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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1962/28

RUM JUNGLE CREEK AND RUM JUNGLE CREEK SOUTH PROSPECTS GEOPHYSICAL SURVEYS,

NORTHERN TERRITORY 1960

by

J. DALY and D. L. ROWSTON

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SUMMARY

This Record describes a geophysical survey, using mainly electromagnetic methods, made over the Rum Jungle Creek and Rum Jungle Creek South prospects. The purpose of the survey was to test a suggestion that the existence of strong electromagnetic anomalies might be an indirect guide in prospecting for deposits of uranium minerals in the Rum Jungle district.

The test was successful, in that strong electromagnetic anomalies were observed close to the known uranium orebody at Rum Jungle Creek South prospect.

1. INTRODUCTION

Since the first discovery of uranium minerals at Rum Jungle in 1949, prospecting for uranium has been carried on continuously in the Administrative Division of the Hundred of Goyder, which contains the known deposits in the Rum Jungle district. However, prospecting has been difficult owing to the extensive cover of soil and laterite, which limits outcrop throughout most of the district. At a conference of interested parties in May 1960 it was suggested that, as the known uranium deposits are generally associated with sulphide mineralization, the use of geophysical methods aimed at the discovery of deposits of sulphide mineralization might be an indirect guide to areas favourable for the occurrence of uranium. The grounds for this suggestion are discussed in detail by Daly (1962). As a first test of this hypothesis, it was decided that a geophysical survey using electromagnetic and self-potential methods should be made over the Rum Jungle Creek and Rum Jungle Creek South prospects, in each of which a uranium deposit of economic grade had been proved by drilling. The results of this survey are described in the present Record.

The survey was made by D.L. Rowston and A. Douglas, assisted by staff of the Darwin Uranium Group, during June 1960.

2. DESCRIPTION OF PROSPECTS

The Rum Jungle Creek prospects are situated about two miles west of Batchelor township, and 64 miles south of Darwin (Plate 1).

The mineralization occurs in black slate and chloritic schist of the Golden Dyke formation, which are bounded to the north by quartzite breccia. The contact between the slate and the breccia is faulted and dips steeply south-west. Some of the drill holes on the prospects encountered limestone, and it is also known from drilling that a considerable body of amphibolite occurs close to the prospects. As the aeromagnetic survey of the Rum Jungle district showed no defined anomalies in this area, it was concluded that the amphibolite in question must be very weakly magnetic, a fact which has been supported by laboratory tests on drill core specimens. As regards rock types, the geological environment of the prospects is similar to that of the orebodies previously worked at Rum Jungle. However, notwithstanding the considerable amount of drilling which has been done, it has not been possible to arrive at reliable conclusions on the structure of the area around the prospects.

Significant mineralization is almost entirely confined to the Rum Jungle Creek South prospect; it consists of pitchblende with minor amounts of pyrite, and occurs in the slate and schist, but no structural control has been recognized. No other base metal sulphides are present. Plate 2 shows the location of the mineralized area, as known in September 1960, with reference to the contact of the slate with the quartzite breccia.

3. TECHNICAL DETAILS

The characteristics of the geophysical methods used, and the bases of their application in the Rum Jungle area has been discussed in detail by Daly (1962). As the survey was designed to test the value of indications of the possible presence of sulphides as an indirect guide in prospecting for uranium, the main emphasis was placed on the use of electromagnetic methods, which are generally best suited to the detection of sulphide bodies; the Turam method was used. Some tests were also made with the self-potential method. In addition, magnetic observations were made, as a check on the results of the aeromagnetic survey in this area. Radiometric measurements were made over the Rum Jungle Creek South area.

The survey baselines were laid out parallel to the strike of the quartzite breccia contact. As the strike of the contact is not constant, two separate layouts were pegged, with baselines at different bearings; one covered the Rum Jungle Creek prospect, and the other the Rum Jungle Creek South prospect. Plate 2 shows the location of the survey grids with reference to mine co-ordinates of Territory Enterprises Pty Ltd (TEP).

4. RESULTS

Radiometric

The results of radiometric measurements are shown as contours of radioactive intensity on Plate 3. These results have confirmed previous measurements by TEP with added detail.

Electromagnetic

The results of the Turam survey are shown on Plates 3 to 7. They show a broad zone of anomalies, with a strike generally parallel to the quartzite breccia contact. Over the Rum Jungle Creek prospect, the anomalies are weak but increase in intensity to the south-east. Over the Rum Jungle Creek South prospect, the anomalies are stronger, and are very strong in the neighbourhood of the orebody. Towards the south-eastern end of the Rum Jungle Creek South prospect, the anomaly zone contracts in width, and the intensity of the anomalies decreases.

The character of these anomalies is quite different from that of other electromagnetic anomalies in the Rum Jungle district. Surveys at Brown's deposit (Daly, Horvath and Tate, in preparation), Waterhouse No. 1 prospect (Daly and Tate, 1958), and Waterhouse No. 2 prospect (Daly and Tate, 1960) have disclosed extremely strong, sharp anomalies; the ratio and phase anomalies coincide in position, and are due to narrow bodies of high conductivity. The results of the present survey have been treated in the usual way by considering ratio and phase profiles separately, marking the points at which ratio maxima and phase minima occur, and joining corresponding points on each profile, to obtain the approximate position of the axes of the anomalies. If individual anomalies are due to narrow conducting bodies, the axes of the various anomalies as determined from ratio and phase measurements should nearly coincide.

The anomaly axes determined in this way are shown on Plate 3, and it is apparent that the anomalies are of a very unusual type. If it is to be supposed that each anomaly is due to a separate conductor, it must be concluded that three separate conductors are present, of which one gives a strong ratio anomaly with no phase anomaly and two give strong phase anomalies with no ratio anomaly. However, inspection of the phase contours shown on Plate 4 suggests that this method of treating the results is misleading. The phase minima are not always sharply defined, but on many traverses are merely local minima in a wide zone of very strong anomaly.

It is considered, therefore, that anomalies in ratio and phase should be taken together, and interpreted as due to a single body. If this is so, it is necessary to explain the considerable displacement in position between ratio and phase anomalies. This question is discussed in detail by Daly (1962), and reasons are given why an anomaly of this type may be considered typical of the effect due to a conducting body of considerable width.

Magnetic and self-potential methods

The magnetic and self-potential methods were used on several traverses. However, no defined anomalies were found, and their use was discontinued.

5. CONCLUSIONS

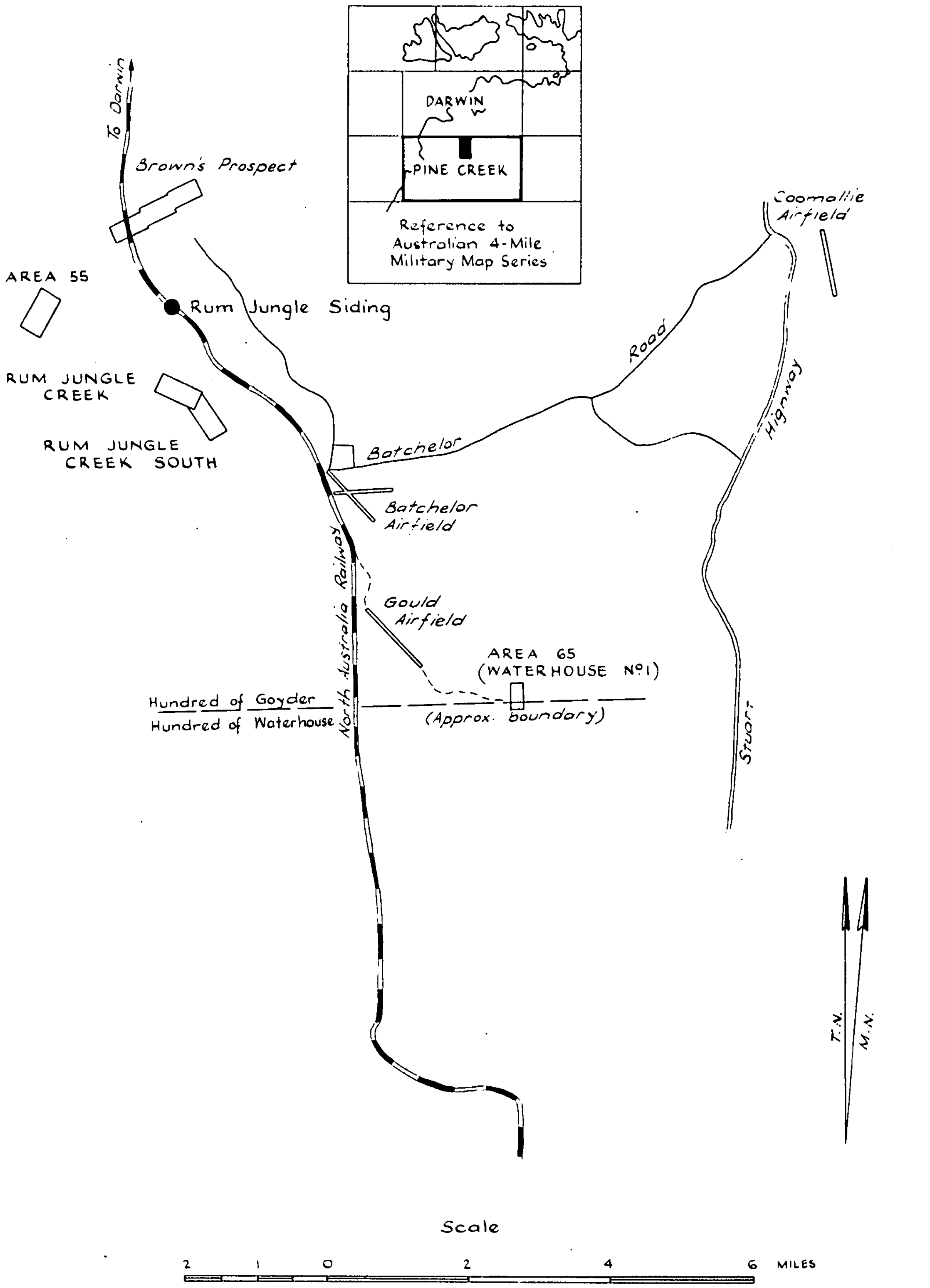
The electromagnetic results are the only ones that provide a basis for definite conclusions. It is considered that the anomalies indicate the presence of a wide zone of good conductivity in the Rum Jungle Creek South area. The zone is best defined in the area between 22E and 35E. On the basis of a theory discussed by Daly (1962), it is considered that the southern boundary of the zone coincides roughly with the position of the ratio anomaly axis as shown on Plate 3, and that the results do not admit of estimating the position of its northern boundary. The conducting zone becomes indefinite east of 35E on the Rum Jungle Creek South layout, and becomes weaker and finally disappears in the Rum Jungle Creek area to the west.

The cause of the high conductivity in this zone is not known. By analogy with other highly conducting bodies in the Rum Jungle area it is presumed that it is due to a higher content of pyrite or graphite than occurs in the country rock generally. Tests on drill core samples have shown that the Rum Jungle Creek South orebody contains a small percentage of pyrite and a rather smaller percentage of graphite. However, Plate 8 shows the position of the anomaly zone relative to the orebody. It appears that the orebody lies mainly south of the anomaly zone, so that samples taken from it are not likely to be representative of the formation that causes the anomaly. Plate 8 also shows the assumed position of thrusts postulated by TEP, and subsurface contours of limestone as determined from diamond-drill intersections. There appears to be no obvious correlation between any of these features and the body that causes the anomaly.

Considered as a test of a proposed method of prospecting for uranium, however, the survey was successful. The strongest anomaly is immediately adjacent to the orebody, and a line of drill holes across the anomaly at its strongest point would certainly have led to the discovery of the orebody. It is considered that the application of electromagnetic methods can be a very useful tool in prospecting for uranium deposits in the Rum Jungle district, and that, if anomalies of the particular type discovered at Rum Jungle Creek South should be found in other areas, they would provide a valuable target for exploration for the presence of uranium orebodies.

6. REFERENCES

DALY, J., HORVATH, J., and TATE, K.H.	-	Brown's Deposit geophysical survey, N.T. 1957. Bur. Min. Resour. Aust. Rec. (in preparation).
DALY, J.	1962	Rum Jungle district, Northern Territory, introductory report on geophysical surveys 1960-61. Bur. Min. Resour. Aust. Rec. 1962/27.
DALY, J., and TATE, K.H.	1958	Geophysical survey, Waterhouse No. 1 uranium prospect, N.T. (1957). Bur. Min. Resour. Aust. Rec. 1958/81.
DALY, J., and TATE, K.H.	1960	Waterhouse Nos. 2, 3, and 4 uranium prospects, geophysical surveys, N.T. 1957. Bur. Min. Resour. Aust. Rec. 1960/109.



LOCALITY MAP

RUM JUNGLE CREEK, RUM JUNGLE CREEK SOUTH PROSPECTS

AREA 55 - AREA 65

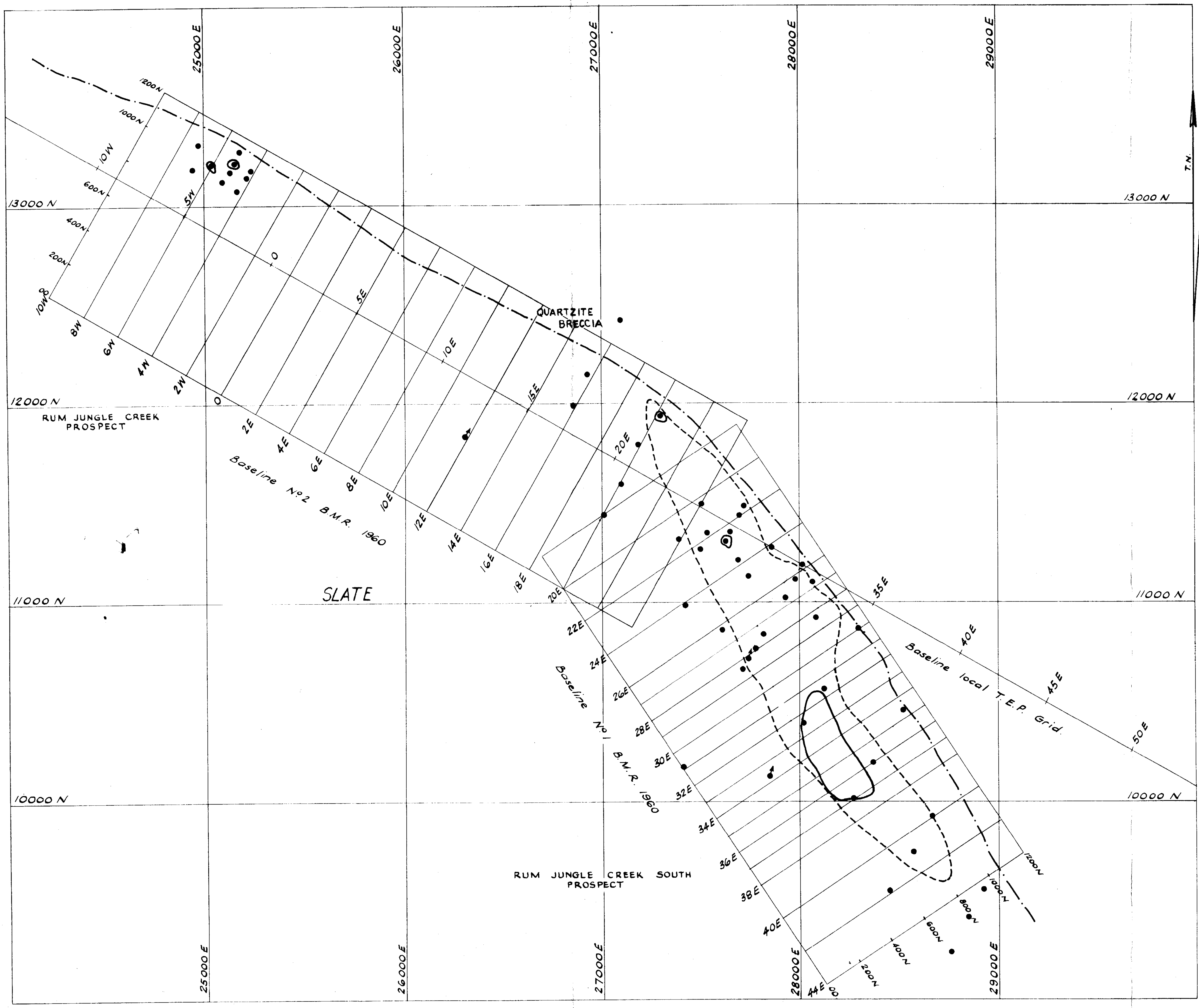
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T. 1960.

Bureau of Mineral Resources, Geology and Geophysics,
Darwin September 1960.

G71-201

TO ACCOMPANY RECORD No 1962/28

PLATE 2



Reference

- - - - Limit of mineralisation

——— Limit of ore grade mineralisation 850' contour, Sept. 1960.

—·—·— Southern limit of quartzite breccia.

● Drill hole.

Scale

400 0 400 800 FT.

TRAVERSE LAYOUT

RUM JUNGLE CREEK, RUM JUNGLE CREEK SOUTH PROSPECTS.

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1960.

ADAPTED FROM T.E.P. PLAN T29.

Bureau of Mineral Resources, Geology and Geophysics, Darwin, September 1960.

G71-202

TO ACCOMPANY RECORD No 1962/28

PLATE 3

BASELINE Nº1 B.M.R. 1960

Reference

Turam phase axes < -10°

Turam phase axes -7·5 to - 10°

Turam ratio axes > 1·30

Turam ratio axes 1·2 - 1·3

Scale

100 0 100 200 FEET

Geophysicist: [signature]

Bureau of Mineral Resources, Geology and Geophysics,
Darwin September 1960.

RADIOMETRIC CONTOURS AND TURAM AXES

RUM JUNGLE CREEK SOUTH PROSPECT

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T. 1960

CONTOUR INTERVAL 0·01 MILLIROENTGENS/HOUR
GENERAL BACKGROUND 0·015 mR/hr

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TO ACCOMPANY RECORD No 1962/28

PLATE 4

TURAM RATIO CONTOURS

RUM JUNGLE CREEK SOUTH PROSPECT

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T. 1960.

CONTOUR INTERVAL 0·05 DEGREES
FREQUENCY 440 ~
COIL SEPARATION 50 FEET

Scale
100 50 0 100 200 FT.

Geophysicist: D L Rowston

Bureau of Mineral Resources, Geology and Geophysics,
Darwin September 1960.

G71-204

TO ACCOMPANY RECORD No 1962/28

TURAM PHASE CONTOURS

RUM JUNGLE CREEK SOUTH PROSPECT

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T. 1960.

CONTOUR INTERVAL 2·5 DEGREES
FREQUENCY 440 ~
COIL SEPARATION 50 FEET

Scale

100 0 100 200 FEET

Geophysicist: [signature]

Bureau of Mineral Resources Geology and Geophysics
Darwin September 1960.

G71-205

TO ACCOMPANY RECORD No 1962/28

TURAM RATIO CONTOURS

RUM JUNGLE CREEK PROSPECT

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, 1960.

CONTOUR INTERVAL 0·05°

COIL SEPARATION 50 FEET FREQUENCY 440 C/S

Scale

100 0 100 200 FT.

Geophysicist: [signature]

Bureau of Mineral Resources Geology and Geophysics
Darwin October 1960.

G71-206

TO ACCOMPANY RECORD No 1962/28

PLATE 7

TURAM PHASE CONTOURS

RUM JUNGLE CREEK PROSPECT

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, 1960.

CONTOUR INTERVAL 2.5 DEGREES
COIL SEPARATION 50 FEET, FREQUENCY 440 C/S

Scale
100 0 100 200 FT.

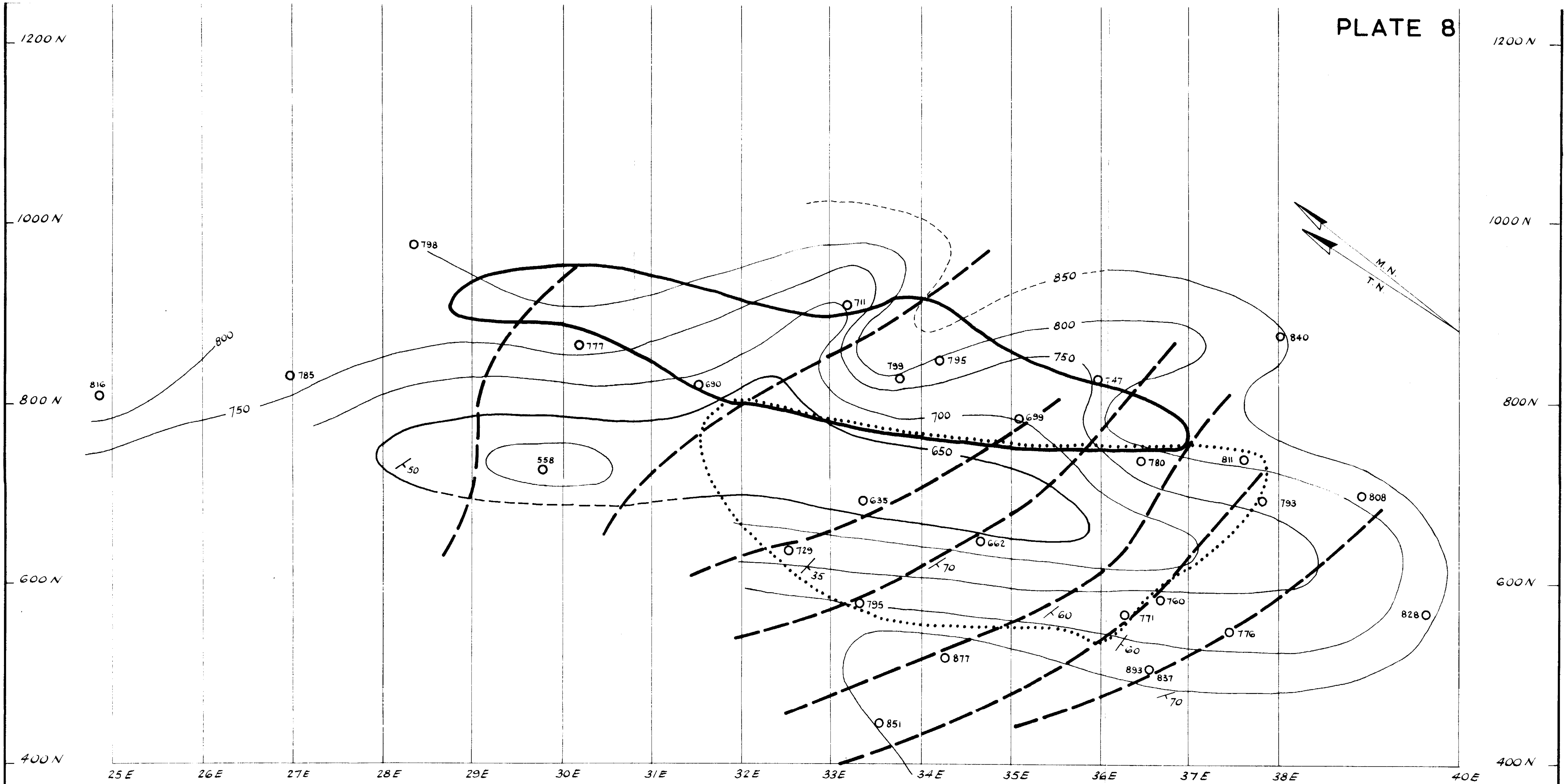
Geophysicist R.L. Rowston

Bureau of Mineral Resources, Geology and Geophysics
Darwin October 1960.

G71-207

TO ACCOMPANY RECORD No 1962/28

PLATE 8



Reference

1:30 Turam ratio contour
850' Ore body contour
Structure contour on limestone (B.M.R.)
Thrusts (T.E.P.)
O 795 Limestone intersection
50 Dip (T.E.P.)

Assumed Surface Datum: 1000 ft.

PLAN SHOWING POSITION OF MAIN TURAM ANOMALY

IN RELATION TO ORE BODY AND POSSIBLE GEOLOGICAL STRUCTURE

RUM JUNGLE CREEK SOUTH PROSPECT

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T. 1960

Scale

100 0 100 200 FT.

Geophysicist: D. Rowston

Bureau of Mineral Resources, Geology and Geophysics
Darwin, N.T. December 1960.

G71-208

TO ACCOMPANY RECORD No 1962/28