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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1966/88

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GEOPHYSICAL SURVEYS IN THE RUM JUNGLE TRIANGLE AND EMBAYMENT AREAS,

NORTHERN TERRITORY 1964

PART 1 OF 2

by

J. ASHLEY

PART 1 (TEXT AND PLATES 1 TO 5)

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ILLUSTRATIONS

SUMMARY

Electromagnetic, radiometric, and magnetic surveys were made in two parts of the area bounded by the Giant's Reef Fault, the Mount Fitch Fault and the Rum Jungle Granite in continuation of the search by the Bureau of Mineral Resources for uranium and base-metal mineralisation.

In the Rum Jungle Triangle area, strong electromagnetic anomalies were detected over the Golden Dyke Formation in the vicinity of areas of West Finniss and Dolerite Ridge Extended. The anomalies are continuations of those previously detected in these areas and further investigation by drilling is unwarranted.

Weak electromagnetic anomalies occur over a strong geochemical anomaly located south-west of Area 55W on the western side of the Finniss River. A position is suggested for a diamond-drill hole, which would test both the geochemical and electromagnetic anomalies.

Radioactivity is about twice the background level in several localities. However, in only four of these localities does the radioactivity increase with depth. It is recommended that detailed deep auger drilling be carried out in these four areas.

Magnetic surveys were made over areas where aeromagnetic anomalies have been located. Anomalies over the Golden Dyke Formation are most probably caused by pyrrhotitic amphibolite. The position of the amphibolite may be important in the location of uranium ores. Recommendations are made for further electromagnetic surveys in one area between the amphibolite and the Coomalie Dolomite. A strong magnetic anomaly was located over a bed of hematite boulder conglomerate at the top of the Crater Formation.

In the Embayment area, weak electromagnetic anomalies were detected. A magnetic survey showed that hematite boulder conglomerate was the cause of an aeromagnetic anomaly. No recommendations for further work are made.

The results of diamond drilling of electromagnetic anomalies in 1964 are discussed in an Appendix.

1. INTRODUCTION

In 1964, exploration for uranium and base metals continued in the Rum Jungle area. The exploration programme was formulated by the Australian Atomic Energy Commission, Territory Enterprises Proprietory Ltd (TEP), and the Bureau of Mineral Resources (BMR). This report describes the geophysical results obtained in two areas known as the Rum Jungle Triangle and Embayment areas. Plate 1 shows their location.

Geophysical work has been carried out in the Rum Jungle area by the BMR since 1949. The known economic mineralisation has been found in the lower Proterozoic Golden Dyke Formation close to its contact with the Coomalie Dolomite. The present surveys mostly cover the Golden Dyke Formation and the Coomalie Dolomite and virtually complete the preliminary investigation of an area enclosed by the Giant's Reef Fault, the Mount Fitch Fault, and the Rum Jungle Granite.

The geophysical methods used were electromagnetic (Slingram and Turam), surface radiometric, and ground magnetic. Radiometric and electric loggings were carried out in six diamond-drill holes that had been drilled to test the electromagnetic anomalies outlined during the 1963 Rum Jungle survey (Ashley, 1965).

The geophysical surveys were made by the Darwin Uranium Group of the BMR between the 14th August and the 28th October 1964. The field party consisted of one geophysicist, (K. Duckworth), one geophysical assistant, and four field-hands. Traverses in the Triangle area were surveyed and pegged by Timbs and Britten of Sydney, and in the Embayment area by TEP.

Geological and geochemical surveys of the Rum Jungle Triangle area were also made by the BMR. TEP conducted a geochemical survey of the Embayment area.

The co-operation and assistance of the Staff of TEP is gratefully acknowledged.

2. GEOLOGY

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

The geological map shown in Plate 2 has been compiled from the following sources : Ruxton and Shields (1963), Pritchard, Barrie, Jauncey, and Fricker (1963), Spratt (1963), Dodson and Shatwell (1965), and Pritchard (pers. comm.).

Lower Proterozoic

Crater Formation. Predominantly arkosic in composition, the constituent minerals being largely derived from the underlying Rum Jungle Granite. There are at least two horizons of hematite-rich conglomerate.

Coomalie Dolomite. Includes coarse textured whitish to pale-pink bioherm limestone, medium- to fine-textured dark grey calcilutite, with pyrite and rarely chalcopyrite.

Golden Dyke Formation. Consists of black carbonaceous and chloritic shales, laminated shales, greywacke, quartz sericite schist, and minor intercalations of impure limestone. Sulphide minerals are not uncommon. The carbonaceous and chloritic shales are the host rocks of known uranium mineralisation. Amphibolite, of variable composition but usually containing tremolite, is found stratigraphically close to the junction between the Golden Dyke Formation and the Coomalie Dolomite and is usually included in the Golden Dyke Formation. Pyrrhotite is a common mineral in the amphibolite.

Acacia Gap Tongue. Regarded as an intraformational arenaceous facies within the Golden Dyke Formation. The rocks are a aeries of quartzites, sandstones, and shales, often containing abundant pyrite.

Basic intrusives. Mostly dolerite.

Rum Jungle Granite.

Upper Proterozoic

Depot Creek Sandstone. Pink quartz sandstone with lenses of hematite-rich calcarenite breccia and lenses of quartz pebble conglomerate.

Structure

Structurally the area is dominated by the Rum Jungle and Waterhouse domes with basement rocks exposed in their centres and Lower Proterozoic metamorphics folded around them. Faulting is common in the area; the most striking is the Giant's Reef Fault, which disrupts Upper Proterozoic and older rocks. (Pritchard et al, 1963).

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 ground surveys an airborne magnetic and radiometric survey was made in 1952. Plate 1 shows the areas that have been surveyed and gives the references to the appropriate reports.

The geophysical methods that have been used are the following : electromagnetic, self-potential, magnetic, radiometric, gravity, bore hole logging, and induced polarisation. The most widely used methods are electromagnetic and radiometric; virtually all the areas shown in Plate 1 have been surveyed by these methods. Self-potential surveys have been made in the vicinity of Brown's, Mount Burton and Mount Fitch prospects, Area 55, and in the Rum Jungle Creek South area. An induced polarisation test survey was made in various localities (Eadie, 1964). Essentially, the self-potential and induced polarisation methods give no more information than the electromagnetic method. A gravity survey was made in the Rum Jungle Embayment area (Langron, 1956) but the method is limited in its application to mineral search in the area. Ground magnetic surveys have been made to determine the cause of anomalies detected by the airborne survey. Bore hole logging, particularly radiometric logging, is an important tool in uranium search.

Plate 2 shows the axes of electromagnetic and magnetic anomalies for all the areas.

4. GEOPHYSICAL METHODS, OPERATIONS, AND PRESENTATION OF RESULTS

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

Measurements were taken along traverse lines. In the Rum Jungle Triangle area a grid of east-west traverses 400 feet apart was pegged by the contract surveyor. Slingram readings at a frequency of 1760 c/s and a coil separation of 200 feet were taken every 50 feet initially along traverses 800 feet apart. Turam measurements at a frequency of 440 c/s and a coil separation of 50 feet were made in selected areas. The radiometric survey was made using Harwell ratemeters, type 1368A; readings were taken every 50 feet along traverses 400 feet apart. The magnetic survey was restricted to those areas over which airborne magnetic anomalies occur. Measurements of changes in the vertical component of the magnetic field were recorded at various intervals along selected traverse lines.

In the Embayment area, traverses 2500 feet apart were surveyed by TEP and pegged at 200-ft intervals. The field party pegged these lines at 50-ft intervals and surveyed them with the Slingram equipment. Magnetic readings were taken along two of the above traverses and along one additional traverse which was surveyed by compass and tape.

Radiometric and electric logs were made of six bore holes in areas Mount Fitch 1, Mount Fitch 2, and Dolerite Ridge Extended. These results are discussed in the Appendix.

The following table gives a summary of the amount of ground covered by the various surveys :

Type of survey	Ground covered
Electromagnetic	78.5 line miles
Radiometric	109.5 line miles
Magnetic	12 line miles
Radiometric logging	1871 feet
Electric logging	1871 feet

For the purposes of presentation of results, the Rum Jungle Triangle area has been divided into four segments and designated Figures 1, 2, 3, and 4 as shown in Plate 1. Slingram and Turam results are shown as contour maps in Plates 4, 5, 7, and 8, radiometric results are presented in profile form in Plate 6, and magnetic results in contour form in Plate 9.

The Slingram and magnetic results for the Embayment area are shown in profile form in Plate 11.

Radiometric and electric logs of drill holes are shown as profiles in Plate 12, together with the geological logs.

In Plate 2, axes of electromagnetic and magnetic anomalies are shown for all areas. Turam axes are shown only where Slingram results were not obtained.

5. NOTES ON INTERPRETATION OF ELECTROMAGNETIC RESULTS

Daly (1962) has discussed the interpretation of electromagnetic surveys, but in the light of more recent information some further comments are added here on the interpretation of Slingram surveys.

The type of anomaly from a particular body depends on the shape of the body, its distance below ground surface, its conductivity in relation to surrounding material, and on the coil separation of the Slingram apparatus. A series of model experiments have been initiated by the Darwin Uranium Group to investigate Slingram anomalies produced by different types of bodies. In the experiments, a coil separation of 18 inches is used. The coils are approximately one inch long. Power is supplied at a frequency of 1760 c/s to the transmitting coil by an R.C. oscillator and the signal from the receiver coil is measured by the field equipment compensator. Conducting bodies of different shapes and sizes have been made from galvanised iron sheet. The experiments are by no means complete but a few examples, together with equivalent field examples and drilling results, are shown in Plate 3. All the models have a dimension, perpendicular to the section shown, that is large compared with the coil separation.

An interesting feature of examples (2), (3), and (4) in Plate 3 is the dramatic change in the character of the anomaly when the depth to the surface of the body changes from 50 feet to 100 feet. Large areas of positive real-component readings have been observed in the field, particularly in Batchelor Laterites Extended area (Douglas, 1964), and it would seem that they are due to a good conductor at a depth of about 100 feet. The effect of the conductivity of the body has not yet been investigated; it may be, for instance, that a large body of low conductivity at a depth of 50 feet would produce a positive real-component anomaly.

A useful method for estimating the horizontal width of a conductor from the anomaly is to measure the distance between the outer maxima of the anomaly and subtract 250 feet. This rule applies only for a coil separation of 200 feet.

Anomalies over conductors dipping at 60° are very little different from those over similar vertical bodies.

Results of model experiments to date are sufficient to illustrate that diamond-drill holes should not be indiscriminately sited to test real-component minima. The imaginary-component anomaly is often useful in deciding if an anomaly is due to a narrow or broad conductor.

6. DISCUSSION OF RESULTS

Rum Jungle Triangle area

Electromagnetic. Electromagnetic results are shown in the contour maps of Plates 4, 5, 7, and 8. From Plate 4 and 5 anomaly axes have been defined and are shown in Plate 2.

From Plate 2 the distribution of anomalies in relation to geology can be summarised as follows :

(a) The Giant's Reef Fault zone is, in part, anomalous.

(b) The Crater Formation is almost devoid of anomalies.

(c) The Coomalie Dolomite exhibits weak anomalies south of Traverse 134N and in the vicinity of the Giant's Reef Fault zone north of Traverse 214N. In places there are anomalies associated with the junction between the Coomalie Dolomite and the Crater Formation.

(d) The Golden Dyke Formation is most anomalous between Traverses 254N and 302N.

Elsewhere, particularly between 234N and 134N, there are a few weak anomalies.

Anomalies over the Giant's Reef Fault zone are stronger in the imaginary component that the real component. Most of them are due to narrow bodies within, probably, 50 feet of ground surface. Conductivities of these bodies are nowhere high.

Geochemical results have been obtained over the fault zone (Dodson & Shatwell, 1965) between Traverses 34N and 54N and between Traverses 182N and 214N. The results are shown in Plate 10. There are no large geochemical anomalies associated with electromagnetic anomalies and it is not recommended that the latter be tested by drilling.

There are several weak anomalies over the Coomalie Dolomite; none of these represents high conductivity changes and they probably indicate variations in lithology rather than mineralisation. Within the Coomalie Dolomite, there are two areas, between Traverses 90N and 126N and between Traverses 170N and 198N, that give high geochemical values. The latter area was investigated by the Turam method and results are presented in Plate 8. Weak Turam anomalies trending north-south are coincident with the geochemical anomaly. Any drilling on the basis of geochemical results should be located to test the zone vertically beneath the Turam anomalies.

Electromagnetic anomalies over the Golden Dyke Formation west of the Dolerite Ridge and West Finniss areas are continuations of anomalies previously located in Mount Fitch 1 and Dolerite Ridge Extended areas. The zone between Traverses 258N and 282N has been investigated with the Turam method; the results are shown in Plate 7. The anomalies represent narrow conductors whose top surfaces lie probably within 50 feet of ground surface. Drilling in the West Finniss and Mount Fitch 1 areas has shown that the anomalies are due to pyritic shales. There are no geochemical anomalies within this zone, and diamond drilling to test the electromagnetic anomalies is unwarranted. A lithological boundary within the Golden Dyke Formation is indicated by the western boundary of the zone of anomalies. Probably this is a change from carbonaceous and chloritic shales and schist to sericitic shale.

In the area bounded by Traverses 218N and 254N between 110E and 150E the strike of the Golden Dyke Formation is nearly east-west. It is possible that some conducting zones have been missed by taking measurements on east-west traverses. The area should be further investigated along north-south traverses.

Radiometric. Radiometric measurements were made along traverses spaced 400 feet apart. The results are presented in profile form in Plate 6. Areas over which the radioactivity exceeds 0.020 milliroentgen/hour are outlined in Plate 6 and designated A to M. Also indicated are those auger holes which show radioactivity increasing with depth. Of the areas A to M, only areas A, B, D, and E show radioactivity increasing with depth in more than one auger hole. B and D are areas which do not contain near-surface conductors, whereas A and E are adjacent to such conductors. Further investigation, possibly by deep auger drilling, should be made of areas A, B, D, and E. All areas where radioactivity increases with depth should be similarly investigated. Area H is a costean in area 55 West; further investigation is unnecessary.

Magnetic. Contours of vertical magnetic field are shown in Plate 9. Contour values are referred to a base station value of +220 gammas at 37075N/15900E (TEP Mine Grid coordinates) in area Mount Fitch 2. Axes of magnetic anomalies are shown in Plate 2.

The magnetic anomalies north of 20,000N are probably due to pyrrhotitic amphibolite within the Golden Dyke Formation. Magnetic anomalies in Brown's area and in area Mount Fitch 2, which are continuous with the anomalous zone shown in Plate 9, have been shown by diamond drilling to be due to pyrrhotitic amphibolite.

The anomalous magnetic zone coincides closely with the zone of electromagnetic anomalies. The axes of magnetic anomalies follow the general strike of the Golden Dyke Formation; the east-west strike of this Formation is well indicated by the anomaly axis through 250N/120E and 247N/140E.

The magnetic anomaly between Traverses 138N and 62N is over a bed of hematite boulder conglomerate at the top of the Crater Formation. Maximum amplitude of the anomaly is about 9000 gammas, almost the highest recorded in the Rum Jungle district. The width of outcrop of the conglomerate is 5 to 10 feet. Interpretation of the anomaly has shown that it is not due to a bed of conglomerate of uniform width of the order of 10 feet. The anomaly can be produced by a vertical dike 200 feet wide at a depth of 100 feet with a narrow extension to the surface. The magnetic susceptibility of such a body would be about 5×10^{-2} CGS units. The magnetic anomaly does not extend over the whole length of the conglomerate. A possible explanation is that during the late stages of deposition of the Crater Formation there was deposition of magnetite in a depression or basin. The magnetic anomaly now indicates the edge of the tilted basin.

Embayment area

Electromagnetic (Slingram) and magnetic results are presented in profile form in Plate 11. Slingram measurements could not be made south of 318E/336N and 293E/318N owing to the proximity of the power house at the Rum Jungle treatment plant.

Axes of the electromagnetic anomalies A, B, and C are shown in relation to the geology in Plate 2.

In the real component, A, B, and C are similar to boundary anomalies but the imaginary component is typical of narrow conductors. Possibly the anomalies are due to increased conductivity at lithological boundaries. It is considered that A is over the junction of the Coomalie Dolomite and the Crater Formation, although on Traverse 368E the anomaly is not close to the indicated boundary (Plate 2). Conductivity changes are nowhere high.

The magnetic survey was made to determine the cause of an aeromagnetic anomaly. On Traverse 278E the magnetic 'high' is over the hematite boulder conglomerate of the Crater Formation and it is apparent that magnetic portions of the conglomerate account for the magnetic anomaly.

7. CONCLUSIONS AND RECOMMENDATIONS

Rum Jungle Triangle area

Electromagnetic surveys have outlined one area of moderately large conductivity variations, i.e. to the west of Dolerite Ridge area. Anomalies are extensions of those detected previously in adjacent areas. Testing of the latter by diamond drilling has shown the increased conductivity is due to pyritic schists and shales. Further testing is considered unwarranted.

Anomalies occur over the Giant's Reef Fault zone and are generally parallel to the faulting. As the faulting probably post-dates the uranium and base metal mineralisation in the Rum Jungle district, the anomalies most probably do not represent such mineralisation.

Weak electromagnetic anomalies occur over the zone of geochemical anomaly between Traverses 170N and 198N. Any drilling based on the geochemical results should also be designed to test the zone vertically beneath the axes of the Turam anomalies (Plate 7). A diamond-drill hole for this purpose could be collared at 182N/109E and inclined to the east at 55°.

Further electromagnetic work is recommended in the area bounded by Traverses 254 N and 218N between 110E and 150E. Within this area, the strike of the Golden Dyke Formation is more nearly east-west than north-south and it is considered that the present survey has not adequately investigated the area. It is recommended that traverses, initially 800 feet apart, be measured with the Slingram equipment. The area is a favourable one for ore deposition as it is over the Golden Dyke Formation between amphibolite, which is indicated by the magnetic anomaly between Traverses 246N and 250N, and the Coomalie Dolomite, i.e. an environment similar to that of the Brown's orebody and the Mount Burton orebody.

Radioactivity in some parts of the area is as high as twice the background level. Probing of auger drill holes has shown that in four anomalous areas, A, B, D, and E (Plate 6), the radioactivity increases with depth. It is recommended that detailed deep auger drilling be carried out in each of these areas.

Embayment area

The electromagnetic survey did not locate any highly conducting bodies in this area. A more detailed survey may be useful in aiding geological mapping. The magnetic survey has shown that the aeromagnetic anomaly is caused by magnetic portions of the hematite boulder conglomerate within the Crater Formation.

8. REFERENCES

ASHLEY, J. 1965 Rum Jungle area geophysical surveys, Northern Territory 1963. Bur. Min. Resour. Aust. Rec. 1965/3.

DALY, J. 1962 Rum Jungle district, Northern Territory, introductory report on geophysical surveys 1960-61. Bur. Min. Resour. Aust. Rec. 1962/27.

DODSON, R. G. AND SHATWELL, D. O. 1965 Geochemical and radiometric survey Rum Jungle 1964. Bur. Min. Resour. Aust. Rec. 1965/254.

DOUGLAS, A. 1964 Batchelor Laterites Area Extended, geophysical survey, Rum Jungle, NT 1962-63. Bur. Min. Resour. Aust. Rec. 1964/5.

EADIE, E. N. 1964 Induced polarisation test survey, Rum Jungle, Northern Territory 1963. Bur. Min. Resour. Aust. Rec. 1964/188.

LANGRON, W. J. 1956 Geophysical survey in the Rum Jungle area, Northern Territory. Bur. Min. Resour. Aust. Rec. 1956/43.

PRITCHARD, P. W., BARRIE, J., JAUNCEY, W., FRICKER, A. G. 1963 Progress report, Rum Jungle phosphate survey 1962/63. Bur. Min. Resour. Aust. Rec. 1963/73.

RUXTON, B. P., SHIELDS, J. W. 1963 Geochemical and radiometric survey, Rum Jungle, Northern Territory 1962. Bur. Min. Resour. Aust. Rec. 1963/131.

SPRATT, R. N. 1963 Report on exploration in the Hundred of Goyder, October 1962 - September 1963, and proposals for further exploration. Territory Enterprices Pty Ltd Rep. (unpubl.).

MALONE, E. J. 1962 Explanatory notes on the Darwin geological sheet D/52-4 (1:250,000 geol. series). Bur. Min. Resour. Aust. Explan. Notes.

APPENDIX

NOTES ON DIAMOND DRILLING RESULTS, RUM JUNGLE, 1964

Diamond-drill holes, BMR DDH 64-1, 2, 3, 4, 6, and 7, were drilled to investigate the sources of electromagnetic anomalies. The location of the holes is shown in Plate 2. Electric and radiometric logs were made and results are presented in Plate 12, Figures 1-6, together with the geological logs. In Plate 13 the drill hole lithologies are given in relation to the electromagnetic results. It should be noted that the drilling sections are shown at a scale of one inch = 100 feet, whereas the electromagnetic profiles are drawn with linear scale of one inch = 400 feet.

BMR 64-1

Collar : 382.75N/135.70E on the Mount Fitch No. 2 grid (same as TEP Mine Grid).
Depression : vertical.
Length : 300 feet.

Amphibolite containing pyrite (about 10%) was the only rock type encountered beneath the alluvium. The electric log shows low resistance except for the intervals 150-182 feet and 280-300 feet. Evidently the pyritic amphibolite produces the electromagnetic anomaly. The peak to peak width of the anomaly is 700 feet giving a horizontal width of the amphibolite of about 450 feet.

Radioactivity is low throughout the hole.

BMR 64-2

Collar : 383N/129.5E. Mount Fitch No. 1 grid.
Depression : vertical
Length : 254½ feet.

From beneath the alluvium to 81 feet are black shales, then amphibolite to 211 feet and finally black shale and dolomite calcilutite to the bottom of the hole. Electrical resistance is generally low to about 210 feet, thereafter it increases. The amphibolite is characterised by very low uniform radioactivity. Highest radioactivity, only 0.035 milliroentgen/hour was observed just below the casing.

Initial interpretation of the Slingram results was that there were two narrow conductors centred below 125½E and 129½E. Reinterpretation in the light of model experiment results indicates that the anomaly is due to a wide body between 125E and 130E, with its upper surface about 50 feet below ground surface. The anomaly is probably due to a wide conductor made up of pyritic black shales and pyritic amphibolite. The drill hole shows a conductor at 129½E but does not test the Slingram interpretation of a wide body.

BMR 64-3

Collar : 370N/127E. Mount Fitch No. 1 grid.
Depression : vertical
Length : 290½ feet.

Carbonaceous slates, chloritic schists, and greywacke were encountered to 271½ feet and then calcareous material to the end of the hole. Pyrite occurs throughout, up to 15%, with some pyrrhotite in lesser amounts. The electrical log shows that resistance is generally low although there are several thin beds of medium to high resistance.

The minima in the electromagnetic anomaly are the same as the minima in the vicinity of BMR 64-2. Reinterpretation of the anomaly here is that it is due to a wide body between 126½E and 133E with its upper surface less than 50 feet below ground surface. The drill hole has not tested this interpretation.

A postulated geological section, which includes results from BMR 64-2, is given in Plate 3, example 3.

BMR 64-4

Collar : 370.75N/143.50E. Mount Fitch No. 2 grid (same as TEP Mine Grid).
Depression : vertical
Length : 324¾ feet.

Only amphibolite was encountered below the alluvium. Pyrrhotite exceeds pyrite in quantity and together these minerals make up about 10% of the rock.

Electrical resistance is variable. From 72 to 150 feet it is low and this is evidently the zone producing the electromagnetic anomaly. Radioactivity is low throughout the hole.

The electromagnetic anomaly is due to a conductor about 100 feet wide (horizontally) dipping to the west. There is a similar conductor centred below 146E. Both conductors are probably due to zones of high pyrrhotite and pyrite content within the amphibolite.

A sharp magnetic anomaly of about 3000 gammas is centred at 144E. The anomaly is no doubt due to the pyrrhotite within the amphibolite.

BMR 64-6

Collar : 318N/133E. Mount Fitch No. 1 grid.
Depression : 55°.
Bearing : 87° magnetic.
Length : 354 feet.

The following rock types were encountered : 0-60 feet alluvium, 60-122 feet black slate and schist, 122-162½ feet dolerite, 162½-188½ feet black slate, 188½-200 feet dolerite, 200-236 feet black slate, thence alternate bands of black slate and calcilutite. Pyrite is present throughout in quantities up to 5% in the first 200 feet and up to 10% after 200 feet. Pyrrhotite is present, in some parts exceeding 5%. Resistance is variable, dolerite has low to medium resistance and black slate and calcilutite have low to high resistance.

The dolerite exhibits very low radioactivity. In the black slate and calcilutite, radioactivity in places is about twice the mean level of radioactivity recorded from similar rocks in other holes.

Reinterpretation of the electromagnetic anomaly leads again to the conclusion that the anomaly is due to a wide conducting zone which has only been partly tested by the drill hole. Limits of this zone are 134E and 142E and its upper surface is about 50 feet below ground surface. The conducting zone is viewed by the instrument as one zone, whereas in fact it is a series of steeply dipping beds of black slate, calcilutite, and dolerite.

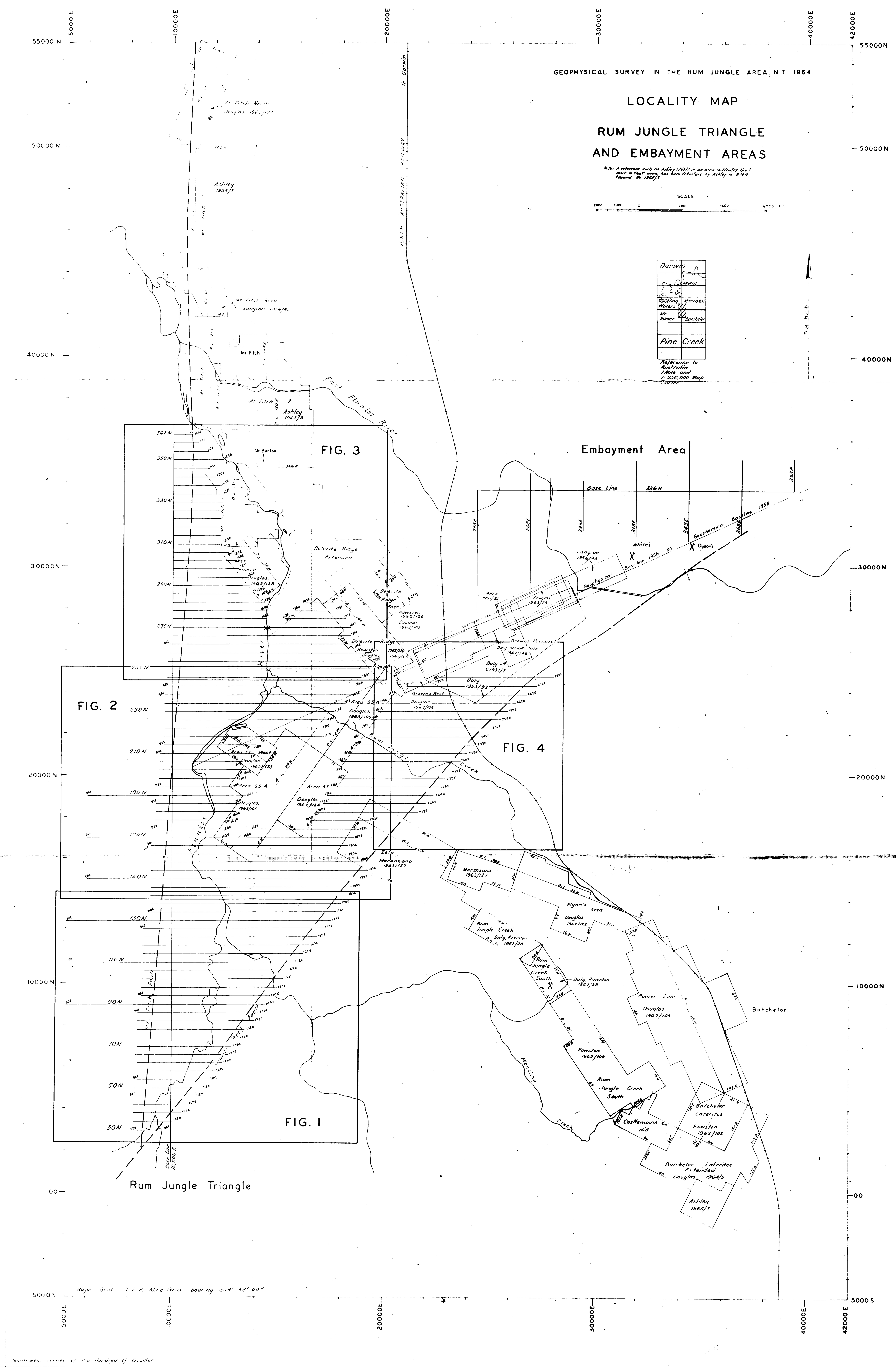
BMR 64-7

Collar : 66N/168W. Dolerite Ridge Extended grid.
Depression : 55°.
Bearing : 50° magnetic.
Length : 354 feet.

The geological log is as follows : 0-68 feet alluvium, 68-155 feet dolerite, 155-290 feet mostly black slate, 290-354 feet dolerite. The dolerite contains pyrite up to 5% and the sediments up to 10%. The electrical log shows that the dolerite is of variable resistance from medium to high and the black slate is mostly of low resistance. The dolerite has a very low uniform radioactivity, the black slate exhibits variable radioactivity, with a mean level of about 0.024 milliroentgen/hour. A good comparison of radiometric logs from the Widco and 1417A equipments was obtained in this hole. The Widco scintillometer probe is a continuously recording unit and responds to narrower zones of different radioactivity than the Geiger Muller tube of the 1417A instrument, as the latter is read at one-foot intervals along the hole. The Widco probe gives slightly higher readings (about 0.005 milliroentgen/hour) than the 1417A probe.

The width of the electromagnetic anomaly indicates that the anomaly is caused by a conductor about 120 feet wide (horizontally). The horizontal width of the black slate is 130 feet and the slate is certainly the cause of the anomaly. It is interesting to note that the average pyrite content of the black slate is only about 5% and yet the real-component Slingram anomaly is some 80% in amplitude. The black slate here is not evidently much more graphitic than in the other diamond-drill holes. It is suggested that the core be examined for base metal mineralisation.

PLATE I

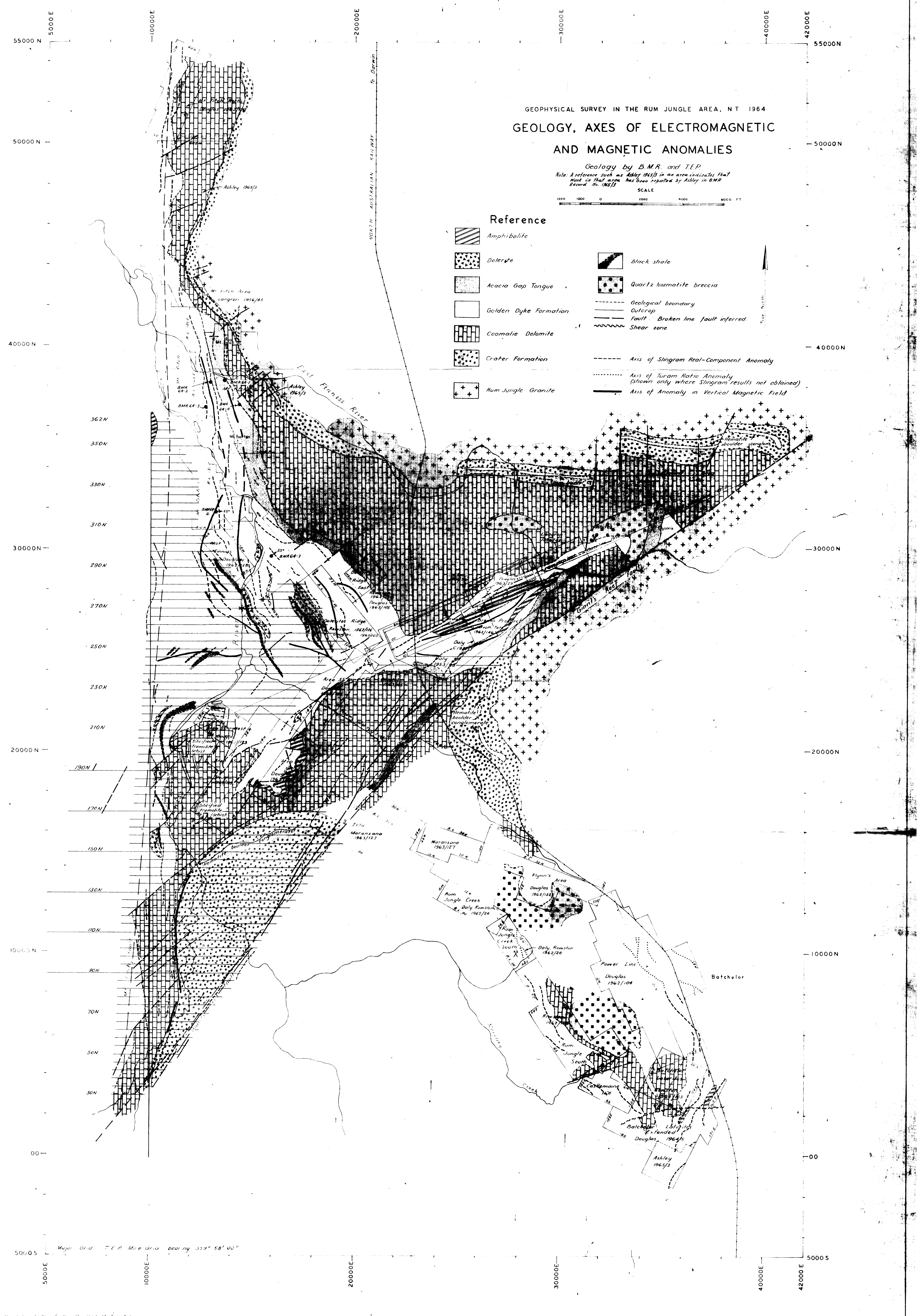


Bureau of Mineral Resources, Geology and Geophysics Darwin June 1965

D52/B7-136

TO ACCOMPANY RECORD No. 1965/

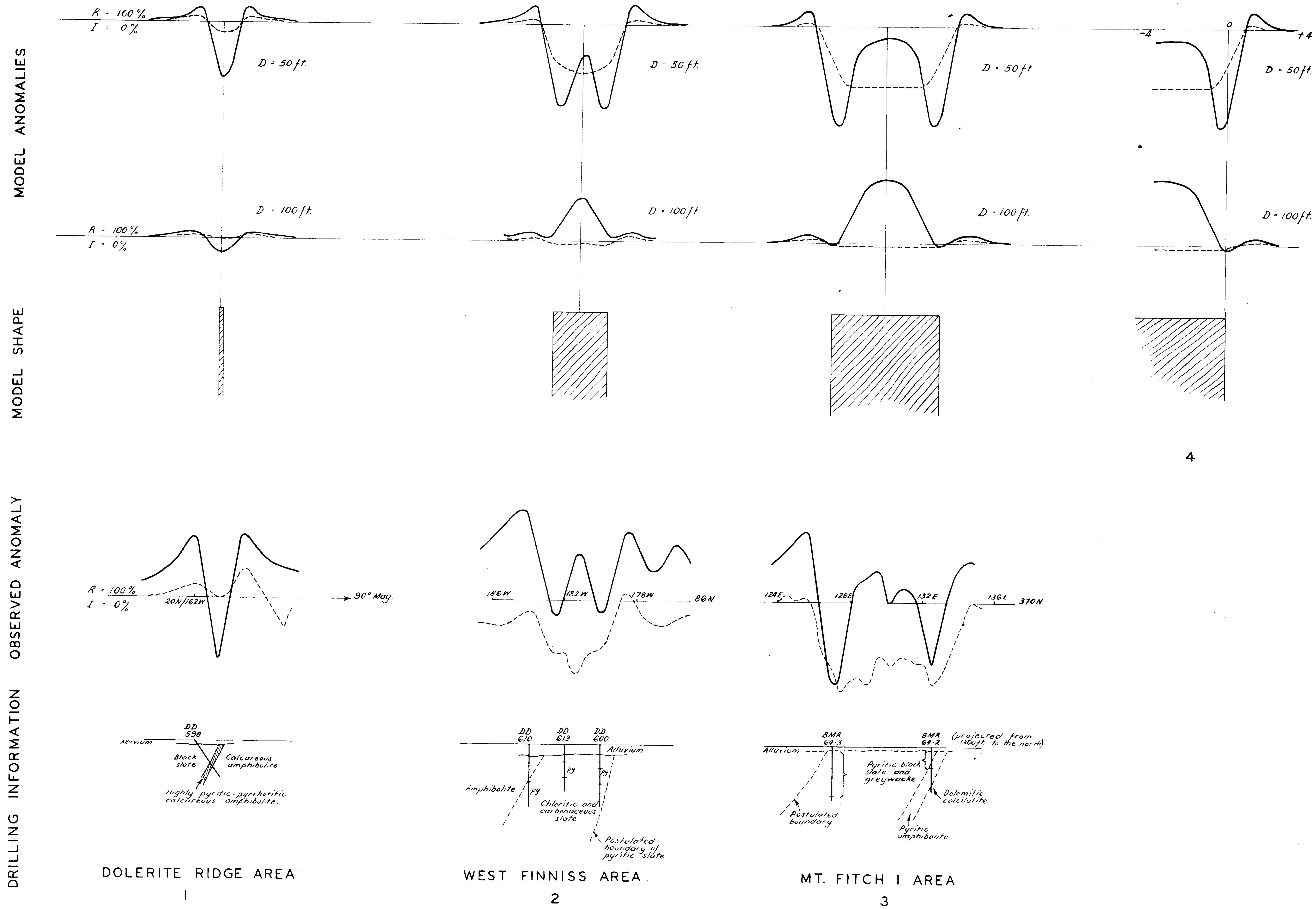
PLATE 2



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

D 52/B7-137

PLATE 3



GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964

EXAMPLES OF MODEL AND OBSERVED (FIELD) SLINGRAM ANOMALIES

D = *Depth to top surface of Model*
R = *Real Component* ————
I = *Imaginary Component* ------

SCALE

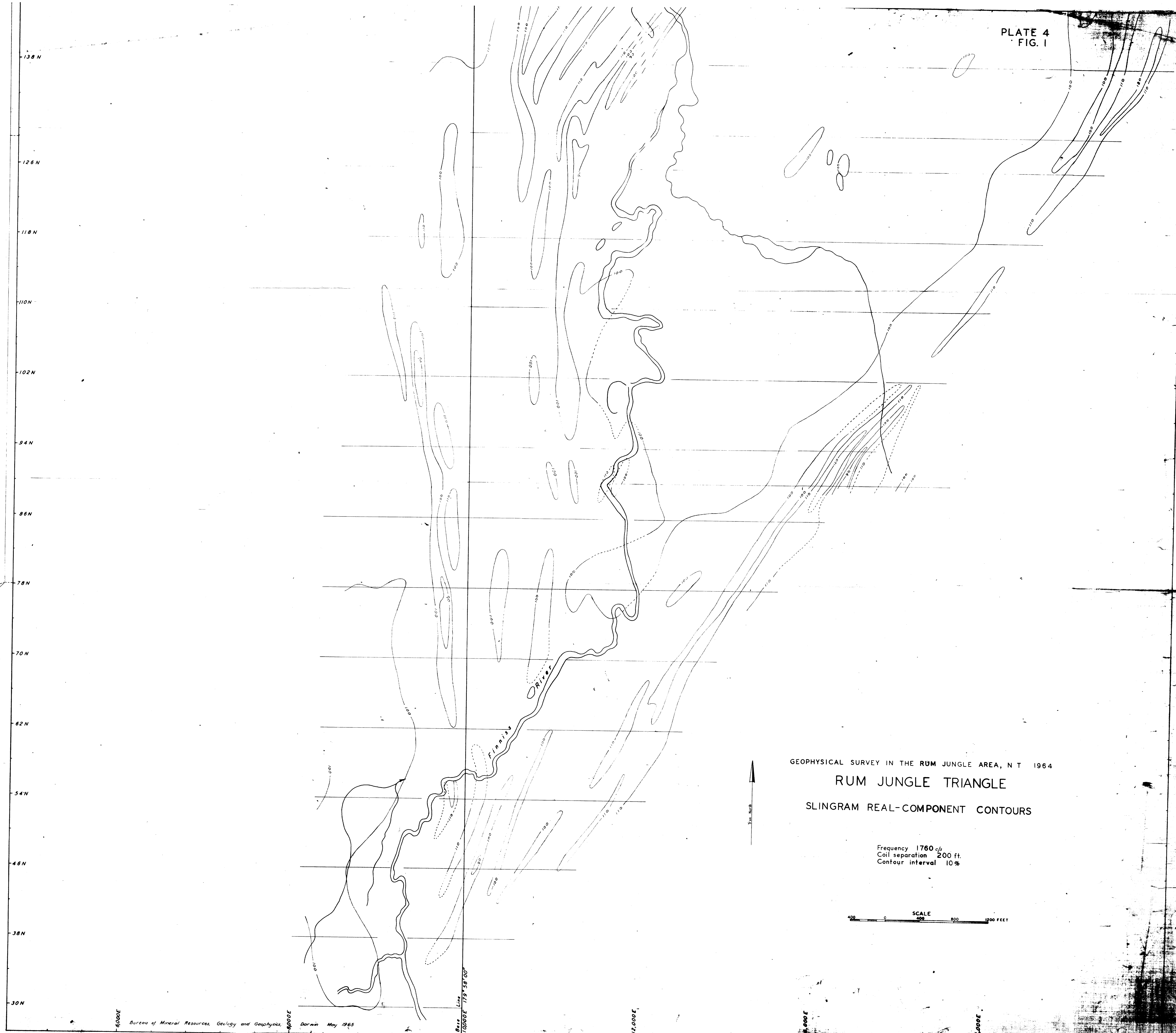
(*Horiz. + Vertical*) 400 0 400 800 1200 FEET
ANOMALY (*Vertical*) 20 0 20 40 60 %

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

D 52/B7-138

TO ACCOMPANY RECORD No. 1966/88

PLATE 4
FIG. 1



GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964

RUM JUNGLE TRIANGLE

SLINGRAM REAL-COMPONENT CONTOURS

Frequency 1760 c/s
Coil separation 200 ft.
Contour interval 10%

SCALE
400 0 400 800 1200 FEET

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

PLATE 4
FIG. 2


GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T. 1964
RUM JUNGLE TRIANGLE
SLINGRAM REAL-COMPONENT CONTOURS
Frequency 1760 c/s
Coil separation 200 ft.
Contour interval 10%
Area of Turam survey
SCALE
1958 Geophysical and Geochemical Baseline
Rum Jungle Creek
Finniss River
Between 98% and 102%
Base Line 10,000 E
250N
242N
234N
226N
218N
210N
202N
194N
178N
170N
154N
8,000E
12,000E
14,000E
16,000E
18,000E
20,000E

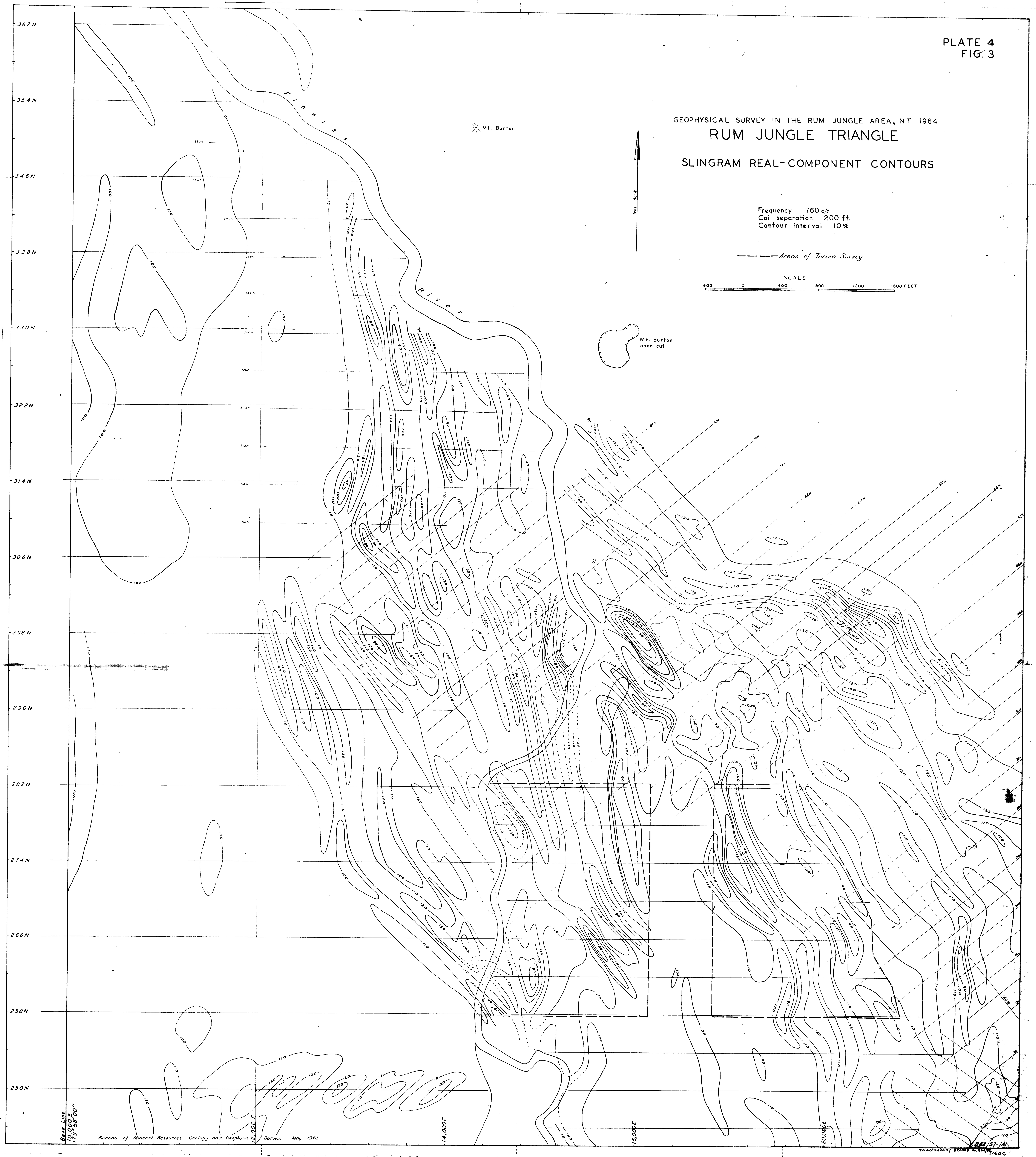


PLATE 4
FIG. 3
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1964
RUM JUNGLE TRIANGLE
SLINGRAM REAL-COMPONENT CONTOURS
Frequency 1760 c/s
Coil separation 200 ft.
Contour interval 10%
Areas of Turam Survey
SCALE
400 0 400 800 1200 1600 FEET
True North
Mt. Burton
Mt. Burton open cut
Finniss River
362N
354N
346N
338N
330N
322N
314N
306N
298N
290N
282N
274N
266N
258N
250N
Base Line 10,000E 119°58'00"
12,000E
14,000E
16,000E
20,000E
Bureau of Mineral Resources, Geology and Geophysics Darwin May 1965
TO ACCOMPANY RECORD No. 1966/
D52/87-141
S/60C

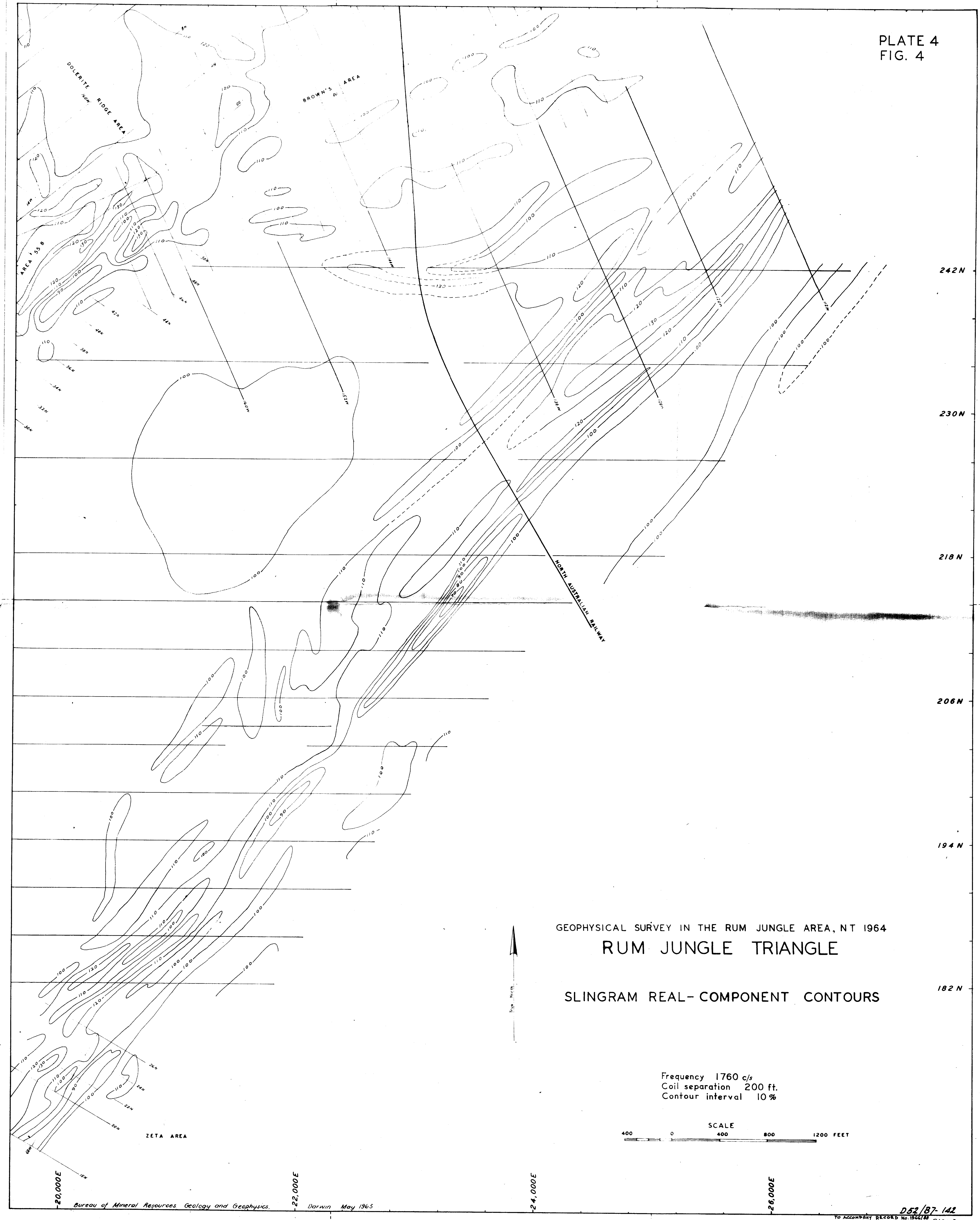


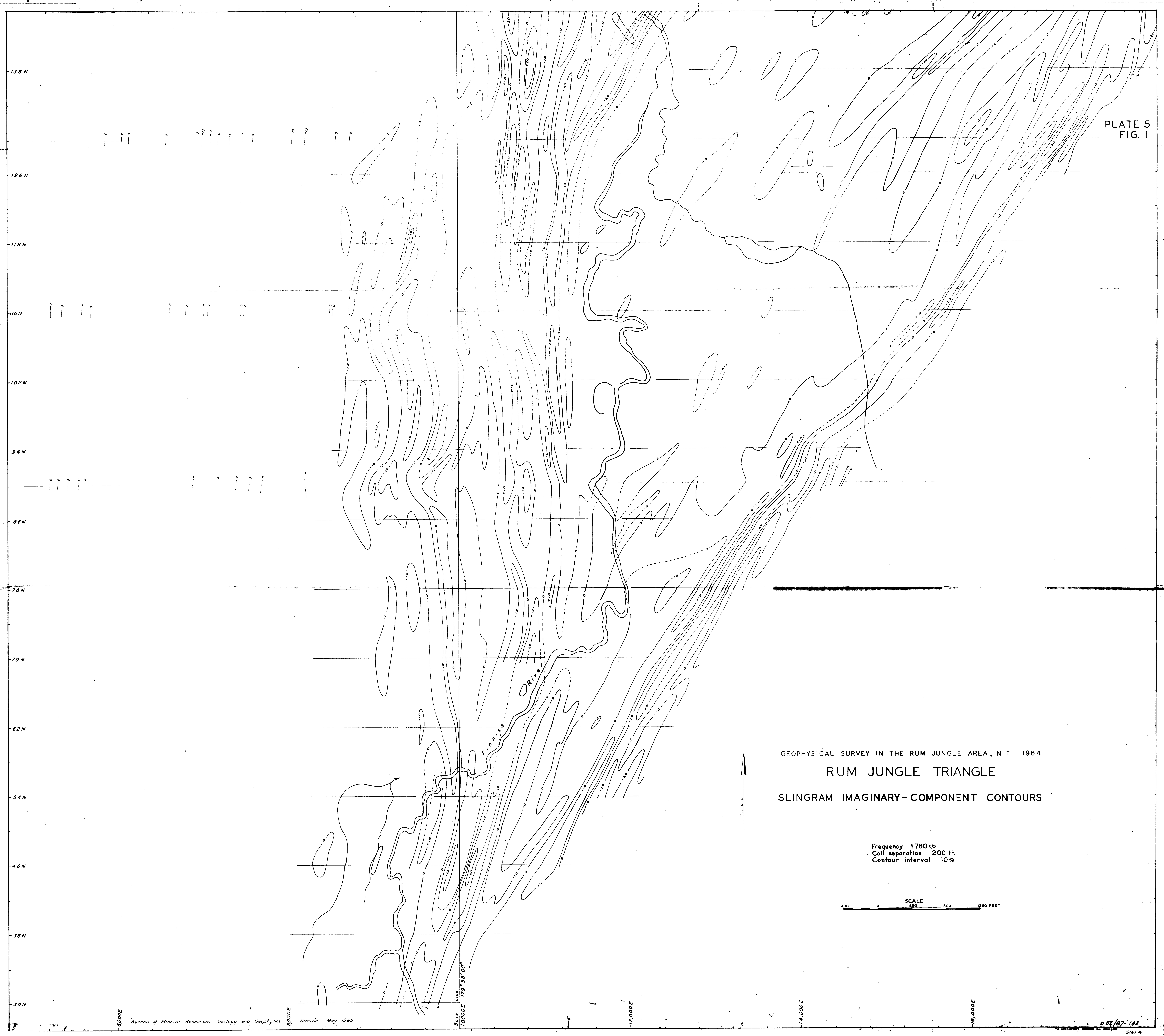
PLATE 4
FIG. 4

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1964

RUM JUNGLE TRIANGLE

SLINGRAM REAL-COMPONENT CONTOURS

PLATE 5
FIG. 1



GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964
RUM JUNGLE TRIANGLE
SLINGRAM IMAGINARY-COMPONENT CONTOURS
Frequency 1760 c/s
Coil separation 200 ft.
Contour interval 10%
SCALE
400 0 400 800 1200 FEET
True North
Finniss River
Base Line 10,000E 179°58'00"
6,000E
8,000E
12,000E
14,000E
16,000E
138N
126N
118N
110N
102N
94N
86N
78N
70N
62N
54N
46N
38N
30N
Bureau of Mineral Resources, Geology and Geophysics, Darwin May 1965
D52/B7-143
S161A

PLATE 5
FIG. 2


GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964
RUM JUNGLE TRIANGLE
SLINGRAM IMAGINARY-COMPONENT CONTOURS
True North
Frequency 1760 c/s
Coil separation 200 ft.
Contour interval 10%
SCALE
400 0 400 800 1200 FEET
1958 Geophysical and Geochemical Baseline
Rum Jungle Creek
Finniss River
250N
242N
234N
226N
218N
210N
202N
194N
186N
178N
170N
162N
154N
146N
190N
170N
150N
8,000E
10,000E
12,000E
14,000E
16,000E
18,000E
20,000E
Bureau of Mineral Resources, Geology and Geophysics - Darwin

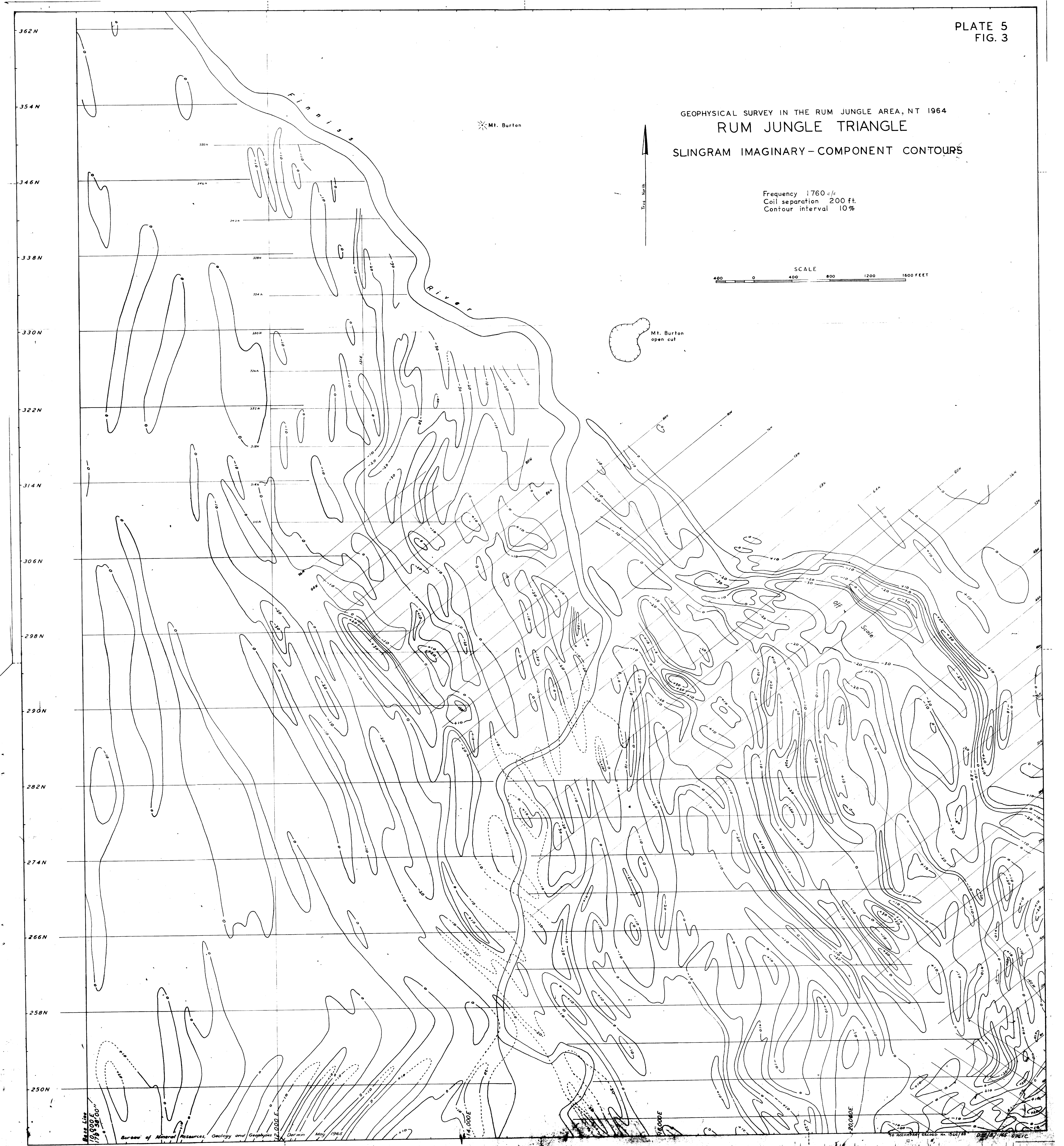


PLATE 5
FIG. 3
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1964
RUM JUNGLE TRIANGLE
SLINGRAM IMAGINARY-COMPONENT CONTOURS
Frequency 1760 c/s
Coil separation 200 ft.
Contour interval 10%
SCALE
400 0 400 800 1200 1600 FEET
True North
Mt. Burton
Mt. Burton open cut
Finniss River
Off Scale
362N
354N
346N
338N
330N
322N
314N
306N
298N
290N
282N
274N
266N
258N
250N
Base Line 10,000 E 175° 58' 00"
12,000 E
14,000 E
16,000 E
20,000 E
Bureau of Mineral Resources, Geology and Geophysics Darwin May 1965
TO ACCOMPANY RECORD No. 1966/88

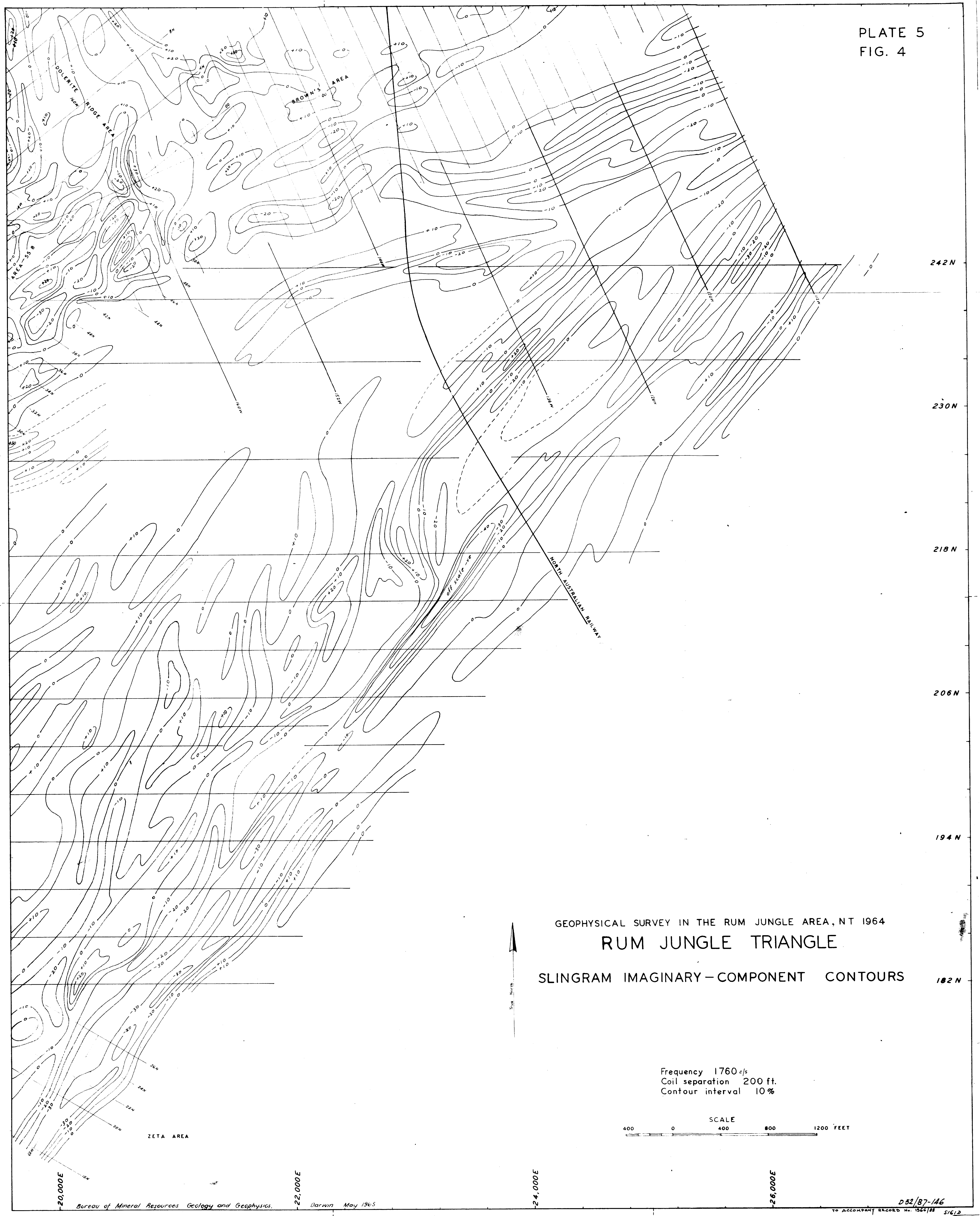


PLATE 5
FIG. 4

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1964

RUM JUNGLE TRIANGLE

SLINGRAM IMAGINARY–COMPONENT CONTOURS

1966/88
COPY 3

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1966/88

Copy 3.

GEOPHYSICAL SURVEYS IN THE RUM JUNGLE TRIANGLE AND EMBAYMENT AREAS,

NORTHERN TERRITORY 1964

by

J. ASHLEY

PART 2 (PLATES 6 TO 13)

PART 2 of 2

1966/88
COPY 3

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1966/88

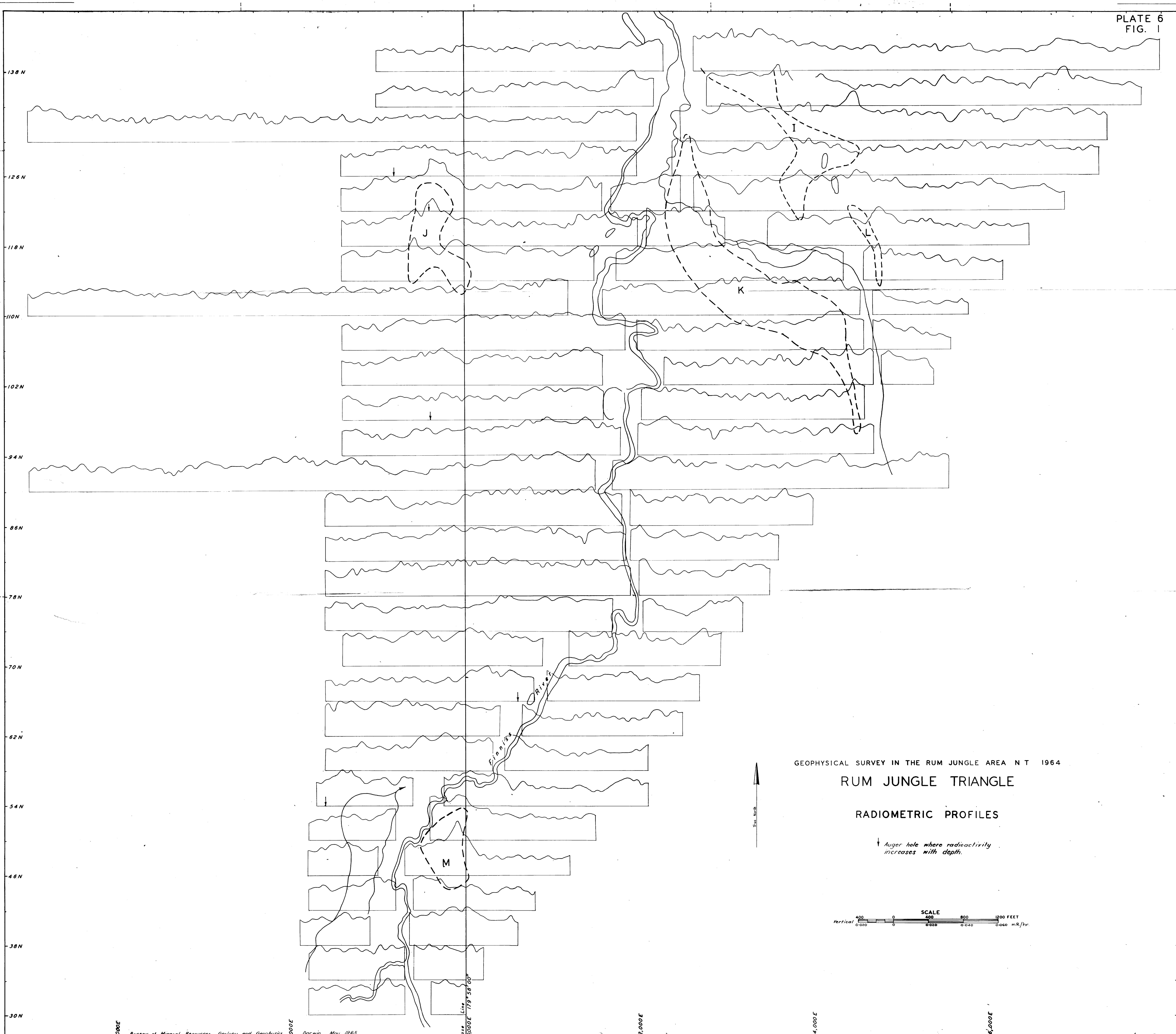
GEOPHYSICAL SURVEYS IN THE RUM JUNGLE TRIANGLE AND EMBAYMENT AREAS, NORTHERN TERRITORY 1964

by

J. ASHLEY

PART 2 (PLATES 6 TO 13)

PLATE 6
FIG. 1



TO ACCOMPANY RECORD No. 1966/88 5162A

PLATE 6
FIG. 2


GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T. 1964
RUM JUNGLE TRIANGLE
RADIOMETRIC PROFILES
True North
Auger hole where radioactivity increases with depth
SCALE
400 0 400 800 1200 FEET
Vertical 0.020 0 0.020 0.040 0.060 mR/hr
A
B
C
D
E
F
G
H
I
Rum Jungle Creek
Finniss River
1958 Geophysical and Geochemical Baseline
Base Line 10,000E
179°58'00"
250N
242N
234N
226N
218N
210N
202N
194N
190N
186N
178N
170N
162N
154N
150N
146N
6,000E
8,000E
12,000E
14,000E
16,000E
18,000E
20,000E
D52/B7-148
TO ACCOMPANY RECORD No 1966/88
G162 8

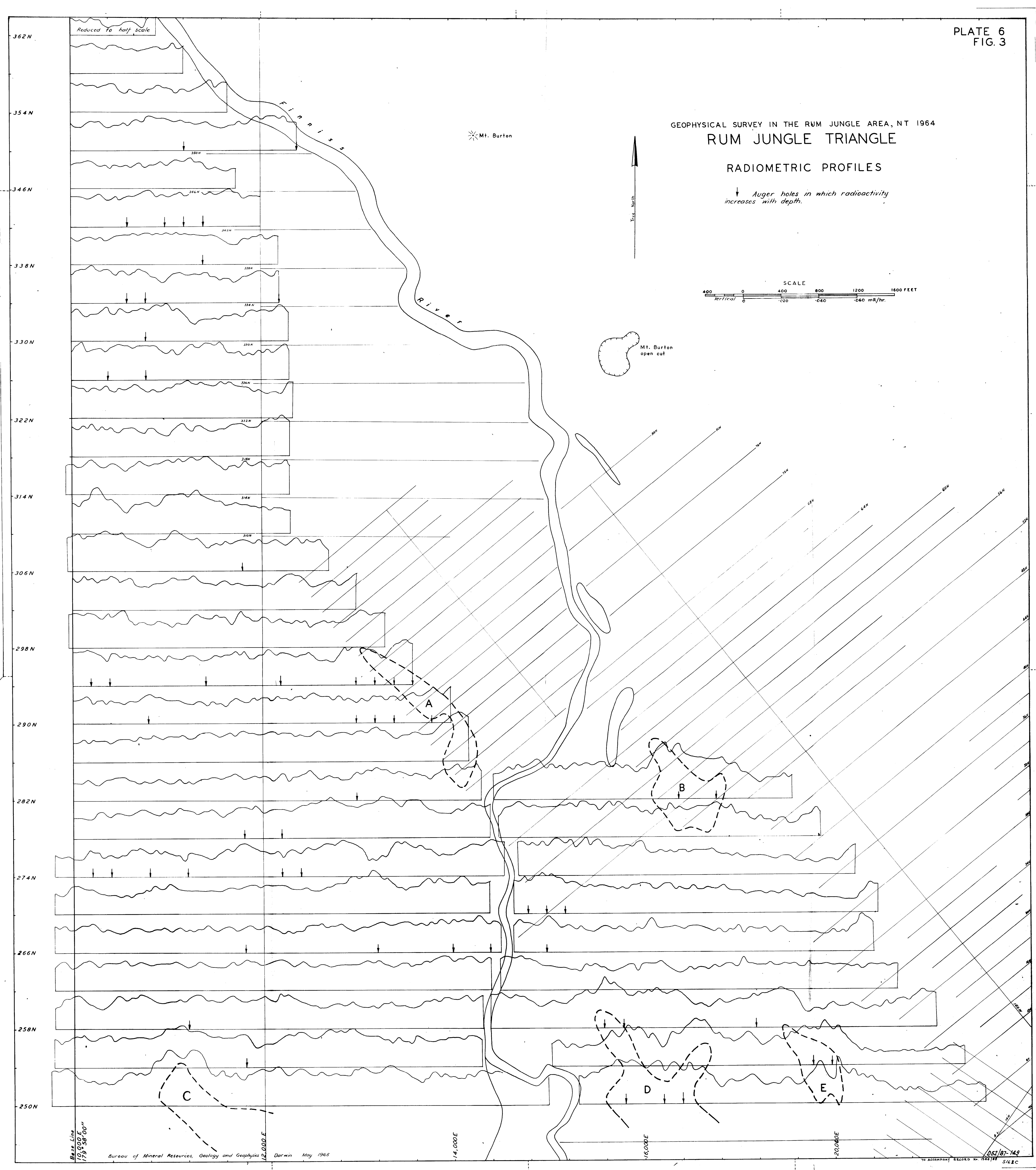


PLATE 6
FIG. 3
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1964
RUM JUNGLE TRIANGLE
RADIOMETRIC PROFILES
Auger holes in which radioactivity increases with depth.
SCALE
400 0 400 800 1200 1600 FEET
Vertical 0 ·020 ·040 ·060 mR/hr.
Reduced to half scale
Mt. Burton
Mt. Burton open cut
Finniss River
True North
A
B
C
D
E
362N
354N
346N
338N
330N
322N
314N
306N
298N
290N
282N
274N
266N
258N
250N
Base Line 10,000E 179° 58' 00"
12,000E
14,000E
16,000E
20,000E
Bureau of Mineral Resources, Geology and Geophysics Darwin May 1965
D52/B7-149
TO ACCOMPANY RECORD No. 1966/85

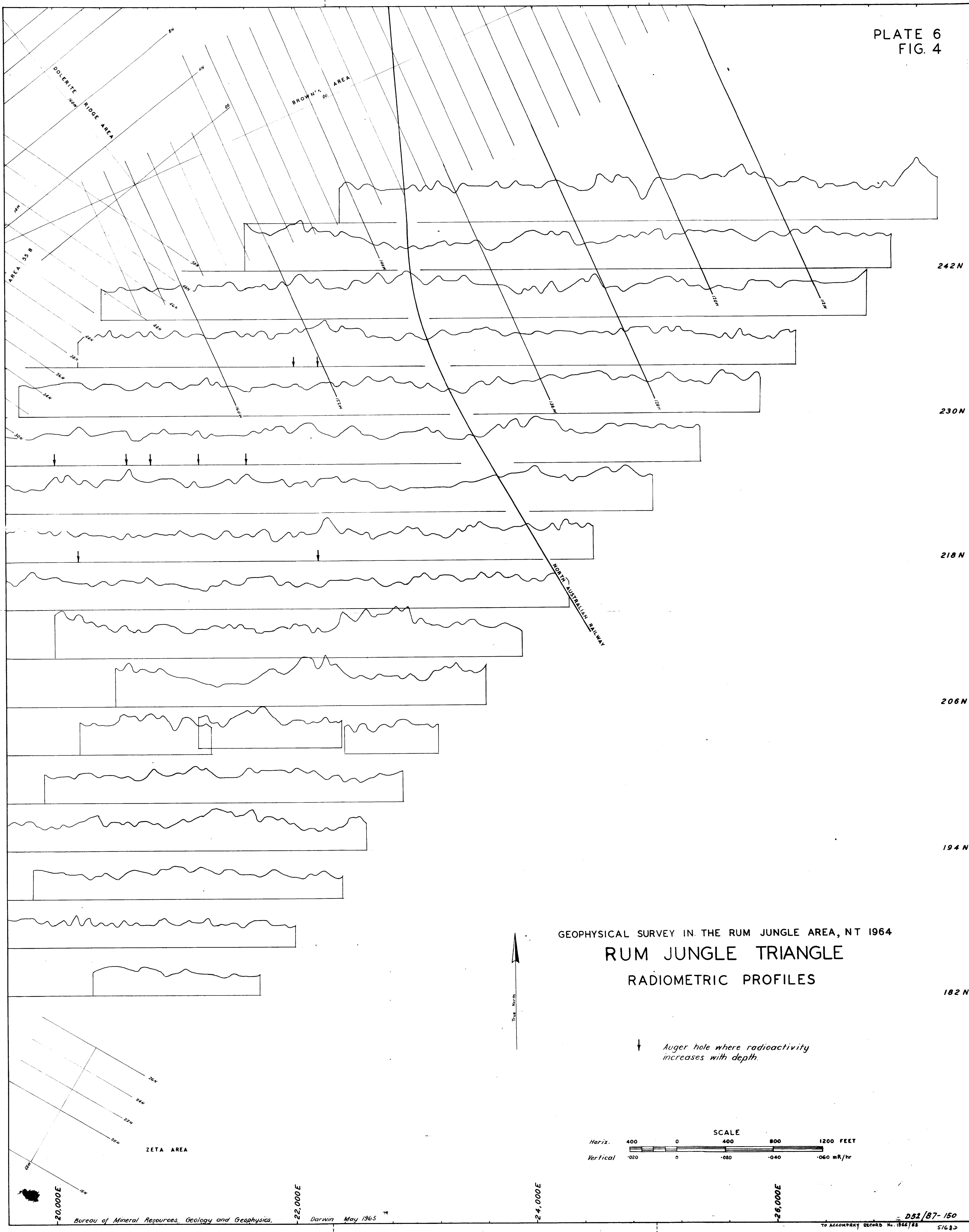
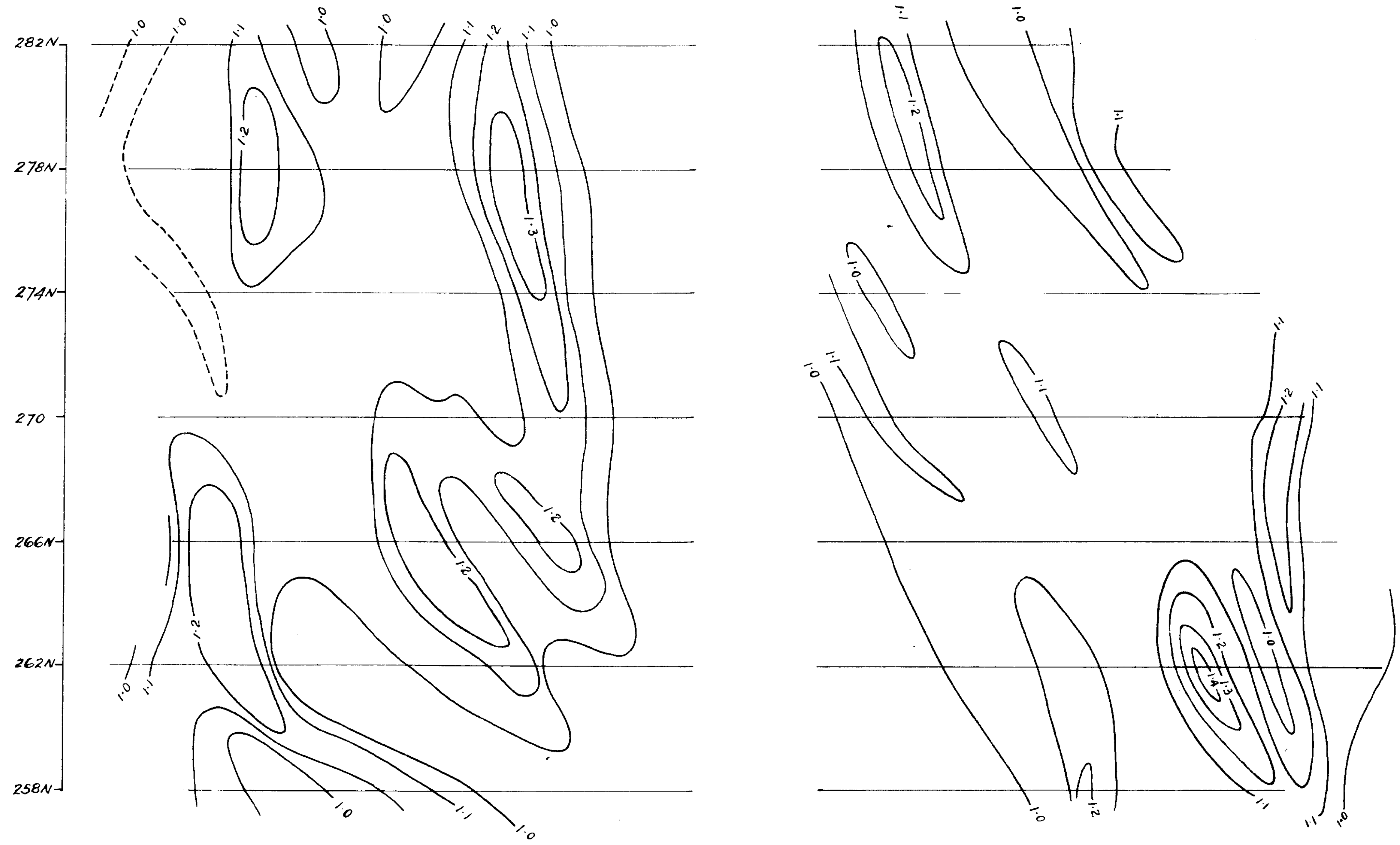
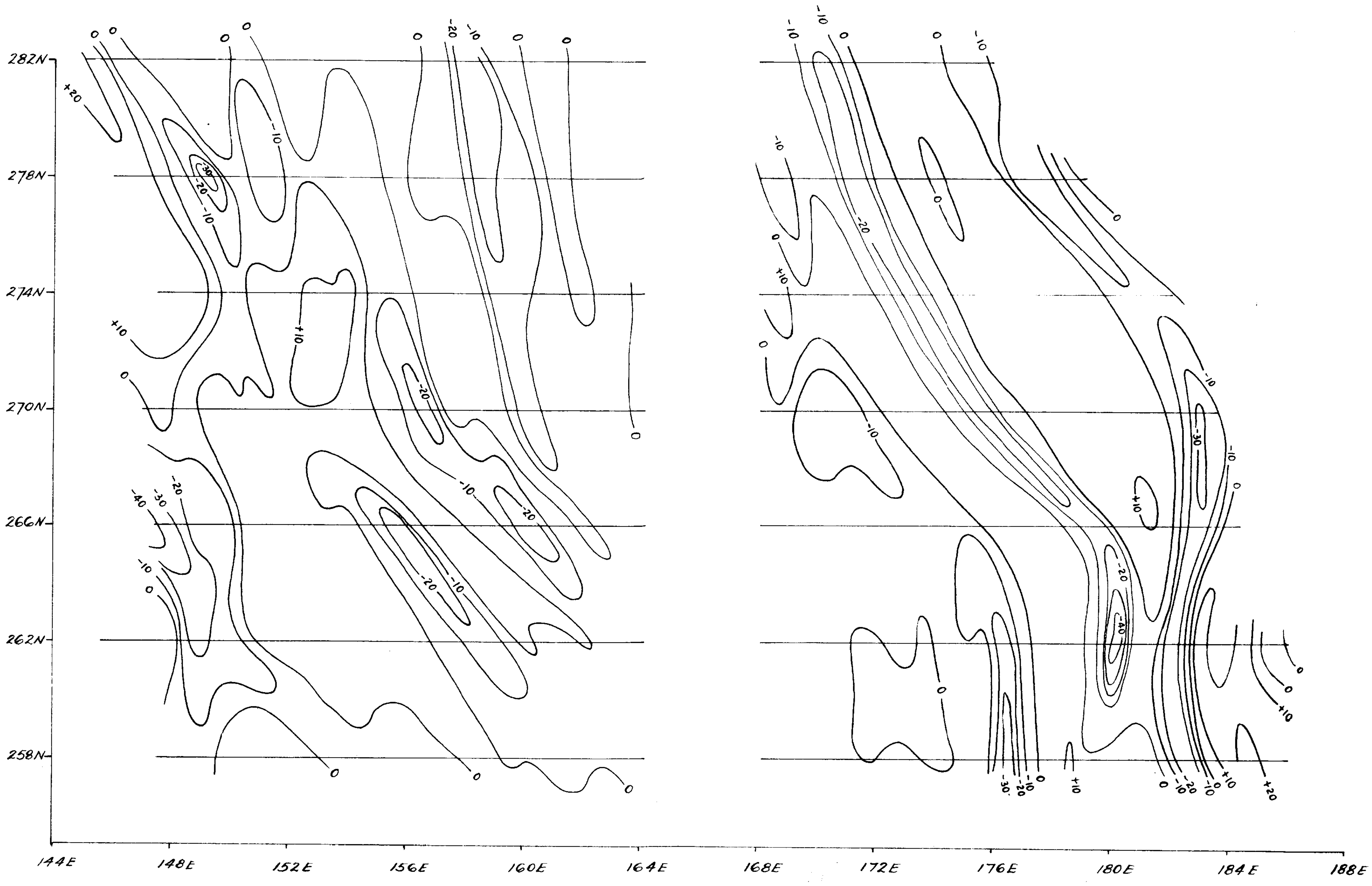


PLATE 6
FIG. 4
DOLERITE RIDGE AREA
BROWN'S AREA
AREA 55 B
NORTH AUSTRALIAN RAILWAY
ZETA AREA
242 N
230 N
218 N
206 N
194 N
182 N
20,000E
22,000E
24,000E
26,000E
True North
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, NT 1964
RUM JUNGLE TRIANGLE
RADIOMETRIC PROFILES
Auger hole where radioactivity increases with depth.
SCALE
Horiz. 400 0 400 800 1200 FEET
Vertical ·020 0 ·020 ·040 ·060 mR/hr
Bureau of Mineral Resources, Geology and Geophysics, Darwin May 1965
D52/B7-150
TO ACCOMPANY RECORD No. 1966/88

PLATE 7



TURAM RATIO CONTOURS *Contour interval 0·1*



TURAM PHASE CONTOURS *Contour interval 10°*

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964

AREA DOLERITE RIDGE - WEST FINNISS

TURAM RATIO AND PHASE CONTOURS

Frequency 440 c/s
Coil separation 50 ft.

True North

SCALE

400 0 400 800 1200 FEET

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

D52/B7-151

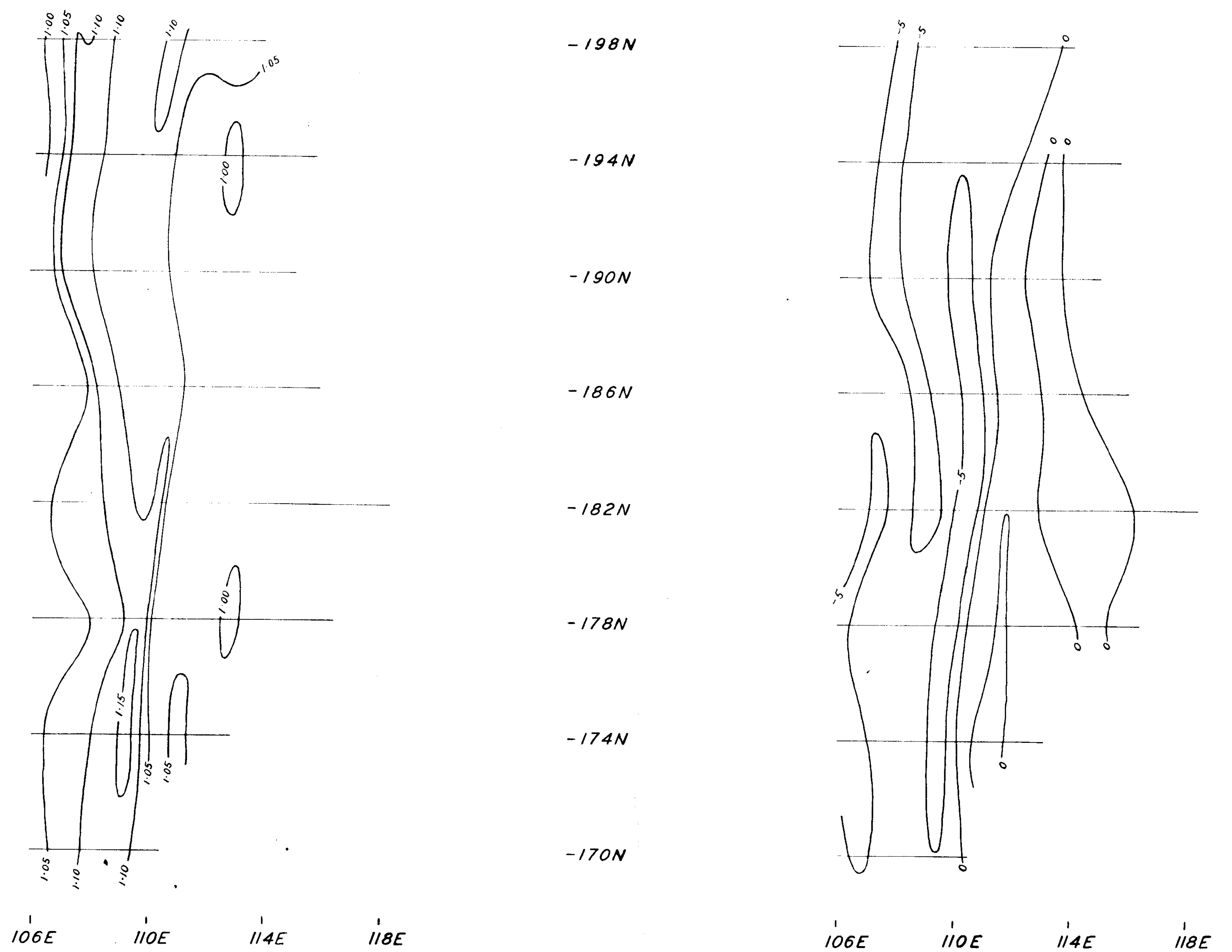
TO ACCOMPANY RECORD No. 1966/88

5163

PLATE 8

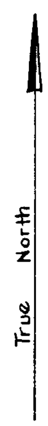
TURAM RATIO CONTOURS

TURAM PHASE CONTOURS



Contour interval 0·05

Contour interval 5°



GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964

RUM JUNGLE TRIANGLE

TURAM RATIO AND PHASE CONTOURS
OVER GEOCHEMICAL ANOMALY

SCALE
400 0 400 800 FEET

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

D52/B7-152

TO ACCOMPANY RECORD No. 1966/88

PLATE 9
326N
(Mt. Fitch I Grid)
294N
258N
15,000 E
20,000 E
30,000 N
25,000 N
20,000 N
15,000 N
10,000 N
5,000 N
120 E
140 E
164 E
1958 Base Line
Base Line 10,000 E
138N
130N
118N
110N
103N
90N
78N
70N
62N
-5,000
-10,126
True North
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA N T 1964
CONTOURS OF VERTICAL MAGNETIC FIELD
RUM JUNGLE TRIANGLE
Contour interval: 500 or 1000 gammas.
Measured during 1964 field season.
Measured during 1962 field season.
SCALE
1000 0 1000 2000 3000 FEET
Bureau of Mineral Resources, Geology and Geophysics, Darwin June 1965
D52/B7-153


PLATE 10
352 N
350 N
330 N
310 N
290 N
270 N
250 N
230 N
210 N
190 N
170 N
150 N
130 N
110 N
90 N
70 N
50 N
30 N
True North
Billabong
Billabongs
Rum Jungle Creek
Finniss River
Base Line 10,000 E
Reference
Copper > 500 p.p.m.
Zinc > 300 p.p.m.
Cobalt > 100 p.p.m.
Nickel > 400 p.p.m.
Radiometric > ·050 mR/hr
Electromagnetic axes of major Slingram Real-component anomalies
Magnetic axes of major anomalies in Vertical Magnetic field.
Numbers refer to anomalies mentioned in the geochemical report by Dodson and Shatwell (1965)
GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964
RUM JUNGLE TRIANGLE
(After Dodson and Shatwell, 1966)
GEOCHEMICAL RESULTS
SCALE
1000 0 1000 2000 3000 FEET
Bureau of Mineral Resources, Geology and Geophysics, Darwin May 1965
D52/B7-154
To accompany Record No. 1966/88 S166 GP

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T 1964

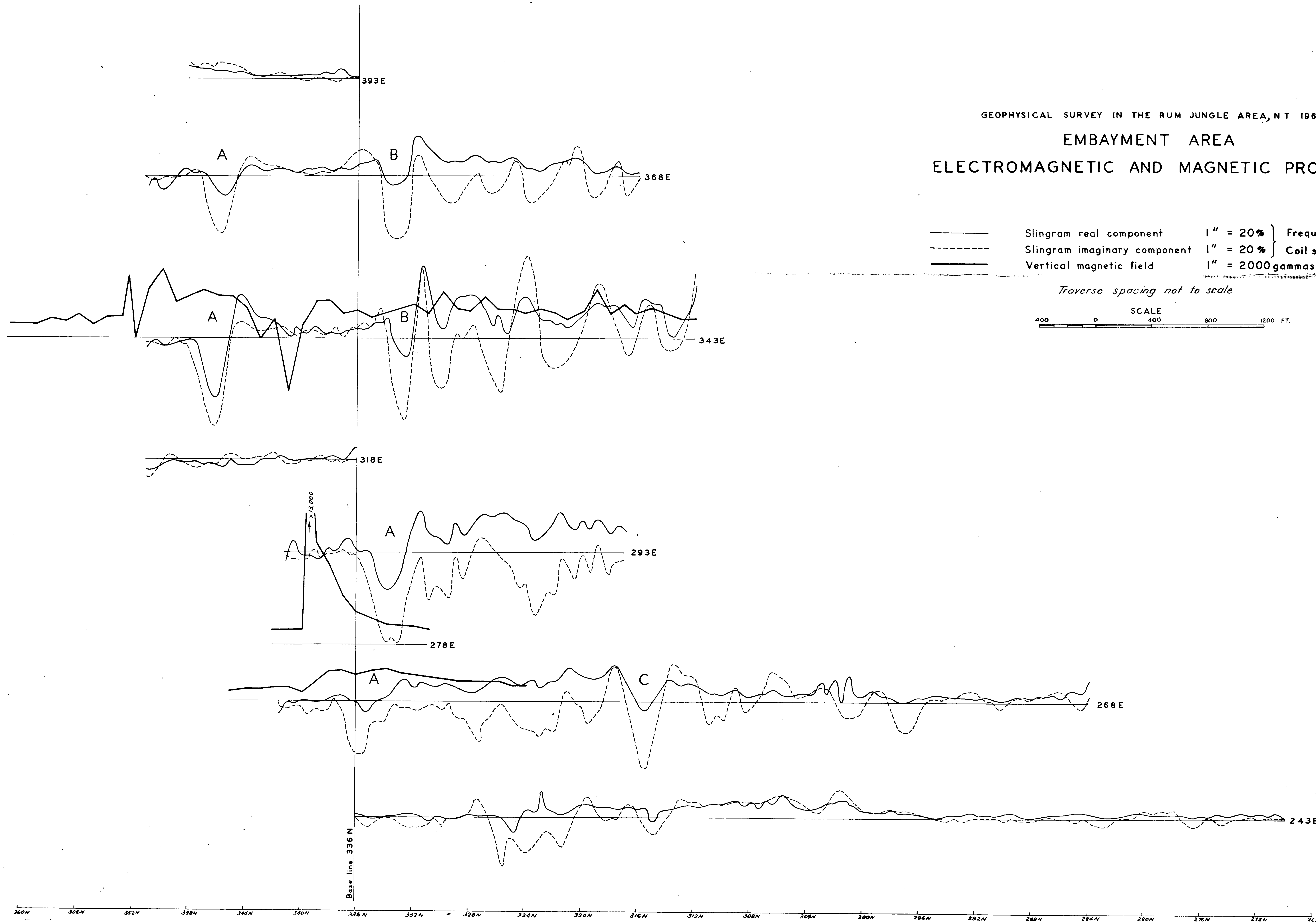
EMBAYMENT AREA

ELECTROMAGNETIC AND MAGNETIC PROFILES

———— (thin solid line)	Slingram real component	1" = 20%	Frequency 1760 c/s
- - - - - (dashed line)	Slingram imaginary component	1" = 20%	Coil separation 200 ft.
━━━━ (thick solid line)	Vertical magnetic field	1" = 2000 gammas	

Traverse spacing not to scale

SCALE
400 0 400 800 1200 FT.



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

D52/B7-155

PLATE 12
FIG. 1

RADIOMETRIC, ELECTRICAL AND GEOLOGICAL LOGS

DIAMOND-DRILL HOLE BMR 64-1

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

D52/B7-156

PLATE 12
FIG. 2

RADIOMETRIC, ELECTRICAL AND GEOLOGICAL LOGS

DIAMOND-DRILL HOLE BMR 64-2

PLATE 12
FIG. 3

RADIOMETRIC, ELECTRICAL AND GEOLOGICAL LOGS

DIAMOND-DRILL HOLE BMR 64-3

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

D52/87/158

TO ACCOMPANY RECORD No. 1966/88 S/68C

PLATE 12
FIG. 4

RADIOMETRIC, ELECTRICAL AND GEOLOGICAL LOGS

DIAMOND-DRILL HOLE BMR 64-4

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

D52/B7-159

PLATE 12
FIG. 5

RADIOMETRIC, ELECTRICAL AND GEOLOGICAL LOGS

DIAMOND-DRILL HOLE BMR 64-6

PLATE 12
FIG. 6

RADIOMETRIC, ELECTRICAL AND GEOLOGICAL LOGS

DIAMOND-DRILL HOLE BMR 64-7

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

D52/B7-161

DIAMOND DRILLING AND RESISTANCE LOGGING RESULTS, ELECTROMAGNETIC PROFILES

R — Resistivity
Py — Pyrite
Ph — Pyrrhotite
↓ — Location of DDH collar
——— Slingram real component
- - - - - Slingram imaginary component

Scale — Electromagnetic Profiles: 400 0 400 800 FEET, Horizontal

Scale — Diamond Drilling Results: 100 0 100 200 FEET

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

D52/87-162