COMMONWEALTH OF AUSTRALIA

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DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RESTRICTED

Record No. 1968 / 136

016833

Discussion on Seismic Record Sections, Ngalia Basin Survey, Northern Territory 1967 - 1968

by

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(available with this report on request)

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(Record No. 1968/136: Discussion on Seismic Record Sections, Ngalia Basin Seismic Survey, Northern Territory 1967-1968; by E.R. Smith)

SUMMARY

Seismic Party No. 1 of the Bureau of Mineral Resources has carried out seismic reflection and refraction exploration in the Ngalia Basin, Northern Territory, during 1967 and 1968. The traverses shot to the end of September, 1968 are shown in Plate 1. A short discussion of the interpretation of these sections is presented herein.

INTERPRETATION OF RECORD SECTIONS

Three main primary reflections are recorded on Traverse E. For ease of dicussion, these are designated (from top to bottom), the "M" horizon, the "P" horizon, and the "Q" horizon. Average vertical velocities (and interval velocities) have been calculated to each of these reflection horizons from the Expanded Reflection Spread shot about s.p. 2350 on Traverse E, and using these velocities, the depths to the horizons have also been calculated. These results are listed in Table 1.

Refraction shooting was also carried out along Traverse E, and three refractors were recorded; the velocities and depths calculated for these refractors are also shown in Table 1. There is no apparent correlation between the reflection horizons and the refractors on the basis of depth. However an offset reflection traverse was shot and this indicates that the "P" reflection originates from close to the 18600f/s.refractor. It will be assumed that the two originate from the same stratigraphic unit, but it is probable that the reflection horizon comes from layering below the refracting interface.

The reflection profiling along Traverse E shows the three horizons to be conformable and approximately horizontal, their depths averaging about 3000', 5,000' and 8000' respectively. There is a small rise towards the eastern end.

The reflection profiling was extended to the south-east along Traverse H towards an outcrop area of the Lower Palaeozoic and Upper Proterozoic formations. The two shallower horizons, "M" & "P", remain conformable to s.p. 3007 where the "M" horizon has become too shallow to record with the normal reflection spread. Over this section of traverse M, the two horizons dip to the north-west at 8^{o} and are at depths of 1200 ft. and 3100 ft. at s.p. 3007. Assuming the "M" horizon continues dipping at 8^{o}, it would outcrop near s.p. 3012. Mt. Eclipse Sandstone is mapped on the surface as far as s.p. 3015 in the vicinity of Traverse H. Therefore the "M" reflection originates from layering within the lower part of the Mt. Eclipse sandstone.

The continuity of the "P" horizon is badly disturbed between s.p. 3009 and s.p. 3010, probably because of faulting. From s.p. 3013 to s.p. 3015, the horizon dips to the west at 15^{o} and has risen to a depth of 1600 ft. at s.p. 3015. It cannot be followed further to the east, but at this dip it should outcrop between s.p. 3018 and s.p. 3019. This appears to place the "P" horizon below the Ordovician formations and within the Proterozoic Mount Doreen Formation. A dolomite occurs near the top of this formation, and as the "P" horizon is associated with a refractor of velocity 18,600 ft/sec., it may be associated with this dolomite sequence. The Walbiri Dolomite of Cambrian age does not outcrop in this area, but it could be present in the section, in which case it would be an alternative correlation for the "P" horizon.

There is considerable thinning (1500') between the "P" and "Q" horizons from s.p. 3008 to s.p. 3012. The record quality across this zone is poor, and the "Q" horizon may also be faulted, as is the "P" horizon near s.p. 3010. A fault is also indicated near s.p. 3003 by a discontinuity in the "Q" horizon. At this stage, a reasonable assumption for the stratigraphic correlation of the "Q" horizon is the Vaughan Springs Quartzite or Pre-cambrian basement, in either case it being the effective basement to the sedimentary section.

The stratigraphic correlations of the three reflection horizons inferred above, are included in Table 1.

The same suite of three reflection horizons can only be recognised with certainty along the northern portion of Traverse A, from s.p. 1600 to s.p. 1620. They are conformable and exhibit a synclinal fold close to the steep northern margin of the Basin, and an anticlinal fold culminating at s.p. 1604. The latter feature is probably the western extension of the anticlinal nose draped over a basement block about 8 miles east of the traverse. A major fault occurs on the southern flank of the anticline, down thrown to the south.

The reflection section on the south side of this fault differs in character from that on the north side, which contains the suite of three prominent reflections, and therefore correlation across the fault is uncertain. There is only one strong reflection immediately south of the fault, which is at a depth of approximately 12000'. This could correlate with either the "P" or the "Q" horizon. The throw of the fault is of the order of 4000 feet, and there is some evidence that it may be a thrust fault.

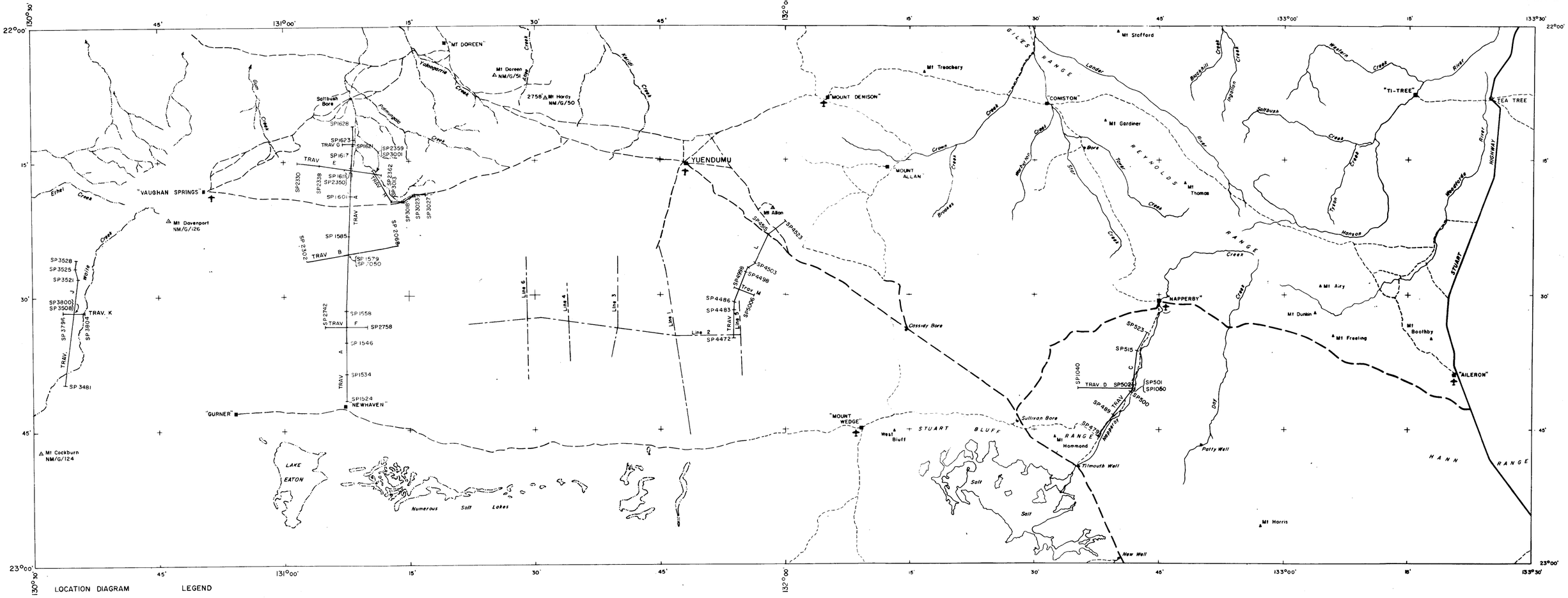
The reflections gradually rise to the south from this point, probably interrupted by faulting near s.p. 1568, until they disappear at s.p. 1543 due to a deterioration in record quality.

Traverses C and D provide little information other than that there is about 8000 ft. of sedimentary section in the central part of the Basin near Napperby, and that the layers dip to the north.

CORRELATIONS ON TRAVERSES E & H

Reflections				Refractors			
	Time	Average velocities	Interval velocities	Depth	Velocity	Depth	
"M"	0.410	14500	14500	3000'	14000-15000 16,800	Sub-weath 1900'	Mt. Eclipse sandstone
"P"	0.630	15900	17600 18800	5000'	18,600	4000'	Mt. Doreen Formation
"Q"	0.955	16800		8000'			Vaughan Springs Quartzite

PLATE I



LOCATION DIAGRAM

REFERENCE TO AUSTRALIA STANDARD 1:250,000 MAP SERIES : MT DOREEN

LEGEND

- Mission
- Homestead
- River or creek (Intermittent)
- Lake (Intermittent)
- Track
- Previous seismic survey

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETRES

NGALIA BASIN SEISMIC SURVEY 1967-68
LOCATION OF TRAVERSES

TO ACCOMPANY RECORD No. 1968/136

F52/B3-21