

DEPARTMENT OF SUPPLY & SHIPPING.

Mineral Resources Survey.

Report No. 1943/13.

REPORT OF GEOPHYSICAL SURVEY OF CHILCOT COPPER MINES.

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1. INTRODUCTION.

The Chilcot copper mine is situated 15 miles south-west from Orange, from which it may be reached by reasonably good road. It was examined during 1942 by Dr. H. H. Fisher, Chief Geologist, Mineral Resources Survey, who recommended that a geophysical survey be made to search for additional ore shoots along the lode channel. Dr. Fisher's report (No. 1942/20) dated 17th August, 1942, describes the deposit and the present mining operations.

Typical specimens of ore and country rock supplied by Dr. Fisher were tested for magnetic properties. It was found that a type of ore which occupied a marginal position in the ore bodies exhibited very high magnetic susceptibility while the higher grade ore and country rock showed low susceptibility. The ore specimens were from the sulphide zone, the top of which occurs at about 100 feet from the surface. The width of the lode channel is about 10 feet. On the basis of the above tests, the problem appeared favourable for the application of the geomagnetic method of survey to search for further possible shoots of ore along the lode channel having dimensions comparable with those of the known lode. The fairly high sulphide content of the lode was regarded as favourable for the application also of the spontaneous polarisation method and the electro-magnetic method.

The geophysical survey was made during the three weeks ending 19th December. Operations were commenced over the area north-east of the mine, extending a distance of 550 feet from the mine, thus covering the part favoured by Dr. Fisher for extension of the lode channel. Later the survey was extended a similar distance to the south-west and the north-eastern part was extended a further 150 feet.

Methods used comprised geomagnetic, spontaneous polarisation, electro-magnetic and potential ratio. Traverses were placed at 50 feet intervals and observations by the various methods were made at intervals of 25 feet and, in some parts, at closer intervals.

It is desired to record appreciation of the co-operation, during field operations, of Mr. J. G. Thomas, owner of Chilcot copper mine.

2. RESULTS OF THE SURVEY.

Plate 1 (No. 821) shows the area covered by the survey with the position of traverse lines, certain geological features and surface features.

The position of No. 1 level (104 ft.) is taken from Dr. Fisher's plan and fixed relative to the positions of the main shaft and the air shaft at the south-western end of the No. 1 level as determined by the surface survey. The upper part of the air shaft is on an underlay of undetermined degree and consequently the fixation of the No. 1 level outline on the plan is approximate.

From a consideration of the available evidence concerning

the strike of the lode channel, it is presumed that at about 50E, which is near the end of the present mine workings, the lode channel bends or is faulted and its subsequent course to the north-east is represented by a gold lode which has been partly stoped and can be traced by surface workings up to about 225E. The probable strike of the lode channel cannot be determined from surface aspects beyond this point. Of possible importance in this respect, however, is the seam of gossan about 9" wide, exposed at the end of the pit near 350E/80S. This gossan is definite evidence of mineralisation, but it need not be related to the main lode channel and may represent an isolated occurrence.

Evidence regarding strike of the lode channel on the south-west side of the main shaft is limited. The strong ironstone gossan capping shown on the plan apparently ends under the dump material surrounding the main shaft. The shaft near traverse 132W shows a type of lode material and traces of mineralisation are visible in the two small costeans.

A superficial deposit of lateritic material is exposed in the old open cuts and shallow shafts to the north of the main shaft. It has a thickness of about 25 feet where completely exposed in the open cut near 175E/300N.

(a) Geomagnetic Method.

A vertical force Variometer, with scale value 32.6 gammas per scale division, was used. The magnetic profiles, Plate 2, showing variations in vertical component of the earth's magnetic field, are much disturbed throughout the area surveyed. Features responsible for such disturbances include the following:-

Variation in the magnetic properties of the country rock, probably due largely to varying magnetite content. These effects are of varying degree of intensity, the strongest being the anomaly centred at 50E/400S (which is assumed to be due to country rock). Typical effects appear on profile 150E between 100S and 300S.

Presence of superficial laterite. This material exhibits strong permanent magnetism in parts with moderate magnetic properties general in other places where it was tested. The anomaly due to the laterite is represented by the increased intensity on the northern parts of traverses 50E to 450E and also probably 132W. The effect of the laterite is demonstrated on profile 250E where the increased intensity disappears at the point 225N which is on the floor of the open cut with no laterite underfoot.

Presence of ironstone gossan. The outcrop of ironstone, presumably forming the capping of the main lode, exhibits intense permanent magnetism. Anomalies due to this gossan are very intense but of local extent which is typical under such conditions. They are present on profiles 50E and 100E. The small seam of gossan near traverse 350E produces a narrow anomaly of similar type.

On the basis of the foregoing aspects of interpretation the following conclusions can be drawn regarding the magnetic results as a whole.

(1) Main Lode. Discussion of possible extension of Lode Channel in North-Easterly direction.

On traverse 50E, an anomaly due to the gossan capping is present from 00 to about 35. The reduced intensity at 50E and 75E may be a deeper seated effect, but in any case the origin of the

anomaly represented is likely to be in the known lode channel and the fact that the anomaly extends to 75E does not necessarily mean that magnetic lode material is present outside the known position of the lode channel.

On profile 100E the effect of the ironstone gossan is marked at 37E only. This point is near the end of the surface outcrops of gossan. It is probable that the known body of gossan is responsible for the increased intensity at the points 25W, 00 and 15S.

Profiles 150E, 200E and 250E show minor irregularities only in the region of the possible line of extension of the lode channel. No diagnostic value can be placed on these irregularities owing to their abundance on other traverses. They are presumed to arise from the country rock. Traverse 300E is of little value in this region due to proximity of a galvanised iron dwelling.

Profile 350E shows strong local anomaly due to the gossan seam at 84S. Profiles 375E, 400E and 425 E show ill-defined anomalies of shallow seated origin and of low intensity which may be due to material related to the gossan seam on traverse 350E. Further to the east on traverses 450E, 500E, 550E and 600E, this anomaly becomes more definite and is shown on Plate 1 in the form of "lines of equal anomaly". These lines suggest that the anomaly is due to two lens-like bodies of magnetic material. The stronger anomaly is the western one and its dimensions suggest that the material responsible would be found at depth of the order of 30 to 40 feet.

In regard to this western anomaly it can be stated that:-

It is unlikely that laterite is responsible because topographical conditions are probably unsuitable for accumulation of laterite over the area concerned.

Country rock may be responsible.

Magnetic lode material may be the cause and this belief is favoured only because of apparent possible connection with the gossan seam at 350E/80S.

The best site for testing this anomaly would be at 450E/175S. This allows for a displacement of 7 feet of the anomaly maximum to the north of the point vertically above the origin of the anomaly due to inclination of the earth's magnetic field.

If there is any extension of the main lode channel in a north-east direction beyond about 225E, where presumably its position is marked by the gold lode workings, so far as the geo-magnetic survey is concerned the only indications obtained which may be due to such extension are those described above. If the lode channel extends in any other direction, it is unlikely that any large bodies of magnetic material are associated with it.

(11) Discussion of possible Extension of Lode Channel in South-Westerly Direction.

The outstanding anomaly on the south-western side of the main shaft is that found on 450W and centred at 132W. Related anomalies of lesser degree are present on traverses 475W, 425W and 400W, so that the anomalous zone has a length approaching 100 feet.

The probable maximum width of the material responsible is of the order of 15 feet and the dimensions of the anomaly on traverse 450W suggest that the depth to the anomaly body is less than 10 feet.

The anomaly is typical of those produced by the ironstone

gossan, and as a shallow depth was suggested, arrangements were made to test the anomaly during the course of the survey.

A costean 2' wide was put down at 450W/128N to 137N i.e. 9' long. It reached a depth of 11'6" and operations were suspended for the time being. The material revealed in that depth was, apart from surface soil, entirely a soft laterite. The laterite exhibited moderate to high magnetic susceptibility.

It seems likely that this laterite is responsible for the anomaly, but arrangements have been made to deepen the costean to bedrock to prove whether there is any ironstone gossan below the magnetic laterite.

As laterite with pronounced magnetic properties is present on this south-western side of the area as well as the northern side, no doubt many of the irregularities present on profiles 132W to 500W are due to laterite, others are probably due to country rock and there are no anomalies which can be confidently attributed to extension of the lode channel.

The anomaly showing reduced intensity, centred at 400W/68S, with corresponding anomalies of lesser degree on traverses 450W, 350W and 300W is a feature worthy of special mention. It is possible that it is a negative anomaly due to abnormal polarisation. This condition of polarisation is probably equally likely to occur in laterite and ironstone gossan. The line formed by this anomaly on the traverses mentioned passes close by an outcrop or boulders of aplitic or siliceous material showing traces of mineralisation near 450W/75N. The point 400W/68S would be the best site for testing this anomaly. A shaft 10 feet or more in depth may be necessary.

(b) Spontaneous Polarisation Method.

The profiles showing variations in earth potentials are practically devoid of anomaly indicating the lack of strong spontaneous polarisation activity which might be expected to exist under the conditions at Chilcot. The active oxidation of the sulphide ores, which gives rise to spontaneous polarisation phenomena would, it is thought, have been accentuated by the recent dewatering of the mine to the depth of about 180 feet. Normal ground water level is about 100 feet. A reason for the lack of spontaneous polarisation activity associated with the ore body might be that the sulphide content is disseminated and the ore bodies, therefore, have little conductive continuity.

(c) Electro-magnetic method.

The profiles show no anomalies of greater intensity than about one microgauss and no significance can be attached to the results. The lode channel, where known, gives no satisfactory anomaly.

(d) Potential Ratio method.

Anomalies indicating poor conductors are present coinciding with the main ironstone gossan outcrop, the aplite body to the south of the mine, and on traverses 400W and 450W near the outcrops or boulders of aplitic or siliceous material previously mentioned.

A pronounced good conductor indication is present at 132W/25S. An isolated indication of this kind without confirmation by other methods is of unknown significance and it cannot be confidently related to lode channel occurrence.

3. SUMMARY AND CONCLUSIONS.

An area 1150 feet long and 600 feet wide was covered by geophysical survey employing four methods. The geomagnetic method gave results indicating much variation in vertical component

intensity due to a number of causes. Certain anomalies have been selected for investigation because they may be due to material in the lode channel. The three electrical methods applied gave no anomalies which could be attributed to the extension of the lode channel or shoots of ore therein.

CANBERRA, A.C.T.
18th Feb. 1943.

L.A.R.
L. A. RICHARDSON,
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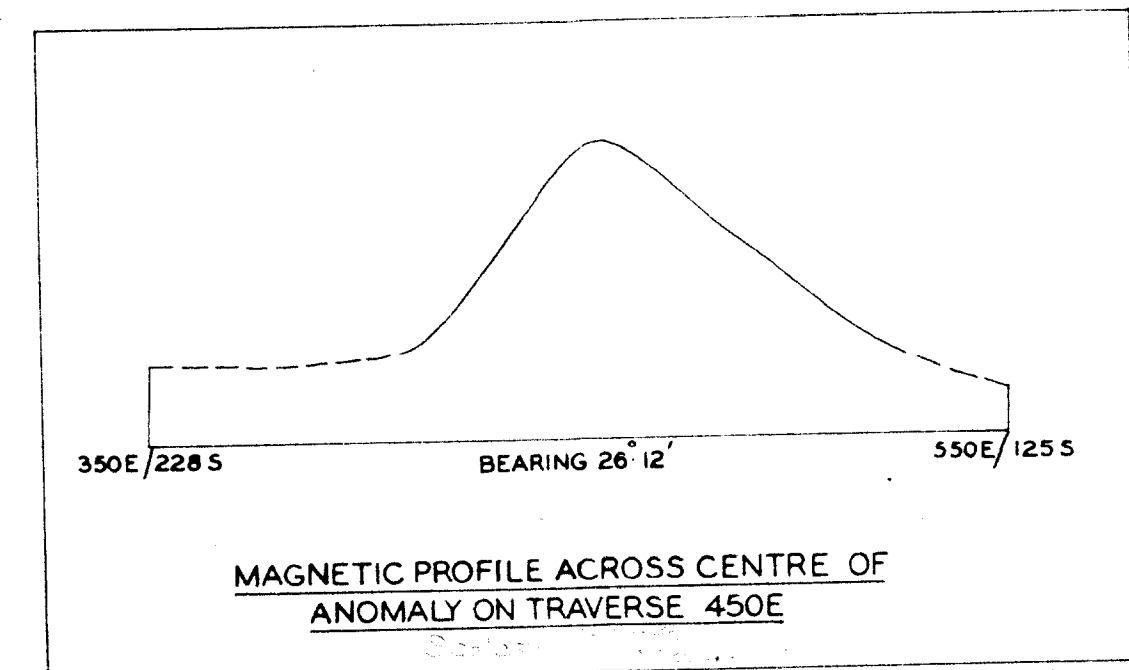
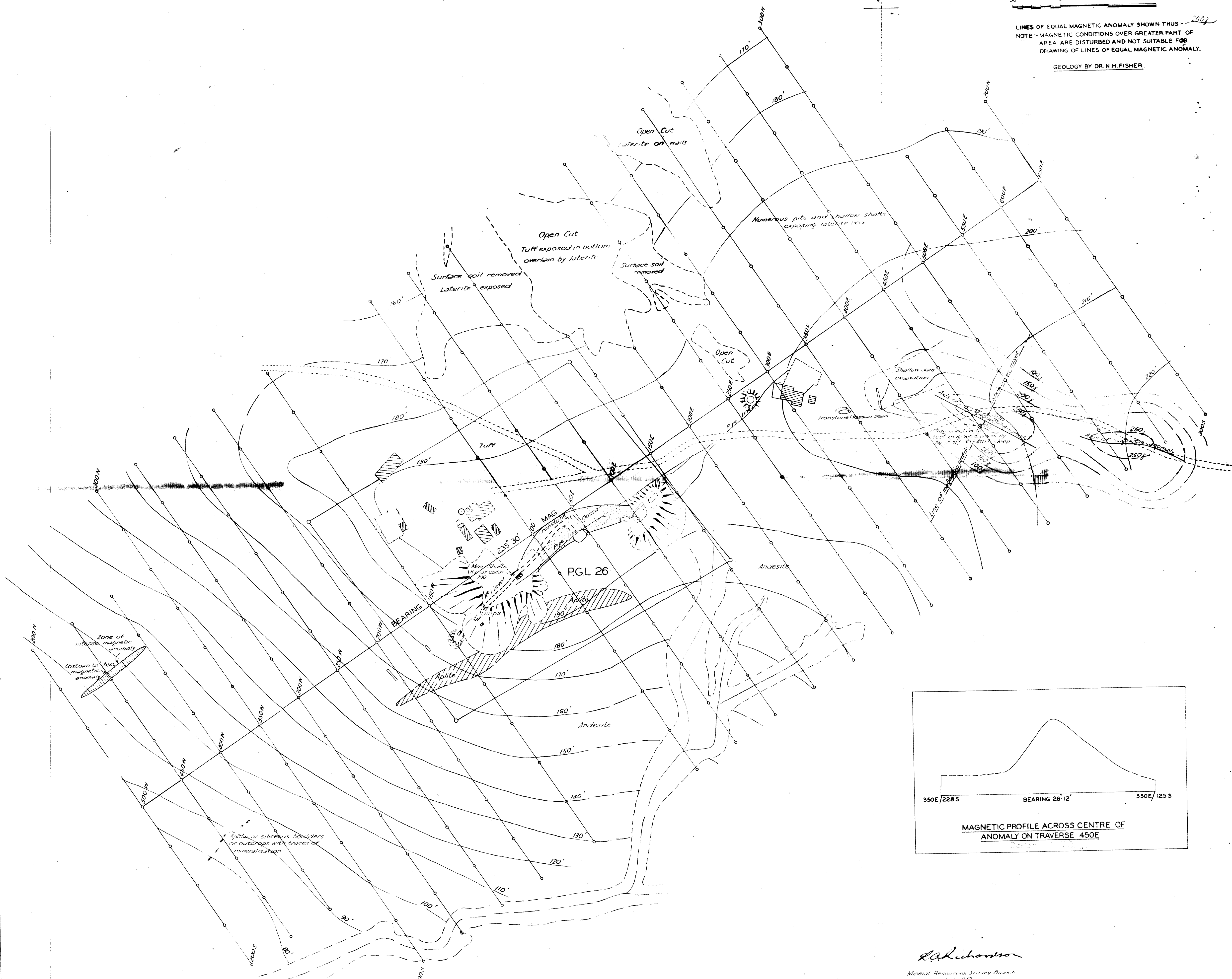
CHILCOT COPPER MINE GEOPHYSICAL SURVEY PLAN

SHOWING
SURFACE FEATURES SOME GEOLOGICAL
FEATURES AND POSITION OF TRAVERSE LINES ETC.

50 0 50 100 FT.

LINES OF EQUAL MAGNETIC ANOMALY SHOWN THUS -
NOTE - MAGNETIC CONDITIONS OVER GREATER PART OF
AREA ARE DISTURBED AND NOT SUITABLE FOR
DRAWING OF LINES OF EQUAL MAGNETIC ANOMALY.

GEOLOGY BY DR. N.H. FISHER

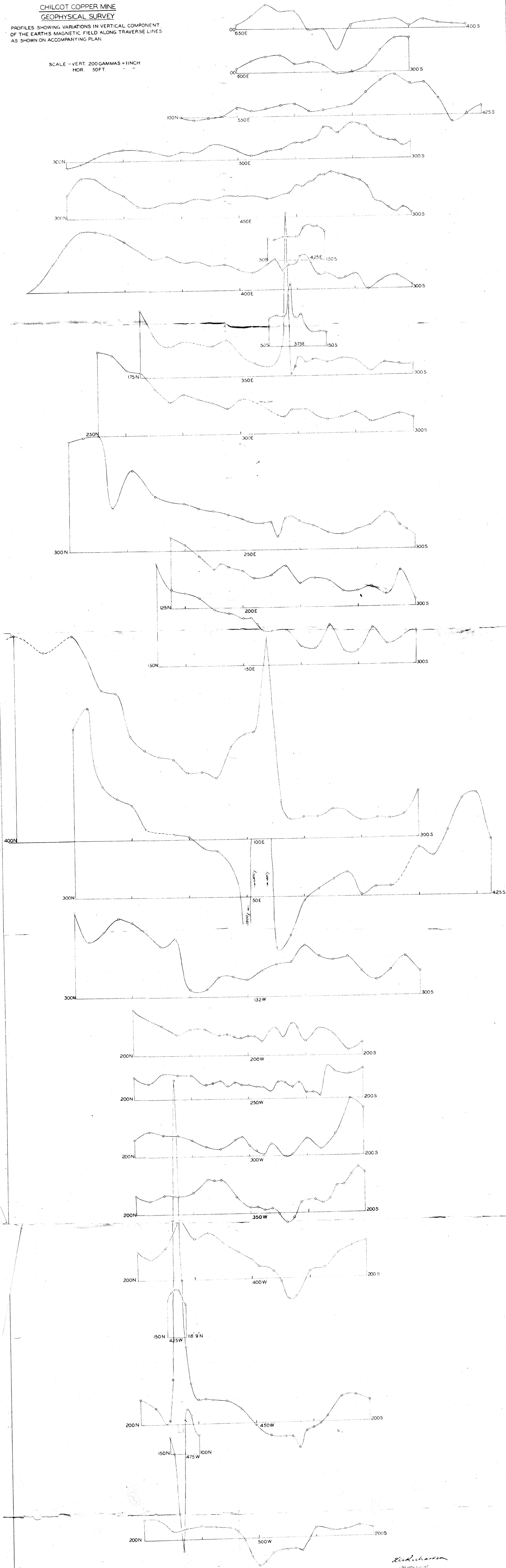


R. Kitchin
Mineral Resources Survey Branch
Feb 1942

CHILCOT COPPER MINE GEOPHYSICAL SURVEY

PROFILES SHOWING VARIATIONS IN VERTICAL COMPONENT
OF THE EARTH'S MAGNETIC FIELD ALONG TRAVERSE LINES
AS SHOWN ON ACCOMPANYING PLAN.

SCALE - VERT. 200 GAMMAS = 1 INCH
HOR. 50 FT.



Richardson
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