

ADMIN. LIBRARY

82 NT/10

F. 182.

Copy 3

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS.

RECORDS

1958 NO. 108

THE GROUND INVESTIGATION OF AERORADIOMETRIC
ANOMALIES OBTAINED BY DC3 HIGH LEVEL SURVEY,
RUM JUNGLE DISTRICT, N.T., 1957.



by

B.J. BAMBER

RECORDS 1958 NO.108

THE GROUND INVESTIGATION OF AERORADIOMETRIC
ANOMALIES OBTAINED BY DC3 HIGH LEVEL SURVEY,
RUM JUNGLE DISTRICT, N.T., 1957.

by

B.J. BAMBER.

CONTENTS.

	Page.
1. INTRODUCTION	1
2. GEOLOGY	1
3. TECHNICAL DETAILS	2
4. RESULTS AND CONCLUSIONS	3
5. RECOMMENDATIONS AND RESULTS OF TESTING	4
6. REFERENCES	5

ILLUSTRATIONS.

Plate 1. Map of Rum Jungle District showing radioactive anomalies investigated by Ground Parties, 1957.

ABSTRACT.

The report describes the results of the ground investigation of 251 airborne anomalies in the Rum Jungle district. The anomalies were recorded during an airborne scintillograph survey by D.C.3 aircraft in 1952.

Conventional carborne radiometric equipment and hand counters were used. One hundred and seventy anomalies were found to occur in slightly radioactive sedimentary rocks in hilly country, 33 on alluvial flats, 26 on laterite, 13 on granite outcrops and 5 on rubble surface. Four airborne anomalies could not be identified on the ground.

As a result of the ground radiometric investigation, geological inspection was made of 7 anomalies on outcropping sedimentary rocks and of 5 on rubble. None of the anomalies appeared to be associated with significant uranium mineralisation. Further recommendations, not yet carried out, include the geological inspection of 3 anomalies in sedimentary rocks and the testing by shallow boring of representative anomalies occurring in alluvium.

1. INTRODUCTION.

During 1952, an airborne radiometric survey was carried out by the Bureau over an area of about 1,500 square miles surrounding the uranium deposits at Rum Jungle (Wood and McCarthy (1952)). A D.C.3 aircraft was used, fitted with scintillation detector and shoran positioning equipment. The record of radioactivity obtained had the following characteristics:-

- (1) a fairly uniform average level of radioactivity over considerable areas,
- (2) statistical fluctuations about the average level,
- (3) superimposed increases in level of radioactivity over small areas, which were significantly greater than the statistical fluctuations.

The variations of type (3) were identified as radioactive anomalies and their positions are shown on Plate 1.

The total number of anomalies recorded is over 900. In the course of the geological investigations carried out by the Bureau and Territory Enterprises Pty. Ltd. in the Rum Jungle area, a considerable number of the anomalies which were regarded as most likely to be related to uranium mineralization was inspected on the ground. During 1956, an assessment of the remaining anomalies was made by E. J. Malone, on the basis of regional geology, and a number of areas was selected, in which it was considered that geological conditions might be favourable for the occurrence of deposits of radioactive minerals. The present report deals with an inspection on the ground of the anomalies occurring in most of these areas. Other anomalies in the favourable areas have been inspected by other officers, (Langron, report in preparation), and there remains a small section in the north-western corner of the map area which has not yet been examined.

Plate 1 shows the location of D.C.3 anomalies in the Rum Jungle district and areas enclosing the D.C.3 anomalies which have been investigated by the writer.

2. GEOLOGY.

The geology of the Rum Jungle district has been the subject of intensive study by geologists of the Bureau and Territory Enterprises Pty. Ltd. for several years. A geological map based on the latest findings is in course of preparation. For the purpose of the present report, a summary description will suffice.

The sedimentary rocks of the area are members of the Brocks Creek group of Lower Proterozoic age. They have been intruded by two granites, the Rum Jungle and Waterhouse granites. Around the granite intrusions, the sediments have been domed; otherwise they strike generally north and dip steeply.

In the Rum Jungle area, the following succession of formation crops out, proceeding outwards from the granite -

Granite, moderately radioactive.

Crater Formation, mostly quartz arenite. This formation is rather strongly radioactive, due to the presence of thorium.

Coomalie Dolomite: cherty dolomite, non-radioactive.

Acacia Gap Formation: mainly hard quartzite, non-radioactive.

Golden Dyke Formation: siltstone, carbonaceous siltstone etc. radioactive in places; the known deposits of uranium and base metals in the Rum Jungle area occur in carbonaceous beds of this formation.

Burrell Creek Formation: sandstone and siltstone, slightly radioactive in places. The Adelaide River mine and other uranium prospects occur in this formation.

Because the granite is an intrusive body which has caused doming of the sediments, the above order does not correspond with the stratigraphic succession of the rocks. In order of decreasing age, the succession is as follows:-

Crater Formation
Coomalie Dolomite
Acacia Gap Formation
Golden Dyke Formation
Burrell Creek Formation
Granite.

A large part of the area is covered by soil and laterite, and slight radioactivity occurs in low-lying areas of soil.

3. TECHNICAL DETAILS.

The investigation of each anomaly included -

- (1) The location of a radioactive area on the ground which could be considered as the cause of the airborne anomaly.
- (2) A decision as to whether there was any possibility that the radioactivity encountered on the ground could be associated with a significant deposit of radioactive minerals.

In order to establish the cause of an airborne anomaly, the position of the anomaly was transferred from the shoran controlled plot, as shown on Plate 1, to an air-photo mosaic of the appropriate military one mile sheet. From the mosaic, the position of the airborne anomaly was located on the ground, by reference to topographical features shown on the air photos. An area approximately 1,000 feet square centred on this position was examined for radioactivity.

If unrestricted coverage by vehicle was possible, this area was covered by traverses about 100 feet apart using the Harwell vehicle borne equipment type 1181B, the position of the vehicle being recorded by means of compass and speedometer. If all or part of the area was inaccessible to a vehicle, it was covered on foot in about the same detail, using Harwell portable Geiger ratemeters type 1292A.

In all but four cases examined, a radioactive high was located, which was considered to account for the airborne anomaly. From previous experience, it was possible to say in most cases that the radioactivity observed was not likely to be associated with significant deposits of radioactive minerals. When any doubt existed, the areas in question were recommended for geological examination, or testing by shallow boring.

4. RESULTS AND CONCLUSIONS.

In all, 251 anomalies were examined. The causes of the anomalies may be grouped as follows.

- (1) Radioactive Laterite. This accounted for 26 anomalies. Previous experience in the Rum Jungle district shows that radioactivity in a laterite is no evidence of the presence of radioactive minerals in the underlying rocks. No further investigation of these anomalies was recommended.
- (2) Radioactivity in Alluvium. 33 anomalies were attributed to slight radioactivity in alluvium. Previous testing of areas of radioactive alluvium has generally failed to discover deposits of radioactive minerals. However, the No. 2 shaft at Whites deposit at Rum Jungle was located on such an area. As there is no geological basis for deciding whether or not any such anomaly is favourable, it is recommended that a representative selection of these anomalies be tested by boring to shallow depths. If, in any particular case, it is found that radioactivity increases markedly with depth more extensive testing would be warranted.

The sites of the anomalies recommended for testing are as follows (specified in map co-ordinates of Plate 1).

1st. Priority. 213362, 234315, 198312, 262326, 221229, 211319, 274185, 274198, 981222, 266247.

2nd. Priority. 250294, 222266, 214265, 283293, 261202, 332237, 292245, 294257, 296256.

- (3) Radioactivity on surfaces covered with Rubble. 5 anomalies fall in this class. It was considered that geological examination was desirable.
- (4) Radioactivity in Outcropping Sedimentary Rocks. 170 anomalies are associated with sedimentary rocks, generally of the Burrell Creek Formation. 20 of these are caused by rock outcrops showing slight radioactivity, surrounded by non-radioactive

alluvium. No further examination was recommended on any of these.

The remaining 150 anomalies of this class occur in hilly country. During the airborne survey an attempt was made to eliminate anomalies due solely to topographical variations by maintaining a continuous record of the height of the aircraft using a radioaltimeter and discarding any anomalies which could be directly correlated with variations in the same sense on the altimeter chart. However, it is obvious that this method cannot be complete in areas where topographic conditions are complicated, and it must be expected that, when surveys are made over radioactive rocks dissected in a complicated pattern, it will be quite impossible to eliminate all anomalies due to topography by any method of treating the results. Ten anomalies in this class, in which the rocks causing the anomaly appeared to be more radioactive than is usual within the area, were recommended for geological examination.

- (5) Radioactivity associated with Granite. Thirteen anomalies were attributed, either to radioactive granite outcrops, or to erosion products from such outcrops in creek beds. As it is generally considered that radioactivity in granite is not likely to be associated with deposits of radioactive minerals of commercial grade, no further examination of these anomalies was recommended.
- (6) Anomalies for which no cause could be assigned. Four anomalies fall in this class. The ground investigation revealed no radioactivity corresponding to the anomalies plotted on the airborne anomaly map.
- (7) Anomalies which could not be examined. Two such anomalies (shown as "I" on Plate 1) are included here. Anomaly, map co-ordinates 277647, is located in a tidal mud flat and could not be reached. Anomaly, map co-ordinates 213179, is in a disused ammunition dump, entry to which was forbidden by the Army Authorities.

5. RECOMMENDATIONS AND RESULTS OF TESTING.

Further examination, either by geological inspection or by shallow drilling, has been recommended on a number of the anomalies listed above. Results of such testing will form the subject of other reports. However, the present position may be summarised as follows:-

- (1) Testing by shallow drilling was recommended on a number of the anomalies in class 2 above. This work has not yet been performed.
- (2) Geological inspection of five anomalies in class 3 was recommended. This has been carried out, with the result that no further investigation was considered warranted.

- (3) Geological inspection of ten anomalies in class 4 was recommended. Seven of these have been examined and no further investigation was recommended. Three have not yet been examined.
- (4) There remains a small area in the north western portion of the map, in which D.C.3 anomalies have not yet been inspected on the ground. It is recommended that this inspection be carried out.

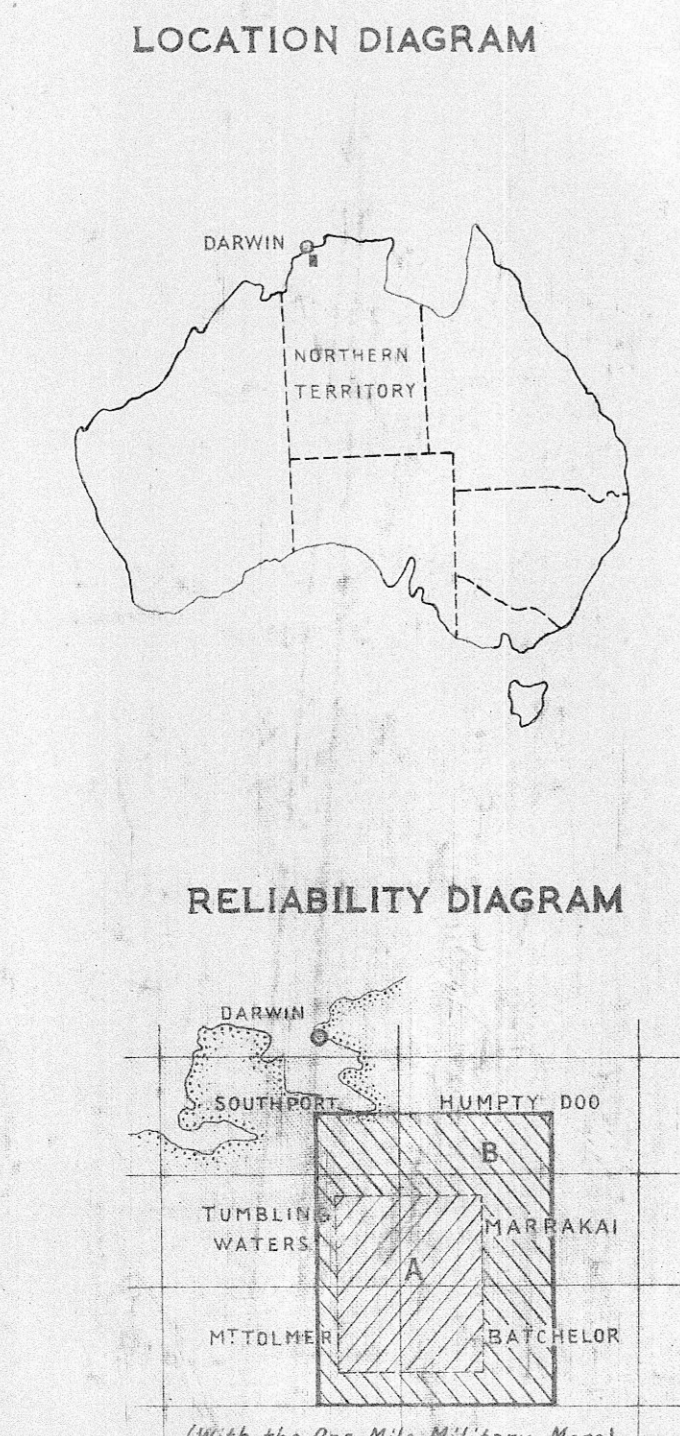
6. REFERENCES.

WOOD, F.W. and McCARTHY, E.F. ~ Record 1952 No. 79.



LEGEND

- 1st Order Anomaly, Greater than NINE Times Average Statistical Variation of Intensity
- 2nd Order Anomaly, Greater than SIX Times Average Statistical Variation of Intensity
- 3rd Order Anomaly, Greater than THREE Times Average Statistical Variation of Intensity
- Anomaly Shown along Line of Flight
- Plateau - Region of Continuous Radioactivity with Average of Second Order Anomaly
- River or Creek
- Watercourse (non-perennial) and Area Subject to Inundation
- Railway
- Mine Road
- Track (vehicular)
- Track (foot or pack)
- Bridge
- Culvert
- Mine
- Airstrip
- County Boundary (approximate)
- Hundred Boundary (approximate)



SCALE

MILES 1 0 1 2 3 4 5

MAP OF

RUM JUNGLE DISTRICT

NORTHERN TERRITORY

AREAS CONTAINING RADIOACTIVE ANOMALIES

INVESTIGATED BY GROUND PARTIES, 1957

LEGEND

- Area containing anomalies investigated by B. J. Barber and discussed in this report
- Area containing anomalies not investigated by B. J. Barber, but recommended for investigation
- Anomaly not located on the ground - not included in report
- Anomaly which has been geologically inspected
- Anomaly recommended for geological inspection

RADIOACTIVE DATA

The anomalies obtained by the airborne scintillometer indicate areas of high radioactivity and have been classified into three orders which, in decreasing radioactivity intensity, are first, second and third order. The points marked on the plan represent the places where the maximum radioactivity was recorded. The source, or sources, of any anomaly may lie anywhere within a radius of 500 feet of the point marked. The source of the anomaly may range from small areas of high radioactivity to large areas of lower radioactivity.

Some anomalies were much sharper and of more restricted length along the lines of flight than others and have been marked with 'C' on the map. They are probably due to localized sources close to the lines of flight. Similar sources remote from the lines of flight would give broader anomalies of lower relative intensity.

Some areas are shown as plateaus on the map. The radioactivity of the ground was recorded as higher than normal, uniformly throughout each area. Where scintillometer anomalies are shown within the plateaus, their order (first, second or third) is determined by the order of their intensity above the average intensity of the plateau.

The scintillometer was flown, when practicable, at a constant height of 500 feet above the ground. At this height it effectively covered a strip of ground 1,000 feet wide and flight lines were therefore spaced at intervals of one-fifth of a mile apart. The height of the aircraft was controlled by radio altimeter and the position by radar (Radar) navigation aids. Although the scintillometer was flown for the most part at 500 feet above the ground, local topographical features, such as hills, were crossed at a lower height where ground level data (topographical features) could be responsible for some of the anomalies, especially in areas where the country rock has radioactivity slightly higher than normal.

It should be noted that it is only the radioactivity of the ground surface that has been measured. Radioactive rocks may be completely screened or substantially reduced in magnitude by a few inches of soil. For this reason, and also because the strength of the gamma-ray emission from the source may be as significant as first order anomaly, it is thin is made that all of the anomalies are not necessarily of the same magnitude of radioactivity. It is possible that some of the subsequent investigation on the ground is necessary to determine their significance and possible economic implications.

MAP DATA

PROJECTION: Transverse Mercator - Australian Series.

CONTROL: AN/APN-3, AN/CPN-2. Shoran controlled beacon sites near Mt. Fitch and Mt. Peel (situated outside this map), Tenger, Jee, Darwin, and existing trigonometrical stations and astronomical fixes.

DETAIL: Shoran controlled traverses along roads and railway with planimetric detail superimposed from National Mapping Service 1:50,000 scale sheets. Contour assembly mapping and Royal Australian Survey Corps 1:50,000 standard maps. Geophysical data were plotted from Shoran controlled traverses at approximately one-fifth of a mile separation, based on 1:50,000 scale.

RELIABILITY: Geophysical data, relatively accurate. Geographical planimetric relationship, shown in reliability diagram: Box (A) Accurate; Box (B) Reliable Sketch only.

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics G 71-174