BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

1983/29

RECORD

CENTRAL EROMANGA BASIN

REFRACTION SURVEYS

1980, 1981;

OPERATIONS REPORT

by

JO LOCK

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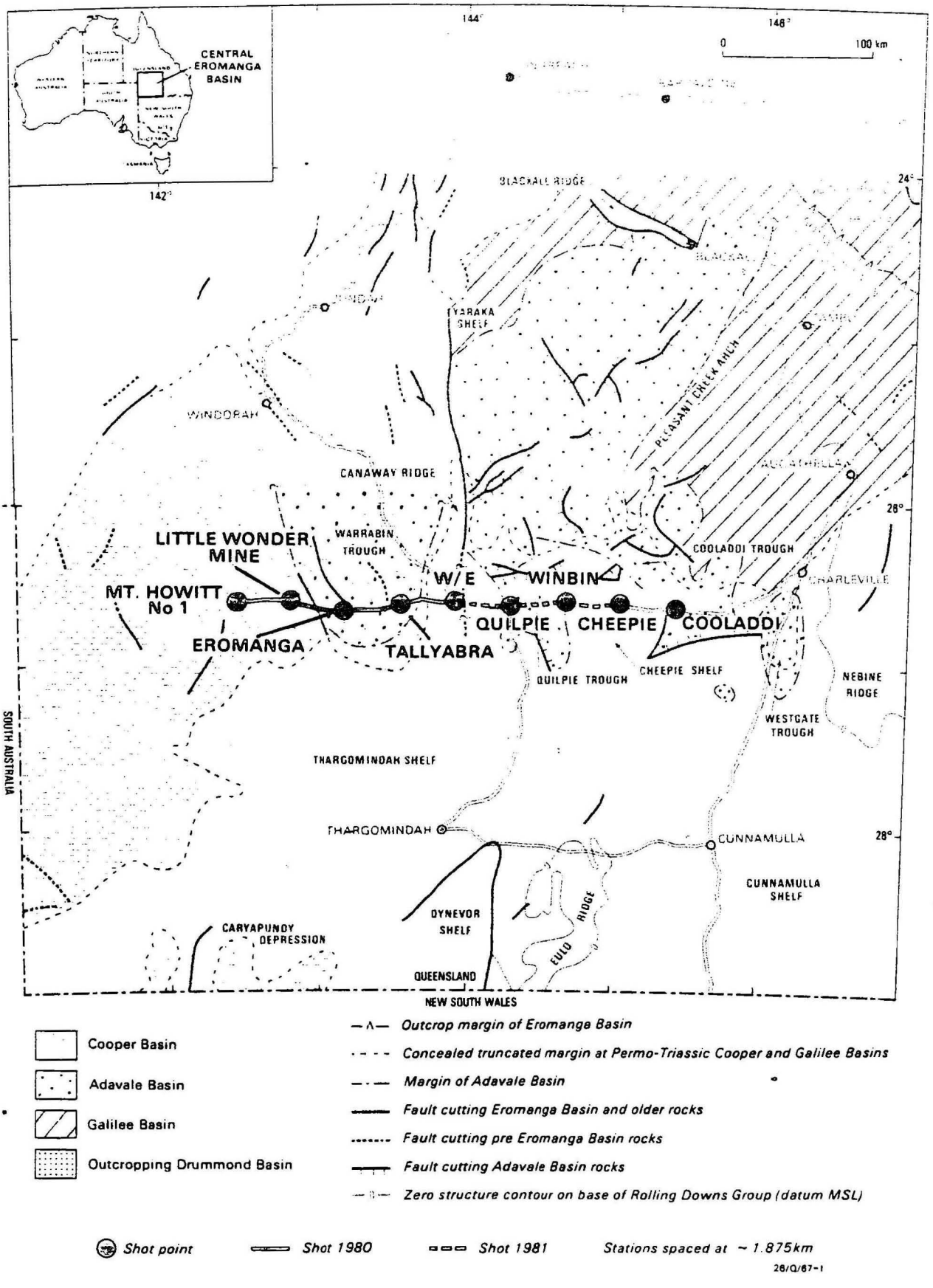

Fig.1 Structural sketch map of the central Eromanga Basin. Shot locations for the short-range seismic refraction lines recorded in 1980 (solid) and 1981 (dashed) are shown

1. INTRODUCTION

In 1980 and 1981 the Regional Geophysical Surveys seismic refraction group took part in a large scale, multidisciplinary, geophysical survey in the central Eromanga Basin region.

The program for the central Eromanga Basin Project and its objectives including previous geological and geophysical investigations are outlined in Harrison and others (1980). The planned geophysical program and objectives are discussed in more detail in Moss (1980) and Pinchin (1980). Wake-Dyster and Pinchin (1981) reported the progress of seismic reflection and gravity field work during the 1980 field season and the 1981 season was reported in Sexton and Taylor (1983).

The central Eromanga Basin was defined by Senior and Habermehl (1980) as bounded by latitudes 24 degrees to 29 degrees south and longitudes 141 degrees to 147 degrees east. It is essentially a conformable sequence of Early Jurassic to late Cretaceous sedimentary rocks, covered by Tertiary and Quarternary sediments except where it crops out in the eroded eastern margin of the basin. It entirely conceals the underlying Devonian to Carboniferous Adavale Basin and the Permian to Triassic Cooper Basin. The geology and structure of the basins is inferred from well data and seismic surveys in the the region. The regional extent of and structural elements within these basins are shown in Figure 1. Eromanga Basin sediments blanket the entire region and are not shown. The stratigraphy of the Adavale, Cooper and Eromanga Basins is listed in Table 1. Moore and Mount (1982) present a comprehensive collection of recent geological and geophysical work in the form of summary papers of the contributions to the Eromanga Basin Symposium, held in Adelaide, November, 1982.

The refraction program has two main thrusts. Short-range refraction recording was designed to provide detailed velocity/depth information within the Cooper and .Adavale Basins and the overlying Eromanga Basin sequence, and in particular define the depth to and the detailed velocity/depth profiles of the basement. Long-range recording was designed to delineate deeper crustal structure down to the mantle. These data, when combined with vertical reflection and gravity data could then be used to interpret geological structure, and rock type, structural relationships between the Quilpie and

Warrabin Troughs, the Canaway Ridge, the Cheepie Shelf and the Cooper and Adavale Basins (Figure 1). This would provide an understanding of the structural and deformational history of the area, the relationship of the structures of the deep crust to basin evolution, and aimed to provide information on the overall tectonic framework of the region.

2. SEISMIC REFRACTION RECORDING EQUIPMENT

Recordings were made on 21 BMR automatic tape recording systems; these systems have been described by Finlayson and Collins (1980). Each system consisted of a seismometer, amplifier, frequency modulator, tape recorder, calibrator, clock and radio receiver, as well as ancillary equipment such as power supplies. Four channels were recorded on tape; the seismic signal at two gain levels, a radio signal from VNG, Lyndhurst, Victoria, and a coded clock signal.

Six systems used Precision Instruments (PI) recorders, recording on half inch tape, and fifteen used modified Akai tape decks recording on quarter inch tape. Each system used a single, short period, vertical Willmore Mark II or Mark III A seismometer set to a free period of 0.75 seconds. The amplifiers were set to 96 dB gain at all recording sites except where noted in Tables 10 and 11; the low-gain channel on all systems was 24 dB below the high-gain, ie 72 dB.

The built-in filters were set to a passband of 0.01-20.0 Hz. Where sets were to be left on-site overnight, systems were programmed to record continuously between 0700 and 1800 hours Eastern Standard Time during the day and remain on stand-by overnight. All recording systems had the same polarity with respect to the direction of ground motion. Power was provided from 12 volt 80 ampere-hour lead-acid marine batteries.

In 1980 Akai set 001 was fitted with a prototype NCE3 clock for field testing. The NCE3 clock differs from the origional NCE1 clock in the following ways. The NCE3 uses CMOS logic and therefore requires far less power. The NCE3 clock/radio comparitor compares the two signals only on the radio second pulse to reduce spurious triggering of the comparitor by radio noise whereas the NCE1 clock compares the two signals continuously. Time and comparator are shown by means of a LED display in the NCE1 clock and by a liquid crystal

display in the NCE3 clocks. The latter saves power and can be easily read in strong sunlight. The power requirements of a set when recording was reduced from 1.65 amps to 790 milliamps when the NCE1 clock was replaced by the NCE3 clock. The NCE3 clock field tested satisfactorily in 1980 and all 21 sets were fitted with this type of clock for the 1981 field season. When the 1980 field tapes were played back, the coded clock signal recorded on three sets were found to be very poor; whether this was due to tape quality, head alignment or a clock problem is not clear. However, it is worth noting that all the 1981 field tapes have good coded clock signals.

In 1981 the AC stepper motors in Akai sets 001, 003 and 015 were replaced by new geared-down DC motors for field testing. These motors further reduced power requirements to 250 milliamps on average. The DC motors performed reliably in the field and gave tape speed control within 10 percent of the required 15/256 inch/second.

Parallax errors occur between the various recorded channels of both the PI and the modified Akai systems. The corrections for the Akai systems (sets 001 to 015) are listed in Table 10 in Collins (1981). These corrections are small and in practice are ignored. Corrections for the PI systems (sets 016 to 021) determined in 1981 are also listed in this table; however these corrections were found to be inappropriate and were redetermined in 1982. The new corrections are listed in Table 2.

3. 1980 FIELD SURVEY

3.1 Survey Design

Pre-survey modelling studies by C.D.N Collins in 1980, using existing refraction data and postulated seismic velocities and depths for deep structure, indicated that all refractors down to and including the basement should be recorded as first arrivals along a traverse of 37.5 km. The basement was expected to have a velocity of about 5.9 km/sec (Bigg-Wither & Morton, 1962; Alliance, 1966; British Petroleum, 1966) and was estimated to be about 5 km deep in most areas. The basement comprises lower Palaeozoic rocks of the Thomson Fold Belt (Kirkegaard, 1974; Rumph, 1978). Deep seismic sounding in the Permo-Triassic Bowen Basin on the eastern margin of the Thomson Fold Belt (Collins, 1978) showed a sub-basement refractor of 6.4 km/s at a depth of

about 6 km. If this refractor existed in the central Eromanga Basin area, arrivals from it would be observed beyond about 30 km and would mask basement arrivals. If it was absent, the basement refractor may be recorded to greater distances and traverses of 75 km would then provide better coverage.

It is convenient to divide the discussion of the recording of the 1980 central Eromanga Basin refraction survey into two parts.

The first phase of refraction recording was along a 150 km east-west traverse from the Windorah/Eromanga (W/E) road junction to Mt Howitt No. 1 well (Figure 1). This line was also covered by deep crustal vertical and, in places wide-angle seismic reflection recording (reflection traverse 1). The traverse crossed the Canaway Ridge, the Warrabin Trough and the eastern part of the Cooper Basin. Short-range refraction recordings were made to determine the structure and velocity/depth profile of the basin sequences and underlying basement.

The 150 km long line was divided into four 37.5 km end-to-end traverses. 200 kg were shots fired at each end to give four short reversed lines along which recordings were made at 21 stations, spaced at 1.875 km intervals. 400 kg off-set shots were fired 37.5 km from the ends of most traverses to give three reversed overlapping traverses of 75 km. Figure 2 shows a diagrammatic representation of this shooting scheme. Each shaded block in Figure 2 represents a 37.5 km long seismic line. The solid lines beneath the blocks indicate that the shots numbered above were recorded along this line. The dotted lines show the location of off-set shots recorded along the line. The location of shots 007-020 and stations 016-096 are shown schematically in Figure 3a. This figure, when used in conjunction with Figure 2, enables the compilation of seismic record sections for each line.

The second phase of the refraction recording was along a 300 km east-west traverse from Cheepie to Terebooka Bore. This traverse crossed the Cheepie Shelf, Quilpie Trough, Canaway Ridge, Warrabin Trough and the eastern Cooper Basin (Figure 4). These long-range seismic refraction recordings were made to determine the deep crustal structure and velocity/depth profile beneath the basins in the central Eromanga Basin area. Arrivals were recorded from refractors throughout the crust down to and including the upper mantle.

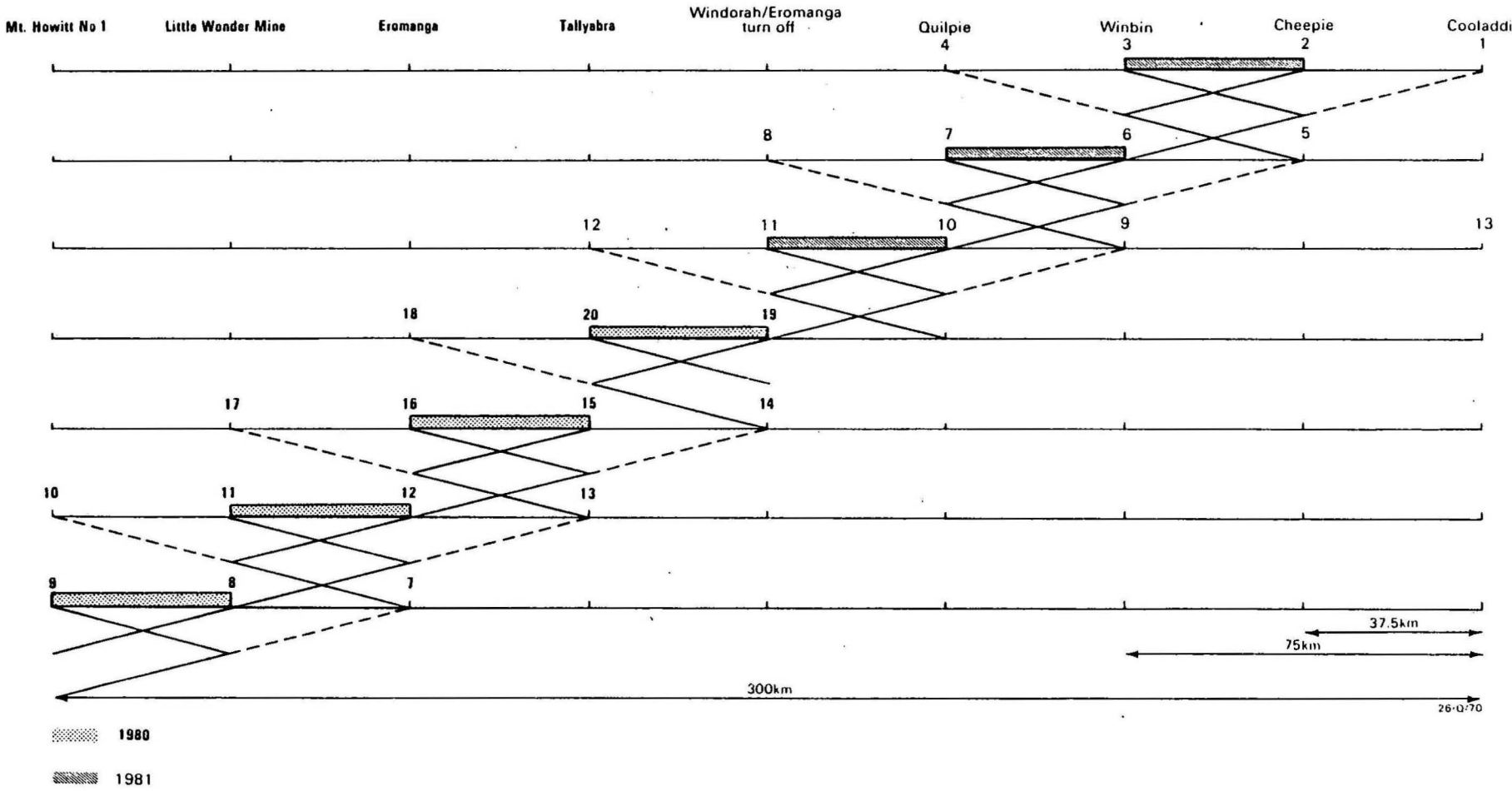

Fig. 2 Schematic representation of the shooting and recording scheme for the long-range E/W seismic refraction lines designed for the 1980 and 1981 central Eromanga field surveys

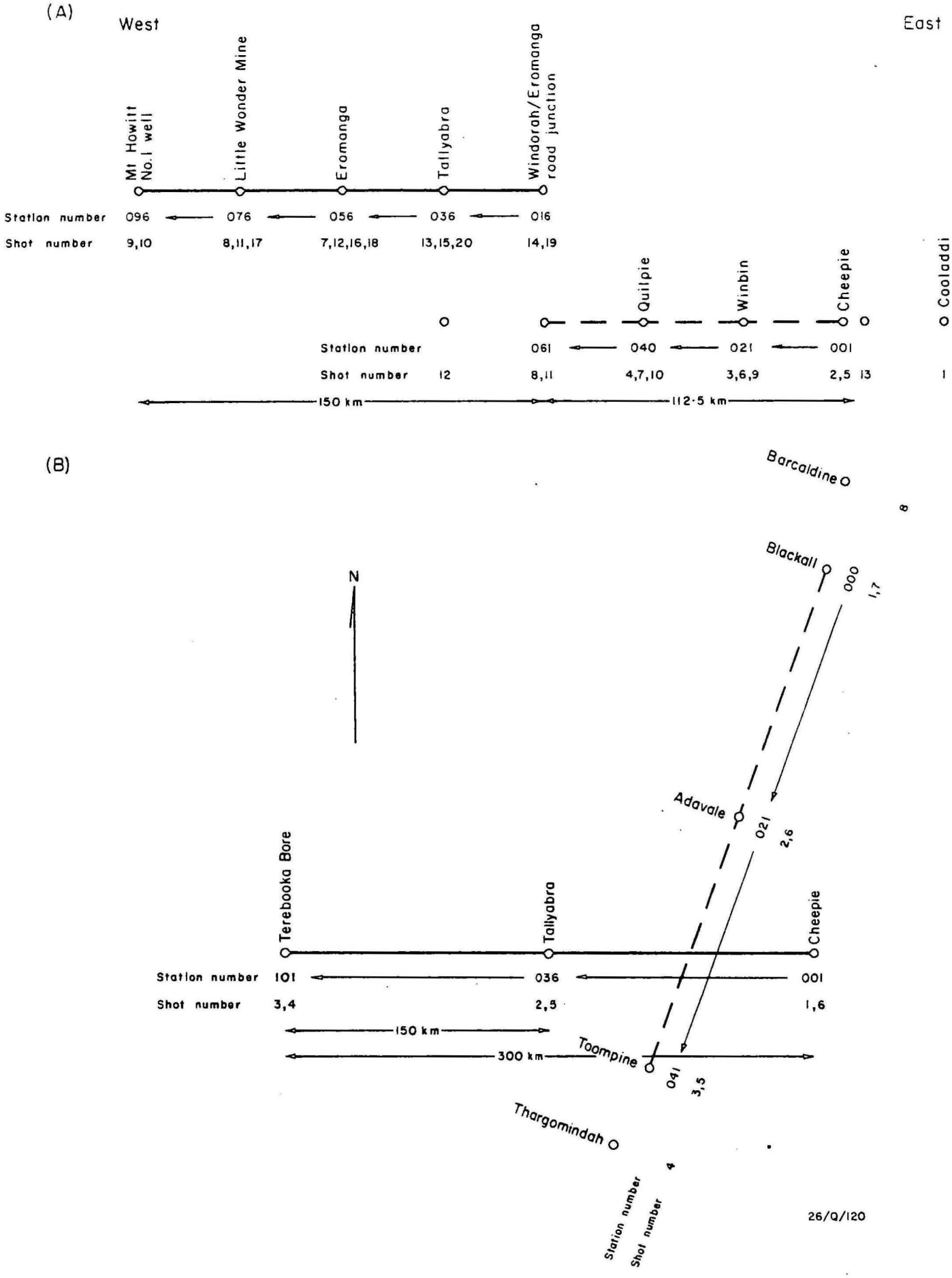

Fig. 3 Sketch map of shot and station locations for (A) short-range, (B) long-range seismic refraction lines central Eromanga Basin. 1980 locations are indicated indicated by a solid line and 1981 locations are indicated by a dashed line

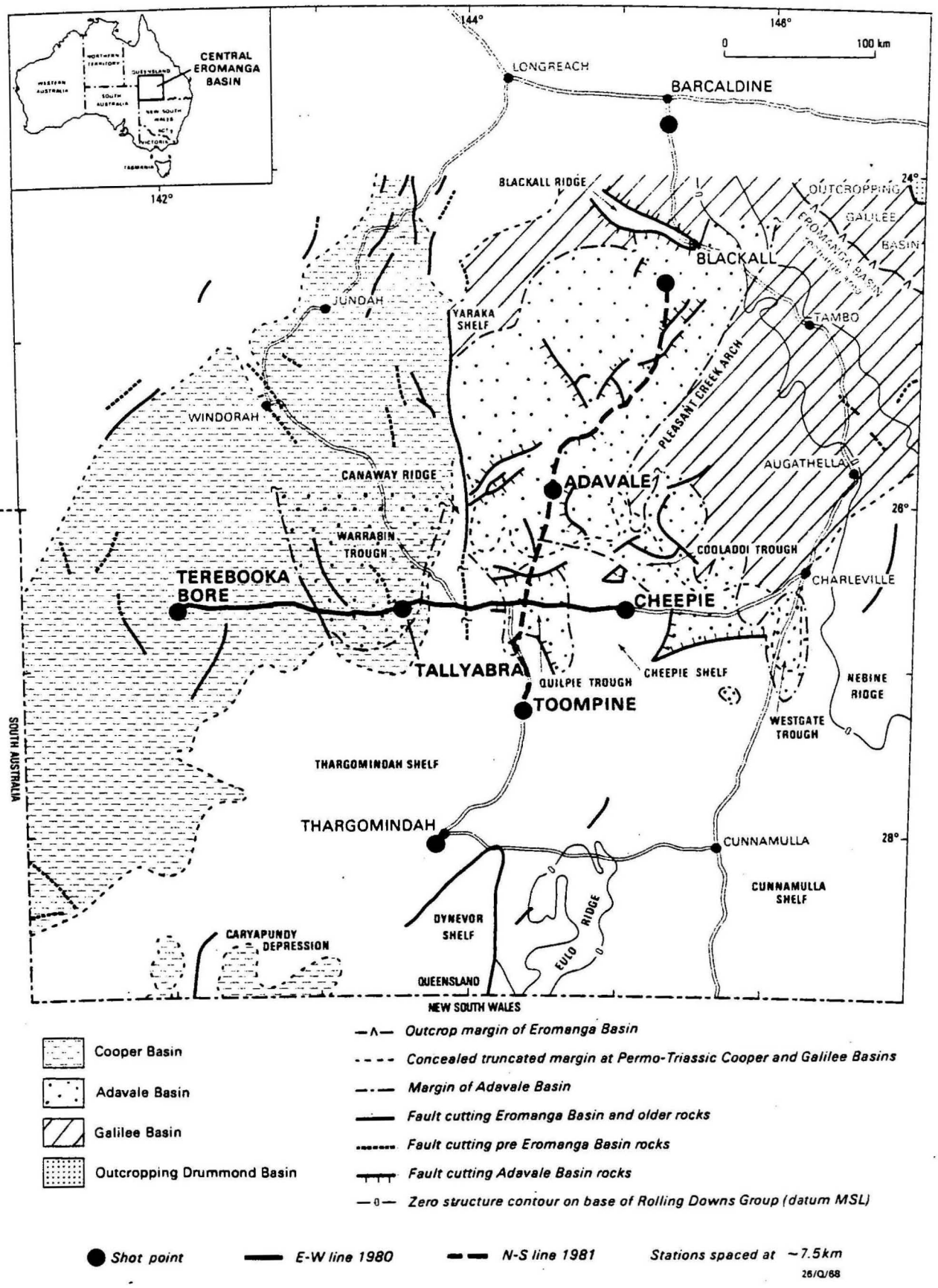

Fig. 4 Structural sketch map of the central Eromanga Basin. Shot locations for the long-range seismic refraction lines recorded in 1980 (solid) and 1981 (dashed) are shown

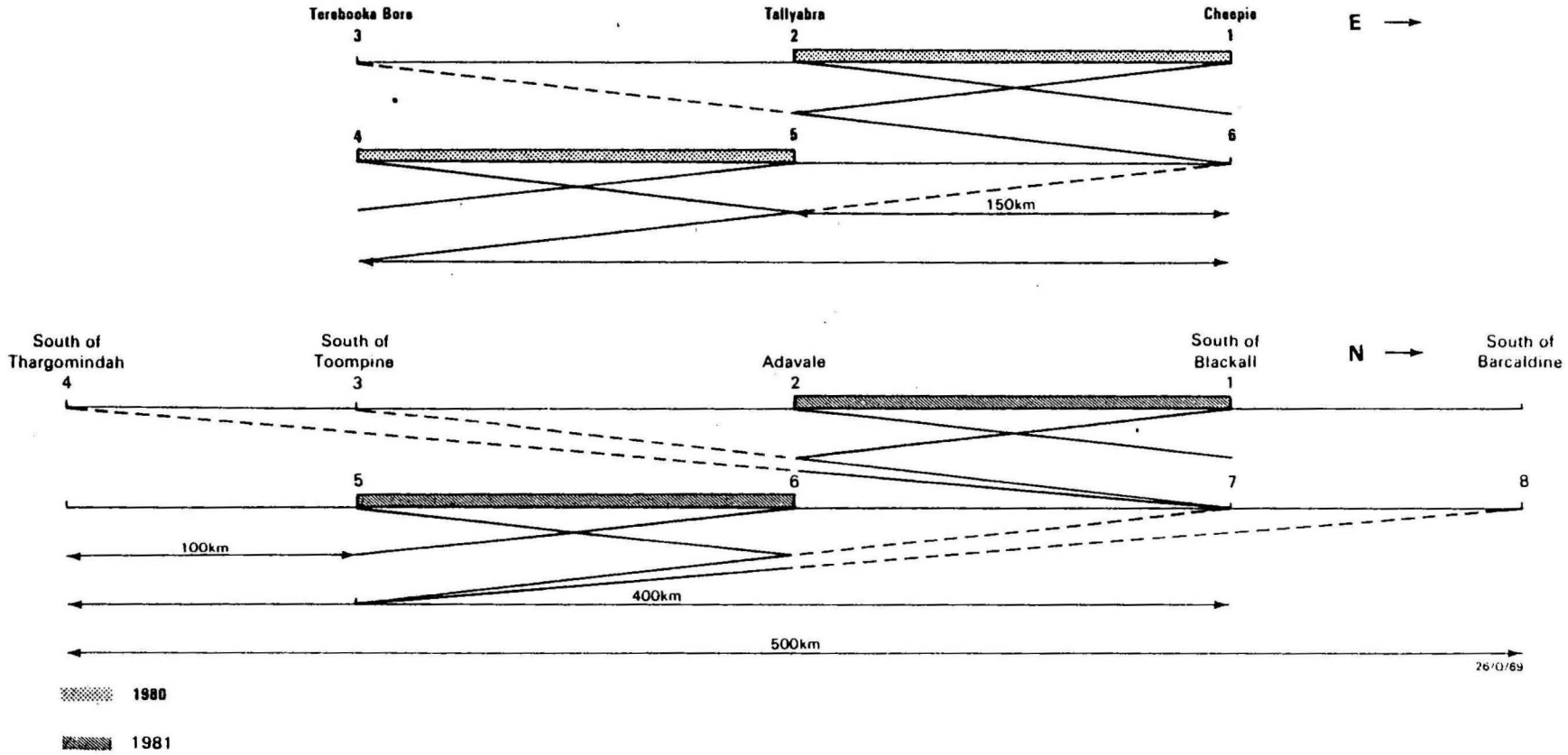

Fig. 5 Schematic representation of the shooting and recording schemes for the long-range E/W and N/S seismic refraction lines designed for the 1980 and 1981 central Eromanga field surveys

The 300 km line was divided into two 150 km end-to-end traverses; 750 kg shots were fired at each end of the 150 km traverses to give two reversed lines along which recordings were made at 21 stations, spaced at 7.5 km intervals. 2500 kg shots, offset 150 km from each end of these traverses, extended the lines to give a reversed 300 km traverse. Figure 5 shows a diagrammatic representation of this shooting scheme. Each shaded block in Figure 5 represents a 150 km long seismic line. The solid and dotted lines have the same meaning as in Figure 2. The location of shots 001-006 and stations 001-101 are shown schematically in Figure 3b. This figure, when used in conjunction with Figure 5, enables the compilation of seismic record sections for each line.

Table 3 lists the shots and stations which can be used to form the reversed record sections for lines shown schematically in Figure 2 and 5 for 1980. Personnel and equipment are listed in Appendix 1.

3.2 Shot Positions

All shots locations (007-020) for the short lines were surveyed by staff of the Australian Survey Office along reflection traverse 1. The reflection survey peg numbers at which shots were to be located were determined before the start of the survey. Shots 002 and 005 for the long refraction line were at the same surveyed location as shots 013, 015 and 020 for the short lines.

Shots 001 and 006 at the eastern and shots 003 and 004 at the western ends of the long-range line were marked on airphotos and then on 1:250,000 scale topographic maps prior to the survey. Actual locations were decided in the field by the reflection party who drilled and loaded the shots when site access and drilling suitability were known.

3.3 Recording Station Positions

The short-range refraction lines were planned along reflection traverse 1. Reflection traverse 1 was routed partly along or close to the Quilpie-Eromanga road from the Windorah/Eromanga road junction to Eromanga township. West of Eromanga the traverse was bulldozed to Mt Howitt No. 1 well (Figure 1). Reflection geophone locations were surveyed and pegged by the staff of the Australian Survey Office. Stations 016 to 096 were located either at a peg or

midway between two adjacent pegs. Reflection geophones were spaced at 83.3 m intervals and refraction stations were planned at intervals encompassing 22.5 pegs (83.3 x 22.5 = 1.875 km). The peg numbers at which stations would be located were determined before the start of the survey. Stations midway between two pegs were indicated by adding 0.5 to the more westerly peg number of the adjacent pair. Station data are listed in Table 4.

Stations 001 to 101 were to be occupied for the long range refraction line. Stations 001 to 015 were marked at approximately 7.5 km intervals from Quilpie to the Windorah/Eromanga road junction along the Charleville-Quilpie -Eromanga road on airphotos at positions determined from a 1:250,000 scale topographic map. From the Windorah/Eromanga road junction to Mt Howitt No. 1 every 5th refraction survey station from 016 to 096 was reoccupied. Stations 097 to 101 from Mt Howitt No. 1 well to Terebooka Bore were marked on airphotos at approximately 7.5 km intervals transferred to 1:250,000 scale topographic map.

The recording station data are listed in Table 5.

3.4 Shot Patterns

Shot statistics are listed in Tables 6 and 7. Twenty shots were fired, 8 of 200 kg; 6 of 400 kg, 4 of 750 kg and 2 of 2500 kg, giving a total of 12 tonne. A break down of explosives used is listed in Table 8.

Explosives were loaded into drill holes 40 m deep with 100 kg per hole. The explosive used was ICI Anzite Blue. Shot patterns were square with 10 m separation between holes. Large shots were located at least 500 m away from roads to prevent damage to the road surface or to culverts. Due to difficult drilling conditions the shots at Terebooka Bore were loaded into drill holes 60 to 80 m deep, with 200 kg of explosives per hole. Difficulty in drilling was experienced where sites were located on silcrete outcrop or silcrete layers occured at shallow depths. Most holes bottomed below the water table.

3.5 Shot Firing and Timing

Two chart recorders were used for shot-timing at shot sites. Each recorder consisted of a 2 Hz SIE geophone, the signal from which was amplified

by a TAM 5 amplifier and recorded on a Hellige Helcoscript chart recorder; VNG radio time signals were recorded on the event channel so that the first break for each shot could be accurately timed.

A few 400 kg shots were fired electrically from a shooting truck under radio control from the reflection recording truck. These shots were used to record wide-angle reflections as well as refraction data. Some refraction shots were fired using 12 volt heavy-duty marine batteries. When only 200 kg of a 400 kg charge at the Windorah/Eromanga road junction detonated this practice was discontinued. All remaining shots were fired electrically with high voltage blasters.

Only one hole of the shot pattern at Terebooka Bore blew out and all shots were apparently seismically efficient.

3.6 Recording Station Sites

Sites 001-015 were flagged at approximately 7.5 km intervals at positions which could be reliably identified on aerial photographs. Stations sited along the reflection traverse were located using the survey peg numbers. Sites 097 to 101 were more difficult to locate as the terrain in this area is flat, largely treeless with occasional sand dunes and extensive clay pans. Sites were chosen that could be identified on aerial photographs or located by bearings taken from identifiable features. In the field, these station locations were marked on aerial photographs taken from 7620 m (25,000 ft), then later transferred to 1:100,000 scale orthophoto maps from which latitude and longitude were scaled.

This region generally has low relief and little rock outcrop. Consequently seismometers were usually three quarters buried in material ranging from soil through to sand and well tamped. The seismometer cable was buried to reduce the liklehood of damage by animals. The recording equipment and batteries were wrapped in black plastic for weather-proofing and protected by an aluminium coated "space blanket" as a shield from the sun to reduce the day-time temperatures within the recorders. Wherever possible, recording sites not on bulldozed sections of the line were located off the road, concealed by terrain or vegetation, to minimise traffic noise and avoid vandalism.

A list of station numbers, corresponding reflection peg numbers, station latitude and longitude, recording times and recorder gain are given in Tables 4 and 5. The start and stop times of recording at each station could be useful if, for instance, recordings of earthquakes occurring during this survey are required. Comments give any operational problems encountered.

It is possible for one person to deploy and pick up seven recording systems along a short line in one day but it is difficult to maintain this pace over a period of time. Two days to shoot a short line is a more realistic time allowance. There were few equipment failures and wind delayed shooting until late afternoon on only one day. It was not necessary to recharge batteries on this survey.

3.7 Comments

Some difficulty was experienced with radio communications during the middle part of the day owing to interference. When the party was spread out over the entire 300 km of line, radio communication on EMR reserved frequency 6815 kilohertz was only possible in the early morning and late afternoon.

All seismic tape recordings have been played back on an analogue Siemens Oscillomink chart recorder and the data digitised on the EMR playback system (Liu and Seers,1982). First arrival times have been read and corrected. Travel time plots of first arrival times have been made and record sections of all lines compiled. The data have been checked for errors and corrected. Latitudes and longitudes for all unsurveyed stations have been scaled off 1:100,000 scale orthophoto maps and plotted by computer at the same scale to check for errors in location. Shot-station distances and azimuths have been calculated. Velocity/depth modelling for both the short-range and the long-range refraction lines have been completed. During interpretation it was found that low-gain records, while often having low initial onsets for first arrivals especially towards the ends of the lines, clearly showed important second arrivals. Consequently further digitising was carried out so that record sections at low gain could be constructed for all lines to assist in interpretation.

Minor problems occurred with some recording equipment in 1980 and caused the loss of 6 out of 420 records. Two records were lost from set 004 when it was located at Terebooka Bore. The recorder ceased correct operation after a 750 kg shot was fired there. Three records were lost from set 005 when the clock ceased operating and no time signal was recorded on the tape. One record only was lost from set 010 when it stopped because of a power failure. A further 10 records could not be digitised as the time codes were too poor to allow even a manual start to digitising. These were two records from set 008 and four from each of sets 016 and 019. Some records had insufficient signal to read initial onset times for example when shot 014 of 400 kg at the Windorah/Eromanga road junction was fired and only 200 kg detonated.

4. 1981 FIELD SURVEY

4.1 Survey Design

The refraction program was designed to extend the 1980 survey by continuing short-range refraction recording from the Windorah/Eromanga road junction east to Cheepie (Figure 1), so that most (262.5 km) of the 300 km 1980, long-range refraction line was covered. Also, a north-south long-range refraction line intersecting the 1980-81 east-west line about 10 km east of Quilpie, was recorded (Figure 4). It is again convenient to consider the recording in two parts.

The first phase of refraction recording, along 112.5 km of east-west traverse from east of Cheepie to the Windorah/Eromanga road junction, was covered by deep vertical reflection recording to 20 seconds. This traverse crosses the Cheepie Shelf, the Quilpie Trough and the Canaway Ridge, and coincides with reflection traverse 9 and the adjoining eastern extension of 1980 traverse 1. Short-range refraction recordings were made with the same aims as in 1980.

Three end-to-end 37.5 km traverses (totalling 112.5 km) were reversed by 200 kg shots at each end. Recording was at 21 stations spaced at 1.875 km intervals. 400 kg off-set shots were fired 37.5 km from each end of these lines, giving two reversed overlapping traverses each of 75 km, and linking the 1980 and 1981 surveys. Figure 2 shows a diagrammatic representation of this recording scheme. The locations of shots 001-013 and stations 001-061

are shown schematically in Figure 3a. This figure used in conjunction with Figure 2 enables the compilation of seismic record sections for each line.

The second phase of refraction recording was along a 300 km north-south line from 35 km south of Blackall to Toompine. This traverse crossed the thick sequences of Adavale Basin at or close to the axis of the basin, the Quilpie Trough and the Thargomindah Shelf (Figure 4).

Since amplitudes of the first arrivals were low towards the end of each line recorded in 1980, it was decided to increase shot sizes from 750 kg to 900 kg and from 2500 kg to 3000 kg. Station spacing of 7.5 km was retained and the same shooting scheme as in 1980 was followed. Two end-to-end 150 km traverses were reversed by 900 kg shots at each end. 3,000 kg shots off-set 150 km from each end of these traverses, extended the lines to give a reversed 300 km traverse. Two off-end shots of 3,400 kg each were fired at Thargomindah and south of Barcaldine, extending the maximum recording distance to 400 km without additional station shifts. Figure 5 shows a diagrammatic representation of this recording scheme. The locations of shots 001-008 and statipns 001-041 are shown schematically in Figure 3b. This figure used in conjunction with Figure 5 enables the compilation of seismic record sections for each line.

Table 9 lists the shots and stations which can be used to form reversed record sections for lines shown schematically in Figures 2 and 5 for 1981. Personnel and equipment are listed in Appendix 2.

4.2 Shot Positions

Shots 002-012 for the short-range lines were positioned at locations surveyed by the staff of the Australian Survey Office between Windorah/Eromanga road junction and Cheepie. The reflection peg numbers at which these shots were to be located were chosen prior to the start of the survey.

The location of shot 001, west of Cooladdi (Figure 1), was marked on 1:250,000 scale geological and 1:100,000 scale orthophoto maps, as were the locations of shots 001-008 for the long-range north-south line. These shots

were relocated where necessary because of silcrete outcrop or difficulty of access.

4.3 Recording Station Positions

The short-range refraction lines were recorded between the Windorah/Eromanga road junction and Cheepie, coincident with the eastern extension of reflection traverse 1 and adjoining traverse 9. Reflection traverse 9 was routed along the Charleville-Quilpie road from Cheepie to Coolbinga railway siding (between Quilpie and Winbin, Figure 1). The traverse was bulldozed to the west terminating at the Windorah/Eromanga road junction. Reflection traverse 9 joined the eastern extension of 1980 traverse 1, south of Quilpie. Reflection geophone locations were surveyed and pegged by the staff of the Australian Survey Office. Stations 001-061 were located along this east-west line using the same scheme as in 1980. Station data are listed in Table 10.

Stations 001-041 (Figure 4) were occupied for the long-range, north-south refraction line. Stations were spaced at approximately 7.5 km intervals. Where possible the sites were located at prominent features seen on the 1:250,000 scale geological and 1:100,000 scale orthophoto maps, such as fence crossings, road junctions and creek crossings. Stations 001-021 were positioned from 35 km south of Blackall to Adavale along the Blackall-Adavale road.

Seismic reflection traverse 10 was located along the almost straight Adavale/Quilpie road, with a short straight bulldozed extension to Adavale in the north and a longer straight bulldozed extension to the south almost through to the Quilpie-Toompine-Thargomindah road (Figure 4). It was not planned to survey this line until late in the reflection field program for 1981. Accordingly sites 022-035 were sited along the traverse at prominent features on maps. Stations 036-041 were sited along the Quilpie-Toompine -Thargomindah road to Toompine (Figure 4).

Station data are listed in Table 11.

4.4 Shot Patterns

Two geophysicists (C.D.N. Collins and J. Lock) went to central Eromanga Basin two weeks in advance of the remainder of the refraction field party

and visited each unsurveyed shot site prior to the commencement of the drilling. Shot locations were flagged for the drillers, marked on aerial photographs, and 1:100,000 scale orthophoto maps for later scaling of latitude and longitude.

Shot statistics are listed in Tables 12 and 13. Twenty one shots were fired; 6 of 200 kg, 7 of 400 kg, 4 of 900 kg, 2 of 3000 kg, and 2 of 3400 kg, giving a total of 20.4 tonne. Explosives used are listed in Table 14.

During reflection shot-hole drilling almost continuous surface and/or subsurface silcrete was found to occur along the east-line from Cheepie to the Windorah/Eromanga road junction. This made drilling extremely difficult and slow, so in order to speed up drilling, it was decided that the holes would be drilled in a rectangular pattern, 15 m apart to 60-80 m and loaded with 200 kg of explosives per hole.

4.5 Shot Firing and Timing

Four high-voltage portable blasters were used to fire all shots. Shot 011 (200 kg) at the Windorah/Eromanga road junction detonated in two 100 kg blasts approximately 9 seconds apart. The reason for this is unknown. Two 200 kg shots in the east-west line fractured the ground some distance from the shot site and blew out steam and dust. The 3,400 kg shot at Thargomindah, which was loaded through three layers of silcrete into wet rock, blew out in three holes. The method of shot timing was the same as that used in 1981.

The initial site selected for shots 001 and 007, south of Blackall, was found to be unsuitable because of unconsolidated sand and river gravel. A new site was chosen about 7 km north of the original site. Instead of re-siting stations 001-021, it was decided to build a manually operated recording station from spares. This system was used to time 007 and was used as a recording station 000 for shot 002 at Adavale, shot 003 at Toompine, and shot 004 at Thargomindah. Good quality chart records were obtained.

4.6 Recording Sites

Stations sited along the surveyed reflection traverses 1 and 9 were

located, flagged and seismometer holes were dug prior to the start of refraction recording. South of Quilpie the traverse crossed the channels of the Bulloo River and earth bridges had been bulldozed across the larger channels to allow the reflection party access to the line. Heavy overnight rain washed out one of these bridges, isolating the planned location of station 042 at peg 3227.5, so the station was re-sited at peg 3216, 958 m to the west of the original location.

Prior to the start of recording the positions marked on the orthophoto maps for stations 001-023 and 036-041 on the north-south line were identified in the field, flagged and seismometer holes were dug.

The 1981 winter in this area was unusually wet, so at the start of the field season there was no access to the seismic reflection lines planned in the western part of the region. Consequently reflection traverse 10 along the Adavale-Quilpie road and its southern bulldozed extension were surveyed and continuous seismic reflection shot. Stations 024-034 were therefore sited at survey pegs close to the originally planned locations. As the bulldozed line did not go as far south as originally intended because of water flowing in the channels of the Bulloo River, station 035 was shifted to the south-west onto the Quilpie-Thargomindah road.

Recording stations were set up in the same manner as in 1980. Lists of station numbers, corresponding reflection survey peg numbers, station latitude and longitude, recording times and recorder gain are given in Tables 10 and 11. Comments note any operational problems encountered.

4.7 Comments

More equipment failures occurred in 1981 than in the previous year, and one day was spent on repairs to vechicles and recording equipment. Other smaller repairs were necessary to both vehicles and equipment throughout the survey.

Tests of radio communication equipment were made in the field over both long and short distances at various times of the day, and it was found that on BMR frequency 4630 kilohertz it was possible to achieve readable radio communications at all times.

A number of delays in the shooting schedule were caused by bad weather. Heavy rain made the bulldozed line impassible for one day. Three consecutive days of high wind delayed the shooting of the shot 008 (near Barcaldine). rain began falling as the sets were being put out on the northern half of the Blackall-Toompine line so all stations were weather-proofed. The Adavale-Blackall road is black soil from north of Adavale to 30 km south of Blackall where the single-track sealed road ends. Heavy rain for two nights and the intervening day made the black soil section of the road impassable. One further day was allowed for the road to dry out. As the sets had not been left on program, batteries and quarter-inch tapes on the Akai sets were replaced before firing the last two shots, 003 at Toompine and 004 at Thargomindah.

All records have been played back on a Seimens Oscillomink chart recorder and analogue field tapes digitised at the BMR. First arrival times have been read and time corrected. Latitudes and longitudes for all unsurveyed shots and stations have been scaled off on 1:100,000 scale orthophoto-maps and plotted by computer at the same scale to check for errors in location. Shot-station distances and azumiths have been calculated for all stations. Travel-time plots of first arrival times for the three reversed 37.5 km lines and the two reversed 75 km lines have been made. Checking of anomalous first arrival times has been carried out and record sections for these lines have been compiled. Velocity/depth modelling and interpretation of these data is nearing completion.

Recording equipment problems caused the loss of 17 out of 441 records. Most of the problems experienced were with the PI systems. Obstruction of the take-up spool resulted in the loss of four records from set 018 and two records from set 019. Two records were lost from set 017 when the set would not start up because of a dirty motor drive contact. Nine records were lost from set 019 due to the motor drive losing speed control. Set 017 was inadvertently set to 72 dB on high gain and five records had insufficient amplitudes to read first arrival times. Shot 011 of 200 kg at the Windorah/ Eromanga road junction fired as two 100 kg shots approximately 9 seconds apart and was recorded with insufficient amplitude to read first arrival times over much of the 37.5 km line. On sets 009, 011 and 016 some records were obscured by high amplitude noise which could have been system generated. Two events on each of sets 007, 015 and 018 could not be found at the expected arrival time.

5. CENTRAL EROMANGA BASIN DIGITAL DATA FILE MANAGEMENT

All central Eromanga digital files are catalogued on the in-house HP 2100 computer system under security code 383 on cartridge 380. Each file name consists of a leading alphabetic character, which varies according to the seismic line and recorder gain, followed by a two-digit shot number then a three digit station number. The alphabetic scheme used to distinguish seismic lines and different recorder gains is shown in Appendix 3. The same shot and station were used several times in the course of these surveys. Shots 001 to 020 and stations 001 to 101 were used in 1980. Shots 001 to 012 and stations 001 to 061 were used on the east/west line from Windorah/Eromanga road junction to Cheepie in 1981. Shots 001 to 008 and stations 001 to 041 were used on the north/south line from Blackall to Toompine in 1981. The leading alphabetical character of the digital file name therefore distinguishes between files with the same shot and station number but a different location.

EROMAN:383:380 is a central Eromanga Basin Management file. It contains a catalogue of files used in the compilation of various types of central Eromanga Basin Data. For each seismic line it lists the shot numbers for that line, the names of files which will produce a listing of digital file headers, a plot of observed first arrival times versus distance, and given a velocity/depth model will plot it and theoretical travel times calculated assuming flat layers, a record section on the Gould or Calcomp plotter. This file will be periodically updated to include any other appropriate files as work proceeds. The current contents of EROMAN and two copies of central Eromanga Basin digital data files have been archived onto magnetic tape. These are standard HP archive and retrevial tapes (1982/83 type) which are 9-track, 600-BPI, phase encoded using 512-word records and 16-bit words. The 1980 and 1981 short-range data have been archived onto tapes numbered HP950, HP951, HP875 and HP465, respectively. The 1980 and 1981 long-range data has been archived on tapes HP693 and HP948.

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APPENDIX 1. BMR personnel, vehicles and equipment for 1980 field work.

Total field work period for 1980 was from 14/8/80 to 15/9/81 inclusive.

PERSONNEL

Party Leader	D.M. Finlayson
Geophysicist	C.D.N. Collins
Geophysicist	J. Lock
Technical Officer	C. Rochford
Field Hand	A. Toohey

VECHICLES

3 D1310 30 cwt International trucks

1 short wheel base Landrover

EQUIPMENT/TRUCK

1 Codan VHF transceiver

7 seismic recording systems

7 seismometers plus 1 spare

24 80 amp hour batteries plus 2 spares

equipment and vehicle spares

camping equipment

OTHER EQUIPMENT

2 sets shot timing gear

1 high voltage blaster

APPENDIX 2. BMR personnel, vehicles and equipment for 1981 field work.

Total field work period for 1981 was from 15/10/81 to 30/11/81 inclusive.

PERSONNEL

Party Leader	C.D.N. Collins	15/10/81 - 30/11/81
Geophysicist	J. Lock	15/10/81 - 30/11/81
Senior Technical Officer	J.W. Williams	2/11/81 - 30/11/81
Technical Officer	J.W. Whatman	2/11/81 - 30/11/81
Field Hand	D. Ford	2/11/81 - 30/11/81

VEHICLES

2 D1310 30 cwt International trucks

1 K20,4x4 30 cwt Chevrolet truck

1 long wheel base Landrover

EQUIPMENT/TRUCK

1 Codan VHF transceiver

7 seismic recording systems

7 seismometers plus 1 spare

24 80 amp hour batteries plus 2 spares

equipment and vehicle spares

camping equipment

OTHER EQUIPMENT

2 sets of shot timing gear

4 high voltage blasters

2 100 m lengths twinflex on back pack reels

APPENDIX 3. Central Eromanga digital file naming scheme.

Leading Alphabetic Character of Digital Files

Date	Short Line Data		Long Line Data	
	HI gain	LO gain	HI gain	LO gain
1980	*E	F	E	E/F
1981	*Q		*A	A/B

*E - Eromanga

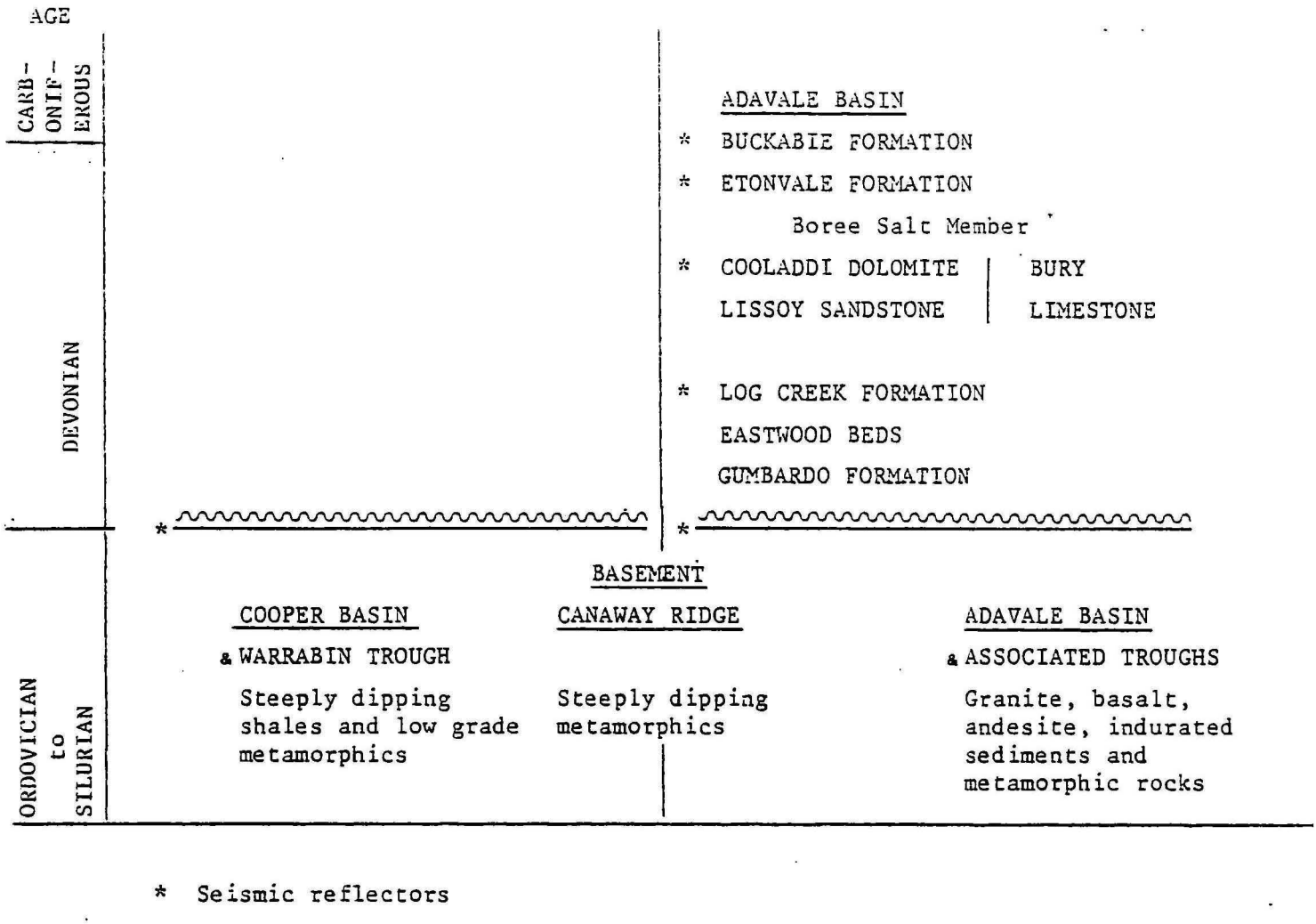
*Q - Quilpie

*A - Adavale

Leading alphabetical character is followed by a two digit shot number and a three digit station number to give each digital file a unique name.

TABLE 1. CENTRAL EROMANGA BASIN STRATIGRAPHY

AGE	WEST EROMANGA BASIN	CANAWAY FAULT	EAST EROMANGA BASIN
CRETACEOUS	ROLLING DOWNS GROUP		ROLLING DOWNS GROUP
	* WINTON FORMATION		* WINTON FORMATION
	MACKUNDA FORMATION		MACKUNDA FORMATION
	ALLARU MUDSTONE		ALLARU MUDSTONE
	* TOOLEBUC FORMATION		* TOOLEBUC FORMATION
	WALLUMBILLA FORMATION		WALLUMBILLA FORMATION
	Coreena Member		Coreena Member
	Doncaster Member		Doncaster Member
	TRANSITION B		CADNA-OWIE FORMATION
			* Wyandra Sandstone Member
	MOOGA FORMATION		
	Murta Member		
	Namur Member		HOORAY SANDSTONE
JURASSIC	INJUNE CREEK GROUP		INJUNE CREEK GROUP
	WESTBOURNE FORMATION		WESTBOURNE FORMATION
	ADORI SANDSTONE		ADORI SANDSTONE
	BIRKHEAD FORMATION		BIRKHEAD FORMATION
	* HUTTON SANDSTONE		* HUTTON SANDSTONE
	"BASAL JURASSIC"		EVERGREEN FORMATION
			Boxvale Sandstone Member
			PRECIPICE SANDSTONE
Lower to Middle TRIASSIC	COOPER BASIN		
	* NAPPAMERRI FORMATION		
PERMIAN	GIDGEALPA GROUP		
	* TOOLACHEE FORMATION		
	EPSILON FORMATION		
	MURTEREE FORMATION		
	PATCHAWARRA FORMATION		
CARBON-IFEROUS	MERRIMELIA FORMATION		



* Seismic reflectors

TABLE 2. Head Parallex Errors, Recording Systems 016-021, 1982.

Set	Correction when Radio is the Reference Signal		Correction when Clock is the Reference Signal	
	Low gain	High gain	Low gain	High gain
016	-0.10	+0.26	-0.38	-0.02
017	-0.10	-0.36	+0.24	-0.02
018	-0.09	-0.12	0.00	-0.02
019	0.00	-0.09	+0.08	0.00
020	-0.02	-0.10	+0.07	-0.01
021	-0.01	-0.01	+0.07	-0.02

TABLE 3. Shot and station numbers for the reversed refraction lines shot in the central Eromanga Basin in 1980.

Length of Line Km	Station Spacing Km	Size of shot tonne	Station Numbers	Forward Line	Shot Number	Reversed Line	Shot Number
37.5	1.875	0.2	16-36	Windorah/Eromanga turn-off to 'Tallyabra'	19	'Tallyabra' to Windorah/ Eromanga turn-off	20
			36-76	'Tallyabra' to Eromanga	15	Eromanga to 'Tallyabra'	16
			56-76	Eromanga to Little Wonder Mine	12	Little Wonder Mine to Eromanga	11
			76-96	Little Wonder Mine to Mt Howitt No 1 well	8	Mt Howitt No 1 well to Little Wonder Mine	9
75.0	1.875	0.2, 0.4	16-56	Windorah/Eromanga turn-off to Eromanga	19,14	Eromanga to Windorah/Eromanga turn-off	16,18
			36-76	'Tallyabra' to Little Wonder Mine	15,13	Little Wonder Mine to 'Tallyabra'	11,17
			56-96	Eromanga to Mt Howitt No.1 well	12,7	Mt Howitt No 1 well to Eromanga	9,10
150.0	7.5	0.75	1-36*	Cheepie to 'Tallyabra'	1	'Tallyabra' to Cheepie	2
			36-101*	'Tallyabra' to Terebooka Bore	4	Terebooka Bore to 'Tallyabra'	5
300.0	7.5	0.75, 2.5	1-101*	Cheepie to Terebooka Bore	1,6	Terebooka Bore to Cheepie	4,3

* Every 5th station from 16-96 was reoccupied.

TABLE 4

CENTRAL EROMANGA BASIN 1980, station numbers, tape and recorder numbers, reflection survey peg numbers, station locations and recording period at each station for the E/W line from Windorah/Eromanga turn-off to Mt Howitt No. 1 well. The following formats have been used:

Latitudes are given in degrees and minutes south;

Longitudes are given in degrees and minutes east:

Recording periods are given in days, hours, and minutes, the days being numbered sequentially from 27, 27th August to 33, 2nd September in some cases, and 27, 27th August to 02, 2nd September in most cases;

Times are Eastern Standard Time;

Amplifier gain is in decibels.

Station Number	Tape and Recorder Number	Reflection Survey Peg Number		Latitude deg.	Latitude min.	Longitude deg.	Longitude min.	Recording Period on d.	on h.	on m.	off d.	off h.	off m.	Amplifier gain in dB	
016	010	2800	R	26	36.75	143	55.15	27	08	53	27	17	41	96	
017	006	2777.5		26	36.82	143	54.01	27	09	30	27	17	55	96	
018	007	2755	Y	26	36.90	143	52.89	27	09	55	27	18	04	96	
019	011	2732.5		26	36.75	143	51.78	27	10	21	27	18	15	96	
020	019	2710	Y	26	36.51	143	50.68	27	10	50	27	18	30	96	
021	009	2687.5		26	36.41	143	49.57	27	11	30	28	10	32	96	
022	021	2665	Y	26	36.55	143	48.45	27	12	01	28	10	51	96	
023	014	2642.5		26	36.66	143	47.33	27	09	26	27	18	57	96	
024	015	2620	R	26	36.56	143	46.21	27	15	20	27	18	35	96	
025	001	2597.5		26	36.45	143	45.09	27	11	00	27	18	16	96	
026	020	2575	Y	26	36.28	143	43.98	27	11	35	27	17	57	96	
027	018	2552.5		26	35.99	143	42.90	27	12	25	27	17	39	96	
028	002	2530	Y	26	35.96	143	41.77	27	13	00	28	11	15	96	
029	003	2507.5		26	35.93	143	40.64	27	13	35	28	06	16	96	tape drive stopped when set picked up - flat battery
030	013	2485	Y	26	35.96	143	39.52	27	13	07	27	19	05	96	
031	005	2462.5		26	36.17	143	38.41	27	12	38	27	18	51	96	
032	017	2440	R	26	36.53	143	37.36	27	12	09	27	18	34	96	Tape drive stopped when set picked up - flat battery
033	016	2417.5		26	36.92	143	36.32	27	11	28	27	18	18	96	
034	012	2395	Y	26	37.31	143	35.28	27	10	42	27	18	05	96	
035	004	2372.5		26	37.62	143	34.20	27	10	04	27	17	52	96	

Station Number	Tape and Recorder Number	Reflection Survey Peg Number		Latitude deg.	Latitude min.	Longitude deg.	Longitude min.	Recording Period on d.	on h.	on m.	off d.	off h.	off m.	Amplifier gain in dß	
036	008	2351	Y	26	37.83	143	33.12	27	09	24	27	17	42	96	site at peg 2351, 1 peg east of the shot point at peg 2350.
								29	10	36	29	15	25		
037	004	2327.5		26	38.02	143	31.96	29	10	22	29	15	40	96	
038	013	2305	Y	26	38.27	143	30.89	29	10	03	29	16	17	96	
039	005	2282.5		26	38.53	143	29.80	29	09	49	29	16	30	96	
040	017	2260	R	26	38.79	143	28.71	29	09	28	29	16	55	96	
041	016	2237.5		26	39.04	143	27.62	29	09	16	29	16	42	96	
042	012	2215	Y	26	39.30	143	26.52	29	08	58	29	16	16	96	
043	010	2192.5		26	39.55	143	25.43	29	10	17	29	13	53	96	
044	011	2170	Y	26	39.81	143	24.33	29	09	59	29	14	14	96	
045	019	2147.5		26	40.05	143	23.24	29	09	45	29	14	31	96	
046	006	2125	Y	26	40.10	143	22.12	29	09	33	29	14	47	96	
047	007	2102.5		26	39.98	143	21.00	29	09	20	29	15	08	96	
048	009	2080	R	26	39.85	143	19.88	29	09	09	29	15	23	96	
049	021	2057.5		26	39.73	143	18.73	29	08	53	29	15	28	96	
050	018	2035	Y	26	39.62	143	17.64	29	09	00	29	17	16	96	
051	020	2012.5		26	39.51	143	16.51	29	09	18	29	15	39	96	clock set up 5 minutes slow, should read 44 minutes at switch off time
052	001	1990	Y	26	39.41	143	15.39	29	09	35	29	15	19	96	

Station Number	Tape and Recorder Number	Reflection Survey Peg Number		Latitude deg.	Latitude min.	Longitude deg.	Longitude min.	Recording Period on d.	on h.	on m.	off d.	off h.	off m.	Amplifier gain in dB	
053	015	1967.5		26	39.51	143	14.28	29	09	52	29	14	55	96	
054	014	1945	Y	26	39.75	143	13.18	29	10	07	29	14	31	96	
055	002	1922.5		26	39.99	143	12.08	29	10	20	29	14	10	96	
056	003	1900	R	26	40.18	143	10.98	29	10	38	29	13	47	96	site 100 m east of the shotpoint at peg 1900
								31	11	09	31	17	50		
057	018	1877.5		26	40.19	143	9.85	31	10	26	31	18	07	96	
058	001	1855	Y	26	40.15	143	8.72	31	10	13	31	18	17	96	
059	020	1832.5		26	39.97	143	7.61	31	10	00	31	18	24	96	
060	015	1810	Y	26	39.79	143	6.50	31	09	50	31	18	31	96	
061	014	1787.5		26	39.62	143	5.39	31	09	39	31	18	39	96	
062	002	1765	Y	26	39.44	143	4.27	31	09	23	31	18	49	96	
063	012	1742.5		26	39.26	143	3.16	31	09	18	31	18	58	96	
064	016	1720	R	26	39.08	143	2.05	31	09	31					Tape did not spool and is tangled. Set switched off before time read.
065	017	1697.5		26	38.91	143	0.94	31	09	42	31	19	58	96	
066	005	1675	Y	26	38.73	142	59.83	31	09	55	31	19	51	96	
067	004	1652.5		26	38.55	142	58.71	31	10	08	31	19	43	96	
068	013	1630	Y	26	38.29	142	57.62	31	10	24	31	19	36	96	
069	008	1607.5		26	38.03	142	56.53	31	10	41	31	19	30	96	
070	011	1585	Y	26	37.76	142	55.44	31	10	51	31	18	44	96	
071	010	1652.5		26	37.49	142	54.35	31	10	31	31	18	35	96	

Station Number	Tape and Recorder Number	Reflection Survey Peg Number		Latitude deg.	min.	Longitude deg.	min.	Recording Period on d.	h.	m.	off d.	h.	m.	Amplifier gain in dB	
072	019	1540	R	26	37.22	142	53.26	31	10	12	31	18	29	96	
073	006	1517.5		26	36.99	142	52.16	31	09	51	31	18	21	96	
074	007	1495	Y	26	36.51	142	51.17	31	09	37	31	18	12	96	site 50 m from shotpoint at peg 1450.
075	021	1472.5		26	36.22	142	50.11	31	09	07	31	18	00	96	
076	009	1450	Y	26	35.98	142	49.02	31	08	36	31	17	47	96	
								02	14	14	02	16	37		
077	021	1427.5		26	35.79	142	47.82	02	13	50	02	16	58	96	
078	007	1405	Y	26	35.63	142	46.88	02	13	33	02	17	14	96	
079	006	1382.5		26	35.77	142	45.72	02	13	23	02	17	25	96	
080	010	1360	R	26	35.83	142	44.59	02	13	02	02	17	38	96	
081	011	1337.5		26	35.93	142	43.47	02	12	23	02	17	51	96	
082	019	1315	Y	26	36.12	142	42.37	02	12	20	02	18	03	96	
083	002	1292.5		26	36.45	142	41.30	02	15	00	02	16	36	96	
084	014	1270	Y	26	36.57	142	40.18	02	14	45	02	16	52	96	
085	020	1247.5	Y	26	36.57	142	39.07	02	14	27	02	17	04	96	
086	015	1225	Y	26	36.70	142	37.95	02	14	07	02	17	22	96	
087	001	1202.5	Y	26	36.84	142	36.83	02	13	48	02	17	48	96	
088	018	1180	R	26	36.89	142	35.71	33	13	48	33	13	49	96	
089	003	1157.5	Y	26	36.91	142	34.58	02	14	11	02	14	22	06	
090	012	1135	Y	26	36.94	142	33.45	33	14	28	33	18	05	96	
091	005	1112.5		26	37.02	142	32.32	33	14	42	33	17	50	96	

Station Number	Tape and Recorder Number	Reflection Survey Peg Number		Latitude deg.	Latitude min.	Longitude deg.	Longitude min.	Recording Period on d.	on h.	on m.	off d.	off h.	off m.	Amplifier gain in dB	
092	016	1090	R	26	37.10	142	31.20	33	14	55	33	17	39	96	
093	004	1067.5	Y	26	37.17	142	30.07	02	15	13	02	17	21	96	
094	017	1045	Y	26	37.25	142	28.94	33	15	18	33	17	05	96	clock/radio comparitor errors uncertain both when the set was put out and when it was picked u
095	013	1022.5	Y	26	37.39	142	27.82	33	15	28	33	16	52	96	
096	008	1000	R	26	37.52	142	26.70	33	15	36	33	16	46	96	

TABLE 5

CENTRAL EROMANGA BASIN 1980, station numbers, tape and recorder numbers, reflection survey peg numbers, station locations and recording period at each station for the E/W line from Cheepie to Terebooka Bore.

The following formats have been used:

Latitudes are given in degrees and minutes south
Longitudes are given in degrees and minutes east;
Recording periods are given in days, hours, and minutes, the Days being numbered sequentially from 27, 17th August to 38, 7th September in some cases and 27, 27th August to 06, 6th September in most cases;

Times are Eastern Standard Time;
Amplifier gain is in decibels.

Station Number	Tape & Recorder Number	Reflection Survey Peg Number		Latitude Deg	Latitude min	Longitude Deg	Longitude min	Recording Period on d	on h	on m	off d	off h	off m	Amplifier gain in dB	Comments
001	003			26	38.51	145	02.76	06	13	08	06	16	45	96	
002	001			26	37.88	144	58.63	06	12	26	06	16	59	96	
003	015			26	38.22	144	54.00	06	12	07	06	17	28	96	
004	018			26	37.77	144	49.80	06	11	41	06	17	47	96	
005	002			26	38.10	144	45.63	06	11	16	06	18	09	96	
006	014			26	37.27	144	41.17	06	10	47	06	18	24	96	
007	020			26	37.12	144	36.16	06	10	24	06	18	50	96	
008	004			26	37.15	144	32.14	37	09	54	38	10	58	96	
009	017			26	36.36	144	28.43	37	09	30	38	10	42	96	
010	013			26	35.68	144	23.40	37	09	07	38	10	24	96	
011	016			26	36.63	144	18.76	37	08	46	38	10	08	96	
012	005			26	37.00	144	13.70	06	09	32	06	19	09	96	
013	008			26	37.15	144	08.85	06	10	33	06	18	54	96	
014	012			26	37.62	144	04.60	06	11	06	06	18	40	96	
015	007			26	38.67	144	00.27	06	11	18	06	18	26	96	
016	010	2800	R	26	36.75	143	55.14	06	11	38	06	18	01	96	Tape not driving, motor noise evident, all other systems OK - loose circuit board?
020	019	2710	Y	26	36.51	143	50.68	06	11	51	06	17	58	96	
024	011	2620	R	26	36.56	143	46.21	06	12	12	06	17	32	96	
028	006	2530	Y	26	35.96	143	41.77	06	12	38	06	17	33	96	
032	009	2440	R	26	36.53	143	37.36	06	12	58	06	17	13	96	
036	021	2351		26	37.83	143	33.12	03	15	13	04	12	16	96	
								06	12	23	06	16	46		
040	007	2260	R	26	38.79	143	28.71	03	15	51	04	13	13	96	
044	009	2170	Y	26	39.81	143	24.33	03	16	35	04	13	41	96	
048	006	2080	R	26	39.85	143	19.88	03	14	21	04	13	59	96	

Station Number	Tape & Recorder Number	Reflection Survey Peg Number		Latitude Deg	Latitude min	Longitude Deg	Longitude min	Recording Period on d	on h	on m	off d	off h	off m	Amplifier gain in dB	Comments
052	010	1990	Y	26	39.41	143	15.39	03	13	42	04	15	45	96	
056	011	1900	R	26	40.18	143	10.98	03	12	22	04	15	24	96	
060	019	1810	Y	26	39.79	143	06.50	03	11	36	04	15	04	96	
064	020	1720	R	26	39.08	143	02.05	03	11	54	05	12	45	96	
068	003	1630	Y	26	38.29	142	57.62	03	12	30	05	12	28	96	
072	002	1540	R	26	37.22	142	53.26	03	13	09	05	12	09	96	
076	015	1450	Y	26	35.98	142	49.02	03	13	55	05	11	43	96	
080	001	1360	R	26	35.83	142	44.59	03	14	45	05	11	22	96	
084	014	1270	Y	26	36.57	142	40.18	03	15	23	05	10	38	96	
088	018	1180	R	26	36.89	142	35.71	03	16	38	05	09	30	96	
092	016	1090	R	26	37.10	142	31.20	34	17	02	35	16	29	96	
096	008	1000	R	26	37.52	142	26.70	34	16	20	35	16	03	96	Seismometer unservicable when set picked up. Clock exactly 5 minutes slow.
097	005			26	37.85	142	21.10	34	15	51	35	15	34	96	
098	013			26	37.43	142	15.75	34	15	19	35	14	48	96	
099	012			26	36.72	142	10.42	34	14	25	35	13	49	96	
100	017			26	36.75	142	10.42	34	13	50	35	13	31	96	
101	004			26	36.75	142	07.10	34	12	58	35	13	03	96	

TABLE 6

Shot statistics for the central Eromanga Basin 1980, short-range E/W refraction line from Windorah/Eromanga road junction to Mt Howitt No 1 well.

Shot Number	Date 1980	Size kg	Time (EST) day	hour	min.	sec.	Latitude(S) deg	min.	Longitude(E) deg	min.	Location
007	2/9	400	02	16	10	05.06	26	40.18	143	10.98	W of Eromanga
008	2/9	200	02	16	30	05.18	26	35.98	142	49.02	Little Wonder Mine
009	2/9	200	02	16	20	04.97	26	37.52	142	26.70	Mt Howitt No. 1
010	31/8	400	31	17	20	05.04	26	37.52	142	26.70	Mt Howitt No. 1
011	31/8	200	31	17	40	05.33	26	35.98	142	49.02	Little Wonder Mine
012	31/8	200	31	17	30	06.31	26	40.18	143	10.98	W of Eromanga
013	31/8	400	31	17	10	04.86	26	37.83	143	33.10	"Tallyabra"
014	29/8	400	29	13	40	04.98	26	36.75	143	55.14	Windorah/Eromanga turnoff
015	29.8	200	29	11	45	05.13	26	37.83	143	33.10	"Tallyabra"
016	29/8	200	29	11	35	05.17	26	40.18	143	10.98	W of Eromanga
017	29/8	400	29	13	25	04.92	26	35.98	142	49.02	Little Wonder Mine
018	27/9	400	27	16	15	04.81	26	40.18	143	10.98	W of Eromanga
019	27/8	200	27	17	32	05.09	26	36.75	143	55.14	Windorah/Eromanga turn-off
020	27/8	200	27	16	00	06.46	26	37.83	143	33.10	"Tallyabra"

TABLE 7

Shot statistics for the central Eromanga Basin 1980, long-range E/W refraction line from Cheepie to Terebooka Bore.

Shot Number	Date 1980	Size kg	Time (EST) day	hour	min.	sec	Latitude(S) deg	min.	Longitude(E) deg	min.	Location
001	6/9	750	06	13	55	05.05	26	38.51	145	02.71	Cheepie
002	6/9	750	06	16	40	05.29	26	37.83	143	33.10	"Tallyabra"
003	6/9	2500	06	13	30	05.00	26	38.11	142	02.82	Terebooka Bore
004	4/9	750	04	10	49	18.96	26	38.11	142	02.82	Terebooka Bore
005	4/9	750	04	12	45	05.32	26	37.83	143	33.10	"Tallyabra"
006	4/9	2500	04	08	24	04.32	26	38.85	145	02.71	Cheepie

TABLE 8. Explosives used for central Eromanga Basin Survey 1980.

Shot Site	Shot Number	Weight of shot per hole kg	Number of holes	Depth of hole in m.	Shot weight kg	Total Explosives at site kg	Total Explosives kg
Windorah/Eromanga	19	100	2	40	200		
turn off	14	100	4	40	400		
						600	
'Tallyabra'	15	100	2	40	200		
	20	100	2	40	200		
	13	100	4	40	400		
						800	
Eromanga	12	100	2	40	200		
	16	100	2	40	200		
	7	100	4	40	400		
	18	100	4	40	400		
						1,200	
Little Wonder Mine	8	100	2	40	200		
	11	100	2	40	200		
	17	100	4	40	400		
						800	
Mt Howitt No 1 well	9	100	2	40	200		
	10	100	4	40	400		
						600	4,000
Cheepie	1	100	8	40	750		
	6	100	25	40	2,500		
						3,200	
'Tallyabra'	2	100	8	40	750		
	5	100	8	40	750		
						1,500	
Terebooka Bore	4	100	8	40	750		
	3	100	25	40	2,500		
						3,200	8,000
							12,000

TABLE 9. Shot and Station numbers for the reversed refraction lines shot in the central Eromanga Basin in 1981.

Length of Line Km	Station Spacing Km	Size of shot tonne	Station Numbers	Forward Line	Shot Number	Reversed Line	Shot Number
37.5	1.875	0.4	1-21	Cooladdi eastern offset	1		
		0.2	1-21	Cheepie to Winbin	2	Winbin to Cheepie	3
			21-41	Winbin to Quilpie	6	Quilpie to Winbin	7
			41-61	Quilpie to Windorah/Eromanga turn-off	10	Windorah/Eromanga turn-off to Quilpie	11
75.0	1.875	0.4	1-41	Cheepie to Quilpie	2,5	Quilpie to Cheepie	7,4
			21-61	Winbin to Windorah/Eromanga turn-off	6,9	Windorah/Eromanga turn-off to Winbin	11,8
			41-61	Quilpie to 'Tallyabra'	10,-*	Tallyabra to Quilpie	20*,12
			16-36*				
150.00	7.5	0.9	1-21	Blackall to Adavale	1	Adavale to Blackall	2
			21-41	Adavale to Toompine	6	Toompine to Adavale	5
300.0	7.5	0.9, 3.0	1-41	Blackall to Toompine	1,7	Toompine to Blackall	5,3
400.0	7.5	3.4	1-21, 21-41	Blackall to Adavale	4	Adavale to Toompine	8

* represent 1980 shots and stations.

TABLE 10

CENTRAL EROMANGA BASIN 1981, station numbers, tape and recorder numbers, reflection survey peg numbers, station locations and recording period at each station for the E/W line, Cheepie to the Windorah/Eromanga turn-off.

The following formats have been used:

Latitudes are given in degrees and minutes south;

Longitudes are given in degrees and minutes east;

Recording periods are given in days, hours, minutes, and the days are numbered sequentially from day 10, 10th November to 13, 13th November 1981.

Times are Eastern Standard Time;

Amplifier gain is in decibels.

Station Number	Tape and Recorder Number	Reflection Survey Peg Number	Latitude deg.	Latitude min.	Longitude deg.	Longitude min.	Recording Period on			off			Amplifier gain in dB	Comments
								h.	m.		h.	m.		
001	019	9798	26	38.48	145	02.03	10	13	19	10	18	10	96	When site visited to fire shot 2, the tape was wrapped around the capstan and was not transporting - Time of snarling unknown. Problem corrected 1700; after Shot 2 was fired at 1740 the tape was snarled again. Tape threading instructions marked to inside of lid removed - may have been catching. Set was operating normally at pick up time
002	021	9775.5	26	38.38	145	00.93	10	12	48	10	18	26	96	
003	015	9753	26	37.97	144	59.91	10	12	25	10	18	43	96	
004	007	9730.5	26	37.89	144	58.78	10	11	48	10	18	56	96	
005	006	9708	26	37.72	144	57.67	10	11	19	10	19	19	96	
006	002	9685.5	26	37.86	144	56.56	10	10	50	10	19	42	96	
007	008	9663	26	38.01	144	55.43	10	10	25	10	19	58	96	
008	004	9640.5	26	38.16	144	54.32	10	10	06	10	18	05	96	
009	013	9618	26	38.30	144	53.20	10	10	28	10	18	16	96	
010	005	9595.5	26	38.46	144	52.08	10	11	21	10	18	28	96	
011	009	9573	26	38.60	144	50.96	10	13	21	10	18	40	96	
012	018	9550.5	26	38.75	144	49.85	10	12	56	10	18	50	96	Tape snarled when set picked up - normal operation time unknown.
013	011	9528	26	38.62	144	48.74	10	12	10	10	19	11	96	
014	017	9505.5	26	38.32	144	47.67	10	14	23	10	19	24	72	
015	012	9483	26	38.05	144	46.60	10	14	53	10	20	00	96	
016	010	9460.5	26	38.07	144	45.48	10	14	23	10	19	48	96	
017	001	9438	26	37.88	144	44.38	10	13	30	10	19	18	96	
018	003	9415.5	26	37.48	144	43.35	10	12	53	10	18	51	96	
019	014	9393	26	37.38	144	42.22	10	12	12	10	18	32	96	
020	020	9370.5	26	37.22	144	41.12	10	11	26	10	18	06	96	

Station Number	Tape and Recorder Number	Reflection Survey Peg Number	Latitude deg.	Latitude min.	Longitude deg.	Longitude min.	Recording Period on	on h.	on m.	off	off h.	off m.	Amplifier gain in dB	Comments
021	016	9348	26	37.15	144	39.99	10	10	25	11	16	21	96	
022	020	9325.5	26	37.12	144	38.81	11	09	56	11	16	40	96	
023	012	9303	26	37.09	144	37.72	11	10	28	11	16	58	96	
024	010	9280.5	26	37.03	144	36.60	11	11	07	11	17	16	96	
025	003	9258	26	36.98	144	35.47	11	11	38	11	17	35	96	
026	014	9235.5	26	37.01	144	34.35	11	12	08	11	17	57	96	
027	001	9213	26	37.04	144	33.21	11	12	29	11	18	12	96	
028	019	9190.5	26	37.10	144	32.08	11	12	06	11	16	45	96	Original clock unserviceable, replacement had no comparitor errors. No servo light when set picked up. When switched off then on again, servo light intermittent.
029	021	9168	26	37.26	144	30.97	11	11	18	11	17	03	96	
030	007	9145.5	26	37.44	144	29.86	11	10	53	11	17	22	96	
031	015	9123	26	37.60	144	28.74	11	10	37	11	17	36	96	
032	002	9100.5	26	37.77	144	27.63	11	10	23	11	17	51	96	
033	008	9078	26	37.86	144	26.50	11	09	42	11	18	27	96	
034	006	9055.5	26	37.85	144	25.38	11	09	26	11	18	04	96	
035	017	9033	26	37.84	144	24.25	11	09	33	11	17	46	72	
036	011	9010.5	26	37.83	144	23.13	11	09	58	11	17	30	96	
037	009	8988	26	37.94	144	22.00	11	10	24	11	17	16	96	
038	005	8965.5	26	38.11	144	20.89	11	10	53	11	17	00	96	
039	013	8943	26	38.27	144	19.77	11	11	27	11	16	45	96	
040	004	8920.5	26	38.47	144	18.63	11	12	19	11	16	23	96	
041	018	8898	26	38.60	144	17.54	11	13	47	12	09	46	96	Tape snarled up when set checked at 11 14 00, tape rethreaded and threading instructions removed from inside lid. Tape spooling correctly when set picked up.
							13	12	34	14	09	51	96	

Station Number	Tape and Recorder Number	Reflection Survey Peg Number	Latitude deg.	Latitude min.	Longitude deg.	Longitude min.	Recording Period on h.	on m.	off h.	off m.	Amplifier gain in dB	Comments
042	011	3216	26	38.86	144	15.86	13	06 53	14	10 27	96	Station at survey peg 3216 west of correct position as earth bridges across the Bulloo River washed out thus preventing access to peg 3227.5 from either E or W.
043	017	3205	26	38.92	144	15.31	13	07 14	14	10 39	72	
044	009	3182.5	26	38.92	144	14.19	13	07 34	14	10 54	96	
045	005	3160	26	38.84	144	13.06	13	07 54	14	11 09	96	
046	013	3137.5	26	38.75	144	11.94	13	08 22	14	11 04	96	
047	010	3115	26	38.64	144	10.81	13	12 58	13	18 20	96	
048	004	3092.5	26	38.53	144	09.68	13	09 06	13	18 43	96	
049	016	3070	26	38.40	144	08.56	13	09 41	13	19 11	96	
050	003	3047.5	26	38.29	144	07.44	13	08 58	13	19 29	96	
051	020	3025	26	38.16	144	06.31	13	08 22	13	19 03	96	
052	014	3002.5	26	38.05	144	05.19	13	07 44	13	18 47	96	
053	001	2980	26	37.92	144	04.07	13	07 05	13	18 33	96	
054	012	2957.5	26	37.81	144	02.95	13	06 48	13	18 18	96	
055	006	2935	26	37.64	144	01.83	13	08 40	14	08 08	96	
056	019	2912.5	26	37.46	144	00.71	13	11 10	14	08 58	96	No speed control, tape run off.
057	021	2890	26	37.28	143	59.60	13	11 03	14	09 21	96	No radio signal, therefore no clock/radio comparitor errors.
058	007	2867.5	26	37.11	143	58.49	13	10 33	14	09 38	96	
059	015	2845	26	36.94	143	57.37	13	10 13	14	09 47	96	
060	002	2822.5	26	36.80	143	56.26	13	09 46	14	10 07	96	
061	008	2800	26	36.75	143	55.14	13	09 22	14	10 08	96	

TABLE 11

CENTRAL EROMANGA BASIN 1981, station numbers, tape and recorder numbers, reflection survey peg numbers, station locations and recording period at each station for the N/S line 30 km. south of Blackall to 3.5 km south of Toompine.

The following formats have been used:

Latitudes are given in degrees and minutes south;
Longitudes are given in degrees and minutes east;
Recording periods are given in days, hours, minutes and
the days are numbered sequentially from day 10, 10th November to 21, 21st November, 1981;

The times are Eastern Standard Time;

Amplifier gain in Decibels.

Note For sites 0-21 the break in time occurs when the magnetic tapes on the AKAI sets 001-015 were changed, and on all sets the batteries were changed, clock/radio comparitor errors reset to zero and the sets restarted. Shots 3 and 4, only were recorded on the second tape.

For sites 21-41 the break in time occurs when the batteries were changed and the clock/radio comparitor errors were reset to zero.

Station	Tape & Recorder Number	Reflection Survey Peg Number	Latitude Deg	Latitude min	Longitude Deg	Longitude min	Recording Period on d	on h	on m	off d	off h	off m	Amplifier gain in dB	Comments
000	Helige		24	39.23	145	17.66								
001	004		24	43.14	145	17.05	18	17	34	21	13	05	96	
							21	13	11	22	10	13		
002	009		24	48.72	145	17.49	18	17	08	21	12	38	96	
							21	12	43	22	12	31		
003	013		24	52.75	145	16.92	18	16	00	21	12	15	96	
							21	12	19	22	12	10		
004	005		24	57.19	145	16.62	18	16	31	21	11	42	96	
							21	11	49	22	11	51		
005	017		25	00.97	145	16.70							96	18/11/81 tape drive inopperative. 21/11/81 motor contact sprayed with FREON, motor drive then OK, but had stopped when set picked up. Hours should read 10 not 11.
							21	09	26	22	11	30		
006	011		25	04.89	145	15.00	18	15	41	21	11	56	96	
							21	11	04	22	11	09		
007	018		25	09.49	145	14.37	18	14	31				96	Set stopped, 21/11/81
							21	10	33	22	10	42		
008	001		25	13.50	145	12.31	18	14	57	21	11	25	96	
							21	11	30	22	11	56		
009	014		25	16.41	145	09.51	18	15	26	21	11	00	96	
							21	11	00	22	12	16		
010	019		25	19.67	145	06.00	18	18	35	21	12	13	96	
							21	12	14	22	12	39		
011	008		25	23.35	145	02.77	18	18	10	21	13	00	96	
							21	13	00	22	13	04		

Station	Tape & Recorder Number	Reflection Survey Peg Number	Latitude Deg	min	Longitude Deg	Recording Period on d	h	m	off d	h	m	Amplifier gain in dB	Comments
012	006		25	25.02	144 58.13	18	17	49	21	17	45	96	When batteries changed clock hours incorrect and time 2 seconds slow. Hour display counts through 13.
						21	13	50	22	11	28		
013	021		25	27.61	144 54.82	18	17	31	21	14	13	96	Clock/radio comparitor errors not reset to zero when battery & tape changed.
									22	13	46		
014	002		25	31.68	144 52.15	18	17	11	21	14	29	96	
						21	14	29	22	14	09		
015	007		25	34.64	144 48.89	18	17	13	21	14	43	96	
						21	14	44	22	14	31		
016	015		25	35.77	144 41.25	18	16	45	21	15	02	96	
						21	15	02	22	14	52		
017	016		25	39.55	144 37.40	18	16	15	21	15	19	96	
						21	15	22	22	15	11		
018	010		25	42.21	144 36.10	18	15	51	21	15	31	96	
						21	15	33	22	15	28		
019	020		25	49.95	144 34.66	18	15	30	21	15	44	96	
						21	15	45	22	15	43		
020	012		25	50.09	144 34.36	18	14	59	21	16	02	96	
						21	16	02	22	16	01		
021	003		25	54.81	144 33.11	15	11	11	17	16	15	96	
						17	16	15	17	16	16		Date incorrect, reset to 21 at this time
						21	16	19	22	16	19		

Station Number	Tape & Recorder Number	Reflection Survey Peg Number		Latitude Deg	Min	Longitude Deg	min	Recording Period on d	h	m	off d	h	m	Amplifier gain in dB	Comments
022	012			25	59.03	144	32.69	15	12	36	17	15	38	96	
								17	15	39	18	14	14		
023	001			26	02.80	144	32.05	15	11	54	17	15	09	96	
								17	15	12	18	11	20		
024	014	0994	Y	26	06.20	144	31.80	15	11	25	17	14	52	96	
								17	14	52	18	10	41		
025	018	0892	R	26	10.75	144	31.16	15	10	50	17	14	36	96	
								17	14	37	18	10	22		
026	011	0808	R	26	13.85	144	28.79	15	10	37	17	14	23	96	
								17	14	24	18	10	05		
027	017	0696	R	26	18.64	144	28.25	15	10	20	17	14	06	72	
								15	14	08	18	09	45		
028	009	0612	R	26	22.23	144	27.24	15	10	01	17	13	48	96	minutes should read 54, corrected at
								17	13	36	18	09	29		17 13 55
029	013	0520	R	26	25.77	144	25.0 1	15	09	53	17	13	42	96	
								17	13	42	18	09	13		
030	005	0416	R	26	30.43	144	24.42	15	09	37	17	13	28	96	
								17	13	28	18	08	53		
031	004	0320	R	26	34.74	144	23.90	15	09	19	17	13	15	96	
								17	13	16	18	08	39		
032	020	0232		26	38.75	144	23.18	15	10	01	17	13	32	96	
								17	13	32	18	10	55		
033	010	0150		26	42.31	144	22.55	15	11	14	17	16	54	96	
								17	17	00	18	10	20		

Section Number	Tape & Recorder Number	Refraction Survey Peg Number	Latitude deg	Latitude min	Longitude deg	Longitude min	Recording on d	Recording on h	Recording on m	Period d	Period h	Period m	Amplifier gain in dB	Comments
034	016	0060	26	46.32	144	21.83	15	12	39	17	15	07	96	Tape drive and radio stopped, battery flat
							17	15	07	18	09	28		
035	019		26	50.85	144	18.32	15	09	23	17	13	33	96	Set now repaired. Clock/radio comparitor
										18	08	46		errors not reset to zero.
036	008		26	54.80	144	21.08	15	09	45	17	13	53	96	
							17	13	53	18	09	09		
037	021		26	59.15	144	22.12	15	10	04	17	14	06		
							17	14	11	18	09	30		
038	015		27	03.58	144	24.28	15	10	26	17	14	25	96	Tape drive stopped, battery very low
							17	14	30	18	09	56		charge.
039	006		27	07.42	144	24.42	15	10	43	17	16	36	96	
							17	16	36	18	10	18		
040	002		27	11.47	144	23.50	15	11	04	17	14	47	96	
							17	14	36	18	10	18		
041	007		27	15.33	144	21.72	15	11	21	17	16	15	96	
							17	16	15	18	11	08		

TABLE 12

Shot statistics, for the central Eromanga Basin 1981, short-range E/W refraction lines from Cheepie to Windorah/Eromanga road junction.

Shot Number	Date 1981	Size Kg	Time (EST) day	hour	min.	sec.	Latitude (S)	Longitude (E)	Location
001	10/11	400	10	15	30	32.23	26 38.70	145 22.91	Cooladdi
002	10/11	200	10	17	40	02.66	26 38.48	145 02.03	Cheepie
003	10/11	200	10	16	02	02.55	26 37.15	144 39.99	Winbin
004	10/11	400	10	17	55	15.84	26 38.60	144 17.54	Quilpie
005	11/11	400	11	14	10	12.74	26 38.48	145 02.03	Cheepie
006	11/11	200	11	15	55	05.84	26 37.15	144 39.99	Winbin
007	11/11	200	11	14	16	26.24	26 38.60	144 17.54	Quilpie
008	11/11	400	11	16	10	12.29	26 36.75	143 55.14	Windorah/ Eromanga Turn off
009	13/11	400	13	16	45	13.03	26 37.15	144 39.99	Winbin
010	13/11	200	13	13	40	15.49	26 38.60	144 17.54	Quilpie
011	13/11	200	13	16	30	02.83	26 36.75	143 55.14	Windorah/ Eromanga Turn off
012	13/11	400	13	13	30	04.37	26 37.83	143 33.10	"Tallyabra"
013	13/11	400	13	18	11	14.56	26 38.25	145 05.87	Cheepie

TABLE 13

Shot statistics, for the central Eromanga Basin 1981, long-range N/S refraction line from 35 km S of Blackall to Toompine.

Shot Number	Date 1981	Size kg	Time (EST) day	hour	min.	sec.	Latitude (S) deg.	min.	Longitude (E) deg.	min.	Location
001	18/11	900	18	21	44	09.86	24	39.23	145	17.66	S of Blackall
002	18/11	900	18	21	36	06.12	25	54.70	144	32.98	Adavale
003	21/11	3000	21	16	40	06.86	27	15.25	144	21.59	S of Toompine
004	21/11	3400	21	19	20	07.81	28	03.53	143	46.82	S of Thargomindah
005	15/11	900	15	13	000	27.62	27	15.35	144	21.59	S of Toompine
006	15/11	900	15	13	16	03.53	25	54.71	144	33.16	Adavale
007	15/11	3000	15	16	55	03.97	24	39.23	145	17.66	S of Blackall
008	18/11	3400	18	08	13	04.33	23	42.48	145	16.83	S of Barcaldine

TABLE 14. Explosives used for central Eromanga Basin survey, 1981.

Shot Site	Shot Number	Weight of Shot per hole	Number of holes	Depth of hole	shot weight	Total explosives at site	Total explosives
		kg		m.	kg	kg	kg
Cooladdi	1	200	2	80	400		
						400	
Cheepie	2	200	1	80	200		
	5	200	2	80	400		
	13	100	4	40	400		
						1,000	
Winbin	3	200	1	80	200		
	6	200	1	80	200		
	9	200	2	80	400		
						800	
Quilpie	7	200	1	80	200		
	10	200	1	80	200		
	4	200	2	80	400		
						800	
Windorah/Eromanga	11	200	1	80	200		
Turn-off	8	200	2	80	400		
						600	
'Tallyabra'	12	200	2	80	400		
						400	4,000
Barcaldine	8	200	17	80	3,400		
						3,400	
Blackall	1	200	5	80	900		
	7	200	15	80	3,000		
						3,900	
Adavale	2	200	5	80	900		
	6	200	5	80	900		
						1,800	

Shot Site	Shot Number	Weight Shot per hole	Number of holes	Depth of hole	Shot weight	Total explosives at site	Total explosives
		kg		m.	kg	kg	kg
Toompine	5	200	5	80	900		
	3	200	15	80	3,000		
						3,900	
Thargomindah	4	200	17	80	3,400		
						3,400	16,400
							20,400