COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

REPORT No. 1947/60

PRELIMINARY REPORT

GEOPHYSICAL SURVEY AT COBAR, N.S.W.

L. A. RICHARDSON, SUPERINTENDING GEOPHYSICIST

and

W. D. KEATING, GEOPHYSICIST.

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CONTENTS

		Page
I	Introduction	1
II	Geology and Object of the Survey	2
III	Results of the Survey	3
IV	Drilling Recommendations	6
V	Summary and Conclusions	7

PLANS

Plate 1 Plan showing area surveyed, principal geophysical features and magnetic anomalies (Plan No. G.14).

Plate 2 Sheet showing complete survey results in the form of magnetic vertical force profiles (Plan No. G.15).

Melbourne,
3rd November, 1947.

PRELIMINARY REPORT

GEOPHYSICAL SURVEY AT COBAR, N.S.W.

ABSTRACT

As the first step in a geophysical investigation which is part of an exploratory programme being carried out on the Cobar Mining Field by the Bureau of Mineral Resources, Geology and Geophysics, and the N.S.W. Department of Mines, about three months have so far been spent on field work using the magnetic method only.

This survey first covered the New Cobar-Chesney part of the main line of mineralisation, and broad magnetic anomalies of low intensity were found associated with the New Cobar and Chesney orebodies. It is believed that the anomalies are due largely to the pyrrhotite known to occur in the ore of these mines. The survey was then extended northerly to the Fort Bourke Shaft, southerly to the Wood Duck Shaft and westerly to the Gladstone and Dapville areas. On the Dapville area two anomalies were found which are comparable in type and intensity, though smaller in extent, than the anomalies associated with the New Cobar and Chesnay Mines.

It is possible therefore that these anomalies may indicate the presence of copper-gold mineralisation in the Dapville area. Accordingly it has been recommended that the areas beneath these anomalies should be tested by diamond drilling.

I. INTRODUCTION

This geophysical survey was undertaken as part of a campaign by the N.S.W. Mines Department and the Commonwealth Bureau of Mineral Resources, Geology and Geophysics to explore the ore possibilities of the Cobar Mining Field.

Tests, made in January 1947, on specimens of ore from the operating mines (New Occidental, New Cobar and Chesney) showed that some of the ore from the New Cobar and Chesney Mines

/2..

exhibited appreciable magnetisation due to its pyrrhotite and possibly magnetite content.

The survey was commenced on 26th March, 1947 using the magnetic method only as a first method of attack. This phase of the survey was terminated on 2nd July, 1947. Watts Vertical Force Variometers Nos. 15887 and 16128 were used, the field work being carried out by the writers. Arrangements were made for part of the pegging of traverses to be carried out by the survey staff of the New Occidental Company.

It is proposed to reopen the survey on an expanded scale in the near future.

II. GEOLOGY AND OBJECT OF SURVEY.

Information concerning the geological background of the problem was provided by the recent work of the Geological Section of the Bureau and by a report prepared early in 1947 by C. St. J. Mullholland and S.O. Rayner of the N.S.W. Mines Department.

The geological features, which have a direct bearing on the geophysical work, may be summarised as follows.

1. The ore bodies in the vicinity of the New Occidental and New Cobar Mines occur in a belt of sedimentary rocks comprising sandstones and slates.
2. The ore bodies are siliceous and the percentage of total sulphides is small.
3. Pyrrhotite is a constituent of some of the ore from the New Cobar and Chesney Mines.
4. The areas or zones in which new ore bodies may be found appear to be broadly indicated by the distribution of the known ore bodies.

The first objective of the survey was to search for magnetic anomalies, possibly arising from pyrrhotite and magnetite mineralisation, between the New Cobar and Chesney mines. This followed a recommendation made by the Geological Section of the Bureau. The survey was eventually extended northerly to the Fort Bourke Shaft, southerly to include the

/3..

Burrabungie, Mt. Pleasant and Wood Duck areas and westerly to the Gladstone and Dapville areas.

The magnetic method was used in this first stage of the survey because it offers a ready means of detecting the presence of concealed mineralised centres or zones, such as exist at Cobar, in those cases where the mineral composition of the zone includes a sufficient quantity of either magnetite, pyrrhotite, ilmenite or certain forms of hematite.

The essential features of the magnetic method of prospecting may be briefly outlines as follows. Rocks forming the Earth's crust have an intensity of magnetisation composed of remanent magnetisation and magnetisation by induction in the Earth's magnetic field. Those rocks which contain none of the above mentioned minerals commonly exhibit very low intensity of magnetisation and vice versa. The effect of high rock magnetisation is to produce a magnetic field which can, under favourable circumstances, be measured at the surface and which is a function of the intensity of magnetisation, mass, form and depth of the rock-mass concerned. This field is commonly referred to as a magnetic anomaly because it represents an irregularity in the Earth's magnetic field. In geophysical prospecting it is customary to determine this anomalous field in terms of its vertical component by observing the differences in the vertical component of the Earth's magnetic field from point to point over the area being surveyed.

III. RESULTS OF THE SURVEY.

Over the greater part of the area surveyed there are minor magnetic disturbances of superficial or near-surface origin and it is believed that these have little significance. If there are any exceptions i.e. disturbances due to the near-surface portions of mineralised zones, their identification as such would be difficult and no attempt to pick out such anomalies is being made at this stage.

In addition to the above mentioned local anomalies however, there are certain anomalies of low intensity which extend over considerable areas and these are believed to be important. The most pronounced of these covers the whole extent of the New Cobar and Jubilee ore bodies and one of smaller extent and intensity was found covering portion of the northern gold shoot at the Chesney Mine.

The position and form of these two anomalies suggest that their origin may lie in the sulphide zone. For instance, on theoretical grounds, the New Cobar anomaly could be due to a steeply dipping mineralised formation, 50 feet in width in its central part, the depth to its top being 250 feet and its intensity of magnetisation being 14×10^{-4} C.G.S. units. The form of the Chesney anomaly suggests that the material responsible has an irregular pipe-like distribution, or that it arises from more than one magnetised body.

It is tentatively assumed that the abovementioned anomalies are due to pyrrhotite and possibly magnetite mineralisation which is closely related to the known copper-gold mineralisation in each case. It is therefore further assumed that the discovery of anomalies of similar form in virgin ground provides targets which should be tested by exploratory drilling in the search for copper-gold mineralisation. No similar anomalies were found between the New Cobar and Chesney mines or at any other place along the main line of mineralisation. On the Dapville area, however, two anomalies were discovered which are comparable to the New Cobar and Chesney anomalies in type and intensity, but somewhat smaller in extent. The centre of No. 1 anomaly is situated in the vicinity of mineralised outcrops which have received some very shallow testing. Although the intensity and extent of this anomaly are less than that of the New Cobar and Chesney anomalies, it is believed that it may indicate the presence of significant mineralisation and its exploration by drilling is recommended. No. 2 anomaly is less definite in form than those previously described but in regard

/5..

to intensity and extent it is comparable with the No. 1 anomaly. The distribution of magnetisation may be more complex and less deep-seated than that of the other anomalies. It is recommended that the No. 2 anomaly also be tested by drilling.

It seems likely that Nos. 1 and 2 anomalies are situated on what might be called the Dapville line of mineralisation and it is interesting to note that the northerly extension of this line passes some distance to the east of the Great Cobar mine, suggesting that the Dapville line of mineralisation is not the same as that on which the Great Cobar mine is situated.

The results in the vicinity of the Gladstone mine are much disturbed by superficial features in the outcropping rocks and by iron debris around the old shafts. The profiles at the north-western corner of the Gladstone block show some features suggesting similarity with the New Cobar and Chesney anomalies, and extension of the survey to the west and to the north is to be made to determine the complete form of these features.

The complete results of the survey in the form of profiles are shown on the accompanying Plate 2. Plate 1 is a plan of the area on a scale of 500 feet to an inch, showing the areas covered by the survey, the principal geological features and the magnetic anomalies in the form of smoothed isomagnetic lines. For a detailed study of the survey results, a plan on the scale of 100 feet to an inch would be more suitable than Plate 1, but it is considered that the latter is more convenient for the purpose of this preliminary report.

It will be noted that the New Cobar anomaly has an internal feature striking north-easterly due to a narrow zone of increased intensity. It has not been completely defined by the work completed to date and its economic importance cannot be assessed. This feature will be examined further when the surveys are resumed.

The Chesney anomaly appears to end abruptly on the south side although there is some doubt due to the fact that the adjacent ground carried numerous mine installations and could

not be completely surveyed. The drive and cross-cuts on the No. 4 level penetrated to about the centre of this anomaly so that it has been explored on that level. The distribution of pyrrhotite and magnetite in various levels of this mine will be studied and the results used in a detailed analysis of this anomaly.

IV. DRILLING RECOMMENDATIONS

On geological grounds the Dapville area was recommended for testing by drilling by Messrs. Mullholland and Rayner. It seems likely that the geophysical survey has indicated a more specific target than could be determined from geological evidence and it is considered that this should be tested by drill holes, laid out according to the geophysical evidence as a first step in the exploration of this area.

No. 1 Anomaly Centre (Dapville)

Two bores, 200 feet apart, are recommended for the preliminary testing of this anomaly. The bore sites selected are situated on the east side of the anomaly, depressed 50° in the direction 240° (Magnetic), to intersect the N - S axis of the anomaly at a depth of 500 feet from the surface. Particulars of the sites are as follows:-

Drill Site No. 1

Geophysical co-ordinates	1606N/2720W.
Length of Hole	About 750 feet.

Drill Site No. 2

Geophysical co-ordinates	1420N/2645W.
Length of Hole	About 750 feet.

No. 2 Anomaly Centre (Dapville)

The form of this anomaly is irregular and one drill site only is recommended at this stage to test the anomaly at a depth of about 500 feet from the surface, the hole to be depressed 50° in the direction 264° (Magnetic). Particulars of the site are:-

/7..

Drill Site No. 3

Geophysical co-ordinates 2900N/2700W.

Length of Hole About 750 feet.

There would be no objection on geophysical grounds to an alteration in the above recommendations to provide for initial testing at a depth of say 300 feet from the surface instead of 500 feet, particularly in the case of No. 2 Anomaly Centre. The sites for the drill holes mentioned above are shown on Plate 1.

V. SUMMARY AND CONCLUSIONS.

The results of the geophysical survey to date have revealed four broad magnetic anomalies of low intensity. Two of these are centred on or near known mineralisation zones. The other two are in virgin ground and it is believed that they may be important in defining targets for diamond drilling in the search for copper-gold mineralisation in this area.

If the anomalies No. 1 and No. 2 described above are found to indicate mineralisation, then it is clear that the survey should be extended northerly on a wide front to cover the New Cobar, Gladstone, Dapville and Great Cobar lines of mineralisation and also southerly for some distance.

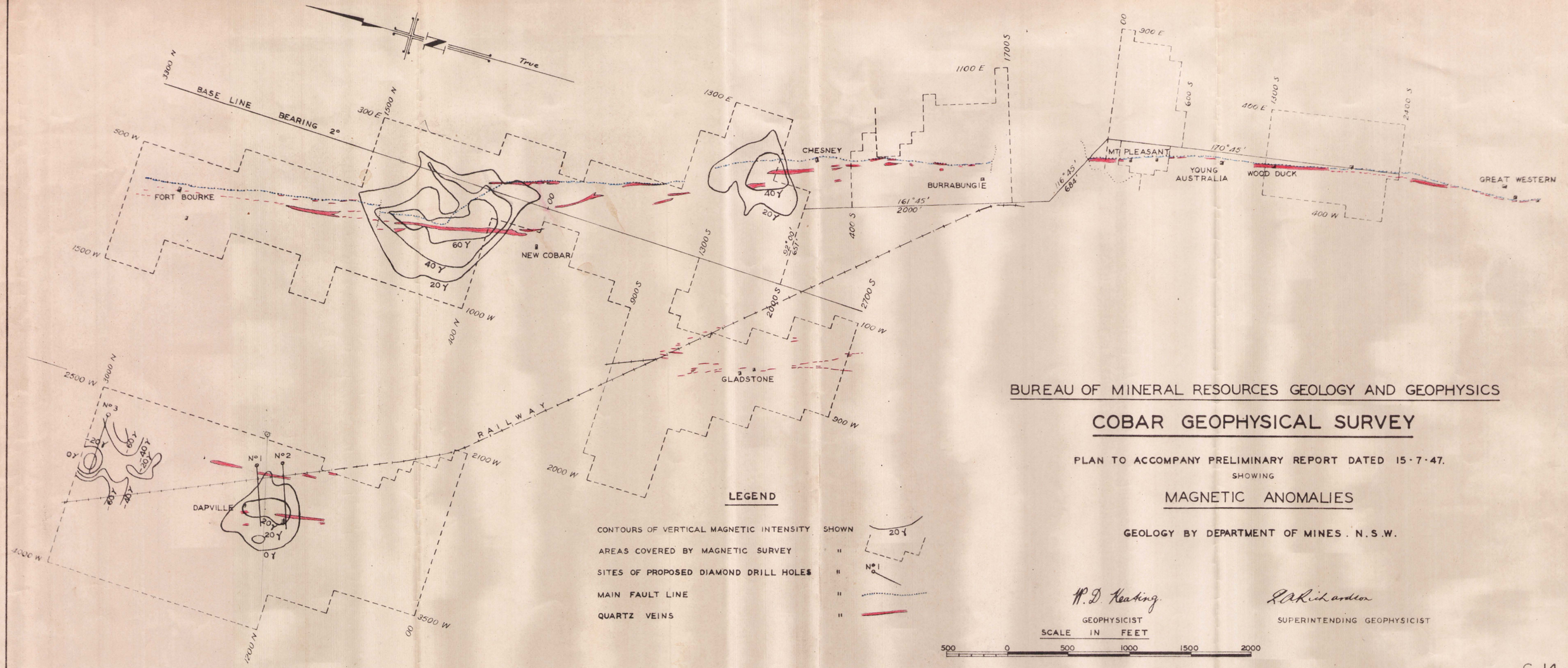
On the Fort Bourke - Great Western line, only the New Cobar and Chesney magnetic anomalies were found. It is not claimed that the absence of similar anomalies elsewhere on that line detracts from the possibilities of ore occurrence since there could be ore bodies at depth containing no magnetic minerals.

(L. A. RICHARDSON),
Superintending Geophysicist.

(W. D. KEATING),
Geophysicist.

Melbourne,
3rd November, 1947.

PLATE 1



LEGEND

CONTOURS OF VERTICAL MAGNETIC INTENSITY	SHOWN	20 Y
AREAS COVERED BY MAGNETIC SURVEY	"	
SITES OF PROPOSED DIAMOND DRILL HOLES	"	No 1
MAIN FAULT LINE	"	
QUARTZ VEINS	"	

SCALE IN FEET

500 0 500 1000 1500 2000

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

COBAR GEOPHYSICAL SURVEY

PLAN TO ACCOMPANY PRELIMINARY REPORT DATED 15·7·47.

SHOWING

MAGNETIC ANOMALIES

GEOLOGY BY DEPARTMENT OF MINES. N.S.W.

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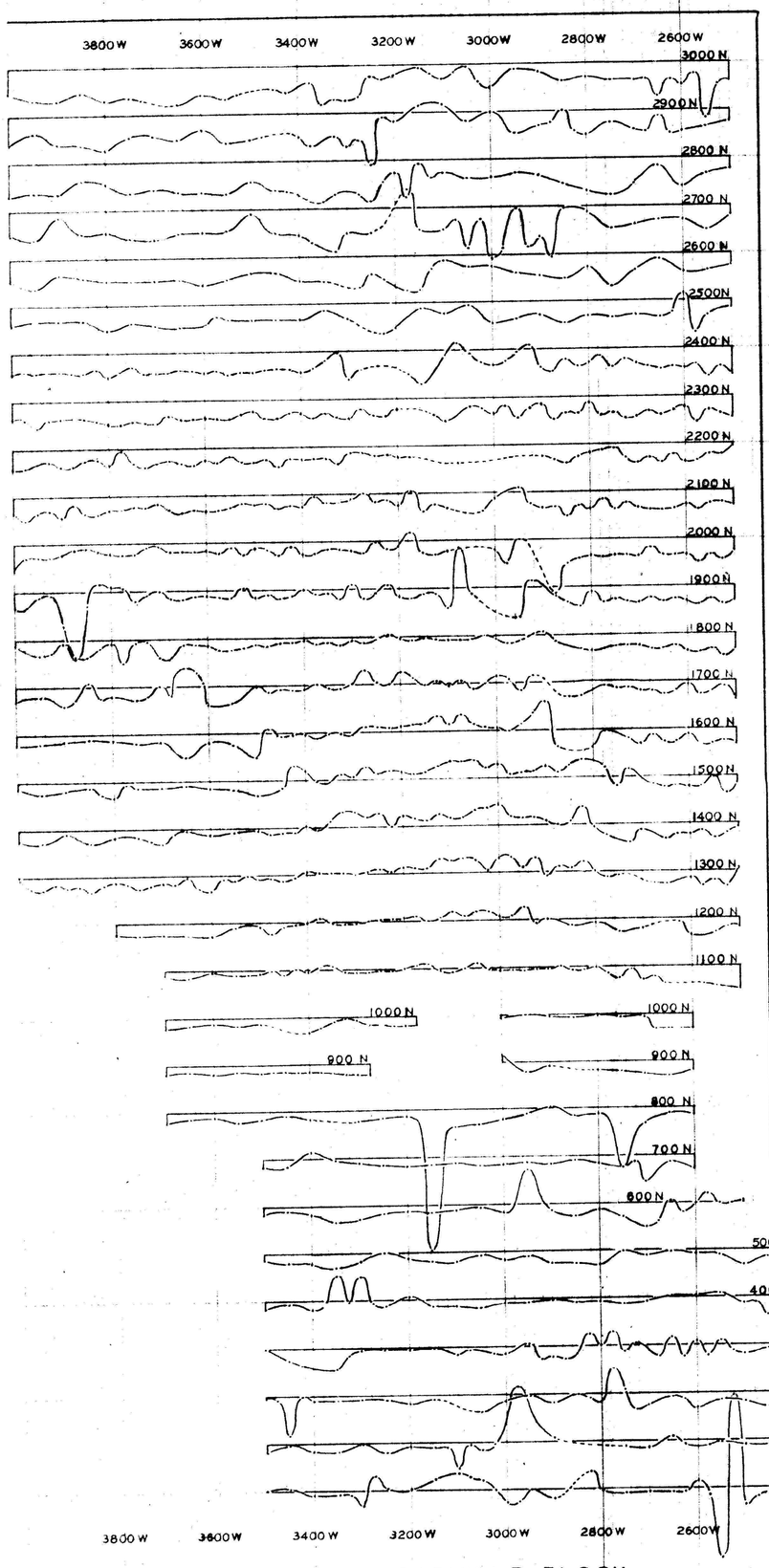
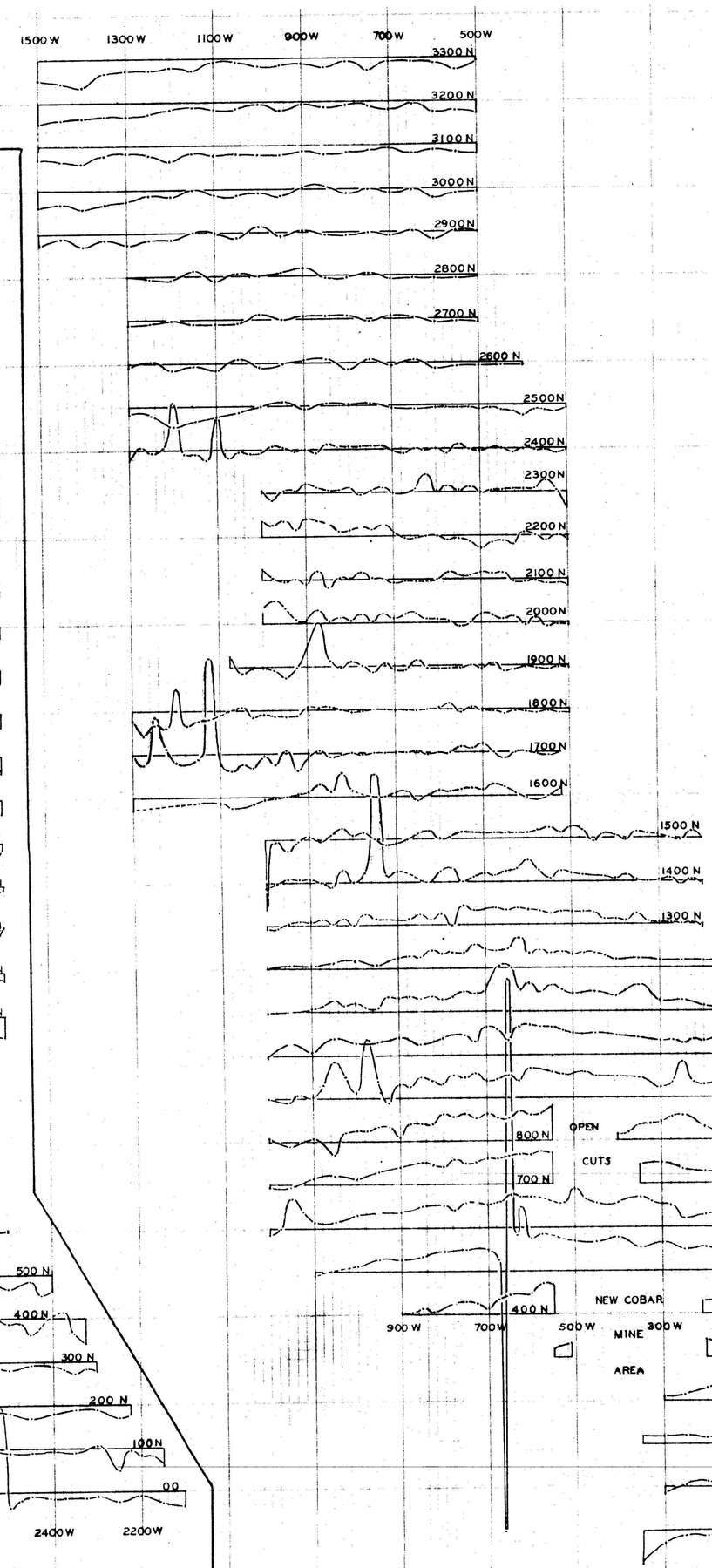
GEOPHYSICIST

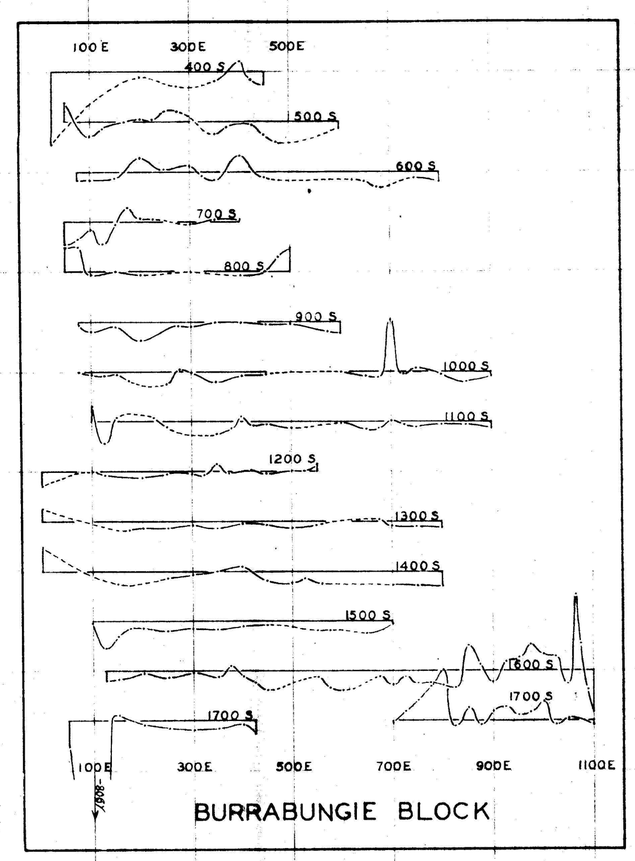
L. A. Richardson
SUPERINTENDING GEOPHYSICIST

G 14



DAPVILLE BLOCK





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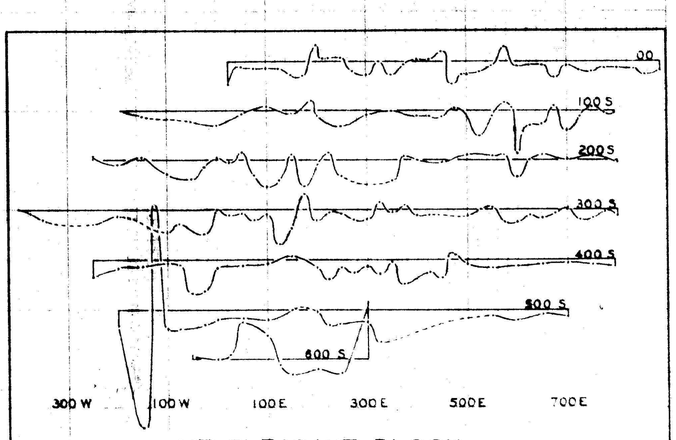

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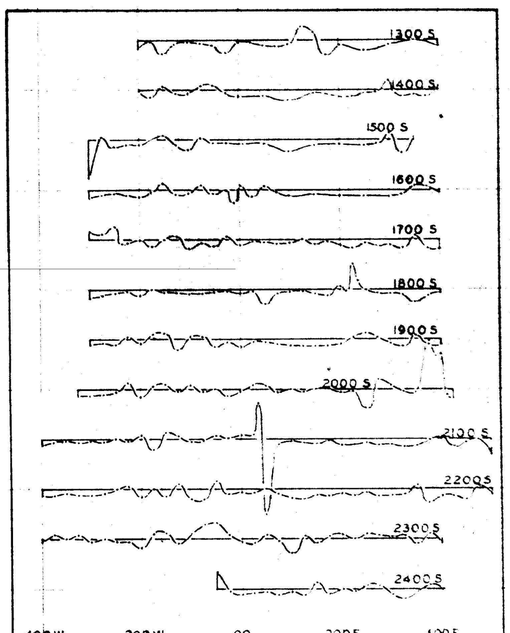
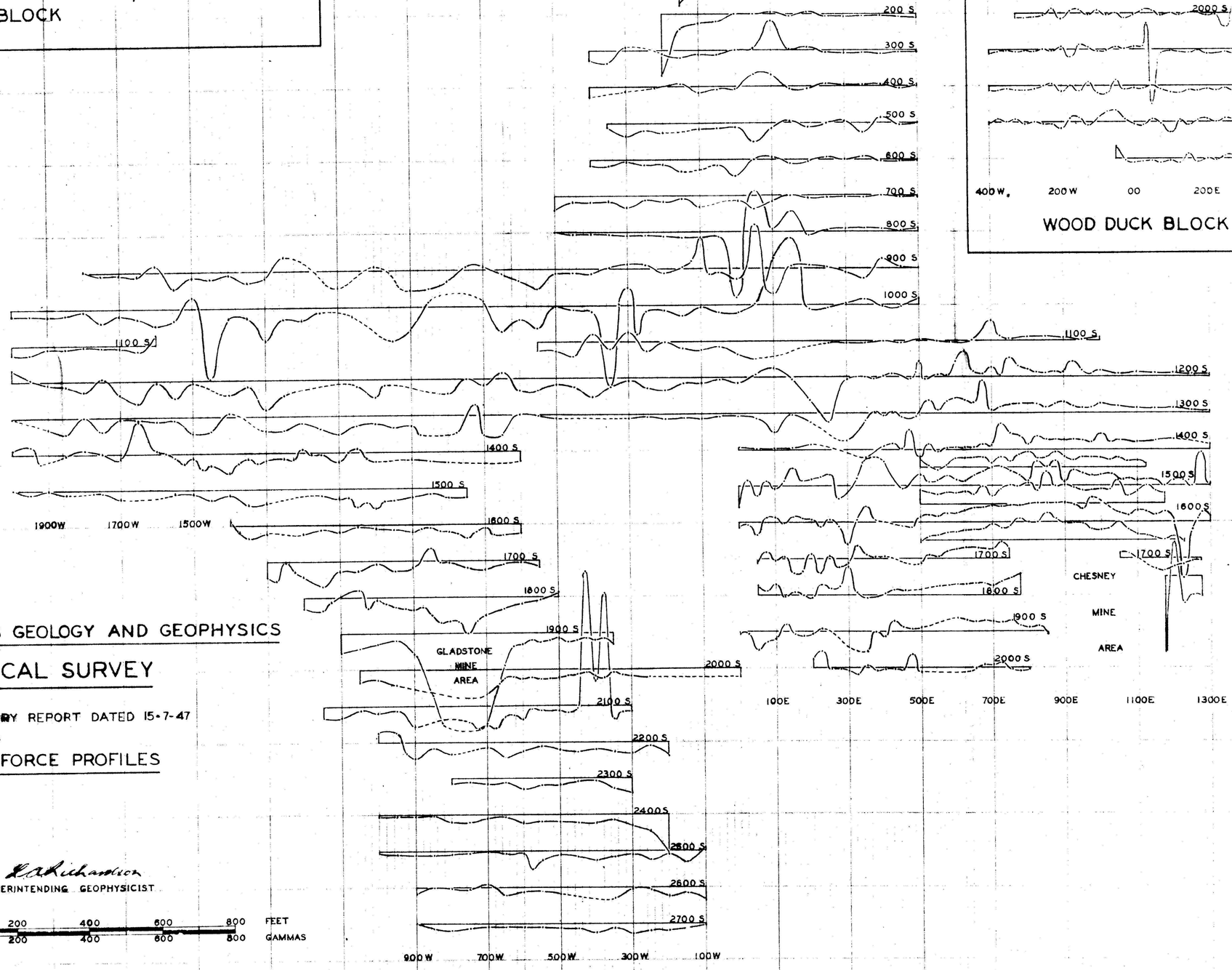


WOOD DUCK BLOCK



BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

COBAR GEOPHYSICAL SURVEY

PLATE TO ACCOMPANY PRELIMINARY REPORT DATED 15-7-47

SHOWING

MAGNETIC VERTICAL FORCE PROFILES

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HORIZONTAL 200 0 200 400 600 800 FEET
VERTICAL 200 0 200 400 600 800 GAMMAS

PLATE 2

G 15