DEPARTMENT OF MINES AND ENERGY
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MICROPALAEONTOLOGICAL EXAMINATION OF DRILLCORE FROM THE BASEMENT ROCKS IN OVERLAND CORNER 1 (MURRAY BASIN)

by

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ABSTRACT

The Overland Corner 1 petroleum exploration well, Canegrass Lobe, Murray Basin, entered 12 m of steeply dipping grey siltstone as 'basement' below Permo-Carboniferous, Mesozoic and Tertiary strata. The siltstone contains fine sandy laminations and small carbonaceous shale flakes. There are spaced fractures but no penetrative slaty cleavage, and, surprisingly, no visible metamorphism. No indigenous microfossils were found in either thin section or maceration, and there is no biostratigraphic evidence of the age.

INTRODUCTION

Micropalaeontological examination of drillcore from the 'basement' rocks encountered in International Mining Corporation Overland Corner 1 (Murray Basin) follows from interest expressed by the company in the economic potential of these rocks, and in particular, whether they are unproductive Kanmantoo Group (normally metamorphosed) or mid-Palaeozoic strata that may have some hydrocarbon potential.

LOCATION AND GEOLOGY OF OVERLAND CORNER 1

The Overland Corner 1 drillsite is situated 10 km north of Overland Corner at Lat. 34°04'06"S, Long. 140°18'03"E, within the Canegrass Lobe in the western Murray Basin, immediately west of the Hamley Fault as shown on the RENMARK 1:250 000 sheet (Firman, 1972).

The drillhole penetrated Tertiary, Mesozoic and Permo-Carboniferous strata to a depth of 642.1 m, and then intersected some 12 m of 'basement' rocks to a total depth of 654.7 m. The nearest other drillholes that have entered rocks older than late Palaeozoic are Berri North 1 (34 km ESE of Overland Corner 1),

which entered metagreywacke, and Loxton 2 (60 km SSE of Overland Corner 1), which entered greywacke (Thornton, 1974). Other bores south of the River Murray entered metasediments that have been correlated with the Kanmantoo Group (Thornton, 1974), as have the greywackes in Berri North 1 and Loxton 2. However, on the CHOWILLA sheet to the north, Rogers (1977), suggested that the basement north of and perhaps beneath the Canegrass Lobe is largely Adelaidean, but drillhole data are very sparse. Thornton (1974) discussed the mainly arenaceous sediments, of possible Devonian age, in the Renmark Trough but expressed uncertainty as to the western extent of these sediments in the Canegrass Lobe. Thus available data suggest that the pre-Permo-Carboniferous 'basement' in Overland Corner 1 could be Adelaidean, Cambrian Kanmantoo Group, or (?)Devonian.

Description of Drillcore

The 12 m core consists of rather uniform, medium grey siltstone which appears to be practically unmetamorphosed. A bedding lamination, a few millimetres thick, is expressed by grainsize variations, and small wispy, dark grey flakes of very fine grained material are scattered parallel to the bedding. The bedding dips at about 70° (assuming vertical drillhole) and there is an incipient fracture cleavage dipping at about 45° in the opposite direction. No penetrative slaty cleavage is visible.

In thin section (T.S. 45420, from 643.7 m) the rock consists of alternating, crudely defined bands of siltstone and fine sandstone. The siltstone consists of very fine grained quartz, clay minerals and fine flakes of white mica, the latter being almost completely randomly oriented. Locally, there is a slight tendency to parallelism with bedding. The sandy laminae are 1 to 2 mm thick and contain angular to subangular quartz and minor carbonate, up to 0.1 mm in grain size, scattered in a silty matrix. Their boundaries are rather diffuse. The silty and sandy laminations appear to contain little or no organic matter. However, the siltstone does include wispy fragments of carbonaceous shale which lack quartz and mica flakes; their pale greyish-brown colour in thin section suggests that these do contain organic matter. The rock is cut by a number of spaced fractures at a high angle to bedding, and limonite staining along

these fractures indicates that the rock has been subject to slight pre-Permo-Carboniferous weathering. No microfossils were found in thin section, either in the siltstone or in the shale clasts.

EXAMINATION OF MACERATIONS

Samples of grey siltstone were collected from 654.5 m and 643.7 m. These were macerated in hot HF and hot concentrated HCl, and temporary slides of the washed residues were examined. These contained pale greyish-brown (?)organic material presumed to have originated from the carbonaceous shale clasts; it was mostly clumped into irregular masses which were difficult to disperse, and in which no evidence of microfossils was seen. Further treatment by light oxidation with Schultz solution and heavy liquid separation of the remaining mineral material produced moderate quantities of residue of brownish-grey, structureless organic material. No indigenous microfossils were found, although, in two slides, single, poorly preserved specimens of the Cretaceous spores Cicatricosisporites australiensis and ?Todisporites sp. occur (W.K. Harris, pers. comm., July, 1984). Leitz Orthoplan stage coordinates are 464-941 (slide S5942-1) and 581-991 (slide S5941-1). Both samples are from 643.7 m, just below the late Palaeozoic unconformity. These spores are clearly contaminants, probably from drilling mud adhering to the core.

CONCLUSIONS AND RECOMMENDATIONS

The steeply dipping siltstone 'basement' in Overland Corner 1 contains no indigenous microfossils. There is therefore no biostratigraphic evidence for the age of these rocks. Lithologically, they resemble a number of late Proterozoic formations known from the Adelaide Geosyncline, rather than Kanmantoo Group. The apparent absence of even low grade metamorphism is surprising, however. Although there is no evidence of a mid-Palaeozoic age for these rocks, and their steep dip strongly suggests that they are pre-Delamerian, they do contain organic material of moderately light colour. It is

recommended that the thermal maturation and total organic carbon be determined before they can be ruled out as potential source rocks for the generation of petroleum or gas.

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