

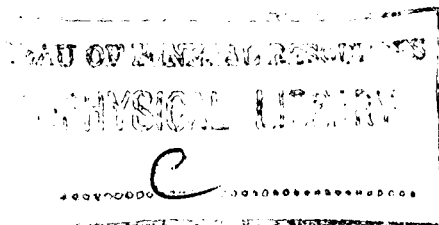
1963/25

C

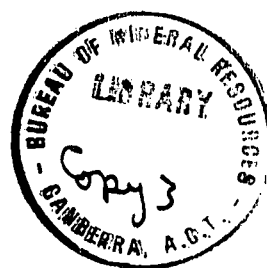
COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS



RECORD No. 1963/25

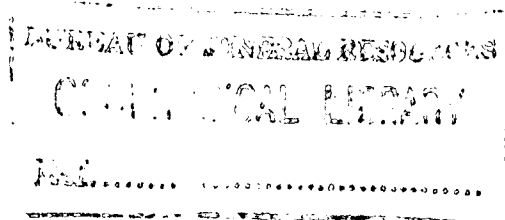


CHOWILLA AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, SA 1961

by

G.A. Young

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.



RECORD No. 1963/25

CHOWILLA AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, SA 1961

by

G.A. Young

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

CONTENTS

	Page
SUMMARY	
1. INTRODUCTION	1
2. METHOD	1
3. EQUIPMENT	1
4. GEOLOGY	2
5. RESULTS	3
6. REFERENCES	3

ILLUSTRATIONS

Plate 1. Preliminary magnetic and radiometric results
(Drawing No. I54/B1-2)

SUMMARY

An airborne magnetic and radiometric survey of the part of the Chowilla 1:250,000 map area bounded by latitudes $33^{\circ}15'S$ and $34^{\circ}00'S$ and longitudes $139^{\circ}30'E$ and $141^{\circ}00'E$ was made during February 1961; the surveyed area was located geologically within the north-western boundary of the Murray Basin. This Record describes the operations and discusses a preliminary analysis of the magnetic and radiometric results.

The general trend of tectonic features of basement rocks immediately north and west of the Murray Basin are reflected in the magnetic trends located in the northern and western regions of the survey area. Magnetic anomalies of a 'line-of-poles' configuration which extend southwards through the Murkaby, Koomooloo and Lindley one-mile areas are associated with the Florieton and Morgan Faults. The sediments of the Murray Basin, as reflected by the increasing depth to the magnetic basement, are shown to increase in thickness in a south-easterly direction towards the Chowilla one-mile area.

Although no radiometric anomalies were located in the survey area a noticeable increase in the background gamma-radiation level is apparent in the area of shallow magnetic basement.

1. INTRODUCTION

The airborne magnetic and radiometric survey of part of the Chowilla 1:250,000 area (Plate 1) was made by the Bureau of Mineral Resources, Geology and Geophysics at the request of the South Australian Mines Department. This survey, together with similar work carried out by Adastra Hunting Geophysics Ltd for the South Australian Mines Department and by private oil companies (O'Driscoll, 1960), has resulted in complete aeromagnetic coverage of the Murray Basin west of longitude 141°00'E.

The survey was flown by the DC.3 aircraft VH-MIN, which operated from Renmark during February 1961. The Bureau of Mineral Resources personnel engaged in the survey were G.A. Young, A.J. Barlow, M.J.W. Duggin, A. Drage, P.B. Turner, C. Braybrook, D. Park and K. Mort. Trans-Australia Airlines staff concerned were Captain G. Close, First Officer D. Baker, and W. Milnes.

All survey records were handed over to the South Australian Mines Department for reduction and subsequent production of an aeromagnetic contour map of the area.

2. METHOD

The survey consisted of continuously measuring the variation in the total intensity of the Earth's magnetic field, and in the level of gamma radiation, along predetermined east-west flight-lines within the area. These flight-lines were spaced at one-mile intervals, and were marked on aerial photographs to form a basis for navigation.

The aircraft's track was continuously recorded by means of a 35-mm vertical strip camera supplemented by air-position data. The height of the aircraft was maintained at 500 ft (\pm 100 ft) above ground level.

A system of north-south tie-lines, spaced at 15-mile intervals, was flown to enable the reduction of the results of the complete survey to a common datum for magnetic contouring.

3. EQUIPMENT

The aircraft was equipped with a saturable-core fluxgate magnetometer, the detector head of which was mounted in a boom projecting from the tail of the aircraft. This mounting arrangement, together with compensating coils located in the boom, reduces the magnetic disturbance field of the aircraft to a negligible order in the vicinity of the detecting element. The output of the magnetometer was recorded graphically on a Speedomax chart recorder and in a coded form on five-hole digital punch tape.

The radiometric equipment consisted of two modified twin-crystal MEL scintillation detector heads, mounted within the aircraft and feeding into a BMR-type ratemeter, and a plastic phosphor scintillation detector head suspended 290 ft below the aircraft in a towed 'bird' and feeding into a second BMR-type ratemeter. The outputs of the two ratemeters were graphically recorded on Kelvin & Hughes chart recorders.

An STR 30B frequency-modulated radio-altimeter was used to measure the height of the aircraft above the ground. The altitude profile was recorded on a Kelvin & Hughes chart recorder.

The aircraft's track was recorded by an Aeropath 35-mm strip camera. Additional data for areas of low topographic detail were provided by an air-position indicator which produced a continuous plot of the aircraft's air position.

An electronically controlled fiducial-marker system provided correlation of chart, tape, and film records.

4. GEOLOGY

Plate 1 shows a regional geological map of the Chowilla 1:250,000 area and surrounding areas; this is based on the Tectonic map of Australia (published by the Bureau of Mineral Resources, 1960).

Most of the surveyed area lies within the north-western part of the Murray Basin; the oldest sedimentary rocks exposed in this part of the Basin are of Tertiary age.

In the extreme north-western part of the Chowilla 1:250,000 area early Palaeozoic to Proterozoic rocks of the Mount Lofty/Olary arc are exposed. These rocks, which include sediments and metasediments, form the basement of the Murray Basin in this region. Structural elements within these rocks north-west and north of the Chowilla 1:250,000 area, paralleling the boundary of the Basin, strike at 015 degrees and 050 degrees respectively.

Borehole data have confirmed the presence of basement faulting (Florierton and Morgan Faults) west of the Murray River south of Morgan; this faulting extends northwards into the Lindley, Koomooloo, and Murkaby one-mile areas. In addition, borehole data (Kenny, 1934; O'Driscoll, 1960) show the thickening of Tertiary sediments in a south-easterly direction to over 1500 ft and the presence of unknown thicknesses of underlying Cretaceous sediments in the area about Loxton and Renmark (Crespin, 1956). Farther east the AOG Wentworth No. 1 well entered probable Lower Permian sediments at just over 1600-ft depth and was completed at 2081-ft depth in conglomerates of probable Lower Permian age (Evans, 1962). The Loxton bore and Wentworth well are located outside the boundaries of the area shown on Plate 1.

5. RESULTSMagnetic results

The magnetic profiles show considerable magnetic disturbance in the western and northern parts of the surveyed area and little magnetic activity in the remainder of the area (Plate 1).

The trends of the magnetic anomalies located in the disturbed area are continuous with trends located in the areas that had previously been surveyed immediately north and south of the Chowilla area. The predominant feature of these trends is the change from a 020-degree strike in the Lindley, Koomooloo, and Murkaby one-mile areas, to a 060-degree strike in the Pine Valley one-mile area. The sources of the anomalies are probably within the Upper Proterozoic basement rocks as they closely follow the structural trends of these rocks. In the north-western corner of the Murkaby one-mile area, where Upper Proterozoic rocks are exposed, the gradients of the magnetic anomalies indicate that the sources are close to the surface.

Magnetic anomalies of a 'line-of-poles' configuration are apparently associated with the Floriston and Morgan Faults which extend southwards through the Murkaby, Koomooloo and Lindley one-mile areas into the Renmark 1:250,000 area. Such magnetic anomalies could be produced by basic intrusive rocks along the fault zone, and similar linear magnetic features located in this area may be associated with further basement faulting.

The general decrease in magnetic disturbance progressing from the north-western corner of the surveyed area to the south-eastern corner reflects the increasing thickness of the Murray Basin sediments in this direction. It is estimated that there is less than 1000 ft of sediments in the centres of the Lindley and Pine Valley one-mile areas, and that there is about 3000 ft of sediments in the centre of the Chowilla one-mile area. It would therefore seem likely that Lower Cretaceous sediments underlie those of the Tertiary in the south-eastern region of the surveyed area, but probably do not attain any appreciable thickness.

Radiometric results

No radiometric anomalies were detected in the surveyed area. However, there was a noticeable increase in the background gamma-radiation level in the north-western part of the surveyed area which corresponds very broadly with the area of shallow basement rock. An area in the south-eastern part of the Chowilla one-mile area also shows an increase in the level of radioactivity.

6. REFERENCES

- | | | |
|-------------|------|---|
| CRESPIN, I. | 1956 | Stratigraphy and micropalaeontology of Australian Oil and Gas Corporation Bore No. 1 Loxton, South Australia. <u>Bur. Min. Resour. Aust. Rec. 1956/77</u> (unpubl.) |
|-------------|------|---|

- | | | |
|--------------------|------|--|
| EVANS, P.R. | 1962 | A palynological report on AOG
Wentworth No. 1 NSW with observations
on the Permian of the Oaklands-
Coorabin area of the Murray Basin.
<u>Bur. Min. Resour. Aust. Rec. 1962/4</u>
(unpubl.) |
| KENNY, E.J. | 1934 | West Darling district. A geological
reconnaissance with special reference
to the resources of subsurface water.
<u>Minor. Resour. N.S.W. 36.</u> |
| O'DRISCOLL, E.P.D. | 1960 | The hydrology of the Murray Basin
province in South Australia.
<u>Bull. geol. Surv. S.A. 35.</u> |

