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MOONEY SEISMIC SURVEY

DATA ACQUISITION REPORT

ONSHORE

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**MOONEY SEISMIC SURVEY
DATA ACQUISITION REPORT**

**FOR
PEDIRKA PETROLEUM LTD.**

**BY

NORPAC INTERNATIONAL, INC.,**

PARTY NV-05 (AUST 288)

JAN - FEB 1986

ONSHORE

R86/17 C

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INTRODUCTION

NORPAC INTERNATIONAL, INC., was contracted by Pedirka Petroleum Ltd. to conduct the 1986 Mooney Seismic Survey - A Vibroseis Multi Fold Reflection Survey in E.P. 2, located in the far central south of the Northern Territory.

The Mooney Seismic Survey consisted of four lines, totalling 99.6 kilometres of 12 Fold Coverage.

Recording commenced on 17th January, 1986 and was completed on the 24th January 1986.

Pedirka Petroleum Ltd. was represented in the field by Mr. Bruce Beer for the duration of the Survey.

TERRAIN AND LOGISTICS

TERRAIN

The Mooney Survey was located in the southern part of the Simpson Desert - The largest parallel sand dune desert in the world. The dunes were generally orientated north - north west to south - south east with the slip face to the east. Crossing was therefore best made from west to east.

ACCESS

Access into the general area was made via the 'rig road' from Oodnadatta to Colson #1 rig site. An alternative route from Alice Springs via 'Numery' station to Colson #1 was also available, but used infrequently from Colson #1, the only access to the Survey area was by means of Seismic lines cut for the concurrent Bejah Seismic Survey.

CAMP SITES

The Base Camp consisted of air-conditioned caravans providing living accommodation for up to 46 personnel, Kitchen, Diner, Showers and Laundry, Survey Office, Cable Repair Shop, Party Manager's Office, Mechanic's Workshop and Data Processing Van. The camp was powered by two 65 KVA generators, used alternatively.

The Base Camp was located at the Colson #1 Well site for the duration of the Survey. The Colson airstrip, seven kilometres to the NNW was used.

CAMP SITES cont.

As Base Camp mobility was severely limited, the Recording crew fly camped on the lines, with helicopter support. A two seat piston engined helicopter was utilised to ferry personnel, cooked food and data between the Base Camp and Fly Camp.

The Fly Camp consisted of one kitchen/sleeper caravan, camp shower and marquees with bedding.

LOGISTICS

Drinking water and food supplies were obtained from Cooper Pedy, water from the Cooper Pedy Progress and Miners Association and food from M. Lucas and Son.

Camp water was obtained from Purni #1 Bore, while water for drilling was obtained from Erabena #1, both of these necessitated long hauls.

Fuel was supplied by J.E. & J. Pecanek of Oodnadatta to their bulk tank at Macumba #1 rig site.

Daily radio communications were scheduled between the Field crew and NORPAC's Brisbane office, using Codan SSB radios. SSB radios were also used between the Dozing, Drilling, Survey and Weathering crews, as well as to the Recording Fly Camp. However, radio reception for the duration of the Survey was very poor.

The Flying Doctor was also available on SSB radio. A Flying Doctor Medical Chest was kept on the crew.

The Pedirka Petroleum Ltd. representative also had SSB communication twice daily with their Expediter in Alice Springs.

Movement throughout the Survey was hampered severely by the steep, soft dunes, although detours were cut, traversing these was made difficult by the softness of the sand brought about by the extreme temperatures. A Log Skidder was made available to assist the drill rig and water trucks.

LINE CLEARING

Buchanan's Earthmoving, based in Brisbane were contracted for line clearing which was commenced on 7th January, 1986. They supplied two Dozers - A CAT D8K and a CAT D7G as well as a CAT 140 Grader and CAT Log Skidder. The Skidder being to assist movement of the drill rig.

Dozing production of 0.7 km per hour per machine was considered satisfactory in view of the heavy sand cutting.

Dozing was completed on 18th Janaury, 1986.

SURVEYING

PERMITTING

Permitting for the Prospect was carried out by Pedirka Petroleum Ltd. in accordance with Government regulations. The Central Lands Council's permission was sought before line clearing commenced.

After discussions with local Aborigines through a Central Lands Council Anthropologist and after a scouting trip by them, permission was given to cut the lines as per programme as no significant sites exist in the area.

EQUIPMENT

Survey equipment used on the Mooney Seismic Survey included a Wild T2000 Electronic Theodolite combined with a Wild DI5L Distance Measuring System, and a Wild GRE 3 Electronic Field Book. All calculations were made using the 'Swift' Software package on a T.I. Personal Computer.

FIELD PROCEEDURE

1. PEGGING

Station intervals were pegged using a chain made from plastic coated steel wire. The chain was checked frequently.

2. ELEVATIONS

The reverse reciprocal method of Trig Heighting was employed for elevation determination. Intermediate elevations were determined by a single pointing. Due to the lack of previous survey work in the area a Doppler Satellite Station was established at the intersection of lines MY-02 and MY-03. This was used as the Elevation Datum for all lines in the Mooney Survey.

3. CO-ORDINATES

Control of line bearings was maintained by continuous backsighting, combined with sun observations taken at regular intervals along the lines. The Doppler Satellite Station was used as the co-ordinate take-off.

4. PERMANENT MARKERS

Permanent markers consisting of star pickets driven into the ground with a metal tag attached showing line and station number were placed at intervals not exceeding 5 kilometres. They were also placed at all line intersections.

5. CLOSURES

Due to the nature of the Survey only one internal loop could be closed. It was seen to tie within the specified limits of 5 K cms for vertical and 5 K metres for horizontal.

(Where K is the length of Traverse in kilometres)

CLOSURES cont.

The helicopter was utilised by the Surveyors for locating pre
- 1970 existing lines so that they could be tied. These
lines were almost impossible to locate from the ground.

RECORDING

The energy source was provided by three Litton Model 311 buggy-type articulated Vibrators, with Pelton Advance 1, Model V Electronics. A spare Vibrator which was continuously swapped about was kept with the Recording crew.

Data was recorded on a 96 channel DFS V System which was interfaced with a Calder Real Time Correlator and FT 1 Data Processing Unit.

The R.T.C. was not used in the chosen mode of recording.

Field data was recorded in the following formats:

1. Diversity Stacked Uncorrelated

SEG-B - 6250 B.P.I.

2. Diversity Stacked Correlated

SEG-Y - 6250 B.P.I.

The only experimental work performed consisted of a comparison of four verses six verses eight sweeps per V.P, this was conducted at V.P. 735.5 on line MY-02.

Standard daily instrument tests were performed along with daily hard wire similarities. A full set of instrument tests were performed at the commencement and completion of the concurrent Bejah Seismic Survey.

The relatively slow production rate of 12.5 km per day could almost entirely be put down to the heat and difficulty in movement in the east to west direction. Due to this difficulty east-west lines had to be recorded from west to east, in one case this meant the line move was much longer than appeared necessary and very time consuming.

DRILLING

Reflection Drilling, supplying a midway 10m drilling rig mounted on a 6 x 6 Ford Louisville and backed-up by two Mercedes 1000 gallon water trucks were contracted for the Mooney Survey.

Drill production was tailored in an attempt to keep in step with the Recording crew, however, production was severely hampered by the necessity to mud pit every hole with the consequence of very long water hauls.

A Zelikson 2000 gallon water truck on rental from Seiscom Delta arrived on location on 27th January, 1986. This alleviated the situation somewhat, but the round trip for water from Erabena was in some instances in excess of 16 hours.

Drilling commenced on 25th January, 1986 and was completed on 4th February, 1986.

A total of 1975 meters was drilled with an average hole depth of 73 metres.

UPHOLE SURVEY

Static corrections were derived from uphole shots recorded continuously along the lines. These were computed in the field by NORPAC Seismologists.

The Uphole Recording Team consisted of an Observer/Shooter, Shooters Assistant and Pre-loader. The Observer's equipment consisted of a Toyota-mounted instrument cabin fitted with a 24 trace OYO Mc Seis 1500 recording system and OYO Blaster. Each shot was recorded on a Dry-Write Electostatic OYO camera. Cap-Under tests were conducted at regular intervals to check the system delay.

For computation, Velocities were obtained from the gradients of lines connecting points on the time verses depth plots of the Uphole Survey. Afer determination of V_0 , V_1 and D_w static calculation using the 'Norstat' statics package on a T.I. Personal Computer was performed.

The following formula was used:

$$T_s = (DAT - E + D_s)/V_r - [D_w/V_0 + (D_s - D_w)/V_1]$$

WHERE E = SURFACE ELEVATION
 Ds = DEPTH OF DEEPEST RELIABLE SHOT
 Dw = DEPTH OF WEATHERING
 Vr = REPLACEMENT VELOCITY = 2000 m/s
 Vo = WEATHERING VELOCITY
 V₁ = SUB-WEATHERING VELOCITY
 Ts = STATIC CORRECTION

At the completion of the Survey a Statics Package consisting of Statics Correction, Computations Printout and Uphole Survey Records was dispatched to Pedirka Petroleum Ltd.

APPENDIX I

FIELD RECORDING PARAMETERS

VIBROSEIS:	Mooney Seismic Survey
	Lines MY-01 - MY-04
TAPE FORMAT:	Uncorrelated Diversity Stack SEG-B 6250 BPI
	Correlated Diversity Stack SEG-Y 6250 BPI
RECORD LENGTH:	12 sec (8 sec sweep + 4 sec listen)
SAMPLE RATE:	2 ms
FILTERS:	Hi-cut 128 Hz 72 dB/Oct
	Lo-cut 8 Hz 18 dB/Oct
RECORDING CHANNELS:	96 + AUX
SPREAD CONFIGURATION:	1515-105-0-105-1515
COVERAGE:	1200%
GEOPHONE ARRAY:	LRS 1000 10 Hz, 12 Phones
	Single weight in line centred on peg
ELEMENT SPACING:	2.73
STATION INTERVAL:	30m
SOURCE TYPE:	3 x Litton 311 Vibrators
SOURCE INTERVAL:	120m (4 stations)
VIBRATOR GEOMETRY:	10m P-P, 2m move-up
SWEEP FREQUENCY:	10 - 80 Hz
SWEEP FUNCTION:	Linear, 3 sweeps/V.P
DRIVE LEVEL:	60%
AMPLITUDE TAPER:	NIL
COSINE TAPER:	0.25 secs

APPENDIX 2

TECHNICAL EQUIPMENT LIST

- 1 FT-1 System with 2 Associated STC Dual Density Tape Drives,
Calder Digital Real Time Correlator (RTC not used in chosed
mode of recording) and 770 Intelligent
terminal
- 1 Calcomp 11 inch Plott/Printer
- 1 96 Channel TI DFS V IFP, 9 Track Recording System
- 1 DFS V FX 6250 Tape Drive
- 1 64 Channel SIE ERC 10C Recording Oscilligraph
- 1 I/O Rota-long switch, 240 channel
- 350 Litton LRS 1000 Geophone strings (10 Hz) (12 Phones per
string)
- 88 Main Cables, 220 metres, 4 take-outs per cable
- 2 Extention cables, 240m
- 7 Mitrek Radios (Vibrators)

- 14 Tait Radios (Line communication)
- 6 Codan 6801 MK2 SSB Radios
- 1 Geophone Tester
- 1 SWR Meter (Radio check)
- 4 Litton LRS 311 Vibrators
- 5 Pelton Advance 1 Model 5 Vibrator Electronics
- 1 T.I. Field Timap 221 Data Processing System (2 STC Tape
 Transports, 2 Kennedy Transports)
- 1 Documation M600L Punch Card Reader
- 1 Calcomp 500 Printer/Plotter
- 1 Eprom Blower
- 1 Eprom Eraser
- 3 TI Personal Computers
- 1 Mc Seis 1500 24 Channel Recording System
- 1 OYO Signal Enhancement Unit

- 1 OYO Display Unit
- 1 OYO Seismic Amplifier
- 1 OYO Blaster
- 1 Wild T 2000 Electronic Theodolite
- 1 Wild T 16 Theodolite
- 1 Wild DI 5 E.D.M.
- 1 Wild GRE 3 Electronic Field Book
- 4 HP 41 CX Programmable Calculators

FIELD VEHICLE LIST

- 4 Litton LRS 311 Vibrators
- 1 Isuzu JCS 6x6 Vibrator Service/Maintenance
- 1 Isuzu TW 6x6 Generator Truck (2 x 65 KVA Gen + 1 x 25 KVA Gen)
- 2 Isuzu 4x4 Fuel Tanker (1500 gallons)

- 3 Isuzu 6x6 Water Tanker (1500 gallons)
- 1 Isuzu TS 6 x 6 Recorder
- 1 Toyota HJ60 Station Wagon/Party Manager's Vehicle
- 1 Toyota HJ60 Station Wagon/Uphole Survey Recorder
- 1 Toyota HJ47 4 x 4 Landcruiser Line Vehicle
- 6 Toyota HJ47 4 x 4 Landcruiser Cable/Geophone Vehicle
- 1 Toyota HJ47 4 x 4 Station Wagon Personnel Carrier
- 2 Toyota HJ47 4 x 4 Landcruiser Survey Vehicle
- 1 Toyota HJ47 4 x 4 Landcruiser Mechanics Vehicle
- 2 Toyota HJ47 4 x 4 Landcruiser Preloaders/Magazine
- 1 Vibrator Spares Trailer
- 1 Mechanics Workshop Trailer
- 1 Field Processing Unit
- 1 Kitchen Trailer
- 1 Mess Trailer

- 1 Shower Trailer
- 1 Survey/Cable Repair Trailer
- 1 PM Office/6 Bed Sleeper Trailer
- 5 8 Bed Sleeper Trailers
- 1 4 Bed Fly Camp/Kitchen

APPENDIX 3

PERSONNEL LIST

Party Manager	G. Paton
Relief Party Manager	H. Cutler
Seismologists/Data Processors	Z. Cerros
	M. Davies
	M. Sheehy
Observers	R. Dunlop
	W. Arnold
	W. Bryen
Observers (Up-hole Survey)	C. Macauley
	T. Bellamy
Vibrator Mechanics	K. Hayes
	M. Hillman
Workshop Mechanics	K. Duncan
	J. Klekar
	B. Clarke
Surveyors	P. Ackland
	C. Andrew
	S. Long

Head Linesmen	2
Line Labour	17
Vibrator Operators	6
Uphole Survey Assistants	4
Survey Assistants	5
Supply Truck Drivers	3
Cooks	2
Camp Attendants	3
	<hr/>
	59
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APPENDIX 4

UPHOLE SURVEY LIST

<u>LINE</u>	<u>STATION</u>	<u>DEPTH</u>
A86 - MY-01	133, 470, 783, 868	80m
" "	691	75m
" "	246, 365, 580	70m
S86 - MY-02	133, 240, 344, 473, 590, 695, 853, 1000	70m
S85 - MY-03	1134	65m
S85 - MY-03	133	85m
" "	243, 361, 467, 573, 691, 791, 900	70m
S86 - MY-04	460, 580	80m
" "	345	75m
" "	133, 240, 691	70m

APPENDIX 5

LIST OF PERMANENT MARKERS

LINE - S86 - MY-01

<u>STATION</u>	<u>EASTING</u>	<u>NORTHING</u>	<u>ELEVATION</u>
100	700017.70	7206945.64	101.41
240	703985.94	7208294.45	101.79
540	712493.32	7211184.24	99.89
740	718163.35	7213108.94	97.00
900	722702.99	7214649.54	83.52

LINE - S86 - MY-02

1167	716275.17	7186431.78	92.96
1032	714956.79	7190260.57	82.81
880	713473.49	7194571.93	92.87
740	711915.97	7198473.69	89.26
696	711423.60	7199698.59	90.28
540	709684.51	7204044.57	98.35
400	708127.80	7207946.75	106.58
345	707512.64	7209478.13	108.91
200	705898.95	7213518.49	100.20
100	704784.67	7216306.33	98.39

LINE S86 - MY-03

<u>STATION</u>	<u>EASTING</u>	<u>NORTHING</u>	<u>ELEVATION</u>
100	704096.47	7197061.56	92.74
240	708037.60	7198484.91	93.37
520	715927.05	7201329.45	84.82
780	723261.79	7203959.01	98.99
933	727576.99	7205504.30	97.89

LINE S86 - MY-04

100	713960.63	7219429.44	100.04
240	715565.88	7215549.51	95.86
345	716768.47	7212638.11	92.95
520	718774.32	7207784.79	89.22
691	720737.89	7203044.86	94.11
732	721208.66	7201906.88	96.29

APPENDIX 6

STATISTICAL SUMMARY

RECORDING

Date Commenced	17/ 1/86
Date Completed	24/ 1/86
No. of days Experimental	NIL
" " " Recording	8
" " hours "	72.25
" " " Travel	5.25
" " " Down	15.75
" " " S/B Weather	NIL
" " Kilometres Recorded	99.6
Average No. of Kilometres per Recording Day	12.45

DOZING

Date Dozing Commenced	7/ 1/86
" " Completed	18/ 1/86
Total No. of Hours	D7G: 9.25
	D8K: 103.25
Total No. of Hours	Grader - 40.75

DRILLING

Date Drilling Commenced	25/ 1/86
" " Completed	4/ 2/86
No. of Holes Drilled	27
Total No. of Metres	1975
Total No. of Hours	128.5

APPENDIX 7

LINE LISTS AND LENGTHS

	<u>LINE</u>	<u>VP to VP</u>	<u>KMs</u>
1200% 6 Sweeps and 8 Secs	MY-01	100 - 900	24.0
	MY-02	1163 - 103	31.8
	MY-03	100 - 932	24.96
	MY-04	100 - 728	<u>18.84</u>
TOTAL KILOMETRES			<u>99.6</u>



