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OPERATIONS REPORT
MOONEY SEISMIC SURVEY
JANUARY - FEBRUARY 1986
EP 2 - PEDIRKA BASIN 1986

PEDIRKA PETROLEUM N.L.

OPERATIONS REPORT

MOONEY SEISMIC SURVEY
JANUARY - FEBRUARY 1986
EP 2 - PEDIRKA BASIN, N.T.

Prepared by: J.L. Douglass

Douglass Exploration Pty Limited

Date: March 1986

Approved by: ..... Management Date: 17/4/86

..... Geophysics Date: 16/4/86...

1986/19

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APPENDICES

1. INTRODUCTION

Pedirka Petroleum N.L. on behalf of the EP 2 Joint Venture contracted Norpac International of Brisbane to conduct the 100km 1986 Mooney Vibroseis Seismic Survey.

Norpac sub-contracted Buchanan's Earthmoving of Brisbane to clear line, Reflection Drilling of Brisbane to drill upholes, and Brisbane Helicopters to provide helicopter support.

Pedirka Petroleum N.L. sub-contracted Bruce Beer of Adelaide to provide crew supervision in the field, and overall supervision was by Douglass Exploration Pty Limited of Brisbane. Data processing was contracted to Hosking Geophysical of Sydney.

After permitting, line clearing commenced on January 7, 1986. Chaining commenced on January 17, 1986, levelling on January 18, and uphole drilling on January 25.

Production recording commenced on January 17 and concluded on January 24. Uphole drilling, which had fallen behind schedule, finally was completed on February 4.

The Mooney Seismic Survey was worked in conjunction with the Bejah Seismic Survey in the adjacent permit OP 238.

2. LOCATION

The Mooney Seismic Survey was located in the south eastern part of the Northern Territory between latitudes 25°05' and 25°25' south and longitudes 136°55' and 137°15' east, and was entirely within the Simpson Desert. The towns of Alice Springs, NT, and Oodnadatta, SA, are located approximately 350 and 290 air km to the northwest and southwest of the centre of the survey area.

Geologically, the survey was located in the north Pedirka Basin, and within permit EP 2.

The Mooney Seismic Survey consisted of four regional lines totalling 99.60km.

3. ACCESS, CAMPS, WATER, LOGISTICS AND COMMUNICATIONS

ACCESS

The only access to the Mooney area is from the adjacent permit OP 238.

There were three possible principal accesses to the OP 238 survey areas. The first was from the north and west. From Alice Springs to Numery Station there is good bitumen and dirt road access. From Numery Station to Colson #1 wellsite, the old rig road (constructed in 1979) was in fair to good condition and mainly followed dune corridors. Alice Springs to Colson was approximately 470km and could be driven in 10-11 Toyota hours with minimal four wheel drive requirement.

The second principal access was the dirt road from Oodnadatta to Purni Bore, and then by the rig roads from Purni to Colson #1 wellsite. This route of approximately 290km was in fair to good condition. The crew mobilised from Mungeranie on the Birdsville track and travelled via Oodnadatta because the third principal access (the Delhi rig road route from the Birdsville track to Colson #1) was washed out in places.

Within the OP 238 survey areas the existing accesses consisted of the Alice Springs-Colson-Macumba rig road, and the 1985 Colson Seismic Survey lines.

Consequently, since the Colson lines only extended to the Bejah Detail area (approximately 30km northeast of Colson #1) a considerable network of new accesses had to be constructed. These new accesses included:

1. Bejah Detail to East Border of 30km.
2. East Border to Erabena Water Bore of 40km.

Access 1 was cross dune and access 2 was mainly interdune.

Access 1 was the main access to the Mooney area since Mooney was directly linked to the East Border grid. Mooney was itself centred approximately 30km north of the centre of East Border.

The 1960's vintage seismic lines in the area were of no value for access and were difficult to see.

CAMPS

One base camp site was used by Norpac for the Mooney Survey. It was established January 6, 1986, and was located at -

Latitude 25°57' south
Longitude 136°40' east

and was at Colson #1 wellsite.

The recording crew fly camped with a minimum of equipment and were supported in this by the helicopter.

The line clearing crews also fly camped with the aid of their support people.

The drill crew were able to move their kitchen caravan with them into the prospect. They of course had the log skidder without which such camp moving would have been impossible.

WATER

Water availability was very poor. In the survey area there was no potable water. Consequently the drinking water all came by water truck from Coober Pedy. Drilling water, while not present in the survey area, was more readily available but the long hauls and high drilling water demand provided many difficulties. The drilling water was hauled from Erabena #1 Water Bore with average distance being 105km. Fortunately, the disposition of the dunes meant that with full loads, the water trucks were travelling against the relatively easier westward dune faces.

The upholes drilled did not make any water so that no new water wells could be developed. The available evidence from previous seismic surveys and exploration wells in the general area had in any case suggested that hole depths of the order of 200 metres plus would be required. The time, effort, and cost involved in doing this was not justified, especially since success could not be guaranteed.

The drilling water source was as follows:

Erabena #1	Latitude	26°01' south
	Longitude	137°14' east

This well produced salty, non-potable water and was produced by using a surface air compressor.

LOGISTICS

It follows that the logistics of the survey area were difficult and that considerable pre-planning was necessary.

Food Supplies

Stores were picked up by Norpac's supply truck from Coober Pedy (approximately 480km from Colson #1). This arrangement worked very well.

Fuel Supplies

Bulk diesel fuel and Augas drums were supplied and delivered to Macumba #1 by Pecanek Haulage from Oodnadatta. The crew fuel trucks distributed fuel from the delivery point. The contractors had plenty of storage and trucks, and fuel provision was never a problem.

Spare Parts

A stock of spare parts was available in the field camps. Other spares were flown from Brisbane or trucked in depending on the urgency.

The operation was rarely hampered by lack of parts.

Explosives

The crew brought with them the required explosives inventory. Sufficient quantities for each day's operation were drawn from the licenced field magazines by Norpac's licenced shooter.

COMMUNICATIONS

Radio Communications

Inter-camp, vibrator, and recorder communication were facilitated with the provision of 21 4 channel 40 watt Motorola Mitrek VHF radios.

Five 10 channel, 100 watt SSB radios were used for long distance communication. Radio communication with Brisbane was quite efficient.

The drill crew's internal radio communication was poor and was detrimental to optimum performance.

The helicopter's radio communications were poor. Norpac installed in it one of their VHF radios for air to ground communications, but the helicopter never did have adequate air to Alice Springs communications. Legally it is not a requirement. In every practical sense it is essential.

Pedirka Petroleum's field representative efficiently communicated twice daily to Sydney Oil's base in Alice Springs by Stingray 120 SSB radio on 4505 KHz or 7485 Hz. Communication was fair to good during early morning and late afternoon hours.

Telephone Communications

Pedirka Petroleum's agent in Alice Springs, Doug White, communicated daily with Sydney in addition to telefaxing all daily reports.

Crew Rotation

The Norpac crew worked a 20 days on, 10 days off rotation. All personnel were rotated by charter aircraft to Brisbane.

Airstrips

One airstrip was used, that at Colson.

Colson	Latitude	25°56' south
	Longitude	136°38' east

This strip is approximately 7km northwest of Colson #1 and has effective length of 900 metres.

It was intended to build an airstrip in the Mooney area but no suitable claypan could be found.

4. TERRAIN AND WEATHER

TERRAIN

The survey area lay entirely within the Simpson Desert. The terrain is characterised by NNW-SSE trending dunes. The dunes are not aligned in a regular, parallel sequence. Consequently the imagined relative ease of inter dune or "corridor" travel is a fallacy. The dunes themselves ranged in height up to approx. 35 metres above the desert's sand plain floor and were spaced as close as 200 metres apart. In and between the survey areas the terrain was fairly consistent and claypans were rare. The preferred direction of cross dune travel is from west to east since the slip faces of the dunes invariably face to the east.

The terrain is such that specially equipped vehicles are required for optimum performance. The alternative requires great physical and mental endurance. Vegetation in the survey area consisted of the ubiquitous spinifex and scrubby trees.

WEATHER

The weather was generally fine with warm nights and mainly very hot days. The survey was undertaken in the hottest period of the year and all personnel must be congratulated for producing a generally good performance in the torrid conditions. Wind and the consequent flying sand were not as prevalent as during the previous year's survey.

No time was lost for weather during the survey.

5. SCOUTING AND PERMITTING

SCOUTING

At the end of November 1985, John Douglass and Doug White scouted the rig road from Numery to Colson #1 which was established to be in fair to good condition. They also checked for water supplies south of Numery but concluded that the necessary haulage distances were excessive. They also scouted the rig road from Colson #1 to the south and established that it did not require the anticipated upgrading. They also checked the Oolarinna #1 wellsite for water but concluded that it would be only of limited use.

PERMITTING

Permitting was carried out with the Central Lands Council through the offices of Mr. Bob Liddle in Alice Springs. As a consequence one permitting trip was made.

This trip was made from January 3-7, 1986, when two aboriginal elders from Maryvale and Mt. Dare in company with the CLC anthropologist visited the crew advance party. With the aid of the crew helicopter, the Mooney area was inspected. The CLC party satisfied themselves that the intended programme would not cross any sacred sites, and they gave approval for the programme to go ahead as planned.

The survey area was all on vacant Crown Land and there were no fences whatsoever.

6. LINE CLEARING

For a listing of performance, equipment, and personnel, please refer to the Appendices.

Buchanan's Earthmoving of Brisbane were employed on a turnkey contract for the line cutting, and on an hourly contract for the inter-prospect accesses.

Lines were cut to a maximum width of 16 feet and the depth was kept as shallow as possible to avoid later erosion.

Lines were set off for the dozers by a surveyor with at least two sighter poles to establish the correct bearing. The operators then maintained their own direction with assistance from the surveyor when necessary.

The quality of the line clearing was generally good.

The productivity of the line clearing was good. Downtime was minimal and the operators and equipment were very well supported by the infield supervisor and his assistant.

The equipment provided was satisfactory and the operators experienced and hard working. For much of the programme these men slept in their machines at night and thus travel time was minimal.

The D-7 found heavy going in the dunes at times and a second D-8 would have been more efficient.

Ted or Lex Buchanan was on the crew for most of the time and hence supervision was good. Norpac's supervision was poor to fair and was directly responsible for the paid standby hours.

Pedirka Petroleum had a representative present throughout the programme.

The line clearing operation was considered to be very satisfactory.

7. SURVEYING - FIELD PROCEDURES AND MEASUREMENTS

For a listing of equipment and personnel, please refer to the Appendices.

LINE SETTING OUT AND RELATIONSHIP TO PROGRAMMED POSITION

The programme map provided was on a scale of 1:100,000 and due to the natural requirement not to obliterate existing information, some of the line intentions were not clear on the map itself. In addition, it was suspected that some of the old 1960 lines had been incorrectly plotted on the base map. Hence, before the survey began, the contractual agreement was amended to incorporate line details and intersection points which clarified the exact intention of the programme. It was also stressed that the use of the crew helicopter at Pedirka Petroleum's expense by the surveyors was expected and necessary to locate the old lines.

For the Mooney area, the set outs would have to be effected by chained or measured distances from the helicopter located old lines.

In the event the lines were cut, without exception, in incorrect positions and with errors of up to 1.7km. However, the regional programme intentions were not jeopardised because part of the reason for the errors was that the 1960's lines, in the main, were incorrectly plotted. The errors were known to Pedirka Petroleum before the survey conclusion and it was not considered necessary to do any re-cutting. However it was considered necessary to remind the field crew of the necessity of certain ties, and to make these ties. Consequently on one occasion, the log skidder had to cut a small section of line.

The other reasons for the errors were poor Norpac supervision and a failure to use the helicopter properly.

CHAINING

The station interval throughout was 30 metres, and was measured with a steel cable which was calibrated regularly. Pin flags of different colours were used for vibrator points and geophone stations.

The stations were numbered consecutively from 100 at the start of each line in the south or west.

Chaining notes were compiled for each line. These showed all dunes, detours, or cross lines when identifiable.

SURVEYING

Vertical control was maintained using standard levelling procedures. Left and right face vertical angles were observed on all change points, intersections, and permanent markers. A second set of readings was taken as a check run, using a different height of target prism. Single face readings were taken to every tenth intermediate station. All readings were entered into a Wild Electronic Field Book, which unfortunately was down at times due to excessive heat.

Horizontal control was maintained by left and right face readings along the lines. Solar observations were taken at regular intervals and applied to the angles. All distances were measured electronically with the EDM.

PERMANENT MARKERS

Star iron pickets with aluminium tags attached stating line numbers and station numbers, were used as witness marks. A dumpy peg cemented at the base served as the instrument station and bench mark for the permanent marks. Permanent markers were placed at the ends of lines, existing and new line intersections, and otherwise every 5km.

The survey field procedures were not carried out very efficiently. While the personnel and equipment supplied were of a fairly high standard there were many errors and problems. The end result was satisfactory but cost Norpac in expense and reputation. The surveying procedures got off to a poor start with no survey work done in advance of the recording crew. Hence the surveyors were behind from the beginning, and the last field measurements were taken four days after recording conclusion.

SATELLITE NAVIGATION SURVEY

During the course of the Mooney Seismic Survey, Pedirka Petroleum N.L. contracted Geomeasure Pty Limited of Brisbane to conduct one satellite navigation survey. This survey station was located at the intersection of Mooney lines 1 and 2.

8. SURVEYING - COMPUTATIONS

Computations were carried out on a T.I. Personal Computer with input from the Wild Electronic Field Book.

Unfortunately, the extreme heat effected the reliability of the Field Book so that field productivity was only fair and consequently the final survey products were behind schedule.

Survey data take-offs were from the new SATNAV station referred to previously.

Horizontal and vertical loops, and closures to existing modern work, were well within the tolerance stipulated by Pedirka Petroleum of five times the square root of the traverse length.

For each line, listings of elevations and co-ordinates were supplied together with intersection diagrams, PM lists, vertical profiles, chain diagrams, and edited field notes. The elevations and co-ordinates were also output on floppy disks.

The lines were plotted on the 1:100,000 base map supplied.

9. UPHOLE DRILLING

For a listing of performance, equipment, and personnel, please refer to the Appendices.

Reflection Drilling of Brisbane were employed on an hourly contract.

The uphole programme target consisted of 27 holes at approximately 4km spacings. Hole depths were expected to be a maximum of 90 metres. The target was achieved and hole depths were in the range of 65-85 metres, and with an average of 73 metres.

Formations encountered were mainly clays, sand, and sandstones with occasional silcrete stringers. All drilling was mud pitted.

Consequently, the provision of water was always a problem. Reflection Drilling commenced with two water trucks plus a third for emergencies. The third water truck was essentially useless in that its lack of mobility prevented it from doing other than staying with the rig. Pedirka Petroleum attempted to procure a large capacity water truck from Alice Springs, but when Reflection offered a much cheaper water truck from Brisbane the latter was chosen. This water truck, hired from Seiscom Delta, was a Zeligson 6 x 6 mounted with a 2000 gallon tank. The Zeligson had unfortunately been neglected in maintenance and was plagued with down time. It was, however, of considerable help to the drilling operation.

Penetration rates were very satisfactory but the water problem badly effected overall productivity. It was hoped that water could be found in the prospect areas but there was no trace and hence very long water hauls were necessary.

The personnel provided were of high quality and are to be commended for getting the job done in extremely difficult circumstances. The leadership and organisation of Jim Devlin is noteworthy. The equipment was in reasonably good condition with the exception of the third water truck.

Throughout the drilling operation a log skidder supplied by Buchanan's Earthmoving was attached to the operation. Without its help the job could not

have been done. In addition to helping the water trucks and rig, the presence of the log skidder enabled the drill personnel to move their camp regularly and avoid what could have been a disastrous travel time accumulation. The log skidder operator and his machine were of top quality.

The drilling operation commenced behind schedule due to repair work en route, and finished 11 days behind recording. Pedirka Petroleum's representative was present during the entire operation.

The operation was fairly supported by Reflection's base in Brisbane and Norpac's supervision was fair.

The uphole drilling operation was considered to be only fair, even though the objectives were realised.

10. UPHOLE PRE-LOADING

Norpac provided a licenced pre-loader with a licenced Toyota 4 x 4 pick up truck to prepare the harness and load the hole as soon as drilling was completed.

The general harness configuration was one detonator at 5 and 10 metres, single "A" boosters at 15 metres and then at 5 metre intervals to 45 metres, and two "A" boosters at 5 metre intervals from 50 metres to TD. At deep levels a third "A" booster was used.

All holes were tamped with cuttings. Few holes were difficult to load and loading poles were not necessary. The number of misfires was small.

The pre-loading operation was carried out quickly and efficiently.

11. UPHOLE RECORDING

For a listing of personnel, equipment, and uphole locations, please refer to the Appendices.

The concept of the programme was to locate upholes at line intersections and 4km intervals. Uphole depths were to be such that the weathering base was penetrated by at least 15 metres or four normal shots.

In the event, the spacing was approximately 3.69km, and 11 holes penetrated less than 15 metres of sub-weathering material. All holes did penetrate the weathering base.

Four geophones connected to two separate traces were offset at distances of 1 and 3 metres from the top of the hole. The camera records were "picked" on the line, and plotted on a time versus depth graph.

Only rarely did uphole recording lag uphole drilling by more than a few hours. Hence the drilling programme was well controlled.

Record quality and camera presentation was good. Cap tests were done daily to check for instrument delay.

The uphole recording operation was performed very competently.

12. UPHOLE RESULTS, STATICS, DATA SHIPMENTS

In addition to the on line QC plot, each uphole was plotted in the field office and recorded lithologies were logged.

All upholes penetrated the weathering base. The table of values in Appendix A-1 demonstrates the variability of the weathering base.

Weathering depths ranged from 40 to 72 metres. Weathering velocities ranged from 950 to 1200 m/s and sub-weathering velocities from 1770 to 2860 m/s. The high weathering velocities incorporate stringer velocities.

High velocity stringers and velocity inversions were common but could not be predicted. The near surface velocity profile was moderately complex with a three layer case predominating. Refraction methods are not recommended for this area.

For each line, a cross sectional elevation plot was made, on which uphole locations, depths, velocities and lithologies were marked. The surface terrain was annotated on the top of the profile. The datum plane was 91 metres ASL.

Ed Boylan, Pedirka Petroleum's Processing Supervisor, calculated the statics model from the uphole results.

On Pedirka Petroleum's instructions, the uphole camera monitors, time depth plots and cross sections were forwarded with the reflection data to the processing centre in Sydney, on a line by line basis when possible. However, due to surveying difficulties, and the drill lag, complete line by line shipments were rare.

Data shipments were closely monitored, and despatches were regular.

13. EXPERIMENTAL RECORDING

No full scale experimental recording programme was conducted for the Mooney Seismic Survey. The parameters used were those, which had been decided by experimentation, used for the East Border Survey in the directly adjoining permit OP 238.

A short experiment was conducted on line MY-02 which confirmed the choice of six sweeps.

14. PRODUCTION RECORDING

For listings of parameters, performance, equipment, and personnel, please refer to the Appendices.

QUALITY CONTROL PROCEDURES

Since the Mooney Survey was incorporated with the Bejah Survey in OP 238 a full set of monthly instrument tests had been carried out prior to the start of Mooney and after the end of Mooney. All tests were satisfactory. A polarity test had also been conducted and was finalised as standard SEG.

Daily instrument tests and hardwire similarities were carried out each morning before production began. A "remote nest" or point source similarity was performed weekly.

Geophones were slowly rotated through the repair shop but were adequate.

Geophone and vibrator plants and spacings were generally good.

Pedirka Petroleum instituted a set of rules regarding the number of dead traces, number of vibrators, recoveries etc., and the rules were strictly observed.

Monitors were displayed for every VP for alternate banks.

The data was acquired using three vibrators with the fourth as a standby unit on the line and the fifth as an extra standby unit in base camp. This worked efficiently and there were no occasions when the number of working vibrators was less than three.

In general, the recording truck and line quality control was of a fair to good standard, but this was imposed by Pedirka Petroleum.

RECORD QUALITY

Record quality was fair to good with many events to 1.6 seconds and of up to 35 Hz frequency. Ground roll was quite strong. The experimental recording and processing from OP 238 had however shown that filtering techniques would remove the ground roll.

Recording quality produced by the survey was expected to yield very satisfactory sections.

PRODUCTIVITY

With regard for the logistical layout of the programme, the very hot weather, and the Simpson Desert itself, it is considered that the recording crew performed very well.

High downtime (16.8%) and line move time (10.4%) were obvious imitations, but the line labour was insufficient and momentum was unnecessarily lost.

Most of the technical down time was heat related and the vibrator mechanics especially are to be commended for their efforts. The crew worked long hours and endured much personal hardship. The sheer impracticality of moving the base camp into the prospect area forced a situation in which the recording crew mainly had to sleep on the line. Without helicopter support this could not have been done.

The EP 2 Joint Venture gained significantly from the OP 238 work since the crew essentially mobilised to EP 2 for little cost.

15. HELICOPTER SUPPORT

The contractual agreement provided that Pedirka Petroleum N.L. paid for the first five hours daily of helicopter time and fuel for regular recording crew support work plus other non-recording crew support work.

Norpac contracted Brisbane Helicopters and the Bell 47 piston engine machine arrived at Colson #1 camp on January 4, 1986. The helicopter was immediately put to work assisting the permitting operation. Unfortunately on January 6, the machine had to make a forced landing due to engine failure but put down safely on the Alice Springs rig road approximately 7km north of camp. The tail rotor was damaged and the machine was not serviceable until January 10. In the meantime Norpac contracted Capricorn Helicopters of Alice Springs to provide a Hughes 500 piston engined helicopter and it started work on January 9, and worked until January 15 when it returned to Alice Springs. The Bell 47 worked on until January 18 when a fault was discovered in the main rotor. This machine did not work again. So the Hughes 500 returned on January 21 and apart from a mandatory six day service in Alice Springs, worked until the end of the combined EP 2/OP 238 job on February 15.

Each helicopter was small with space for only two passengers. However, it was never Norpac's intention to use it to ferry the recording crew. Its function was to carry the necessary daily supplies for the recording crew which spent their evenings camped on the line. This function was carried out most efficiently, and without the helicopter the recording crew's production would have been destroyed.

The helicopter(s) was also used for permitting, occasional line clearing support, water scouting, and survey control support. This latter function was not carried out efficiently in that the machine was primarily used to check that cut lines were in reasonably correct positions, whereas it should also have been used to help to position the lines in the first place.

The pilot of the Bell 47 was inexperienced but the Hughes 500 pilot was quite competent.

Of major concern to both Norpac and Pedirka Petroleum was the failure of both helicopter companies to emplace an HF radio in the machines for communication with Alice Springs control. Norpac did provide VHF radios for air to ground contact but the emergency procedure communication had to be done by the existing radio link between Pedirka Petroleum's field representative and Alice Springs agent who then telephoned the Alice Springs D.C.A. control.

The D.C.A. regulations permit a helicopter to fly in a small local area without an HF radio, but future helicopter supported seismic operations anywhere should make mandatory the provision of such a radio.

16. FIELD DATA PROCESSING

Norpac's F.D.P.U. was at base camp at all times. Pedirka Petroleum had declined to use it on a regular basis. It was used for some processing of the adjoining permit OP 238's programme but it was not justified for the Mooney programme.

17. CAMP EQUIPMENT AND PERSONNEL

For listings of camp equipment and personnel, please refer to the Appendices.

EQUIPMENT

While the crew trailers were well designed (apart from the mess trailer) and strongly built, and there was plenty of storage, workshop, and office space, the running gear was not designed for camp moves in sand dune terrain. Consequently the camp moves were limited and increased non-productive travel time.

Water and fuel storage was good, and electrical power was plentiful.

The base camp equipment in summary was fair to good.

The surveyors' fly camp was barely adequate and requires upgrading.

PERSONNEL

The cooking staff provided reasonable meals, and the camp was kept clean and hygienic.

The shop and maintenance personnel were of fair to good standard but the long supply and drinking water line was stretched at times. Paper work was done efficiently.

Overall the camp was of fair to good standard and morale was high most of the time.

The recording crew's fly camp deserves special mention. It was in fact a line camp with a minimum of equipment and open air sleeping accommodation. The crew were paid a daily bonus for their discomfort and probably preferred not to have to drive to main camp.

18. FIELD MANAGEMENT AND ORGANISATION

Field management of the crew was only fair. Strong leadership was not provided. It was left to each crew section to do their own thing.

Consequently the crew coherence was also only fair. The many survey problems led to inter-crew friction and cost Norpac a lot of money.

A strong leader could have organised the crew to produce a very good job.

Briefing within the crew and from Brisbane was moderate.

The field management did visit the line activities but relied too much on the crew section leaders to solve problems. Management and organisation of the camp and support activities was fairly good.

19. CONCLUSIONS

1. The recorded data was expected to produce very satisfactory sections.

2. The technical competence of the recording crew was made to be satisfactory.

3. Recording productivity was good, but the helicopter support was essential.

4. The line clearing operation was very satisfactory.

5. Surveying was poor with numerous errors and low productivity.

6. The drilling operation was only fair and was severely hampered by the water logistical problems. Its log skidder support was essential.

7. The objectives of the uphole programme were nearly but not fully realised.

8. Communications in the drilling and helicopter operations were poor, but otherwise were satisfactory.

9. The F.D.P.U., even though it was not used, was available for use.

10. The city based data processing was delayed by slow drilling and surveying.

11. Crew management and organisation were only fair.

12. The Mooney Seismic Survey was acquired within the budget and in general can be considered to be a success. The whole operation benefited enormously by being conducted together with the Bejah Seismic Survey in adjacent OP 238. The job was done in some of the most hostile terrain in Australia and at the hottest time of the year.

13. The contractual format used was successful.

14. The choice of Norpac as prime contractor was justified.

20. RECOMMENDATIONS

1. The contractual agreement used for the Mooney Seismic Survey contained most of its required technical and operational requirements including line intentions and ties. Despite this written briefing, Norpac did not read it very thoroughly. Pedirka Petroleum's Seismic Supervisor had to brief the crew in person.

   Hence, with Norpac, it is recommended that a mandatory oral as well as written briefing be given to Norpac's Supervisor and Party Manager well before the work actually commences.

   Hopefully this action will remove many of the problems that beset Norpac at Mooney.

2. Any client must have a first class supervisor to force Norpac to conduct the work in a technically proficient manner.

3. Future uphole drilling in the area must be supported by four water trucks. It seems fairly sure that potential aquifers are too deep and uncertain for development unless the contract is big, and thus long water hauls will remain necessary.

   There are very few contractors with properly equipped desert water trucks and thus the seeming overkill is essential. All four water trucks must be all wheel drive because the access roads become churned up and bad sand sections develop.

   At the same time a log skidder is also essential.

4. The slow productivity of surveying led to processing delays which could have been critical. Since we are constantly told how wonderful state of the art surveying equipment is, it seem ludicrous for it to have been so unproductive. Part of the problem was of course the lack of a lead at the beginning of the job.

It would seem reasonable for the client to introduce contract penalty clauses to try and eliminate poor procedures.

5. It is recommended that a F.D.P.U. be available for future work. The pitiful turn around time of most city based processors gives cause for alarm.

6. It should be mandatory for future work in the Simpson Desert that all independent vehicles and helicopters be equipped with S.S.B. radios.

7. The nature of a turnkey contract enables the Contractor to use his specified number of personnel, and as long as the work is technically competent, the client has historically had little control of personnel choice. It is recommended that the client should insist on the right to request removal of personnel for deficiencies in personal qualities as distinct from technical qualities. Sheer lack of drive created unnecessary problems for both Pedirka Petroleum and Norpac.

APPENDIX A-1

UPHOLE LOCATIONS AND DATA - REGIONAL GRID AREAS

LINE	STATION	INTERSECTION	DEEPEST SHOT (m)	Vw(m/s)	Vsw(m/s)	Dw(m)	STRINGER
MY-01	133		80	1200	2220	60	Yes
	246		70	1080	2220	60	Yes
	470		80	1160	2860	70	Yes
	580		70	1110	1820	60	Yes
	691	MY-04	75	1150	2140	60	Yes
	783		80	1150	1880	63	Yes
	868		80	1160	1900	55	Yes
MY-02	133		70	1090	2000	55	Yes
	240		70	960	1820	60	Yes
	344		70	950	1820	60	Yes
	473		70	980	1820	60	Yes
	590		70	1150	2000	60	Yes
	695	MY-03	70	1080	1880	55	Yes
	853		70	1040	1820	50	Yes
	1000		70	1010	2000	40	No
	1134		65	1050	2300	40	Yes
MY-03	133		85	1050	2140	72	Yes
	243		70	1060	1820	58	No
	467		70	1140	2220	60	Yes
	573		70	1110	1770	55	Yes
	691	MY-04	70	1080	2000	60	Yes
	791		70	1150	1900	46	No
	900		70	1090	1900	50	No
MY-04	133		70	1120	1820	55	Yes
	240		70	1100	2000	53	Yes
	460		80	1080	2100	63	Yes
	580		80	1120	2220	57	Yes

APPENDIX A-2

RECORDING PARAMETERS

Lines S-86 MY-01, 02, 03, 04, (Regional Program)

INSTRUMENTATION

Instruments	: DFS V/FT-1
Number Channels	: 96
Tape Formats	
Uncorrelated Diversity Stacked	: SEG-B. 6250 BPI
Diversity Stack & Correlated	: SEG-Y. 6250 BPI
Filters, Slope	: Hi-cut 128 Hz, 72 DB/OCT Lo-cut 8 Hz, 18 DB/OCT
Sample Rate	: 2ms
Record Length	: 12 S. (8S Sweep, 4S listen)
Correlation Type	: Minimum phase
Real Time Correlator	: Yes but not used

SOURCE

Vibrators	: 3 x LRS-311
Electronics	: Pelton Advance Model 5
Vibroseis Polarity Code	: SEG Standard
Sweeps/VP	: 6
Sweep Type	: Linear
Sweep Frequency	: 10-80 Hz
Cosine Taper	: 0.25S
Amplitude Taper	: Nil
Array-inline	: No. 3, P-P 12M, Move-up 2m
Source Length	: 34m
Drive Level	: 60%

RECORDING PARAMETERS (Continued)

RECEIVER

Manuf/Model/Res. Freq.	: Litton/LRS 1000/10 Hz
No./String, How connected	: 12.6 Series x 2 Parallel
Array	: 12 inline @ 2.73m Spacing

SPREAD

Group Interval	: 30m
Subsurface Coverage	: 1200 %
Receiver Location	: Centered on flag
VP Interval	: 120m
VP Location	: Between flags
Gap	: 6 stations
Spread	: 1515-105-0-105-1515m

APPENDIX A-3

PERSONNEL

Norpac's office personnel consisted of a Manager, Expediter and Administrative Staff based in Brisbane, and an Operations Supervisor who operated between Brisbane and the field camp.

FIELD PERSONNEL

Management

1 Party Chief	Graeme Paton
1 Assistant Party Manager	Howard Cutler

Seismology/Processing

2 Seismologists	Zoltan Ceross
	Mick Davies

Survey

1 Head Surveyor	Phil Ackland
1 Surveyor	Chris Andrew
3 Rodmen/Chainmen	

Recording

1 Senior Observer	Rick Dunlop
1 Observer	Warren Bryan
1 Line Boss	
12 linemen	

Vibrators

1 Vibrator Technician/Mechanic	Bob Anderson
4 Vibrator operators	

PERSONNEL (Continued)

Upholes

1 Weathering Observer — Mark Sheehy
1 Shooter
1 Preloader

Camp

1 Cook
1 Cook Helper
1 Camp Attendant
1 Mechanic
2 Drivers

Additional field personnel were supplied to permit a leave rotation based on 20 days on and 10 days off.

Drilling (Reflection Drilling)

1 Driller
2 Drill Helpers
3 Water Truck Drivers (one for Seiscom Delta water truck)

Line Clearing (Buchanan Earthmoving)

3 Operators
1 Supervisor/Mechanic
1 Operators Assistant

Log Skidder (Buchanan Earthmoving)

1 Driver

APPENDIX A-4

EQUIPMENT

1. SEISMIC INSTRUMENTATION (REFLECTION)

A 96 trace, DFS V Recording System with a Field TIMAP model FT-1-221; Oscilloscope, ERC-10 camera, C.D.P. Switch; and Spares, T.I. 6250 B.P.I. Tape Drive and Real Time Correlator.

2. PROCESSING

T.I. Field TIMAP: 4 Transports (new 6250 B.P.I. capability); 22" Gould Plotter, T.I. Personal Computer with direct input to TIMAP (i.e. no punch cards); Software package; associated peripheral equipment, all mounted in a fully air-conditioned 30' trailer.
1 Calder Eprom Blower with T^2 functions.

3. ENERGY SOURCE

5 Buggy mounted LRS model 311 Vibrators, fitted with Pelton Advance I Model V Electronics, with Linear Sweep, Non-Linear Sweep and Vari-Drive capabilities. All units equipped with Terra Tyres.

4. CABLES AND GEOPHONES

90 128 pair cables with four takeouts per cable fitted with AMPHIB 122 connectors and LMP-4 type takeouts. Takeouts located at 40 metre intervals.
380 strings of geophones (12 geophones per string), 10 Hertz.
I/O Geophone Shaker Table.
Cable Tester and Fault Locator.

EQUIPMENT (Continued)

5. SURVEY INSTRUMENTATION AND EQUIPMENT

1 Wild T16 Theodolite
1 Wild T2000 Infomatic Theodolite
1 Wild D14L Electronic Distance Measurer
1 Wild GRE 3 Electronic Field-Book
1 T.I. Personal Computer
1 Survey Line Camp Trailer with Kitchen and Generator

6. INSTRUMENTATION AND EQUIPMENT (UPHOLE)

24 Channel OYO Refraction Recording System, Model McSeis 1500, and necessary peripheral equipment and spares.
6 Uphole Geophones
Blaster
Cable and Single phones, 25 metre group interval
1 Refraction Recorder, air-conditioned 4 x 4 Toyota
2 Cable Trucks with racks - 4 x 4 Toyotas

7. VEHICLES

1 Party Manager's vehicle, 4 x 4 Toyota
1 Fuel/Utility vehicle, 4 x 4 Toyota for Line Crew
1 Personnel Carrier, 4 x 4 Toyota
*1 Vibroseis Mechanics' vehicle, 4 x 4 Crew Cab Isuzu complete with tools, welder etc.
1 Parts Trailer complete with spare parts
2 Survey vehicles, 4 x 4 Toyota
6 Cable/Geophone vehicles, 4 x 4 Toyotas with cable and geophone racks
*1 Fuel Truck, 6 x 6 with 1500 gallon tank
*1 Fuel Truck, 4 x 4 with 1500 gallon tank
*3 Water Trucks, 6 x 6 with 1500 gallon tank
1 Mechanics' vehicle, 4 x 4 Toyota
*1 Reflection Recording vehicle and Instrument Cab, 6 x 6 Isuzu

*These vehicles fitted with "Super-Single" sand tyres.

EQUIPMENT (Continued)

8. RADIOS

5 Transceivers, SSB 10 Channel, 100 Watt for base camp communications
21 Mitrek Transceivers, 4 Channel, 40 Watt, for Field communications as follows:
2 Recording Units
4 Vibrator Units
13 Vehicle Radios
2 Spares

9. FIELD OFFICE

A complete field office with all necessary equipment and supplies (included photo-copier).

10. WORKSHOP EQUIPMENT

Complete workshop equipment, including electronic test equipment, gas and electric welding plants for the overhaul, maintenance and repair of equipment.

11. CAMP EQUIPMENT

Camp equipment and messing for Staff and Field Personnel:
5 Eight Man Sleepers
1 Office
1 Kitchen
1 Mess
1 Shower/Laundry
1 Workshop
1 Survey/Stores/Cable Repair Trailer

All of the above are air-conditioned, with 2 x 52 KVA generators mounted on a truck - Isuzu 4 x 4 - fitted with "Super-Single" sand tyres.

EQUIPMENT (Continued)

12. EXPLOSIVES STORAGE

1 Licenced Detonator Magazine
1 Licenced Powder Magazine

13. LINE CLEARING (Buchanan Earthmoving)

1 Caterpillar D8 Bulldozer
1 Caterpillar D7 Bulldozer
1 Caterpillar 12 Grader
1 Self-contained trailer camp
1 Kenworth prime mover and low loader
2 Toyota 4 x 4 trucks
1 SSB radio

14. DRILLING (Reflection Drilling)

1 Midway 10M Drilling rig mounted on a Ford Louisville 6 x 6 truck
*1 Isuzu water truck 4 x 4 with 1000 gallon water tank
2 Mercedes water trucks 4 x 4 each with 1000 gallon water tank
1 Toyota Landcruiser 4 x 4
1 Downhole Hammer
1 Kitchen Caravan with Annexe
1 Sleeper Caravan
1 Generator
1 SSB Radio
1 Zeligson 6 x 6 Water Truck with 2000 gallon water tank (supplied by Seiscom Delta)

*This vehicle was for camp water and as a standby.

15. LOG SKIDDER

1 John Deere 440B Log Skidder

APPENDIX A-5

CHARGEABLE REIMBURSIBLE USAGE

UPHOLE EXPLOSIVES

1.8m Detonators	332
"A" Boosters	584
Bell wire in metres	29000
Harness Weights	54

DIESEL FUEL (in Litres)

Drilling Vehicles	4180
Log Skidder	280
Seiscom Delta Water Truck	1529

HELICOPTER FUEL (in Litres)

Avgas	2240

DRILLING

Rock Bits	3

APPENDIX A-6

PERMANENT MARKERS

LINE	STATION	EASTING	NORTHING	ELEVATION	REMARKS
MY-01	100	700017.70	7206945.64	101.41	SOL
	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	EOL
MY-02	100	704784.67	7216306.33	98.39	SOL
	200	705898.95	7213518.49	100.20	
	345	707512.64	7209478.13	108.91	INT 86-MY-01 SAT STN
	400	708127.80	7207946.75	106.58	
	540	709684.51	7204044.57	98.35	
	696	711423.60	7199698.59	90.28	INT 86-MY-03
	740	711915.97	7198473.69	89.26	
	880	713473.49	7194571.93	92.87	BEND
	1032	714956.79	7190260.57	82.81	
	1167	716275.17	7186431.78	92.96	EOL
MY-03	100	704096.47	7197061.56	92.74	SOL
	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	EOL
MY-04	100	713960.63	7219429.44	100.04	SOL
	240	715565.88	7215549.51	95.86	
	345	716768.47	7212638.11	92.95	INT 86-MY-01
	520	718774.32	7207784.79	89.22	
	691	720737.89	7203044.86	94.11	INT 86-MY-03
	732	721208.66	7201906.88	96.29	EOL

APPENDIX A-7

PRODUCTION LINE LISTING

PROSPECT: MOONEY

LINE	START VP	END VP	START DATE	END DATE	TOTAL VP	CUM. VP	TOTAL KM	CUM. KM	DIRECTION
MY-02	1163	103	17/1	19/1	266	266	31.80	31.80	SE-NW
MY-01	100	900	20/1	21/1	201	467	24.00	55.80	SW-NE
MY-04	100	728	21/1	22/1	158	625	18.84	74.64	NW-SE
MY-03	100	932	23/1	24/1	209	834	24.96	99.60	SW-NE

APPENDIX B-1

LINE CLEARING

TURNKEY AND HOURLY CONTRACT

	D-7	D-8	Total
DOZERS			
Work hours	8.25	130.75	139.00
Down hours	0	8.75	8.75
Standby hours	0*	4.0*	4.0*
Change hours	0**	0**	0**
Total hours	8.25	143.50	151.75
Kilometres	8.00	92.00	100.00
Productivity km/hr	0.97	0.64	0.66

*Standby waiting on surveyors - Norpac charge
**Interprospect accesses

GRADER	
Work hours	62.25
Down hours	0
Standby hours	0*
Charge hours	0**
Total hours	62.25
LOW LOADER	
Work hours	0

APPENDIX B-2

UPHOLE DRILLING

HOURLY CONTRACT

Holes drilled	27
Metres drilled	1975
Hours work	99.50
Hours travel	8.50
Hours interprospect move	0
Hours wait on water	17.50
Hours down	0
Total hours	125.50
Charge hours	125.50
Production rate m/hr	15.74
Zeligson water truck hours	41.50

APPENDIX B-3

RECORDING

TURNKEY AND HOURLY CONTRACT

Lines recorded	4
Kilometres	99.60
VP's	834
Hours work	63.25
Hours travel	5.25
Hours down	15.75
Hours standby	0
Hours line move	9.75
Hours interprospect move	0
Total hours	94.00
Productivity km/total hour	1.06
Productivity VP's/total hour	8.87

DOWNTIME

Instrument system	2.25
Vibrators	6.00
Waiting on spread	6.50
Recording truck	1.00
	15.75

CHARGE HOURS (included in total hours)

Experimental	0.25
	0.25

APPENDIX B-4

LOG SKIDDER (HOURLY CONTRACT)

Work hours	28.00
Standby hours	97.00
Total hours	125.00
Fuel usage liters	280

APPENDIX B-5

HELICOPTER TIME DISTRIBUTION (HOURS)

	Helicopter #1	Helicopter #2	Total
Recording Crew	13.483	23.600	37.083
Surveying	0	10.070	10.070
Permitting	5.200	0	5.200
Drilling	0	0	0
Line Clearing	1.530	0	1.530
Water Scouting	0	3.800	3.800
	20.213	37.470	57.683