnets with extremely high Cr_2O_3 contents are (>12 wt %) present, and are most abundant in K4. Most of the garnets have peridotitic compositions but a few eclogitic garnets were found.

Application of the Dawson and Stephens' (1975,1976) statistical classification of garnets (Table 8) shows that most of grains are chrome pyropes (cluster group 9) while a considerable proportion of titanian pyropes (cluster group 1) are also present. The garnet populations from the different kimberlites are similar, but this statistical classification shows that there are some minor differences; (i) cluster group 3 garnets (calcic-pyrope almandine) are virtually confined to the Group 1 kimberlites and (ii) cluster group 11 garnets (titanian, uvarovite pyrope) are more abundant in the Group 3 kimberlites.

Only a few garnets have been recovered from samples of the Group 2 kimberlites (K5 and K6) and these fall predominantly into Cluster

Group 9 of Dawson and Stephens (1975, 1976) or Cluster Group 19 and to a lesser extent Cluster Group 20 of Danchin and Wyatt (1979). The paragenesis of these garnets almost certainly relates to the micro-xenoliths discussed below. The rarity of the typical kimberlitic mantle-derived garnets in the Group 2 bodies is very unusual and may in fact indicate that they are not true kimberlites.

Ilmenite: At least one hundred grains from each of the kimberlite bodies K4, K5, K6, K7, K12 and K13 were analysed and selected results are given in Table 9. The ilmenites from the Group 3 kimberlites all display a similar range in compositions, mostly falling within 9-16 wt % MgO, 50-58 wt % TiO_2 and 0.1 to 2 wt % Cr_2O_3. Plots of these oxides (Figures 8, 9 and 10) clearly show that the Group 3 ilmenites comprise two populations which have different TiO_2, MgO, Cr_2O_3 and Fe_2O_3 contents.

The ilmenites recovered from the K5 and K6 bodies (Group 2) have characteristic compositions and are collectively different from the Group 3 ilmenites. The K5 ilmenites have an average MgO content of 11.2 wt % (100 grains) whereas the K6 ilmenites have an average MgO content of 8.3 wt % (89 grains). The Group 2 ilmenites have much higher Cr_2O_3 and lower Al_2O_3 contents than those from Group 3 as may be seen from the examples given in Table 9, and from Figures 9 and 10 where the Group 2 ilmenites are compared with an example from Group 3 (K13) in terms of MgO versus TiO_2 and Cr_2O_3 respectively.

Chromites: Numerous chromites were recovered from the Group 1 kimberlites and selected analyses are given in Table 10. The grains seem to fall into three compositional groups (i) high - Cr_2O_3, low TiO_2, (ii) lower Cr_2O_3, high TiO_2 and (iii) lower Cr_2O_3, low TiO_2 and high Al_2O_3 (e.g. analyses 1, 2 and 3 respectively, Table 10). The first group with greater than 60 wt % Cr_2O_3 have compositions similar to chromites found as inclusions in diamond (Meyer and Boyd 1972, Prinz et al. 1975, Tsai and Meyer 1979, Harris and Gurney 1979). The second group have compositions typical of chromites recovered from normal kimberlites. The K5 and K6 (Group 2) kimberlites only contain

examples of the third group of aluminous spinels (average Al_2O_3 content of 22 to 23 wt %). The compositions of these grains are similar to the spinels from the micro-xenoliths discussed below. No spinels were recovered from the Group 3 kimberlites.

Chrome Diopside: Only a few chrome diopsides have been recovered and the compositions of the grains are typical of those known to occur in other kimberlites (Table 11).

Ultramafic micro-xenoliths: During the examination of the heavy mineral concentrate produced from crushed K6 kimberlite approximately thirty micro-xenoliths were found. These micro-xenoliths (1-2 mm) were composed of pale pink garnet, clinopyroxene and spinel, and analyses of the constituent minerals are given in Table 12. Compositional variation in these fragments was found to be minimal. Possible altered orthopyroxene was also observed, and if orthopyroxene is in fact present, the fragments are best referred to as spinel-garnet-websterites, and if not as spinel-garnet-clinopyroxenites. No olivine was observed. The garnet is a low TiO_2, relatively low Cr_2O_3 peridotitic garnet which falls into Dawson and Stephens' (1975, 1976) cluster group 9 or Danchin and Wyatt's (1979) cluster group 19.

Danchin and Wyatt (1979) have noted that garnets from spinel bearing peridotites are, without exception, low in both TiO_2 and Cr_2O_3 contents (i.e. cluster Groups 19 and 20) and the Orroroo spinel micro-xenoliths are therefore consistent with this observation.The spinels in the micro-xenoliths are aluminous chromites and similar in composition to those found in peridotites but fall in the high-alumina part of the compositional range. The clinopyroxenes have low TiO_2 (<0.1 wt %) and low Cr_2O_3 (<1 wt %) contents and Ca/Ca+Mg ratios of 0.49 (Table 12). None of the mineral suspected to have been orthopyroxene was sufficiently unaltered for microprobe analysis.

No other ultramafic xenoliths have been found in the Orroroo kimberlites and thus a paleogeothermal interpretation for this part of Australia is not possible.

DIAMONDS

Bulk samples of kimberlite from most of the Orroroo bodies were treated for diamonds but none of them were found to approach economic grades. Diamonds were, however, recovered from K1, K2, K3, K4, K7, K12 and K13. The majority of the diamonds recovered were from K7 and K13 although a considerable number were also found in the K12 kimberlite. Despite the treatment of bulk samples of kimberlite from K5 and K6 no diamonds were recovered from these bodies. K8 also appears to be barren. Comparing the diamond recovery with the suggested sub-grouping of the dykes shows that Group 3 contains more diamonds than Group 1 while Group 2 appears to be barren.

A total of 140 diamonds from the Orroroo kimberlites were selected for detailed research. They range in size from 0.4 - 0.1 mm (equivalent to +36 to +12 Tyler mesh sieve sizes). The diamonds were classified according to the scheme devised by Harris et al. (1975), but because so few diamonds were examined, no significant variation was recorded between diamond size and the principal characteristics of diamond morphology and colour. Consequently these results were grouped and are shown in Table 13.

Although over 50% of the diamonds are classified as irregular, the overall characteristics suggest that the original diamond population at Orroroo is similar in most respects to other specific kimberlitic diamond populations. For example, the various growth forms (Table 13) are typical of diamonds from elsewhere; the various resorbed crystals, derived from a proportion of the growth forms (see Moore and Lang 1974), exhibit no unusual or distinctive shape characteristics; and the presence of both growth and resorbed crystals among the irregular fraction is a common feature of other kimberlitic diamonds (see Harris et al. 1975, 1979).

Colourless and brown stones, in equal proportion, dominate the colour characteristics (see Table 13). Such colours are not unusual and in fact are to be expected if the trends in colour characteristics noted for diamonds elsewhere - namely the steady increase in the proportion of colourless and brown-coloured diamonds at the expense of yellows with decreasing diamond size - continue to these much smaller sized diamonds (see Harris et al. 1975, 1979).

The Orroroo diamonds also exhibit such typical surface features as negative trigons and lamination lines, and ten stones contained very small (generally <100 micron) syngenetic mineral inclusions (see below).

DIAMOND INCLUSION MINERALOGY AND CHEMISTRY

With one exception, the inclusions in the Orroroo diamonds were all <100 micron in largest dimension. They consisted of five black internal disc or rosette fracture systems typical of sulphide inclusions (see Harris 1972), three colourless and two reddish brown-coloured minerals. On the basis of inclusion size, six diamonds containing two sulphides, two colourless and two red-coloured inclusions were crushed using a small vice. One colourless and two red inclusions were recovered.

The colourless inclusion ORR3 from K13, 210 x 110 x 100 micron, exhibited high birefringence and had an elongate cubo-octahedral morphology typical of those imposed by diamond on inclusions (see Harris and Gurney 1979). The two reddish-brown inclusions ORR4A and ORR6A from K7 and K3 respectively, 50 x 30 x 10 micron and 90 x 80 x 50 micron, were both transparent and isotropic. The larger one had several facets but no overall shape was identified.

The three inclusions were mounted in epoxy and polished to a 0.25 micron diamond finish in preparation for microprobe analysis. The grains were analysed using the ARL-SEMQ electron microprobe at the

Anglo American Research Laboratories in Johannesburg, raw data being corrected according to the Bence-Albee (1968) procedure.

The results are shown in Table 14. The colourless inclusion (ORR3) is enstatite with a chemistry typical of most enstatites found as inclusions in diamond (cf. cols. 1, 4, 5 and 6, Table 14). The two transparent red-brown inclusions (ORR4A and ORR6A) are magnesio-wustites with Mg/(Mg+Fe) ratios of 85.7 and 86.8 respectively (cols. 2 and 3, Table 14).

Previously, magnesio-wustites, one co-existing with enstatite, have been identified in four separate diamonds from the Koffiefontein mine, South Africa, (Gurney et al. unpublished data). Comparison with representative analyses of those data (cf. cols. 2, 3 with 7, 8, Table 14) shows that the Orroroo magnesio-wustites are very similar, Mg/(Mg+Fe) ratios for all analyses ranging from 85.7 to 87.1. Orroroo magnesio-wustites have no silica or sodium and lower levels of chromium than their Koffiefontein counterparts, but whether or not any significance can be attached to the amount of NiO in the Orroroo inclusions is uncertain, since NiO was not determined when the Koffiefontein inclusions were analysed.

Although three of the four magnesio-wustites from Koffiefontein were transparent, isotropic crystals, the fractured nature of three of the four diamonds from which the inclusions were recovered, suggested that these magnesio-wustites were epigenetic inclusions.

The present additional evidence from Orroroo now puts that earlier appraisal in doubt. There was no evidence of prior fracture in the two Orroroo diamonds from which the magnesio-wustites were recovered. The physical characteristics of colour, transparency and isotropy of these inclusions are alike and the crystals are stoichiometric and chemically similar. Moreover there is a similarity of these characteristics to those exhibited by the Koffiefontein inclusions.

If magnesio-wustites are a new syngenetic oxide in diamond, then their presence places some diamond formation at much deeper levels than had previously been thought, for magnesio-wustites are considered to be an important constituent of the deeper levels of the mantle (Yagi et al. 1979). For example, if the enstatite (see col. 6, Table 14) and magnesio-wustite found together in the Koffiefontein diamond crystallised in equilibrium then the present experimental evidence (Yagi et al. 1979) indicates that at 1,000°C the pressure would need to be in excess of 255 kb - a depth of approximately 800 km.

The magnesio-wustite inclusions therefore pose some formidable problems. If they are syngenetic then the depth of formation for some diamonds is increased by at least a factor of four. If epigenetic, then the breakdown or alteration reaction of a syngenetic inclusion has to be very precise. Simple desilicification of olivine or enstatite with typical chemistries will not produce magnesio-wustites with Orroroo or Koffiefontein compositions.

WHOLE-ROCK GEOCHEMISTRY

Whole-rock compositions were determined for several parts of the drill core from K7 and the results are given in Table 15. The petrography of the drill core showed that there was little variation, and as expected only minor variation in the whole-rock geochemistry was found (Table 15). The sample numbers given in Table 15 start at the top of the drill core (60.0 metres - sample 1) and terminate close to the bottom of the drill core (61.3 metres - sample 13).

The whole-rock analyses are considered to be representative of the kimberlite since the Orroroo drill core has a uniform texture and mineralogy, and great care was taken to remove all xenolithic and extensively altered material as well as secondary veins. Also these samples have been affected by only very minor amounts of weathering. It is considered that some of the low totals result from problems in total volatile release during loss on ignition and that loss on fusion determinations would have been more accurate.

The high CO_2 and CaO values reflect the abundant groundmass calcite, the high K_2O contents, the groundmass phlogopites, and the P_2O_5 contents, the apatite. The Na_2O contents are low which is characteristic of normal kimberlites, and higher values noted in other kimberlitic studies almost certainly reflect some contamination. The Orroroo analyses compare well with those of other fresh kimberlites with similar mineralogy (e.g. Scott 1981; Clement, in preparation). Comparing the Orroroo data with a variety of kimberlites from other localities (e.g. Dawson 1967; Gurney and Ebrahim 1973) they again fall within the range of compositions of samples from these different localities. This range is obviously broadened by the variation in primary mineralogy, alteration and contamination. It should be noted that great care should be taken when comparing whole-rock data with those published in the literature since many of the analysed samples obviously suffer from problems of alteration and contamination particularly where diatreme-facies rocks have been analysed.

RELATED INTRUSIVES

Kimberlitic/lamprophyric/carbonatitic intrusives have been known in this part of Australia for some time and reports concerned with them are Colchester (1972), Tucker and Collerson (1972), Stracke et al. (1979), Ferguson et al. (1979) and Ferguson and Sheraton (1979). Kimberlitic rocks occur in the vicinity of Terowie ($\pm$50km south of Orroroo) and Port Augusta about 80 km to the west of Orroroo. These intrusions are geographically separate from the Orroroo kimberlites described here and will not be discussed further.

Tucker and Collerson (1972) refer to primary carbonate-bearing lamprophyric rocks (at 32°36'S, 138°35'E) $\pm$4 km south of K3 (Figure 1). They apparently comprise five small dykes (1m wide and up to 100m long) and two possible plugs all within an area of 500 x 800m. Tucker and Collerson (1972) subdivided these rocks into two types, the first containing abundant mica and some olivine pseudomorphs and the second containing two generations of olivine (pseudomorphs), as well as groundmass phlogopite. They concluded that they were not true

kimberlites because no indicator minerals were recovered. The petrographic description and photomicrograph of the second type, however, suggests a close similarity to the Orroroo kimberlites. It is therefore likely that at least the second type form part of the same general episode of intrusion as the Orroroo kimberlites and may in fact be true kimberlites (after Clement et al. 1977).

Stracke et al. (1979) and Ferguson and Sheraton (1979) report the occurrence of kimberlitic intrusions at Walloway (32°37'S, 138°35'E) which plot within 1' (2km) of those described by Tucker and Collerson (1972) and it is presumed that they refer to the same intrusions. Stracke et al. (1979), however, described the Walloway occurrences as comprising seven kimberlitic dykes some with elongate "blows" with a northerly trend and largest body being 20 m long. It is of particular interest to note that the Rb/Sr phlogopite age of 172 my given by Stracke et al. (1979) is very close to those found for the Orroroo intrusions which were determined using zircons. This further supports the suggestion that at least some of the Walloway intrusions form part of the Orroroo suite. Tucker and Collerson (1972) noted the altered nature of most of these rocks and the high $^{87}Sr/^{86}Sr$ ratio of 0.737 obtained for the phlogopite from the Walloway intrusions (Stracke et al. 1979) probably reflects this alteration. Ferguson and Sheraton (1979) indicated that the Walloway carbonated kimberlitic intrusives are associated with carbonatite but no details are given except for one whole-rock analysis (Table 5, Ferguson and Sheraton 1979).

SUMMARY

It has been shown in this study that the intrusions north of Orroroo being discussed here can be subdivided into three main groups primarily from the abundances and chemistry of their indicator mineral contents. The relevant information is summarised below:

Group 1 - comprises K1, K2, K3, K8, K9
- all fall on one strike line
- petrography of some surface samples shows that they are

altered phlogopite-bearing kimberlite

- K3 is dated at 170 my
- contains abundant peridotitic and a few eclogitic garnets
- ilmenite is rare
- chromites are common and many of the grains have compositions similar to chromites found as inclusions in diamonds
- a few diamonds were recovered
- magnesio-wustite was found as an inclusion in a diamond.

Group 2 - comprises K5 and K6

- the strike of K5 is similar to that of the other intrusions but K6 has a slightly different strike direction
- K5 has been dated at 170 my
- contains rare garnets which are cluster group 19 types (after Danchin and Wyatt 1979)
- ilmenite is extremely abundant, K5 contains ilmenite with high Cr_2O_3 and medium MgO while K6 contains grains with high Cr_2O_3 and low MgO
- only aluminous Cr-spinels occur
- no diamonds were recovered
- a few garnet-spinel-clinopyroxene ultramafic micro-xenoliths were recovered and the garnets and spinels are similar in composition to the few grains found in the heavy mineral concentrate
- samples examined petrographically are heavily altered but do contain phlogopite and olivine pseudomorphs. The phlogopite may be different in habit to that in Groups 1 and 3.

Group 3 - comprises K4, K7, K12, K13

- diamond drill core from K7 is calcite, phlogopite kimberlite and surface samples from K4 are altered but very similar
- the kimberlite matrix mineral chemistry and whole-rock geochemistry of drill core from K7 are characteristic of kimberlites
- contains common garnets which are mostly peridotitic in

composition although a few eclogitic grains also occur
- ilmenite is common, the majority having high MgO and fairly low Cr_2O_3 and are therefore different from Group 2 ilmenites
- chromite is absent
- some diamonds were recovered and they appear to be more abundant in these dykes than in Group 1
- magnesio-wustite and enstatite were found as inclusions in diamond.

CONCLUSIONS

Exploration sampling located a suite of kimberlite dykes in an area north of Orroroo in South Australia. The dykes can be sub-divided into three groups (1, 2 and 3) on the basis of their geographic distribution, the abundances and chemistry of garnet, ilmenite and chrome spinel recovered from heavy mineral concentrates, and the diamond contents. The chemical compositions of the indicator minerals are similar to those found in other true kimberlites elsewhere. Fresh drill core from one body within the Group 3 dykes has been classified as a hypabyssal, calcite, phlogopite kimberlite. The petrography, olivine and groundmass mineral chemistry and whole-rock geochemistry are similar to certain other kimberlites, in particular those from the type area near Kimberley, South Africa. All of the intrusions in the Orroroo Province are extensively altered at surface but certain members of Groups 1 and 3 can be identified as kimberlites with similar groundmass mineralogies. No conclusion can be reached concerning the petrography of the Group 2 intrusions but the lack of garnet may tentatively suggest that they are not normal kimberlites. Individual dykes from the Group 1 and 2 intrusions have been dated at 170 my.

The colour and shape of diamonds recovered from Groups 1 and 3, are similar in most respects to other specific kimberlitic diamond populations. Group 2 was not found to be diamondiferous. One enstatite and two magnesio-wustite inclusions were recovered from within three of the diamonds. The presence of apparently syngenetic magnesio-

wustite inclusions in diamond poses formidable problems with regard to the depth of origin of these diamonds, and suggests that some diamond may derive from considerable depths in the mantle.

Thus the Orroroo kimberlites have been sub-divided into three sub-groups which are closely related in both space and time, but which carry quite different suites of mantle derived minerals. If the mineralogies of the kimberlites are equivalent (which they appear to be for Groups 1 and 3), it would appear that the contained mantle-derived minerals are xenocrystic. This in turn suggests that the dykes were intruded as three quite separate pulses and that the magma sources for the pulses had experienced different pre-intrusion histories.

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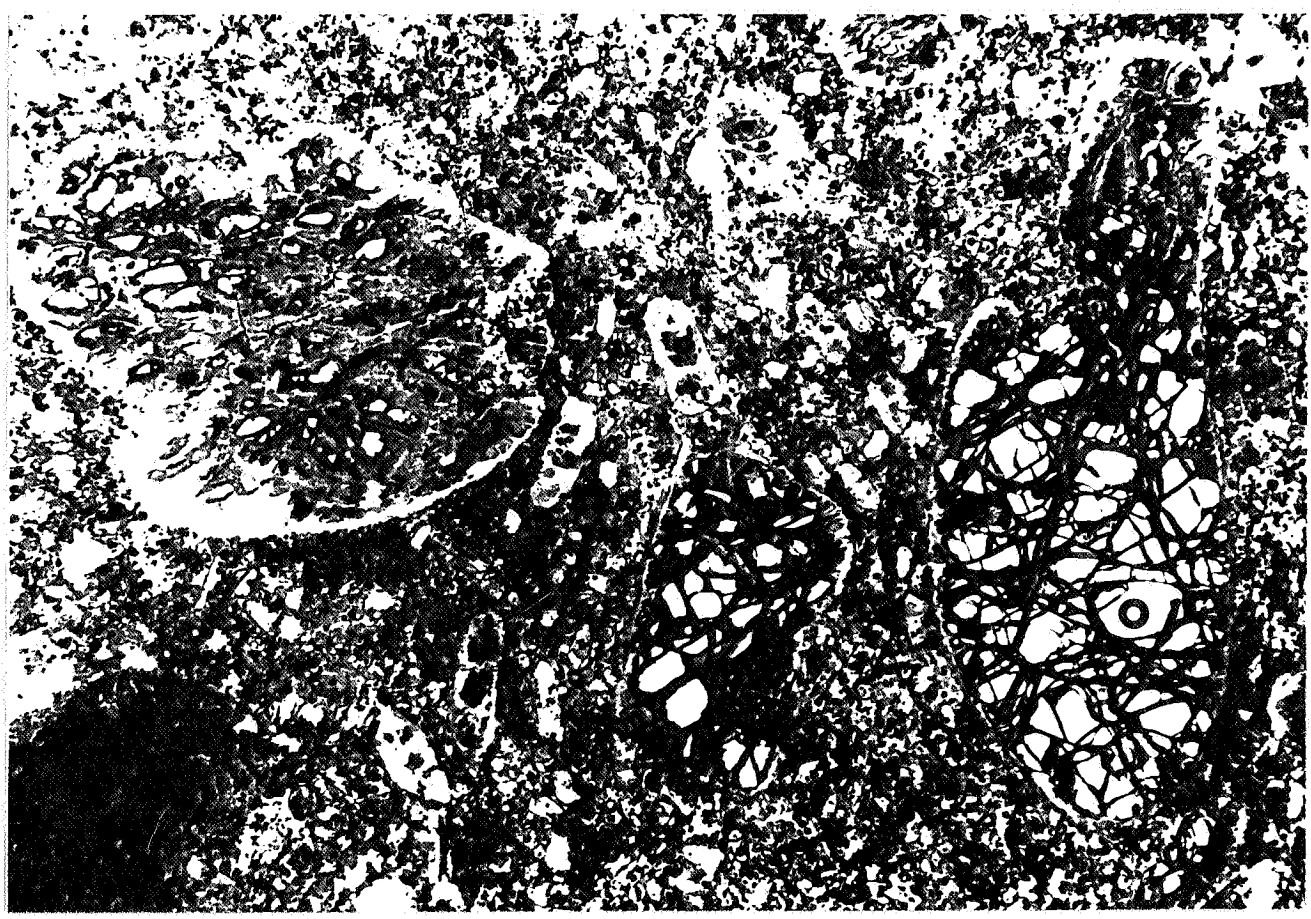


Plate 1 Sample K7900A from the core of K7 in the Orroroo Province.

Field of view = 10 mm. Plane polarised light.

This photomicrograph shows the two generations of olivine which are diagnostic of kimberlites. Partially serpentinised, rounded olivine macrocrysts (o) are set in a microporphyritic matrix. Numerous microphenocrysts of olivine, generally totally serpentinised, occur throughout this matrix.

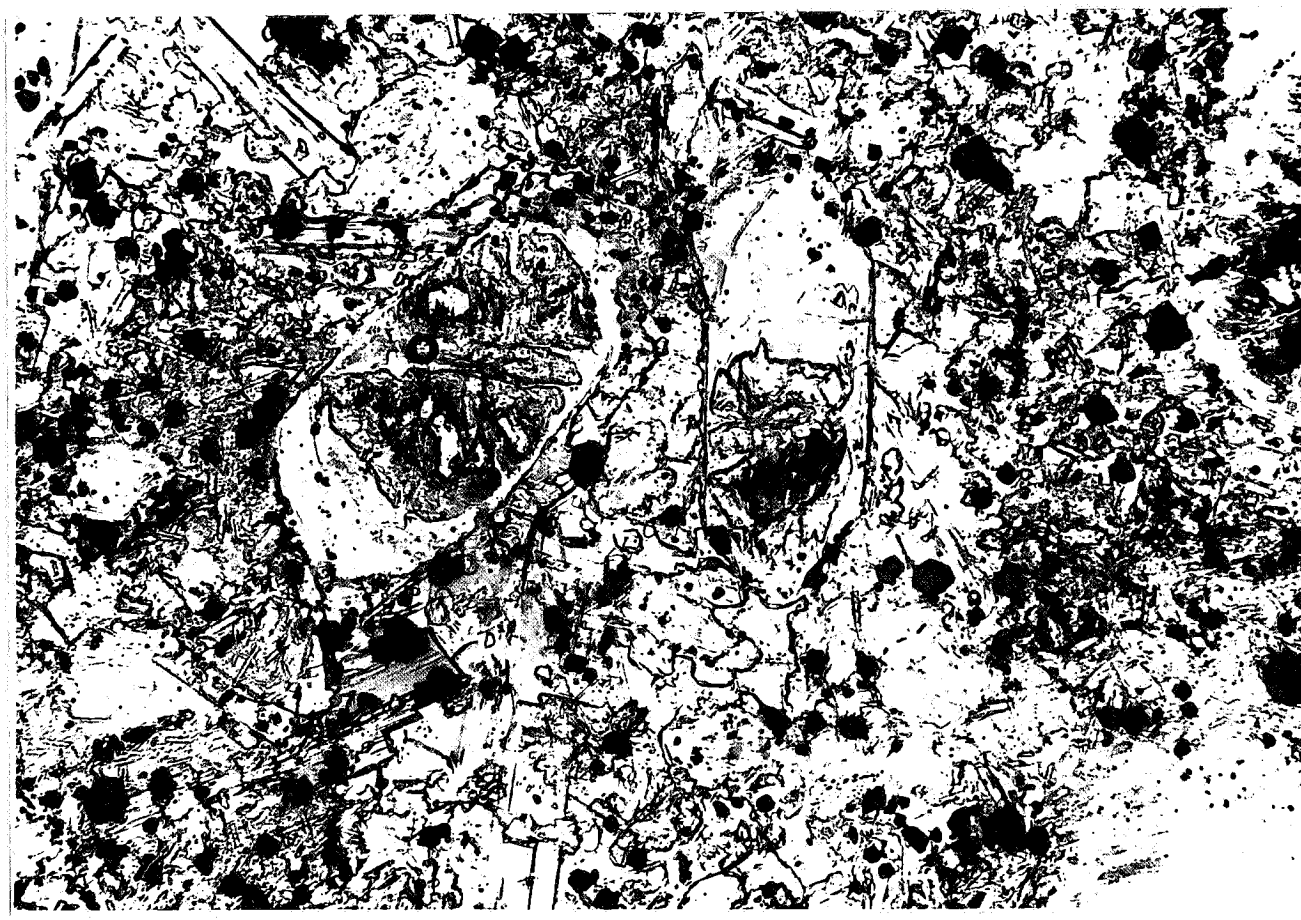


Plate 2 Sample K7900A from the core of K7 in the Orroroo Province.

Field of view = 1.6 mm. Plane polarised light.

Serpentinised, euhedral microphenocrysts of olivine (o) with a few fresh remnants of olivine present. The olivines are set in a finer grained groundmass composed of phlogopite, perovskite, spinel, carbonate, serpentine and apatite.

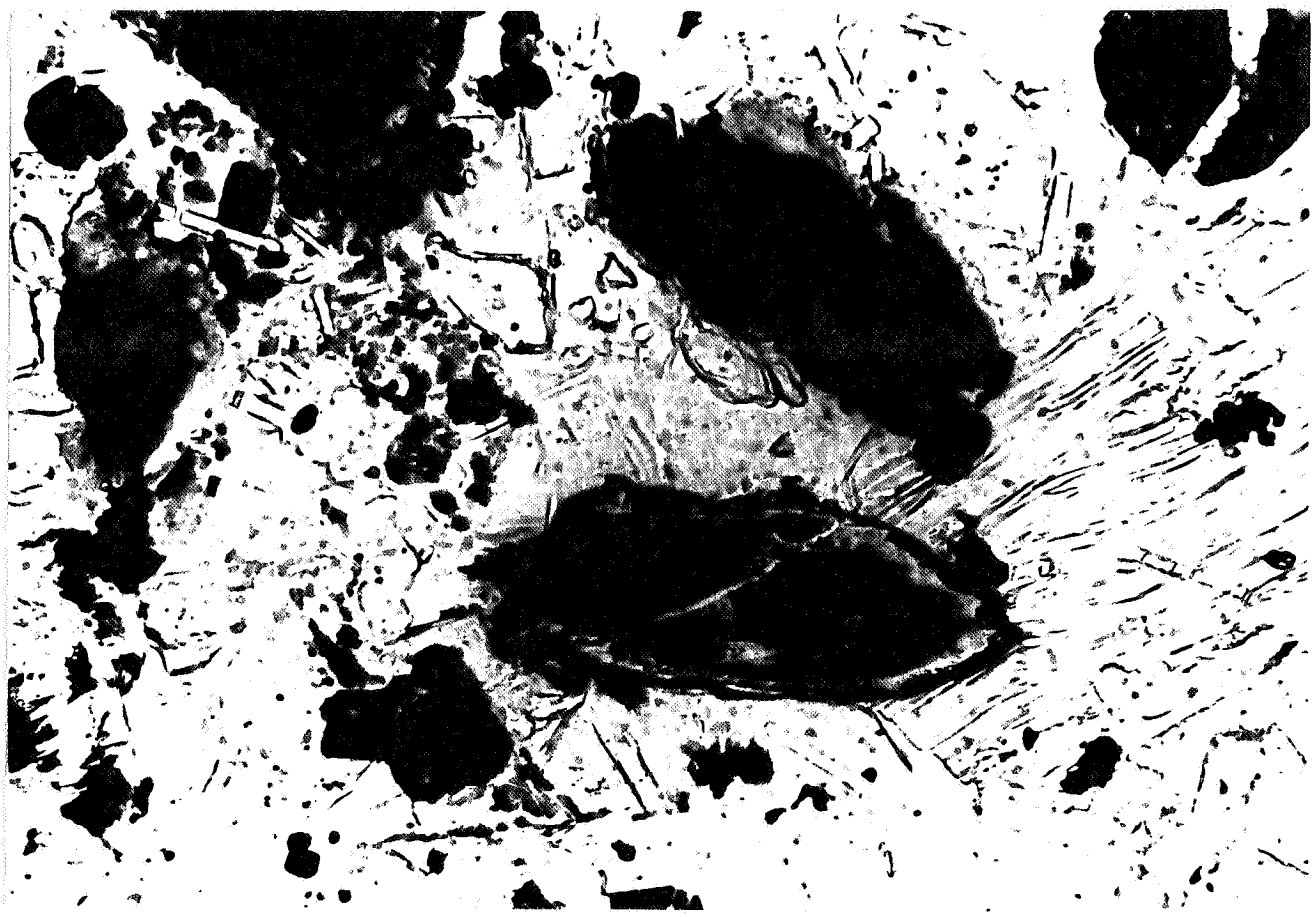


Plate 3 Sample K7900B from the core of K7 in the Orroroo Province.

Field of view = 0.6mm. Plane polarised light.

This part of the sample occurs close to that shown in Plates 1 and 2 but the olivine pseudomorphs have become opaque through the presence of variable but often abundant amounts of black material which may be graphite. The groundmass shown here includes phlogopite, carbonate, serpentine, pervoskite and apatite.

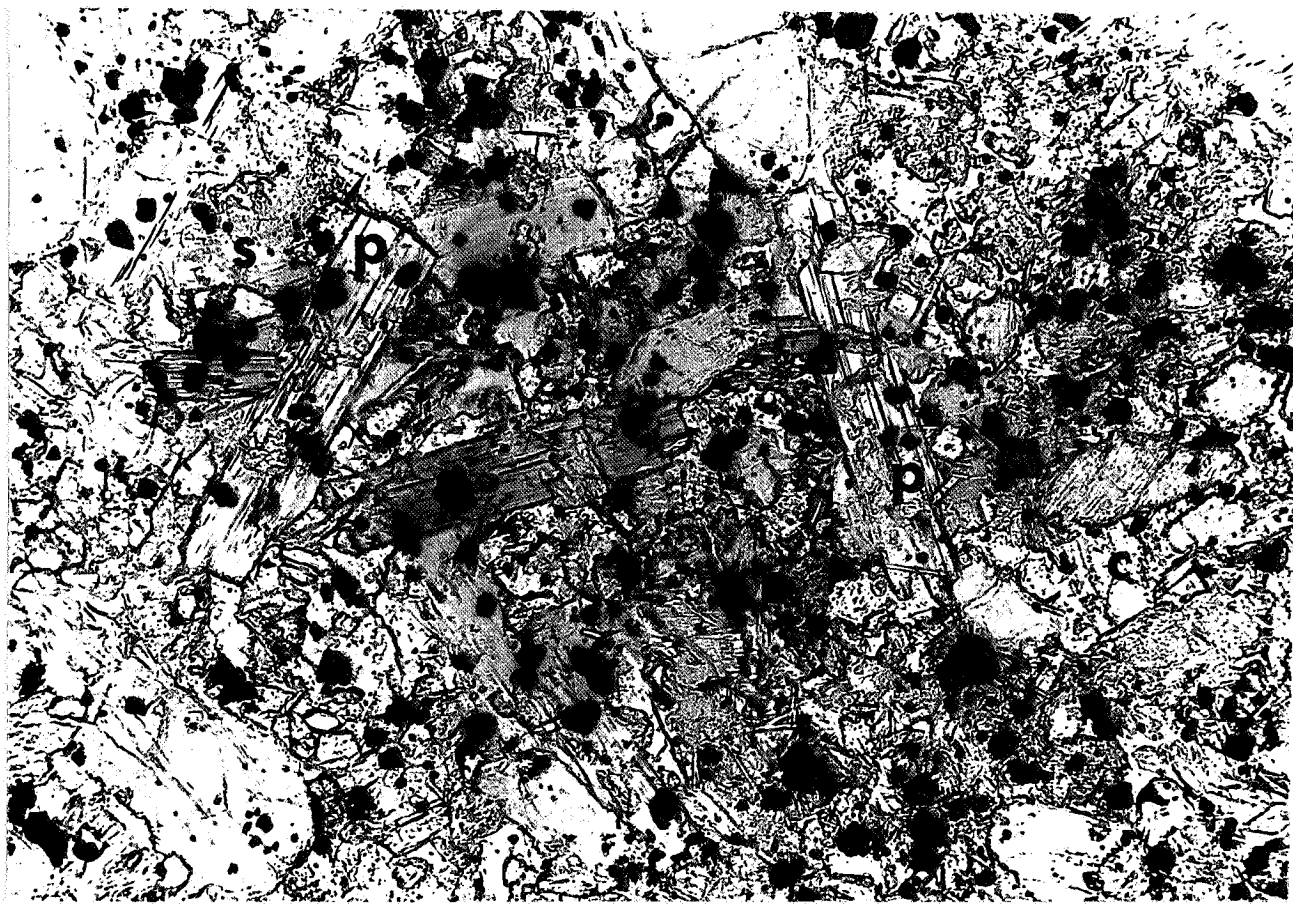


Plate 4 Sample K7900A from the core of K7 in the Orroroo Province.

Field of view = 1.6 mm. Plane polarised light.

The groundmass of Plates 1 and 2 at higher magnification. The groundmass comprising numerous laths of phlogopite (p), equant grains of perovskite and spinel both of which appear to be opaque in the photomicrograph. Interstitial areas composed of calcite (c) and serpentine (s). A few olivine pseudomorphs and laths of apatite can also be observed.

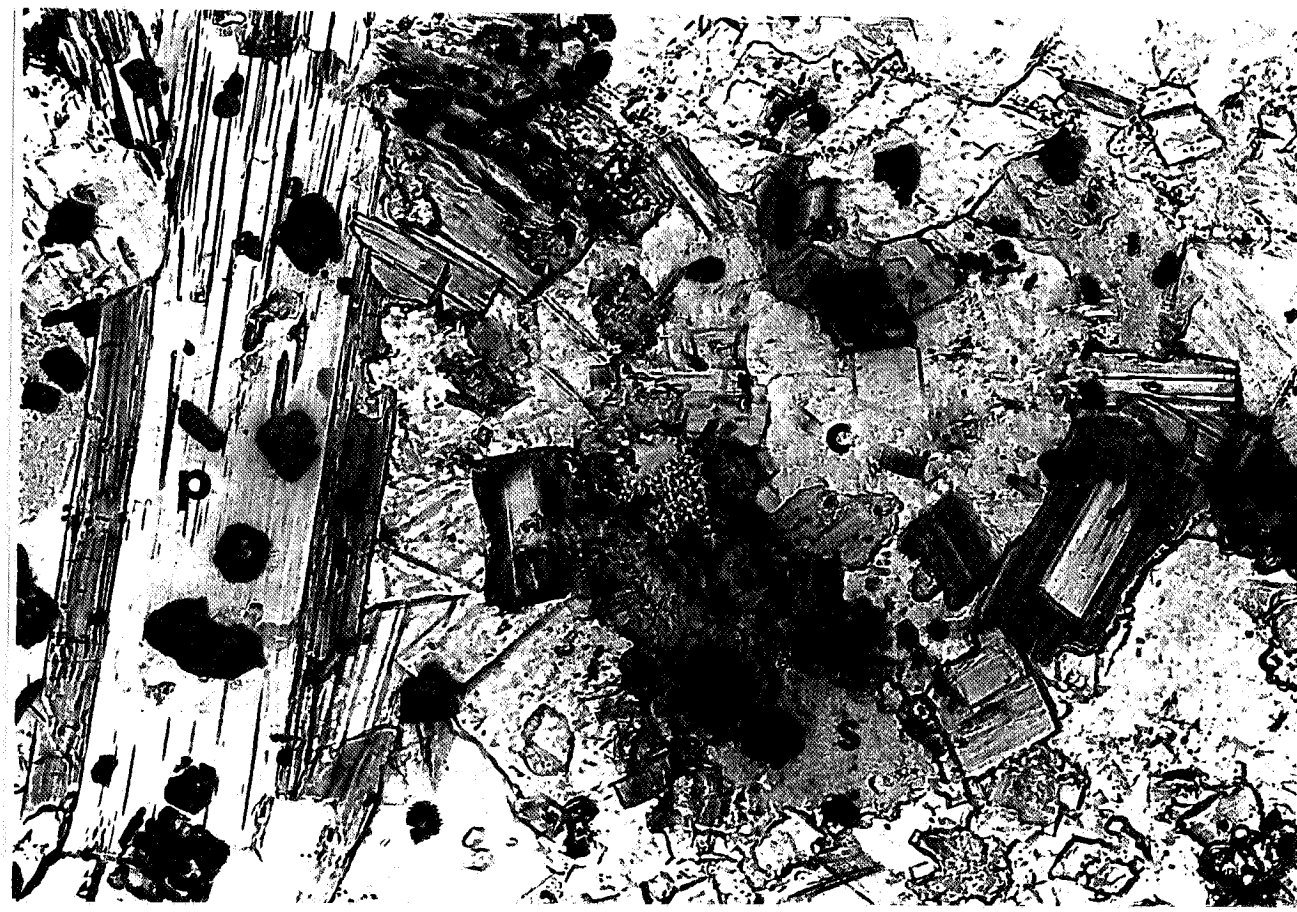


Plate 5 Sample K7900A from the core of K7 in the Orroroo Province.

Field of view = 0.4 mm. Plane polarised light.

Part of the groundmass where the light coloured phlogopite cores (p) have mantles of darker, reversely pleochroic tetraferriphlogopite (t). Other groundmass minerals shown includes carbonate (c), serpentine (s), equant grains of translucent perovskite and opaque spinel. The occasional spinel has an atoll-type structure.

Figure 1 Location of the kimberlites which occur in the area north of Orroroo, South Australia.

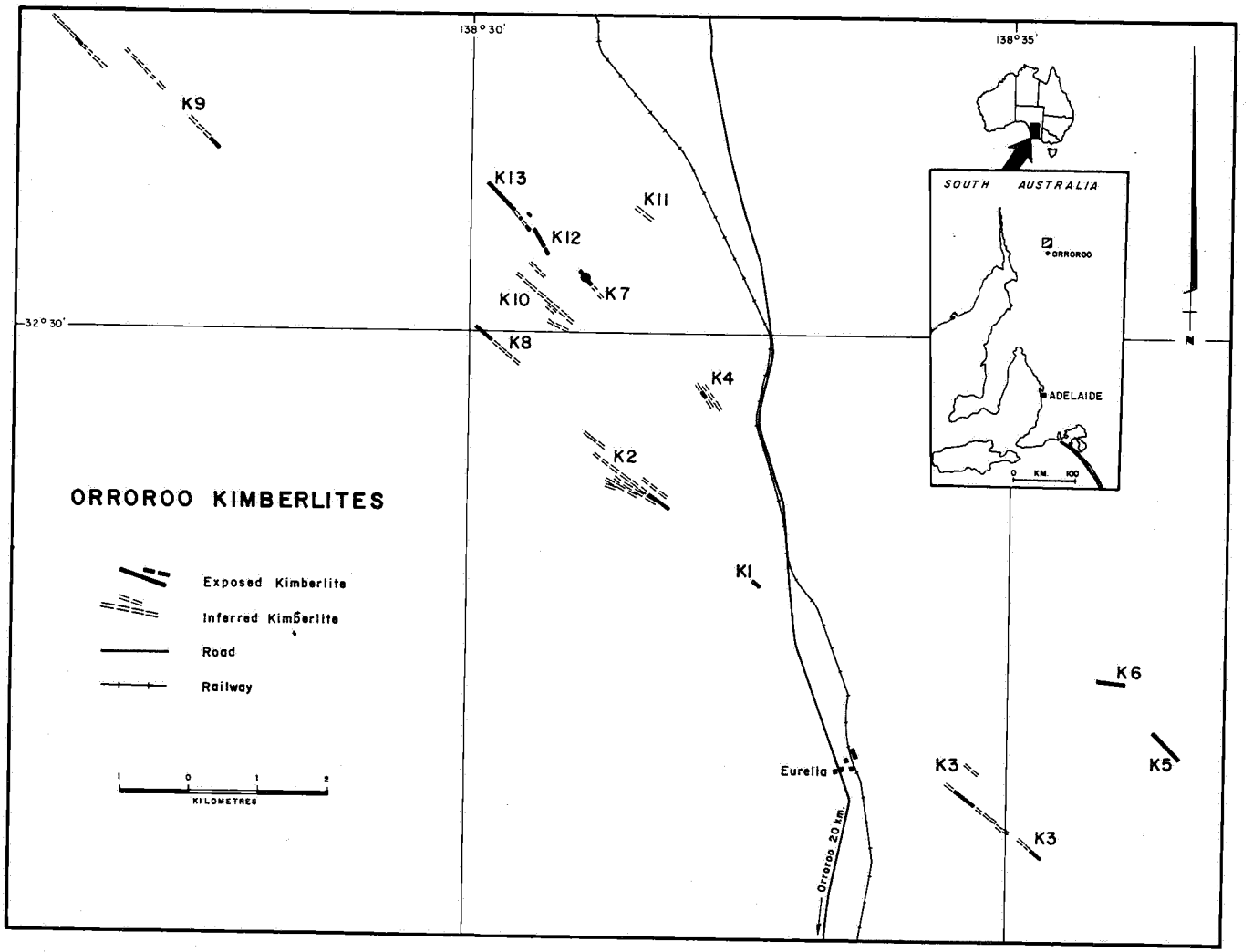

138°30'
138°35'
32°30'
K9
K13
K11
K12
K10
K7
K8
K4
K2
K1
K6
K5
K3
K3
Eurelia
Orroroo 20 km.
ORRORO KIMBERLITES
Exposed Kimberlite
Inferred Kimberlite
Road
Railway
1 0 1 2
KILOMETRES
SOUTH AUSTRALIA
ORRORO
ADELAIDE
0 KM. 100
N

Figure 2 Frequency distribution diagrams for the compositions of cores and rims of olivines represented by the Mg/(Mg+Fe) atomic ratios.

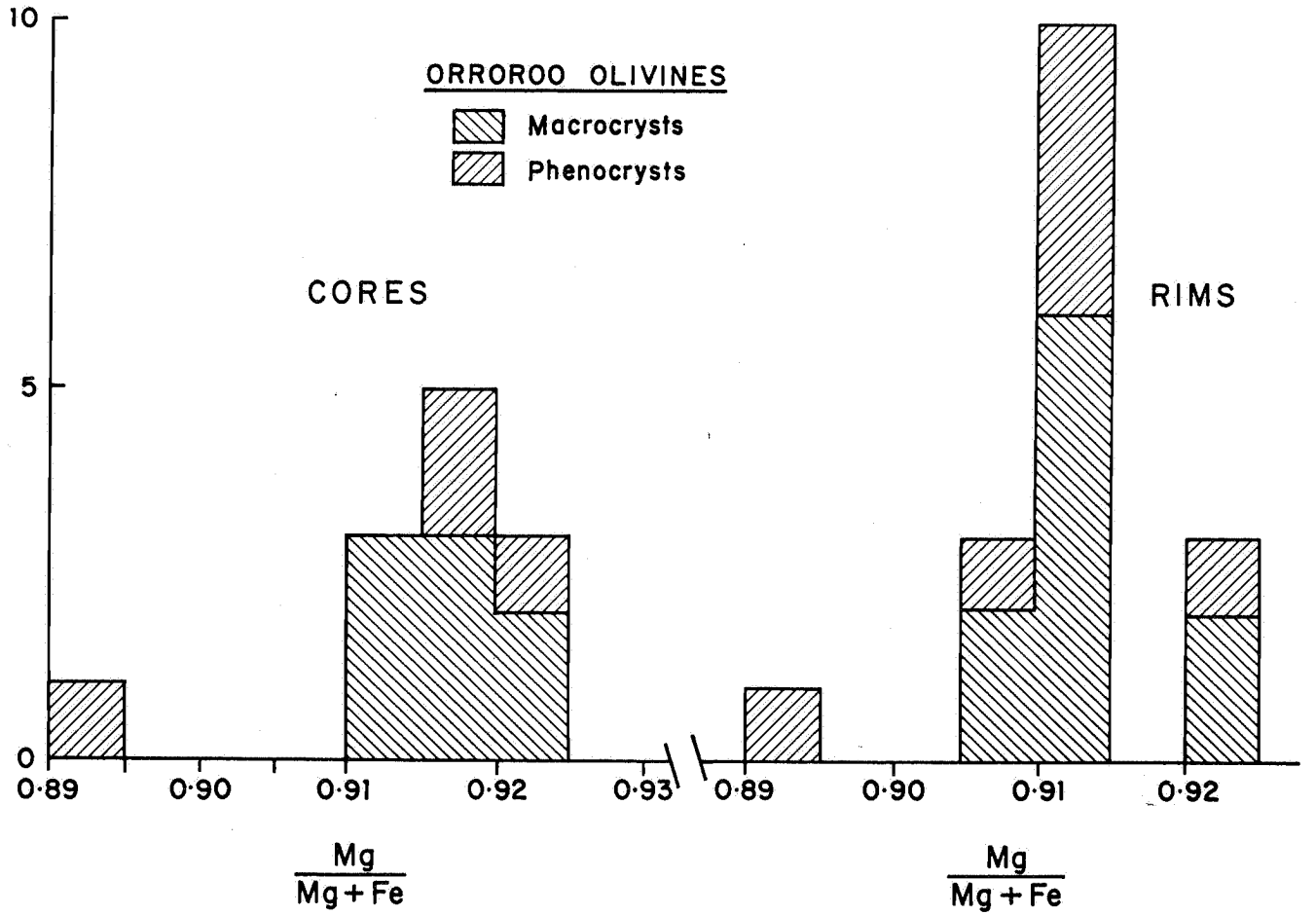

ORRORO OLIVINES
Macrocrysts
Phenocrysts
CORES
RIMS
10
5
0
0·89
0·90
0·91
0·92
0·93
0·89
0·90
0·91
0·92
Mg / Mg + Fe
Mg / Mg + Fe

Figure 3 Compositional zoning within olivines.

Legend

Vertical axis represents composition in terms of Mg/(Mg+Fe) atomic ratios. Horizontal axis gives distance from edge of crystal.

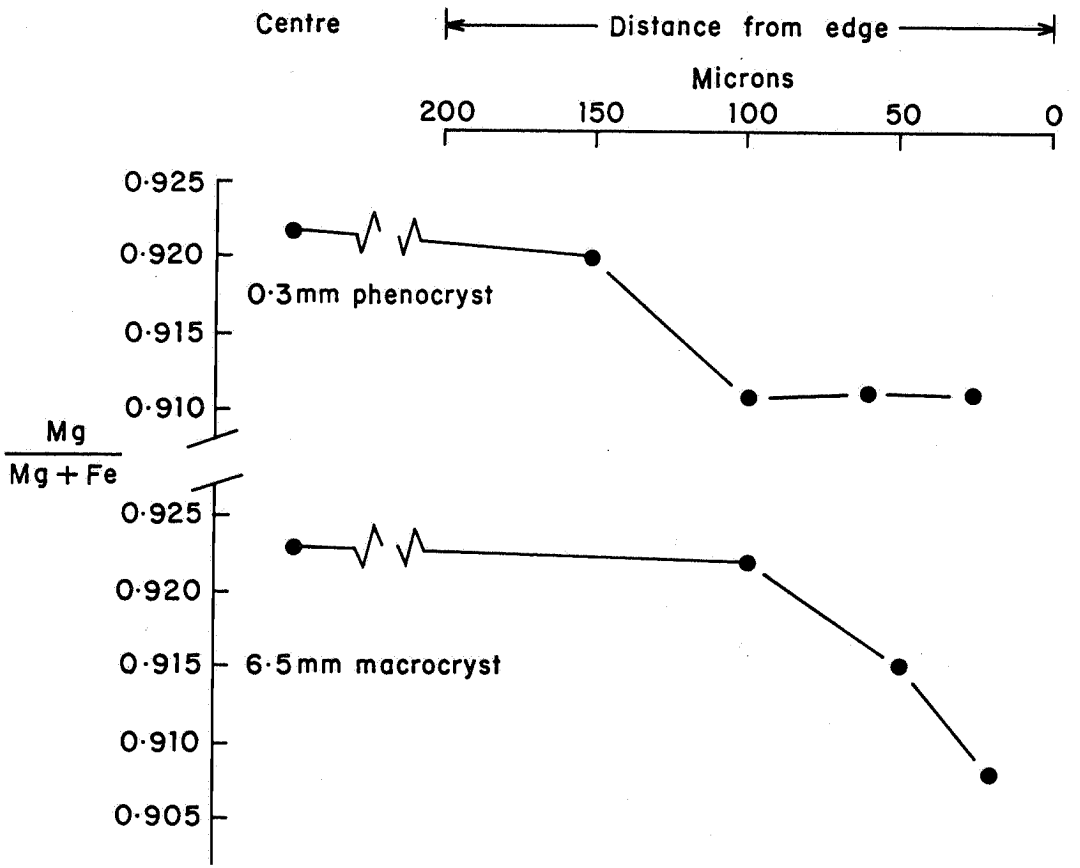

Centre
Distance from edge
Microns
200
150
100
50
0
0·925
0·920
0·915
0·910
0·3mm phenocryst
Mg / Mg + Fe
0·925
0·920
0·915
0·910
0·905
6·5mm macrocryst

Figure 4 TiO_2 wt% versus Mg/(Mg+Fe) atomic ratio for phlogopites from Orroroo and from other kimberlite occurrences.

Legend

Field 1 = rims and edges of normally pleochroic core of groundmass phlogopites from the drill core of K7 at Orroroo. The reversely pleochroic tetraferriphlogopite mantles are also shown although they do not fall within this field.

Field 2 = main compositional field for phlogopites from other kimberlite ocurrences. The data used are from Swartruggens (Skinner and Scott 1979), several kimberlites on Somerset Island (Clarke and Mitchell 1975, Mitchell 1978, Mitchell 1979), from Greenland (Emeleus and Andrews 1975) and Type 2 or normal micas from Saltpeterpan, Zout en Zuur, Star, Swartruggens, Lovedale, Monteleo, Roberts Victor and Excelsior, all in South Africa and Upper Canada Mine dyke in Ontario (Smith et al. 1978). Most of the points fall in field 2a. All analyses from Upper Canada Mine and one from Tunraq, Somerset Island, fall in field 2b. Outliers are shown by crosses.

Field 3 = kimberlite dykes from Holsteinsborg Greenland (Scott 1977, 1981). The field shown here represents only main concentration of a wide range of compositions.

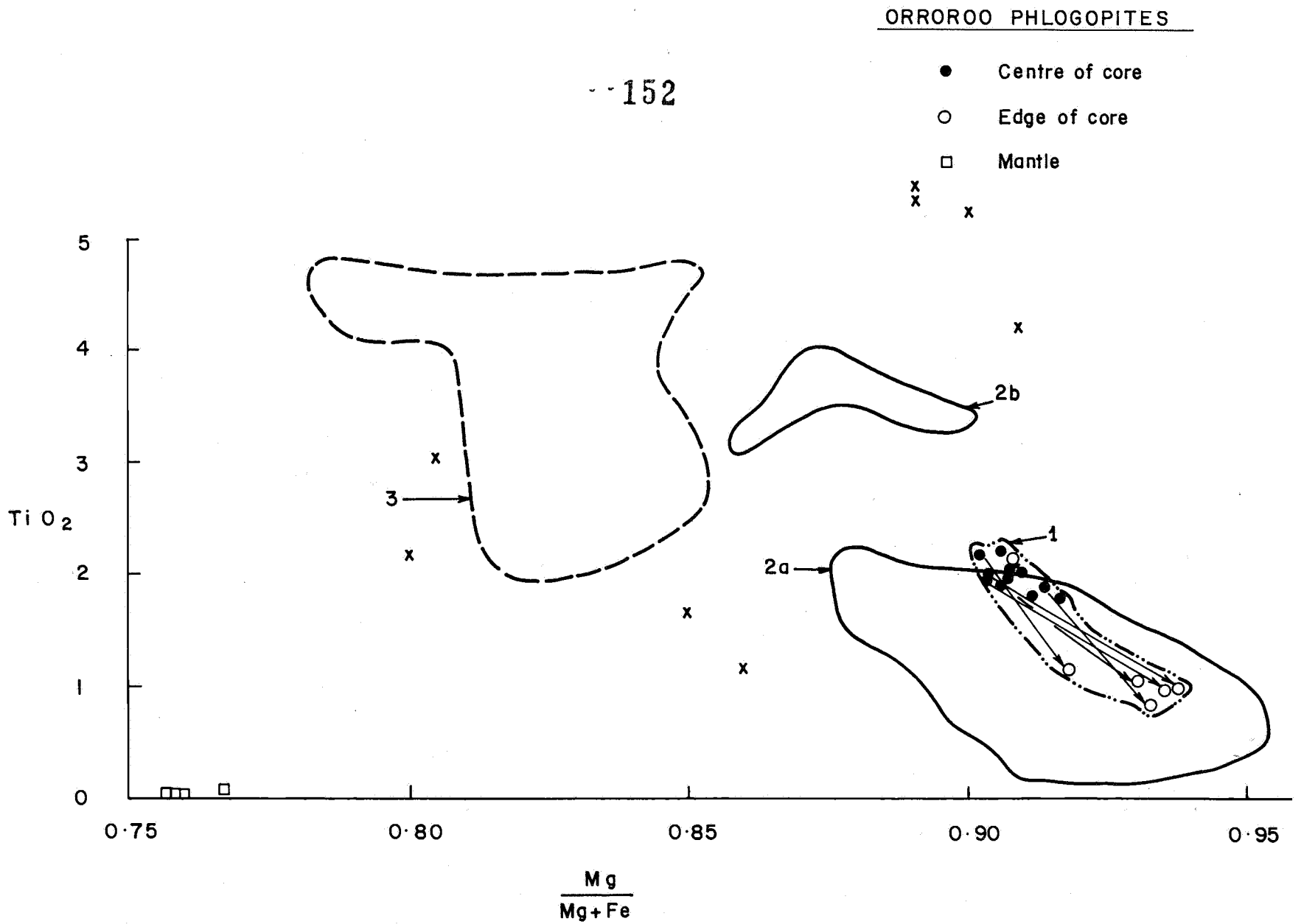

ORRORO0 PHLOGOPITES
Centre of core
Edge of core
Mantle
5
4
3
2
1
0
Ti O2
0·75
0·80
0·85
0·90
0·95
Mg / Mg+Fe
1
2a
2b
3

Figure 5 TiO_2 versus Al_2O_3 wt % plot for phlogopites from Orroroo and from other kimberlite occurrences.

Legend

Mostly as for Figure 4 except as follows:

Field 2c = phlogopites from Upper Canada Mine, Tunraq and Peuyuk C from Somerset Island.

Field 2d = most of the South African occurrences given by Smith (et al. 1978), Swartruggens, some from Tunraq and Greenland.

Field 3 = unlike Fig. 4 this field includes all compositions for the Holsteinsborg dykes in Greenland.

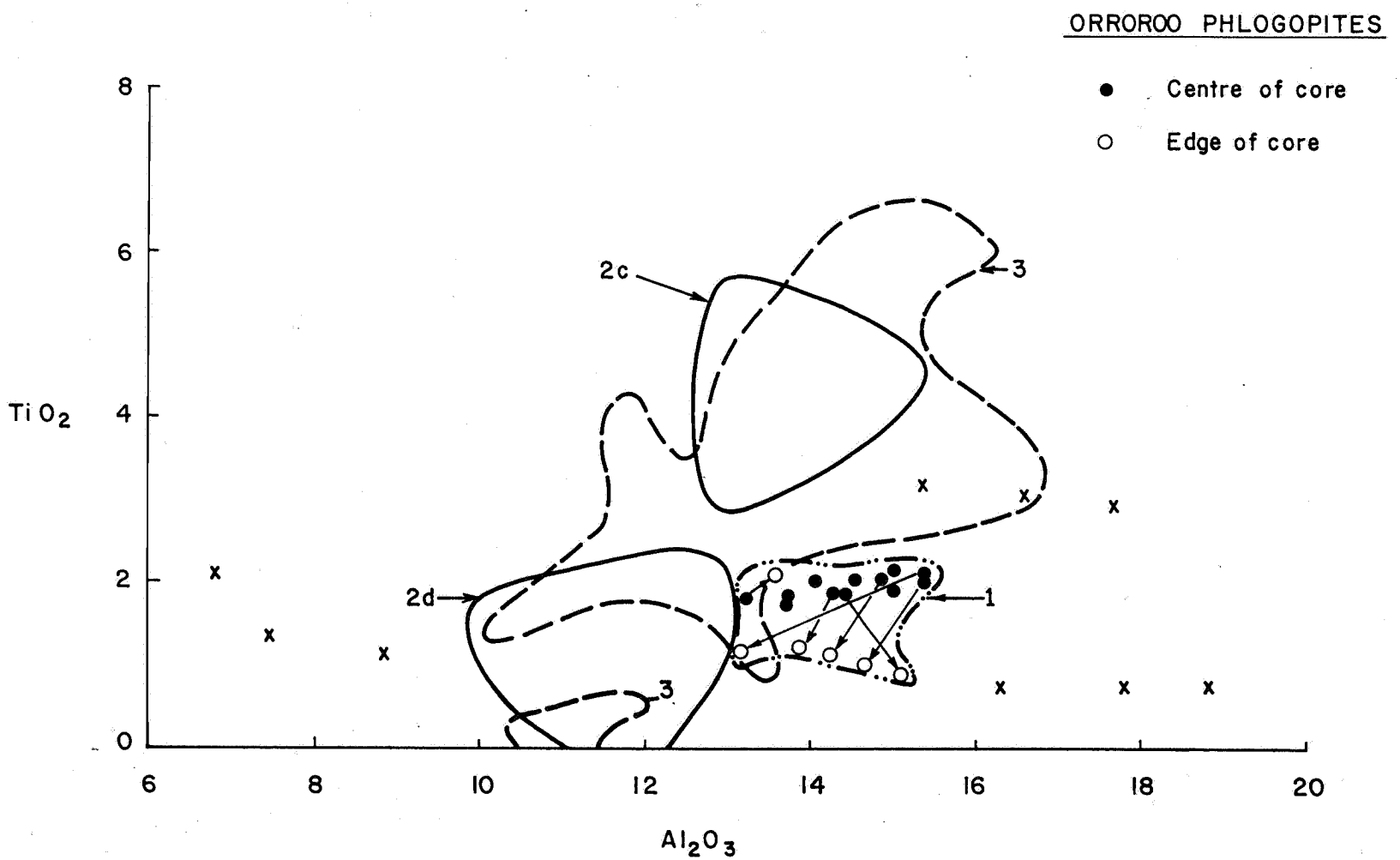
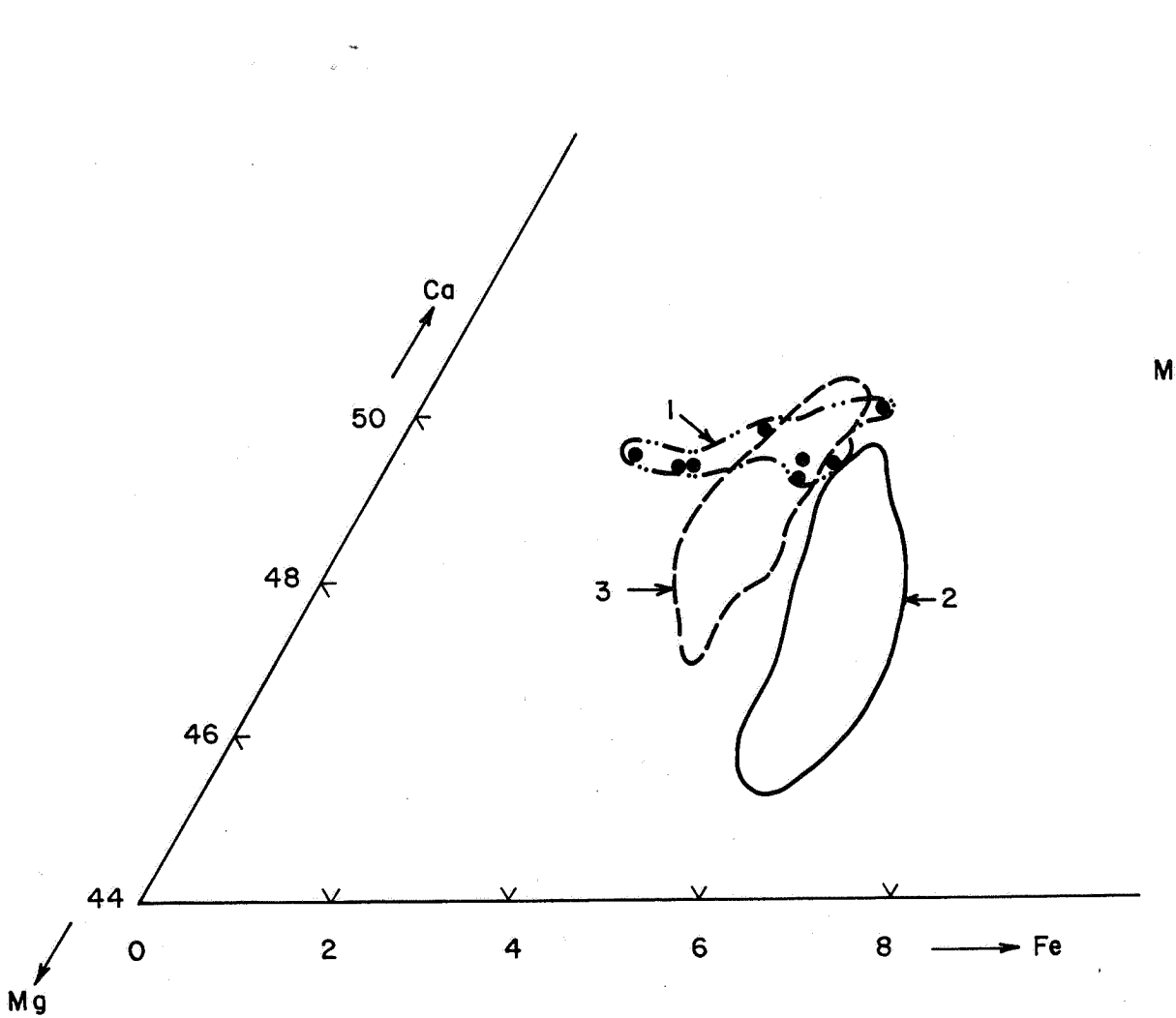

ORRORDO PHLOGOPITES
Centre of core
Edge of core
2c
3
2d
1
3
TiO_2
Al_2O_3
0
2
4
6
8
6
8
10
12
14
16
18
20

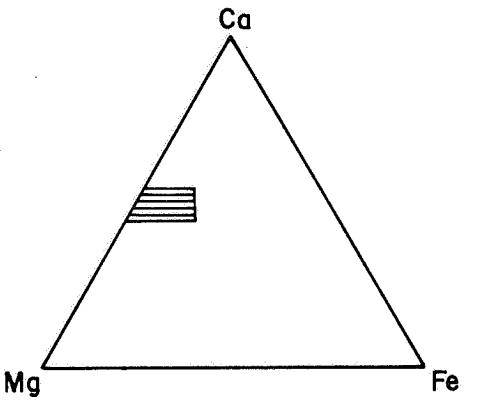
Figure 6 Ca-Mg-Fe atomic proportion plot of groundmass clinopyroxenes from Orroroo together with compositional fields for other kimberlites.

Field 1 = Orroroo kimberlites

Field 2 = Roberts Victor, New Elands, Zout en Zuur in South Africa (Dawson et al. 1979) and Pyramidfjeld in Greenland (Emeleus and Andrews 1975).

Field 3 = Main, Change House and normal kimberlites, Swartruggens, South Africa (Skinner and Scott 1979).





● Groundmass clinopyroxene from Orroroo

Figure 7 Cr_2O_3 versus FeO wt% plot for garnets from the Group 1 and 3 kimberlites in the Orroroo Province.

Legend

The shaded area incorporates 1145 data points. The inner area of shading shows where the greatest concentration of data points occur.

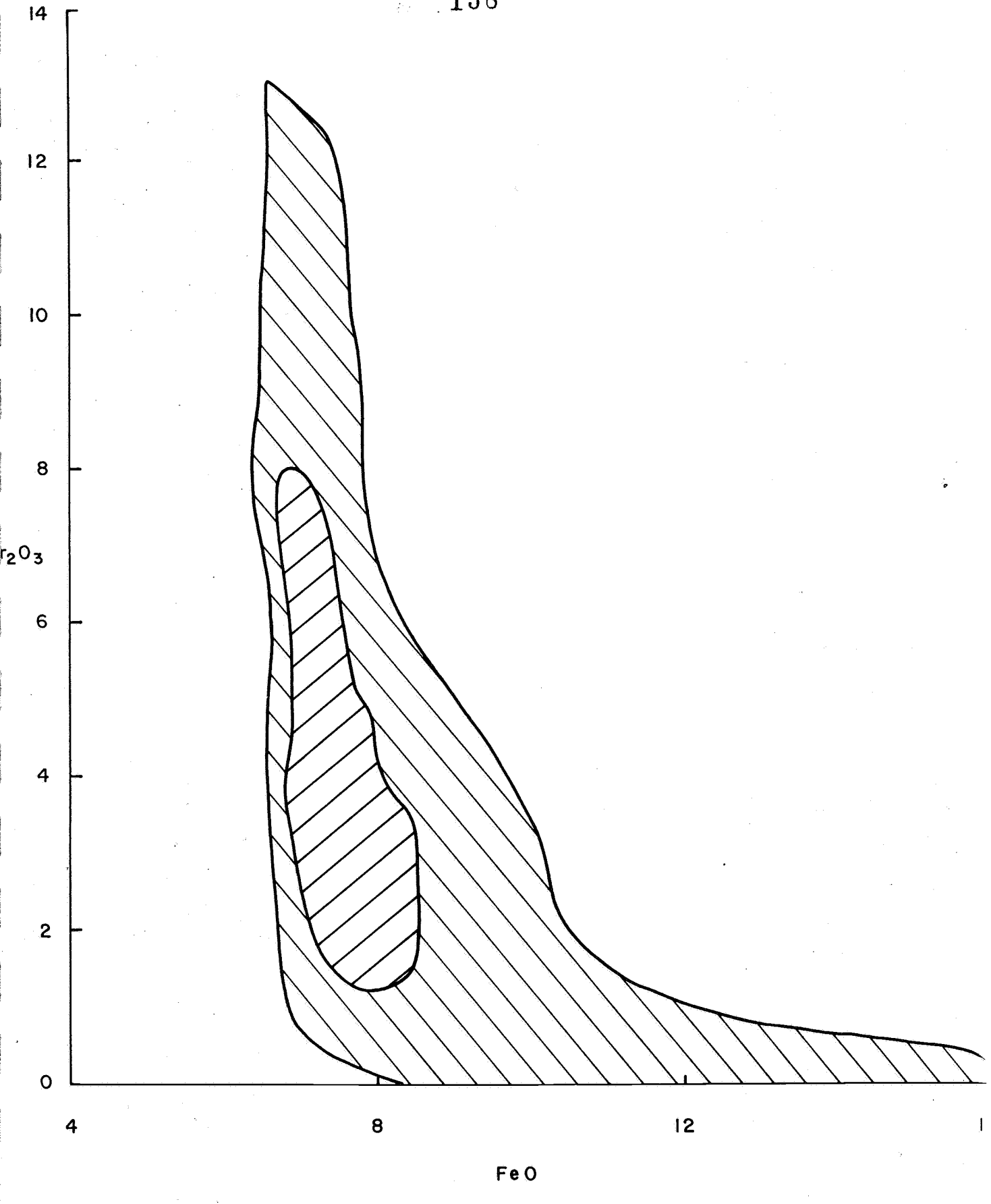

14
12
10
8
6
4
2
0
Fe_2O_3
4
8
12
FeO

Figure 8 Ternary plot for the ilmenites from the Group 3 kimberlites in the Orroroo Province.

Legend

A total of 710 data points were used to compile the plot. A few outliers to the main data are shown by crosses.

ORROROO ILMENITES

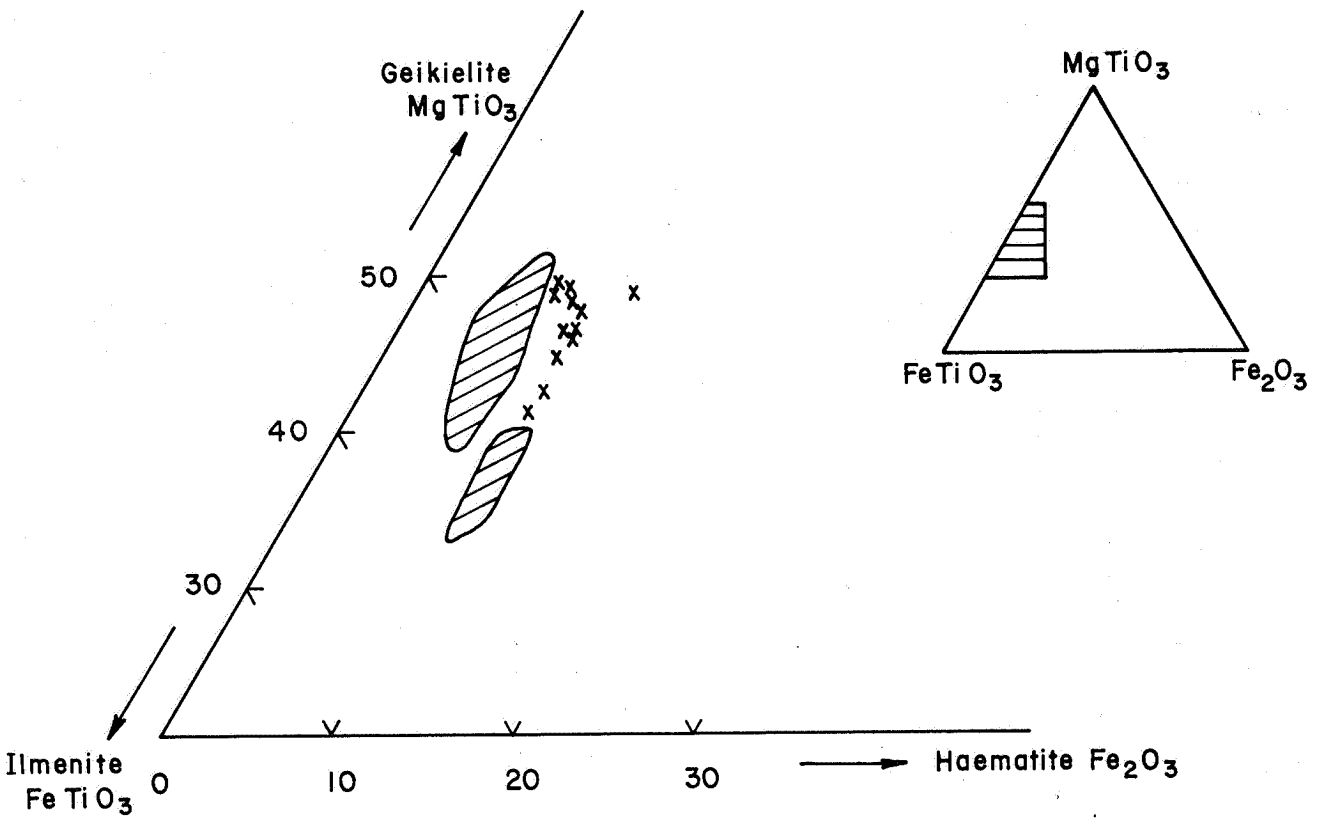


Figure 9 MgO versus TiO_2 wt% plot for ilmenites from the K5, K6 and K13 intrusions in the Orroroo Province.

Legend

The compositional fields for K5 and K6 include data for 100 and 89 grains respectively.

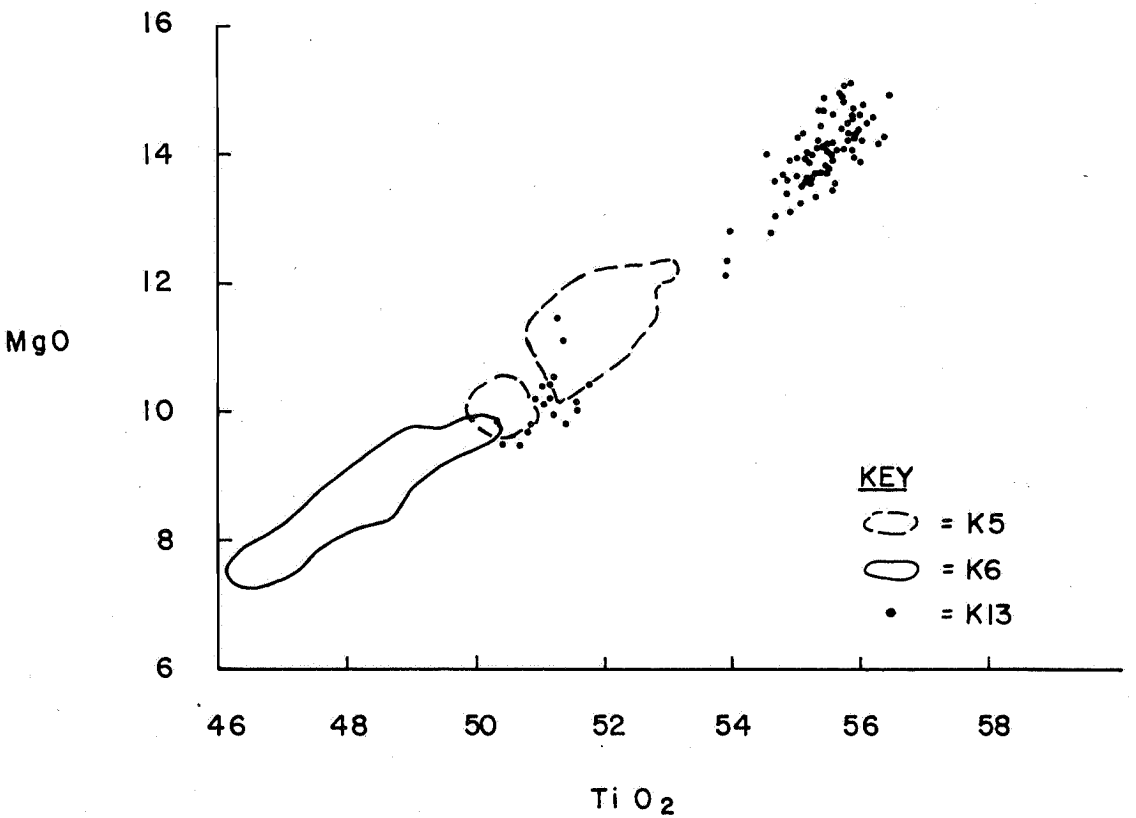

16
14
12
10
8
6
MgO
46
48
50
52
54
56
58
Ti O2
KEY
= K5
= K6
= K13

Figure 10 MgO versus Cr_2O_3 wt% for ilmenites from the K5, K6 and K13 intrusions within the Orroroo Province.

Legend

The compositional fields for K5 and K6 include data for 100 and 89 grains respectively.

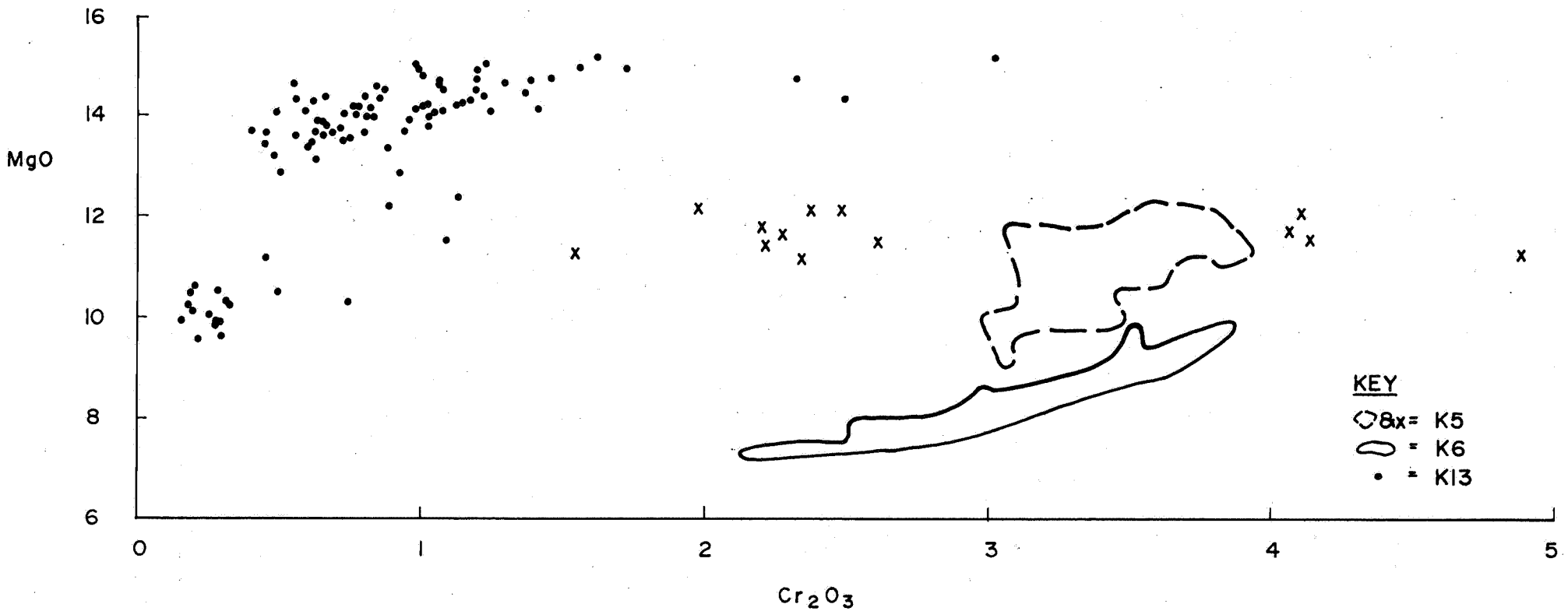

16
14
12
10
8
6
MgO
0
1
2
3
4
5
Cr_2O_3
KEY
8x = K5
= K6
• = K13

Table 1 **Modal analyses of sample K7900A from the core of intrusion K7**(expressed as percent)

Olivine	32.8
Phlogopite	27.2
Calcite	20.4
Serpentine	11.2
Perovskite	3.4
Oxide (opaque)	3.0
Clinopyroxene	≤1
Apatite	≤1

Table 2 **Analyses of olivine macrocrysts and phenocrysts from Orroroo**

Legend: 81-866 - centre of 6.5 mm grain; 81-869 - 100 microns from edge of 81-866; 81-868 - 50 microns from edge of 81-866; 81-872 - centre of 1.8 mm grain; 81-873 - edge of 81-872; 81-876 - centre of 1 mm subhedral crystal; 81-880 - intermediate between centre and edge of 81-876; 81-879 - 100 microns from edge of 81-876; 81-878 - 60 microns from edge of 81-876; 81-877 - 30 microns from edge of 81-876; 81-886 - centre of 1.8 mm subhedral crystal; 81-887 - edge of 81-886. ND = not detected

Crystal Type	MACROCRYST						PHENOCRYST						
Analysis Number	81-866	81-869	81-868	81-867	81-872	81-873	81-876	81-880	81-879	81-878	81-877	81-886	81-887
SiO_2	40.25	40.72	40.68	40.71	40.13	40.32	40.40	40.59	40.14	40.66	40.23	40.70	40.12
TiO_2	0.02	0.02	0.03	0.02	ND	0.01	0.01	0.02	0.02	0.03	0.04	ND	ND
Al_2O_3	0.02	0.01	0.01	0.02	0.03	0.04	0.02	0.02	0.01	0.02	0.02	0.02	0.02
Cr_2O_3	ND	ND	ND	ND	ND	0.02	ND	ND	0.04	0.02	ND	ND	0.01
FeO	7.65	7.73	8.41	9.00	8.83	9.27	7.71	7.98	8.90	8.90	8.83	8.39	8.62
MnO	0.09	0.09	0.10	0.11	0.10	0.12	0.09	0.10	0.14	0.14	0.14	0.11	0.09
NiO	0.33	0.37	0.32	0.32	0.34	0.36	0.34	0.35	0.36	0.28	0.25	0.36	0.38
MgO	51.66	51.55	50.82	49.85	50.40	49.99	51.38	51.21	50.81	50.78	50.69	51.01	50.44
CaO	0.03	0.04	0.04	0.07	0.06	0.08	0.03	0.04	0.09	0.11	0.13	0.05	0.08
TOTAL	100.05	100.53	100.41	100.10	99.89	100.21	99.98	100.31	100.51	100.94	100.33	100.64	99.76
Formula													
O	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Si	0.980	0.986	0.989	0.995	0.983	0.986	0.984	0.986	0.979	0.986	0.981	0.987	0.984
Ti	–	–	0.001	–	–	–	–	–	–	0.001	0.001	–	–
Al	0.001	–	–	0.001	0.001	0.001	0.001	0.001	–	0.001	0.001	0.001	0.001
Cr	–	–	–	–	–	–	–	–	0.001	–	–	–	–
Fe	0.156	0.157	0.171	0.184	0.181	0.190	0.157	0.162	0.181	0.180	0.180	0.170	0.177
Mn	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.002
Ni	0.006	0.007	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.005	0.005	0.007	0.007
Mg	1.874	1.860	1.841	1.815	1.841	1.823	1.865	1.854	1.847	1.835	1.843	1.844	1.843
Ca	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.003	0.003	0.001	0.002
Atomic Ratio Mg/(Mg+Fe)	0.923	0.922	0.915	0.908	0.910	0.906	0.922	0.920	0.911	0.911	0.911	0.916	0.912

Table 3: **Chemistry of olivine and its Pseudomorphs from Orroroo**

Legend: 82-25 Fresh remnant at centre of 2.7 mm anhedral olivine macrocryst; 82-26 - 25 microns from original edge of 81-25, again a fresh remnant; 82-27 - pale green serpentine after olivine, defocussed beam, 82-28 - an early alteration crack within the olivine pseudomorph which is now composed of serpentine and some brown material, defocussed beam; 82-29 - secondary material with very deep orange-brown colour, defocussed beam; 81-909 - an olivine pseudomorph containing abundant opaque material; 81-911 - virtually opaque 0.23 mm subhedral olivine pseudomorph ; - 82-53 - opaque area of 0.31 mm subhedral olivine pseudomorph, defocussed beam; 82-54 - other half of same olivine pseudomorph as 82-53 where composed of pale green serpentine with only a slight dusting of opaque material, defocussed beam; 82-55 - opaque, 0.23 mm,euhedral olivine pseudomorph, defocussed beam. ND = not detected

Sample Number	K7900A				K7900B					
Mineral	Olivine		Serpentine		Clay	Serpentine				
Analysis Number	82-25	82-26	82-27	82-28	82-29	81-909	81-911	82-53	82-54	82-55
SiO_2	40.92	40.84	38.82	39.15	47.58	40.40	39.27	39.76	41.71	39.66
TiO_2	ND	0.01	ND	ND	ND	0.01	0.03	0.01	0.02	0.01
Al_2O_3	0.01	0.02	0.08	0.01	0.01	0.26	0.31	0.29	0.14	0.30
Cr_2O_3	ND	ND	ND	ND	ND	ND	0.04	0.01	0.01	0.04
FeO	8.08	8.89	7.70	6.16	7.62	8.26	9.19	8.63	6.83	8.92
MnO	0.11	0.18	0.08	0.03	0.01	0.19	0.22	0.20	0.16	0.20
NiO	0.42	0.22	0.58	0.33	0.38	0.41	0.50	0.45	0.40	0.59
MgO	51.09	50.54	34.88	37.46	24.13	34.12	34.18	33.31	33.07	33.17
CaO	ND	0.17	0.08	0.04	0.24	0.11	0.11	0.10	0.11	0.09
Na_2O	0.01	ND	0.03	0.01	0.07	0.02	0.05	0.01	0.01	0.03
K_2O	ND	0.02	0.02	0.01	0.25	0.02	0.04	0.03	0.01	0.04
TOTAL	100.64	100.89	82.27	83.20	80.29	83.80	83.94	82.80	82.47	83.05
Atomic ratio										
Mg/(Mg+Fe)	0.919	0.910	0.890	0.916	0.850	0.880	0.869	0.873	0.896	0.869

Table 4 **Groundmass phlogopite, perovskite and apatite analyses from Orroroo**

Legend: 81-904 - centre of 0.35 mm euhedral lath; 81-905 - edge of normally pleochoic core of 81-904; 82-10 - centre of 0.58 mm euhedral lath; 82-11 - edge of core 82-10; 82-14 - centre of 0.47 mm euhedral lath; 82-15 - edge of 82-14; 82-22 - centre of 0.47 mm euhedral phlogopite; 82-23 - edge of core 82-22; 81-907 - centre of core; 82-18 - narrow core of 0.16 mm euhedral lath; 81-906 - centre of 60 micron mantle overgrowing core of 81-907; 82-19 - relatively wide mantle of core 82-18; 81-895 - 0.1mm subhedral crystal; 81-896 - 0.09 mm subhedral crystal; 81-897 - 0.12 mm mantle of core 82-18; 81-895 - 0.1 mm subhedral crystal; 81-896 - 0.09 mm subhedral crystal; 81-897 - 0.12 mm euhedral crystal; 81-898 - edge of 81-897; 82-4 - 0.07 mm lath; 82-7 - 0.10 mm subhedral lath. ND = not detected.

	Phlogopite Cores										Phlogopite Mantles		Perovskite				Apatite	
Analysis Number	81-904	81-905	82-10	82-11	82-14	82-15	82-22	82-23	81-907	82-18	81-906	82-19	81-895	81-896	81-897	81-898	82-4	82-7
SiO_2	36.19	38.46	37.18	38.70	38.04	37.47	36.83	38.75	38.55	38.23	39.79	40.10	ND	ND	ND	ND	0.69	0.89
TiO_2	2.19	1.21	2.07	1.01	1.91	0.85	2.01	1.07	1.92	2.06	0.05	0.02	52.75	54.60	53.75	53.82	ND	ND
Al_2O_3	14.99	13.18	15.40	14.65	14.43	15.03	14.88	14.33	13.76	14.04	0.54	0.38	0.57	0.30	0.33	0.41	ND	ND
Cr_2O_3	0.05	ND	0.03	ND	0.03	ND	0.03	ND	0.06	0.11	ND	ND	0.08	0.06	0.06	0.05	ND	ND
FeO	4.69	4.13	4.42	2.98	4.49	2.75	4.50	3.13	4.15	4.17	15.13	15.07	2.71	1.81	2.08	2.28	0.18	0.13
MnO	0.06	0.06	0.05	0.05	0.07	0.05	0.06	0.06	0.05	0.05	0.34	0.43	ND	ND	ND	ND	ND	0.01
NiO	0.03	0.03	0.02	0.01	0.03	ND	0.03	0.02	0.02	0.02	0.03	0.01	0.01	ND	0.02	0.03	0.02	ND
MgO	23.94	25.98	23.44	25.49	24.02	25.55	23.96	25.55	24.68	23.80	26.76	26.29	0.06	0.08	0.08	0.04	0.09	0.08
CaO	0.04	0.03	0.01	0.03	ND	ND	0.02	0.07	0.02	0.05	0.06	0.09	38.38	37.24	36.99	38.31	56.41	56.15
Na_2O	0.12	0.10	0.11	0.06	0.10	0.07	0.11	0.06	0.08	0.09	0.06	0.06	0.25	0.45	0.51	0.29	0.05	0.07
K_2O	8.39	9.68	9.27	9.67	9.28	9.07	9.13	9.89	9.86	10.20	9.20	9.80	0.03	0.03	0.01	0.02	0.05	0.04
BaO	3.20	1.02	3.01	2.08	1.96	3.85	3.04	1.90	0.78	1.53	ND	0.09	0.16	0.17	0.17	ND	0.02	ND
SrO	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.22	0.13	0.17	0.21	0.68	0.58
ZrO	0.12	ND	0.16	0.01	0.19	0.11	0.16	0.04	0.03	0.06	0.05	ND	0.41	0.13	0.19	0.23	ND	ND
P_2O_5	0.04	0.05	ND	0.02	0.02	ND	0.01	ND	0.02	0.05	0.01	0.01	0.02	0.05	0.07	0.06	38.97	38.53
F	1.14	1.05	1.39	2.11	1.53	2.23	1.52	1.70	0.86	1.56	0.28	0.16	0.38	ND	0.33	ND	3.62	3.29
F=O total	94.71	94.54	95.97	95.98	95.46	96.09	95.65	95.86	94.48	95.36	92.18	92.44	-	-	-	-	99.24	98.40
Total	95.19	94.98	96.56	96.87	96.10	97.03	96.29	96.57	94.84	96.02	92.30	92.51	96.03	95.05	94.76	95.92	100.76	99.79
Formula																		
O	22.000	22.000	22.000	22.000	22.000	22.000	22.000	22.000	22.000	22.000	22.000	22.000	24.000	24.000	24.000	24.000	24.000	24.000
Si	5.350	5.599	5.427	5.584	5.540	5.471	5.408	5.592	5.599	5.573	6.274	6.321	-	-	-	-	0.096	0.128
Ti	0.242	0.132	0.227	0.110	0.209	0.092	0.224	0.117	0.209	0.227	0.007	0.004	7.636	7.876	7.824	7.736	-	-
Al	2.611	2.262	2.651	2.489	2.475	2.589	2.574	2.438	2.354	2.413	0.099	0.069	0.128	0.072	0.076	0.092	-	-
Cr	0.007	-	0.004	-	0.004	-	0.004	-	0.007	0.011	-	-	0.012	0.008	0.008	0.008	-	-
Fe	0.579	0.502	0.539	0.359	0.546	0.337	0.554	0.378	0.502	0.510	1.995	1.987	0.436	0.292	0.336	0.364	0.020	0.016
Mn	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.044	0.059	-	-	-	-	-	-
Ni	0.004	0.004	0.004	-	0.004	-	0.004	0.004	0.004	0.004	0.004	-	-	-	0.004	0.004	0.004	-
Mg	5.273	5.636	5.100	5.482	5.214	5.562	5.243	5.496	5.342	5.170	6.288	6.178	0.016	0.024	0.024	0.012	0.020	0.016
Ca	0.007	0.004	-	0.004	-	-	0.004	0.011	0.004	0.007	0.011	0.015	7.916	7.656	7.672	7.848	8.580	8.600
Na	0.003	0.029	0.029	0.018	0.029	0.018	0.033	0.018	0.022	0.026	0.018	0.018	0.092	0.168	0.192	0.108	0.012	0.020
K	1.580	1.797	1.727	1.778	1.723	1.690	1.709	1.822	1.826	1.896	1.852	1.973	0.008	0.008	0.004	0.004	0.008	0.008
Ba	0.187	0.059	0.172	0.117	0.110	0.220	0.176	0.106	0.044	0.088	-	0.007	0.012	0.012	0.012	0.012	-	-
Sr	-	-	-	-	-	-	-	-	-	-	-	-	0.048	0.016	0.020	0.024	0.056	0.048
Zr	0.011	-	0.015	-	0.014	0.007	0.015	0.004	0.004	0.004	0.004	-	0.044	0.012	0.020	0.024	-	-
P	0.007	0.007	-	0.004	0.004	-	-	-	0.004	0.007	-	-	0.004	0.016	0.016	0.012	6.044	6.020
Atomic ratio																		
Mg/Mg+Fe	0.901	0.918	0.904	0.938	0.905	0.943	0.904	0.936	0.914	0.910	0.759	0.757	-	-	-	-	-	-

Table 5 **Analyses of groundmass spinel and serpentine from Orroroo**

Legend: 82-39 - 0.16 mm subhedral, brown, translucent spinel different in appearance from other groundmass spinels. Fe_2O_3 = 2.88, FeO = 8.48, Total = 99.22; 82-40 - centre of 30 micron, equant, euhedral grain. Fe_2O_3 = 41.13, FeO = 20.65, Total = 97.67; 82-41 - centre of 25 micron anhedral grain. Fe_2O_3 = 7.05, FeO = 13.28, Total = 99.58; 82-42 - centre of euhedral equant grain. Fe_2O_3 = 7.25, FeO = 15.89, Total = 99.94; 82-43 - centre of 100 micron irregular oxide. Fe_2O_3 = 63.76, FeO = 27.86, Total = 98.87; 82-44 - 10 microns from edge of 82-43. Fe_2O_3 = 64.69, FeO = 24.65, Total = 98.76; 82-46 - centre of 45 micron euhedral crystal Fe_2O_3 = 6.74, FeO = 14.39, Total = 98.84; 82-47 - centre of 40 micron subhedral grain. Fe_2O_3 = 8.55, FeO = 13.72, Total = 99.38; 82-24 - serpentine base to groundmass using defocussed beam; 82-37 - serpentine base to groundmass in area where olivines are relatively fresh; 82-38 - similar to 82-37 but different area. ND = not detected.

Mineral	Spinel								Serpentine		
Analysis Number	82-39	82-40	82-41	82-42	82-43	82-44	82-46	82-47	82-24	82-37	82-38
SiO_2	ND	ND	0.01	ND	ND	ND	ND	ND	38.61	35.33	37.61
TiO_2	0.09	4.45	3.26	3.78	1.82	1.80	3.46	3.50	0.03	0.06	0.03
Al_2O_3	42.82	4.44	9.25	12.50	1.95	1.93	11.62	11.70	3.39	8.37	5.38
Cr_2O_3	25.11	16.89	51.45	46.12	0.29	0.30	47.89	46.62	ND	ND	ND
FeO	11.09	57.66	19.62	22.41	85.23	82.86	20.45	21.41	7.89	9.64	7.96
MnO	0.18	1.16	0.42	0.69	0.31	0.37	0.53	0.49	0.23	0.27	0.24
NiO	0.22	0.07	0.22	0.20	0.06	0.07	0.17	0.14	0.03	0.01	0.06
MgO	19.41	8.63	14.31	13.07	2.57	4.50	13.87	14.35	33.86	31.11	33.46
CaO	0.01	0.24	0.31	0.43	0.12	0.39	0.15	0.27	0.18	0.26	0.20
Na_2O	ND	ND	ND	ND	ND	ND	ND	ND	0.09	0.05	0.03
K_2O	ND	0.01	0.02	0.01	0.13	0.06	0.02	0.04	0.22	0.94	0.24
TOTAL	98.93	93.55	98.87	99.21	92.48	92.28	98.16	98.52	84.53	86.04	85.20
Atomic Ratio Mg/(Mg+Fe)	-	-	-	-	-	-	-	-	0.884	0.852	0.882

Table 6: **Groundmass clinopyroxene from Orroroo**

Legend: 82-2 - 0.04 mm anhedral groundmass grain; 82-3 - 76 micron grain; 82-5 - 16 micron, equant, euhedral basal section; 82-6 - 0.23 mm anhedral lath. 82-33 - crystal of clinopyroxene less than 50 microns in size that occurs within the alteration halo around a kimberlitized xenolith; 82-35 - 50 micron equant, subhedral crystal in segregation. ND = not detected.

Mineral	Clinopyroxene					
Analysis Number	82-2	82-3	82-5	82-6	82-33	82-35
SiO_2	54.13	53.78	54.01	54.39	53.03	54.39
TiO_2	0.40	0.57	0.54	0.22	0.69	0.52
Al_2O_3	0.01	0.01	0.02	0.01	1.08	ND
Cr_2O_3	ND	ND	ND	ND	ND	ND
FeO	2.15	3.06	2.10	1.64	3.05	2.97
MnO	0.14	0.21	0.14	0.13	0.09	0.19
NiO	0.01	0.01	ND	0.01	ND	ND
MgO	17.62	16.70	17.46	17.78	16.89	17.00
CaO	25.55	25.11	25.32	25.58	25.27	25.59
Na_2O	0.15	0.27	0.25	0.14	0.24	0.19
K_2O	ND	ND	ND	0.01	ND	0.01
TOTAL	100.16	99.72	99.84	99.91	100.34	100.86
Formula						
O	6.000	6.000	6.000	6.000	6.000	6.000
Si	1.973	1.973	1.974	1.982	1.939	1.973
Ti	0.011	0.016	0.015	0.006	0.019	0.011
Al	-	-	0.001	-	0.047	-
Cr	-	-	-	-	-	-
Fe	0.066	0.094	0.064	0.050	0.093	0.090
Mn	0.004	0.007	0.004	0.004	0.003	0.006
Ni	-	-	-	-	-	-
Mg	0.957	0.913	0.951	0.966	0.920	0.921
Ca	0.998	.987	0.992	0.999	0.990	0.996
Na	0.011	0.019	0.018	0.010	0.017	0.013
K	-	-	-	-	-	-
Atomic ratio						
Mg/(Mg+Fe)	0.935	0.907	0.937	0.951	0.908	0.911

Table 7: **Selected analyses of garnets recovered from heavy mineral concentrates of different kimberlites within the Orroroo Province.**
Legend: Most of the analyses are for single grains. Analysis 6 from K6 represents an average of 81 grains.

Kimberlite Group	1								2	3							
Kimberlite Number	K1		K2		K3		K9		K6	K4		K7		K12		K13	
Analysis Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
SiO_2	42.00	40.01	41.21	40.22	41.60	41.39	41.41	41.61	41.56	41.48	40.53	41.57	41.05	40.90	40.57	41.52	40.79
TiO_2	0.21	0.27	1.12	0.21	0.36	0.36	0.75	0.17	0.09	0.50	0.07	0.02	0.40	0.89	0.13	0.28	0.69
Al_2O_3	22.66	16.02	20.74	22.99	21.39	19.77	22.19	20.93	22.05	22.29	14.04	21.31	20.64	22.43	19.34	20.65	17.78
Cr_2O_3	1.78	9.95	1.92	0.19	2.73	4.71	1.32	3.80	2.71	0.88	12.45	4.30	3.60	0.43	6.37	3.89	7.50
FeO	8.54	6.86	10.02	14.82	7.82	7.23	10.62	7.78	8.13	10.10	6.69	7.71	8.00	11.28	7.41	7.25	7.08
MnO	0.35	0.35	0.32	0.30	0.32	0.31	0.35	0.38	0.47	0.36	0.33	0.41	0.30	0.37	0.41	0.34	0.35
MgO	20.68	18.53	19.93	12.54	21.22	19.54	18.75	19.23	19.64	20.25	19.07	19.13	20.28	19.27	18.82	20.69	19.59
CaO	4.40	7.15	4.99	9.39	4.75	5.46	4.81	5.58	5.73	4.53	6.19	5.98	5.41	4.90	6.69	5.13	5.59
TOTAL	100.62	99.14	100.25	100.66	100.19	98.77	100.20	99.48	100.38	100.39	99.37	100.43	99.68	100.47	99.74	99.75	99.37

Table 8: **A summary of the compositions of some of the garnets recovered from the Orroroo kimberlites in terms of the statistical classification of Dawson and Stephens (1975, 1976)**

Legend: The first column refers to the cluster groups of Dawson and Stephens (1975, 1976). Cluster 1 = titanian pyrope, 2 = high titanium pyrope, 3 = calcic pyrope-almandine, 6 = pyrope-grossular-almandine, 9 = chrome pyrope, 11 = titanian uvarovite-pyrope, 12 = knorringitic uvarovite-pyrope. The proportions of garnets in any group is expressed as a percentage of the total number of grains classified which is given in the bottom row.

Kimberlite Group	1				3			
Kimberlite Number	K1	K2	K3	K9	K4	K7	K12	K13
1	20.0	41.0	32.1	15.0	14.5	32.6	25.7	18.5
2	6.6	2.8	4.5	-	5.8	4.1	4.2	0.7
3	7.6	0.9	3.6	-	-	-	0.3	-
6	-	-	0.9	-	-	-	-	-
9	64.8	53.3	58.0	85.0	70.9	62.2	62.0	76.9
11	0.9	1.9	0.9	-	5.8	1.0	7.8	3.8
12	-	-	-	-	3.0	-	-	-
No of grains	105	107	112	100	103	98	334	286

Table 9: **Selected analyses of ilmenites recovered from heavy mineral concentrates of different kimberlites in the Orroroo Province.**
ND = not detected. All analyses are of single grains.

Kimberlite Group	2						3											
Kimberlite Number	K5			K6			K4			K7			K12(a)			K13		
Analysis Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SiO_2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TiO_2	50.90	51.81	51.90	47.41	48.13	48.48	55.12	50.51	54.65	55.23	52.14	51.13	55.43	50.35	56.06	55.43	51.12	52.36
Al_2O_3	0.04	0.07	0.22	ND	0.02	0.02	0.56	0.60	0.64	0.58	0.07	0.67	0.54	0.58	0.64	0.60	0.66	0.75
Cr_2O_3	3.48	3.53	2.48	2.87	3.24	3.19	0.65	0.23	2.40	0.87	3.53	0.28	0.41	0.45	1.39	1.06	0.33	5.32
FeO	33.60	32.32	32.80	39.94	38.56	38.97	29.85	37.45	26.85	28.07	32.64	37.02	29.71	37.17	27.02	29.14	36.90	27.38
MnO	0.31	0.31	0.28	0.39	0.41	0.40	0.24	0.21	0.28	0.24	0.30	0.21	0.30	0.23	0.24	0.27	0.21	0.24
MgO	10.60	11.80	12.13	8.04	8.79	8.27	13.58	9.85	14.82	14.55	11.43	9.88	13.73	9.55	15.54	14.06	10.05	13.70
CaO	ND	0.03	0.04	0.03	0.03	0.02	0.05	0.02	0.04	0.04	0.02	0.03	0.05	0.04	0.05	0.05	0.03	0.04
TOTAL	98.93	99.87	99.85	98.68	99.18	99.35	100.05	98.87	99.68	99.58	100.13	99.22	100.17	99.37	100.94	100.61	99.30	99.79

Table 10: Selected analyses of chrome spinels recovered from heavy mineral concentrates of different kimberlites in the Orroroo Province

Legend: Most of the analyses are for single grains. Analysis 7 gives the average of 25 analyses and analysis 18 is the average of 33 grains. ND = not detected.

Kimberlite Group	1																	2
Kimberlite Number	K2						K3	K9										K6
Analysis Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SiO_2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TiO_2	0.23	3.97	0.11	0.28	0.55	3.97	1.57	4.30	0.48	0.36	0.27	0.14	1.83	0.23	0.41	0.65	3.56	0.36
Al_2O_3	5.80	5.52	15.71	5.62	20.38	5.52	8.50	6.18	6.44	6.00	11.36	6.16	5.63	6.60	24.60	8.31	6.06	25.07
Cr_2O_3	62.40	54.11	53.64	63.36	47.30	54.11	56.50	51.50	63.62	57.70	56.89	63.99	60.93	62.44	38.56	59.11	57.26	33.57
FeO	16.50	21.65	14.64	17.46	14.68	21.65	19.00	24.76	15.80	23.25	16.79	16.50	19.61	16.44	20.13	18.78	19.28	24.36
MnO	0.37	0.38	0.33	0.37	0.28	0.38	0.34	0.35	0.34	0.40	0.34	0.34	0.34	0.34	0.27	0.31	0.33	0.29
MgO	12.82	12.87	13.34	13.15	14.82	12.87	10.95	12.91	12.54	11.97	13.51	10.60	9.63	12.66	14.39	11.32	10.92	13.35
CaO	0.03	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.01
TOTAL	98.15	98.51	97.79	100.25	98.02	98.51	96.88	100.01	99.23	99.70	99.18	97.74	97.99	98.72	98.37	98.49	97.43	97.01

Table 11: **Selected analyses of chrome diopsides recovered from heavy mineral concentrates of different kimberlites in the Orroroo Province.**
Legend: Analysis 1 is the average of 13 grains and analysis 2 is the average of 20 grains.

Kimberlite Group	1	2
Kimberlite Number	K2	K6
SiO_2	54.53	54.01
TiO_2	0.20	0.13
Al_2O_3	1.41	0.57
Cr_2O_3	1.95	1.82
FeO	2.52	2.88
MnO	0.09	0.11
MgO	17.86	18.00
CaO	20.10	21.94
TOTAL	98.66	99.46

Table 12: **Selected Analyses of minerals from micro-xenoliths found in heavy mineral concentrates of the K5 kimberlite in the Orroroo Province**
ND = not detected

Mineral	Garnet			Spinel		Clinopyroxene
Analysis Number	1	2	3	4	5	6
SiO_2	42.03	41.06	42.08	ND	ND	54.11
TiO_2	0.09	0.01	0.01	0.27	0.27	0.04
Al_2O_3	22.71	23.73	22.56	21.05	19.91	1.82
Cr_2O_3	1.21	1.03	1.76	41.59	42.64	0.62
FeO	8.69	8.71	8.75	21.44	22.73	2.02
MnO	0.35	0.47	0.46	0.31	0.39	0.08
NiO	-	-	-	ND	ND	-
MgO	19.25	19.81	19.01	13.41	12.23	17.32
CaO	4.94	5.26	5.54	0.02	0.01	23.24
Na_2O	ND	ND	ND	ND	ND	0.72
K_2O	-	-	-	ND	ND	-
TOTAL	99.27	100.07	100.16	98.09	98.19	99.96

Table 13: Diamond Characteristics from Orroroo

a) Crystal Habits -

Growth forms

octahedra	13 :	octahedral macle	8 :	triangular macle	8 :
octahedral aggregates	5 :	macle aggregates	5 .		

Resorption forms

dodecahedra	8 :	flattened dodecahedra	1 :	dodecahedral macle	1 :
dodecahedral aggregate	1 .				

Irregular crystals

irregular macle	7 :	irregular aggregate	8 :	irregulars	75 .

b) Colour -

Colourless	70 ;	brown	69 ;	grey	1 .

Table 14: **Analyses of inclusions in Orroroo diamonds and representative analyses of similar inclusions from southern African diamonds**

ND = not detected, RV = Roberts Victor, P = Premier, K = Koffiefontein, + K262B = co-exists with a magnesio-wustite (see text), - = not determined

	ORRORO			SOUTHERN AFRICA				
Mineral	Enstatite	Magnesio-wustites		Enstatites			Magnesio-wustites	
Sample	ORR3	ORR4A	ORR6A	RV9	P23	K262B+	K30	K33
Analysis Number	1	2	3	4	5	6	7	8
SiO_2	57.44	ND	ND	57.80	57.60	57.10	0.08	0.09
TiO_2	ND	ND	ND	0.04	ND	0.03	ND	ND
Al_2O_3	0.50	ND	0.01	0.39	0.99	1.16	ND	0.07
Cr_2O_3	0.25	0.23	0.16	0.31	0.53	0.36	0.49	0.52
FeO	4.42	22.92	21.13	3.40	4.40	3.33	21.60	20.50
MnO	0.11	0.16	0.15	0.07	0.06	0.11	0.15	0.16
NiO	0.13	1.10	1.20	-	-	-	-	-
MgO	36.31	76.75	77.70	37.20	35.40	36.90	77.30	76.60
CaO	0.73	ND	ND	0.26	0.87	0.12	ND	0.05
Na_2O	0.04	ND	ND	0.14	0.10	ND	0.29	0.25
K_2O	ND	ND	ND	0.06	ND	ND	ND	0.06
TOTAL	99.93	101.16	100.35	99.67	99.95	99.11	99.91	98.30
Si	1.971	-	-	1.976	1.974	1.961	0.002	0.003
Ti	-	-	-	0.001	-	0.001	-	-
Al	0.020	-	0.001	0.016	0.040	0.047	-	0.002
Cr	0.007	0.005	0.004	0.008	0.014	0.010	0.012	0.012
Fe	0.127	0.568	0.532	0.097	0.126	0.096	0.537	0.517
Mn	0.003	0.004	0.004	0.002	0.002	0.003	0.004	0.004
Ni	0.004	0.026	0.029	-	-	-	-	-
Mg	1.857	3.393	3.431	1.895	1.808	1.888	3.427	3.441
Ca	0.027	-	-	0.010	0.032	0.004	-	0.002
Na	0.003	0.001	0.001	0.009	0.007	-	0.017	0.015
K	-	-	-	0.003	-	-	-	0.002
TOTAL	4.019	3.997	4.002	4.017	4.003	4.010	3.999	3.998
Mg/(Mg+Fe)	0.936	0.857	0.866	0.951	0.935	0.952	0.864	0.869
Fe	0.063			0.049	0.064	0.048		
Mg	0.923			0.947	0.912	0.950		
Ca	0.013			0.005	0.016	0.002		

Table 15: **Whole-rock geochemistry for different sections of the drill core from the Orroroo kimberlite K7**
(Dash = not determined; Fe_2O_3 = total iron)

Sample Number	1	2	3	4	8	9	10	11	12	13
SiO_2	30.16	29.64	29.98	30.80	30.38	36.24	31.00	30.40	29.62	27.70
TiO_2	1.39	1.21	1.38	1.41	1.34	0.81	1.33	1.49	1.38	1.08
Al_2O_3	3.04	2.53	2.87	3.07	3.06	1.96	3.05	3.28	2.89	3.46
Cr_2O_3	-	0.23	0.27	0.25	0.24	-	0.24	-	-	-
Fe_2O_3	10.21	8.35	9.02	9.43	8.67	8.84	8.90	9.21	9.79	7.20
MnO	0.19	0.14	0.17	0.15	0.16	0.13	0.15	0.17	0.16	0.13
MgO	25.47	25.45	26.04	25.86	25.29	31.27	23.99	22.86	23.39	24.26
CaO	10.98	10.47	10.36	10.09	10.88	6.91	11.43	12.54	12.38	9.90
Na_2O	-	-	0.08	0.08	-	-	0.05	-	-	-
K_2O	1.21	1.13	1.36	1.58	1.72	1.12	1.55	1.52	1.27	1.13
P_2O_5	0.74	0.65	0.62	0.74	0.67	0.33	0.63	0.93	0.75	0.86
LOI	15.27	16.16	14.65	14.43	16.34	11.46	16.33	16.58	17.94	20.24
TOTAL	98.66	95.96	96.80	97.89	98.75	99.07	98.65	98.98	99.57	95.96
CO_2	-	-	7.18	6.84	-	-	7.86	-	-	-

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

MESH SIZE	65 m BY 65 m
IGRF REMOVED	10000nT DATUM ADDED
CONTOUR INTERVAL	2.5 nT

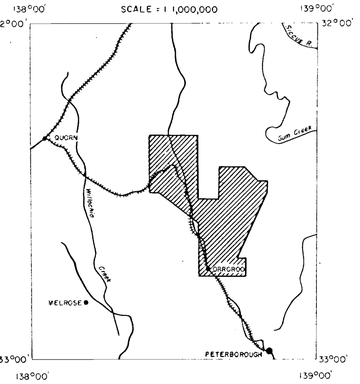
SCALE = 1:20,000

SHEET INDEX

	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP

SCALE = 1:1,000,000



3891-17

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AIRBORNE GEOPHYSICAL SURVEY

ORRORROO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 1 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS.	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT - OCT., 1979	GEOTERREX JOB 87-218

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

MESH SIZE	65m BY 65m
IGRF REMOVED	10000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

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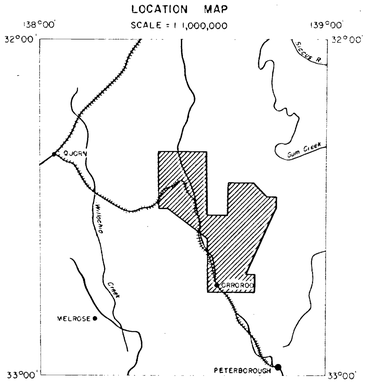
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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AIRBORNE GEOPHYSICAL SURVEY		
ORROROO AREA SOUTH AUSTRALIA		ISOMAGNETIC CONTOUR MAP
SHEET 2 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT / ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT-OCT, 1979 / GEOTERREX JOB 87-218

COOMATTO CREEK

9051

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

MESH SIZE	65m BY 65m
IGRF REMOVED	10000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

N

SCALE = 1:20,000

SHEET INDEX

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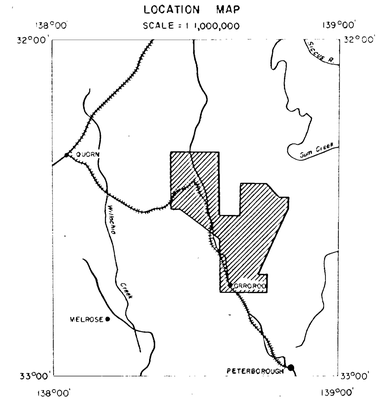
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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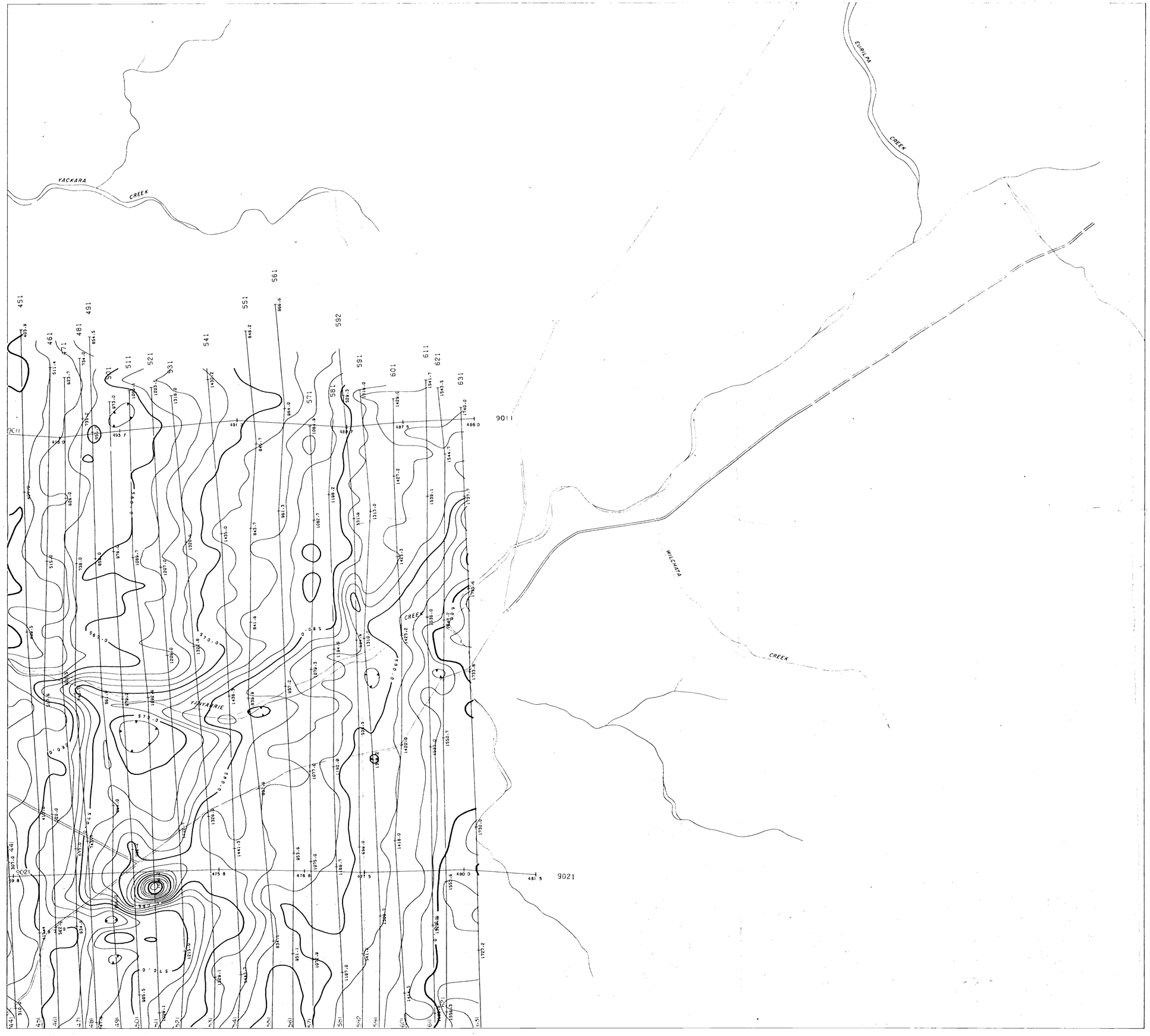
ORRORO0 AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 3 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT-OCT., 1979	GEOTERREX JOB 87-28



SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.3 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

MESH SIZE	65m BY 65m
IGRF REMOVED	10000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

N

SCALE = 1:20,000

SHEET INDEX

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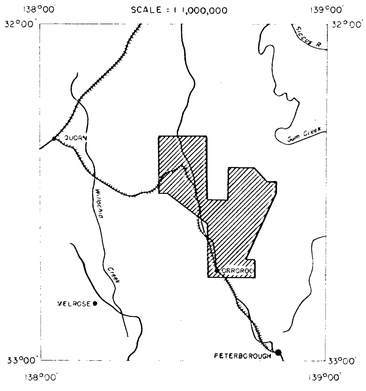
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE : 1 1,000,000



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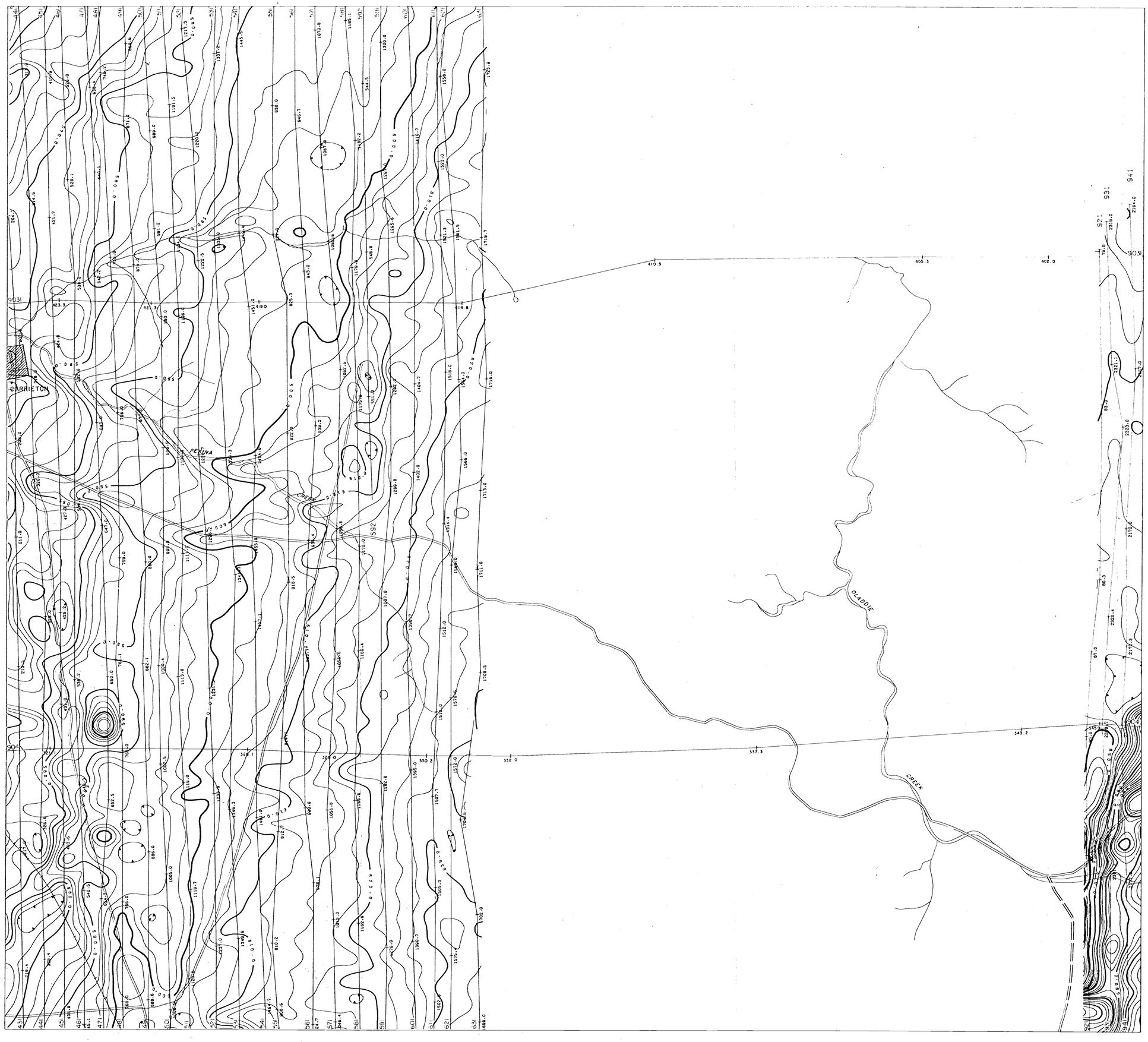
ORRORROO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 4 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT - OCT, 1979	GEOTERREX JOB 87-218



SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RCP
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

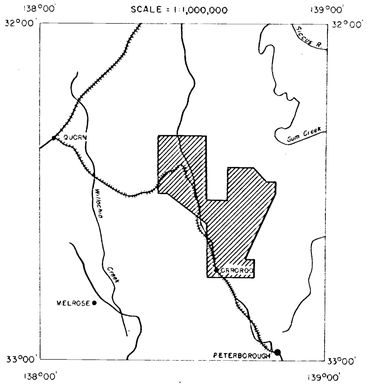
MESH SIZE	65 m BY 65 m
IGRF REMOVED	1000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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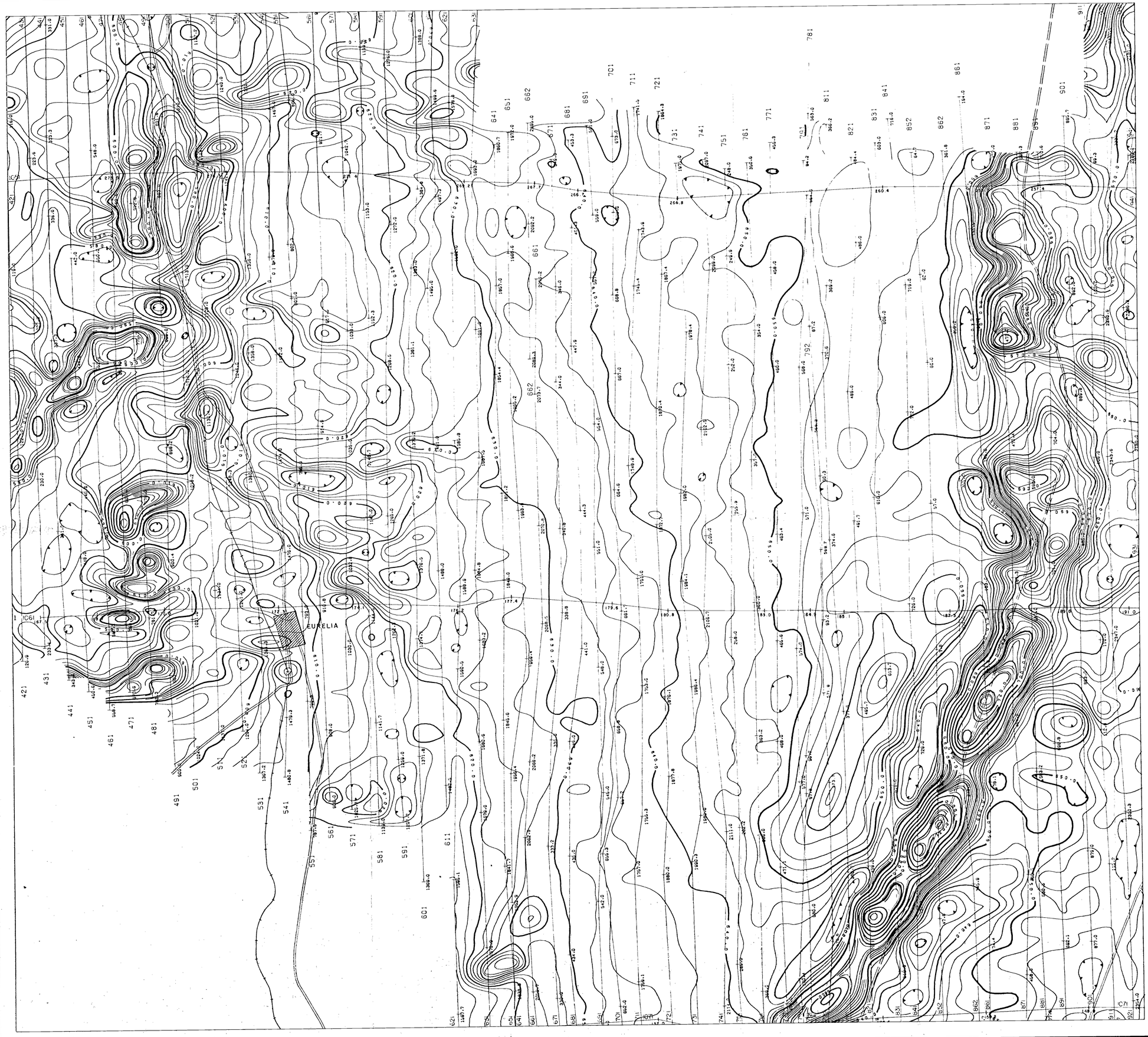
STOCKDALE PROSPECTING LIMITED

AIRBORNE GEOPHYSICAL SURVEY

ORRORROO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 5 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS.	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT - OCT., 1979	GEOTERREX JOB 87-28



SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RO9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

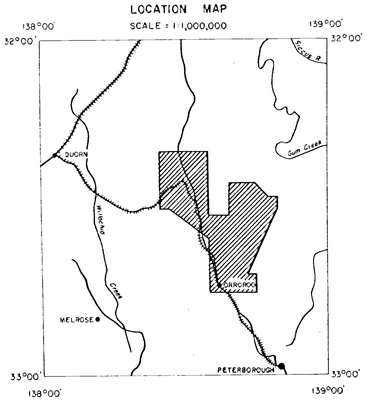
MESH SIZE	65 m BY 65 m
IGRF REMOVED	1000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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STOCKDALE PROSPECTING LIMITED

AIRBORNE GEOPHYSICAL SURVEY

ORRORROO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 6 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE : 1 20,000		FLOWN IN SEPT.-OCT., 1979	GEOTERREX JOB 87-218

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

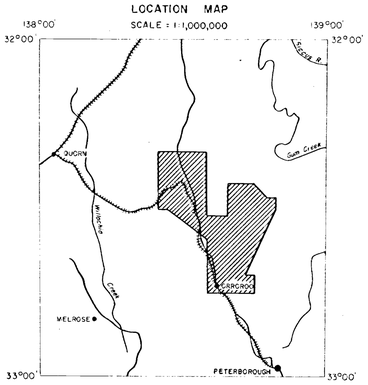
MESH SIZE	65m BY 65 m
IGRF REMOVED	1000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
		11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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STOCKDALE PROSPECTING LIMITED

AIRBORNE GEOPHYSICAL SURVEY

ORRORO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 7 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE : 1 20,000		FLOWN IN SEPT.-OCT., 1979	GEOTERREX JOB 87-218

ORROROO

ARAMMA

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

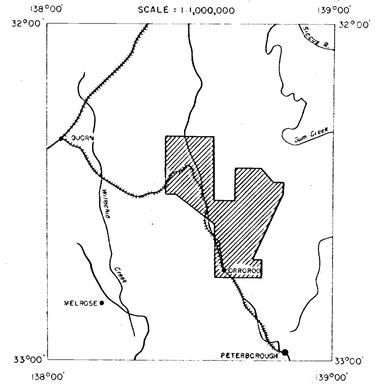
MESH SIZE	65 m BY 65 m
IGRF REMOVED	40000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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AIRBORNE GEOPHYSICAL SURVEY

ORRORO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 8 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT-OCT, 1979	GEOTERREX JOB 87-218

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

MESH SIZE	65m BY 65 m
IGRF REMOVED	1000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

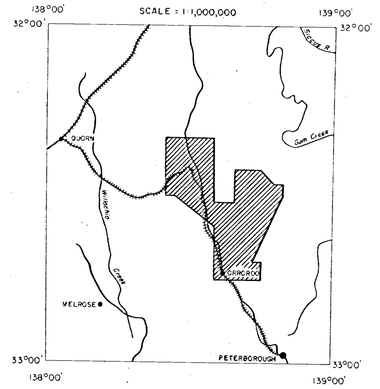
SCALE = 1:20,000

SHEET INDEX

1	4		
2	5		13
3	6	10	14
7	11		
8	12		

LOCATION MAP

SCALE = 1:1,000,000



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AIRBORNE GEOPHYSICAL SURVEY

ORRORDO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 9 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS.	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT.-OCT., 1979	GEOTERREX JOB 87-218

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

MESH SIZE	65 m BY 65 m
IGRF REMOVED	1000nT DATUM ADDED
CONTOUR INTERVAL	2.5 nT

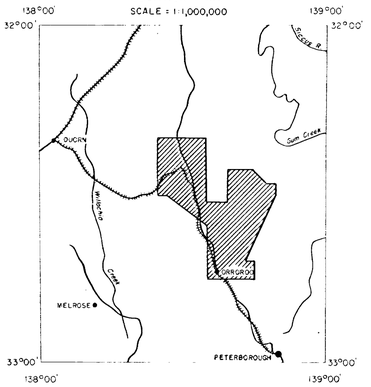
SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP

SCALE = 1:1,000,000



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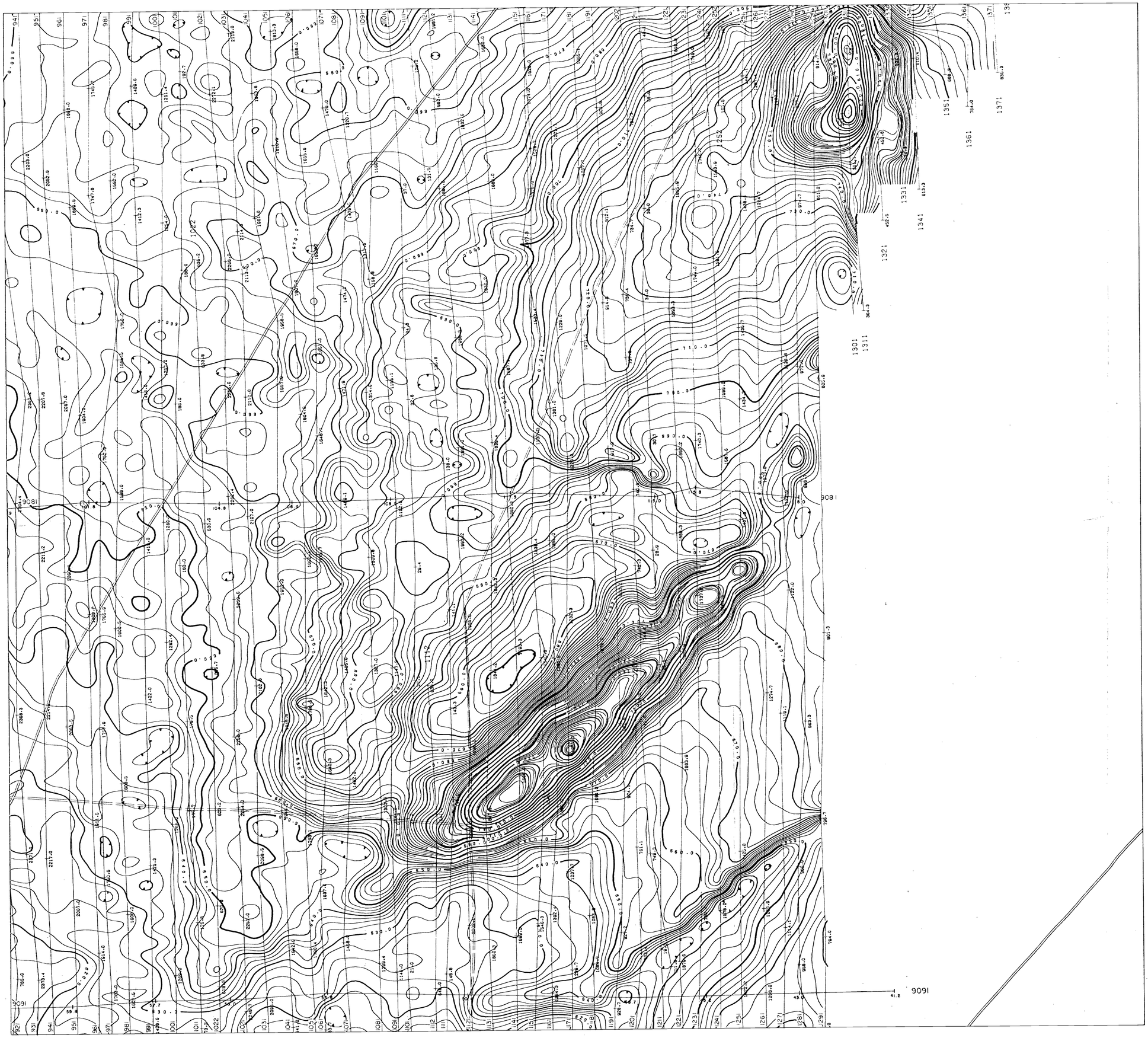
AIRBORNE GEOPHYSICAL SURVEY

ORRORROO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 10 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT-OCT, 1979	GEOTERREX JOB 87-218



SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

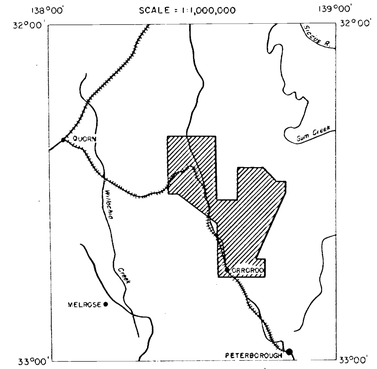
MESH SIZE	65 m BY 65 m
IGRF REMOVED	1000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7		
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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AIRBORNE GEOPHYSICAL SURVEY

ORRORO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 11 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT - OCT, 1979	GEOTERREX JOB 87-218

KYLMORN

NISDALE

9101

SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

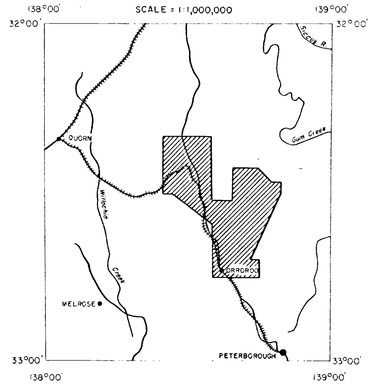
MESH SIZE	65m BY 65m
IGRF REMOVED	10000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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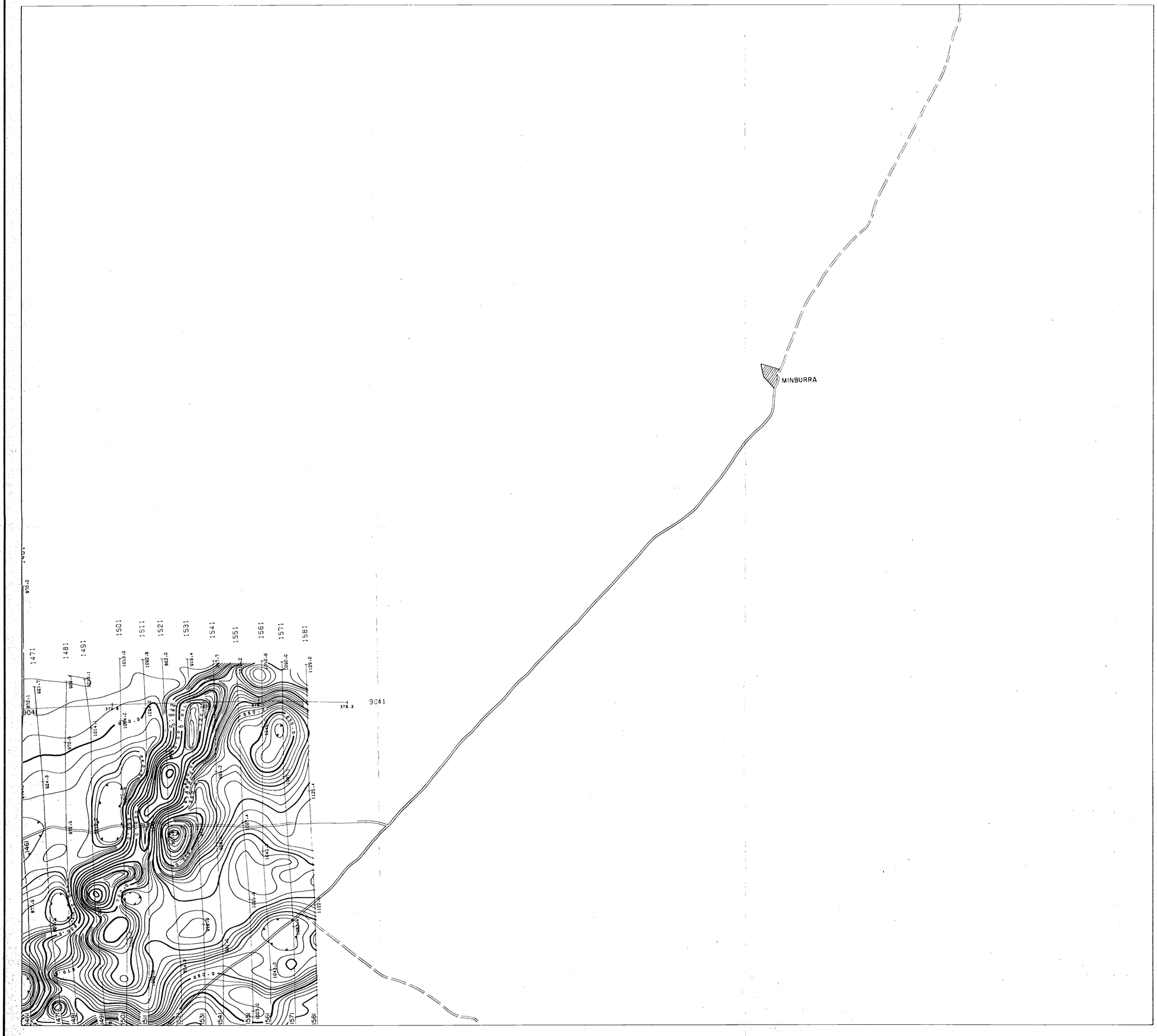
AIRBORNE GEOPHYSICAL SURVEY

ORRORROO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 12 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT.-OCT., 1979	GEOTERREX JOB 87-218



SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

MESH SIZE	65m BY 65m
IGRF REMOVED	1000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

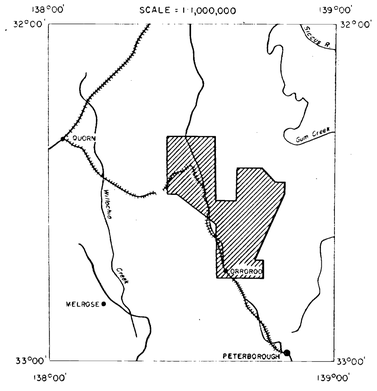
SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP

SCALE = 1:1,000,000



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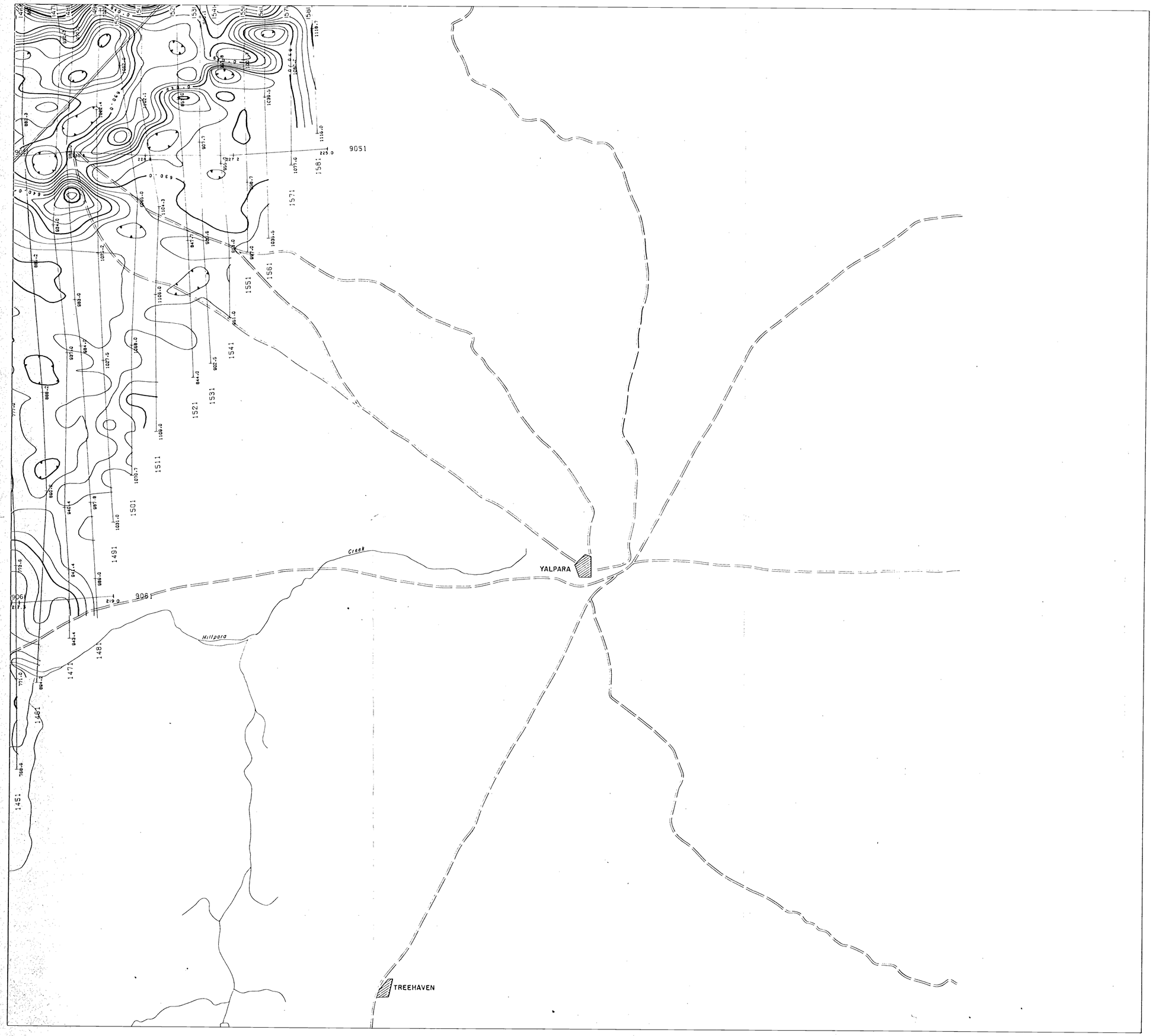
AIRBORNE GEOPHYSICAL SURVEY

ORRORO AREA
SOUTH AUSTRALIA

ISOMAGNETIC CONTOUR MAP

SHEET 13 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT	ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT.-OCT., 1979	GEOTERREX JOB 87-218



SURVEY SPECIFICATIONS

MAGNETOMETER	GEOMETRICS G-803 PROTON PRECESSION
SENSITIVITY	0.25 NANOTESLAS
SAMPLE INTERVAL	0.9 SECOND
FLIGHT LINE DIRECTION	NORTH TO SOUTH
FLIGHT LINE SEPARATION	250 METRES
FLIGHT PATH RECORD	35 mm TRACKING CAMERA
FLIGHT LINE RECOVERY	VISUALLY TO ENLARGED RC9
MEAN TERRAIN CLEARANCE	80 METRES

PROCESSING INFORMATION

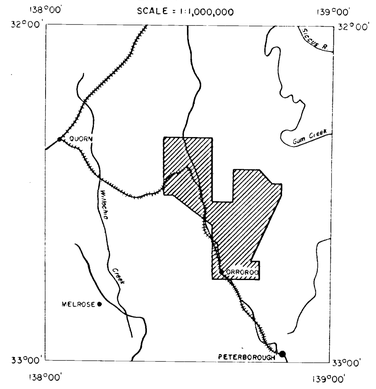
MESH SIZE	65 m BY 65 m
IGRF REMOVED	50000nT DATUM ADDED
CONTOUR INTERVAL	2.5nT

SCALE = 1:20,000

SHEET INDEX

1	4		
2	5	9	13
3	6	10	14
	7	11	
	8	12	

LOCATION MAP
SCALE = 1:1,000,000



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AIRBORNE GEOPHYSICAL SURVEY		
ORRORO AREA SOUTH AUSTRALIA	ISOMAGNETIC CONTOUR MAP	
SHEET 14 OF 14	HORIZONTAL CONTROL BASED ON PHOTOMOSAICS MAPS	CONTOUR INTERVAL 2.5nT / ALTITUDE 80 metres
SCALE 1:20,000		FLOWN IN SEPT-OCT, 1979 / GEOTERREX JOB 87-218