Open File Envelope No. 6331

PEL 16

MURRAY BASIN

1985 OVERLAND CORNER (OC85) SEISMIC SURVEY

FINAL REPORT

Submitted by

International Mining Corporation NL

1985

Enquiries: Customer Services
Ground Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

PRIMARY INDUSTRIES AND RESOURCES SA

ENVELOPE 6331

TENEMENT: PEL 16; Otway Basin

TENEMENT HOLDER: International Mining Corporation NL (operator) and Satima Pty Ltd

CONTENTS

END OF CONTENTS

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P.O. Box 227
Narooma, NSW 2546

21 March 1985

MEMO TO: MRS. M. PHILLIPS

SUBJECT: PEL 16, SEISMIC PROGRAMME 1985
OVERLAND CORNER - 1985.

The attached 1:250,000 Renmark Map has plotted on it the proposed seismic programme for April/May 1985.

It is planned to use a vibroseis crew for this work. At this date a contract has not been signed as the contractor has to fit this small programme in between two longer contracts.

The programme outlined consists of one long line and several short lines. The long line will tie the Overland Corner No. 1 Well to North Renmark No.1 Well and provide a controlled East-West seismic cross section of the Renmark Trough. This line will be run first and further programme modified on this new data.

The two shorter East-West lines are designed to give better control on the down-thrown fault trap mapped on the previous surveys. Additional lines will be programmed as suggested by preliminary data from the field. The total programme is expected to consist of approximately 50 kilometers of line.

Objective 1 is to prove that the Pyap Member (LK) is buried deep enough in the Renmark Trough to be a source for petroleum.

Objective 2 is to define an updip closure in the Renmark Trough as a drilling location.

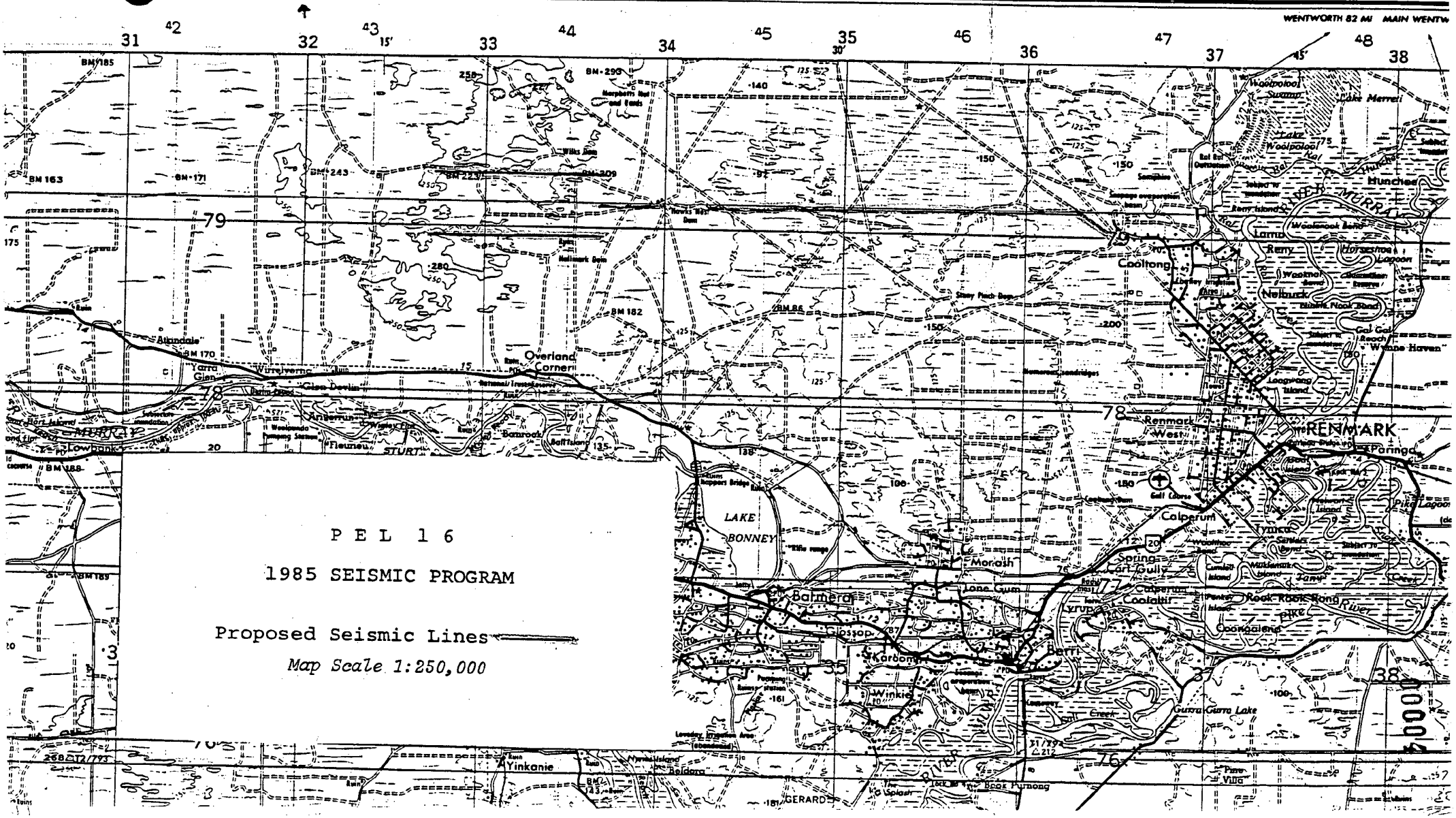
Warren G. Reed

cc: -Mr. Alan James
-Director General, Dept. of Mines & Energy, S.A.

Ap 11.85

RENMARK

EDITION 1 - AAS



00005

DECLARATION OF ENVIRONMENTAL FACTORS

PETROLEUM EXPLORATION LICENCE 16

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0) Survey Name - Overland Corner - 1985

1. IDENTIFICATION

1) Proponent - International Mining Corporation N.L.
and Satima Pty. Ltd.
447 Kent Street, Sydney, NSW 2000

2) Contact Person - Warren Thomson, (02) ~~296356~~ (02) 2678422,

3) Location - a. PEL 16
b. 1:250,000 sheet Renmark

4) Proposal - Vibroseis Seismic Survey of approximately 50 line kilometers.

The initial programme will consist of an east-west line tying Renmark North No. 1 well to line OC83-11 of our previous Overland Corner seismic survey. Additional short lines of between five and ten kilometers in length are planned immediately to the east of the Hamley Fault. However, the exact location will depend on the result of the initial tie line.

It is planned that the field crew will live in Renmark and later in Berri during the survey.

5) Proposed commencing date and duration of programme - April 1985.

6) Owner or occupier of land - All land other than in the immediate vicinity of the Renmark No. 1 well is held under pastoral lease and all of the landowners of these leases were contacted during our previous seismic survey. All of the land-holders will again be contacted prior to the commencement of work.

7) D.E.F. prepared by - Warren G. Reed
Consulting Geologist

8) Date - January 1985

RECEIVED
25 MAR 1985
DEPT. OF MINES AND ENERGY SECURITY

I would suggest the Boy. be requested to put a name to this Survey. My experience is they can tend to become very confusing when data & transparencies are received with no identifying code name.

.../2

2. PHYSICAL ENVIRONMENT

1) Topography and drainage - The area is a gently undulating plain 30-80 meters above sea level, with a well developed east-west trending stabilised red sand dune system. Drainage is internal with no defined drainage channels. Run off collects in clay pans in the interdune corridors.

2) Geological setting - The area lies in the Murray Basin. The surface is composed of the Woorinen Formation of Quaternary age. This unit consists of pale reddish brown silty quartz sands occurring as linear dunes.

3) Hydro-geology - no drilling is planned.

4) Vegetation - in the area comprises mallee scrubland.

5) Fauna - consists of emus, western red kangaroos, echidnas, hairy nosed wombats, mallee fowl and many other small birds, mammals and reptiles.

6) Sites of scientific or cultural value - none in the area.

3. HUMAN ENVIRONMENT

1) Land use - grazing.

2) Land tenure - by pastoral leases and freehold.

3) Settlements -

a. The initial line commences at the western edge of Renmark North.

b. No houses, homesteads or other buildings, with the exception of those at Renmark North, are located in the survey area.

4) Roads and tracks - Access will be by Ral Ral Avenue and station tracks.

.../3

4. EXPLORATION PROGRAMME

1) New access tracks proposed - Clearing will be required on the seismic line. However, as far as possible existing station tracks will be utilised.

2) Site proposals - no field sites required.

3) Drilling proposals - no drilling planned.

4) Water supply arrangements - Drinking water will be brought from town for crew. No other water required.

5) Completion proposals - All roads will be left in order for use of the landholders. Any damage to fences will be repaired to the satisfaction of the landholders. No campsites are proposed but litter disposal will be carefully monitored.

5. POTENTIAL IMPACTS

1) From access - Very little impact is expected. This is borne out by the experience on our 1981 and 1983 surveys in the areas.

2) From campsites - no campsites.

3) From drillsites - no drillsites.

4) From water carting - no water carting.

5) From leisure activities - No effect is expected as seismic crew will be prohibited from using firearms in the area and will not be in the area except whilst working (crew will reside in town).

.../4

6. OWNER/OCCUPIER'S COMMENTS AND REQUIREMENTS

The owners and occupiers of the land have not been contacted concerning the proposed survey. However, when contacted on the previous surveys they indicated that they had no objection. No limitations or restrictions were suggested and all landholders appeared to be pleased that existing roads might be regraded and additional roads cut. We volunteered that we would carefully replace or repair damaged fences and guard against any stock escape. In every case this appeared to satisfy the interested parties.

7. MEASURES PROPOSED TO PREVENT OR REDUCE THE EFFECT OF IMPACTS IDENTIFIED

1) During the programme it is proposed to limit the amount of travel on newly cut lines as far as possible and whenever practical to utilise existing roads. No campsites will be present in the area and no leisure activities permitted. However, an anti-litter campaign will be strenuously enforced.

2) On completion of the programme roads will be left in trafficable condition and any damage to fences will be repaired to the landholder's satisfaction. The person in charge of the field operations will conduct a survey to see that no inadvertent litter remains.

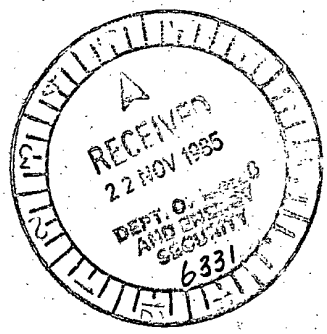
WARREN G. REED

$ FINAL REPORT

1985

OVERLAND CORNER SEISMIC SURVEY

PEL 16, SOUTH AUSTRALIA.



A.W. James & Associates Pty Ltd

November 1985.

TABLE OF CONTENTS:

1. INTRODUCTION

The 1985 Overland Corner Seismic Survey was recorded in PEL 16 near the township of Berri in South Australia. A total of 45.24 kilometres (in three lines OC85-22, 23, 24) of 1200% CDP geoflex sourced seismic data was acquired. The aims of the survey were:

1. To infill existing 1983 and 1981 vintage seismic data and investigate a possible low side fault closure previously indentified along the Renmark Fault Zone.

2. Investigate the depth of burial of the Cretaceons Pyap Member in the Renmark Trough by recording a regional seismic tie from Overland Corner to North Renmark-1

2. SEISMIC DATA ACQUISITION:

2.1 SUMMARY:

Petty Ray Geophysical (a Division of Geosource Ltd) of Brisbane were contracted to acquire the seismic programme. Initially it was intended to use a vibroseis source to provide better energy penetration, particularly along line OC85-22 where a deeper section was expected. However due to unavailability of vibrators, geoflex was substituted as the source. This is the same seismic source as used in 1981 and 1983 seismic surveys.

The following seismic lines constituted the survey.

OC 85-22	sp's 100 - 1144,	31.32 kilometres
OC 85-23	sp's 100 - 344,	7.32 kilometres
OC 85-24	sp's 100 - 320,	6.60 kilometres
	Total:	45.24 kilometres

Data acquisition parametres are as follows:

96 trace, 48-48 split spread (1470-60-0-60-1470 metre offsets)

120 metre shot point interval, 30 metre group interval. 1200% CDP.

Shot configuration: 2x50 metre strands of geoflex centred on shot point. Detonation in centre using two detonators.

12x10 hz geophones per trace, in line over 30 metres.

125-8 hz field filters.

2 millisecond sample rate, 4.0 record length.

No weathering of uphole programme was recorded.

The resultant seismic data quality was excellent, comparing favourably with the previous 1981 and 1983 seismic data. Penetration of the seismic energy proved adequate to accurately define a basement reflector along line OC 85-22 where a thicker total section was evident.

Seismic acquisition commenced on the 15th May and concluded on the 20th May 1985. No delays were experienced and acquisition progressed smoothly at approximately 9 kilometres per day. Field monitors were of good quality, regularly showing at least three events.

Ground roll and airblast noise trains were occasionally strong. This was in response to "blow outs" caused by the inability to adequately bury the geoflex in areas of near surface laterite.

Representatives of the South Australian Mines Department were met in the field during The Operations and observed part of the Seismic Acquisition Programme.

2.2 OPERATIONS REPORT : GEOSOURCE INC.

OPERATIONS REPORT

INTERNATIONAL MINING CORPORATION N.L.

MURRAY BASIN P.E.L. 16

QC85 SEISMIC

1985 OVERLAND CORNER SURVEY

OPERATIONS REPORT

FOR

INTERNATIONAL MINING CORPORATION N.L.

IN THE

MURRAY BASIN P.E.L. 16

OVERLAND CORNER SURVEY

CONDUCTED BY

PETTY-RAY CREW 6150

15 MAY 1985 - 20 MAY 1985

CONTENTS

APPENDICES

ENCLOSURES

1. INTRODUCTION

Petty-Ray Geophysical, a Division of Geosource Inc., performed a seismic survey in the Murray Basin, permit P.E.L. 16 for International Mining from 15 May to the 20th May, 1985.

International Mining was represented in the field by Mr. Allan James.

The Overland Corner program was 45.24 kilometres in 3 lines. Primacord was used as a source, the crew vibrators being committed elsewhere.

2. TERRAIN

The terrain in the survey area consisted of extensive Mallee country with a large but stable dune system running east west. Delays due to fences were minimal. Lack of access from the south of the prospect caused long drive times.

3. WEATHER

Temperatures ranged from 5° - 25°C with some light rain. No delays due to weather occurred.

4. LOGISTICS

Recorded data was handcarried to Brisbane by the Party Manager at the conclusion of the survey.

The crew travelled from the Portland area on the 14th May and returned to Portland at the conclusion of the prospect on 21 May, 1985.

An advance party of surveyors was based in Berri staying at the local hotel, as was the main crew. Petty-Ray Brisbane based supervisor John Horsley had overall responsibility for the operation with on site supervision by William Hogan. All communication from the field was by telephone installed at the local hotel.

5. PERMITTING

Permitting was carried out by William Hogan. All landholders were visited and no problems were encountered. No claims arose from the survey.

Fencing was carried out by a local landholder at Petty-Ray's expense.

6. PERSONNEL

A list of Staff Personnel giving name and job title accompanies this report.

The large majority of hourly hired personnel accompanied the crew from Queensland.

7. LINE LISTING

3 lines prefixed OC85 were recorded. A line listing accompanies this report giving kilometres shot on each line, together with area total.

Total kilometres shot = 45.24 km.

8. EXPERIMENTAL PROGRAMME

No experimental programme was required.

9. RECORDING

(a) Equipment

The field recording equipment was based around an E.T.L. MDS 10V, 96 channel instrument. This equipment provided instantaneous floating point data with a maximum gain range of 138 dB (90dB, IFP AMP + 48 dB K gain), in digital form to an MTM 100 tape drive in SEG B format. The tape drive recorded data onto $^{1}/_{2}$" magnetic tape at a packing density of 1600 b.p.i. at a tape speed of 79.375 inches/second.

Field monitors, for quality control were produced by a 64 trace SDW 400B electrostatic monitor camera.

9. RECORDING

(a) Equipment (Cont'd)

All mandatory daily and monthly tests were successfully carried out on instrumentation. The monthly tests were processed by Petty-Ray Geophysical in their Brisbane Processing Centre.

Quality control of instrument tests and production monitors was carried out in Brisbane and Houston by trained Petty-Ray personnel. A monthly instrument test was run at the start of the prospect. A full listing of equipment used by Petty-Ray during the Overland Corner Survey is attached as an Appendix to this report.

(b) Operations

Operations Diagrams (GEO 211C) are included in this report showing parameters used on production recording. 45.24 kilometres of line was shot in 5 days giving a daily average of 9.05 kilometres.

10. SURVEYING

A Vertical and Horizontal loop closure map is included with this report. Accuracy was within Petty-Ray Quality Control requirements.

Petty-Ray Geophysical has set permanent survey markers at all intersections and at other strategic points along the surveyed lines. Each P.S.M. comprises a star picket with an aluminium punched tag fastened securely to it. 16 such permanent survey markers were set and co-ordinates and elevations of each are listed, by line number, in this report.

* Trademark of Geosource Inc.

10. SURVEYING (Cont'd)

Instruments used were a Wild T16 Theodolite and a Wild DI4 Distomat.

The method used to carry out the survey was reciprocal vertical angles and horizontal angles (ie; instrument set up on every turn point "TP").

A sun observation was observed at the start and end of all lines, and all horizontal angles were adjusted to fit sun observations.

Calculations

Verticals have been calculated using "Reciprocal Vertical angles formulae" for the TP's which eliminates the need to correct for curvature of the earth, and refraction.

The intermediates have been calculated using plane trig, with corrections for curvatures and refraction applied.

Horizontals were calculated using Geographical co-ordinates for line OC85-22 and then converted to Grid Co-ordinates. Lines OC85-23 and OC85-24 were calculated using Grid co-ordinates, ie; Grid Convergence applied to sun observations and Point Scale factor applied to all TP's.

Formulae:

$$hb = ha + S.\sin\frac{Zb - Za}{2} \cdot \sec\frac{\emptyset}{2} + \frac{(i + s)a - (i + s)b}{2}$$

where h = Elevation
S = Slope distance
Z = Zenith angle
$\emptyset$ = Geocentric angle
i = Instrument height
s = Signal Height

10. SURVEYING (Cont'd)

$$\Delta h = S.\text{Sin vertical angle} + \frac{(S^2[1-2m])}{2R}$$

where Δh = Difference in elevation
S = Slope distance
m = Co-efficient for refraction
R = Radius of earth

A = Sin ϕ (difference in longitude from C.M.)

where A = Grid Convergence (+ve E from CM)
(-ve W from CM)
ϕ = Latitude
CM = Central Meridian

$k = 0.9996 + 0.0123 \cdot EA^2 10^{-12}$

where k = Point Scale Factor
Ea = Easting - 500,000 (absolute)

Geographicals have been calculated using the Mid latitude formulae and converted to Grid Co-ordinates using Redfearns formula. Method can be obtained from Clarke "Plane and Geodetic Surveying".

The Central Meridian for this prospect was 141° East, ie; zone 54 on the Universal Transverse Mercator projection.

All control for the prospect was from Trig stations on the Renmark and Overland Corner 1:5000 topographic maps.

Misclosures between Trig stations was approximately 1:5000 for position and 0.5m in height. Co-ordinates were adjusted by the Bowditch Rule between Trig stations; elevations were not adjusted.

10. SURVEYING (Cont'd)

There were no surveying problems during this prospect. Petty-Ray surveyors during the course of the survey informed local property owners of crew movements and performed a valuable public relations function for both International Mining and Petty-Ray.

A Loop Closure map, P.S.M. listing, Area and Line Location maps are included with this report.

Listing of lines surveyed:-

850C-22	SP 100	- SP 1144	=	31.32 Km.
850C-23	SP 100	- SP 344	=	7.32 Km.
850C-24	SP 100	- SP 320	=	6.60 Km.
		TOTAL		45.24 Km.

11. LINE CLEARING

Minimal clearing was required and local contractor, Mr. Mibus of Portland was employed under the direction of client personnel. Clearing was completed using a D7E bulldozer and grading untertaken by a 12E grader. The final width of line was approximately 5 metres. The ploughing of the Primacord was also carried out by Mr. Mibus.

Fencing was carried out by Petty-Ray Personnel.

12. CONCLUSION

The Overland Corner program was completed with an average daily production rate of 9.05 kilometres. The southern part of the prospect provided no access to the middle of the lines thus all travel was from either the eastern or western end of the prospect.

Yours faithfully,

PETTY-RAY GEOPHYSICAL

JOHN HORSLEY

Operations Supervisor

Approved by:

DONALD L. PIWETZ

Area Manager - Australia

EQUIPMENT LISTING

1. Vehicles

8	Toyota 4x4 Pick Ups
4	Toyota 4x4 Station Wagons
3	Isuzu 4x4 Cable/Geophone Trucks
1	International 4x4 Instrument Truck

2. Recording Equipment

1	E.T.L. MDS 10V 96 Channel Recorder
1	SDW 400B Camera
1	RLS 240 CDP Switch
1	LT 240 Line Checker
12	Motorola VHF Communications
6	Codan HF Communications
400	SM-4 12x10 Hz Geophone Strings
89	Cables 3 x 35m. T/O's
1	MS1 Geophone Shaker
2	CC240 Cable Checkers
2	HV-1 Blasters
1	Set Encoder/Decoder 200

3. Survey Equipment

2	Wild T16 Theodolites
1	Wild DI4 Distomat
1	Apple Europlus Micro-Computer
	Compass, Chains, Drafting Equipment

APPENDIX 2

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PERSONNEL LISTING

Party Manager	W. Hogan
Observers	G. Dempsey
	D. Blick
Technical Assistants	H. Hancock
	B. Edwards
Surveyor	F. Tangney
Junior Surveyor	R. Laslett
Mechanic	D. Kajewski
Shooter	J. Perry

In addition to the above staff the following positions were filled by hourly paid employees:-

Recording Helpers	(12)
Shooters Assistants	(2)

APPENDIX 3

LINE LISTING

DATE	LINE NO.	SHOTPOINT	SHOTPOINT	KMS. SHOT	KMS. CUM.	REMARKS
16 May	OC85-22	1136	796	10.32	10.32	S.O.L.
17 May	OC85-22	792	456	10.20	20.52	
18 May	OC85-22	452	100	10.68	31.20	E.O.L. 22
19 May	OC85-24	100	320	6.72		Start & End 24
	OC85-23	100	200	3.12	41.04	S.O.L. 23
20 May	OC85-23	204	344	4.32	45.36	End of Prospect

APPENDIX 4

TAPE LISTING

TAPE NO.	LINE NO.	SHOTPOINT	SHOTPOINT	REMARKS
001	OC85-22	1136	744	
002	OC85-22	740	312	
003	OC85-22	308	100	EOL 22
004	OC85-24	100	320	Start & End line 24
005	OC85-23	100	344	Start & End line 23
				Prospect complete

FOR: INTERNATIONAL MINING

BY: PETTY-RAY GEOPHYSICAL

MONTHLY STATISTICAL REPORT

AREA OVERLAND CORNER PROSPECT

CREW 6150

PERIOD MAY 1985

SOURCE PATTERN:

RECEIVER ARRAY:

CAMP SITES OVERLAND CORNER PROSPECT

SPREAD STA. INT.

VARISOURCE: Normal ☐ Alternate ☐ Out ☐

Date	COVERAGE: Line No.	STATIONS: from	STATIONS: to	No. of Sta.	Sweeps or Drops	COVERAGE: Daily	COVERAGE: Cum.	UPHOLES SHOT: Reprn. Line No.	UPHOLES SHOT: VP	UPHOLES: LINE #	UPHOLES: VP	CUM	HOURS: Daily Tests	HOURS: O.B. Moves	HOURS: Maint. Time	HOURS: Non Prod. Time	HOURS: Time Lost Weath.	HOURS: Travel	HOURS: Record. Time	HOURS: Total Time	REMARKS: CLIENT CHARGE	REMARKS
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																		10.00		10.00	10.00	To Remark
15																		1.5	2.50	4.00	4.00	Lay out line Monthly tests
16	OC 22	1136	796	86		10.32	10.32						0.50	1.25	0.50			1.50	6.75	10.50	10.50	
17	OC 22	792	456	85		10.20	20.52						0.50	1.25	1.50			1.50	6.25	11.00	11.00	
18	OC 22	452	100	89		10.68	31.20						0.25	1.25	0.75			1.50	7.00	10.75	10.75	EOL 22
19	OC 24 OC 23	100 100	320=56 200=26	82		9.84	41.04						0.25	0.50		3.00		1.50	5.50	10.75	10.75	LINE Moves (22-24) (24-23) EOL 24
20	OC 23	204	344	36		4.32	45.36						0.25	0.50		1.50		1.50	3.25	7.00	7.00	Pick up spread Prospect Compl Return to Portland 10 hrs
21																						
22																						
23																						
24																						
25																						
26																						
27																						
28																						
29																						
30																						
31																						
	TOTALS																					

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APPENDIX 5

APPENDIX 6

PERMANENT SURVEY MARKER LISTING

STN. NO.	ELEVATION	EASTING	NORTHING	REMARKS
Line 850C-22				
100	66.63	439 399.44	6 230 147.69	
303	46.21	445 400.14	6 229 107.33	
469 + 19	31.43	450 336.18	6 228 271.74	
648	34.28	455 619.54	6 227 389.62	
906	34.03	463 270.23	6 226 126.62	
1068	45.33	468 086.94	6 225 330.84	Bend
1144	28.79	470 394.90	6 225 352.12	15m. West
	62.02	440 359.59	6 230 025.06	OC83-11 OC81-03 6MW SP 476 29ME OC85-22 SP 132+15 188°39' True 45.2m
Line 850C-23				
100	76.05	436 468.37	6 228 668.88	
124 + 4	68.30	437 192.72	6 228 627.55	
230 + 1	62.15	440 367.05	6 228 429.21	
344	48.42	443 782.49	6 228 223.33	
Line 850C-24				
100	62.66	439 604.30	6 233 200.97	
124	62.53	440 324.68	6 233 209.78	
292 + 20	52.28	446 207.74	6 233 239.47	
320	51.76	446 207.48	6 233 242.01	
	22.71	471 026.23	6 225 588.70	Top Well Cap Renmark #1 Oil Well

Petty-Ray Geophysical

GEOSOURCE

GEO211C

This cover sheet must be completed at the beginning of each line or when parameters change

GENERAL

Crew No. 6150 Contract No.

Client INTERNATIONAL MINING

Area Country AUSTRALIA

County
Concession RENMARK P.E.L.16

State SOUTH AUSTRALIA

Party Mgr W.HOGAN OB/JO G.DEMPSEY

Line No. OC 85-22 Date Start of Line 16-5-85

Sta Int 30 ~~Feet~~ Meters Fold 12.00 %

Spread Dimensions TAKE OUTS 1470-60-00-60-1470
ARRAY CENTRES

SP's Increase N [ ] E [ ] S [ ] W [ ]

GEOPHONES

Manufacture SENSOR Array Length 27.5 m.

Frequency 10 Array Width IN LINE

No. per string 12 Array Centered [ ] Across [ ] Between Sta

per trace 12

	Ser	Par		
String Connected	X	X	Coil Res. 375 OHM	
			Shunt Res. String [ ]	Phone [IK]
Connected at Sta	Ser X	Par [ ]	Separation between elements in the array 2.72 mtr	

RECORDING SYSTEM

Type	MDS 10-V	
Format	SEGB	
No. of Channels	96	
Sample Rate	2m sec	
Record Length	4 sec.	
BPI	1600 PE	
Low-Cut Filter	Freq	12
	Slope	18
High-Cut Filter	Freq	125
	Slope	72
Static Filter	In [ ]	Out [X]
Notch Filter -50 Hz	In [ ]	Out [X]
UH Ch On Tape	Wireline On Tape	aux.4
	Radio On Tape	
On Tape	Time B. AUX 3.	

ENERGY SOURCE

Type Redcord

Manufacturer I.C.I.

Source Control Enc/Dec.200

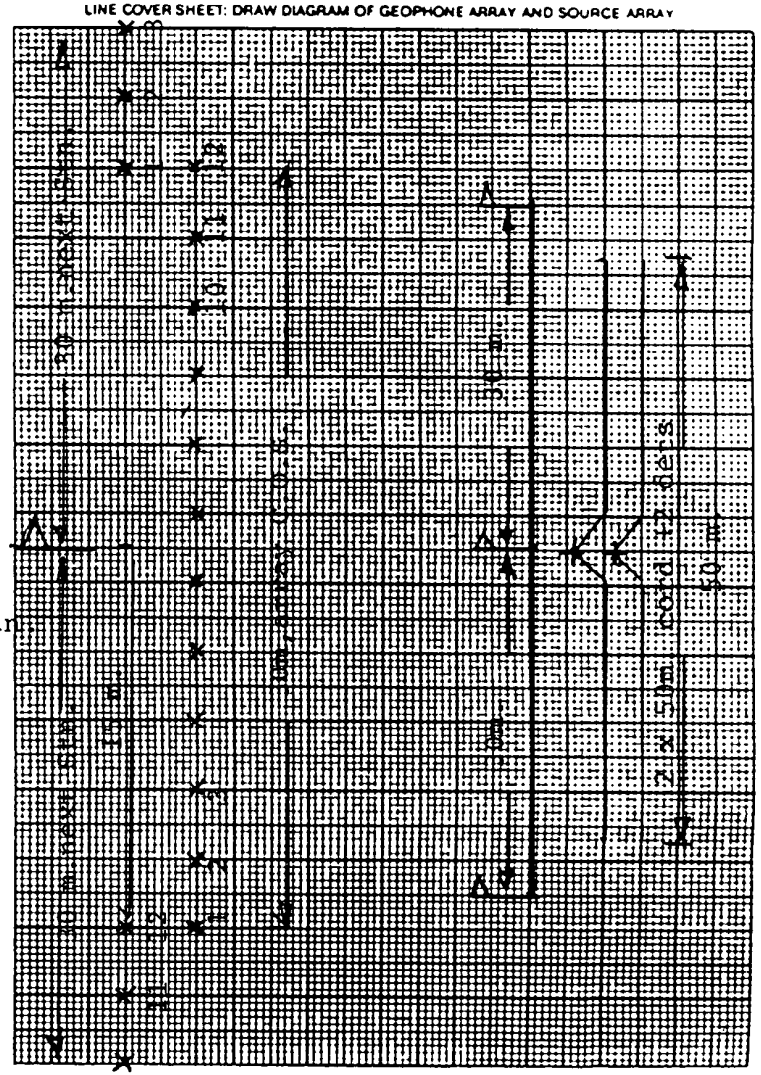
Dynamite
- Holes/Shotpoint Parallel
- Charge/Shotpoint 2 x 50m. C.on Str
- Pattern Length: Feet Meters

Surface Source
- Array Length: ~~Feet~~ Meters
- No. of drops, sweeps, etc. in array:
- Sweep Freq:
- Sweep Length: sec
- Unit Separation: ~~Feet~~ Meters
- Unit Moveup: ~~Feet~~ Meters
- Array Centered: Across Sta [X] Between Sta [ ]

REMARKS Air Gun Delay, etc.

VARI SOURCE USED Yes [ ] No [X] Invalid Channels:

LINE COVER SHEET: DRAW DIAGRAM OF GEOPHONE ARRAY AND SOURCE ARRAY



00032

FIGURE 1

Petty-Ray Geophysical

GEOSOURCE

GEO 211 C

This cover sheet must be completed at the beginning of each line or when parameters change

GENERAL

Crew No. 6150 Contract No. ______

Client INTERNATIONAL MINING

Area Country AUSTRALIA

County Concession RENMARK P.E.L.16

State SOUTH AUSTRALIA

Party Mgr W.HOGAN OB/JO G.DEMPSEY

Line No. OC85-23 Date Start of Line 19-5-85

Sta. Int. 30 ~~Feet~~ Meters Fold 1200 %

Spread Dimensions TAKE OUTS 1470-60-00-60-1470
ARRAY CENTRES

SP's Increase N ☐ E ☐ S ☐ W ☐

GEOPHONES

Manufacturer SENSOR Array Length 27·5 m.

Frequency 10 Array Width IN LINE

No. per string 12 Array Centered Across ☐ Between Sta ☐

per trace 12

String Connected Ser ☒ Par ☒

Coil Res. 375 OHM

Shunt Res. String ☐ Phone 1K

Connected at Sta Ser ☒ Par ☐

Separation between elements in the array 2.72 mtr

RECORDING SYSTEM

Type	MDS 10-V
Format	SEGB
No. of Channels	96
Sample Rate	2 m sec
Record Length	4 sec.
BPI	1600 PE
Low-Cut Filter Freq	12
Low-Cut Filter Slope	18
High-Cut Filter Freq	125
High-Cut Filter Slope	72
Static Filter	In ☐ Out ☒
Notch Filter 50 Hz	In ☐ Out ☒
UH Ch. On Tape — Wireline On Tape	aux.4
UH Ch. On Tape — Radio On Tape	
On Tape	Time B. AUX 3

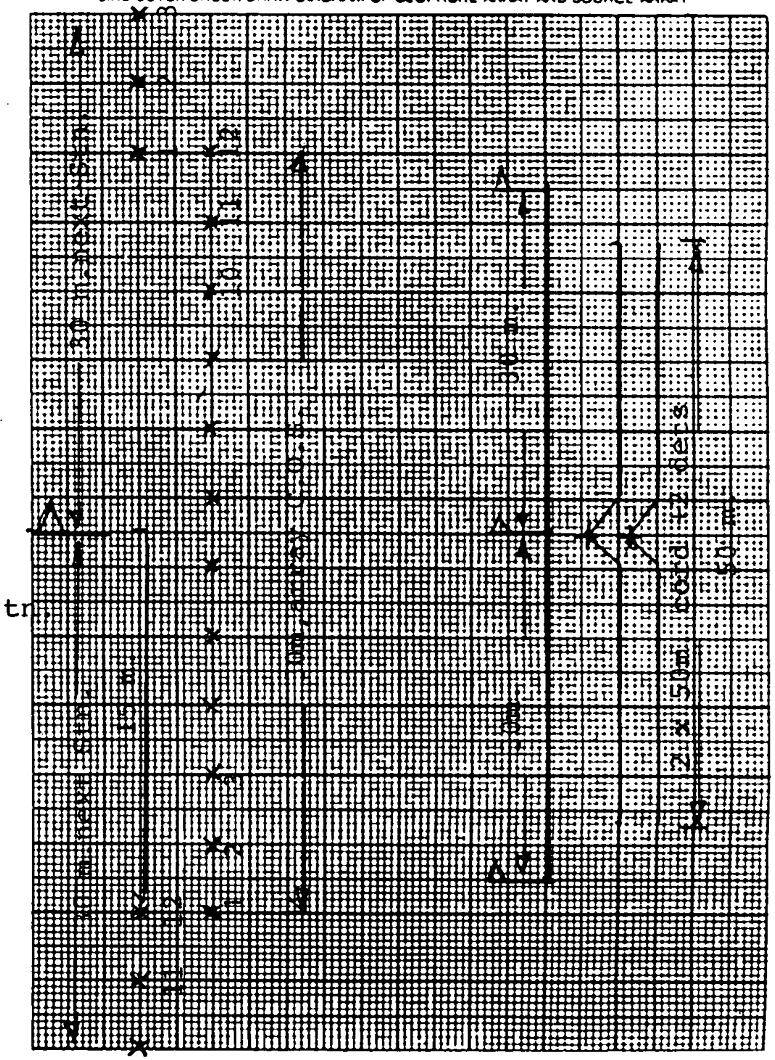
ENERGY SOURCE

Type	Redcord
Manufacturer	I.C.I.
Source Control	Enc/Dec.200
Dynamite — Holes/Shotpoint	Parallel
Dynamite — Charge/Shotpoint	2 x 50m. C.on Str
Dynamite — Pattern Length	Feet / Meters
Surface Source — Array Length	~~Feet~~ Meters
Surface Source — No. of drops, sweeps, etc. in array	
Surface Source — Sweep Freq	
Surface Source — Sweep Length	sec
Surface Source — Unit Separation	~~Feet~~ Meters
Surface Source — Unit Moveup	~~Feet~~ Meters
Surface Source — Array Centered	Across Sta ☒ Between Sta ☐

REMARKS. Air Gun Delay, etc.

VARI SOURCE USED Yes ☐ No ☒ Invalid Channels:

LINE COVER SHEET: DRAW DIAGRAM OF GEOPHONE ARRAY AND SOURCE ARRAY



Petty-Ray Geophysical

GEOSOURCE

GEO211C

This cover sheet must be completed at the beginning of each line or when parameters change

GENERAL

Crew No 6150 Contract No.

Client INTERNATIONAL MINING

Area Country AUSTRALIA

County Concession RENMARK P.E.L.16

State SOUTH AUSTRALIA

Party Mgr W. HOGAN OB/JO G.DEMPSEY

Line No. OC 85-24 Date Start of Line 19-5-85

Sta. Int. 30 ~~Feet~~ Meters Fold 12.00 %

Spread Dimensions TAKE OUTS 1470-60-00-60-1470 ARRAY CENTRES

SP's Increase N [ ] E [ ] S [ ] W [ ]

GEOPHONES

Manufacture SENSOR Array Length 27·5 m.

Frequency 10 Array Width IN LINE

No. per string 12 Array Centered Across [ ] Between Sta [ ]

per trace 12

String Connected Ser [X] Par [X]

Coil Res. 375 OHM

Shunt Res. String [ ] Phone [1K]

Connected at Sta Ser [X] Par [ ]

Separation between elements in the array 2.72 mtr

RECORDING SYSTEM

Type	MDS 10-V	
Format	SEGB	
No. of Channels	96	
Sample Rate	2 m sec	
Record Length	4 sec.	
BPI	1600 PE	
Low-Cut Filter	Freq	12
	Slope	18
High-Cut Filter	Freq	125
	Slope	72
Static Filter	In [ ]	Out [X]
Notch Filter 50 Hz	In [ ]	Out [X]
UH Ch On Tape	Wireline On Tape	aux.4
	Radio On Tape	
On Tape	Time B. AUX 3	

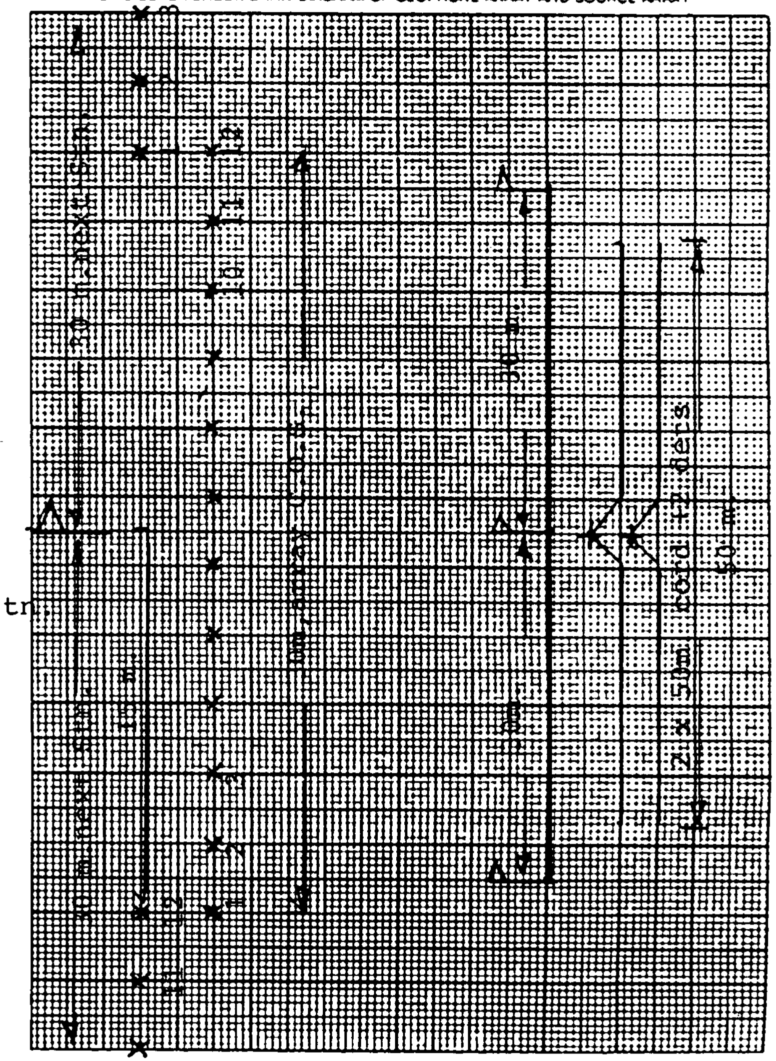
ENERGY SOURCE

Type	Redcord	
Manufacturer	I.C.I.	
Source Control	Enc/Dec.200	
Dynamite	Holes/Shotpoint	Parallel
	Charge/Shotpoint	2 x 50m. C.on Str.
	Pattern Length	Feet Meters
Surface Source	Array Length	~~Feet~~ Meters
	No. of drops, sweeps, etc in array	
	Sweep Freq	
	Sweep Length	sec
	Unit Separation	~~Feet~~ Meters
	Unit Moveup	~~Feet~~ Meters
	Array Centered	Across Sta [X] Between Sta [ ]

REMARKS. Air Gun Delay, etc.

VARI SOURCE USED Yes [ ] No [X] Invalid Channels:

LINE COVER SHEET: DRAW DIAGRAM OF GEOPHONE ARRAY AND SOURCE ARRAY



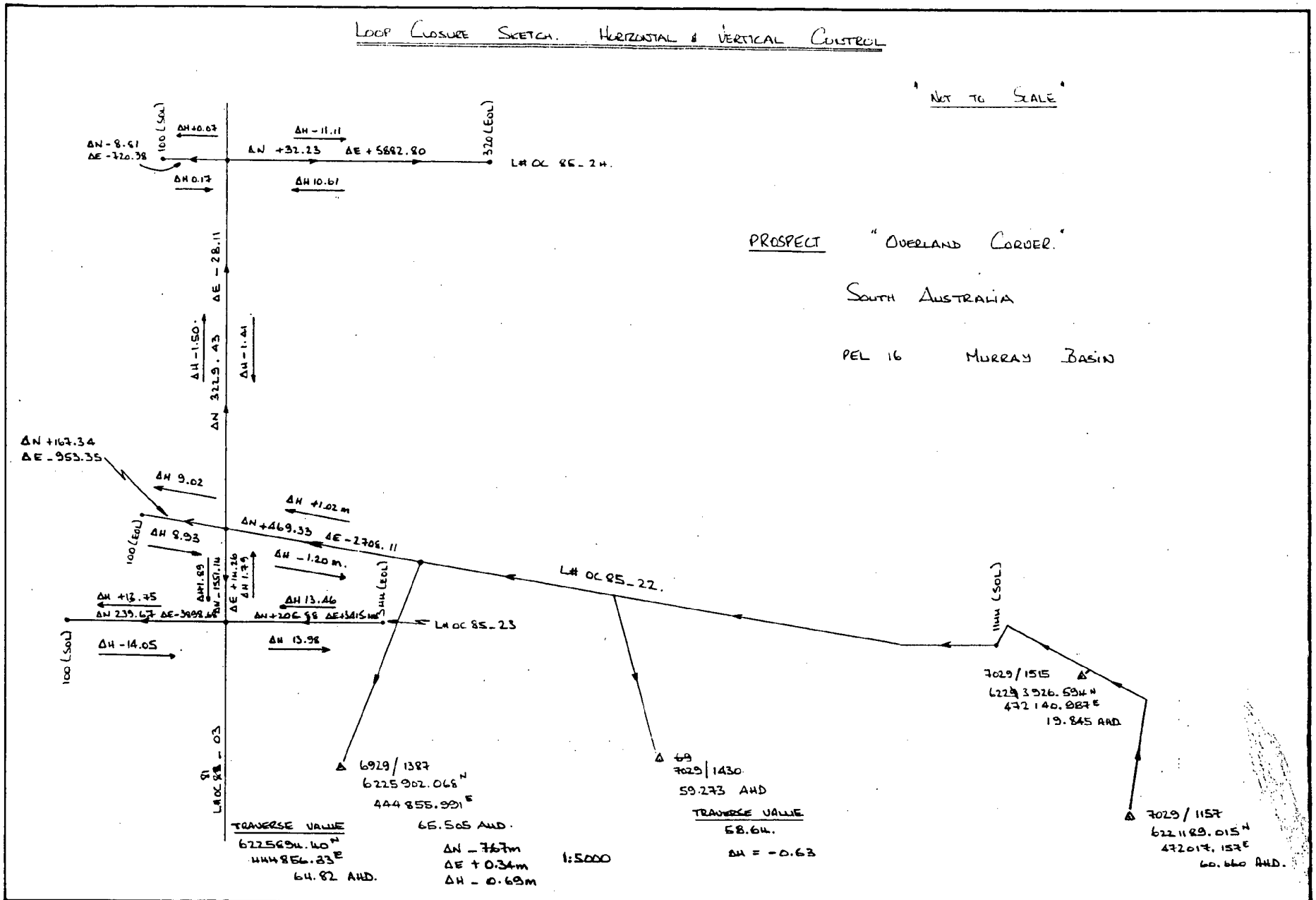

LOOP CLOSURE SKETCH. HORIZONTAL & VERTICAL CONTROL
NOT TO SCALE
PROSPECT "OVERLAND CORNER."
SOUTH AUSTRALIA
PEL 16 MURRAY BASIN
100 (SOL)
320 (EOL)
ΔN -8.61
ΔE -220.38
ΔH +0.07
ΔH -11.11
ΔN +32.23
ΔE +5682.80
L# OC 85_2H.
ΔH 0.17
ΔH 10.61
ΔE -28.11
ΔH -1.50.
ΔN 322.9.43
ΔH -1.41
ΔN +167.34
ΔE -953.35
ΔH 9.02
ΔH +1.02 m
ΔN +469.33
ΔE -2706.11
100 (EOL)
ΔH 8.93
ΔH -1.20 m.
L# OC 85_22.
ΔH +13.75
ΔN 239.67 ΔE -3698.66
ΔH 13.46
ΔN +206.56 ΔE +3415.44
L# OC 85_23
ΔH -14.05
ΔH 13.98
100 (SOL)
91
L# OC 88_03
6929/1387
6225902.068 N
444855.991 E
65.505 AHD.
ΔN -767m
ΔE +0.34m
ΔH -0.69m
TRAVERSE VALUE
6225694.40 N
444856.23 E
64.82 AHD.
69
7029/1430
59.273 AHD
TRAVERSE VALUE
68.64.
ΔH = -0.63
1:5000
7029/1515
6229326.594 N
472140.087 E
19.845 AHD
7029/1157
6221189.015 N
472017.157 E
60.660 AHD.
00035

FIGURE 2

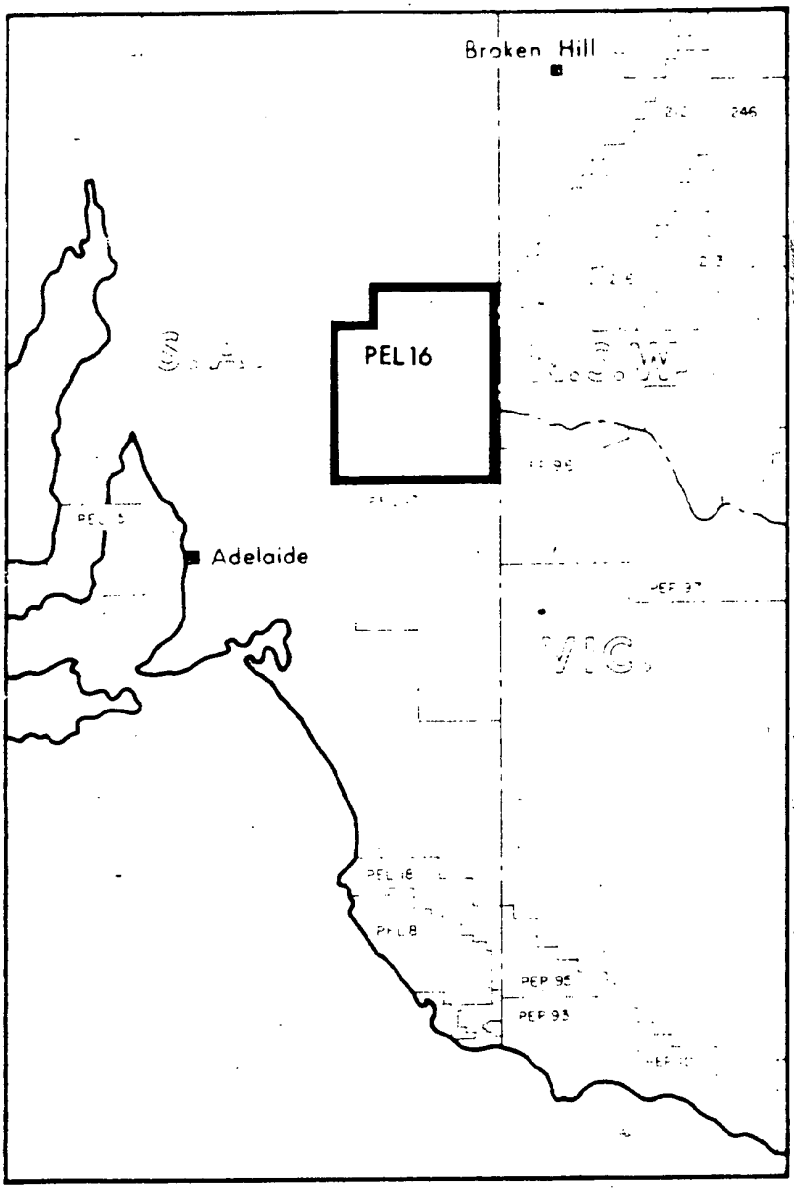
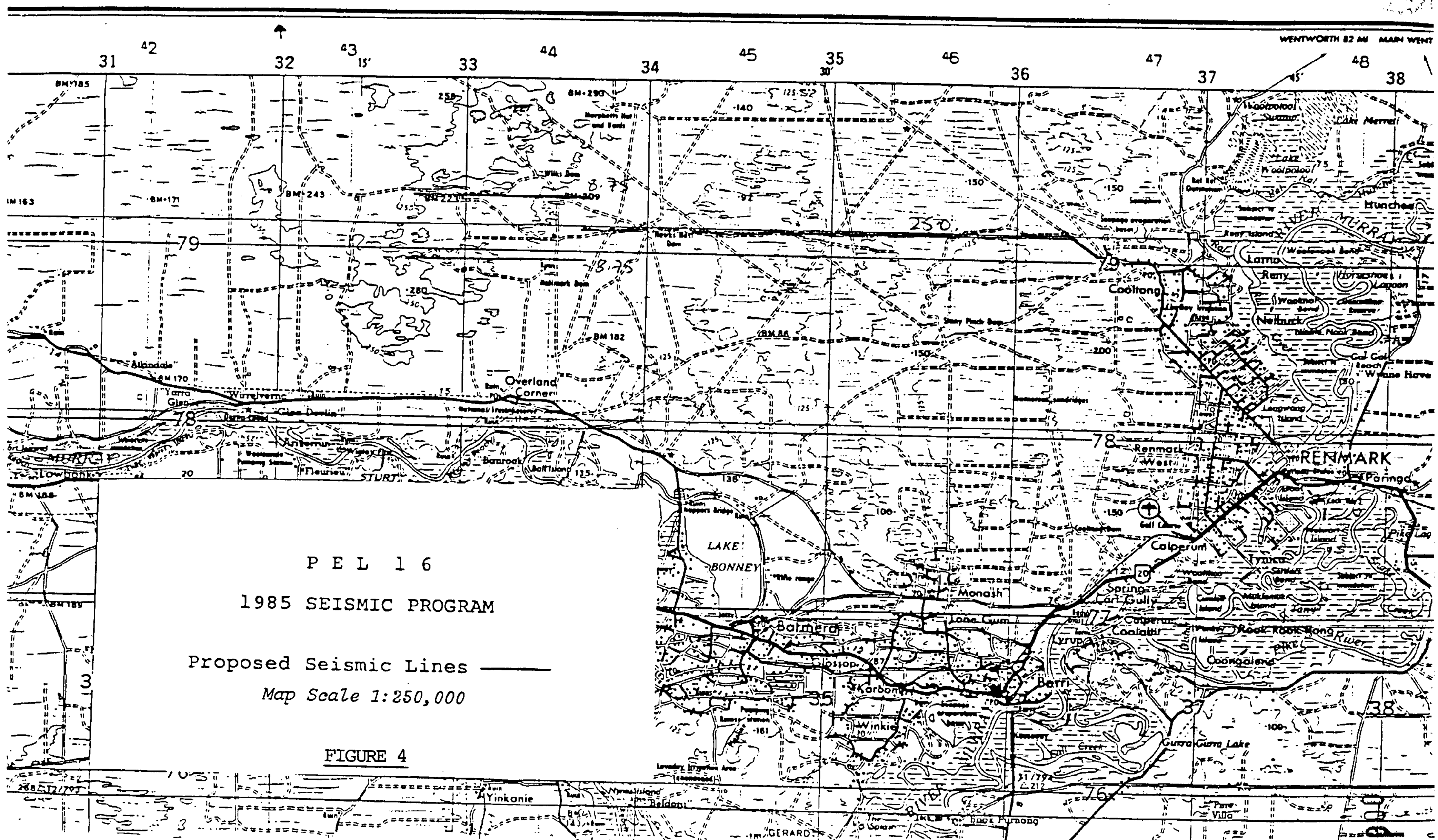


FIGURE 3

RENMARK

EDITION 1 - AAS



P E L 1 6

1985 SEISMIC PROGRAM

Proposed Seismic Lines ————

Map Scale 1:250,000

FIGURE 4

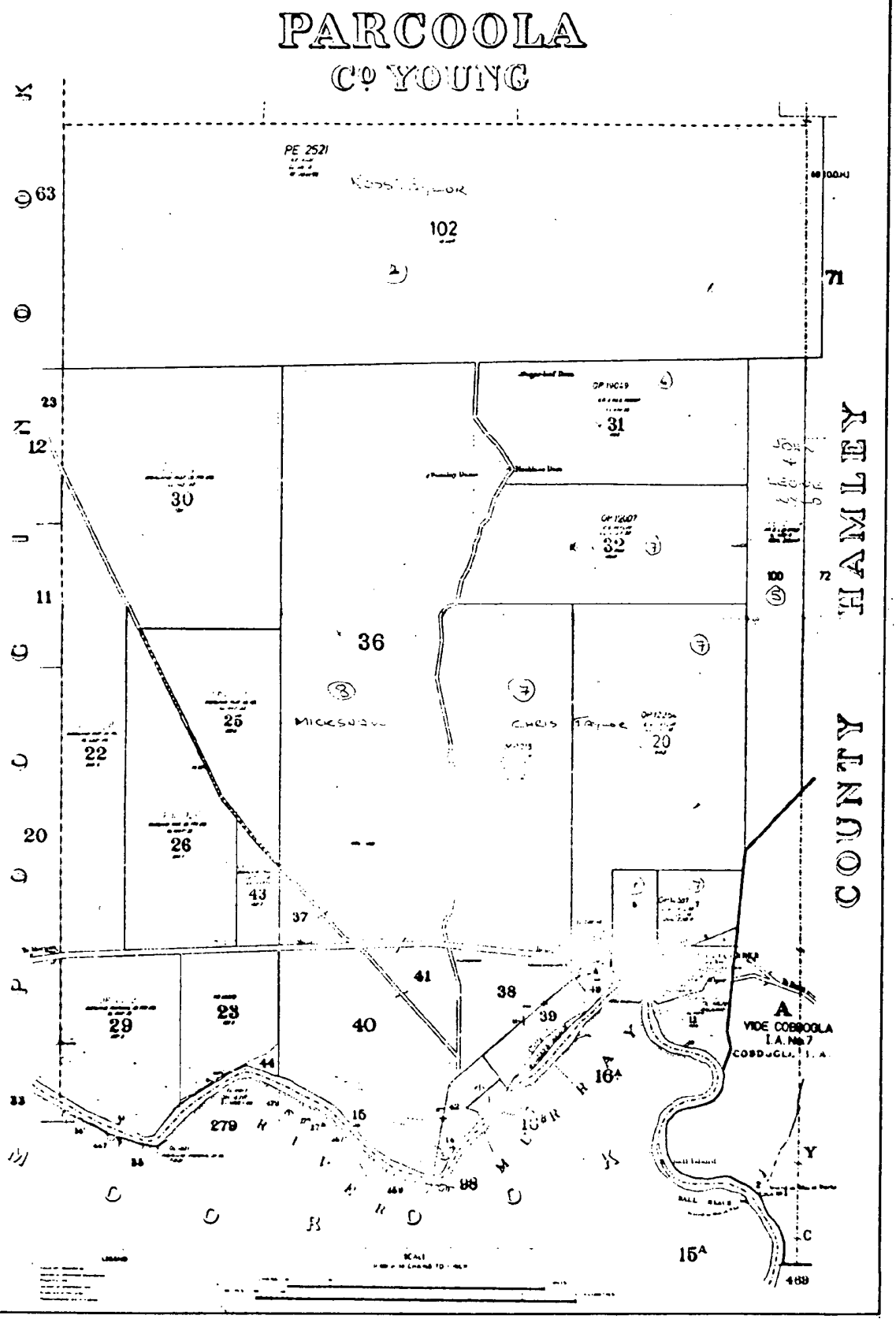

PARCOOLA
Co YOUNG
COUNTY HAMLEY
102
31
30
36
25
22
26
43
37
41
38
39
40
29
23
44
279
16
88
16A
15A
A
VIDE COBBOGLA
I.A. No 7
Y
C
71
72
63
12
11
20

FIGURE 5

3. SEISMIC DATA PROCESSING:

3.1 SUMMARY:

The 1985 Overland Corner Seismic Survey was processed by Digital Exploration Ltd in Sydney and Brisbane. A standard (minimum phase) processing sequence was used. Simple elevation and residual statics were applied, there being no attempt to compensate for near surface weathering.

All 1985 seismic data ties to within 10 milliseconds to 1981 and 1983 seismic data.

The principal processing parametres used were:

Spiking Deconvolution (32 point operator length, 3% white noise)
Velocity analysis every 1.5 kilometres
1200% CDP stack
15/18 hz to 70/72 hz post stack filters
Datum: 0 metres A.S.L.

3.2 SEISMIC PROCESSING REPORT: DIGITAL EXPLORATION PTY LTD

digital exploration limited.,
(a digicon company)

SEISMIC PROCESSING REPORT

OVERLAND CORNER SEISMIC SURVEY

MAY 1985

PERMIT PEL 16

AUSTRALIA

FOR

INTERNATIONAL MINING

BY

DIGITAL EXPLORATION LIMITED

(A DIGICON COMPANY)

54-56 BROOKES STREET,

BOWEN HILLS,

QUEENSLAND. AUSTRALIA.

FRANK LEUNG SENIOR GEOPHYSICIST

INTRODUCTION

1. GENERAL

During May 1985, International Mining Limited carried out the Overland Corner Seismic Survey within the Permit Lease PEL 16 to delineate further structures. A total of 3 lines were recorded by Petty Ray Geophysical Division and processed by Digital Exploration Limited in the Sydney Centre connected through to the Brisbane Centre's Digital computers.

2. PROSPECT

A total 3 lines were recorded within PEL 16. They were :

(A)	OC85 - 22	SP's.	1136 - 100
(B)	OC85 - 23		100 - 344
(C)	OC85 - 24		100 - 320

3. FIELD PARAMETERS

Data was recorded for 12-fold CDP coverage using a MDS10V recording instrument and recorded onto 1/2" magnetic tape in SEG B, phase encoded 1600 B.P.I. format. The following acquisition parameters were used :

[A] RECORDING PARAMETERS -

RECORDED BY	:	PETTY RAY GEOPHYSICAL DIVISION
INSTRUMENTS	:	MDS10V
TAPE FORMAT	:	9 TRACKS, SEG B, PHASE ENCODED
TAPE DENSITY	:	1600 B.P.I.
SAMPLE RATE	:	2 MSEC
RECORD LENGTH	:	4 SEC
GAIN MODE	:	IFP
RECORDING FILTERS	:	9 - 125 HZ.
RECORDING POLARITY	:	SEG STANDARD

[B] SOURCE PARAMETERS -

SOURCE	:	2 X 50M. REDCORD. 2 DET. CENTERED ON STAKE.
DEPTH OF SHOT	:	APPROX. 1 METRE
SHOT INTERVAL	:	120 METRES

[C] SPREAD PARAMETERS -

GEOPHONE TYPE	:	SM4
GEOPHONE ARRAY	:	12 PHONES IN LINE OVER 30 METRES
NUMBERS OF GORUPS	:	96
SPREAD PATTERN	:	1470 - 60 - X - 60 - 1470 METRES
GROUP INTERVAL	:	30 METRES
COVERAGE	:	1200%

PROCESSING SEQUENCE

1. INITIALIZATION

As the survey was previously sampled over areas that had been processed by Seismic Data Processor's International, it was felt that the processing sequence be of similar nature for time and character tie purposes; and, therefore the previous sequence was adopted for processing our 1985 project.

a. Demultiplex
b. Spherical Divergence Correction
c. Trace Editing
d. Deconvolution
e. Common Depth Point Gather
f. Datum Statics Computation and Application
g. Velocity Analysis (every 1.5km)
h. Surface Consistent Residual Statics Computation & Application
i. Normal Moveout Corrections
j. First Arrival Muting
k. Time Variant Equalization
l. Common Depth Point Stack
m. Digital Bandpass Filter
n. Digital Bandpass Equalization
o. Displays

2. BRIEF DESCRIPTION OF THE PROCESSING SEQUENCE

Following are descriptions of the Digital Processes applied to the data. Except for some propriety programs, those used form part of Digicon's basic "DISCO" Seismic Processing System, developed for use with the Digital Equipment Corporation's Vax II/780 Computer.

i) Demultiplex

The multiplexed data from the field tapes are decoded and converted to an internal 9 track, 6250 BPI, trace sequential format for subsequent processing. The demultiplexed records are still sampled at 2ms. intervals to 4.0 sec of length.

ii) True Amplitude (Gain) Recovery

True Amplitude Recovery phase of seismic data processing consists of the following steps -

a. Removal of Binary Gain (non-linear) which is applied to the data during recording.

b. Correction for amplitude loss due to spherical divergence of wave-front as it is propagated downwards through the earth and reflected back to the surface. To correct for this each trace is multiplied by V T, where V is the seismic wave velocity and T is the two-way record time.

iii) Edit

This option is used on some records to zero and surgical mute noisy traces. Information from the displayed demultiplexed records, field monitor records and observer's logs is combined to determine the editing table. Cable configuration, offsets and skipped shots are also checked at this junction.

iv) Deconvolution Before Stack

Deconvolution is the process of designing and applying an inverse filter to remove the effects on the recorded data of the earth's filtering characteristics.

The deconvolution is accomplished by the application of one or more whitening or non-whitening filters designed from the auto-correlation of the data trace of the input record. The filter is designed to whiten or broaden the frequency spectrum within a band pass having an allowable signal-to-noise ratio. By whitening the pass-band, the high requency definition is improved thus providing finer delineation of the reflecting horizons.

For the project, a portion of line OC85-22 was selected and tested with various deconvolution parameters. The following parameters was selected on the basis of how well the wavelet collapsed from the observed record and autocorrelation displays :

Spiking Deconvolution with 64ms. Operator Length and 1% White Noise Added.

Design Gate : Near Offsets : 300ms - 2400ms
Far Offsets : 900ms - 2600ms

v) Common Depth Point Gather

The seismic traces along a line are gathered into data sets on the basis of common reflection points. The offsets, surface and sub-surface co-ordinates and shot sequence numbers are anotated in the trace headers for subsequent processings.

vi) Datum Statics Computation

Datum statics are computed by the same simple (elevation to datum divided by replacement velocity) method as previously processed.

For the project : Datum is 0 M. ASL
Replacement velocity as being 2000 m/sec.

Simply, the Static Model is :

Geophone Statics (TG) = Shot Statics (TS) = -(Elevation - Datum)/2000

The resulted Geophone (TG) and shots (TS) statics are further divided into two components of residual and total floating datum statics. Only residual floating datum statics are applied to ensure all velocity analysis are referenced from surface. The total datum statics are applied after stack to bulk data back to the required datum.

vii) Velocity Analysis (SVEL)

SVEL velocity analysis is an automatic production oriented technique designed to obtain RMS velocity information from seismic data in CDP gathered form.

Based on pre-determined knowledge of the stacking velocities which might be expected in an area, a set of velocity ranges versus two-way reflection time is input to the program together with a number of consecutive CDP gathers for each location where a velocity study is required. Also input is a number, n, (usually 7-11), of velocity functions to be applied to the gathers.

The program takes the maximum and minimum functions as specified by the ranges and times above and intersperses n-2 other functions between them. It then applies these functions, stacks and filters the data.

The SVEL display consists of six parts :

a. The uncorrected central gather of the input group.

b. The central gather NMO corrected by each of the n velocity functions.

c. The stacks fromed by NMO correcting, stacking and filtering the set of CDP gathers using the n functions.

d. A display of velocity versus reflection time showing the n functions and points of high coherence at pre-selected intervals, e.g. : 50 milliseconds.

e. A plot of relative coherence amplitude versus time.

f. A listing of velocities versus time of up to three velocities at any time level, based on coherence measurements.

For this survey the analyses were run over 12 depth points with 9 velocity functions forming the fan. These were run with raw gathers as input.

8. Surface Consistent Residual Statics

The routine assumes that the static variation from trace to trace is caused by velocity and thickness variations in the low-velocity weathering layer. It further assumes that refined static corrections, based on statistics computed from the reflection data itself, are desirable.

The automated statics analysis routine is conducted on NMO corrected gather records by utilizing all possible cross correlations between traces within and from adjacent depth points.

A dip model, representing the observed structure on one or more events within a specified gate or gates, is input to the program to facilitate dip correction within the set of CDP gathers being operated on. The model is interpreted from the previous stacked section in the processing sequence.

The process iterates automatically and makes separate estimations of residual normal moveout and dip, then computes a set of surface consistent residual staics for all shot and receiver locations. The appropriate residuals may be output on tape for application at a later stage, or stored in the data-base.

The following correlation processing controls are generally followed while estimating residual statics and have some data dependence :

a. Static limits (+/- 20 msec. for these data).

b. Damping factor to prevent matrix instability.

c. Number of iterations (3 for these data).

d. The number of depth-points in the cross correlations. This may be constant or variable through the iterations.

e. Inverse filtering controls for low frequency static estimation.

Residual geophone statics are applied in accordance with receiver surface location and residual shot statics with record or shot input sequence. Both are recorded in the appropriate trace headers.

9. Normal Moveout (NMO) Correction

This operation is performed assuming that the energy travels in a straight ray path and utilizes the following equation :

$$T_{recorded}^{2} = T_{corrected}^{2} + \left(\frac{X \times 1000}{VRMS}\right)^{2}$$

A space varying velocity function is utilized and the program computes a new space-varying function for each trace, by making floating point cubic interpolations between input control points, to produce a high fidelity NMO output.

10. Prestack Muting

The function of this process is to mute or scale down the very shallow long offset traces where the signal-to-noise ratio is poor.

In particular, the disproportionate stretching of traces with decreasing velocity and increasing offset, by NMO correction, contributes significantly to poor S/N ratio. An effective muting system, which is both offset and velocity dependent, was achieved by designing a hand mute from the displays of continuous common offset stack (every 60 CDP so that all the offsets were included in the first set of COFS).

Mute used was :

OFFSET (M.)	TIME (MS.)
300	0
301	300
540	650
1470	800

11. AGC Before Stack

At this final stage of preparation of the trace it is assumed that each has been statics and NMO corrected to a simulated zero offset condition, on the datum plane, for the particular CDP. So that each may contribute equally over its full length, to the summed trace, a short gate (500 millisecond) Automatic Gain Control was applied, before stacking, to ensure that all were at optimum level.

12. Common Depth Point Gather

After the completion of prestack muting and balancing the CDP data sets, which are corrected for the final velocity and residual statics, are summed algebraically. The resultant amplitude is divided by the number of live sample contributing to the summation to produce the final unfiltered sample.

13. Digital Time Variant Bandpass Filtering

Zero-phase digital bandpass filters were used in the filtering of out-out stacked data.

Final filters were :

TIME (MSEC.)	LOW CUT (HZ/DB PER OCT.)	HIGH CUT (HZ/DB PER OCT.)
0 - 4000	15/18	70/72

14. Time Variant Equalization

An equalization gate length of 1000 milliseconds was applied to the data. The gate slides along each trace one sample at a time. The average absolute value (AABS) of the gate is computed and a scalar is applied to the centre point of the gate such that the AABS of the gate is now at a predetermined level.

The gate then moves to the next location and the process is repeated. Thus a time variant scalar is determined which brings the trace to the desired amplitude level.

15. Display

Final & Migrated Stack Sections :

Final Display Time :	3 seconds
Horizontal Scale :	12 TPI
Vertical Scale :	5.0 inch/sec
Mode :	Wiggle Trace, Variable Area
Polarity :	Normal Polarity

Top Label Consisted of the Following Annotation :
Total statics (including field & residual statics)
Shot points
Velocity function boxes
Residual Statics (one way statics only) graph
Field statics (only receiver) graph
Elevation
Direction and line annotation.

THE DATA PROCESSING SYSTEM

DIGION's installation in Brisbane is based on two Digital Equipment Corporation VAX II/780 computers, coupled with DIGICON's DISCO seismic data processing system.

The Hardware configuration is extremely flexible, the Brisbane installation being one of many possible alternatives. Included in this establishment are twenty-one tridensity tape drives, five 300 megabyte disc units, four FPS array processors, two Benson electrostatic plotters, and sixteen remote input/output terminals allowing multiuser, multifunctional interactive capabiltiy.

The 32Bit central processing unit and a 4 billion byte virtual memory capacity enhance the scientific application of the VAX II/780.

Plotting in a variety of modes is available through the online Benson plotters and Geospace 6400 drum plotter for film plotting. Offline Xerox 2080 copier gives a choice of high quality reproductions on film or paper at a range of enlarged or reduced sizes.

The DISCO system (DIGICON's INTERACTIVE SEISMIC COMPUTER) is an extension of the DIGICON modular seismic data processing system developed over many years. Being modular, the system is completely flexible allowing complete user control of the number and sequence of operations performed in any job. The DISCO Seismic Monitor assembles the selected modules in the specified order and controls the processing run.

SUMMARY

The project was completed to the satisfaction of the representative Geophysicist, Mr. Alan James and Digicon.

The data quality was good to very good. A noticeable improvement was made at each stage of the processing sequence. All areas were of consistent character.

The project was completed in July with delivery of all of the final film sections.

We would like to extend our thanks to the field crews and to Mr. Alan James for their advice and close liason during the processing phase of this project.

Respectfully submitted,
DIGITAL EXPLORATION LIMITED,

Frank Leung,
SENIOR GEOPHYSICIST

Allan S. Gell,
Supervisor,
LAND DATA PROCESSING

Bimal R. Banerjee,
Manager,
DATA PROCESSING CENTRE

AG01:W:102

4. SEISMIC INTERPRETATION

4.1 GENERAL

The 1985 seismic data was tied into the Overland Corner - 1 well (located at shot point 280 on OC 83-11) via the 1981 and 1983 vintage seismic data (see Appendix 1 for well tops). Additionally these correlations were tied along line OC 85-22 to North Renmark-1. Although this well had no velocity survey, these correlations appear to tie well with the formation tops converted to time using a velocity function derived from the 1985 stacking velocity analysis located on the eastern end of OC 85-22.

The following horizons were correlated on the 1985 seismic data:

Top Eocene	(Yellow Seismic Event)
Top Cretaceous	(Brown Seismic Event)
Top Aption	(Aqua Seismic Event)
Nr.Top L.Cretaccous	(Pyap Member) (Blue Seismic Event)
Top Permian	(Lower Permian) (Purple Seismic Event)
Top Cambrian	(Basement) (Red Seismic Event)

Interpreted seismic lines are enclosed at rear (Plates 1,2 and 3).

4.2 RESULTS:

1. The revised Time Structive Map, near Top Pyap Member (L.Cretaceous) is enclosed at rear (Plate 4). This map shows the low side fault closure, however there being no fault independent closure mapped. This severely downgrades the structural validity (and hence prospectivity) of this feature.

   The correlation of the Pyap Member along line Oc 85-22 suggests that this unit is burried to a maximum thickness of 0.85 seconds TWT (3500ft) near North Renmark-1. A number of single line leads are mapped although these obviously need further seismic detailing to establish four way dip closure. Some normal faulting is interpreted at shot point 984 on OC 85-22 which further indicates that this area of the Renmark Trough is structured.

   The maximum total sediment thickness attained along line OC 85-22 is 1.22 seconds TWT (approx. 4500', 1350 metres). Some deeper seismic events are evident (1.45 seconds TWT sp 880 on OC 85-22) although analysis of shot records and velocity scans indicates that these events are likely to pegleg multiples from the overlying section.

5. HYDROCARBON POTENTIAL OF THE MURRAY BASIN

The hyrocarbon potential of the Murray Basin has been downgraded by previous workers chiefly on two grounds;

1. Lack of any recognised mature source rock

2. Apparent lack of structure within the Renmark Trough where the sedimentary section is thickest.

Recent work undertaken on behalf on International Mining Corporation has significantly upgraded the prospectivity of PEL16.

1. A geochemical study undertaken by AMDEL and the Australian National University of cuttings and samples from Overland Corner-1 indicates that the Pyap Member is a good oil source and capable of generating oil when buried to depths in excess of 1,000 metres. Appendixes 2 and 3 detail these findings and dicuss the previous geochemical findings.

2. Line OC 85-22 from the 1985 Overland Corner Seismic Survey shows the Pyap Member to be buried to depths of approximately 1,000 metres and indicates the presence of structuring of this horizon.

6. CONCLUSIONS AND RECOMMENDATIONS:

The 1985 Overland Corner Seismic Survey was successful in its objectives:

1. Proving a fault dependent low side fault closure against the Renmark Fault

2. Identifying a number of one line leads at to Pyap level near North Renmark-1. The depth to Top Pyap being significantly deeper (approximately 1000 metres) than at Overland Corner-1.

It is recommended that additional regional seismic data be recorded to investigate the depth to Top Pyap in the surrounding area. Additional prospect seismic lines should be recorded with an aim to delineating a Pyap structure at or deeper than 1000 metres.

Following the seismic identification of a valid Pyap structure an exploration well should be drilled to a depth of at least base Pyap Member.

APPENDIX 1:

Overland Corner-1

Well Tops

FORMATION TOPS	KB Depth (metres)	MSL Depth (metres)	TWT (seconds)
Pliocene/mid Miocene	25	+43	
Top Eocene	146	-78	0.103
Eocene/Palcocene	235	-167	0.220
Top Cretaccous	257	-189	0.240
Top Aption	331	-263	0.32
Intra Aption (Pyap Member)	446	-378	0.43
Lower Permian	585	-517	0.56
Cambrian	642	-574	0.62

APPENDIX 2.

Assessment of Hydrocarbon Potential for The Murray Basin.

Dr. Miryam Glikson
Australian National University
17th October 1985

PE216 00058

The Australian National University

Director: Professor Stuart Harris

Centre for Resource and Environmental Studies

GPO Box 4 Canberra ACT 2601
Telegrams & cables NATUNIV Canberra
Telephones 062 49 4277 (enquiries)
062 49 4588 (Director)
Telex CRES AA 62768

17 October 1985

Mrs M. Phillips
Director
International Mining Corporation N.L.
4/447 Kent Street
Sydney NSW 2000

Dear Mrs Phillips

Further to talks with Mr Warren Reed I enclose a conclusive report on the hydrocarbon potential of 6 wells drilled in the Murray Basin. It seems to me that the Overland Corner No.1 well contains good source rocks in terms of organic content and type, and given sufficient depth of burial may well have generated hydrocarbons. Having seen the seismic data and spoken to Warren it is likely that the organic rich source rock beds can be picked up at around 1000m which may have brought them into the oil generation window. None of the other wells seems to contain horizons with sufficient organic matter to consider source rock potential.

Please let me know if I can further assist in the project.

Yours sincerely

Miryam Glikson

Dr Miryam Glikson

enclosed: 1. report
2. account

Assessment of hydrocarbon potential for the Murray Basin

Geochemical data and microscopical analysis show promising source rocks in Overland Corner No.1 bore hole particularly at depth between 488 to 570m, with TOC ranging from 3.6 to 13.10% (cut-off for hydrocarbon generation is between 1 and 2%(1)). Hydrogen index is favourable (up to 584). Maceral analysis indicates exinite - sporinite in sufficient quantities. These macerals are noted to generate hydrocarbons at low maturation (0.4 to 0.5% Ro)(2),(3). The vitrinite reflectances measured for Overland Corner No.1 samples range from 0.18 to 0.26% Rmin and 0.32 to 0.39% Rmax over a depth of 380m. It has been shown that maturation increases exponentially with depth/temperature(4) and therefore in the next 380m, at depth of about 760m the vitrinite reflectance expected may be 0.42% Rmin and 0.57% Rmax. These values would enable generation of liquid hydrocarbons from exinite, cutinite and resinite. Therefore at depth of around 1000m the organic matter may well have reached the oil generation window in a normal thermal gradient area. However geothermal gradients maybe modified by factors such as type of rock and whether poor or good conductors of heat.

The source rocks in Overland Corner No.1 are believed to be organic rich shales within a sandstone sequence of Cretaceous age (W. Reed, pers. comm.). Any early generated hydrocarbons may be retained within the sandstone acting as reservoir.

It has been stressed(5) that the majority of the present oil fields have been formed during the Cretaceous and Tertiary.

Berri North No.1 well has an organic rich horizon at 2860 to 2870 ft. which may have generated some hydrocarbons (Ro = 0.48-0.50%) as has also been reported in the maceral analysis carried out by AMDEL. The latter reported exudatinite which is an early generation product from exinal waxes and possibly resinite. However the quantitative maceral evaluation shows inertinite to be more abundant than exinite. Therefore there may not have been sufficient exinite-cutinite-resinite macerals to contribute to the generation of any significant amounts of hydrocarbons. On the other hand the very high inertinite content in this horizon may point to gas having been generated from vitrinite.

Overall it is evident from the analysis of the sediments in the 6 wells that only Overland Corner No.1 contains rich petroleum source rocks. It is estimated that between 800 and 1000m depth the organic matter may have generated hydrocarbons. The quantity of hydrocarbons generated is difficult to assess at this stage. However the organic rich beds stretch over 90m. There is no information as to the exact thickness of the organic rich horizons as well as the interbedded lean horizons. A rough estimate of the beds high in organic content is about 10m. However there is a large gap in information availble between a lean sample at 533m and the sample with highest organic matter content at 561m, and there may be more organic-rich horizons within this interval.

References

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2. Snowdon, L.R. and Powell, T.G. 1982. Immature oil and condensate - modification of hydrocarbon generation model for terrestrial organic matter. AAPG 66; 175-788.

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5. Tissot, B.P., Bard, J.F. and Espitalie, J. 1979. Principal factors controlling the timing of petroleum generation. Advances in Org. Geochem. 12: 143-152.

APPENDIX 3.

Memo from Warren Reid discussing AMDEL and ANU geochemical work.

APP 2

00063

MEMO TO: Mrs. M. Phillips

SUBJECT: Update on Developments Regarding PEL 16 Prospects

Dr. M. Glikson's studies of the Amdel source rock reports indicate that the hydrocarbon generation potential in PEL 16 is considerably better than we had thought.

This upgrading is based on recent studies carried out at the Australian National University on source rock generation. Using an electron microscope, Dr. Glikson has actually photographed oil generated by bacteria on carbonaceous material buried to relatively shallow depths.

Based on these studies and an analysis of the Amdel data, Dr. Glikson has made the following observations:

1. The source material, in particular exonite and cutinite found in Overland Corner No. 1 in the Pyap Formation, is capable of generating oil at depths of 1000 metres. The analysis indicates material similar to source rock found in New Ireland, Papua New Guinea and in the Gippsland Basin, although we believe of an older age.

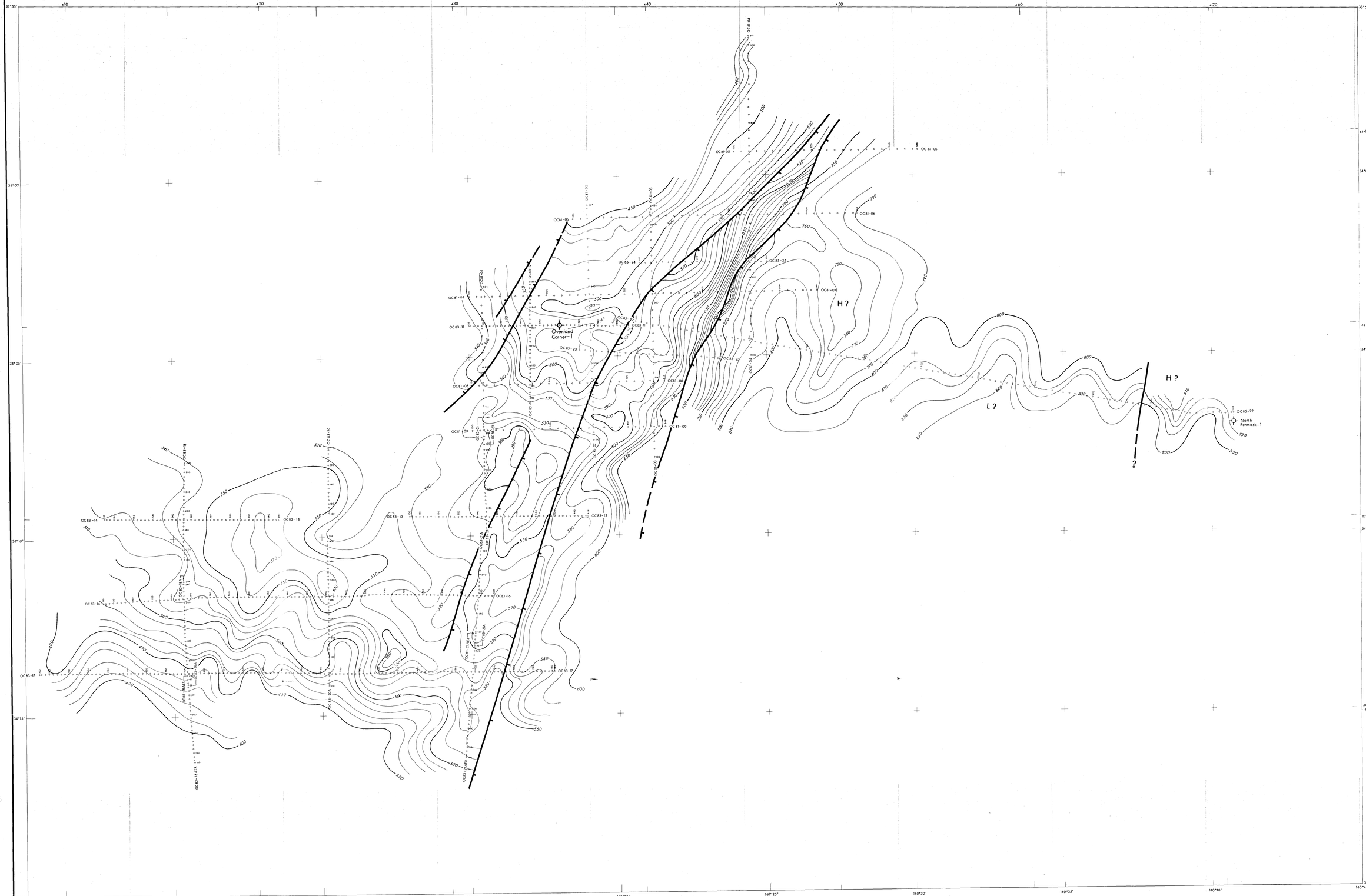
2. The poor source results from the wells other than Overland Corner No. 1 in PEL 16 are probably the result of oxidation. Recent studies indicate that cuttings and cores from wells drilled ten or more years ago give erroneous results due to weathering (i.e. exposure to the atmosphere at the surface).

To further detail the above I have requested the S.A. Mines Department to send Dr. Glikson cuttings and core chips from the Overland Corner No. 1, Berri North No. 1, Monash No. 1 and North Renmark No. 1 wells. A study using the electron microscope should evaluate the degree of oxidization and give us a more reliable source rock evaluation.

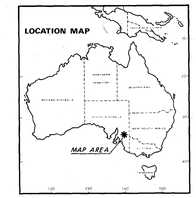
With reference to the Amdel reports, the above confirms Dr. Brian Stevenson's earlier comments that 3200 feet of burial in the PEL 16 area should be sufficient to begin oil generation.

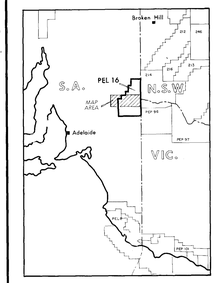
Warren G. Reed

2/11/85



LOCATION MAP





PROJECTION :
A.M.G. ZONE 54

SCALE 1:50,000

0 5 km

INTERNATIONAL MINING CORPORATION N.L.

PEL 16

TIME STRUCTURE MAP

NEAR TOP PYAP MEMBER
(Lower Cretaceous)

6331-4

Author : A.W. JAMES & ASSOCIATES PTY. LTD.

Date : AUG. '85 | Contour interval : 10 ms | PLATE 4