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RECORD No. 1965/3

RUM JUNGLE AREA GEOPHYSICAL SURVEYS,

NORTHERN TERRITORY - 1963

by

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SUMMARY

Electromagnetic, radiometric, and magnetic surveys were made over an area extending from Dolerite Ridge to Mount Fitch North and over a small area adjacent to Batchelor Laterites Extended. The surveys were part of an extensive exploration programme by the Bureau of Mineral Resources in the search for uranium and base metal mineralisation in the Rum Jungle District.

In part of the area between Dolerite Ridge and Mount Fitch North, the survey extended over the junction of the Coomalie Dolomite and the Crater Formation. An electromagnetic anomaly coincides with this junction and is believed to be due to copper mineralisation. Recommendations are made for diamond-drilling in the anomalous area.

A zone of electromagnetic anomalies extends from Dolerite Ridge to the Mount Fitch Prospect. The zone is over the Golden Dyke Formation adjacent to the Coomalie Dolomite and outlines a likely uranium environment. No new large areas of high radioactivity have been discovered and no specific targets for diamond-drilling for uranium mineralisation have been located. Recommendations are made to drill a series of diamond-drill holes along two lines at right angles to the zone of electromagnetic anomalies. Three electromagnetic anomalies have been selected within the zone as being possibly due to base metal mineralisation. Diamond-drill holes have been sited to test these anomalies.

Magnetic surveys have indicated the presence of pyrrhotitic amphibolite within the Golden Dyke Formation.

The survey adjacent to Batchelor Laterites Extended area detected no extensions of the previously located electromagnetic anomalies to the north.

1. INTRODUCTION

The survey described in this Record was part of an extensive uranium exploration programme planned by the Australian Atomic Energy Commission, Territory Enterprises Pty. Ltd. (T.E.P.), and the Bureau of Mineral Resources, Geology and Geophysics (BMR).

The known uranium orebodies in the Rum Jungle area are within the Lower Proterozoic Golden Dyke Formation and close to the contact of this formation with the Coomalie Dolomite. Sulphide mineralisation is associated with the orebodies and detection of such mineralisation is, it is believed, the best indirect method of locating uranium.

The survey areas are shown in Plate 1. The major part of the survey, from Dolerite Ridge to Mount Fitch North, is over Golden Dyke Formation rocks and Coomalie Dolomite. The small survey in area Batchelor Laterites Extended was carried out to determine if previously located electromagnetic anomalies extend southwards.

The electromagnetic methods, Slingram and Turam, were used to locate sulphide mineralisation. Surface radiometric surveys were made in all areas. Some magnetic surveying was done to locate on the ground an aeromagnetic anomaly that extends from the Dolerite Ridge area to Mount Fitch.

The surveys were made by the Darwin Uranium Group, BMR, in the period 29th April to 9th October 1963. The field party included one geophysicist (either J. Ashley or F. Maranzana), one geophysical assistant, and from two to four field assistants. From 22nd May to 22nd August the party was assisting E.N. Eadie, a BMR geophysicist, in conducting an induced polarisation test survey in the Rum Jungle area (Eadie, 1964).

A total of approximately 70 miles of traverse was surveyed. In parts of areas Mount Fitch 1 and 2, BMR geologists made geological and geochemical surveys; relevant information from these surveys is included in this Record.

The co-operation of the staff of T.E.P. in providing relevant survey and geological information is gratefully acknowledged.

2. GEOLOGY

An outline of the regional geology of the Rum Jungle area has been given by Malone (1962).

From a study of the mineralised areas, Whites, Dysons, Rum Jungle Creek South, Mount Burton, Mount Fitch, and Area 55, Williams (1963) has drawn the following conclusions:

(a) All the mineralisation occurs within the Golden Dyke Formation close to the contact between this formation and the Coomalie Dolomite.

(b) The host rock is black slate except at Rum Jungle Creek South, where it is chloritic schist; all the host rocks are pyritic.

(c) The mineralisation is uranium phosphate near the surface, pitchblende at depth.

(d) The mineralisation occurs in intensely deformed rocks in which tectonic features have largely obscured sedimentary features.

(e) Possibly the pitchblende is syngenetic in the black slate and has been, to some extent, remobilised by subsequent periods of deformation and metamorphism.

(f) It does not appear that structure is important in localising the ore.

(g) Base metal mineralisation occurs with uranium mineralisation at Whites, Mount Fitch, Mount Burton, and Area 55.

(h) Evidence suggests that uranium minerals were present before the base metal mineralisation.

Condon and Walpole (1955) claim that the uranium is of sedimentary origin and that there is an association between uranium and the quartz haematite breccia (part of the Coomalie Dolomite). They conclude that the syngenetic minerals have been precipitated by the abundant growth of micro-organisms in the change from shelf to off-shore reef facies. Some of the mineralisation, however, notably the copper, may be epigenetic.

Most authorities agree that at least some of the base metal mineralisation is of a different genesis from that of the uranium.

The geophysical approach to uranium search in the Rum Jungle area is an indirect one. Electromagnetic equipment has been used almost exclusively since 1960 in attempts to locate sulphide mineralisation near the contact between the Golden Dyke Formation and the Coomalie Dolomite. The geological evidence suggests that sulphide and uranium mineralisations are associated.

3. PREVIOUS GEOPHYSICAL WORK

The Bureau of Mineral Resources has conducted geophysical, geological, and geochemical surveys in the Rum Jungle area since 1949.

In addition to several ground surveys, an aeromagnetic and scintillometer survey was made by Wood and McCarthy (1952).

Within the 1963 survey area, the only previous geophysical ground surveys were made by Langron (1956) in the vicinity of the Mount Burton and Mount Fitch Prospects. In these areas, approximately 6000 ft and 30,000 ft of traverse respectively were measured. Electromagnetic and self-potential surveys were made; only minor anomalies were recorded.

Debnam and White (1954) made a geochemical survey over the Mount Fitch Prospect by sampling from T.E.P. costeans along the contact between the Coomalie Dolomite and the Golden Dyke Formation. A very high copper anomaly was delineated along the contact.

T.E.P. have carried out radiometric surveying and drilling at the Mount Fitch Prospect. An extensive radiometric anomaly (three times background) was outlined and some uranium was located by the drilling.

T.E.P. mined a small uranium orebody by the open-cut method at the Mount Burton Prospect.

Extensive costeaning has been carried out along the limestone - slate contact in area Dolerite Ridge Extended. At present T.E.P. is diamond-drilling along this contact.

4. GEOPHYSICAL METHODS AND OPERATIONS

Electromagnetic (Slingram and Turam), surface radiometric and magnetic methods were used.

Daly (1962) has described the principles of the electromagnetic method and they will not be repeated here. All the areas were surveyed with the Slingram equipment at a frequency of 1760 c/s and a coil separation of 200 ft. Some traverses were read at 440 c/s.

Selected areas were subsequently measured with the Turam equipment at frequencies 440 c/s or 880 c/s and a coil separation of 50 ft. The primary electromagnetic field was created by passing a current through a rectangular loop of cable. Measurements were taken outside the loop along traverses at right angles to the cable.

All readings, Slingram and Turam, were taken at 50-ft intervals along traverses spaced 200 or 400 ft apart.

Traverses at a separation of 400 ft were read with Model 1368A Harwell ratemeters calibrated with a Co_{60} source. The readings, taken at 50-ft intervals, were in mR/hr.

Vertical-component magnetic measurements were made at 100-ft intervals along five traverses; all magnetic values refer to a common arbitrary datum. Correction for diurnal variation is insignificant in comparison with the amplitude of the magnetic anomalies and has been neglected.

The grids were surveyed and pegged by the field party and tied in to existing grids or pegs. Pegging along the traverses was at 50-ft intervals (horizontally). The Mount Fitch 2 area grid is based on the T.E.P. mine grid co-ordinate system. Mount Fitch 1 area grid is slightly displaced from the T.E.P. mine grid. Dolerite Ridge Extended grid is an extension of the 1960 Dolerite Ridge grid. A total of approximately 370,000 ft of traverse was pegged.

5. PRESENTATION OF RESULTS

Electromagnetic results are presented as contour maps of each component (real and imaginary for Slingram, ratio and phase for Turam), and also as profiles in particular areas of interest.

The contour maps are at a scale of 400 ft to an inch and the area from Dolerite Ridge to Mount Fitch North has been subdivided into three areas for convenience of presentation. Results of previous surveys at Mount Fitch North (Douglas, 1962a), West Finniss (Douglas, 1962b) Dolerite Ridge and Dolerite Ridge East (Rowston, 1962) are included.

Radiometric results are in the form of contour maps (Plates 12 & 15). Previous BMR radiometric results have been corrected to mR/hr and included.

Magnetic results, for five traverses measured in 1963 and four measured in 1961, are presented in profile form (Plates 13 & 14).

A geological map has been compiled from BMR and T.E.P. information and is shown at a scale of 1000 ft to one inch (Plate 2). Included in this map are the positions of axes of Slingram real-component anomalies and positions of magnetic anomalies.

6. RESULTS

Dolerite Ridge - Mount Fitch North

Electromagnetic. Slingram results for this area are shown as contour maps in Plates 3 to 8 inclusive, Turam results in Plates 9 and 10, and in Plate 11 some Turam and Slingram results are given in profile form. All traverses were first surveyed with the Slingram equipment and three areas (shown in Plates 5 and 7) were then selected for Turam survey.

In Plate 2, axes of Slingram real-component anomalies are shown in relation to the geology. The axes of real-component anomalies have been positioned where the real-component readings reach minimum values. The amplitude of the anomalies varies between 5% and 30%; it is of similar magnitude in the imaginary component. Some of the Slingram results are questionable in the vicinity of the quartzite ridge (Plate 5), as in some cases corrections for ground slopes are only approximate. Where doubtful, the Slingram contours are shown as dashed lines.

The following summary can be made of the distribution of anomalies:

(a) The Coomalie Dolomite exhibits no anomalies.

(b) There is an anomaly coincident with the junction of the Coomalie Dolomite and the Crater Formation.

(c) All anomalies, except that mentioned in (b), occur over the Golden Dyke Formation.

The three areas surveyed by the Turam method are designated T1, T2, and T3. T1 (Plate 5) is part of the Mount Fitch Prospect area and was surveyed to investigate the Slingram anomaly over the junction of the Coomalie Dolomite and the Crater Formation. The Turam results (Plates 9 and 10) are of similar pattern to those of the Slingram.

In area T2 (Plate 7) there are only very weak Turam anomalies, both in ratio and phase (Plate 9 and 10) in contrast to the strong Slingram anomalies. Area T3 (Plate 7) was surveyed to determine the Turam anomaly over a known sulphide body. A 40% pyrrhotitic lode was intersected at a depth of 150 ft vertically below 17N/162.5W and 20N/161W by T.E.P. diamond-drilling. The lode is 20 - 25 ft wide and strikes north with a dip of about 60° to the west. The Turam anomaly is intense in the ratio (1.55 at maximum) and there is no phase anomaly. The Slingram shows a strong real-component anomaly, Anomaly Z (Plate 7), with no imaginary-component anomaly.

Several traverses in areas T1 and T2 were measured at frequencies of 440 c/s and 880 c/s with the Turam equipment. The results, in profile form, are compared with the Slingram results in Plate 11.

Radiometric. The radiometric results are shown in contour form in Plate 12. All readings are in mR/hr except those at Mount Fitch North, which have not been corrected. In the 1963 survey area the following anomalies were located:

1. In the vicinity of the Mount Burton open cut.
2. Centred at 108N/138W.
3. Along and immediately to the north of the East Finniss River.
4. Centred at 422N/126E.
5. At the Mount Fitch Prospect, i.e. between Traverses 434N and 450N.
6. Centred at about 456N/114E.
7. Centred at 466N/117E.

Anomaly 1 is associated with the open cut and is of no interest. The East Finniss River carries the waste from the Rum Jungle uranium treatment plant and the anomalies in the vicinity of the river are due to radioactive waste materials deposited by flood waters. The anomaly at the Mount Fitch Prospect has been thoroughly tested by T.E.P. The significance of the remaining anomalies will be examined in the section 'Discussion of Results'.

Magnetic. The following traverses were measured with the vertical component magnetometer:

Area Mount Fitch 1: 380N, 364N, and 372N

Area Mount Fitch 2: 37875N, 36275N, and 37075N

Area Dolerite Ridge Extended: 56N

Area Dolerite Ridge: 40N
36N, 28N, and 16N (measured in 1961)

A broad magnetic anomaly varying in intensity from 1500 to 5000 gammas was located on each traverse. This is part of the magnetic anomaly shown by the aeromagnetic survey to extend from Browns Prospect to Mount Fitch.

Batchelor Laterites Extended

Slingram and radiometric results are shown in Plate 15.

The Slingram real-component results are similar in character to those for the area immediately to the north, i.e. mostly between 110% and 120%. There is no extension of the real-component anomaly observed to the north. The imaginary component shows two anomalous zones striking roughly south-west. Radioactivity is twice background in several places.

7. DISCUSSION OF RESULTS

Dolerite Ridge - Mount Fitch North

Electromagnetic anomalies, with the exception of anomaly A (Plate 1), are associated only with the Golden Dyke Formation. Two anomalies, B and I, are apparently partly within the Coomalie Dolomite; however, the junction of the Golden Dyke Formation and Coomalie Dolomite is covered by alluvium and possibly the above anomalies are over the Golden Dyke Formation.

Anomalies close to the Coomalie Dolomite are roughly parallel to the western edge of the formation. Further away from the Dolomite, anomalies trend more closely to a north-south direction, e.g. Anomalies E, F, and P.

No distinction has been made in Plate 2 of the magnitude of the anomalies or of the conductivity variations that they represent. The magnitude of an anomaly depends on the size, conductivity, and depth of the conductor. A narrow, steeply dipping conductor produces an anomaly that has minimum Slingram values in both components directly above the conductor. As the conductivity increases, the real-component (Slingram) and ratio (Turam) anomalies increase while the imaginary-component (Slingram) and phase (Turam) anomalies decrease. For flat-lying conductors, anomalies are more complex. However, only steeply dipping conductors have been located in this area. The anomalous conductivity can be due to various types of mineralisation or to water filled fractures, faults, or shears. It is not possible from the readings to determine the nature of the conductivity.

The magnetic anomalies (Plates 13 & 14) are most likely due to amphibolite containing pyrrhotite, magnetite, or both pyrrhotite and magnetite. This has been confirmed for the magnetic anomaly over Browns Prospect. The electromagnetic anomalies that lie within the zone of magnetic anomaly may also be due to pyrrhotite.

The electromagnetic anomalies are now described individually. The anomalies are designated A to Z (Plates 2, 3, 4, 5, 6, 7 and 8).

A. Occurs at the junction of the Crater Formation and Coomalie Dolomite. The intensity of the Slingram anomaly varies; it is between -20% and -35% in the imaginary component and between 100% and 85% in the real component. North of Traverse 470N in the Mount Fitch 1 area, the anomaly represents a moderate conductor; south of Traverse 470N, it represents a poor conductor.

Coincident with the Slingram anomaly is a weak Turam ratio anomaly of up to 1.10 and a Turam phase anomaly of from 5° - 20° (Plates 9 and 10). These results indicate that the conductor is poor. The narrow width of the anomaly shows that the conductor is near the surface.

The junction of the Crater Formation and the Coomalie Dolomite has been investigated by drill holes DG 23, DG 22, DG 24, DG 27, DG 26, and DG 25 (Plate 2). The junction dips at approximately 45° to the west and was reached at depths of 339 ft, 190 ft, 405 ft, 164 ft, 320 ft, and 203 ft, respectively, in the above holes.

The following mineralisation was found:

DG 23	17 ft - 102 ft 5 in	Minor pyrite
	220 ft - 242 ft	Disseminated chalcopyrite and native copper
DG 22	63 ft - 103 ft	Scattered pyrite, chalcopyrite, and pyrrhotite
	71 ft	Band of 20% sulphides (chalcopyrite and pyrrhotite)
	113 ft	Band of up to 10% sulphides (chalcopyrite, pyrite, and chalcocite)
DG 24	250 ft 11 in - 251 ft 7 in	Some chalcopyrite and chalcocite
	348 ft 7 in - 360 ft 10 in	Some chalcocite and malachite
DG 27	122 ft -128 ft	Some chalcocite and malachite
DG 26		No mineralisation
DG 25		No mineralisation

It is probable that the electromagnetic anomaly is due to concentrations of copper minerals. The anomaly north of Traverse 470N should therefore be investigated.

B. A weak anomaly, closely associated with the junction of the Golden Dyke Formation and the Coomalie Dolomite, and probably due to the change in lithology rather than to mineralisation (Douglas, 1962a). There is no high radioactivity associated with the anomaly.

C and D. Both are weak anomalies. C apparently coincides with the junction of the chlorite schist and the carbonaceous schist and chert (Plate 2). Again no high radioactivity.

E. Extends from Traverse 434N in the Mount Fitch 1 area to Traverse 70N in the West Finniss area. The anomaly is not continuous and represents poor, moderate, and good conductors. The good conductors are centred at 393N/124E, 380N/125E, and 369N/127E in the Mount Fitch 1 area. North of 414N the conductivity is low and the anomaly follows to some extent the junction of the chlorite schist and the carbonaceous schist and chert (Plate 2).

The high conductivity is probably due to mineralisation. Between 380N and 364N the anomaly coincides with the western edge of the magnetic anomaly and is probably not, therefore, due to pyrrhotite. Pyrite is the most likely mineralisation.

There are two T.E.P. drill holes close to this anomaly, i.e. No. 610 and No. 613 along Traverse 86N, West Finnis. No. 610 passed through amphibolite, chloritic slate, and carbonaceous slate. There was scattered pyrite throughout and traces of pyrrhotite and galena in the amphibolite. No.613 passed through interbedded carbonaceous and chloritic slates containing scattered pyrite.

E' The most westerly anomalies detected. They are small in extent and represent moderate conductors. They are probably close to the junction of the sericite schist and the carbonaceous schist and chert.

F. Very similar to E but the conductivity maxima are not so high. May, in part, be due to pyrrhotite. T.E.P. drill holes No. 600 and No. 601, in the West Finniss area are coincident with or close to the anomaly. Both holes were drilled vertically to a depth of 300 ft and were in pyritic black slate over the entire 300 ft. The pyrite content was estimated at between 2% and 5% by volume.

H A weak to moderately strong anomaly, displaced at 37075N/13000E by a fault trending north-east. A good conductor is centred at 38275N/13600E. Along Traverse 37075N, the anomaly coincides with a sharp magnetic anomaly (Plate 13) and is probably due mainly to pyrrhotite in that vicinity.

H' A small weak anomaly.

I. A weak anomaly associated with the junction of the Coomalie Dolomite and the Golden Dyke Formation.

K. Represents a poor conductor north of the Finniss River, a moderate conductor south of the river.

L. Represents a poor-to-moderate conductor.

M. A real-component anomaly, small in extent, with no imaginary-component anomaly. It is due to a very good conductor.

N. A weak anomaly close to a radiometric anomaly that is twice the background intensity.

O and Q. Represent moderate conductors. Q probably indicates higher conductivity than Anomaly O.

P. An extensive anomaly of variable intensity. Conductivity poor-to-moderate.

P' A weak anomaly.

R, S, T, and U. Anomalies of similar strength representing moderate conductors. R, S, and T are apparently over dolerite, but it is likely that they represent bands of shale within the dolerite.

V and W. Anomalies parallel to the junction of the Coomalie Dolomite and the Golden Dyke Formation. Both have large negative imaginary-component values, particularly between Traverses 48N and 62N. The Turam results from this area (Plates 9 and 10) show only very weak anomalies. The Slingram anomalies for Traverses 44N and 68N are much smaller for 440 c/s than for 1760 c/s (Plate 11). This indicates that the Slingram anomalies between Traverses 32N and 62N are due to near-surface changes in conductivity. V represents a moderate conductor between Traverses 76N and 84N.

Diamond-drill hole No. 617 is close to Anomaly V although it does not penetrate to a position vertically below it. The rock is carbonaceous slate and chloritic schist containing a small amount of pyrite below 100 ft.

X. A weak anomaly. The Turam results show a ratio anomaly of 1.15 coinciding with the Slingram anomaly between Traverses 45N and 52N, indicating that conductivity increases slightly with depth in this area.

Y. A weak anomaly. There is a Turam ratio anomaly of 1.20 centred at 50N/166.5W, which roughly coincides with the Slingram anomaly, but strikes approximately north-east. The Turam anomaly is probably of deeper and different origin.

Diamond-drill hole No. 619 is collared almost on the axis of the anomaly. From 0 - 200 ft, the rock is mostly chloritic schist with minor pyrite.

Y' An anomaly not fully delineated by the Slingram survey. A Turam ratio anomaly of 1.20 occurs at the same locality and, although small, is worthy of investigation.

Z. A real-component Slingram anomaly with no associated imaginary-component anomaly and therefore representing a very good conductor. The Turam results show a high ratio anomaly, up to 1.55, and no phase anomaly. Slingram and Turam results are compared in profile form in Plate 11. The Slingram anomaly is displaced slightly to the east of the Turam anomaly, indicating a conductor dipping towards the west. The Turam anomaly is offset along Traverse 14N; this probably indicates faulting.

Diamond-drill holes No. 598 and No. 599 were drilled to determine the source of the electromagnetic anomalies. In each hole, from about 150 ft - 170 ft, highly pyritic-pyrrhotitic (40% by volume) calcareous amphibolite was found.

There is no magnetic anomaly associated with the pyrrhotite lode.

From the drilling information available it is likely that all the above anomalies, with the possible exceptions of A and those weak anomalies coincident with lithological changes, are due to pyrite or pyrrhotite. Conductivity has been described as poor, moderate, or good, and drilling evidence suggests that, in terms of pyritic mineralisation, this represents approximately 1% - 5%, 5% - 20%, and greater than 20% respectively.

The magnetic anomaly is almost certainly due to amphibolite containing pyrrhotite and possibly magnetite. The electromagnetic anomalies coinciding with magnetic anomalies due to shallow bodies are likely to be due to pyrrhotite.

Of the radiometric anomalies detected, only those centred at 466N/117E, 456N/114E, and 422N/126E in the Mount Fitch 1 area, and at 108N/138W in the Dolerite Ridge Extended area, are of interest. The first two are over Coomalie Dolomite and, although there are no electromagnetic anomalies, the source of the high radioactivity should be investigated by costeaning or by shallow auger-drilling. The third anomaly is roughly over the contact between the Coomalie Dolomite and the Crater Formation and should be similarly investigated. The fourth anomaly is near the junctions of the Coomalie Dolomite and the Golden Dyke Formation and has been investigated by costeaning.

Uranium mineralisation is associated with pyrite in all the orebodies discovered to date. Forty nine (49) samples from the Rum Jungle Creek South orebody were assayed for uranium, graphite, total sulphur content, and sulphate sulphur. From the assay results, Daly (1963) calculated the pyrite content assuming pyrite to be the only sulphide present. The mean pyrite content of all samples was 2.2%. There was "clear correlation between total sulphur and sulphate sulphur and slight evidence of negative correlation between uranium and graphite" (Daly, 1963). There was no correlation between uranium and pyrite. However, the data were insufficient for well-based conclusions.

It is important to note the low pyrite content. Concentrations of pyrite of this quantity would produce only small electromagnetic anomalies and may not, at depths in excess of 100 ft, produce any Slingram anomalies at all.

Therefore, if uranium orebodies contain as little as 2% sulphide mineralisation, the existence, not the magnitude of electromagnetic anomalies is sufficient to indicate a possible uranium environment.

In view of the foregoing, the whole of the Golden Dyke Formation, where anomalies are present, is a possible uranium environment. Surface radioactivity does not pinpoint any particular areas within this part of the Golden Dyke Formation and it is believed that the best method of locating uranium mineralisation is to drill several lines of drill holes at right angles to the strike of the anomalies.

The above discussion only applies to uranium mineralisation. Sulphide mineralisation, e.g. copper, is indicated directly by electromagnetic anomalies. The location of copper mineralisation at the Mount Fitch Prospect is an encouragement to investigate anomalous areas elsewhere. In particular, anomalies A, E, F, and H should be drilled.

Batchelor Laterites Extended

The Slingram and radiometric contours are presented in Plate 15. The Slingram real-component values are between 110% and 120% and do not show any definite trends. The imaginary-component results show two anomalies trending roughly south-west and are probably related to changes in lithology within the Golden Dyke Formation. There is no evidence of a continuation of the real-component anomaly located further to the north.

8. CONCLUSIONS AND RECOMMENDATIONS

Dolerite Ridge - Mount Fitch North

An electromagnetic anomaly was located at the junction of the Crater Formation and the Coomalie Dolomite. The anomaly may be due in part to copper mineralisation and should be investigated, north of Traverse 450N, by drilling.

The following diamond-drill hole is recommended:

Collar:	490N/132.5E (Geophysical grid coordinates)
Bearing:	110° true
Depression:	55°
Depth:	To the junction of the Crater Formation and the Coomalie Dolomite

A broad zone of anomalies was located over the part of the Golden Dyke Formation adjacent to the Coomalie Dolomite. The anomalies vary in magnitude and extent, and some, i.e. Anomalies V and W, are due to changes in conductivity very near the surface. Radiometric results did not reveal any large areas of previously unknown high radioactivity. Magnetic results indicate the existence of pyrrhotitic amphibolite within the Golden Dyke Formation. Some of the electromagnetic anomalies may be due to pyrrhotite, most are probably due to pyrite.

The entire anomalous zone is a possible uranium environment. In the absence of precise drilling targets the following drilling programme is suggested:

Mount Fitch 1 area:	Along Traverse 318N.
	Vertical diamond-drill holes to a depth of 300 ft at 134E, 137.5E, 141E, 144.5E, and 147.5E.
Dolerite Ridge Extended Area:	Along Traverse 56N
	Vertical diamond-drill holes to a depth of 300 ft at 190W, 186W, 182W, 178W, 174W, 170W, 166W, 162W, 158W, and 154W.

To investigate sulphide mineralisation as possible copper producers, the following diamond-drill holes are recommended:

Mount Fitch 2 area: Collars at - 38275N/13570E
37075N/14350E
37675N/13960E

Mount Fitch 1 area: Collars at - 370N/127E
383N/129.5E

All coordinates are based on geophysical grids. The holes should be vertical and to a depth of 300 ft.

Batchelor Laterites Extended

No recommendations for further work are made.

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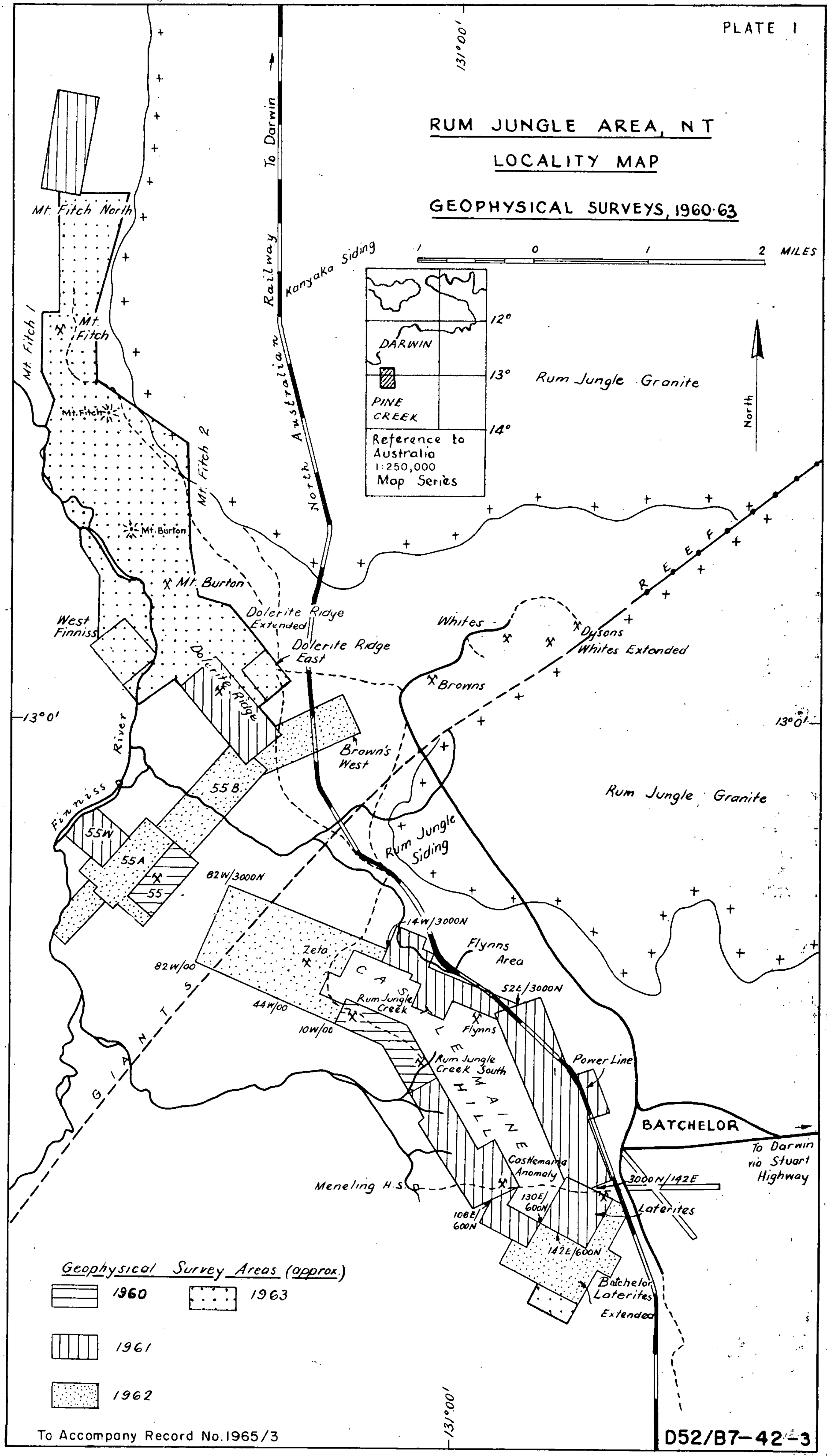


To Accompany Record No. 1965/3


GEOLOGY & LOCATION OF AXES
OF SLINGRAM REAL-COMPONENT ANOMALIES
Geological formation boundary, accurate
" " " approximate
Geological boundary within formation
Fault, approximate
Fault, inferred
Quartz reef
Shear zone, accurate
Shear zone, approximate
Geophysical traverse 1961 and 1963
River or billabong
Axis of Slingram real-component anomaly
B.M.R. Diamond-drill hole Depression 55°
T.E.P. Diamond-drill hole
Approximate width of magnetic anomaly
Reference
LOWER PROTEROZOIC
Pgr Rum Jungle granite
Pdo Dolerite
Goodparla Group
Golden Dyke Formation
Following Lithological Types recognized:
B.M.R.
Pℓd(1) Chlorite schist
Pℓd(2) Carbonaceous schist and chert
Pℓd(3) Sericite schist
T.E.P.
Pℓd Dominantly black shale
Pℓd Chloritic slate
Pℓd Amphibolite
Pℓd ? Biotite-dolomite-schist
Masson Formation
Pℓa Acacia Gap Tongue
Quartzite, carbonaceous siltstone
Batchelor Group
Coomalie Dolomite
Following Lithological Types recognized:
B.M.R.
Pℓo(1) Dolomite weathering to kaolin and chert
Pℓo(2) Tremolite and talc schist
Pℓo(3) Ferruginous sand
Pℓo(4) Sandstone
Pℓo(5) Pink quartzite, quartz hematite breccia
T.E.P. Pℓo Undifferentiated
Crater Formation
Following Lithological Types recognized:
B.M.R.
Pℓr(1) Tectonite (formerly hematite boulder conglomerate) carbonaceous schist and hematite schist with chert lenses
Pℓr(2) Quartzite
Geology north of T.E.P. Mine Grid co-ordinate 35000 N by B.M.R. 1963; south of co-ordinate 35000 N geology by T.E.P.
East Finniss River
Finniss River
Dump
Open Cut
Major Grid: T.E.P. Mine Grid Bearing 359° 58' 00"
Minor Grid: B.M.R. Geophysical Grids 1961 and 1963

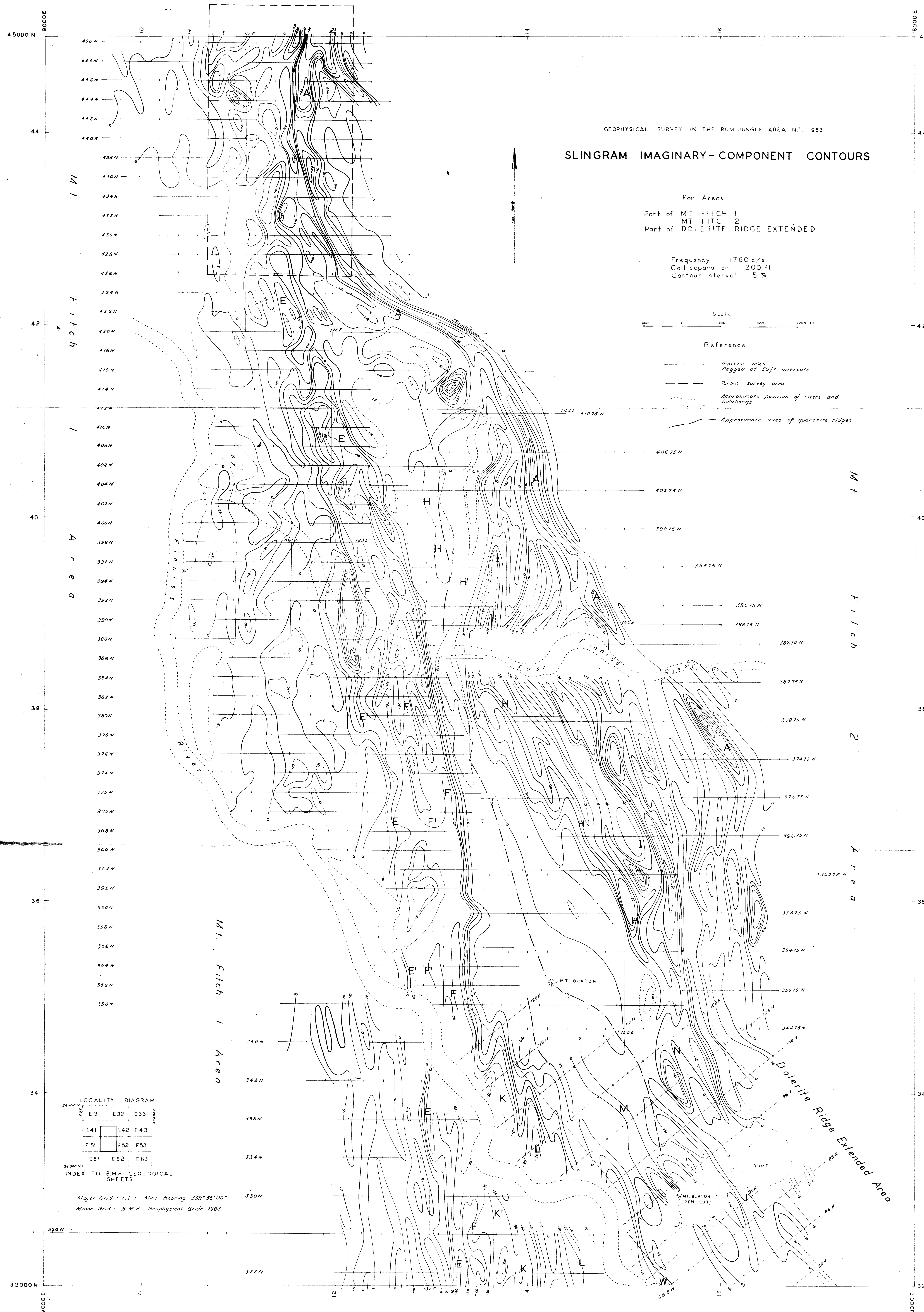

PLATE 3
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1961 & 1963
SLINGRAM REAL- COMPONENT CONTOURS
For Areas:
Mt. Fitch North
Part of Mt. Fitch I
Frequency 1760 c/s
Coil separation 200 ft
Contour interval 5 %
Scale
400 0 400 800 1200 Ft
Reference
Traverses of 1963 grid
Traverses of 1961 grid
All traverses pegged at 50-ft intervals
True North
LOCALITY DIAGRAM
E31 E32 E33
E41 E42 E43
E51 E52 E53
E61 E62 E63
INDEX TO B.M.R. GEOLOGICAL SHEETS
Major Grid: T.E.P. Mine grid Bearing 359° 58' 00"
Minor Grid: B.M.R. Geophysical Grids 1961 and 1963
Mt. Fitch North Area
Mt. Fitch I Area
ANOMALY A
56000 N
45000 N
9000 E
16000 E
Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. March 1964
To Accompany Record No. 1965/3
D52/B7-95


PLATE 4
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1961 & 1963
SLINGRAM IMAGINARY-COMPONENT CONTOURS
For Areas:
Mt Fitch North
Part of Mt Fitch I
Frequency 760 c/s
Coil separation 200 ft
Contour interval 5 %
Scale
Reference
Traverses of 1963 grid
Traverses of 1961 grid
All traverses pegged at 50 ft intervals
True North
LOCALITY DIAGRAM
E31 E32 E33
E41 E42 E43
E51 E52 E53
E61 E62 E63
INDEX TO B.M.R. GEOLOGICAL SHEETS
Major Grid: T.E.P. Mine grid Bearing 359° 58' 00"
Minor Grid: B.M.R. Geophysical Grids 1961 and 1963
Mt. Fitch North Area
Mt. Fitch I Area
ANOMALY A
A
B
C
D
56000 N
45000 N
9000 E
16000 E
Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. March 1964
To Accompany Record No. 1965/3
D52/B7-96

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. March 1964

To Accompany Record No. 1965/3

D52/B7-97



Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. March 1964

To Accompany Record No. 1965/3

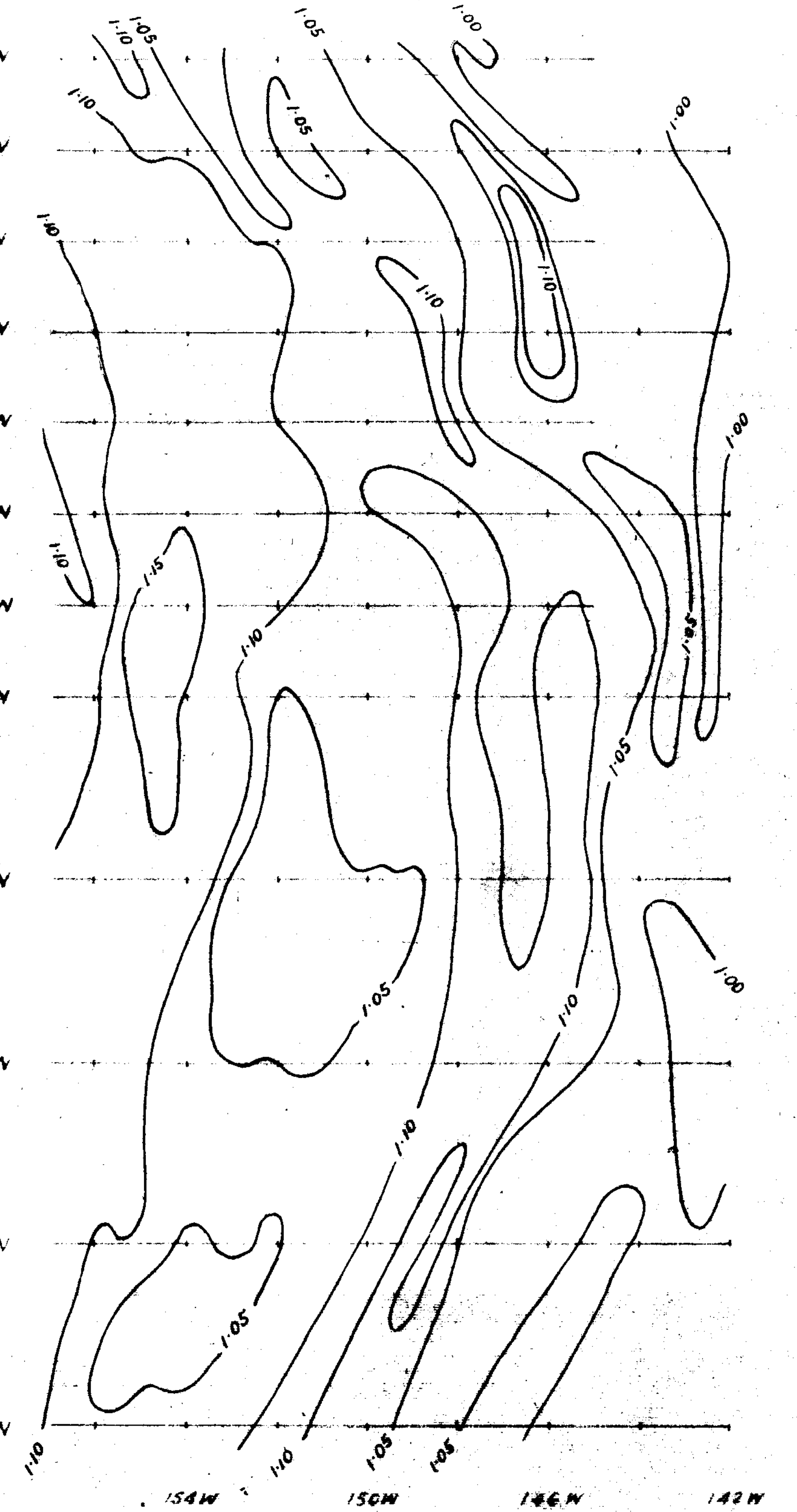
D52/B7-98

Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. March 1964

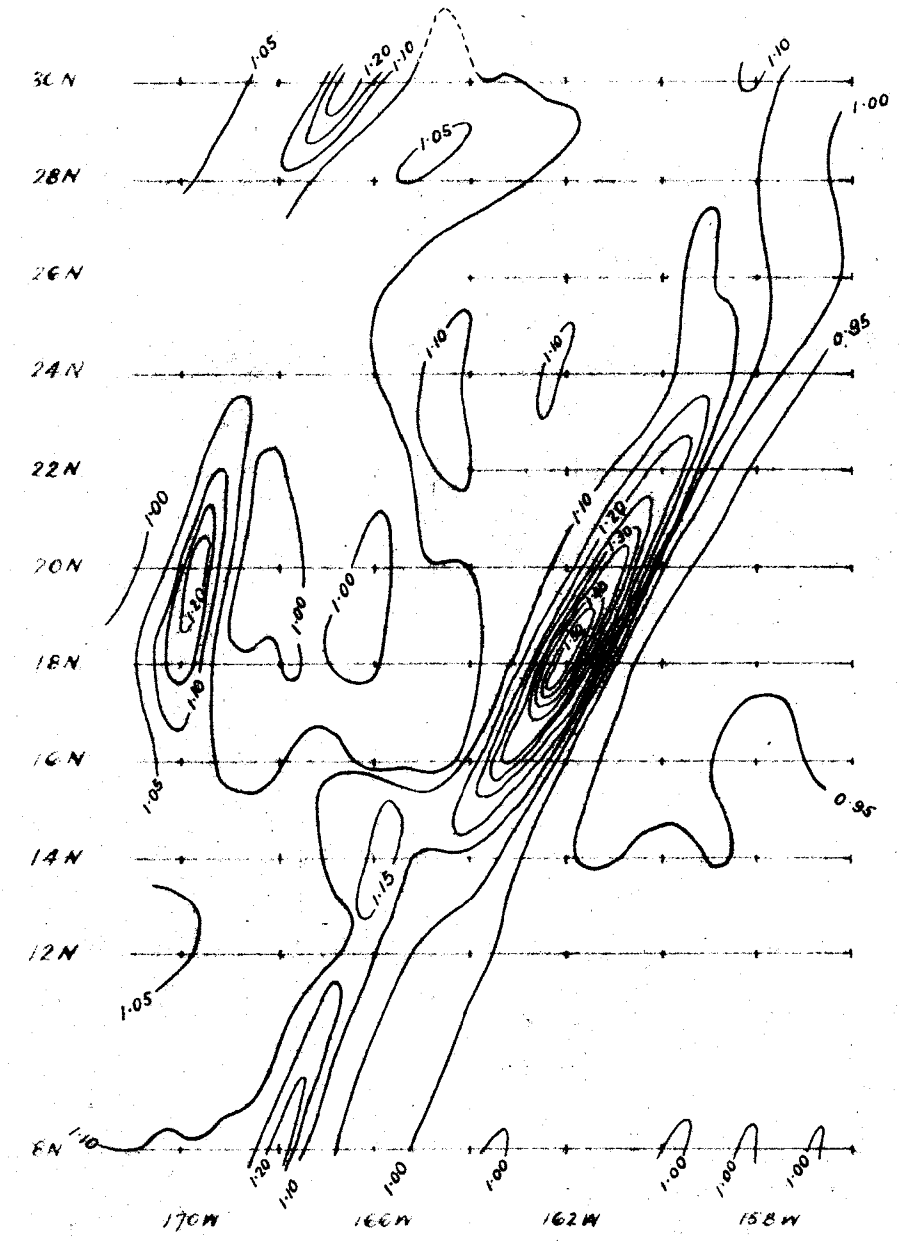
To Accompany Record No. 1965/3

D52/B7-99

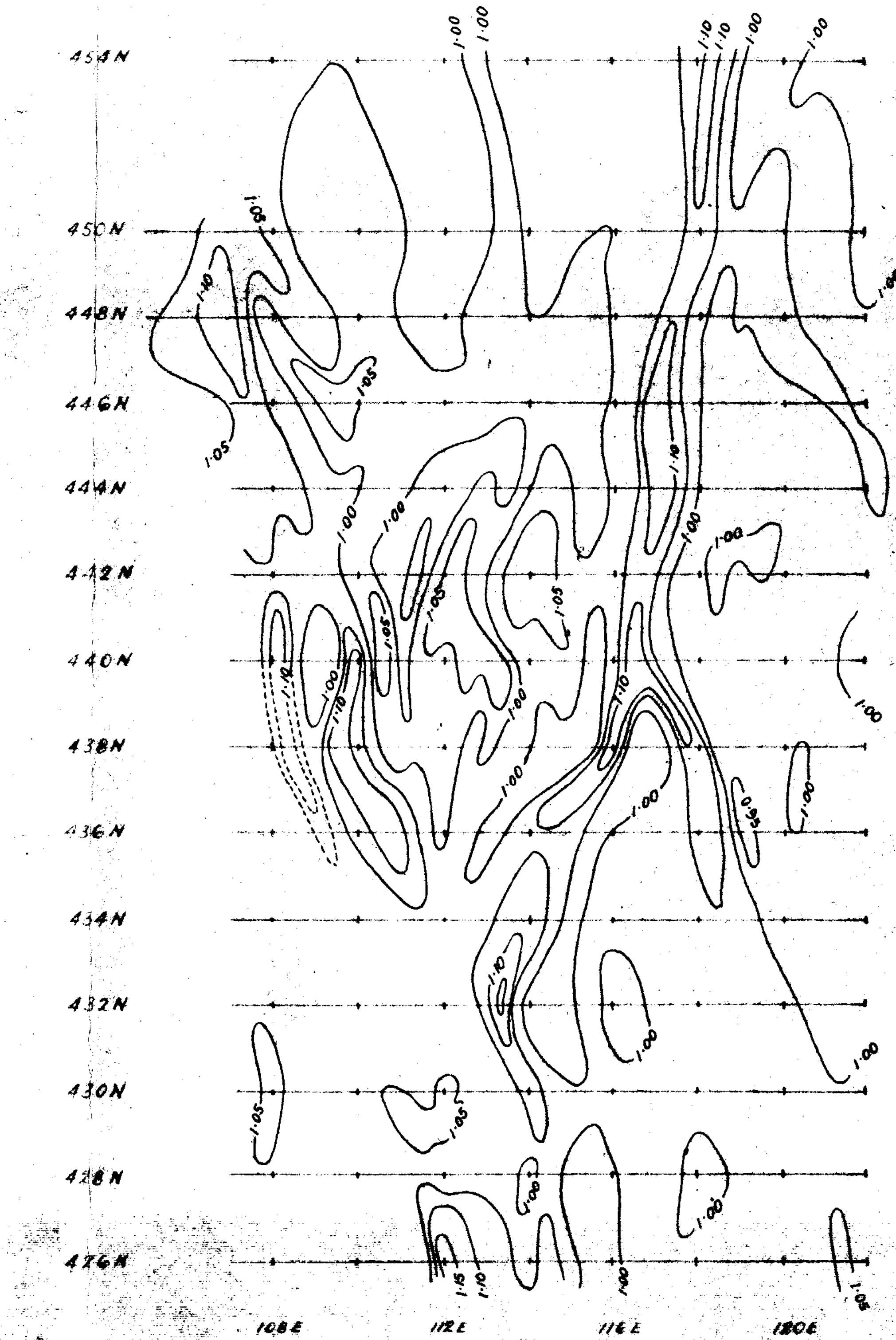

PLATE 8
Mt. Fitch I Area
West Finniss Area
Dolerite Ridge Extended Area
Dolerite Ridge East Area
Dolerite Ridge Area
Finniss River
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA NT 1961 & 1963
SLINGRAM IMAGINARY-COMPONENT CONTOURS
For Areas:
DOLERITE RIDGE
DOLERITE RIDGE EAST
Part of DOLERITE RIDGE EXTENDED
WEST FINNISS
Part of MT. FITCH I
Frequency 1760 c/s
Coil separation 200 ft
Contour interval 5%
Scale
400 0 400 800 1200 FT
True North
Reference
Traverses of 1963 grid
Traverses of 1961 grid
All traverses pegged at 50-ft intervals
Pegs marked at 100-ft intervals
Areas of Turam Survey 1963
River or billabong
LOCALITY DIAGRAM
E31 E32 E33
E41 E42 E43
E51 E52 E53
E61 E62 E63
INDEX TO BMR GEOLOGICAL SHEETS
Major Grid: T.E.P. Mine Grid bearing 359°58'00"
Minor Grid: B.M.R. Geophysical Grids 1961 and 1963
32000 N
24000 N
12000 E
24000 E
Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. March 1964
To Accompany Record No. 1965/3
D52/B7-100



TURAM AREA T2
(Part of DOLERITE RIDGE EXTENDED AREA)



TURAM AREA T3
(Part of DOLERITE RIDGE AREA)



TURAM AREA T1
(Part of MT. FITCH I AREA)

True North

Scale

400 0 400 800 1200

FREQUENCY 440 C/S
COIL SEPARATION 50 FT
CONTOUR INTERVAL 0·05
LOOP POSITION : ON EAST SIDE OF EACH AREA

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1963

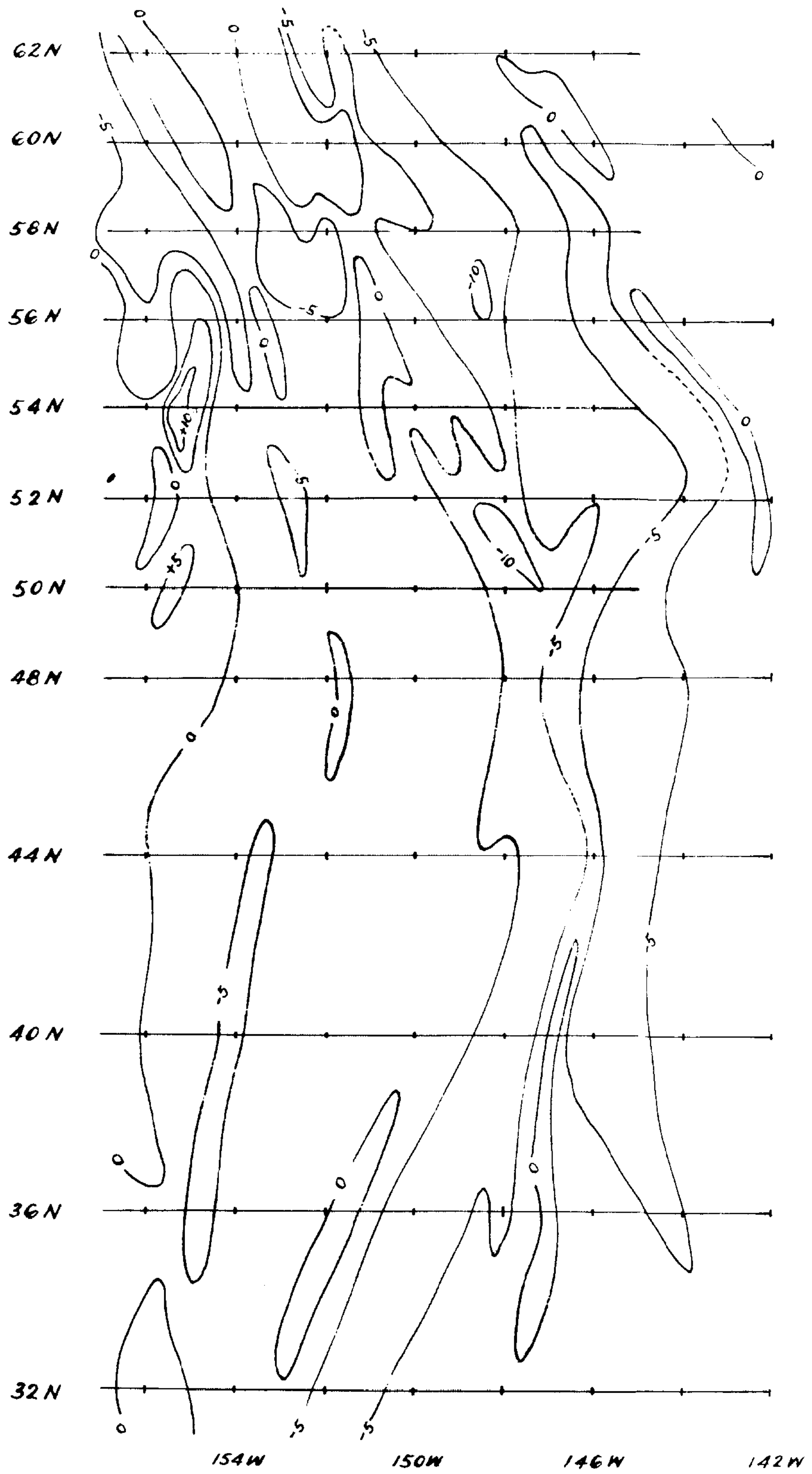
TURAM RATIO CONTOURS

For part of areas :
DOLERITE RIDGE EXTENDED
DOLERITE RIDGE
MT. FITCH I

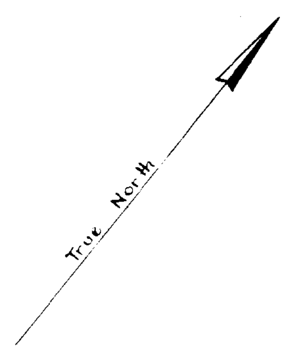
Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. March 1964

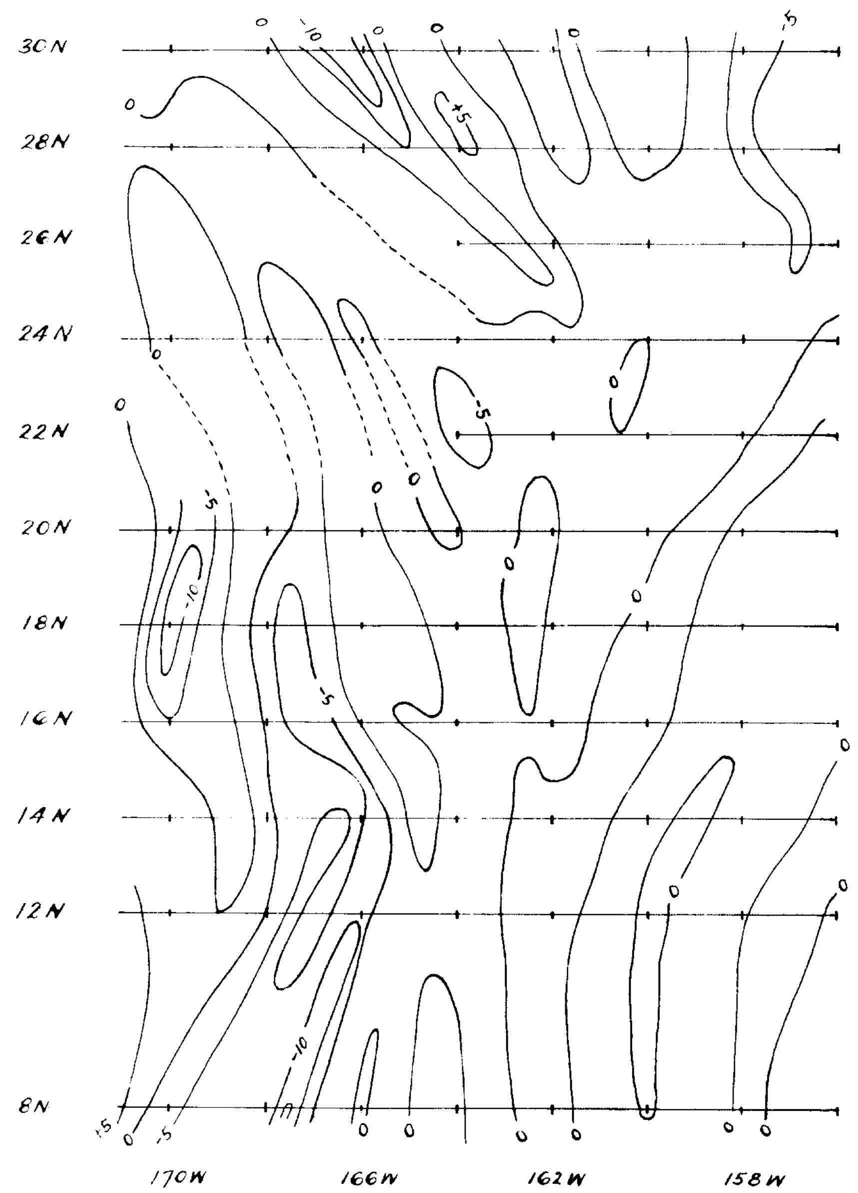
To Accompany Record No. 1965/3

D52/B7-101

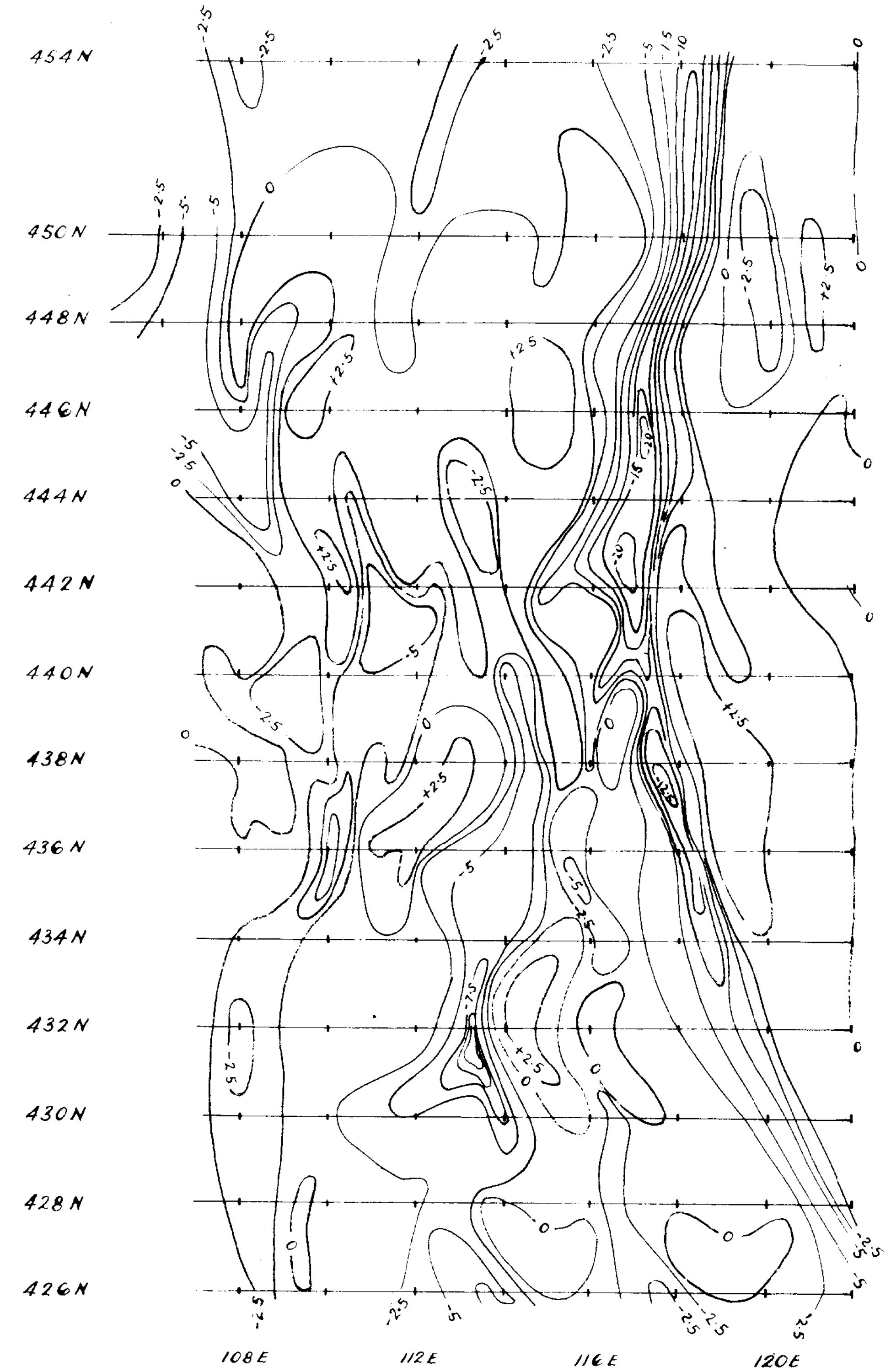


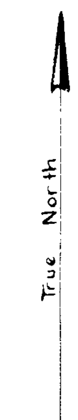
TURAM AREA T2
(Part of DOLERITE RIDGE EXTENDED AREA)





TURAM AREA T3
(Part of DOLERITE RIDGE AREA)





TURAM AREA T1
(Part of MT. FITCH I AREA)

Scale

400 0 400 800 1200

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1963

TURAM PHASE CONTOURS

For part of areas :
DOLERITE RIDGE EXTENDED
DOLERITE RIDGE
MT. FITCH I

FREQUENCY 440 C/S
COIL SEPARATION 50 FT
CONTOUR INTERVAL 0·05°
LOOP POSITION : ON EAST SIDE OF EACH AREA

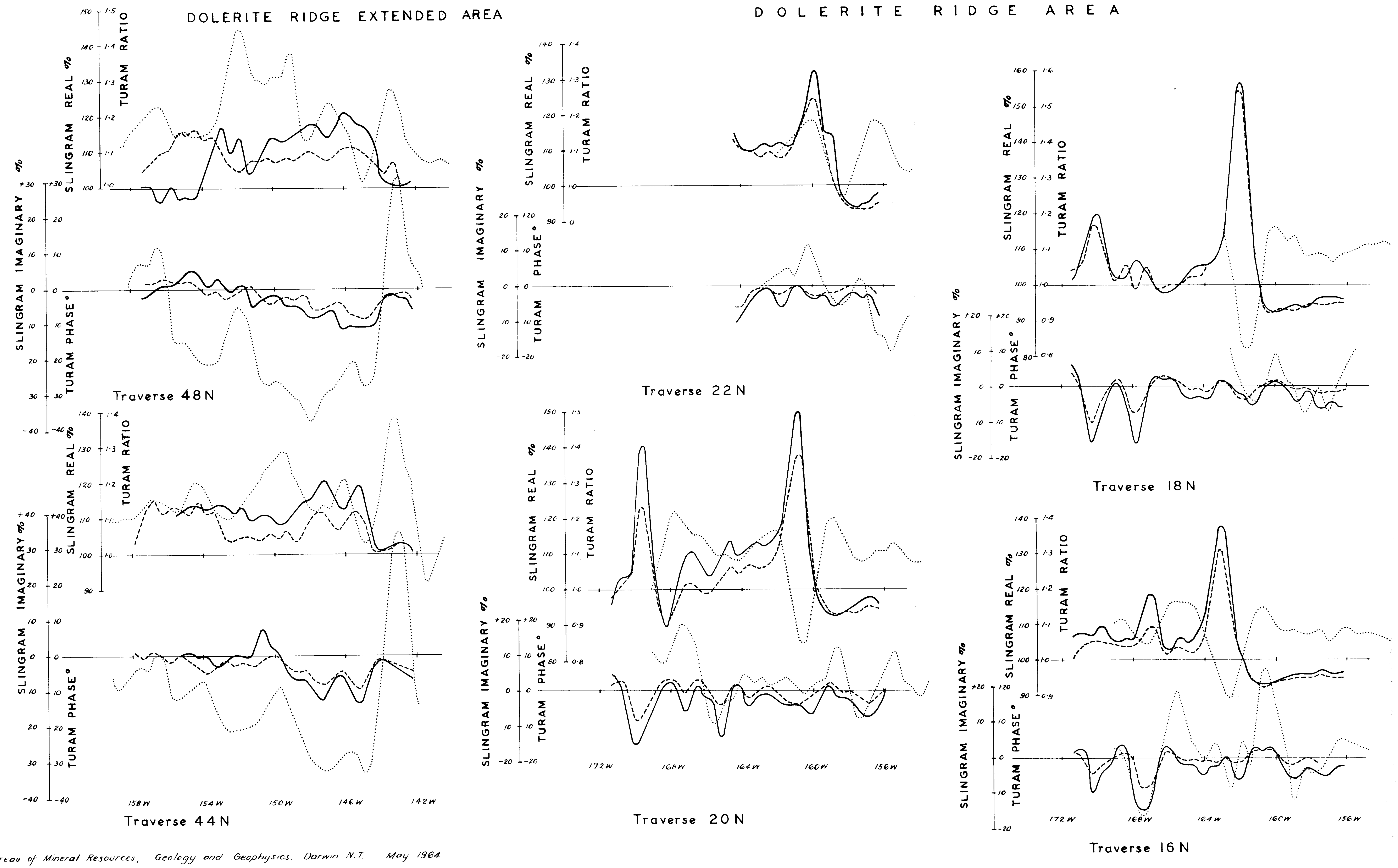
Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. March 1964

To Accompany Record No. 1965/3

D52/B7-102

5137

PLATE II



Reference

Turam 880 c/s coil separation 50 ft
Turam 440 c/s " "
Slingram 1760 c/s coil separation 200 ft

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1963

TURAM AND SLINGRAM PROFILES

For Areas:

Dolerite Ridge
Dolerite Ridge Extended

Scale

400 0 400 800 1200 FT.

Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. May 1964

To Accompany Record No. 1965/3

D52/B7-103

S139

PLATE 12

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. May 1964

To Accompany Record No. 1965/3

D52/B7-104

PLATE 13

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1963

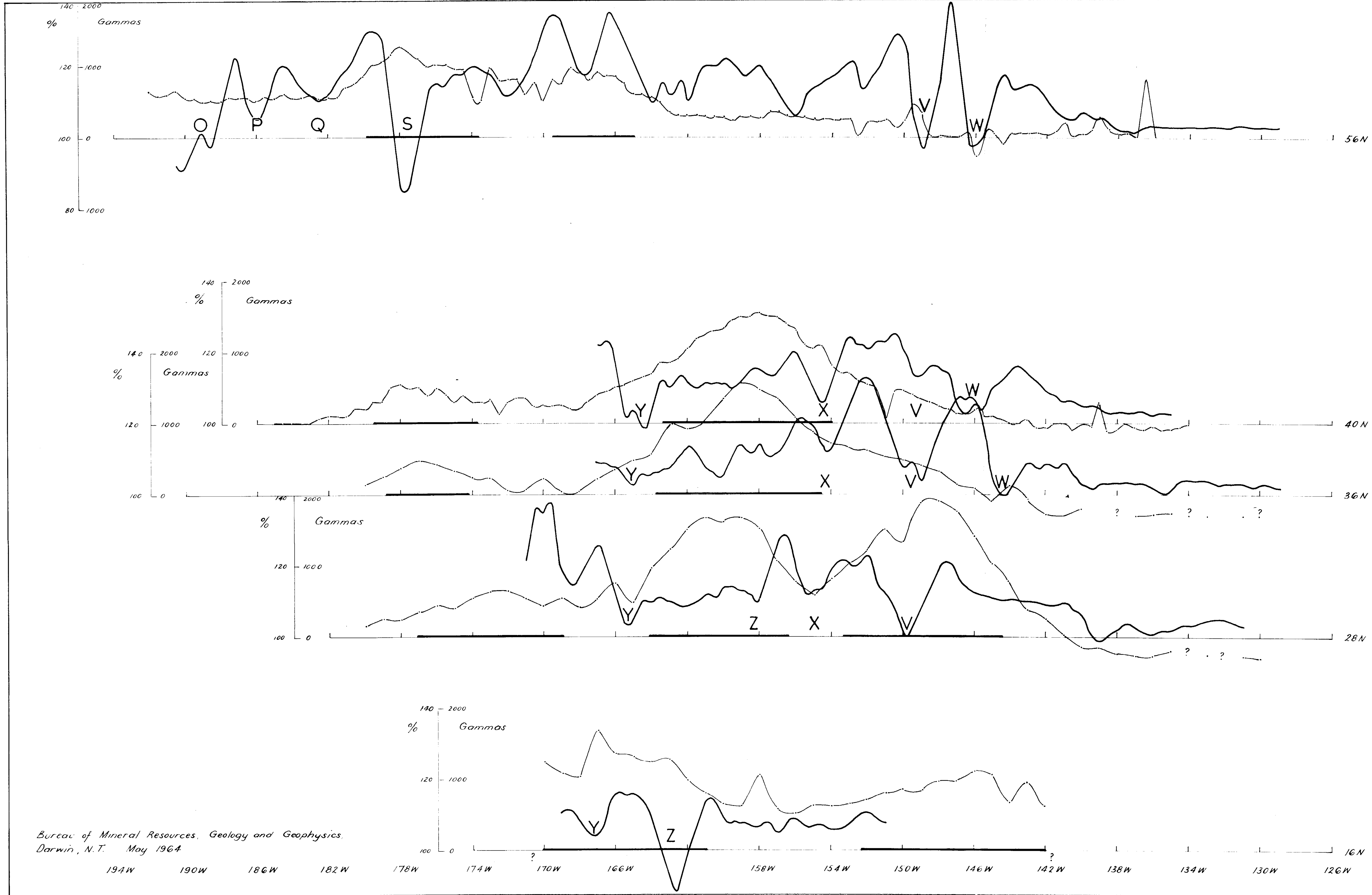
MAGNETIC (Vertical Force) AND SLINGRAM (Real Component) PROFILES

For Areas:

Mt. Fitch 1 and 2

Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. May 1964

PLATE 14



Reference

- Slingram real component anomalies
- Magnetic vertical force
- Approximate width of magnetic anomaly

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA NT.
1961 & 1963

MAGNETIC (VERTICAL FORCE) AND SLINGRAM (REAL COMPONENT) PROFILES

For Areas: Dolerite Ridge
Part of Dolerite Ridge Extended

Scale

400 0 400 800 1200 Ft.

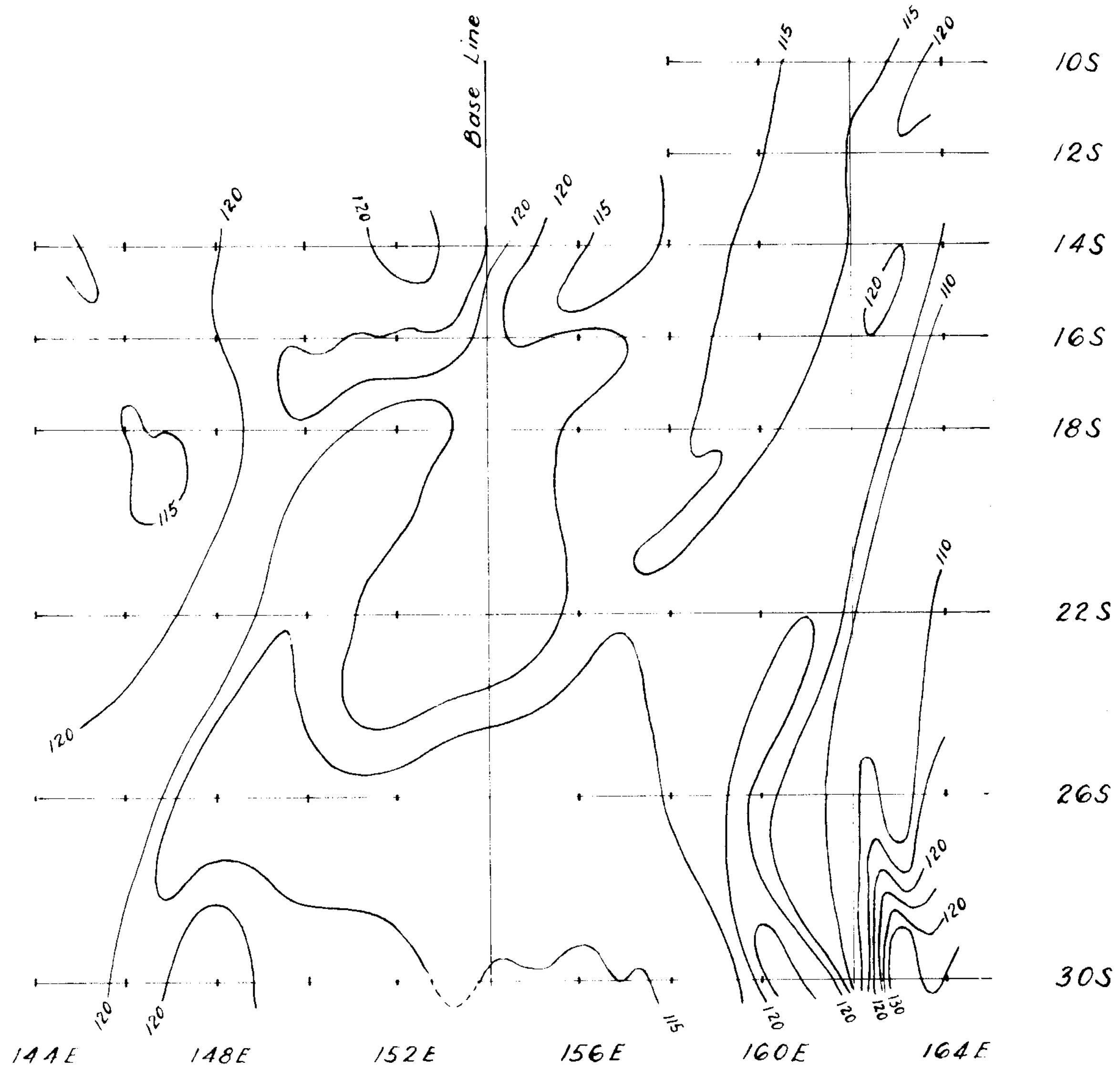
Bureau of Mineral Resources, Geology and Geophysics.
Darwin, N.T. May 1964

To Accompany Record No. 1965/3

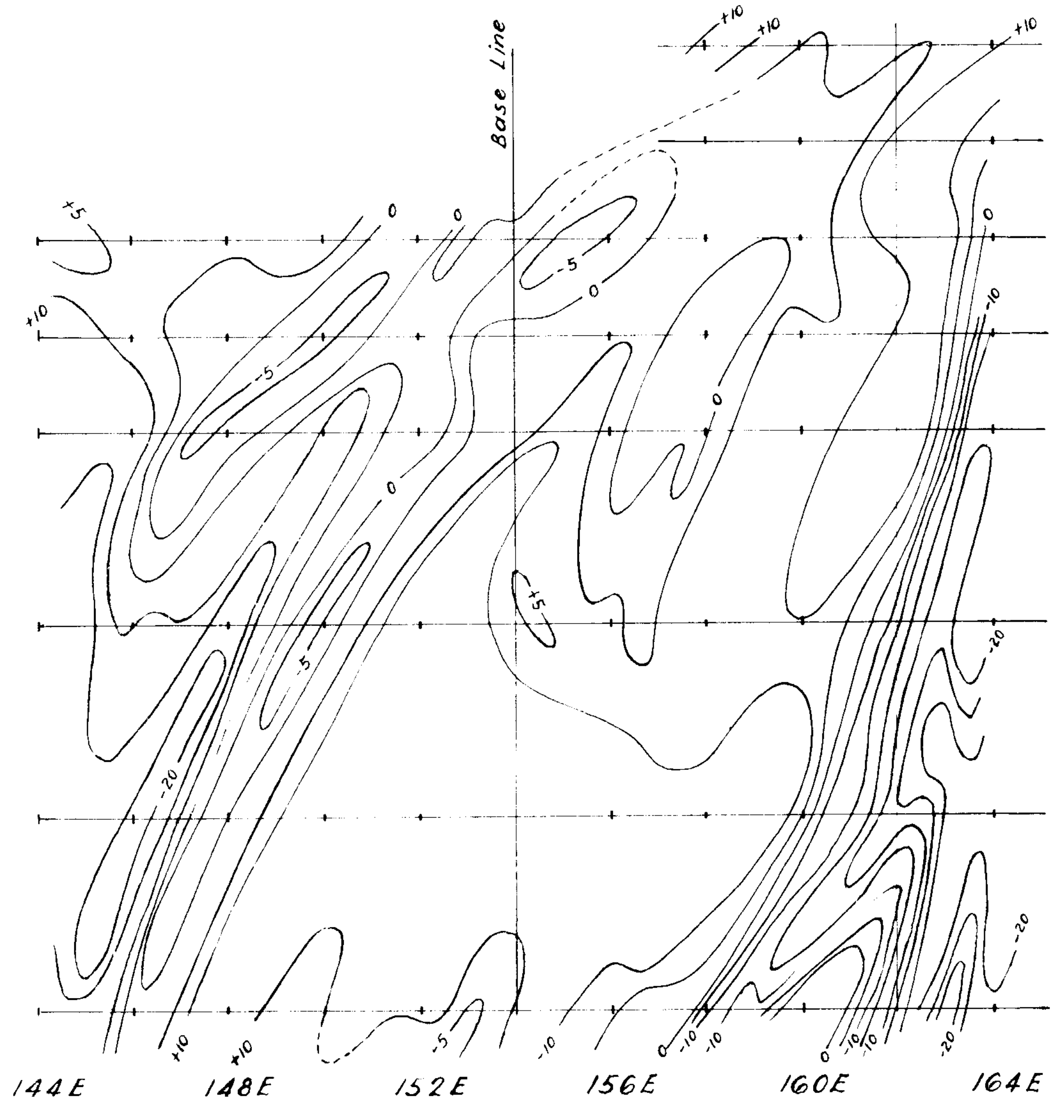
D52/B7-106

S144-GP

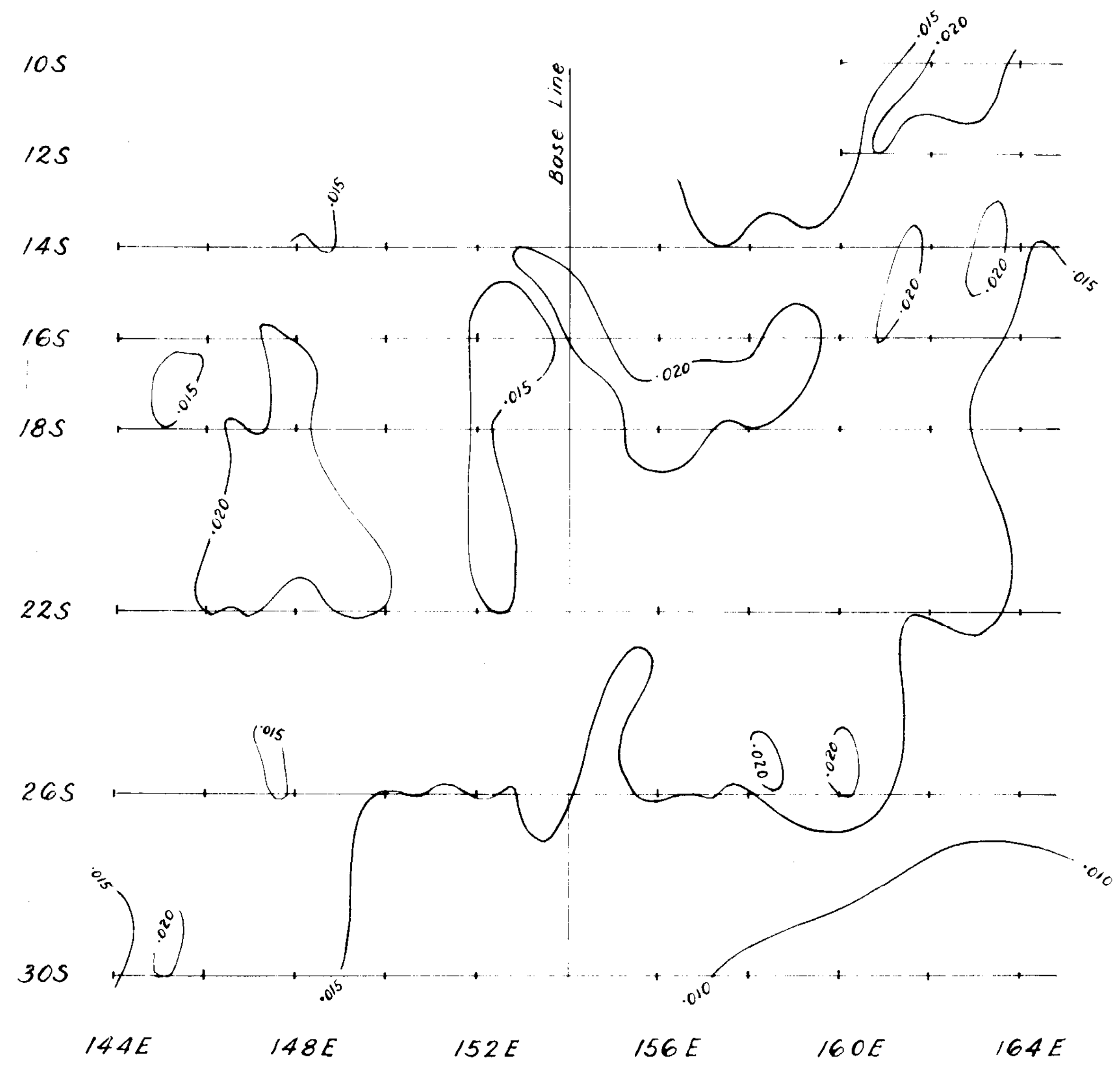
REAL-COMPONENT CONTOURS
Contour Interval 5%

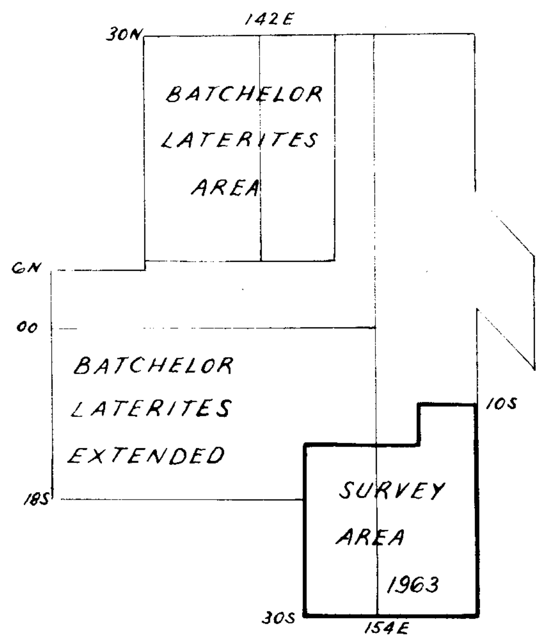


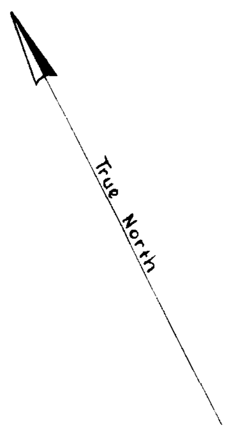
IMAGINARY-COMPONENT CONTOURS
Contour Interval 5%



RADIOMETRIC CONTOURS
Contour Interval ·005 mR/hr.







GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N.T. 1963

SLINGRAM AND RADIOMETRIC CONTOURS

Part of BATCHELOR LATERITES EXTENDED AREA

Slingram { Frequency 1760 c/s
Coil Separation 200 ft

Scale

400 0 400 800 1200 Ft

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. May 1964

To Accompany Record No. 1965/3

D52/B7-107

S143·GP