COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS



RECORD No. 1964/5

# BATCHELOR LATERITES AREA EXTENDED, GEOPHYSICAL SURVEY.

## RUM JUNGLE, NT 1962-63



by

A. DOUGLAS

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*by*

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CONTENTS



ILLUSTRATIONS



SUMMARY


Electromagnetic and radiometric surveys over extensions to the Batchelor Laterites area grid are described. These surveys were made to find the full extent of a conducting zone partly outlined by previous surveys around the southern part of Castlemaine Hill. The Rum Jungle Creek South uranium orebody lies within this conducting zone and it is possible that there are other orebodies.

The results show the conducting zone contains a complex of electromagnetic anomalies. However, only one of these anomalies, Anomaly A, warrants testing by drilling. This anomaly indicates a good conductor at a depth of 200 ft; it is the only anomaly in the conducting zone that closely resembles the anomaly adjacent to the Rum Jungle Creek South orebody. Recommendations are made for testing Anomaly A.

The radiometric results show little of interest.

## 1. INTRODUCTION

Electromagnetic surveys in the Rum Jungle area in 1961 outlined a conducting zone around the southern part of Castlemaine Hill (Daly, 1962). A uranium orebody, Rum Jungle Creek South, occurs in this zone and it is possible that there are other orebodies. Diamond drilling by Territory Enterprises Pty Ltd (TEP) has shown the conductor to be a chloritic slate with pyrite, the host rock of the Rum Jungle Creek South orebody, but as yet no further uranium mineralisation has been found.

However, the full extent of the conducting zone was not shown by the 1961 surveys and it was decided to extend the survey area to cover the whole zone. The work was done in 1962 by the staff of the Darwin Uranium Group of the Bureau of Mineral Resources, Geology and Geophysics.

The areas surveyed were along the eastern and southern borders of the Batchelor Laterites area. Batchelor Laterites is an area of highly-radioactive lateritic gravel about one mile south-east of Batchelor township, NT (Plate 1); this area was surveyed in 1961 and the results are described by Rowston (1962a). For the 1962 survey the Batchelor Laterites area survey gird was extended eastwards and southwards. The whole of the area was covered by the 1961 and 1962 grids has been called Batchelor Laterites Area Extended. The 1961 and 1962 survey areas are indicated separately on Plate 1.

The principles of the electromagnetic methods and their application to the search for uranium in the Rum Jungle Area have been described by Daly (1962). A radiometric survey was also made of the Batchelor Laterites Area Extended.

Shallow auger drilling with geochemical testing of auger samples was carried out over the Batchelor Laterites Area Extended by the Bureau of Mineral Resources during 1961 and 1962 (Ruxton and Shields, 1963 a and b; Pritchard, Barrie, Jauncey, and Fricker, 1963). During 1963 TEP did some diamond drilling in the area. The geology compiled from the auger and diamond-drilling results is shown in Plate 2. There are three main lithological units, viz. limestone with occasional interbedded slate, chloritic and black slates, and amphibolite. The limestone occurs in the north and west of the area and the chloritic and black slates throughout most of the remainder. The amphibolite lies within the slate sequence.

## 2. OPERATIONS

The traverses of the 1961 geophysical grid for the Batchelor Laterites area (Rowston, 1962a) were extended 1100 ft from 154E to 165E and Traverses 4N to 12S were added and pegged as follows:

| Traverse | Portion pegged |
|---|---|
| 4N to 8S | 144E to 165E |
| 10S, 12S | 144E to 160E |
| 6S, 8S, 10S | 124E to 136E |

The Castlemaine Hill survey grid (Rowston, 1962b), which lies adjacent to that of the Batchelor Laterites area and has the same co-ordinate system, was enlarged. Traverses 122E to 130E were extended from 6S to 18S and Traverses 132E to 148E added and pegged from 8N to 18S. Small portions of Traverses 165E (13N to 1N), 167E (13N to 1N), 169E (10N to 2S), and 171E (8N to 3S) were also pegged. All these traverses are shown on Plates 3 and 4.

The grid extensions were surveyed using the electromagnetic (Slingram) and radiometric methods. The Turam electromagnetic method was also used to provide additional information over two parts of the large area, viz. south of 4N between 130E and 154E (Layout 1) and east of 146E between 6S and 24N (Layout 2). The cable loop for Layout 1 was on the north; that for Layout 2 was on the west.

Further Turam work was carried out at Batchelor Laterites Area Extended in 1963. This was a small test survey over part of Layout 2 (Traverses 2S - 8N). For this test survey the cable loop was on the east of the layout. For convenience the results of the 1963 Turam work are also included in this Record.

## 3. GEOPHYSICAL RESULTS

### Radiometric (Plate 2)

The main radiometric anomaly lies in the 1961 survey area and has already been discussed (Rowston, 1962a; Ruxton and Shields, 1963a). The 1962 work showed little of interest. A maximum reading of 0.040 mr/hr (roughly 2 x background) was located at 00/132E. The linear anomalies in the north-east corner of the survey area are attributed to radioactive gravels used for road material and as a foundation for the railway line that crosses this corner of the area.

The radiometric results will not be discussed further as they contain little of interest.

### Electromagnetic

Slingram (Plates 3 and 4). The Slingram results show two zones with markedly different response characteristics:

Zone 1, a featureless area lying west of 148E and north of 6N, and

Zone 2, a highly anomalous area south and east of the featureless area.

The results are difficult to interpret and they suggest a complicated distribution of conductors in the ground, some of which are almost certainly connected with wartime installations.

The anomalies can be divided roughly into two types, viz. those that are narrow and elongate and those that are broad and less markedly linear. The narrow elongate anomalies strike roughly parallel to the boundary between Zones 1 and 2 and occur within about 1000 ft of this boundary; the broad anomalies occur over the remainder of Zone 2. One linear anomaly, Anomaly B, extends for the whole length of the area from 30N/163E to 12S/157E. Over a large area centred on 1N/155E the imaginary components were 'off scale'.

The almost-circular anomalous area centred on 8S/128E is probably caused by old army installations buried in the area.

Turam (Plates 5 to 10)

The Turam results show the same general features as the Slingram results. Zones 1 and 2 and Anomaly B are shown. However, one anomaly, Anomaly A, was detected by the Turam method only. The 1962 Turam results (Plate 7) show Anomaly A as a broad, elongate ratio anomaly with axis extending from 2S/153E to 14N/154E. Anomaly A is only weakly represented in the phase results.

The 1963 Turam survey (Plates 9 & 10) was made to get more information about Anomaly A. For this survey the cable loop was east of the layout; for the 1962 survey the loop was west of the layout. The 1962 and 1963 sets of results, although similar, show two differences:

(a) Anomaly A is less intense when the loop is east of the area, and

(b) changing the position of the loop from west to east of the layout displaces the axis of Anomaly A westwards.

A large anomaly occurs in the south-east corner of layout 2 (Plate 7). In the area shown as 'off scale' the gradients are too steep to be measured. Such steep gradients indicate very shallow bodies, and the anomaly is probably due to a buried iron pipe.

## 4. DISCUSSIONS OF RESULTS

The narrow elongate anomalies that occur within about 1000 ft of the Zone 1/Zone 2 boundary lie within the conducting zone partly outlined by the 1961 electromagnetic surveys. Northwards this zone extends into the Power Line area (Douglas, 1962) and westwards into the Rum Jungle Creek South-Castlemaine Hill area (Rowston, 1962b). The Rum Jungle Creek South orebody is associated with this conducting zone.

The boundaries of the conducting zone cannot be defined exactly. On the north and west the junction is fairly sharp and is probably the limestone/slate contact. This does not agree with the known geology as some of the anomalies apparently lie within the limestone sequence; these anomalies probably indicate shale lenses within the limestone. Non-conducting limestone probably underlies the whole of Zone 1.

The southern and eastern boundary of the conducting zone is less definite. This is to be expected as the geological evidence shows no marked change in lithology that can be correlated with this boundary. The conducting zone is probably a more-conducting rock type within a moderately-conducting shale/amphibolite sequence. The increased conductivity may indicate chloritic slate with pyrite as is known elsewhere along the conducting zone. TEP drilling results support this suggestion.

One anomaly within the conducting zone, Anomaly A, is of particular interest; it is the only anomaly that is similar to that detected adjacent to the Rum Jungle Creek South orebody (Daly and Rowston, 1962): both anomalies are most-strongly-developed on the ratio, are broad (400 ft) and very intense (ratio $> 1.4$), and thus indicate good conductors at depths of about 200 ft. Because of the great similarity between Anomaly A and the Rum Jungle Creek South anomaly, Anomaly A should be extensively tested by diamond drilling. The body causing Anomaly A probably dips eastwards (this would explain the increased intensity of the anomaly when the loop is on the west) and increases in thickness southwards.

Anomaly B probably overlies a shear. This anomaly cuts across the general trend of the other anomalies and its strike, 035 degrees, is very similar to that of the Giants Reef Fault, one of the main lines of movement in the Rum Jungle area. The shear indicated by Anomaly B could thus be of the same age as the Giants Reef Fault. As mineralisation in the Rum Jungle area is thought to predate the formation of the Giants Reef Fault, the shear causing Anomaly B is unlikely to be mineralised.

The cause of the large area of 'off scale' readings in the Slingram imaginary component, centred near 1N/155E, is obscure. This area has been covered twice using the Turam method, with the primary cable on opposite sides of the layout. The anomaly is not clearly shown on the ratio results (Plates 7 & 9) but the phase results (Plates 8 & 10) show anomalies of complex shape, which suggest the presence of several moderately-good conductors close together. The resolution of the Slingram method depends on the coil spacing, which was 200 ft in this case, so that the Turam results may give a more-reliable picture of the distribution of conductivity. However, owing to its unusual nature, this anomaly cannot be interpreted confidently.

## 5. CONCLUSIONS AND RECOMMENDATIONS

The radiometric results for the 1962 work show nothing of interest.

The electromagnetic results outlined a broad zone of variable conductivity, viz. a portion of a conducting zone that extends from Rum Jungle Creek South to the Power Line area. However, only one anomaly, termed Anomaly A, within this zone warrants further testing for mineralisation.

Anomaly A is probably caused by a highly-conductive body at about 200-ft depth. The width and intensity of Anomaly A is very similar to that of the anomaly outlined adjacent to the Rum Jungle Creek South uranium orebody (Daly & Rowston, 1962). Thus Anomaly A could be associated with similar uranium mineralisation. Drill holes to a vertical depth of 300 ft are recommended at the following points locations along Traverse 4N: 151.5E, 152.5E, 153E, 153.5E, 154E, 154.5E, and 155.5E.

TEP has already started a drilling programme to test Anomaly A; three holes have been drilled to 300-ft depth at the following points: 4N/151E, 4N/153E, 4N/155E. No obvious cause of the anomaly has yet been found. However these drill holes are spaced at 200-ft intervals and may have missed the conductor. Drill holes spaced at 50-ft intervals are required to thoroughly test Anomaly A. Some help in siting further drill holes may be obtained from the results of the induced polarisation (I.P.) survey over Anomaly A when these results have been assessed (Eadie, in preparation).

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PLATE 1

# RUM JUNGLE AREA, N.T.

## LOCALITY MAP

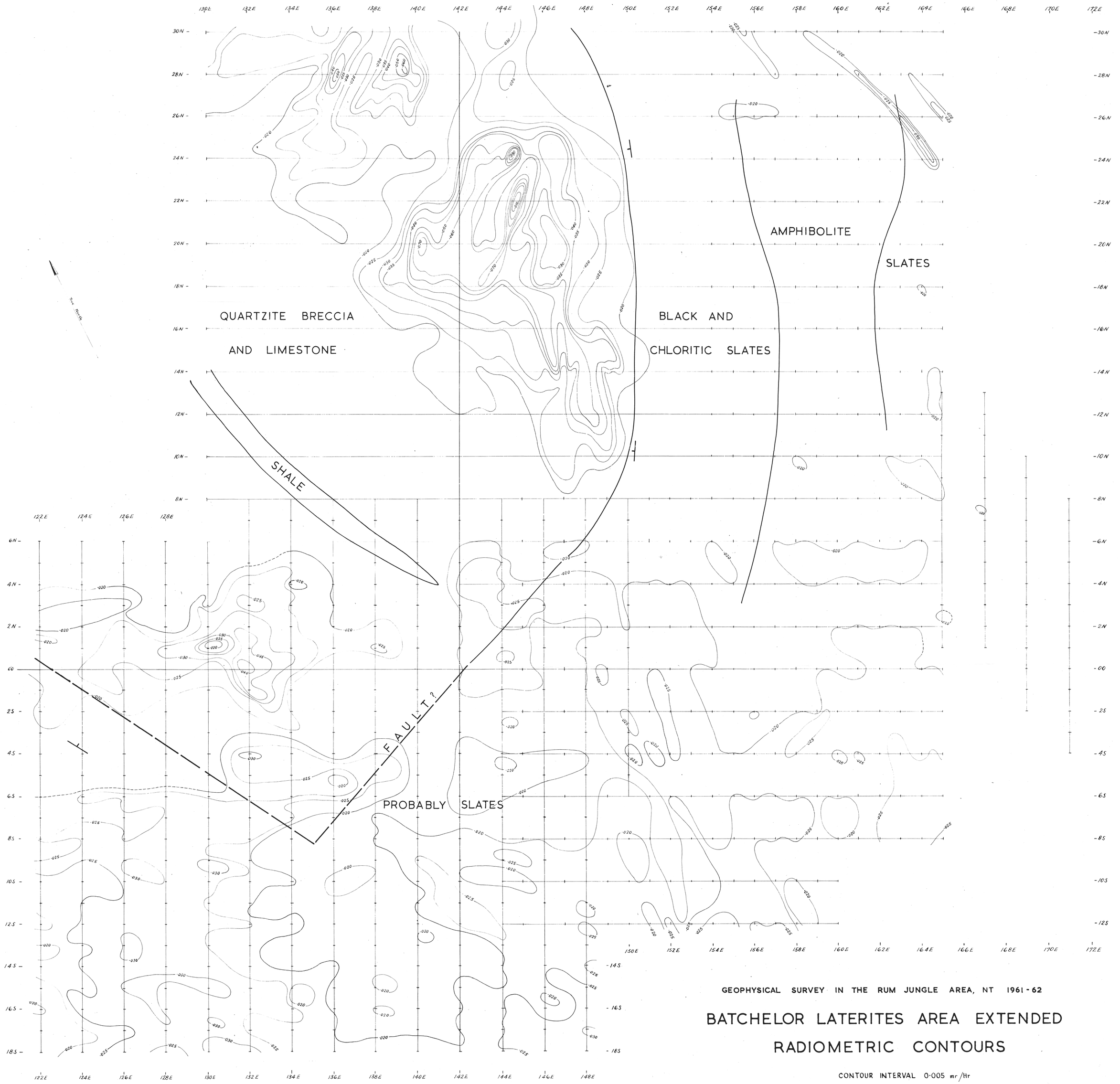
## GEOPHYSICAL SURVEYS, 1960-62





D52/B7-42-1

To Accompany Record No 1964/5




GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1961-62

# BATCHELOR LATERITES AREA EXTENDED RADIOMETRIC CONTOURS

CONTOUR INTERVAL 0·005 mr/Hr

GEOLOGY FROM DIAMOND AND AUGER-DRILL HOLES

Scale

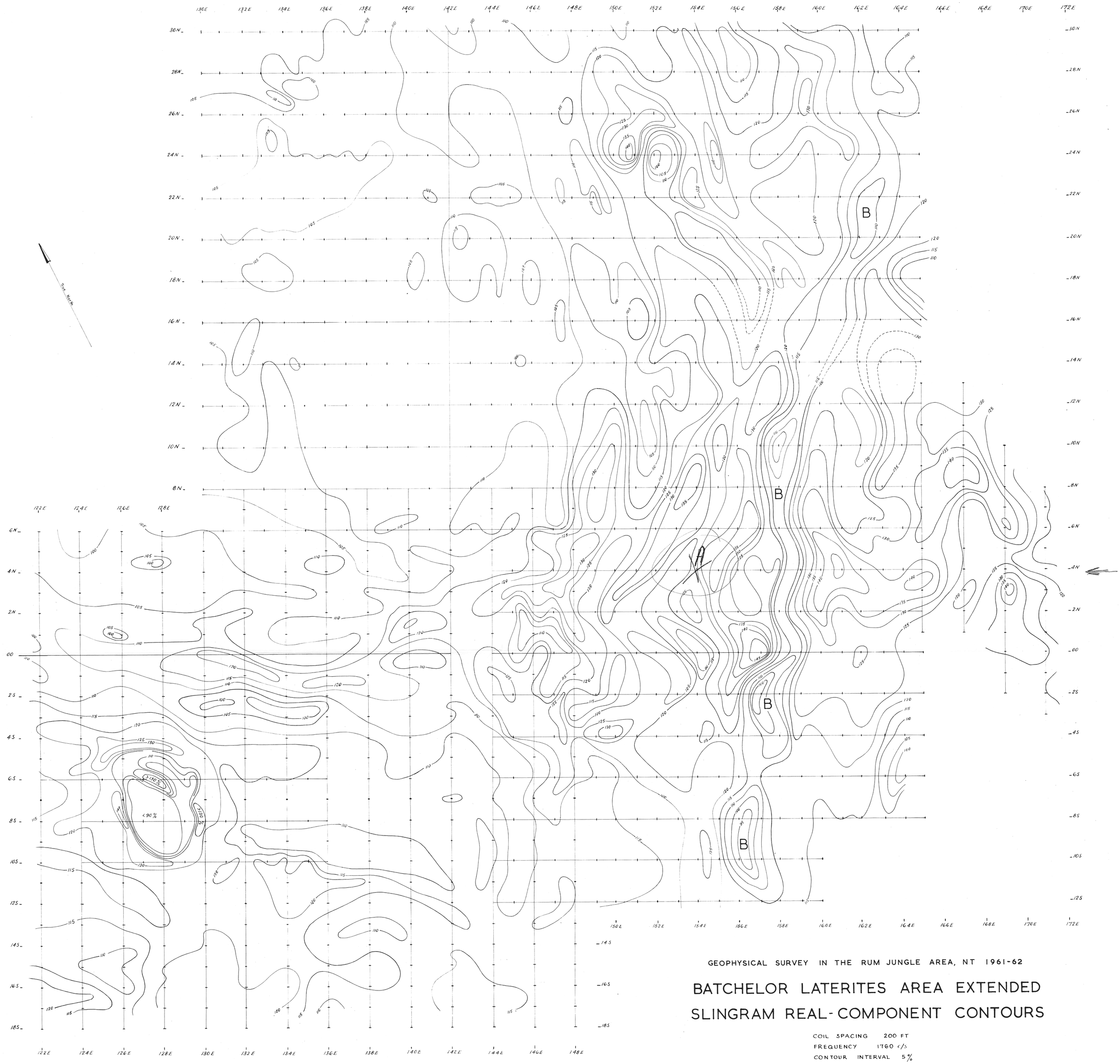
200 0 200 400 600 800 FT

Bureau of Mineral Resources, Geology and Geophysics,
Darwin, NT September 1962

To Accompany Record No 1964/5

D52/B7-66

GP·5114




GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1961-62

# BATCHELOR LATERITES AREA EXTENDED SLINGRAM REAL-COMPONENT CONTOURS

COIL SPACING 200 FT
FREQUENCY 1760 c/s
CONTOUR INTERVAL 5%

Scale

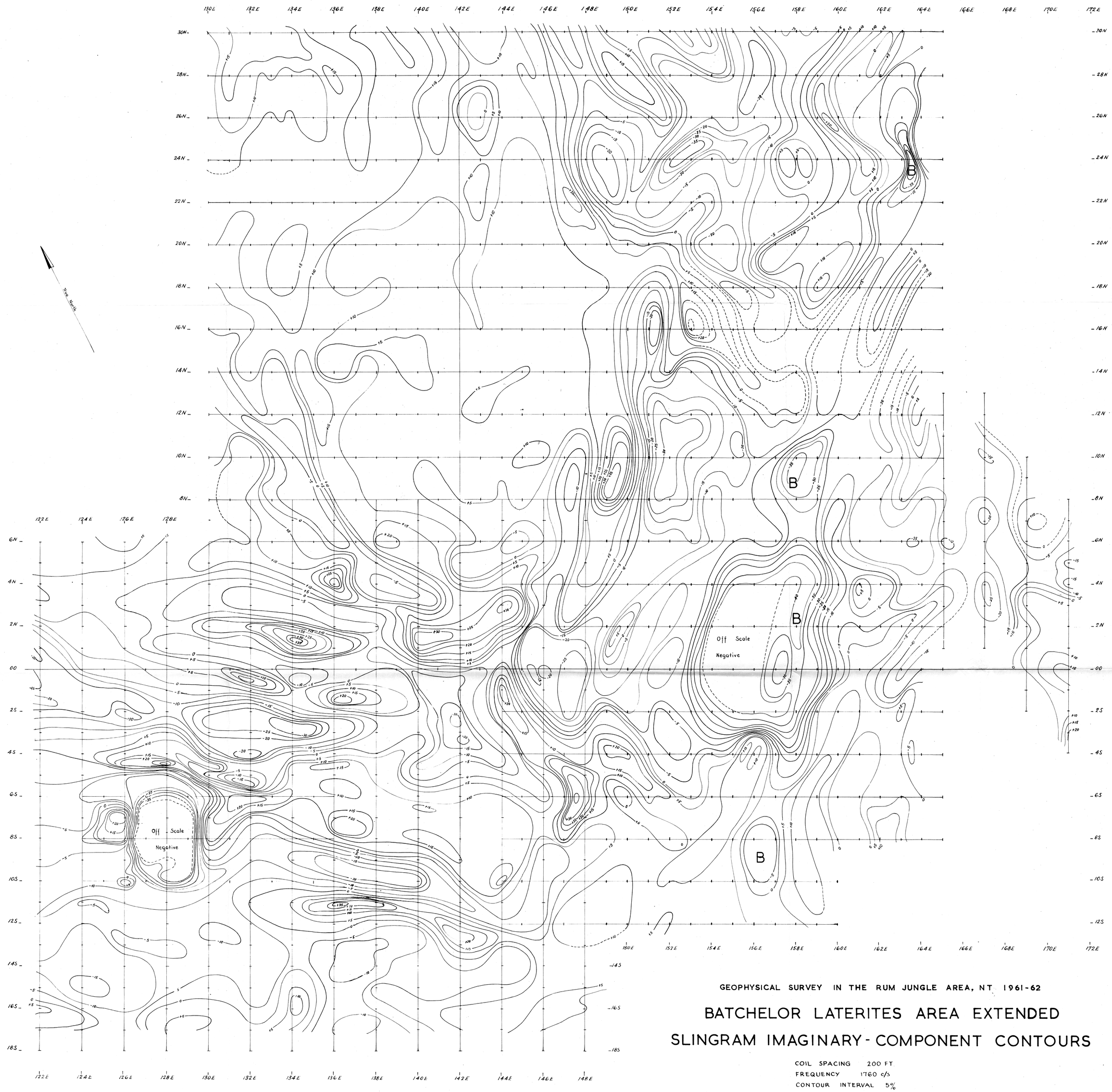
200 0 200 400 600 800 FT

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. September 1962.

To Accompany Record No 1964/5

D52/B7-67

GP-5112




GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1961-62

# BATCHELOR LATERITES AREA EXTENDED
# SLINGRAM IMAGINARY-COMPONENT CONTOURS

COIL SPACING 200 FT
FREQUENCY 1760 c/s
CONTOUR INTERVAL 5%

Scale
200 0 200 400 600 800 FT

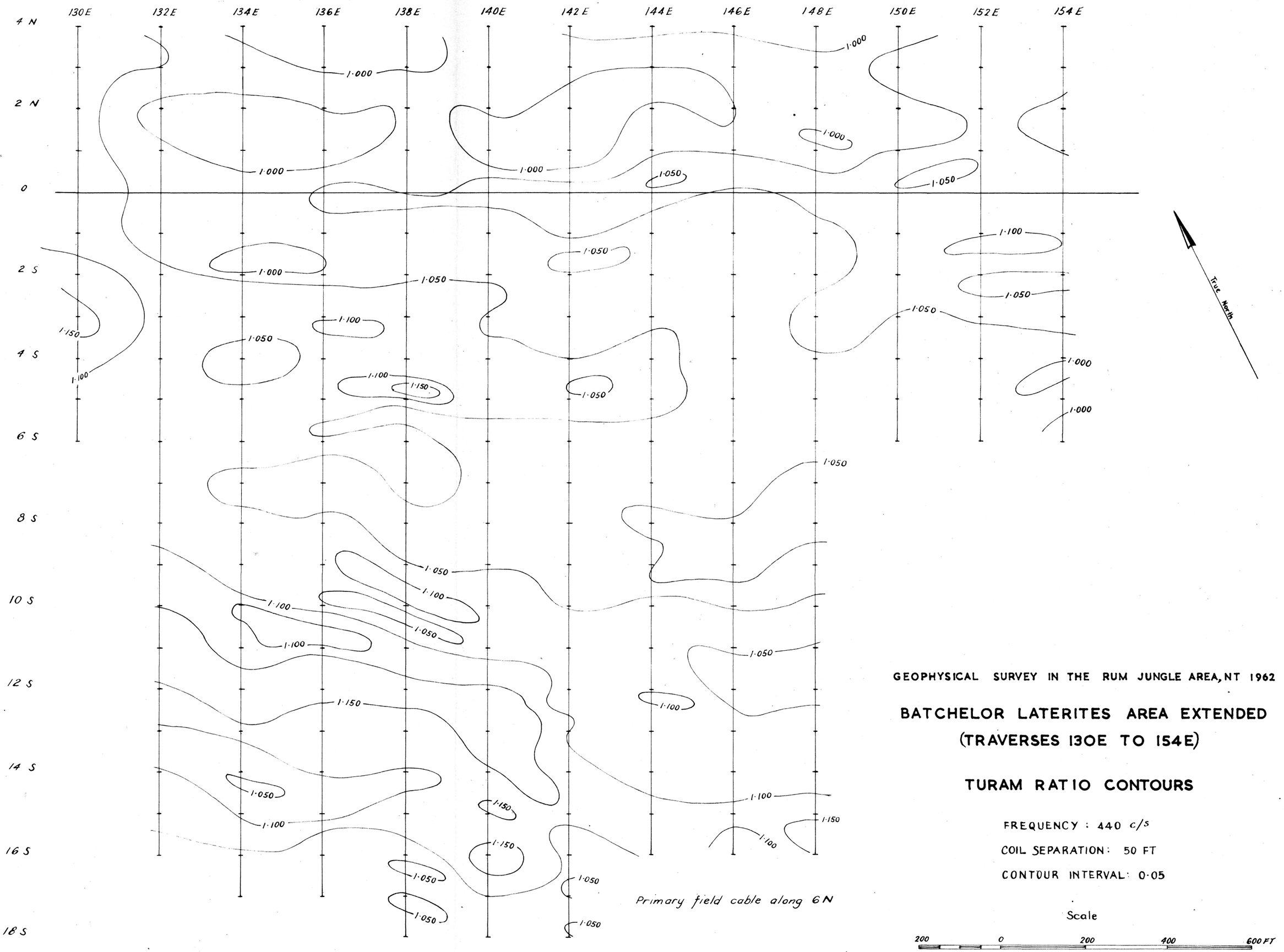
Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. September 1962

To Accompany Record No 1964/5

D52/B7-68

GP-S113

PLATE 5




GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1962

# BATCHELOR LATERITES AREA EXTENDED (TRAVERSES 130E TO 154E)

## TURAM RATIO CONTOURS

FREQUENCY : 440 c/s

COIL SEPARATION: 50 FT

CONTOUR INTERVAL: 0·05

Scale

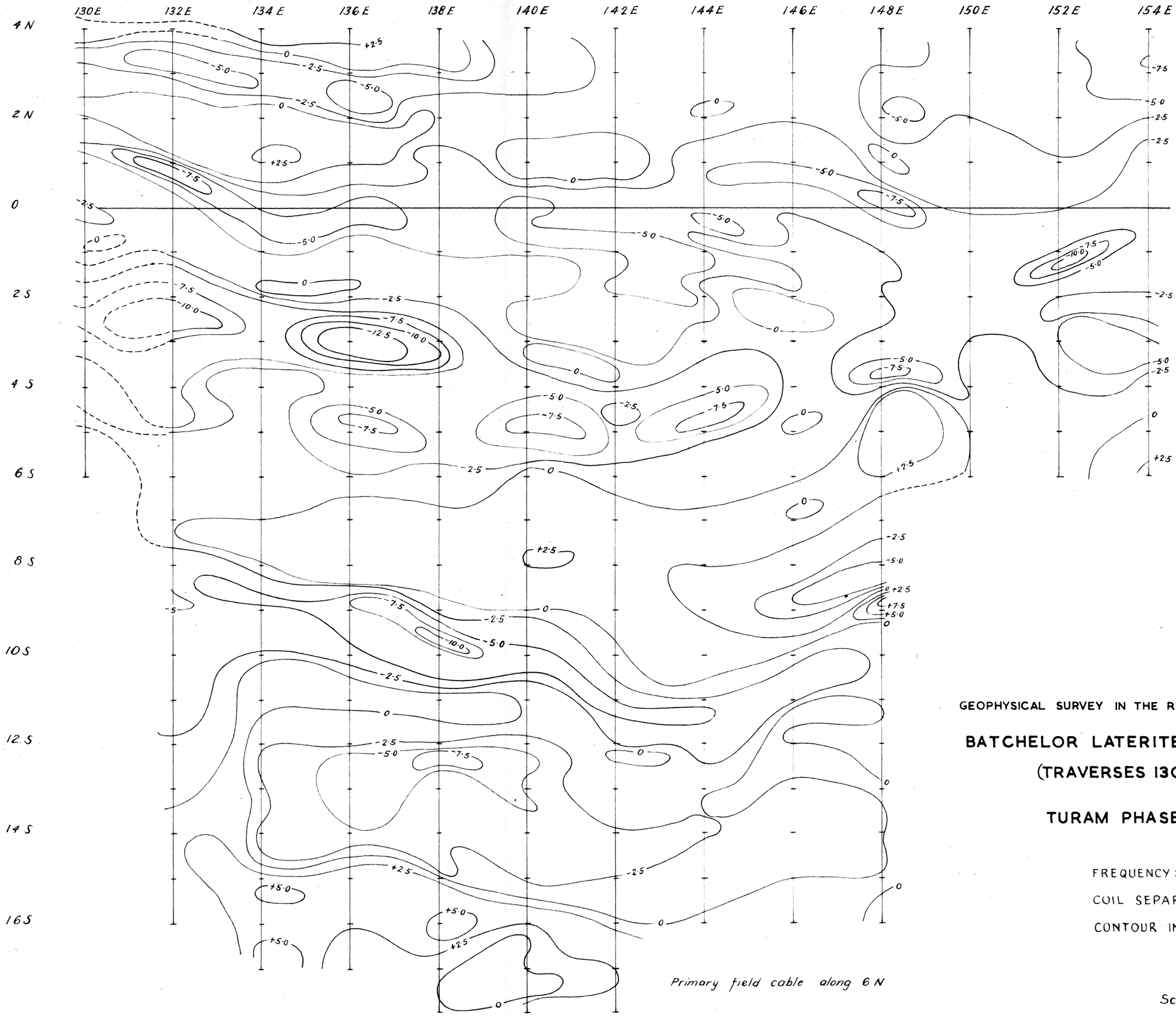
200 0 200 400 600 FT

Bureau of Mineral Resources, Geology and Geophysics, Darwin, NT September 1962

D52/B7-69

To Accompany Record No 1964/5 GP 516

PLATE 6




GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1962

# BATCHELOR LATERITES AREA EXTENDED
# (TRAVERSES 130E TO 154E)

## TURAM PHASE CONTOURS

FREQUENCY: 440 c/s

COIL SEPARATION: 50FT

CONTOUR INTERVAL: 2·5°

Scale

200 0 200 400 600 FT

Bureau of Mineral Resources, Geology and Geophysics
Darwin, N T September 1962

D52/B7-70

To Accompany Record No 1964/5

PLATE 7

6S 4S 2S 00 2N 4N 6N 8N 10N 12N 14N 16N 18N 20N 22N 24N

146E 148E 150E 152E 154E 156E 158E 160E 162E 164E

A

B

Off-scale

Frequency 440 c/s

Coil separation 50 ft

Contour interval 0·05

*Primary field cable along 14 400 E*

TRUE NORTH

SCALE IN FEET

200 0 200 400 600

# GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1962

## BATCHELOR LATERITES AREA EXTENDED

## (TRAVERSES 6S TO 24N)

## TURAM RATIO CONTOURS

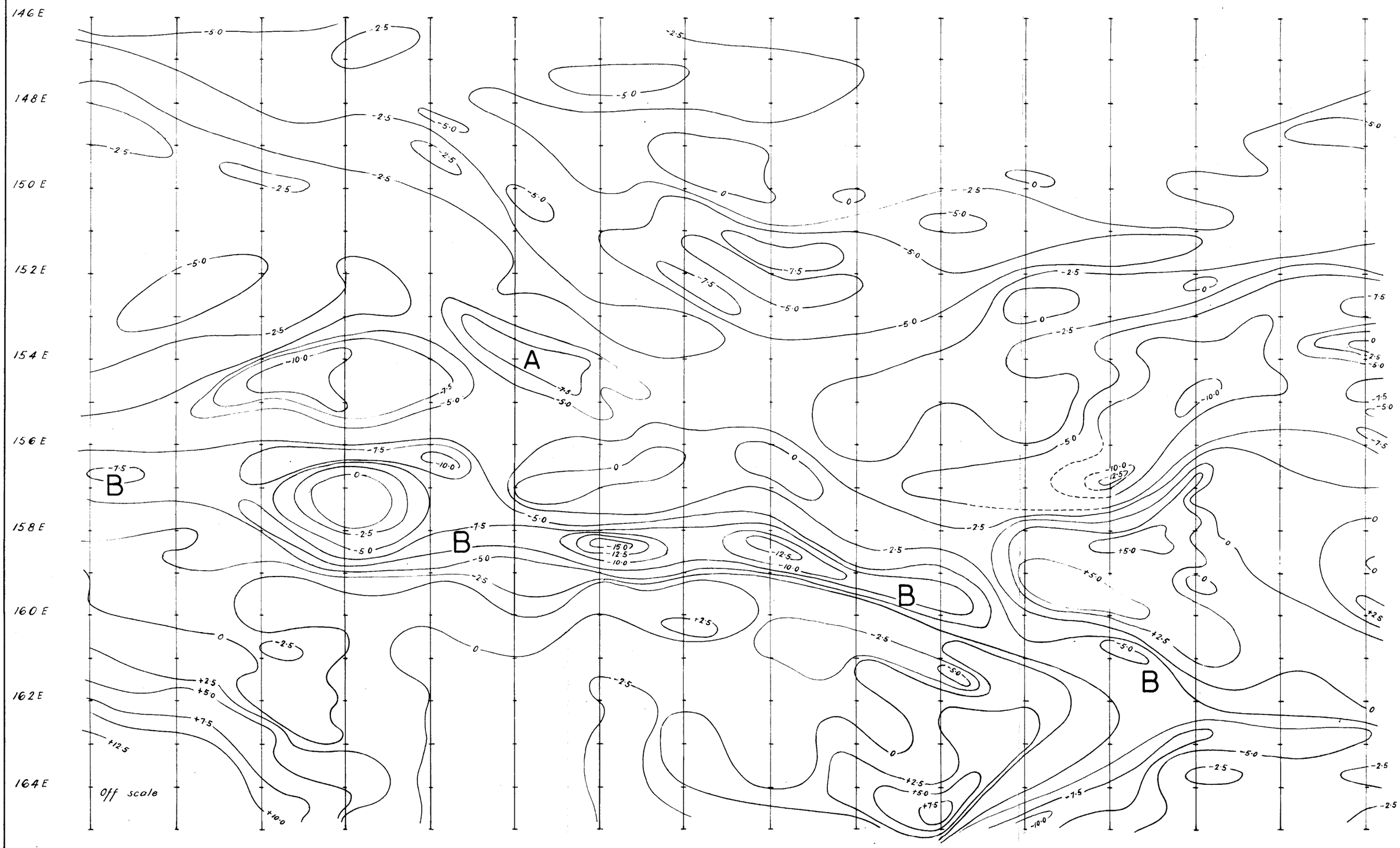
Bureau of Mineral Resources, Geology and Geophysics, Darwin, NT October 1962

To Accompany Record No 1964/5

D52/B 7-71

GP S118

PLATE 8




Frequency 440 c/s
Coil separation 50 ft
Contour interval 2·5°

Primary field cable along 144 E

SCALE IN FEET
200 0 200 400 600

TRUE NORTH

# GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1962

## BATCHELOR LATERITES AREA EXTENDED

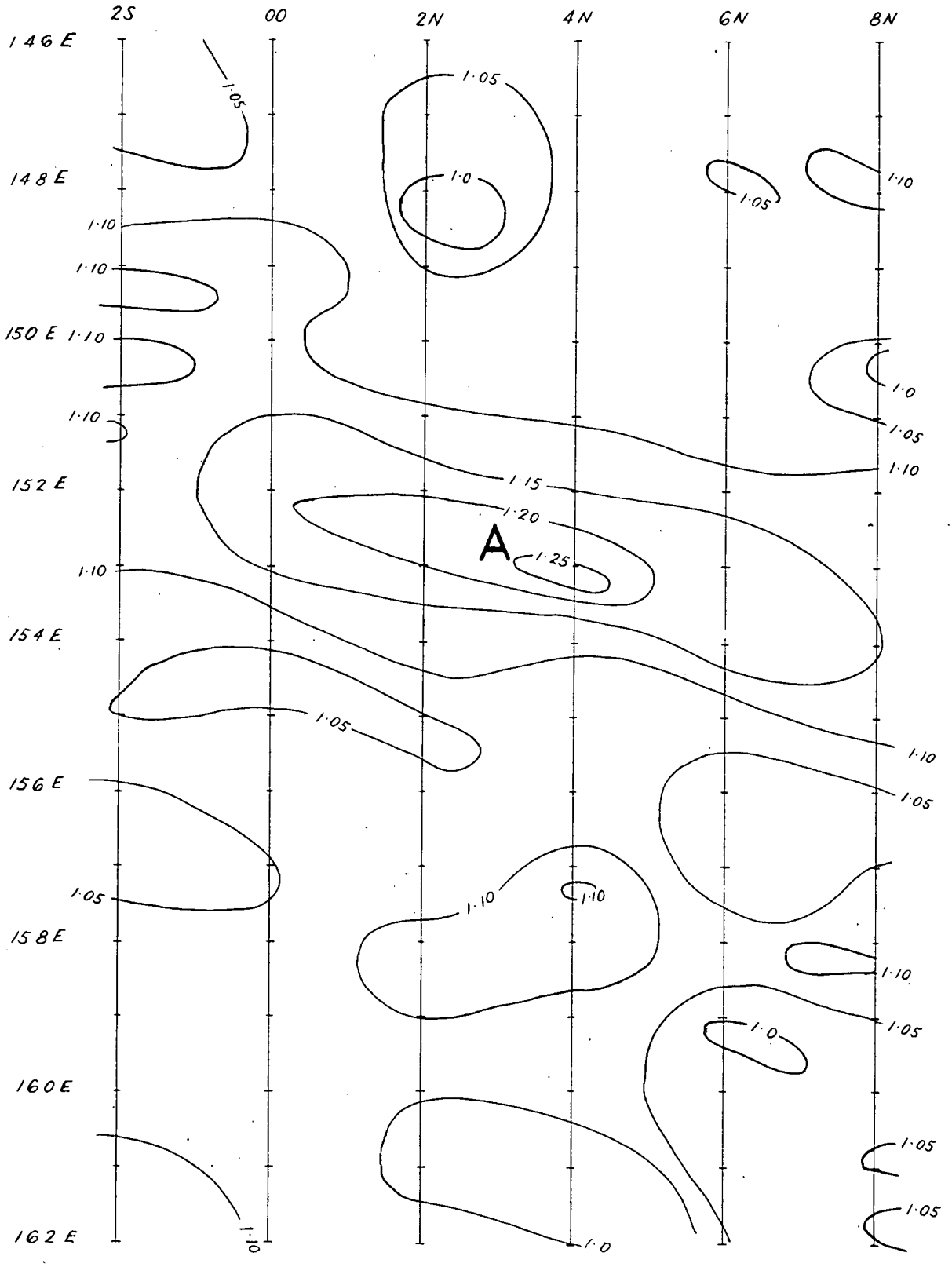
## (TRAVERSES 6S TO 24N)

## TURAM PHASE CONTOURS

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N T October 1962

To Accompany Record No 1964/5

D 52/B 7-72
6P S117




*Frequency 440 c/s*
*Coil spacing 50 ft*

*Primary field cable along 164 E*
*Contour interval 0.05*

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1963

# BATCHELOR LATERITES AREA EXTENDED

# (TRAVERSES 2S TO 8N)

# TURAM RATIO CONTOURS

True North

Scale

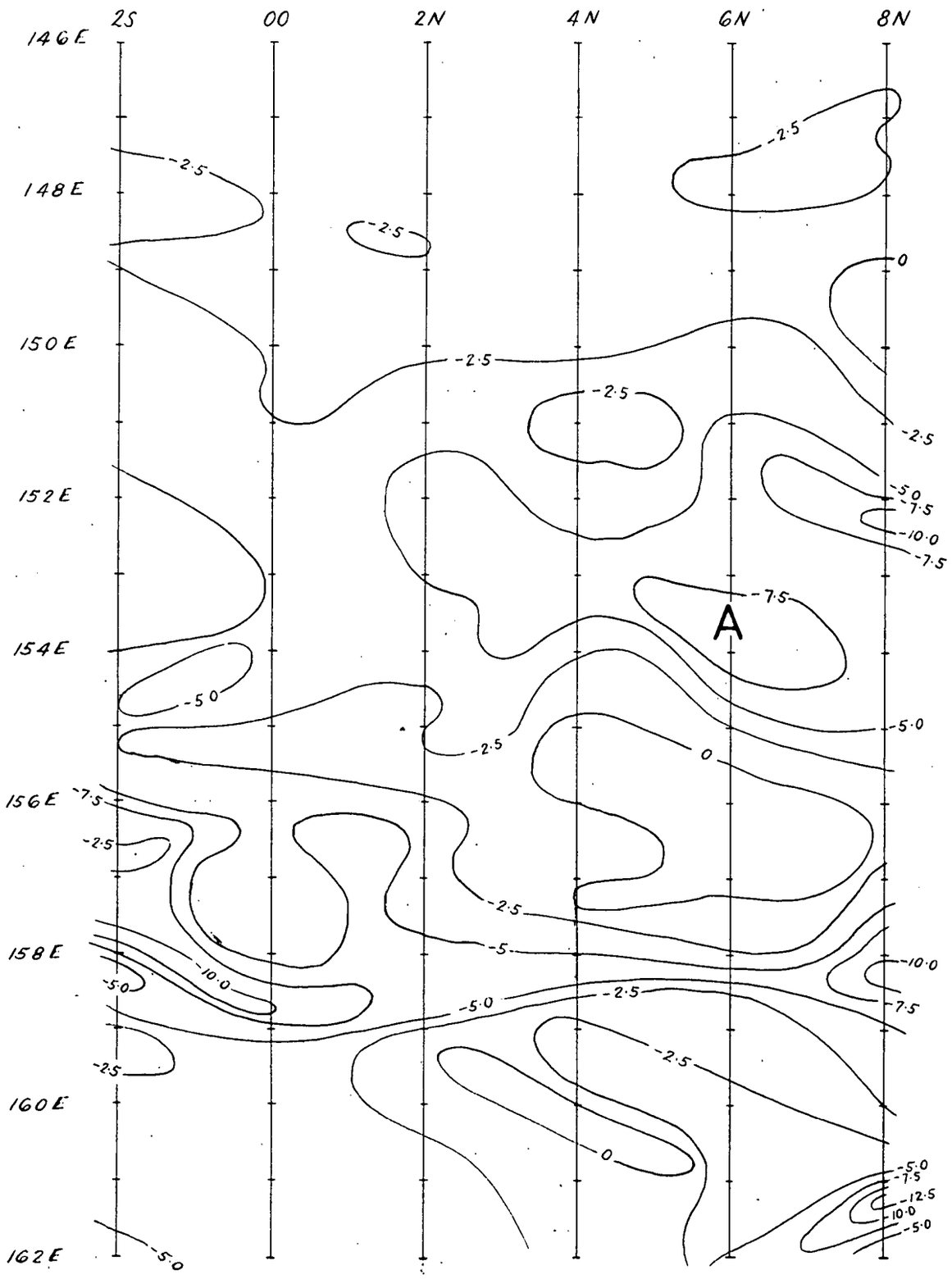
200 0 200 400 600 FT

*Bureau of Mineral Resources, Geology and Geophysics, Darwin, N T June 1963* D52/B7-73

To Accompany Record No 1964/5

S130 · GP

PLATE 10




Frequency 440 c/s
Coil spacing 50 ft

Primary field cable along 164 E
Contour interval 2·5°

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1963

# BATCHELOR LATERITES AREA EXTENDED

## (TRAVERSES 2S TO 8N)

## TURAM PHASE CONTOURS

True North

Scale

200 0 200 400 600 FT

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N T June 1963 D52/B7-74

To Accompany Record No 1964/5

S131·GP