DEPARTMENT OF
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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1979/49

Denison Trough seismic survey, Queensland: Operational Report for 1978 survey and proposed program for 1979 survey.

by

J.A. Bauer* & O. Dixon**

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** Geological Survey of Queensland

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CONTENTS

ABSTRACT

The Bureau of Mineral Resources, Geology and Geophysics (BMR) conducted a seismic survey in the southern Denison Trough, in the western part of the Bowen Basin in Queensland, from July to November 1978.

The aims of the survey were to delineate the configuration of the Trough, in particular the lower part of the Permian sequence and basement, and to provide stratigraphic information from the Permian sequence that, in conjunction with current Geological Survey of Queensland (GSQ) stratigraphic studies, would enable reliable stratigraphic correlations to be made throughout the Trough.

The survey obtained 192 km of digitally recorded 6-fold CDP seismic reflection data. Gravity observations were made at 500-m intervals along the seismic traverses. Only 135 km of the originally proposed program of 300 km of 6-fold CDP recording was completed; wet weather and boggy ground hampered progress and made some program changes necessary. One unprogrammed traverse, and additional comparison shooting on another traverse, were recorded in the Westgrove area. In 1979 it is planned (a) to complete the proposed 1978 program, (b) to do additional work to study in more detail the configuration of the Comet Platform, (c) to assist in siting a proposed GSQ stratigraphic bore on a shallow part of the Comet Platform, (d) to provide a seismic tie to another proposed borehole, (e) and to tie together recent seismic traverses in the Westgrove and Warrinilla areas.

The quality of the data obtained during the 1978 survey varied from poor to very good. In most places the data from the upper part of the Permian sequence was very good, and the excellent resolutions of reflection horizons will enable valuable stratigraphic information to be interpreted from the seismic data. In the lower part of the Permian sequence, in particular the thick Reids Dome Beds, reflection events were weaker and less continuous; however, some data were obtained that provide new information on the thickness and structure of this sequence.

This report presents operational information on the 1978 survey, the proposed program for the 1979 survey, and a brief discussion of the seismic results. The final interpretation of the seismic and gravity results will be the subject of a separate report to be written when all data have been fully processed and analysed.

INTRODUCTION

The Bureau of Mineral Resources, Geology and Geophysics (BMR) conducted a seismic survey in the southern Denison Trough from July to November 1978. The seismic traverses (Pl. 1) fall largely within ATPs 119P, 256P, and 258P. The survey was made in cooperation with the Geological Survey of Queensland (GSQ), which has conducted a stratigraphic drilling program in the area since 1972, and has made detailed stratigraphic studies based on these data and data from petroleum exploration wells. Two geophysicists from GSQ assisted on the survey. They are also participating in joint reporting.

The Denison Trough is the western part of the Bowen Basin. It was formed by downwarping along the western margin of the Bowen Basin in Early Permian time, and contains sediments of Early Permian to Triassic age (Pl. 1). Of these, only the Permian sediments are considered prospective for hydrocarbons.

A large amount of geological mapping, petroleum exploration and stratigraphic drilling, and geophysical work (particularly seismic surveying), has been carried out in the Denison Trough. This has been summarised by Bauer (1978). This work has provided much information on the structure and stratigraphy of the upper part of the Permian sequence, and resulted in the discovery of several small gas fields. There was however, a lack of data from the lower part of the Permian sequence, and insufficient good quality stratigraphic data to enable reliable stratigraphic correlations to be made through the trough.

The objectives of the 1978 BMR survey were to obtain seismic data of high enough quality, by use of CDP and digital recording and processing techniques, to provide structural information at lower Permian and basement level, and stratigraphic data to enable reliable correlations to be made between the wells.

Six traverses totalling 192 km of 6-fold CDP coverage were recorded. Traverses 1, 2, and 3 were recorded in the Warrinilla area to the north, and Traverses 6, 7, and 8 in the Westgrove area in the southern part of the Trough. Of the original proposed program,

Traverse 4 in the Rolleston area and Traverse 5, linking the traverses in the Warrinilla and Rolleston areas, were not recorded. Gravity measurements were made along Traverses 1, 2, 6, 7, and 8.

This report presents details of operations and preliminary results only. Operational statistics, spread and recording parameters, and personnel and equipment are included in Appendixes 1, 2, 3, and 5. Further data processing and analysis are required before a final interpretive report is made. A proposed program of seismic traverses for continuation of the Denison Trough seismic survey in 1979 is given.

An unmigrated section of Traverse 6 in the Westgrove area is included (Pl. 2) to indicate record quality. Copies of the seismic sections from the 1978 survey may be obtained from the Copy Service, Government Printer (Production), GPO Box 84, Canberra 2600.

FIELD OPERATIONS

GENERAL

The survey area lies north of Roma, between the townships of Injune and Rolleston. Access to the area is fair, but most roads are unsealed and impassable after heavy rain.

Survey operations were substantially affected by the extremely wet season. The rainfall of 426 mm between May and September was the highest in the area since recording began in 1948. Field operations began in the Warrinilla area, as proposed by Bauer (1978), but, because of very boggy conditions, were moved to the Westgrove area where surface conditions were a little better. On completion of Traverses 6 and 7 in the Westgrove area conditions were still too boggy at Warrinilla to resume work there, so an additional line, Traverse 8, was recorded in the Westgrove area. Operations then moved to Warrinilla where Traverses 1, 2, and part of 3 were recorded. About one month of recording time was lost during the survey because of rain and subsequent boggy conditions.

BULLDOZING

Bulldozers were hired locally when necessary for clearing, construction of creek crossings, and construction of access tracks. Traverse 6, which for the most part followed an existing seismic line, required only re-clearing. Traverse 7, and the western end of Traverse 8 which traversed very rough terrain, required extensive clearing, construction of creek crossings, etc. The eastern half of Traverse 8 followed a road, as did Traverse 2. Traverse 1 passed through very difficult 'melon-hole' country in parts and required the use of a bulldozer, to make a track along the traverse. Traverse 3, which has been cleared along its total length, required substantial cut-and-fill works at the western end in very rough terrain.

SURVEYING

Surveying was done by the Brisbane branch of the Australian Survey Office in four operations. First, a traverse was sited in relation to boreholes to which it had to tie, taking into account the location of convenient roads, excessively rough terrain etc, and was marked, to indicate the line to the bulldozer driver. After clearing, the traverse was pegged at 41⅔-m intervals, and levelled. It was then traversed using electronic distance measuring equipment to obtain distances and angles for derivation of shotpoint co-ordinates.

The surveying team sometimes had difficulty in keeping ahead of drilling operations. This was caused in part by the need to locate numerous petroleum exploration wells, for some of which the latitudes and longitudes proved to be inaccurate.

The surveyors provided Australian Map Grid (AMG) coordinates for traverse bends and endpoints, elevations referenced to Australian Height Datum (AHD) and latitudes and longitudes for all shotpoints.

DRILLING

Three drilling rigs were used in July and August, and four from then until the end of the survey in mid-November. This number was found to be sufficient to keep ahead of the recording operation. Drilling operations were seriously hampered after heavy rain, as the rigs became bogged if moved.

Drilling conditions were generally very good on Traverses 6, 7, and 8, where Jurassic sandstone and mudstone of the Hutton Sandstone and the Birkhead Formation respectively were encountered. The only poor drilling was on the western end of Traverse 8 where Tertiary basalt overlies the Jurassic formations in places. Holes were generally drilled to 54 m on Traverses 6, 7, and 8, as tests indicated that this was the optimum depth.

Drilling conditions were fair to good on Traverses 1, 2, and 3 except near Moolayember Creek on Traverse 2 where gravel necessitated the use of mud circulation to prevent hole collapse. The main lithology was mudstone of the Triassic Rewan Formation. Holes were generally drilled to 40 m, which was below the base of the weathered layer.

SEISMIC RECORDING

The spread and recording parameters are listed in Appendix 2, and the recording equipment in Appendix 3. The progress of recording was hampered by several factors: (a) insufficient geophones to lay out the total spread for one 'cab position' at a time, which resulted in inefficient operation of the recording crew, (b) the need to use a combination of 24-channel cables with a system of extender cables and 48-channel cables, (c) frequent breaks in the 24-channel cables, and (d) a fault in the radio firing unit which prevented recording for two days. There were no significant malfunctions of the Texas Instruments DFS IV seismic recording system.

Westgrove area

Traverse 6. Recording commenced at the eastern end of Traverse 6, a west-northwest line from the Hutton Creek Anticline to just west of the Merivale Fault. Traverse 6 followed Line C of the 1968 AAO Westgrove survey for much of its length, as this enabled an exact comparison of data and minimised line clearing.

A noise shoot was conducted at the start of recording, analysis of which showed (a) that the optimum recording offset zone was 0 to 1000 m, (b) that a geophone string 83⅓ m long was needed to provide significant attenuation of the longer wavelength noise trains, and (c) that a low-cut

recording filter of 12 Hz would provide significant attentuation of very high amplitude low frequency noise.

It was decided to use 6-fold CDP 48 channel recording with a geophone station spacing of 41⅔ m, as the best compromise between the need for good quality high resolution data especially for stratigraphic studies and the rate of production. On the basis of the noise shoot it was decided to use (a) a recording spread of 958⅓-0-1000 m, with the shot on trace 24, (b) an 8⅓ m long geophone string, considered optimum despite the resultant ground mixing, and (c) a low-cut recording filter of 12 Hz. The sampling rate was set at 2 ms to retain high frequencies.

Previous seismic surveys in the area had suggested that a large charge would be required to penetrate through the thick coal seams, and a charge size of 50 kg/shot was originally selected. However, experiments later showed that a 25-percent reduction in charge size produced no perceptible deterioration in record quality, and the charge was reduced to 37 kg.

A hole depth of 45 m was originally chosen. However, on the basis of (a) an uphole shoot which indicated a very thick weathered layer, and (b) shot depth experiments, this was deepened to 54 m.

Traverse 6 long-offset shots. These shots were recorded after an examination of the brute stack of Traverse 6 indicated the possibility of many multiples. Four 4000-m 6-fold CDP sections of offset shots were recorded on Traverse 6, at the locations shown in Plate 1, using a 1041⅔-3000 m spread. These data will be used (a) to enable better velocity analyses and choice of more accurate velocity functions for stacking purposes, (b) to allow multiple identification through moveout discrimination, and (c) to give trial 12-fold CDP sections by stacking with the original split-spread shots to determine if there is a significant improvement in record quality compared with the 6-fold CDP data.

Traverse 7. Recordings were made on this line with the same recording parameters as for the short-offset shots on Traverse 6.

Traverse 8. It was decided to record Traverse 8 to give an additional section across the Merivale Fault in the southern part of the trough, tying to stratigraphic bore GSQ Taroom 12 and to two wells which intersected basement, AAO Glentulloch 1 on the eastern side of the Merivale Fault and AAO Womblebank 1 on the western side.

The same recording parameters as used on Traverses 6 and 7, except for a smaller charge size, were used on Traverse 8. Experiments to determine whether a smaller charge would be sufficient in this area where the Permian coal seams are thinner, indicated that a 17-kg charge was adequate.

Warrinilla area

Traverse 2. After completion of Traverses 6, 7, and 8 the crew moved north and started Traverse 2. A noise test, an uphole shoot, charge size, and shot depth experiments were carried out before shooting started. These showed (a) that the 958$\frac{1}{3}$-0-1000 m spread was still best, (b) an 8$\frac{1}{3}$-m geophone pattern, with a wave-number cutoff of 6 cycles/1000 m, was necessary to provide attenuation of the longer wavelength noise trains, (c) a low-cut recording filter of 12 Hz would attenuate much of the low-frequency noise, (d) a 40 m shot-hole would be well below the base of the weathered layer, and (e) a 17-kg charge was adequate. All parameters were therefore left the same as for Traverse 8, except for the shallower shot-holes.

Traverse 1. Recording parameters were as for Traverse 2.

Traverse 3. Recording began at the eastern end of Traverse 3, using the same parameters as for Traverses 1 and 2. The 8-km section to the intersection with Traverse 2 was recorded, but rain and waterlogged conditions made it impossible to continue. However, two small isolated sections totalling 7 km, one at the far western end of the traverse near AAO Bandanna 1, the other near SQD1 (Morella), were on higher ground and were able to be recorded.

DEEP CRUSTAL SEISMIC REFLECTION AND REFRACTION RECORDING

A 2000-kg shot was fired on Traverse 1, about 1.5 km west of GSQ Taroom 9. The shot was recorded (a) by the seismic party on a reflection spread extending 4000 m west from the shot, and (b) by the University of Queensland on eleven seismometers spread over a 180-km north-south refraction profile extending north to the South Blackwater coal mine. Apart from the use of an off-end spread, the parameters for the deep crustal reflection recording, shown in Appendix 2, differed from those for the production recording only in the use of an 83⅓-m geophone station interval and no low-cut filter. The refraction profile was reversed using blasts from South Blackwater mine.

Some of the normal production reflection shots were recorded for 16 seconds instead of the usual 6 or 8 seconds to attempt to record deep reflections. These long records were run on the southern 3 km of Traverse 7, on 14 km on Traverse 8 centred approximately at its intersection with Traverse 7, on the southern 5 km of Traverse 2, and on the western 9 km of Traverse 1. These 6-fold CDP segments were sited at the intersections of traverses to allow verification of events as reflections and the determination of true dip.

GRAVITY MEASUREMENTS

Gravity was read at 500-m intervals along Traverses 1, 2, 6, 7, and 8. Operational details for the gravity survey are presented in Appendix 5. The gravity data will be used with the seismic data to make a joint interpretation.

SEISMIC DATA PROCESSING

Processing of the seismic data is being done under contract by Geophysical Service International (GSI) in Sydney.

Weathering corrections were calculated using the uphole method. An elevation datum of 450 m above mean sea level was used on Traverses 6, 7, and 8, and a datum of 183 m above mean sea level on Traverses 1, 2, and 3. The replacement velocity, established by means of uphole shoots and from plots of the first breaks on production reflection records, was 2500 ms^{-1} on Traverses 6, 7, and 8, and 2800 ms^{-1} on Traverses 1, 2, and 3. Weathering and elevation corrections, computed in the field, were transcribed onto computer coding forms for despatch to GSI.

Trace edits were done in the field from the monitor records. Instructions to 'zero', 'reverse', or 'ramp out' sections of traces were also transcribed onto computer coding forms and despatched to GSI. Survey data, such as line bend co-ordinates, were supplied to enable processing of crooked lines where necessary. GSI then output a preliminary stacked section, or 'brute stack', using (a) approximate velocity data derived mainly from well velocity surveys, (b) first break ramps estimated from the field records, and (c) time variant scaling, deconvolution, and filter functions considered appropriate to the data.

Further tests must be done before choosing the optimum velocity functions, first break ramps, scaling functions, time variant deconvolution, and time variant filters for the final stack. Autostatics, and in places, migration, will also be applied to the final stacked sections.

PRELIMINARY RESULTS

The main objective of the survey was largely achieved: data quality is good enough to enable the stratigraphy of the Permian sequence, except for the Early Permian Reids Dome Beds, to be interpreted reliably. However, in the Westgrove area, the data obtained from the lower part and base of the Permian section are incomplete.

Westgrove area

The data in the Westgrove area can be considered in two parts: (a) below the top of the Early Permian Reids Dome Beds, and (b) above the Reids Dome Beds. The upper part of the Reids Dome Beds in the

Westgrove area, particularly in the areas of thicker sedimentation crossed by the western part of Traverse 6 and the northern part of Traverse 7, is characterised by numerous thick coal seams which hinder penetration of seismic energy to the underlying sequence. Thus data from below the top of the Reids Dome Beds in this area are weak and discontinuous. Above the top of the Reids Dome Beds, numerous good-quality continuous reflection events originating from formation boundaries and unconformities were recorded.

Traverse 6 crossed, from east to west, the Hutton Creek Anticline, a small down-faulted graben west of the Hutton Creek Anticline, the Westgrove Anticline, the Merivale Anticline, and the Merivale Fault. The Merivale Fault is believed to be a high-angle reverse fault near which the Late Permian and Triassic strata have been strongly folded and, possibly, additionally faulted; most of the Early Permian sediments are truncated at the fault, and probably were never deposited west of it. The probable base of the Permian is mappable near the eastern end of the traverse as an irregular surface, and there are poorer indications, in the deeper part of the trough towards the Merivale Fault, of reflections which may originate from near the base of the Early Permian sequence. Numerous discontinuous events were recorded from within the Reids Dome Beds. Also on Traverse 6 were features of stratigraphic significance, for example the onlapping of the Cattle Creek Formation onto the Reids Dome Beds between the Westgrove Anticline and AAO Kia Ora 1 and between the Westgrove Anticline and the Merivale Fault, and the thinning, on the flanks of the Westgrove Anticline, of the undifferentiated Early Permian sequence, an interval which corresponds approximately to the interval previously referred to as the Aldebaran Sandstone.

Traverse 7 was recorded southwards, from an area of known thick Early Permian sedimentation in the vicinity of the Westgrove Anticline, to an area of thin Early Permian sedimentation at AAO Glentulloch 1. The main feature on this traverse was the presence of strong reflections from within the Reids Dome Beds near AAO Kildare North 1. These reflections are markedly 'unconformable beneath' reflections from near the top of the Reids Dome Beds. A fault was crossed between AAO Kildare North 1 and AAO Kildare 2 that is believed to be associated with the southern margin of the trough. It is thought that part of the Reids Dome Beds and the Cattle Creek Formation may be faulted out south of this structure.

Traverse 8 is an east-west line across the Merivale Fault. A much thinner and more uniform Permian sequence is present here than in the other traverse areas. The vertical displacement on the Merivale Fault here is similar to that on Traverse 6, but the history of movement on the fault appears to have been quite different in this area.

Warrinilla area

Excellent data were obtained in this area, except on a small section of Traverse 2 where gravel was encountered near the surface. Numerous good-quality continuous reflection events can be mapped with good resolution, from the top of the Bandanna Formation down to the base of the Permian sequence.

Some of the features which can be seen on these traverses are the onlapping of the undifferentiated Early Permian sequence onto the Cattle Creek Formation at PEC Warrinilla 1, with possible erosional truncation of the Cattle Creek Formation on the crest of the anticline, onlapping of units in the upper part of the Reids Dome Beds onto the underlying horizons between PEC Warrinilla 1 and GSQ Taroom 9, and thinning of the undifferentiated Early Permian sequence between GSQ Taroom 9 and GSQ Taroom 10.

PROPOSED PROGRAM FOR 1979 SURVEY

About 165 km of the 1978 proposed program, consisting of the following traverses, remains to be completed (distances still to be covered are given in brackets):

Traverse 3 (25 km). Traverse 3 runs from PEC Warrinilla 3 in the east, through PEC Warrinilla 4 and SQD1 (Morella) to AFO Bandanna 1. About 15 km of this traverse was completed in 1978, leaving 25 km yet to be recorded.

Traverse 2 North (50 km). This was referred to as Traverse 5 in Bauer (1978). It is a northwards continuation of Traverse 2 designed to tie traverses in the Warrinilla area north to Traverse 4. It is also a key line for stratigraphic correlations north from the Warrinilla wells.

Traverse 4 (90 km). This is an east-west traverse, from AFO Purbrook 1 in the east, through AFO Rolleston 1 and AOE3 (Consuelo) to the western margin of the Denison Trough.

Seismic reflection profiling will be carried out as time permits on additional traverses as follows:-

Traverse 4 extension (20 km). This is an eastward extension of Traverse 4 from AFO Purbrook 1 onto the Comet Platform. This extension is designed (a) to establish the nature of easterly thinning of the Reids Dome Beds, Cattle Creek Formation, and Aldebaran Sandstone, (b) to determine basement configuration of the Comet Platform and elucidate the role played by the Comet Platform in development of the Denison Trough, and (c) to examine the significance of an easterly-trending magnetic basement trough in the area (Bauer (1978) fig. 2).

Traverses 5 and 9 (35 km). A north-south cross-traverse, Traverse 5, will be recorded north of the eastern end of the extended Traverse 4 to better define the magnetic basement trough. Traverse 9 will then be recorded east from Traverse 5 along the Dawson Highway. GSQ proposes to site a stratigraphic hole on the Comet Platform; the seismic work is designed to help find an area where basement is within the rig capacity of approximately 1200 m.

Traverse 10 (40 km). It is proposed to run this line from AAO Kia Ora 1 to Fairview Homestead. It is designed to (a) establish the distribution and easterly thinning of the Reids Dome Beds, Ingelara Formation, and Peawaddy Formation, (b) delineate the basement configuration of the Comet Platform, (c) determine the nature of pre-Precipice Sandstone deformation in the area, and (d) investigate the significance of the Nuga Nuga Fault system proposed by Paten & others (1979). It is proposed by GSQ to drill a deep stratigraphic hole in the vicinity of Fairview Homestead; this hole would serve as a useful control point for identification of reflection horizons mapped by the seismic traverse.

Traverse 2 (South) (40 or 80 km). This line would be recorded northwards along the Carnarvon Developmental Road either (a) from where a proposed AAR traverse intersects the Road, or (b) if this traverse is not recorded, from where BMR Traverse 6 intersects the Road to the southern end of BMR Traverse 2. This line would (a) confirm northerly thickening of the Aldebaran Sandstone, and (b) tie modern seismic work in the Westgrove and Warrinilla areas together to provide a regional framework for the construction of isopach and structural maps.

Optimum shooting and recording parameters will be determined by means of noise tests, uphole shoots, and charge size and depth experiments. Mainly 6-fold CDP recording will be used, with a geophone station interval of 41⅔ m and 48 input channels.

The proposed 1979 program consists of 165 km to complete the original program, plus up to 175 km of additional work. In addition to the seismic work, it is proposed to make gravity observations at 500-m intervals along the additional seismic traverses to enable a joint interpretation to be made.

The 1979 survey will take place during August to October inclusive. The personnel, vehicles, and equipment to be employed are listed in Appendix 4.

REFERENCES

BAUER, J.A., 1978 - Denison Trough seismic survey, Queensland, 1978: Presurvey report. Bureau of Mineral Resources, Australia, Record 1978/52 (unpublished).

PATEN, R.J., BROWN, L.N., & GROVES, R.D., 1979 - Stratigraphic concepts and petroleum potential of the Denison Trough, Queensland. APEA J., 1979, 43-52.

APPENDIX 1

Operational statistics

Recording commenced	26.7.78
Recording completed	16.11.78
Length of traverse	192 km
Number of recording days worked	64
Recording days lost	26 (20 due to rain)
Multiplicity	6-fold
Total number of shots	1128
Number of production shots	1052
Average number shots/recording day	17.6
Average number production shots/recording day	16.4
Average surface coverage/recording day	3.0 km
Maximum number production shots/recording day	28
Explosives used	35 000 kg Anzite Blue
Detonators used	1300
Average charge/shot	31 kg
Total number of rig days worked	204
Rig days lost	124 (97 due to rain)
Metres drilled	54 057
Average metres drilled/rig day worked	265

APPENDIX 2

Spread and recording parameters

Production shooting spread	
Spread length and type	958⅓-0-1000 m split, shot on trace 24
Number of channels	48
Geophone station interval	41⅔ m
Multiplicity	6-fold CDP
Number of geophones/trace	16
Geophone pattern	in-line
Geophone spacing	5½ m
Offset shooting spread, Traverse 6	
Spread length and type	1041⅔-3000 m off-end
Number of channels	48
Geophone station interval	41⅔ m
Multiplicity	6-fold CDP
Number of geophones/trace	16
Geophone pattern	in-line
Geophone spacing in line	5½ m
Deep crustal reflection shot spread	
Spread length and type	0-41⅔-4000 m off-end
Number of channels	48
Geophone station interval	83⅓ m
Number of geophones/trace	16
Geophone pattern	in-line
Geophone spacing in line	5½ m
DFS IV instrument settings	
Recording mode	Digital
Format	Seg-B
Number of input channels	48 data, 4 auxiliary
Tape	9 track, 800 bpi NRZI, ½ in
Record length (production)	6 or 8 s
" " (deep crustal reflection)	16 s
Sample rate	2 ms
Gain constant	42 dB
Input filters, production	lo cut: 12 Hz, 36 dB/oct; hi cut: 124 Hz, 72 dB/oct
" " , deep crustal reflection/ refraction shot	lo cut: out; hi cut: 124 Hz, 72 dB/oct
Notch	used near power lines

APPENDIX 3

Personnel and equipment 1978 survey

Personnel

Geophysical Branch

Party Leader	J.A. Bauer
Party Manager	P.J. Flanagan
Geophysicists	F.M. Brassil (19/10 - 20/11)
	W. Anfiloff (1/10 - 12/10)
	O. Dixon (GSQ)
	A. Nelson (GSQ, 29/8 - 12/10)
Technical Officers (Engineering)	J.K.C. Grace (20/7 - 1/9, 13/10 - 1/11)
	G.S. Jennings (6/9 - 18/10)
	D. Gardner (2/11 - 20/11)
Technical Officers (Science)	D. Pfister
	T. Hegvold (16/7 - 12/10)
	G. Price (2/11 - 20/11)
	W.J. Meyer (13/10 - 2/11)
Field Assistants (Shooters)	R.D.E. Cherry
	L.O. Rickardsson
Mechanic	D.K. McIntyre
Core fieldhand	A.C. Takken
Wages hands	14

Petroleum Exploration Branch

Toolpusher	E.H. Cherry
Drillers	T. Shanahan
	K. Reine
	K. Huth
	E.D. Lodwick (23/8 - 17/11)
Assistant driller	J. Henry (23/1 - 17/11)
Wages mechanics	T. Johnson
	A. Crawford (23/8 - 17/11)

Australian Survey Office, Brisbane

Surveyors	F. Wilkinson (26/6 - 17/8)
	T. Walsham (16/8 - 12/10)
	J. Mellor (10/10 - 17/11)
Technical Officers	N. Dale (26/6 - 17/8)
	K. Nielson (16/8 - 12/10)
	P. Noakes (10/10 - 17/11)
Chainmen	3

Equipment

Recording system	TI DFS IV	
Camera	SIE TRO-6	
Switch gear	I/O Rota-long	
Radio firing unit	I/O RFU	
Cables	265 m SCG-5, 24 ch.	- 18
	539 m, 48 ch.	- 5
Geophones	GSC 20D, 8Hz	- 1280
Transceivers	Codan 6924	- 5
	Phillips FM 828	- 8
Gravity meter	Worden W169	
	La Coste G20	

Vehicles

Recording truck	International D1610 3 ton 4 x 4	- 1
Shooting truck	" " " "	- 1
Workshop truck	" " " "	- 1
Flat-top trucks	" " " "	- 2
Water tankers	" " " "	- 4
Pre-loading vehicle	International D1310 30 cwt 4 x 4	
Geophone carriers	Landrover LWB ute	- 3
Personnel carriers	Landrover LWB S/W	- 3
	Landrover LWB p'van (23/8 - 17/11)	- 1
Surveying vehicles	Landrover LWB (supplied by DAS, Brisbane)	- 2
Drilling rigs	Mayhew 1000/Mack 6 x 8 truck	- 3
	" " " " " (23/8-17/11)	- 1
Drill tankers	AEC Militants	- 3
	AEC Millitant (23/8 - 17/11)	- 1
Office caravan	4 wheel	
Kitchen caravan	"	
Ablutions caravan	"	- 2
General purpose trailers	"	- 2
Generator trailer	"	
Workshop trailer	"	
Drill trailer	4 wheel, 6 tonne	
Motor cycle	Yamaha	

APPENDIX 4

Proposed personnel and equipment, 1979 survey

Personnel

Geophysical Branch

Party leader	J.A. Bauer		
Party manager	B. Pedvin	(part-time)	
	J. Somerville	(part-time)	
Geophysicists	O. Dixon (GSQ)		
	W. Anfiloff	(part-time)	
Technical Officers (Engineering)	J.K.C. Grace	(part-time)	
	D. Gardner	(part-time)	
Technical Officers (Science)	D. Pfister		
	G. Price		
	R. DeNardi	(part-time)	P.E. Branch
	G. Fisher	(part-time)	P.E. Branch
Field Assistants (Shooter)	R.D.E. Cherry		
	L.O. Rickardsson		
Field Assistant	A.C. Takken		
Mechanic	D.K. McIntyre		
Fieldhand	D.W. Johnstone		
Cook	1		
Cook's offsider	1		
Additional Fieldhands	11		

Petroleum Technology Section

Toolpusher	A. Zoska	)
Drillers	E.D. Lodwick	)
	L. Keast	) Petroleum Technology Section
	K. Huth	)
	J. Henry	)
Wages mechanic	J. Keyte	)

Australian Survey Office, Brisbane

Surveyor	1	)
Surveying T.O.	1	) Dept. of Admin. Services, Brisbane
Chainmen	3	)

Equipment

Recording system	TI DFS IV	
Camera	SIE TRO-6	
Switch gear	I/O Rota-long	
Radio firing unit	I/O RFU	
Cables	539 m, 48 channel	- 11
	265 m SCG-5, 24 ch.	- 8
Geophones	GSC 20D, 8 Hz	- 1576
Transceivers	CODAN 6924	- 5
	Phillips FM 828	- 8
Gravity meter	1 Worden	

Vehicles

Recording truck	International D1610 3 tonne 4 x 4	
Shooting truck	" " " "	
Workshop truck	" " " "	
Flat-top trucks	" " " "	- 2
Water tankers	" " " "	- 3
Pre-loading truck	International D1310 30 cwt 4 x 4	
Geophone carriers	" " " "	- 3
Personnel carriers	LWB landrovers	- 4
Drilling rigs	Mayhew 1000s'	- 4
Drill tankers	1000 gallon	- 4
Office caravan	4 wheel	
Kitchen caravan	" "	
Ablutions caravans	" "	- 2
Workshop trailer	" "	
General purpose trailers	" "	- 2
Generator trailer	" "	
Drill trailer	" " 6 tonne	
Drill mechanics trailer	2 wheel	
Motor cycle	Yamaha	

APPENDIX 5

Operational details, gravity survey

1. The survey commenced on 2 October and was completed on 16 November 1978.

2. 318 new stations were read.

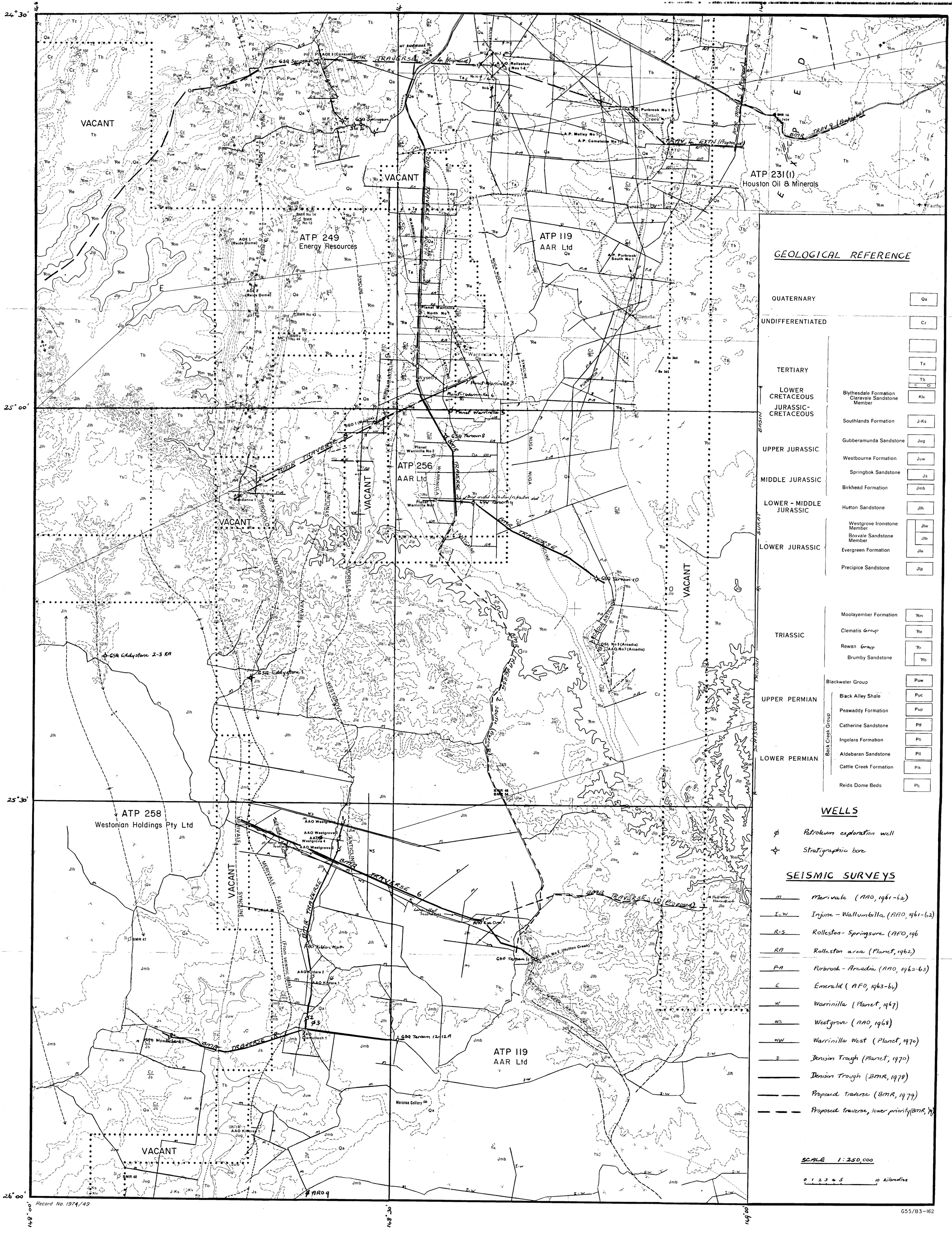
3. Worden W169 (C.F. 0.10085) and La Coste G20 (C.F. 0.10494) were used.

4. The survey was tied to the following base stations:

Station	Value
6003.0215	978901.98
6003.0205	978915.96
6402.1037	978888.53
6402.1120	978874.85

5. All stations were seismic shot-point locations and levels were optically obtained to Third-Order standard.

6. The Survey Number in the BMR filing system is 7813.



Record No. 1979/49

PLATE 1. GEOLOGICAL AND SEISMIC TRAVERSE LOCATION MAP, SOUTHERN DENISON TROUGH

BUREAU OF MINERAL RESOURCES
DENISON TROUGH
TRAVERSE 6 , SP 5872 - 6996

RECORDING PARAMETERS

1. DFS IV 9 TRACK SEG B
2. 48 TRACE 6 FOLD SPLIT SPREAD
3. GEOPHONES - 1 TRACE, GROUP INT 42 M
4. 2 MSEC RECORDING SAMPLE RATE
5. FILTER - 124 HZ
6. SOURSE - DYNAMITE
RECORDED BY BMR 1978

PROCESSING SEQUENCE

1. TRUE AMPLITUDE RECOVERY
2. 2MSEC - 4MSEC RESAMPLE
3. TIME VARIANT SCALING 1SEC GATES
4. VELSCAN ANALYSIS
5. RESIDUAL STATICS CORRECTIONS
6. NMO CORRECTIONS
7. DATUM STATIC APPLICATION
8. 6-FOLD STACK
9. WHITENING DECON 4 X 44 MSEC OPERATORS
10. TVF - SEE PANEL
11. TVS - 200 - 350 - 600 - 1000 MS GATES START 150 MS
12. DISPLAY 10 CM-S 10 TPC

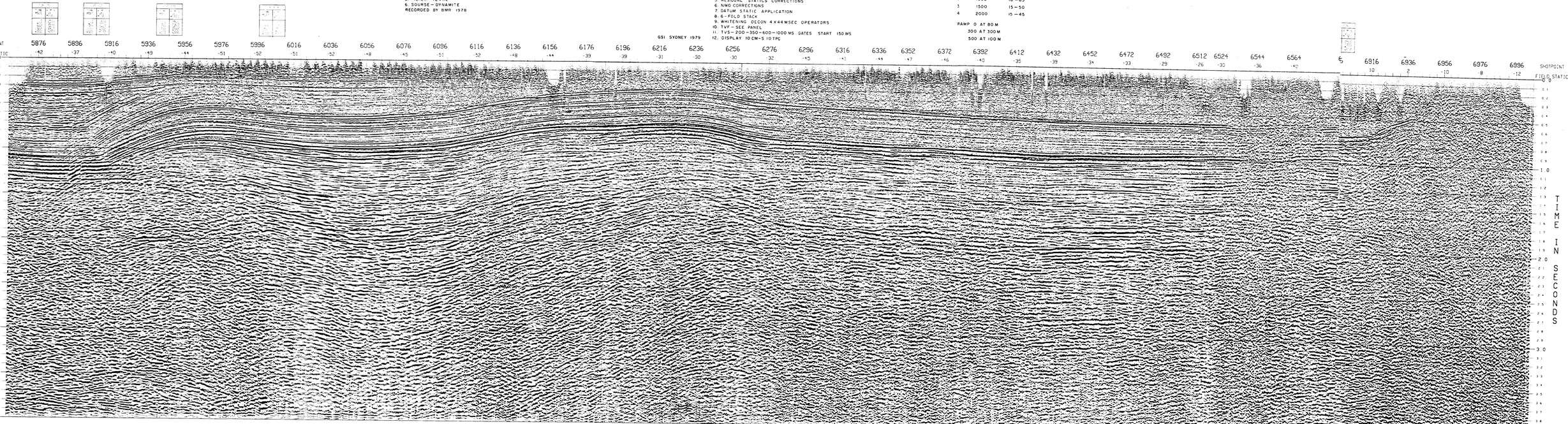
GSI SYDNEY 1979

FILTERS APPLIED

	TIME (MSEC)	FILTER (HZ)
1	0	20 - 80
2	1000	18 - 65
3	1500	15 - 50
4	2000	15 - 45

RAMP 0 AT 80 M
300 AT 300 M
500 AT 100 M

SEISMIC SECTION, TRAVERSE 6



Record 1979/49

G55/83-163