COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD 1961 No. 51

COBAR, NYMAGEE, AND CARGELLIGO (EUABALONG) AIRBORNE MAGNETIC AND RADIOMETRIC SURVEYS, N.S.W. 1957-58

by

A.G. Spence

RECORD 1961 No. 51

COBAR, NYMAGEE, AND CARGELLIGO (EUABALONG)

AIRBORNE MAGNETIC AND RADIOMETRIC SURVEYS, N.S.W. 1957-58

by

A.G. Spence

CONTENTS

		Page
	ABSTRACT	
1.	INTRODUCTION	1
2.	METHOD	1
3.	EQUIPMENT	2
4.	GEOLOGY	2
5.	MAGNETIC RESULTS	3
6.	RADIOMETRIC RESULTS	4
7.	CONCLUSIONS	5
8.	REFERENCES	6

ILLUSTRATIONS

Plate 1. Cobar : map showing preliminary magnetic and radiometric results (G 290-7).

Plate 2. Nymagee : map showing preliminary magnetic and radiometric results (G 338-3).

Plate 3. Cargelligo : map showing preliminary magnetic and radiometric results (G 338-4).

ABSTRACT

Airborne magnetic and radiometric surveys carried out over the 4-mile military map areas of Cobar, Nymagee, and Cargelligo are described, and proliminary results are given. Because of the known association of magnetite and pyrrhotite with some of the ore-bodies in this region, the magnetic results should prove a useful guide to further prospecting.

1. INTRODUCTION

The airborne magnetic and radiometric surveys described in this report were undertaken by the Bureau of Mineral Resources as part of a larger programme requested by the New South Wales Department of Mines.

The areas surveyed were the 4-mile military map areas of Cobar, Nymagee, and Cargelligo. The Cobar area was surveyed in 1957 and the Nymagee and Cargelligo areas in 1958, using the DC. 3 aircraft VH-BUR.

The purpose of the surveys was to assist in the search for ore-bodies, and also to provide information which might be useful in solving problems of regional geological structure.

The survey of the Cobar area was based on Dubbo. The Bureau staff involved were : A.G. Spence (party leader), R.M. Carter, F.G. Walker, P. Grimsley, D.F. Upton, R. Jones, W. Spence and P. Gillespie. The Trans-Australia Airlines staff who assisted were N.K. Pascoe, D. Wright and F.W. McDonald.

For the survey of the Nymagee and Cargelligo areas the aircraft was based at Parkes. The Bureau staff involved were: A.G. Spence (party leader), J.R. Pollard, D.F. Upton, P. Sowden, E.J. Lynne, J. Croger, R. Jones and B. Hamilton. Trans-Australia Airlines staff were P.J. Norriss, J. Bartlett, and A. Smith.

Maps showing the results of the survey in the Cobar 4-mile area have been issued recently. The results of the Nymagee and Cargelligo 4-mile areas should be published by the end of 1961. All maps are being published at a scale of 2 mile to 1 inch, and four such maps are required to cover each 4-mile area.

2. METHOD

The variation in total magnetic intensity was systematically recorded throughout the survey area by an airborne magnetometer. Tie lines were flown to provide the information required to remove systematic error from the magnetic data and to reduce the individual flight lines to a common datum.

Gamma radiation from the ground was recorded by scintillographs to indicate (a) radiometric anomalies i.e. localised areas of above-average radioactivity, and (b) the position of changes in the average level of radioactivity.

The survey area was covered by flying parallel east-west lines spaced 1 mile apart. The nominal altitude of the aircraft was 500 ft above ground level but the actual altitude occasionally varied by as much as 100 ft above or below this level. The aircraft was navigated by comparing ground feature with detail on mosaics of vertical aerial photographs, and the actual track flown was recorded by a vertical camera. The co-ordinates of the aircraft's air position, obtained from the air position indicator, were recorded at 10-second intervals. A combination of the air-position-indicator and photographic data was used to plot the track flown.

3. EQUIPMENT

The magnetometer used was a modified AN/ASQ-8 fluxgate type, with the detector head mounted in a boom on the tail of the aircraft, remote from interfering magnetic fields due to the aircraft itself. The output of the magnetometer, which measured the total field intensity, was recorded on a "Speedomax" recorder.

The radiometric equipment measured the intensity of gamma radiation at two heights, nominally 500 and 200 ft above ground level. The inboard equipment consisted of two "Chalk River" scintillation detector heads feeding into an M.E.L.-type ratemeter. The outboard equipment consisted of a scintillation detector mounted in a "bird" and towed below and behind the aircraft on a 500-ft cable. The output of this detector was connected via the cable to an M.E.L. ratemeter in the aircraft. The output of each system was recorded on a dual-channel "Rectiriter" recorder.

An STR-30B radio altimeter was used for altitude control, and the altitude profile was recorded on a single-channel "Rectiriter" recorder.

An "Aeropath" strip camera and a Mk. 1A air position indicator were used to record the aircraft's position. All records were correlated by a system of fiducial marks and numbers.

4. GEOLOGY

Cobar area (Plate 1)

Most of the Cobar area forms part of the major tectonic feature called the Cobar Platform which is in central New South Wales and borders the western plains. The area includes large regions of Devonian and Silurian rocks and a few scattered granitic intrusions. Recent alluvium and sand cover the rest of the area.

Copper and gold have been mined in the district around Cobar township since 1870 and a few mines are still operating. Mineralisation occurs in a narrow attenuated zone of slate and appears to be localised at intersections of shears and faults. The geology of this district has been mapped in considerable detail. In 1947-49 a programme of geophysical and geological exploration in the area was carried out jointly by the Bureau of Mineral Resources and Zinc Corporation Ltd. (Thomson, 1950).

Detailed geological information on the rest of the Cobar area is sparse and is restricted to a few old mining centres such as Canbelego and Budgery.

Nymagee area (Plate 2)

Most of this area, which is immediately south of the Cobar area, lies in the Cobar Platform. Silurian rocks occur over large portions of the area, but they are mainly soil covered, and outcrops are few. The Silurian rocks are mainly slate and sandstone, and in some places much shearing has changed the slate to schist. Devonian rocks occur mainly as hills and ridges of hard quartzite with shale and sandy limestone. Massive granitic and porphyritic intrusions occurred in late Devonian time and much of the gold and copper mineralisation is related to these.

Copper and gold have been mined at Nymagee and Bobadah, and copper in the Mount Hope area. In most cases the mineralisation has occurred in fracture zones similar to that at Cobar. Magnetite and pyrrhotite are associated with the ore at Nymagee. Uranium mineralisation, associated with copper, occurs in the Erimeran granite at Blackfellows Dam.

Cargelligo area (Plate 3)

This is the most southerly of the three areas surveyed, and lies directly south of the Nymagee area. Much of the area is covered by alluvium of the western plains and the Lachlan River system. Silurian slate and sandstone occur in the eastern half of the area, but not nearly as extensively as in the Cobar and Nymagee areas. Devonian rocks, chiefly quartzite and sandstone, are mainly confined to elevated areas. Intrusive igneous rocks, mainly granite, are confined to the eastern portion of the area. Some Tertiary basalt also occurs, scattered through the area.

Very little mining has been done. Tin has been found at points along a line running approximately north and south through Yalgogrin, and wolfram deposits are known at Erigolia.

5. MAGNETIC RESULTS

Cobar area

Previous magnetic surveys in the Cobar district have revealed many anomalies (Richardson and Keating, 1947; Thomson, 1950). Some of the anomalies associated with known ore-bodies were broad and of low intensity, and consequently it is advisable that anomalies in similar geological environments be further investigated, even if their intensities are as low as 20 gammas. A survey using both magnetic and self-potential methods was carried out in the Hermidale and Girilambone districts, and magnetic anomalies of low intensity were discovered near the mines at Budgery and Girilambone (Barlow, 1950).

Nine anomalies in the Cobar area were further investigated by drilling (Thomson, 1950). Four of these, at Great Cobar, New Cobar, Chesney, and New Occidental, were directly associated with known ore deposits which have been commercially exploited. Three, at Peak, Coronation, and C.S.A., occurred near known ore-bodies but did not lead to further discoveries, and two, at Mopone and Dapville, occurred well away from known ore-bodies. The one at Dapville led to the discovery of an ore-body of minable size and grade.

The aeromagnetic anomalies detected are shown on Plate 1. This shows the peak value of each anomaly with respect to the mean field level in its vicinity. The accuracy of positioning of the anomalies is $\frac{1}{4}$ mile in the east-west direction and $\frac{1}{2}$ mile in the north-south direction.

Some features revealed by this preliminary presentation of results are worth comment. The Devonian area, to the west of Cobar, is practically devoid of anomalies. Most of the anomalies in the north-south belt through Cobar have been discovered and explained by previous workers (Richardson and Keating, 1947; Thomson, 1950). Although there are several anomalies north of Mopone (5 miles north of Cobar) not specifically mentioned in their reports, it appears likely that these are similar to the Mopone anomaly, which was explained by the occurrence of extensively disseminated magnetite.

The strongest anomalies, including one of 2600 gammas, were recorded over Silurian rocks in the south-eastern corner of the area. They are associated with known occurrences of serpentine. Other fairly strong anomalies in the south-eastern corner are probably associated with alluvium-covered serpentine.

A line of negative anomalies which extends about 10 miles in a north-south direction was detected in the central northern section of the area. This feature could be caused by a reverse-polarised dyke. Many of the anomalies appear to fall in lines of considerable length. It is possible that these could mark shear zones similar to that which runs through Cobar.

There is a very disturbed region along the eastern edge of the area. The anomalies in the part of this region north of the Cobar railway were noted by Zinc Corporation Ltd. observers in 1947 (Thomson, 1950). It would be necessary to extend the survey to the east to get a clear picture of this disturbed region.

Nymagee area

Previous geophysical work in this area has indicated magnetic anomalies at Nymagee and Mount Hope (Oldham, 1959; Doyle, 1951).

The aeromagnetic anomalies detected are shown on Plate 2. The accuracy of positioning is about ½ mile in both the north-south and east-west directions.

The anomalies are of relatively low intensity and lie in lines running northward or north-westward. Some of these lines are of considerable length; the one starting in the south-eastern part of Plate 2 and extending into Plate 3 is approximately 25 miles long. These magnetic features show no close correspondence with surface geological boundaries. However, most of them lie in or near areas of Silurian or late Silurian to Middle Devonian rocks.

Anomalies were recorded near the Tallebung tin mines, the Shuttleton copper mine, and the Overflow mine.

Cargelligo area

No known previous geophysical work has been done in this area. The aeromagnetic anomalies detected are shown on Plate 3. The accuracy of positioning is about ½ mile in both the north-south and east-west directions.

The Cargelligo area is south of the Nymagee area and the general northerly or north-westerly trend of the magnetic features noted in the Nymagee area occurs here also. Again the western portion of the area is practically devoid of anomalies. To the north and east of Tullibigeal a line of anomalies follows the eastern contact between granite and Ordovician rocks. Such contact areas may be favourable places for tin mineralisation. Some of the other magnetic features may be associated with sub-surface contacts of a similar type; in particular, the anomalies south-east of Erigolia and those west of Cargelligo.

6. RADIOMETRIC RESULTS

The accuracy of positioning of the radiometric data is within ¼ mile in the east-west direction and ½ mile in the north-south direction in the Cobar area, and about ½ mile in both the north-south and east-west directions in the Nymagee and Cargelligo areas. Details of the radiometric data are discussed below.

Cobar area

Only one radiometric anomaly was detected in the Cobar area. This is located in an area of Silurian porphyry, felsite, and rhyolite about 3 miles south-east of Canbelego. No attempt was made to interpret the Cobar records for changes in level of radioactivity.

Nymagee area

One anomaly was detected in this area. It occurs about 12 miles west-south-west of Nymagee near the edge of an area of Tertiary sandstone and ironstone gravel. Changes in level of radioactive intensity are also indicated on the map of this area (Plate 2). The magnitude of the changes was between one half and one times background level.

Almost all the changes in level of radioactive intensity occur in or near areas of granite or porphyry. The exceptions are in the north-west of the area, in a region of Tertiary sandstone and gravel. In general the porphyritic felsites and rhyolites were found to be more radioactive than the other rock types in the area.

Cargelligo area

Four radiometric anomalies were detected in this area. One occurs in Silurian slates north of Lake Cargelligo, two are to be found in the porphyry and rhyolite west of Lake Cargelligo, and the fourth is near the boundary of an area of Ordovician rocks north-west of Tullibigeal.

Changes in level of radioactive intensity are indicated on the map of this area (Plate 3) in the same way as for the Nymagee area. Here again the distribution of areas of above-average radioactivity indicates that most of the radioactivity is associated with the porphyritic rocks.

7. CONCLUSIONS

The magnetic results should provide a useful guide to further prospecting because of the known association of pyrrhotite and magnetite with many of the ore-bodies in the areas surveyed. The more promising anomalies are those in Silurian rocks, as most of the known mineralisation in the areas surveyed occurs in these rocks. It should be noted however that only a preliminary assessment of the magnetic data can be made from the peak magnetic anomaly values as shown on Plates 1, 2, and 3.

It is not possible to comment on the radiometric anomalies recorded during the survey, as their evaluation must be preceded by a ground inspection. Inspection of the anomalies is recommended when the final maps are published showing the position of the anomalies more accurately. It is considered that change in level of radioactive intensity may provide a guide to geological mappings in some localities.

8. REFERENCES

BARLOW, A.J., 1950 Geophysical surveys at Hermidale and Girilambone, N.S.W. Bur. Min. Resour. Aust. Records 1950/25.

DOYLE, H.A., 1951 Geophysical surveys at Mount Hope, N.S.W. Bur. Min. Resour. Aust. Records 1951/12.

HOWARD, L.E., 1957 Carborne radiometric surveys at Blackfellows Dam prospect near Condoblin, N.S.W. Bur. Min. Resour. Aust. Records 1957/57.

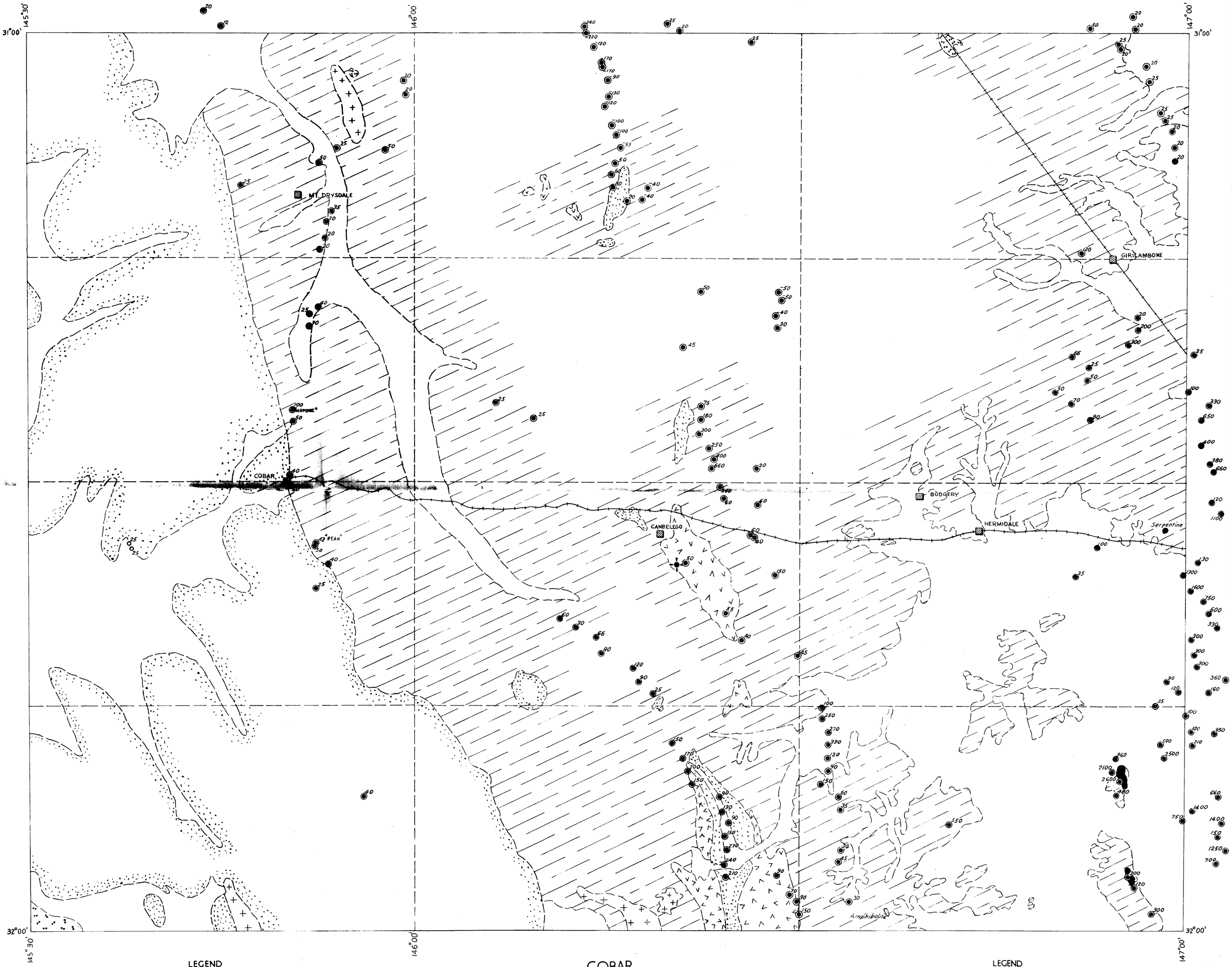
OLDHAM, W.H., 1959 Geophysical survey of Nymagee Copper Field, New South Wales. Bur. Min. Resour. Aust. Records 1959/1

RAYNER, E.O., 1954 Pearces uranium prospect, Blackfellows Dam, Condoblin district. Geol. Surv. N.S.W. Records (Unpublished).

RAYNER, E.O., 1956 Second report on the Blackfellows Dam uranium prospect Condoblin district. Geol. Surv. N.S.W. Records (Unpublished).

RICHARDSON, L.A. and KEATING, W.D. 1947 Preliminary report; geophysical survey at Cobar, N.S.W. Bur. Min. Resour. Aust. Rec. 1947/60.

THOMSON, B.P. 1950 Cobar exploration 1947-9. Zinc Corporation Ltd., (Unpublished company report).



LEGEND

CAINOZOIC — *Alluvium and sand*

Gravels and sand

TERTIARY

Leucite basalt

DEVONIAN — *Sandstone, quartzite, conglomerate and shale.*

Serpentine

Granite

SILURIAN — *Slate, schist, phyllite, chert, crushed sandstone.*

Porphyry, felsite, rhyolite, tuff, breccia and basalt.

COBAR

PRELIMINARY MAGNETIC AND RADIOMETRIC RESULTS

AIRBORNE SURVEY, 1957,

OF

COBAR 4 MILES TO 1 INCH MILITARY MAP AREA, N.S.W.

SCALE

MILES 4 0 4 8 12 MILES

True North — Magnetic North

LEGEND

60 — *Magnetic anomaly showing approximate intensity in gammas above or (-) below mean field level in vicinity of anomaly.*

Radiometric anomaly

Geological boundary

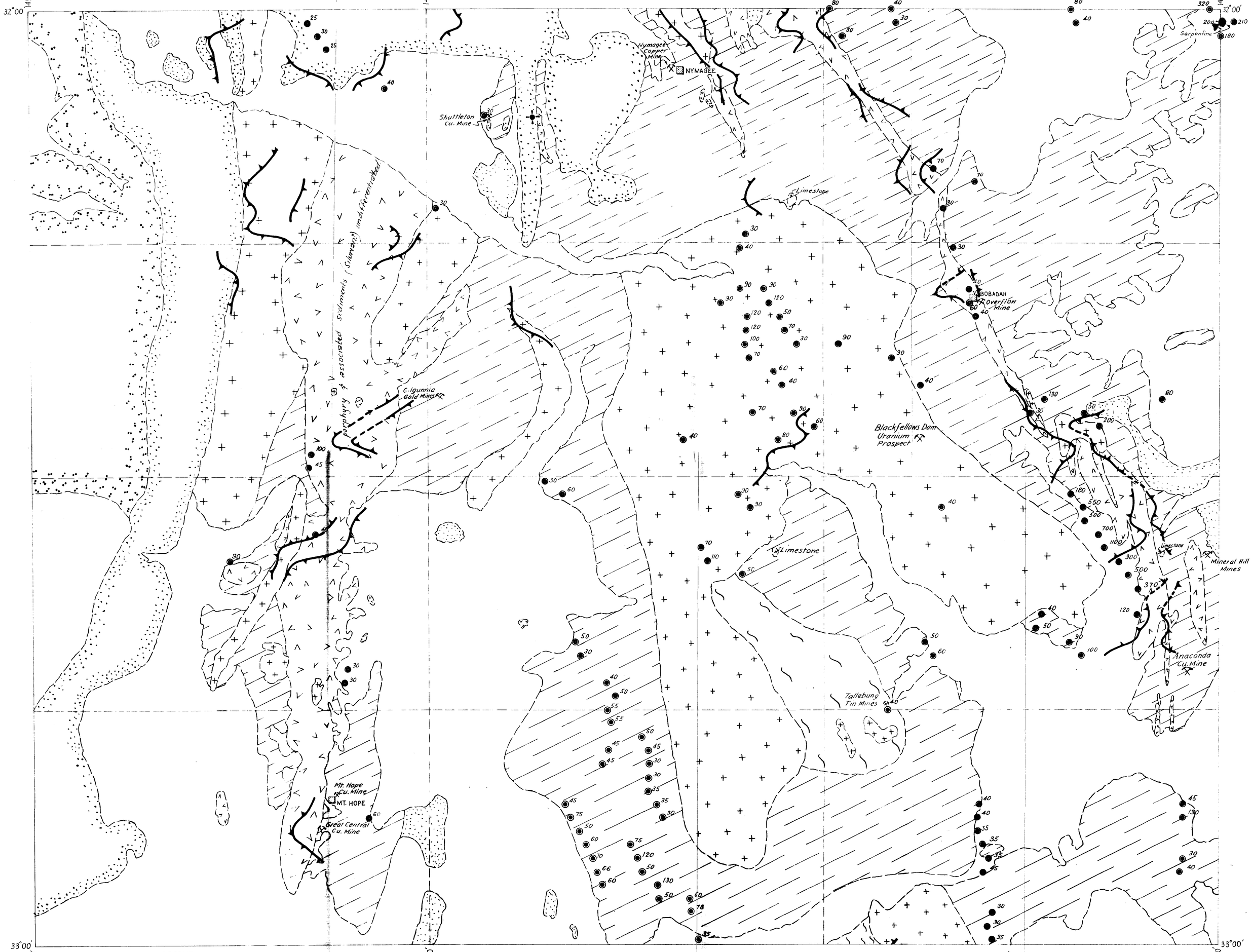
Railway

Geological data from geological map DA 312 (interim compilation on scale 8 miles to an inch), dated 24th February 1960, by Geological Survey of New South Wales.

Geophysical Branch, Bureau of Mineral Resources, Geology & Geophysics.

G290-7

TO ACCOMPANY RECORD 1961, No. 51



LEGEND

QUATERNARY	Alluvium, sand and unconsolidated waste cover.	
TERTIARY	Soft white sandstone ironstone gravel and siliceous capping (greybilly)	
DEVONIAN	Sandstone, quartzite, conglomerate, claystone and shale.	
LATE SILURIAN TO MIDDLE DEVONIAN		Serpentine
		Granite
		Porphyry, felsite, rhyolite, tuff, breccia and basalt, with associated sediments.
SILURIAN		Slate, phyllite, schist, cleaved sandstone, chert shale, quartz veins.
ORDOVICIAN		Slate

NYMAGEE

PRELIMINARY MAGNETIC AND RADIOMETRIC RESULTS

AIRBORNE SURVEY, 1958,

OF

NYMAGEE 4 MILES TO 1 INCH MILITARY MAP AREA, N.S.W.

SCALE

MILES 4 0 4 8 12 MILES

LEGEND

60 Magnetic anomaly showing approximate intensity in gammas above or (-) below mean field level in vicinity of anomaly.

Radiometric anomaly

Change in level of radioactive intensity of magnitude between half and one times background level. The barbed edge faces the area of lower intensity.

Geological boundary

Mines

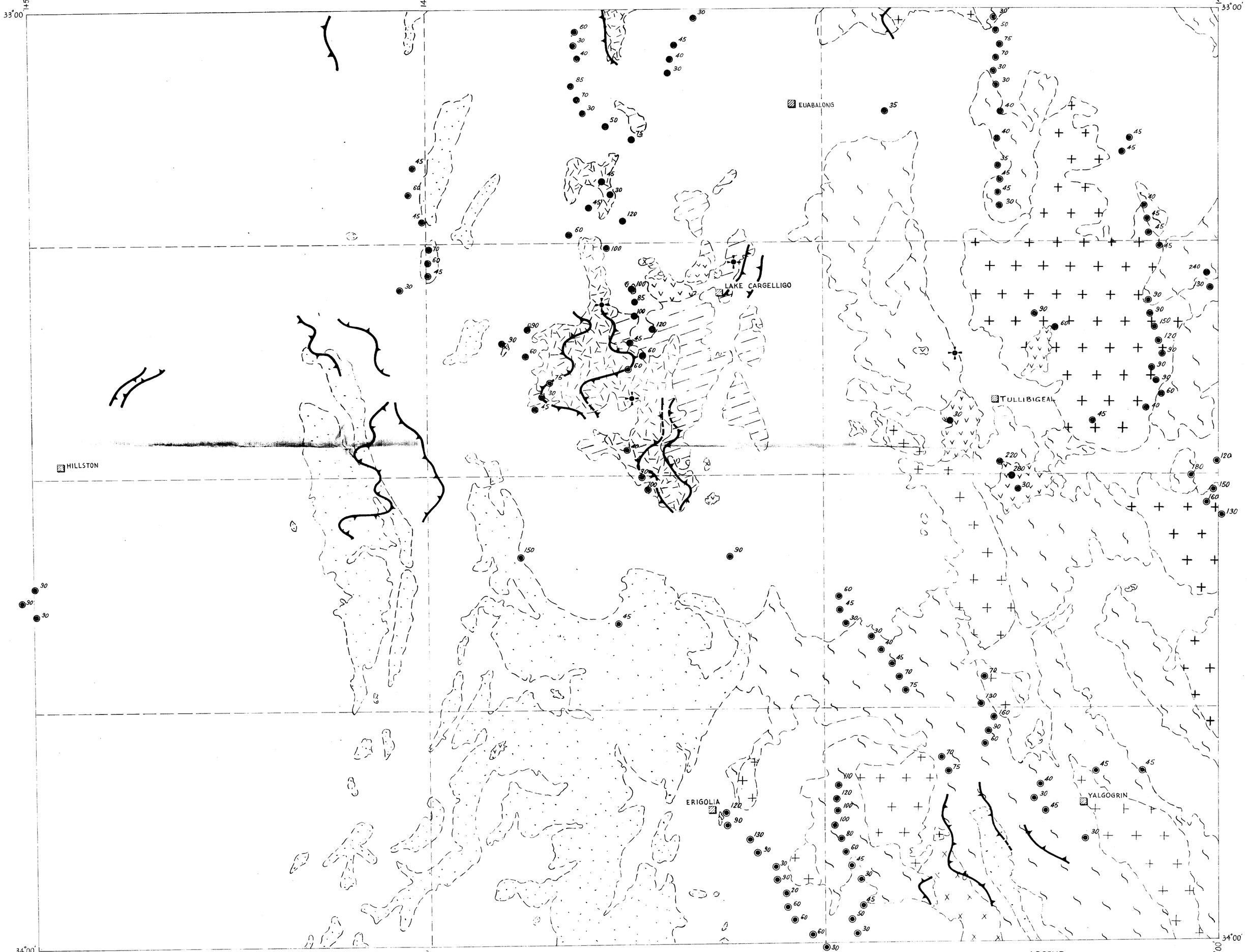
Geological data from draft geological map of Nymagee 4-mile area supplied by Geological Survey of New South Wales, February 1960.

True North
Magnetic North

Geophysical Branch, Bureau of Mineral Resources, Geology & Geophysics.

G 338-3

TO ACCOMPANY RECORD 1961, No.51



LEGEND

TERTIARY TO RECENT — Salt, clay, sand, grit, gravel, travertine, magnesite and grey billy.

TERTIARY — Basalt

UPPER DEVONIAN? — Conglomerate, quartzite, sandstone and shale.

SILURIAN? — Slate, phyllite and sandstone; Rhyolites and porphyry with sheared conglomerate, tuff, slate, schist, and quartzite; Medium to coarse grained porphyritic granite; Medium grained biotite or muscovite granite; Porphyry

ORDOVICIAN — Slate, phyllite, schist, sandstone and quartzite.

LEGEND

60 — Magnetic anomaly showing approximate intensity in gammas above or (-) below mean field level in vicinity of anomaly.

Radiometric anomaly

Change in level of radioactive intensity of magnitude between half and one times background level. The barbed edge faces the area of lower intensity

Geological boundary

CARGELLIGO (EUABALONG)

PRELIMINARY MAGNETIC AND RADIOMETRIC RESULTS

AIRBORNE SURVEY, 1958,

OF

EUABALONG 4 MILES TO 1 INCH MILITARY MAP AREA, N. S. W.

SCALE

MILES 4 0 4 8 12 MILES

True North / Magnetic North

Geological data from Geological Map No B346 of Euabalong 4-Mile Area, dated July 1958, compiled by Officers of the Geological Survey of New South Wales, principally R. J. Griffin.

Geophysical Branch, Bureau of Mineral Resources, Geology & Geophysics.

G 338-4

TO ACCOMPANY RECORD 1961, No. 51