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COMMONWEALTH OF AUSTRALIA
DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORDS 1956, NO. 112

SEISMIC REFLECTION TRAVERSE
WEST OF
LANGEY'S CROSSING,
KIMBERLEY DIVISION, W.A.

By

K. R. VALE and E. R. SMITH

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ABSTRACT.

As a contribution towards the assessment of the oil potential of the Canning Basin, the Bureau carried out a seismic survey in July, 1955 along a traverse to the north-west of Langey's Crossing in the Kimberley Division of Western Australia.

There is a considerable thickness of sedimentary rocks, probably exceeding 20,000 feet, in the nearby Fitzroy Basin, but little is known of the structure of the Canning Basin. The object of the survey was to obtain information on the thickness of the sedimentary rocks in this part of the Basin and on the geological structure of the sedimentary rocks at depth.

The results show that near Langey's Crossing the thickness of the sedimentary rocks probably exceeds 16,000 feet and may exceed 20,000 feet. The traverse was oblique to the assumed direction of the axes of the major structures in the basin and results indicate that it crosses the axis of what appears to be a broad syncline of low relief.

1. INTRODUCTION

As part of the search for oil in Australia, West Australian Petroleum Pty. Ltd. and the Bureau of Mineral Resources have both been carrying out extensive geological and geophysical surveys in the Canning Basin of Western Australia during the past few years. Western Australian Petroleum Pty. Ltd. is currently drilling a deep test bore on Dampier Land.

As a contribution towards assessing the oil potential of the Basin, the Bureau carried out a seismic survey along a traverse near Langey's Crossing, with the object of obtaining information on the thickness of the sedimentary rocks and on the geological structure of the sedimentary rocks at depth. The traverse extends for ten miles south-west along the Derby-Broome telegraph line, from a point about two miles west of the Fitzroy River, north of Langey's Crossing (Plate 2). The direction of the traverse is oblique to the direction of major faulting and folding in the Fitzroy Basin.

The survey was made in July, 1955 by a seismic party in which E.R. Smith (party leader) and M.J. Goodspeed were the geophysicists. Topographic surveying was done by the Department of the Interior, Perth, and the shot-hole drilling by the Petroleum Technology Section of the Bureau.

2. GEOLOGY

The Canning Basin and the adjacent Fitzroy Basin ^{Fitzroy Basin} ~~together~~ ^{as shown} form what was previously known as the Desert Basin. ^{Basin} The boundary between the two has a north-west trend and coincides, for a large part of its length, with the Fenton Fault.

The Fitzroy Basin appears to have a history of greater mobility than the Canning Basin, which has the characteristics of a more stable shelf area. It is likely that the equivalent of most, or all, of the sedimentary rocks which are present in the Fitzroy Basin occur, or may have occurred, in the Canning Basin. The sediments in the Canning Basin may not be as extensive or as thick as those in the Fitzroy Basin, and they may also have undergone longer periods of erosion. An exception to this occurs in the case of the Mesozoic sediments, which are widely distributed in the northern and western parts of the Canning Basin, but appear only as a few scattered remnants in the Fitzroy Basin.

The Fitzroy Basin contains several major anticlines whose axes ~~strike~~ ^{lie} easterly, but little is known of the structure of the Canning Basin.

In order to assess the petroleum prospects of the Canning Basin it is necessary, among other things, to have information on the shape of the Basin, the thickness of sediments within it, and on the structure of the older sedimentary rocks that may have been covered by later sedimentation. It was hoped that the results of the seismic traverse at Langey's Crossing would provide some of this information for a part of the Basin.

3. FIELD OPERATIONS

Field work commenced on the 25th July, 1955 and was completed on the 1st August, 1955. Equipment consisted of a

set of 24-channel reflection instruments made by the Technical Instrument Co. U.S.A., and two mobile Failing "750" drills together with all necessary auxiliary equipment.

The field crews operated from a temporary camp at Langey's Crossing. The headquarters camp was situated about 10 miles east of Broome.

No difficulties were experienced in either drilling or recording, and good records were obtained.

The reflections, corrected for weathering, elevation, and spread effects, are shown in cross-section form on Plate 3. The selection and grading of reflections follow the criteria laid down by Gaby (1947). The time of each reflection corrected to datum, its grade, and the tangent of its angle of dip are all shown on the cross-section.

The velocity distribution used was that calculated from a $t \Delta t$ analysis of a survey made near Broome in 1954 (Vale and Williams, 1955).

4. RESULTS

The cross-section (Plate 3) shows a fair distribution of reflections down to 16,000 feet, a significant number between 16,000 and 20,000 feet and very few below 20,000 feet.

Above 10,000 feet, a south-western component of dip of about one degree can be seen at the north-eastern end of the traverse, and a north-eastern component of dip of about 5 degrees at the south-western end. In between, the dips of the reflections are approximately zero. Below 10,000 feet, the reflections show essentially zero component of dip throughout the length of the traverse, except for a few reflections at the extreme ends of the traverse which, although insufficient for an estimate of dip, do indicate a south-western component at the north-eastern end and a north-eastern component at the south-western end.

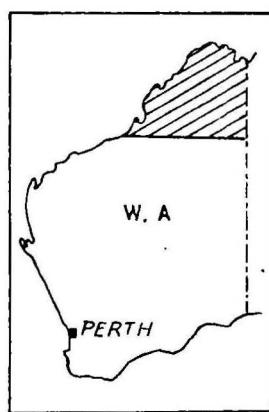
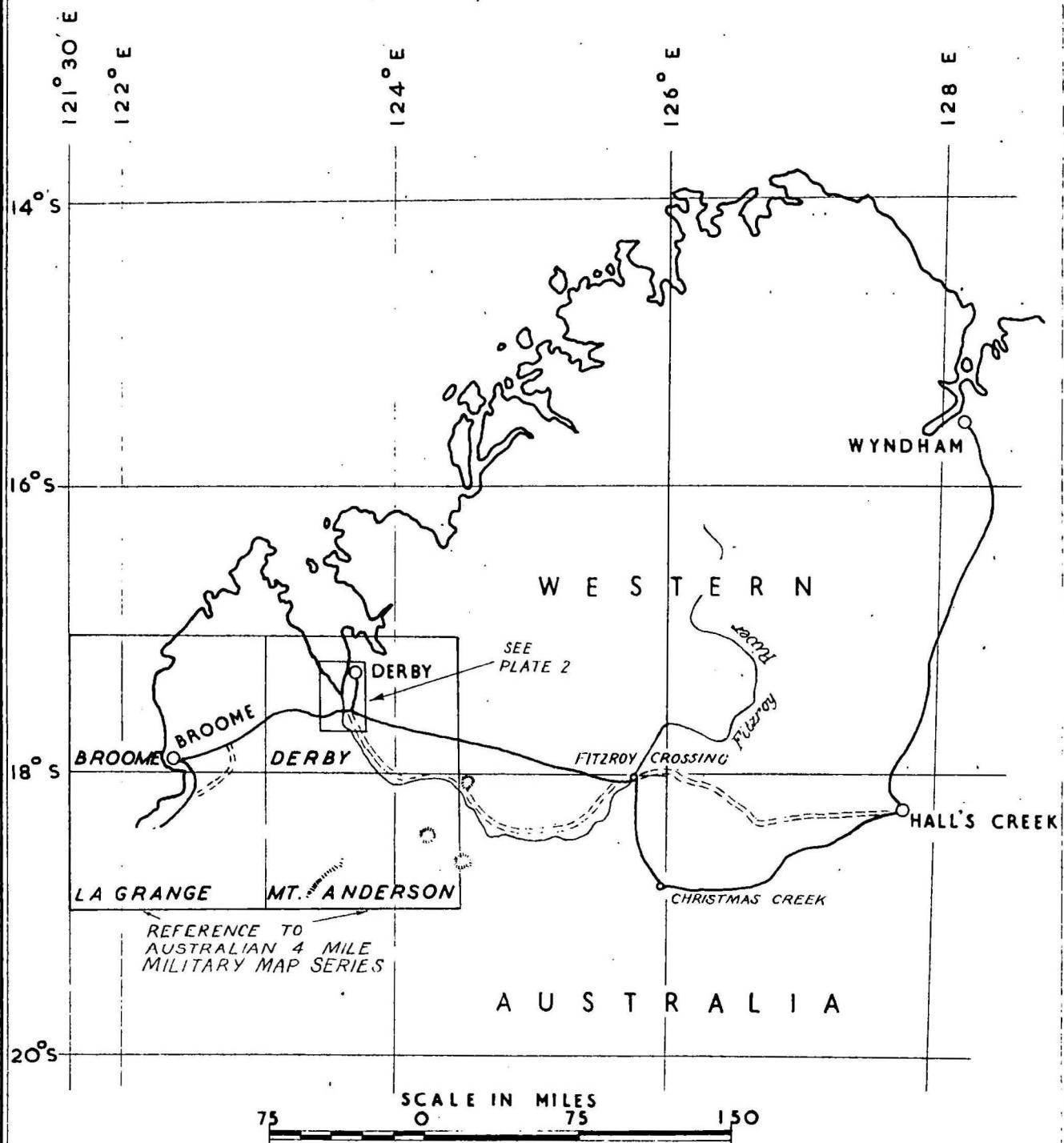
5. CONCLUSIONS

The results indicate that above 10,000 feet there is, within the limits of the traverse, a syncline of low relief, with its axis near S.P.7, and that below 10,000 feet, the beds are essentially flat. The thickness of the sedimentary rocks probably exceeds 16,000 feet and may exceed 20,000 feet.

These results, when considered in conjunction with those obtained by Seismograph Service Ltd. (under contract to West Australian Petroleum Pty. Ltd.) at Jurgurra Creek (Vale and Smith, 1956) and those obtained by the Bureau near Broome (Smith, 1957), indicate that over a large area in the north-western part of the Canning Basin the thickness of the sedimentary rocks exceeds 12,000 feet and may be more than 20,000 feet at its maximum point. That these figures may not be representative of the whole Basin is shown by the results obtained by the Bureau during a survey at La Grange, where a thickness of sedimentary rocks of only 7,000 to 8,000 feet was indicated (Smith and Goodspeed, 1956). Although the thickness at La Grange is admittedly a minimum value, the evidence to date does not show good reason to expect an appreciably greater value.

6. REFERENCES

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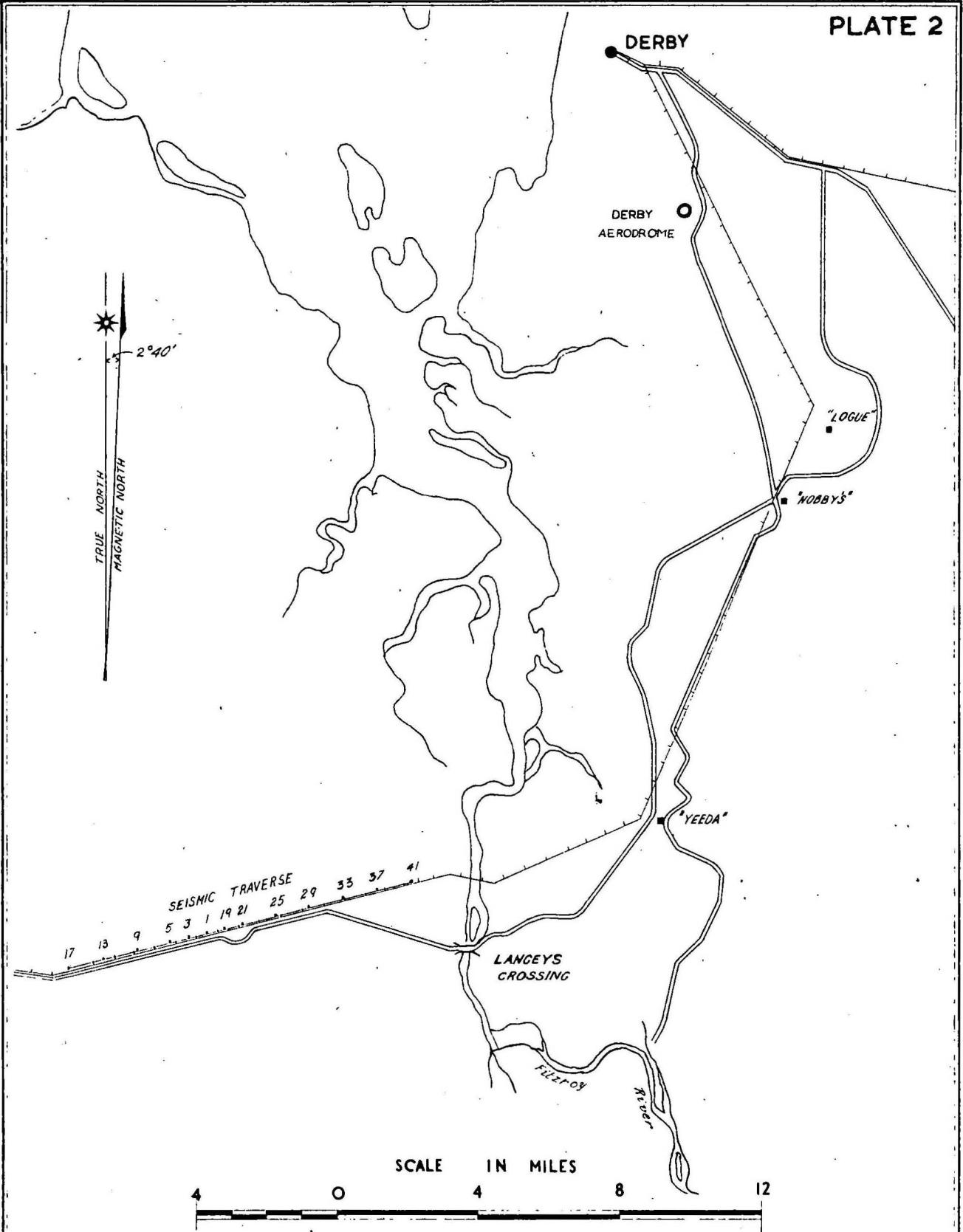


TRUE NORTH
MAGNETIC NORTH

SEISMIC REFLECTION TRAVERSE,
WEST OF LANGEYS CROSSING,
KIMBERLEY DIVISION, W.A.

LOCALITY MAP

GEOPHYSICIST



SEISMIC REFLECTION TRAVERSE
WEST OF LANGEYS CROSSING, KIMBERLEY DIVISION, WA.
PLAN OF TRAVERSE

