DEPARTMENT OF
~~NATIONAL RESOURCES~~
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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

BMR PUBLICATIONS COMPACTUS
(LENDING SECTION)

RECORD 1980/12

DENISON TROUGH SEISMIC SURVEY, QUEENSLAND, 1979 : OPERATIONAL REPORT

by

J.A. BAUER & O. DIXON

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** Geological Survey of Queensland

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ABSTRACT

The Bureau of Mineral Resources, Geology and Geophysics (BMR) conducted a seismic survey in the Denison Trough, in the western part of the Bowen Basin in Queensland, from July to October 1979.

The survey continued work commenced in 1978 aimed at delineating the configuration of the trough and providing stratigraphic information from the Permian sequence which, in conjunction with current Geological Survey of Queensland stratigraphic studies, would enable reliable stratigraphic correlations to be made throughout the trough.

The survey obtained 265 km of digitally recorded mainly 6-fold CDP seismic reflection data. Gravity observations were made at 500-m intervals along the seismic traverses. The quality of the seismic data obtained varied from poor to very good. Generally the data obtained in the southern part of the survey area was very good, but in some parts of the northern area near-surface conditions particularly basalt layers, gravel, or boulders, resulted in data of poorer quality.

This report presents operational information from the 1979 survey and a brief discussion of the seismic results. The final interpretation of the seismic and gravity results will be reported on separately when all data have been fully processed and interpreted.

INTRODUCTION

The Bureau of Mineral Resources, Geology and Geophysics (BMR), conducted a seismic survey in the Denison Trough from July to October 1979. The seismic traverses fall largely within 119P, 256P, 231(1)P, and 263P (Plate 1). 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 made detailed stratigraphic studies based on these data and data from petroleum exploration wells. A geophysicist from GSQ (Dixon) participated in the survey, and GSQ personnel are participating in joint reporting on the project.

The 1979 seismic survey was a continuation of a program commenced in 1978 to provide structural information on the Denison Trough, particularly at lower Permian and basement level, and stratigraphic data to enable reliable correlations to be made throughout the trough. The program, outlined in Bauer (1978), was not completed in 1978 because of unseasonable rains. For 1979, in addition to completing the 1978 program, extra traverses were proposed (Bauer & Dixon, 1979), (a) to study the configuration of the Comet Platform, (b) to help site a proposed GSQ stratigraphic bore bore on a shallow part of the Comet Platform, (c) to provide a seismic tie to another proposed borehole, and (d) to tie together recent seismic traverses in the Westgrove and Warrinilla areas.

During the 15-week survey 265 km of seismic reflection traverse was recorded, of which 225 km was 6-fold CDP and the rest 3-fold CDP. Gravity measurements were made at 500-m intervals along all traverses.

This report presents details of operations and preliminary results only; further data processing and analysis are required before a final interpretation can be made.

FIELD OPERATIONS

GENERAL

The survey area lies mainly in the Rolleston district southeast of Springsure, Queensland (Figure 1). Mail and supplies were obtained from Springsure, which has rail and road freight services, and from Emerald, which has a thrice-daily air service. Towards the end of the season when operations moved south about 100 km, to north of Injune, mail and supplies were obtained from Injune and Roma.

The locations of the traverses recorded during the survey are shown in Plate 1 and the operational statistics are presented in Appendix 1. Work commenced in the Warrinilla area from a camp near Wyseby homestead 65 km south of Rolleston. The recording of those parts of Traverse 3 not completed in 1978, and of the northern extension of Traverse 2 recorded in 1978, was carried out first. Traverses 9, 5, and 4(east) were then recorded from a camp 10 km south of Rolleston, and Traverse 4(west) was recorded from a camp on Meteor Creek 80 km southwest of Rolleston. Lastly, the southern extension of Traverse 2 recorded in 1978 was completed from a camp on the Dawson River 65 km north of Injune.

Of the program proposed by Bauer & Dixon (1979), Traverse 10 was not recorded owing to lack of time, and a 27-km section of Traverse 4, between Traverses 4(east) and 4(west), was omitted because it coincided with a line recorded for Associated Australian Resources Ltd during 1979.

Based on difficulties and inefficiencies encountered during this survey, three recommendations are made for future surveys:

(1) Method of bulldozer hire: Bulldozers were hired locally for traverse clearing. This was not satisfactory as suitable machines were not available every time they were required, which could result in serious delays. For future surveys involving mainly cross-country traverses, we suggest that a dozer be hired on contract for the duration of the survey and a salaried operator be employed. Past experience has shown that paying an operator purely on 'machine hours worked' can be problematical if the dozer is not required full time.

(2) Grading of traverses: Consideration should be given to grading traverses after dozing, as speed of movement along the traverse significantly affects the rate of production. The maximum recording rate achieved in 1979 on a roadside traverse with shot-holes ready drilled was 8.7 km/day, whereas the maximum attainable on a cross-country traverse was only 6.0 km/day.

(3) Drilling capacity: The four drilling rigs used during the survey were too few to allow efficient operation of the recording crew. Recording was often delayed by lack of shot-holes, indeed there were six days on which no recording could be done for this reason. The average recording rate throughout the survey was 4 km/recording day. It is considered that an average rate of 6 km/day, based on a station spacing of 41 2/3 m, could be maintained if sufficient shot-holes were available. It is therefore recommended that at least one and preferably two additional drilling rigs be employed on future surveys.

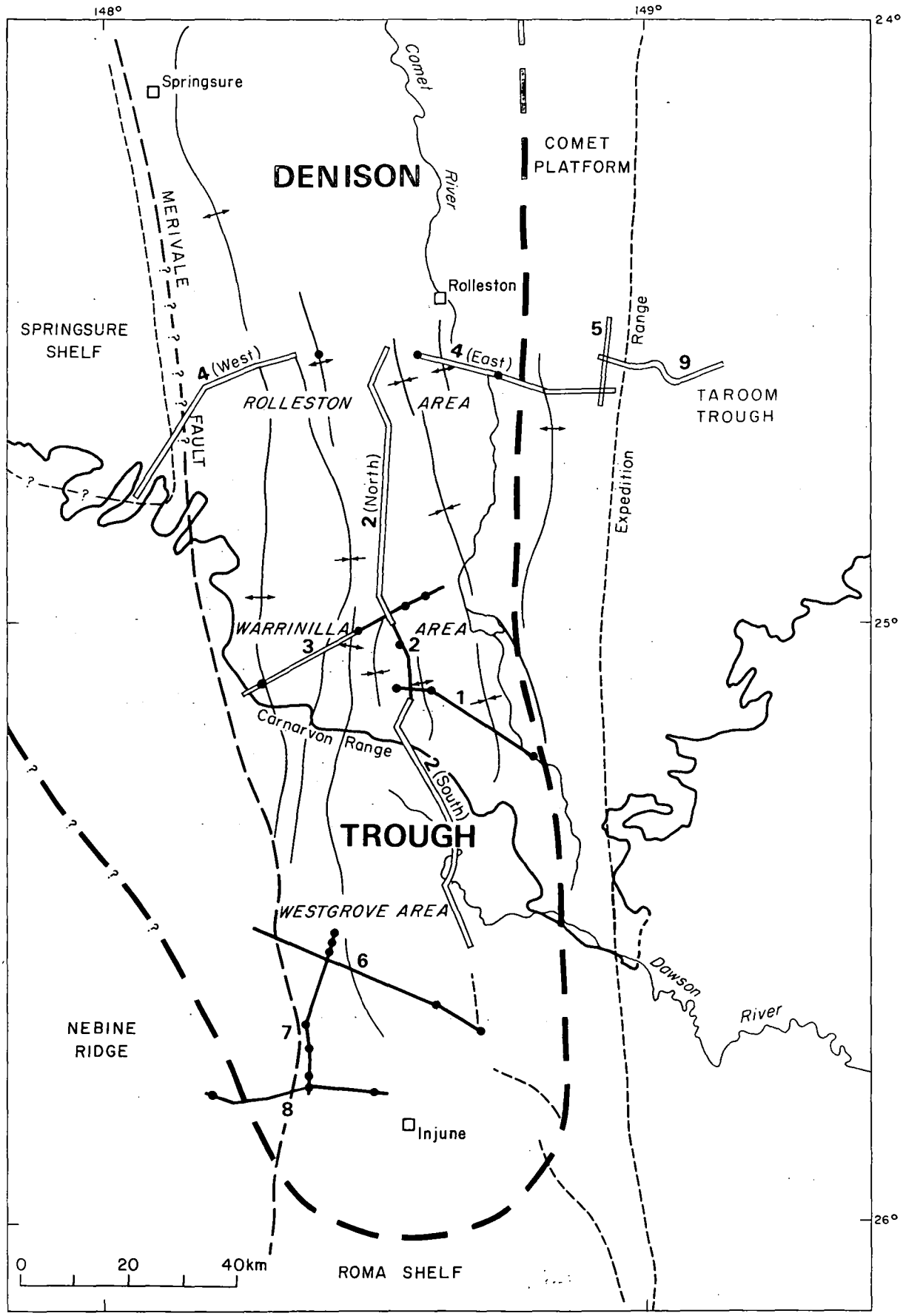


Fig.1 DENISON TROUGH SEISMIC SURVEY, QLD 1978-79
REGIONAL SETTING AND SEISMIC TRAVERSES

BULLDOZING

Traverse 3, crossing the centre of the area, had been cleared in 1978; it required re-dozing, mainly to fill in washed-out creek crossings. Traverse 5, which lay just west of the Expedition Range in the northeast of the area, crossed rough terrain, as did the eastern end of Traverse 4(east). The rest of Traverse 4(east) encountered mainly light scrub and fairly flat terrain, except near the Comet River where many channels were traversed. 'Aquaflex' cord explosive was ploughed on a 10-km section of Traverse 4(east) near AFO Rolleston 1; a feeder tube was constructed to fit the dozer hired locally for this work. Traverse 4(west) along the valley of Meteor Creek required extensive dozing to construct many crossings of the creek. Traverses 2 and 9 followed roads, so no clearing was necessary.

SURVEYING

Surveying was done by the Australian Survey Office. Pegging was done at 41 2/3-m intervals for geophone stations and 166 2/3-m intervals for shot-points, except on the western 40 km of Traverse 4(west), where the shotpoint interval was increased to 333 1/3 m. Traverses were levelled and elevations for all shotpoint and geophone stations were provided, referenced to Australian Height Datum (AHD), to an accuracy of 0.1 m. Traverses were checked with Electronic Distance Measuring equipment. Australian Map Grid (AMG) co-ordinates for traverse end-points and bends greater than 2^{o}, required for the processing of crooked lines, were supplied in the field. Latitudes and longitudes are to be supplied for all shot-points.

DRILLING

The average drilling rate was 704 m/day or approximately 19 shotholes, which represents a total progress of just over 3 km at the shotpoint interval used on this survey.

Drilling conditions varied from extremely bad to very good. Good conditions were encountered on Traverse 3, where shale of the Rewan Formation was intersected. On Traverse 2(north) drilling conditions were good except at the extreme southern and northern ends of the traverse near Carnarvon and

circulation. Drilling conditions on Traverse 9 were variable, either hard quartzite bands or basalt layers being intersected on much of the traverse. Fair to good conditions prevailed on Traverse 5, most holes intersecting shale or sandstone and minor basalt, except near the intersection with Traverse 9 where quartzite bands and basalt were more frequent. On Traverse 4(east) conditions were generally fair to good; most holes intersected clay and shale except at the extreme eastern end of the traverse where some basalt was encountered, and at the western end near the Comet River where a sand layer resulted in loss of circulation. Drilling conditions on Traverse 4(west) were extremely difficult owing to a layer of basalt gravel and boulders which overlies the Permo-Triassic formations in the Meteor Creek Valley. Traverse 2(south) encountered excellent drilling conditions except at its northern end, where sand and gravel near Moolayember Creek necessitated mud circulation.

On the basis of previous work in the area and tests during the survey, a hole depth of 40 m was attempted on all traverses. In areas of difficult drilling, in particular Traverses 9 and 4(west), very hard formations or heavy gravel made it impracticable, considering the limited number of rigs available, to drill holes to this depth. The 40-m holes generally passed through the weathered layer except on some parts of Traverses 5 and 4(east) where the weathered layer is up to 100 m thick.

SEISMIC RECORDING

The spread, recording, and correction parameters used during the survey are listed in Appendix 2, and the recording equipment in Appendix 3.

Traverse 3. Two sections of Traverse 3 totalling 23 km, which could not be recorded in 1978 because of rain, were recorded this year. Most of the spread and recording parameters used to complete the traverse were the same as those used in 1978, i.e. 6-fold CDP 48-channel recording, 958 1/3-0-1000 m recording spread with the shot on trace 24, geophone station interval 41 2/3 m, 16 geophones per trace in line 5½ m apart, 12-124 Hz recording filters, 2-ms sampling rate, and 40-m hole depth. Tests conducted nearby on Traverse 2 in 1978 indicated that the difference in signal-to-noise ratio on records produced with 29-kg, 18-kg, and 9-kg charge sizes was small, but that there was a significant reduction in signal-to-noise ratio using a 5-kg charge. The

charge size was therefore decreased to 8.3 kg/shot compared with 17 kg/shot used in 1978.

The section of Traverse 3 recorded in 1979 included 30 shot-holes which had been loaded in 1978 but which could not be recorded because of rain; of these 30 shots, 26 fired successfully.

Traverse 2(north). Traverse 2(north) was recorded northwards along the Injune-Rolleston road for 50 km from the northern end of Traverse 2 recorded in 1978. All parameters were the same as those used on the section of Traverse 3 recorded in 1979.

Traverse 9. Traverse 9 was recorded for 26 km along the Rolleston-Moura road where it passes through the Expedition Range. To determine optimum recording parameters, a noise shoot, hole-depth comparison, charge-size comparison, and up-hole shoot were done before a start was made on shooting.

The noise shoot showed that within 1 km of the shot, events below 1.0 s were masked by incoherent noise, but that reflections were evident below 1.0 s at recording offsets of 1-2 km. A 0-1958 1/3 m recording spread, 41 2/3-m geophone station interval, 16 geophones/trace in line 5½ m apart, and low-cut recording filter of 12 Hz, were chosen for production recording on the basis of the noise shoot. The hole-depth comparison compared records from 27-m, 36-m, 40-m, and 44-m shot-holes; the 27-m shot was in the weathered layer. Little difference in record quality could be discerned and it was decided to retain the 40-m hole depth. The charge-size comparison was done using 2.5-kg, 4.1-kg, 8.3-kg and 16.6-kg charge sizes. The records showed increasing signal-to-noise ratio with increasing charge size, but the improvement of the 16.6-kg record over the 8.3-kg record, which was noticeable only on that part of record below the zone of interest, was not considered sufficient to warrant the use of a 16.6-kg charge. An 8.3-kg charge size was therefore retained. The up-hole shoot showed a surface layer of velocity 450 m s^{-1} to 3 m, a weathering velocity of 1400 m s^{-1} to 28 m, and a subweathering velocity of 2400 m s^{-1}; subweathering velocity is known from refraction data to vary a great deal.

Traverse 5. Traverse 5 was recorded using the same parameters as for Traverse 9.

Traverse 4. This traverse was recorded in two sections, referred to as Traverses 4(east) and 4(west). The two sections were connected by the Vibroseis line S3 recorded for Associated Australian Resources Ltd (AAR) from AFO Rolleston 1 to 5 km west of AOE 3 (Consuelo) in 1979 as part of a detailed seismic survey in the area.

Traverse 4(east) was recorded using shot holes for 30 km from its eastern end to 10 km east of AFO Rolleston 1, and with 'Aquaflex' cord explosive for the remaining 10 km to AFO Rolleston 1. For the shot-hole section a 958 1/3-0-1000 m split spread was used. This was done because (a) the records produced on Traverse 5 at its intersection with Traverse 4 using 0-1958 m spreads showed little difference in record quality between the short and long recording offset zones, and (b) shorter offsets were preferred to record maximum shallow reflection data. The geophone station interval and geophone pattern were the same as on previous traverses. Hole-depth and charge-size comparison shots were done near the eastern end of Traverse 4(east); on the basis of these a hole depth of 40 m was retained, but the charge size was increased to 12.5 kg/shot.

On the section of Traverse 4(east) that was recorded using 'Aquaflex' cord explosive, a 0-458-2417 m off-end spread was used. The shot consisted of 4 x 99-m strands of 'Aquaflex' ploughed to a depth of 0.6 m and detonated at the western end into a spread east of the shot. Weathering shots consisting of 1-kg charges fired into a reversed 0-180 m spread were done at 1-km intervals to provide control on the thickness and velocity of the weathered layer. Cord explosive was used on this section of Traverse 4 because of extremely poor drilling conditions near the Comet River. Comparisons between shot-holes and various configurations of 'Aquaflex', carried out before starting 'Aquaflex' ploughing, showed that shot-holes consistently gave better records than 'Aquaflex'. 'Aquaflex' was therefore used only in the area of worst drilling conditions, as determined by test drilling.

Traverse 4(west) was recorded using 6-fold CDP on the eastern 12 km of the traverse, and 3-fold CDP on the remaining 40 km. The reduction in multiplicity was effected to enable reasonable drilling progress in the extremely difficult conditions.

The spread configuration used was the same as that for the shot-hole section of Traverse 4(east). A noise shoot conducted prior to commencement of recording showed significant low-frequency noise in the 0-1 km recording offset zone. However, as this was strongly attenuated by the 12-Hz low-cut filter, it was considered preferable to use a maximum recording offset of 1 km rather than, say, 2 km, to minimize data loss around the many unavoidable line bends on this traverse, and to record maximum shallow reflection data. A charge size of 12.5 kg/shot was chosen, based on comparison shots conducted before shooting. A hole-depth of 40 m was attempted, but almost half of the shotholes could not be drilled and loaded to total depth.

Traverse 2(south). Traverse 2(south) was recorded southwards along the Injune-Rolleston road for 57 km from the southern end of Traverse 2 recorded in 1978 to intersect AAR Lines 79-E11 and 79-E13. All recording parameters were the same as on Traverse 2 and 2(north) except for the charge size, which was 12.5 kg on Traverse 2 (south).

GRAVITY MEASUREMENTS

Gravity was read every 500 m along Traverses 2(north), 2(south), 3,4(east), 4(west), 5, 9, and AAR Line 79-S3. Operational details for the gravity survey are presented in Appendix 4. The gravity data will be used with the seismic data to make a joint interpretation.

SEISMIC DATA PROCESSING

The seismic data are being processed under contract by Geophysical Service International (GSI) in Sydney.

Weathering corrections were computed in the field, mainly by using the up-hole method, but in areas of deep weathering it was necessary to use refraction data from the production reflection records. On the section of Traverse 4 shot with 'Aquaflex' cord explosive, weathering shots at 1-km intervals were used in conjunction with the refraction data from the production 'Aquaflex' shots to compute weathering corrections.

The seismic data in each area were reduced to an elevation datum chosen on the basis of the average elevation of that area. The elevation data, and the replacement velocities used for elevation and weathering corrections, are shown in Appendix 2.

The static corrections, a trace edit done from the field monitor records, and AMG coordinates for all line bends greater than 2°, were transcribed onto computer coding forms and sent to GSI. A preliminary 'Brute Stack', section was then produced by GSI using (i) the static corrections, trace edit, and AMG coordinates supplied, (ii) an approximate velocity function derived from analysis of previous seismic data and from well-velocity surveys, (iii) first break ramps chosen from the field records, and (iv) time-variant scaling, deconvolution, and filter functions considered appropriate to the data.

PRELIMINARY RESULTS

Warrinilla area

The work done in this area during 1979 consisted of the northern and southern extensions of Traverse 2, and Traverse 3. Traverse 1 and the central part of Traverse 2 were recorded in 1978.

Data quality in this area is very good. Numerous reflections can be mapped throughout most of the area, including the tops of the Bandanna Formation (Blackwater Group), Black Alley Shale, Peawaddy Formation, Cattle Creek Formation, and Reids Dome Beds. The base of the Permian sequence can be mapped with less certainty over part of the area.

Traverse 3 crossed, from east to west, the Warrinilla Anticline, the Morella Anticline, the Rewan Syncline, and the Bandanna culmination of the Serocold Anticline. The Warrinilla Anticline is a broad feature with an amplitude on this cross-section of a little over 100 m. The Morella Anticline has an amplitude of over 300 m and is bounded on its eastern side by a reversed fault at depth which becomes a monocline higher in the sequence. The Rewan Syncline is a broad gentle depression separating the Morella Anticline from the Serocold Anticline, which has an amplitude of 700 m on this line. These structures are largely analogous to those in the Westgrove area in particular the Morella and Serocold Anticlines on Traverse 3 may be correlated with the Merivale and Westgrove Anticlines on Traverse 6.

The Early Permian Reids Dome Beds can be seen to thicken markedly west of the Morella Anticline, and may be up to 2000 m thick. There may also be lesser thickening of the Reids Dome Beds east of the Morella Anticline. Part of the Cattle Creek Formation and almost all of the Reids Dome Beds present east of the Morella Anticline are absent on its crest, indicating that the area was elevated during or at the end of this period of Early Permian deposition.

Traverse 2(north) runs approximately along strike with respect to the major Triassic folds. Late Permian and Triassic units dip gently northwards along the length of the traverse. The distribution of the Early Permian sequence was, however, significantly affected by a major hinge-line which occurs about 7 km north of Planet Warrinilla North 1, and which underwent several phases of movement during the Early Permian. The Reids Dome Beds and Cattle Creek Formation thicken significantly north of the hingeline, and the Reids Dome Beds reach a thickness of up to 1000 m north of the hinge-line compared with an estimated 200 m to its south. Smaller movements during the Aldebaran Sandstone to Peawaddy Formation interval resulted in discordant relations in the vicinity of the hinge-line, for example, onlap of the Aldebaran Sandstone sequence.

Traverse 2(south) crosses a major monocline, 7 km south of Warrinilla 1, which is down to the south. In the Early Permian it was down to the north, forming a basin for deposition of the Reids Dome Beds and Cattle Creek Formation, then reversed its movement in the Triassic after deposition of a regular Late Permian sequence. The Early Permian sediments thicken southwards towards the monocline, from the section of Traverse 2 recorded in 1978, with divergent reflections, but only a thin Early Permian sequence is present south of the structure. Late Permian units are downthrown to the south by about 600 m, but their thickness is not greatly affected. A marked unconformity occurs between the top of the divergent beds of the Early Permian sequence and the overlying formations.

The remainder of the traverse crosses a relatively thin Permian sequence about 700 m thick, beneath more than 1000 m of younger sediments; the sequence is deformed in two broad folds, each of which has an approximate amplitude of 170 m. In places the Permian sequence onlaps onto an irregular basement surface.

Rolleston area

The work in this area consisted of Traverses 4(east), 4(west), 5, and 9. The data quality varied from good to very poor; poor data were generally related to the nature of the near-surface layer.

Traverse 4(east), together with AAR line 79/S3 and Traverse 4(west), provides a complete section across the Denison Trough from the Comet Platform in the east to the Springsure Shelf in the west. Data quality on Traverse 4(east) is fair to good. A number of good reflections are consistent throughout the traverse. The coals of the Bandanna Formation have a characteristic response below a featureless Mesozoic sequence. A reflection from within the Aldebaran Sandstone occurs widely. Reflections from the base of the Permian sequence can be seen over the Comet Platform but cannot be reliably traced into the deeper parts of the section. The base of the Permian sequence has not been penetrated by any well in the deeper parts of the trough.

The interval from near the top of the Aldebaran Sandstone to the top of the Bandanna Formation maintains a fairly constant thickness over most of the area. It shallows in a broad arch about AFO Purbrook 1, and deepens at the eastern end of Traverse 4(east), in association with minor faulting. The interval between the Aldebaran Sandstone reflection and the base of the Cattle Creek Formation thins eastwards onto the Comet Platform from 900 m at AFO Rolleston 1 to 375 m at AFO Purbrook 1 and to 225 m at the eastern end of the traverse.

The Reids Dome Beds increase in thickness westwards off the Comet Platform into the centre of the trough with apparent top-lap against the overlying Cattle Creek Formation; they are generally conformable with reflections from within the ?Devonian Timbury Hills Formation.

Traverse 4(west) begins 5 km west of AOE 3 (Consuelo) on the Consuelo Anticline, and passes southwest across the Serocold Anticline onto the Springsure Shelf. Very poor reflection quality across the Serocold Anticline makes correlation onto the shelf very difficult. The nearest well, AOE 3 (Consuelo), lies on AAR line 79/S3, in which reflection quality was also poor over the Consuelo Anticline. Character correlation indicates a similar Late Permian sequence at the eastern end of Traverse 4(west) to that at AFO Rolleston 1. The Early Permian section thins gradually westwards for about 24 km southwest

of the Serocold Anticline to a broad asymmetrical anticline, beyond which the Late Permian sequence maintains a constant thickness.

Traverse 5 is a north-south line joining Traverse 4(east) to the western end of Traverse 9 and continuing 10 km northwards. Reflection quality is good, except for a 4-km zone at the north of the intersection with Traverse 9. The sequence is a generally flat-lying extension of the eastern end of Traverse 4(east). A deepening of the Permian sequence by about 120 m occurs near the northern end of the line.

Traverse 9 crosses the Expedition Range east from Traverse 5 into the western part of the Taroom Trough. Record quality is very poor. Reflection segments suggest the sequence is largely horizontal except at the eastern end, where the Permian dips strongly under the thicker Mesozoic sediments in the Taroom Trough.

Final processing of the seismic sections will improve record quality, and enable detailed mapping of reflection horizons and more reliable interpretation of the structure and stratigraphy of the southern Denison Trough.

REFERENCES

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

BAUER, J.A., & DIXON, O., 1979 - Denison Trough seismic survey, Queensland : Operational report for 1978 survey and proposed program for 1979 survey. Bureau of Mineral Resources, Australia, Record 1979/49 (unpublished).

APPENDIX 1

Operational statistics

Recording commenced	24.7.79
Recording completed	2.11.79
Length of traverse	265 km
Recording days worked	65
Recording days lost	9 (campshifts 3, waiting for shotholes 6)
Multiplicity	225 km x 6-fold CDP
	40 km x 3-fold CDP
Total shots	1428
Production shots	1374
Average production shots/recording day	21
Average surface coverage/recording day	4 km
Maximum production shots/recording day	49
Explosives used	14 350 kg Anzite Blue
	21 700 m Aquaflex cord
Detonators used	1330 x 45 m lead
	267 x 18 m lead
Average charge/shot	10.5 kg Anzite Blue
	365 m Aquaflex cord
Drilling days worked	71
Drilling days lost	3 (campshifts)
Rig-days worked	247
Rig-days lost	49 (camp-shifts 12, maintenence & repairs 37)
Metres drilled	49 950
Average metres drilled/drilling day	704
Average metres drilled/rig day	202
Holes drilled	1340
Average holes/drilling day	19
Aquaflex patterns laid	57

APPENDIX 2

Spread, recording and correction parameters

Production shooting spread - Traverses 2(north, 2(south), 3, 4(east) shothole section, 4(west)

Spread length and type	958 1/3-0-1000 m split, shot on trace 24
Number of channels	48
Geophone station interval	41 2/3 m
Multiplicity	6-fold CDP - Traverses 2(north), 2(south), 3, 4(east) shothole section, and eastern 12 km of 4(west). 3-fold CDP - western 40 km of Traverse 4(west)
Number of geophones/trace	16
Geophone pattern	In-line
Geophone spacing	5½ m

Production shooting spread - Traverse 4(east) 'Aquaflex' section

Spread length and type	0-458-2417 m off-end, shot west of spread
Number of channels	48
Geophone station interval	41 2/3
Multiplicity	6-fold CDP
Number of geophones/trace	16
Geophone pattern	In-line
Geophone spacing	5½ m

Production shooting spread - Traverses 5 and 9

Spread length and type	0-1958 1/3 m off-end, shot at eastern end (Traverse 9), shot at southern end (Traverse 5)
Number of channels	48
Geophone station interval	41 2/3 m
Multiplicity	6-fold CDP
Number of geophones/trace	16
Geophone pattern	In-line
Geophone spacing	5½ m

TI DFS IV instrument settings

Recording mode	Digital
Format	Seg B
Number of input channels	48 data, 4 auxiliary
Tape	9 track, 1600 bpi P.E., ½ in.
Record length	6 s
Sample rate	2 ms
Gain constant	42 dB
Input filters	12 Hz, 36 dB/oct - 124 Hz, 72dB/oct.
Notch	Used near power lines.

Elevation data and correction velocities

	Elevation datum (metres above MSL)	Correction velocity (ms^{-1})
Traverse 2, north of station 216	183	2800
Traverse 4, east of AFO Rollerston 1	183	"
Traverse 5	"	"
Traverse 9	"	"
Traverse 2, south of station 2161	450	2500
Traverse 3	463	2800
Traverse 4, west of AOE3 (Consuelo)	500	"

APPENDIX 3

PERSONNEL AND EQUIPMENT

Personnel

Geophysical Branch

Party leader	J.A. Bauer
Party manager	B. Pedvin (16/7 - 6/9) J. Somerville (31/8 - 9/11)
Geophysicist	O. Dixon (GSQ)
Technical officers (Engineering)	J.K.C. Grace (20/7 - 19/8) D. Gardner (16/8 - 5/11)
Technical officers (Science)	D. Pfister (20/7 - 27/9) G. Price
Field Assistants	R.D.E. Cherry L.O. Rickardsson A.C. Takken
Field hand	D.W. Johnstone
Mechanic	D.K. McIntyre
Cook	1
Cook's offsider	1
Additional wages hands	11

Petroleum Exploration Branch

Toolpusher	A. Zoska
Drillers	E.D. Lodwick L. Keast K. Huth J. Henry
Wages mechanic	J. Keyte
Technical Officer (science)	R. DeNardi

Australian Survey Office

Surveyors	J. Mellor (ex Brisbane 24/7 - 21/9) J. Szkraba (ex Canberra, 18/9 - 3/11)
Technical Officers, assistants, chainmen	5 (ex-Brisbane)

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 ch. - 13
Geophones	GSC 20D, 8 Hz - 2000
Tranceivers	Codan 6924 - 5 Phillips FM 828 - 11
Gravity meter	Worden W169

Vehicles

Recording truck	International D1610 3 ton 4 x 4 - 1
Shooting vehicle	Landrover LWB flat-top - 1

Vehicles

Workshop truck	International D1610 3 ton 4 x 4	- 1
Flat-top trucks	" " " "	- 2
Water tankers	" " " "	- 4
Pre-loading vehicle	International D1310 30 cwt 4 x 4	- 1
Geophone carriers	" " " "	- 3
Personnel carriers	Landrover LWB S/W	- 3
	Landrover LWB flat-top (1/9-9/11)	- 1
Surveying vehicles	Landrover LWB (supplied by DAS, Brisbane)	- 3
Drilling rigs	Mayhew 1000/Mack 6 x 8 truck	- 4
Drill tankers	AEC Militant	- 2
Office caravan	4 wheel	- 1
Kitchen caravan	" "	- 1
Ablutions caravans	" "	- 2
General purpose trailers	" "	- 2
Generator trailer	" "	- 1
Workshop trailer	" "	- 1
Drill trailer	" "	- 1
Motor cycle	Yamaha	- 1

APPENDIX 4

OPERATIONAL DETAILS, GRAVITY SURVEY

1. The survey started on 31 July and finished on 31 October 1979.

2. 610 new stations were read.

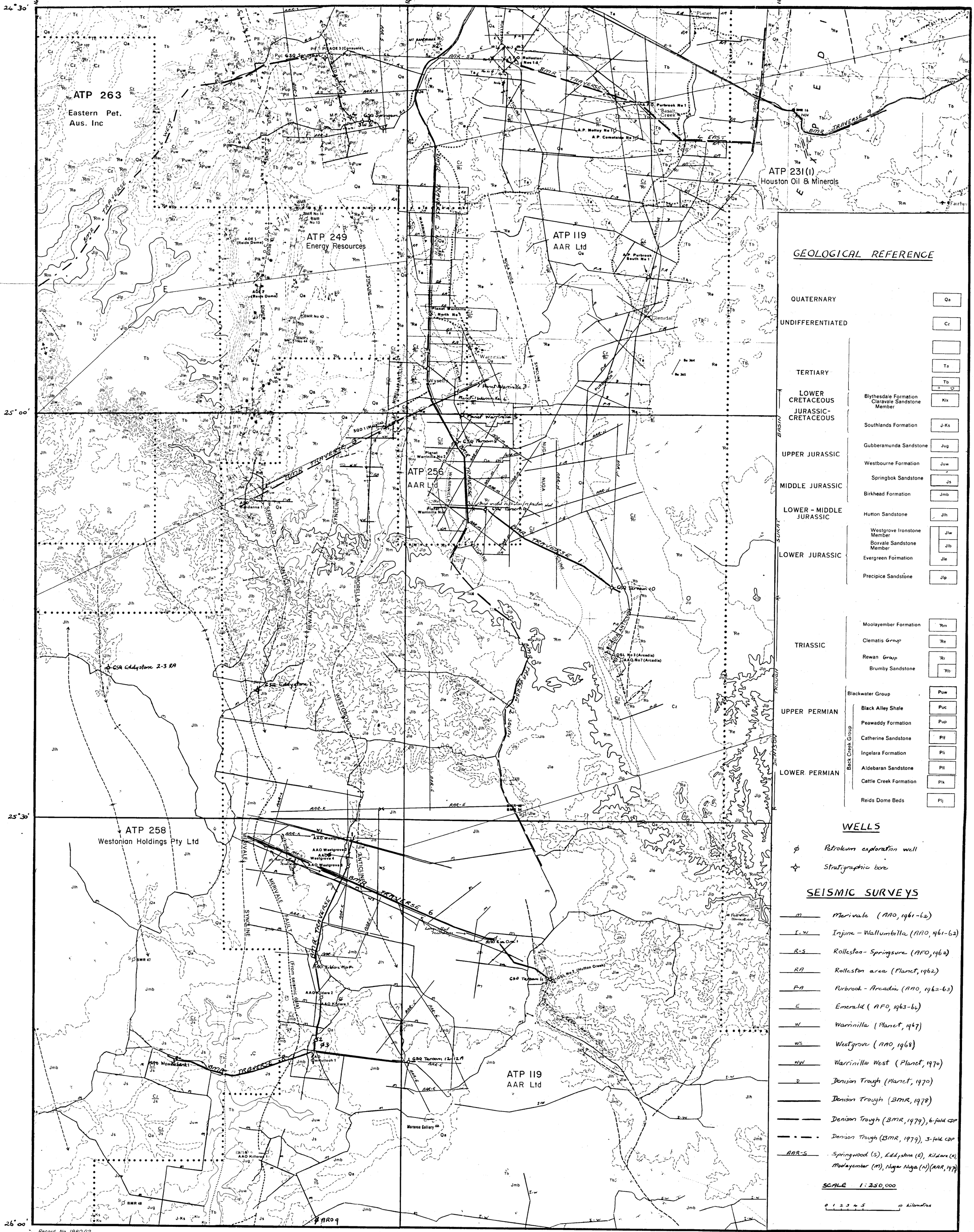
3. Worden W169 (C.F. 0.10085) and La Coste G252 (C.F. 0.10512) were used.

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

Station	Value
6003.0215	978901.98
6003.0221	978892.16
6003.0226	978878.87
6402.1638	978875.58

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 7912.



Record No. 1980/12

C55/B3-162-1

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