COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1965/219

A RECONNAISSANCE GEOPHYSICAL SURVEY OVER THE DALY RIVER MINERAL FIELD,

NORTHERN TERRITORY 1964

by

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SUMMARY

A reconnaissance electromagnetic survey was made over parts of the Daly River mineral field between the 17th and the 28th November 1964.

No anomalies were obtained that could be related to mineralisation, but as the survey was not extensive and only the Slingram method was used, the results do not indicate conclusively whether or not electromagnetic methods would be useful in locating mineralisation. It is recommended that the Turam method; which would give greater penetration, should be tried in the area.

One traverse across the Wallaby copper mine was surveyed with the vertical magnetometer. A small anomaly was detected in the vicinity of the mine and further magnetic surveying should be done to trace the magnetic anomaly.

1. INTRODUCTION

This Record describes a reconnaissance geophysical survey in the Daly River copper field made by the Darwin Uranium Group of the Bureau of Mineral Resources, Geology and Geophysics, (BMR) between the 17th and the 28th November 1964. The copper field is about 80 miles south of Darwin on the northern side of the Daly River. Access is by a dirt road from the 90-mile point on the Stuart Highway. There are a number of prospects within the area and small deposits of copper and silver-lead have been located. Copper ore has been mined from some of the deposits.

The geophysical survey was made in an attempt to locate extensions of the known deposits. Electromagnetic (Slingram) surveys were made over the following areas: Daly River copper mine, Wheal Danks South, Wheal Danks, Wheal Danks North, Wallaby and Hill 4, Empire mine, and Warr's prospect. One traverse across the Wallaby area was surveyed with the vertical magnetometer.

The location of the copper field, the prospects, and the geophysical traverses are shown in Plate 1.

2. GEOLOGY AND HISTORY OF THE AREA

The geology and history of the area are described by Hossfeld, (1937 & 1938). A brief summary is given below.

The mineralisation occurs in slates in the Lower Proterozoic Burrell Creek Formation. The slates, which weather to a reddish brown colour, dip to the east at 60° to 90° and form a belt several miles wide, which trends in a northerly direction. The Daly River copper mine and the Wheal Danks group of prospects are located on a prominent ridge about five miles in length. The Wallaby prospect and the Empire mine are on low ridges, whereas Warr's Prospect is in the middle of a black soil flat; mineralisation at these three prospects is apparently within the same layer of slate. There is some evidence that the mineralisation is related to shearing.

Mineralisation in the area was discovered in 1884, and mining of copper was carried out up to 1912. The biggest producer was the Daly River copper mine; in all, some 6000 tons of ore is estimated to have been removed. Only secondary ore appears to have been mined, although chalcopyrite is present in some of the dumps and there is evidently a possibility of considerable reserves of primary sulphide ore. The mineral field has been examined by several companies since 1912, and in 1957 a diamond-drill hole was put down by Enterprise Exploration Company Pty Ltd (Patterson, 1959). The hole was drilled to 350 feet beneath the open cut of the Daly River copper mine. Traces of copper mineralisation were found.

In 1959 four traverses in the vicinity of the open cut were surveyed by the BMR with the self-potential method (Daly & Langron, 1963). The approximate location of these traverses is shown in Plate 3. No well defined anomalies were detected.

3. GEOPHYSICAL METHODS AND PRESENTATION OF RESULTS

A Slingram survey was made on all traverses. A frequency of 1760 c/s and a coil separation of 200 feet were used; readings were taken at points 50 feet apart. Corrections were applied to the Slingram real component readings to allow for topographic effect.

The electromagnetic method indicates variations in electrical conductivity within the ground. The Slingram method uses two horizontal coils

separated, in this case, by a distance of 200 feet. One coil is fed by an oscillator and produces an alternating magnetic field. This field induces electrical currents in the ground, which via their associated magnetic field induce a current in the receiving coil. The signal in the receiving coil is measured in two components as percentages of a small reference signal that is relayed from the transmitting cable. The real component is a measure of the amount of received signal that is in phase with the transmitted signal and the imaginary component is the amount of signal that is 90° out of phase with the transmitted signal. The coils are moved, at constant separation, along the traverses, and if the ground is electrically homogeneous the real and imaginary component readings are constant. If the ground conductivity is variable then the instrument readings vary in a manner depending on the nature of the conductivity changes. If the anomalous conductivity is due to a narrow, steeply dipping body of high conductivity within about 100 feet of ground surface, then profiles of electromagnetic readings will show minimum values in both components over the body. Wide bodies of high conductivity may be indicated by minimum values in the real component over the edges of the body or by maximum or minimum values in the real component over the whole width of the body, depending on its width and its depth below ground surface. The imaginary component is usually a minimum over the whole width of wide bodies. (Wide in this context means greater than about 100 feet).

One traverse, over the Wallaby area, was surveyed with the vertical magnetometer. Variations in the vertical magnetic field were referred to an arbitrary value assigned to the base station.

Traverses covering the Daly River copper mine, the Wheal Danks group, the Wallaby area, and the Empire mine were laid out at right angles to a common base line. The grid is shown in Plate 1. Electromagnetic and magnetic results for the Wheal Danks group, the Wallaby area, the Empire mine, and Warr's prospect are shown in profile form in Plate 2. Electromagnetic results for the Daly River copper mine are shown as contour maps in Plate 3. The approximate positions of works (pits, open cuts, costeans, shafts, etc.) are shown.

4. DISCUSSION OF RESULTS

Daly River copper mine

There are no electromagnetic anomalies in the vicinity of the workings, but there is a prominent anomaly to the east of the workings on the lower slopes of the ridge. Unfortunately, this anomaly could not be completely delineated in the easterly direction because of the swampy ground. The anomaly is stronger in the imaginary component than the real component, which indicates that it represents only a moderate change in conductivity. An estimate of the width of the body producing the anomaly is 150 feet. A change in the trend of the anomaly occurs between 12S and 16S and may indicate faulting. There is no reason to suppose that this anomaly indicates copper mineralisation.

Wheal Danks group of prospects

No zones of high conductivity are indicated along any of the traverses 60N, 78N, 84N, and 98N, and there is no relation between the electromagnetic readings and the copper workings.

Empire mine

Traverses 4N, 8N, 28N, and 32N are presumed to be over the Empire mine, but it is possible that the name "Empire mine" should only refer to the workings between traverses 28N and 32N.

Imaginary component readings indicate a moderate conductor, about 500 feet wide and extending from 4N (between 4E and 9E) to 32N (Between 5E and 10E). A similar but possibly narrower conductor extends from 4N/13E to 32N/16E. The copper workings occur between these two conductors. The conducting zones are within very wet, flat-lying ground, whereas the non-conducting zone coincides with a low ridge. It is most likely that the conducting zones indicate wet clay or alluvium and have no bearing on mineralisation.

Wallaby area

The Wallaby area includes the Wallaby copper mine (approximate position 88N/21E), the Wallaby silver-lead deposits (approximate position 84N/25E) and the copper indication at Hill 4.

The electromagnetic survey gives no indication of mineralisation.

Magnetite is associated with the mineralisation at the Wallaby copper mine. Traverse 88N was read with the vertical magnetometer and a small magnetic anomaly was located centred at 24E. This anomaly is about 200 feet east of the copper mine and if it can be traced to the north of the mine it could lead to further copper discoveries.

Warr's copper prospect

The mineralisation occurs in two very small rock outcrops in the middle of a black soil flat. Large electromagnetic anomalies were detected on traverses 3S and 6S, but their relation, if any, to the mineralisation is obscure. The ground surface was very wet and this may have had some influence on the electromagnetic results.

Bad weather prevented any further work being done in the area.

5. CONCLUSIONS AND RECOMMENDATIONS

Electromagnetic results were disappointingly poor in that no indications of mineralisation were obtained. Owing to bad weather, it was not possible to do any Turam surveys or follow up the magnetic indication at the Wallaby mine.

The lack of Slingram anomalies in the vicinity of the copper workings could mean either (a) there is no more mineralisation present or (b) mineralisation is present but at a depth greater than the depth of penetration of the equipment. If the latter alternative is true then a detailed Turam survey of the area should be made.

Further Slingram surveys or a Turam survey should be made in the vicinity of Warr's prospect.

The magnetic indication at the Wallaby copper mine should be followed up by making magnetic surveys of the area north and south of the mine.

6. REFERENCES

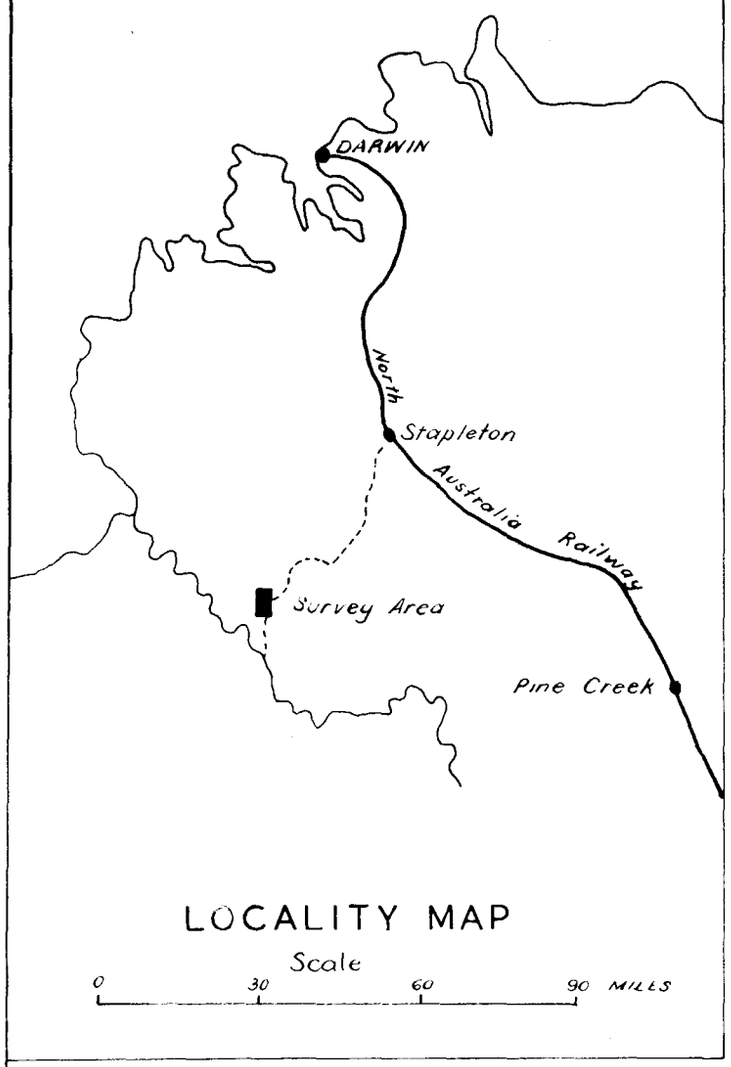
DALY, J. and LANGRON, W.J. 1963 Darwin/Katherine region geophysical reconnaissance surveys, NT 1959. Bur.Min.Resour.Aust.Rec. 1963/28.

HOSSFELD, P.S. 1937 The Daly River copper and silver-lead area, Daly River District. A.G.G.S.N.A. Report Northern Territory No. 19.

HOSSFELD, P.S. 1938 The Wallaby silver-lead lode, Daly River District. A.G.G.S.N.A. Report Northern Territory No. 32.

PATTERSON, G.W. 1959 Diamond drill investigation, Daly River copper mine, Northern Territory. Conzinc.Pty Ltd Explor.Div.Ref. No. 18.

PLATE 1



LOCALITY MAP

Scale

0 30 60 90 MILES

-11°-

T.N.
M.N.

REFERENCE

- Burrell Creek Formation
- Fault
- Small pits, open cuts, costeans
- Track
- 00, 4S, 8S Geophysical traverses

RECONNAISSANCE SURVEY
OVER THE DALY RIVER MINERAL FIELD, N.T. 1964

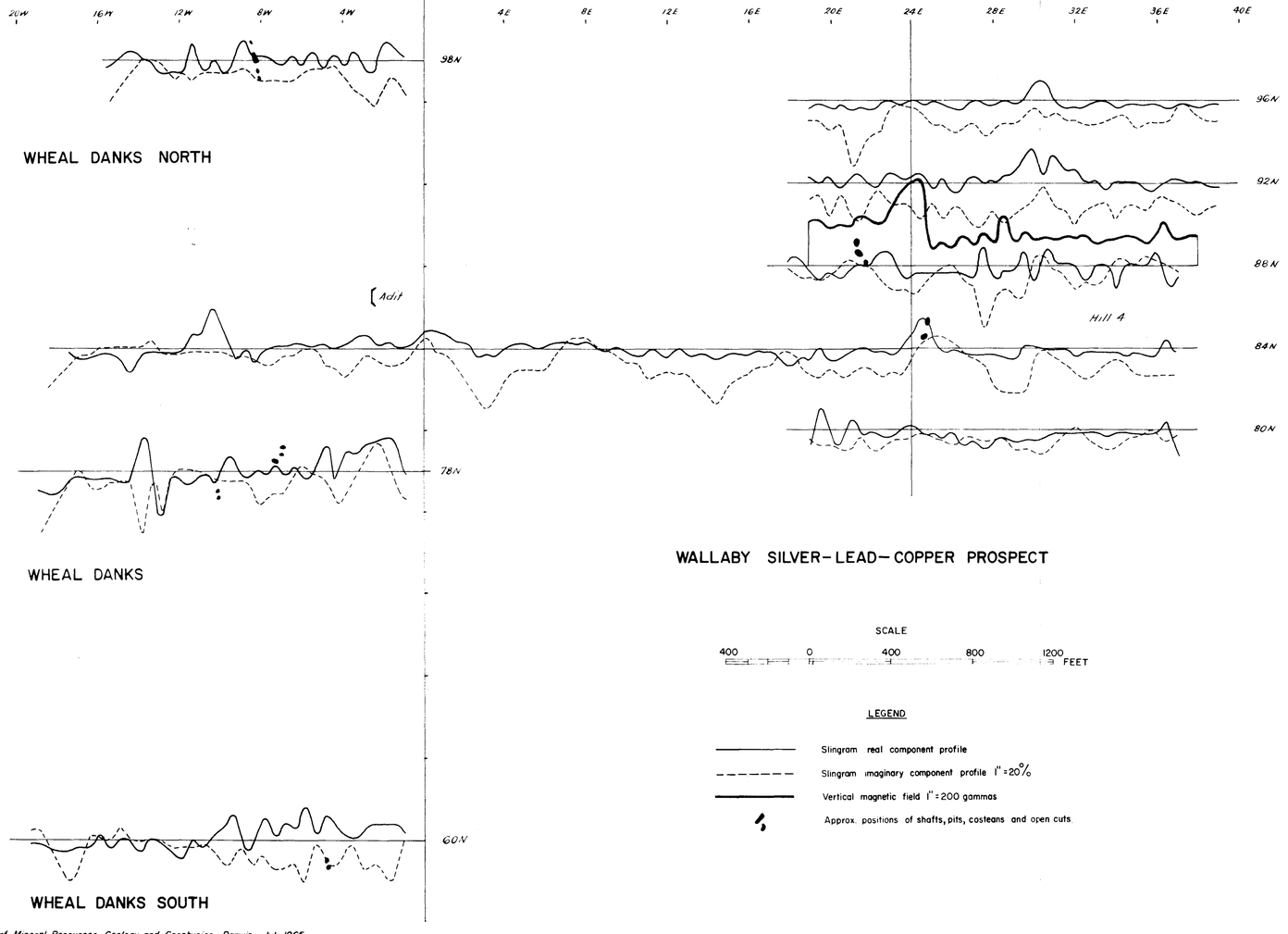
GEOLOGY, PROSPECTS, AND TRAVERSES

Scale (approx)

0 2000 4000 6000 FEET

Bureau of Mineral Resources, Geology and Geophysics, Darwin, July 1965

Compiled from aerial photographs D52/B7-132



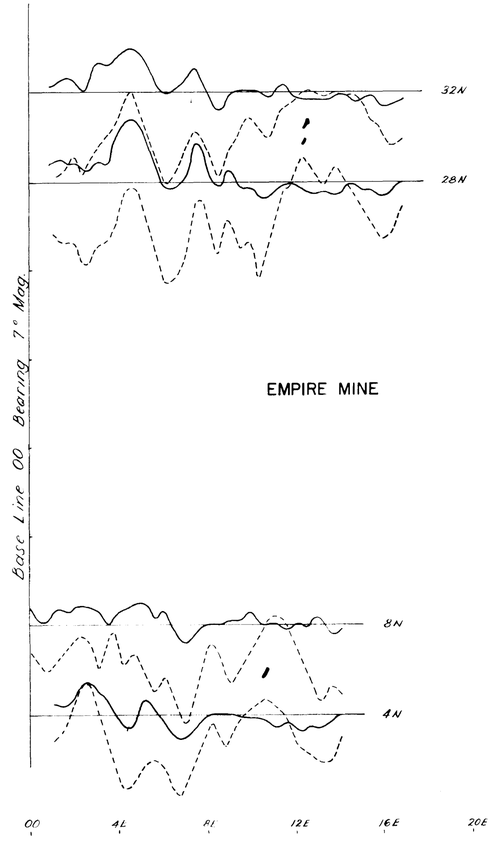
WALLABY SILVER–LEAD–COPPER PROSPECT

SCALE

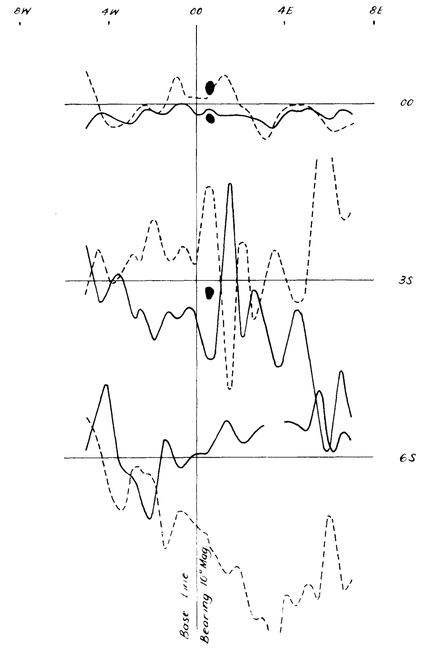
400 0 400 800 1200 FEET

LEGEND

- Slingram real component profile
- Slingram imaginary component profile 1" = 20%
- Vertical magnetic field 1" = 200 gammas
- Approx. positions of shafts, pits, costeans and open cuts



EMPIRE MINE



WARRS COPPER PROSPECT

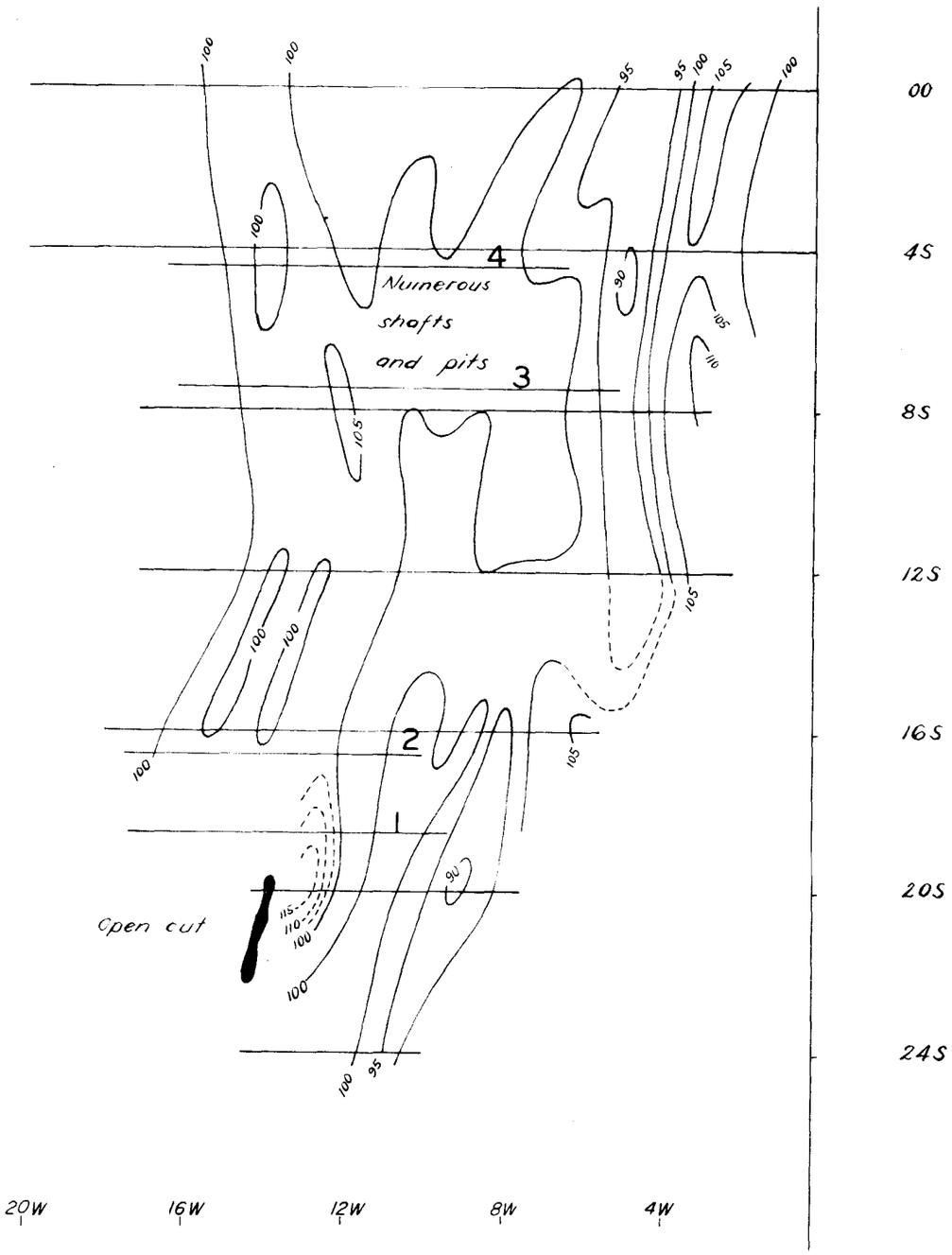
Traverse spacing not to scale

THE DALY RIVER MINERAL FIELD SURVEY, N.T. 1964

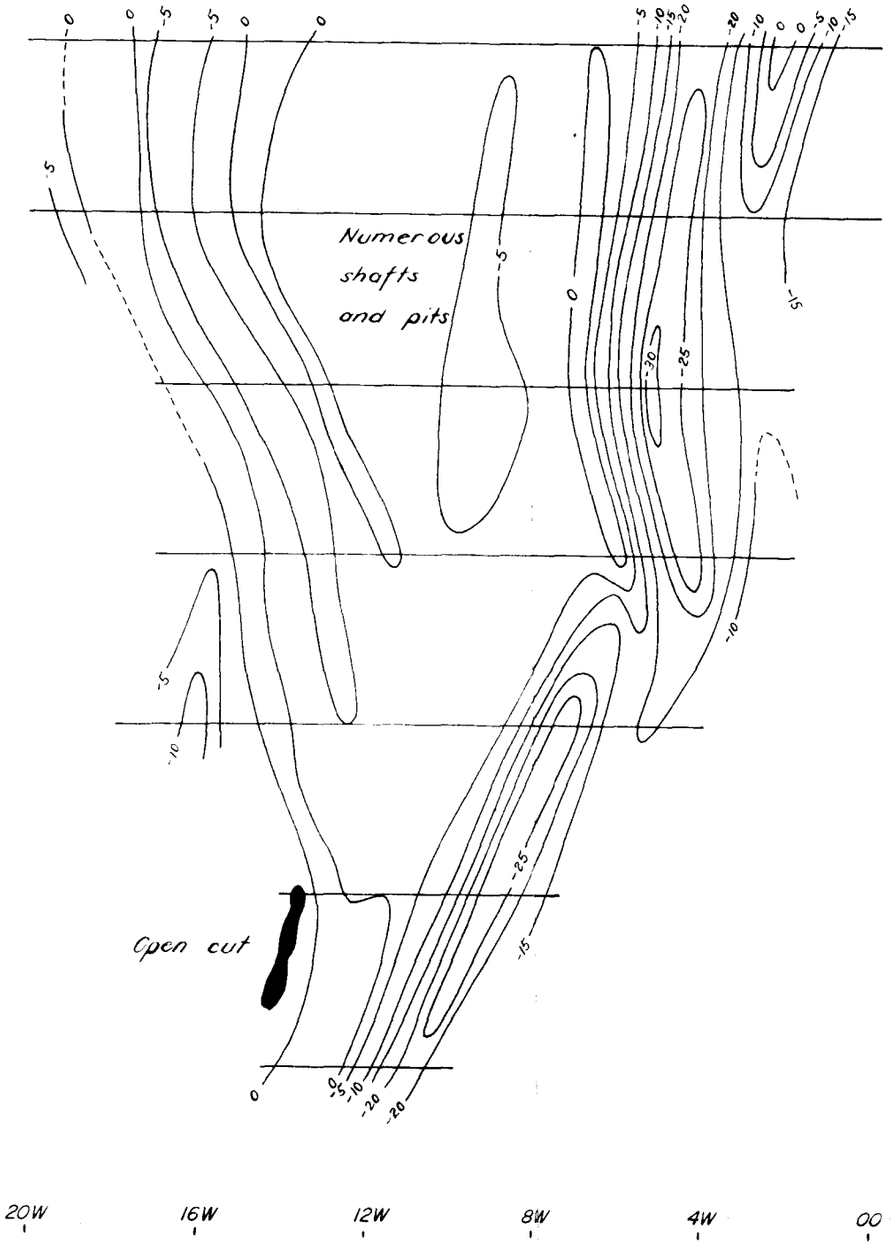
ELECTROMAGNETIC AND MAGNETIC RESULTS

Bureau of Mineral Resources, Geology and Geophysics. Darwin July 1965

D52/87-133



REAL COMPONENT



IMAGINARY COMPONENT

SCALE

400 0 400 800 1200 FEET

2 Self potential traverses (Daly and Langron,)1963

LEGEND

Contour intival 5%
Frequency 1760 c/s
Coil separation 200ft

DALY RIVER COPPER MINE
SLINGRAM CONTOURS

D52/B7-134

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