COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORDS 1961 No. 21

MT. ISA AREA AIRBORNE RADIOMETRIC SURVEY, QUEENSLAND 1958

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ILLUSTRATIONS

ABSTRACT

Between September and December 1958 an Auster aircraft of the Bureau of Mineral Resources carried out a low-level airborne scintillograph survey for uranium in the Mt. Isa region.

An area of 2500 square miles was surveyed and nine radiometric anomalies considered to warrant ground investigation were found. A display of these anomalies was made at Mt. Isa during and after the survey.

A subsequent ground inspection by a geologist of the Bureau indicated that the anomalies are unlikely to be associated with economic uranium deposits. The airborne anomalies were confirmed but no uranium minerals were recognised or lode structures found.

1. INTRODUCTION

Between September and December 1958 a low-level airborne scintillograph survey for uranium was carried out in the Mt. Isa region by the Geophysical Branch of the Bureau of Mineral Resources.

The area surveyed is shown in Plate 1 and forms the southern portion of a much larger area selected for systematic low-level scintillograph survey. This larger area is approximately 40 miles wide in an east-west direction and extends approximately 95 miles south and 130 miles north of Mt. Isa. This area was selected on the basis of the Bureau's regional geological mapping and was designed mainly to cover the Eastern Creek Volcanics, a formation of Lower Proterozoic age, in which many uranium prospects have been discovered.

Those who took part in the survey were J.E.F. Gardener (Geophysicist), W. Gerula (Draftsman) and A.F.S. Young (Assistant Geophysicist). The aircraft was piloted by Flying Officer K. Dodds of Trans-Australia Airlines.

2. EQUIPMENT

The survey was made with the Bureau's Auster aircraft, VH-RES. The scintillograph consisted of a detector head and ratemeter (Austronic Engineering Laboratories, Type AS1), coupled to a Texas Instrument Company dual-recording milliam

The detecting element in the scintillograph consists of a cylindrical thallium-activated sodium iodide crystal $4\frac{1}{2}$ inches in diameter and 2 inches thick, mounted with its axis vertical. This is optically coupled to a photo-multiplier tube. The pulses from the photo-multiplier tube are amplified and integrated in the ratemeter whose output current, registered on a counting-rate meter, is proportional to the gamma radiation detected over the preceding short interval of time. One channel of the recording milliammeter is in series with the counting-rate meter and provides a continuous record of gamma radiation detected; it is on this record that the interpretation of results is based. Operation of the scintillograph was controlled and monitored in flight by a remote control unit.

The aircraft was also fitted with a radio altimeter, type AN/APN-1, whose output was recorded on the second channel of the recording milliammeter, giving a continuous record of the height of the aircraft above terrain.

3. OPERATIONS

The survey was carried out from a base at Dajarra. An area of 2500 square miles was surveyed. The total number of flight line miles was 10,150.

During the survey the aircraft was maintained at a height of approximately 200 feet above ground level and at a speed of approximately 80 knots. Height control was maintained by the use of the radio altimeter. At 200 feet above ground level the lane scanned by the scintillograph is about 500 feet in width. A flight line spacing of a quarter of a mile gives a coverage of about 40 per cent, which provides a reasonable sample of the area. Although the average flight line spacing was a quarter of a mile, the spacing varied considerably over different parts of the area. For instance, over outcrops of the Eastern Creek Volcanics the line spacing was

reduced to about a sixth of a mile but in other parts of the area it was usually greater than a quarter of a mile. Areas were sometimes re-flown to increase the coverage. During the flight the observer plotted flight line positions on aerial photographs.

At the start and end of every survey flight the scintillograph was calibrated by noting its response to a standard source of gamma radiation which was placed in a fixed position relative to the detector head. The instrumental back-ground reading was also determined at the start and end of every survey flight by flying at a height of 2000 feet above ground level. At this height the gamma radiation detectable from the ground is negligible.

The day-to-day direction of the survey was based on available geological evidence, survey results to date, and weather conditions. It was found possible during the first part of the survey to fly twice a day but later, owing to severe turbulence at low levels, only early morning flights were possible. The main interruptions to flying were due to weather, but some time was lost also during aircraft maintenance and repairs.

4. INTERPRETATION PROCEDURE

The results obtained were interpreted in terms of anomalies. Anomalies were assessed by critical inspection of the record of gamma-ray intensity in conjunction with inspections of the radio-altimeter record and the flight-line plot on aerial photographs, so that topographical and geological information could be taken into consideration. The anomalies which were then considered significant were plotted on aerial photographs and re-flown at right angles to the direction of the original survey. The same interpretation procedure was applied to the information obtained from these repeat observations. Those anomalies which, after re-flying, were considered to warrant investigation on the ground, were plotted on aerial photographs and on sketch maps on which the final map is based.

5. DISCUSSION OF RESULTS

Nine anomalies were selected for inclusion in the final map. Their locations are shown in Plate 1.

A group of four anomalies (Nos. 6 to 9) was detected in the southern part of the survey area about 7 miles west-south-west of Rufus Bore. The anomalies occur near the eastern edge of a large area of Eastern Creek Volcanics. No further anomalies were found in this particular area of Eastern Creek Volcanics, although it was subjected to a very close examination.

Another group of three anomalies (Nos. 3 to 5) was detected south of the Dajarra-Ardmore road, about 15 miles from Dajarra. These occur over flat-lying Middle Cambrian sediments. Anomalies 4 and 5 are shown in Plate 1 as extending over fairly wide areas. They consist of many very sharp and localised peaks of radioactivity scattered over the areas marked.

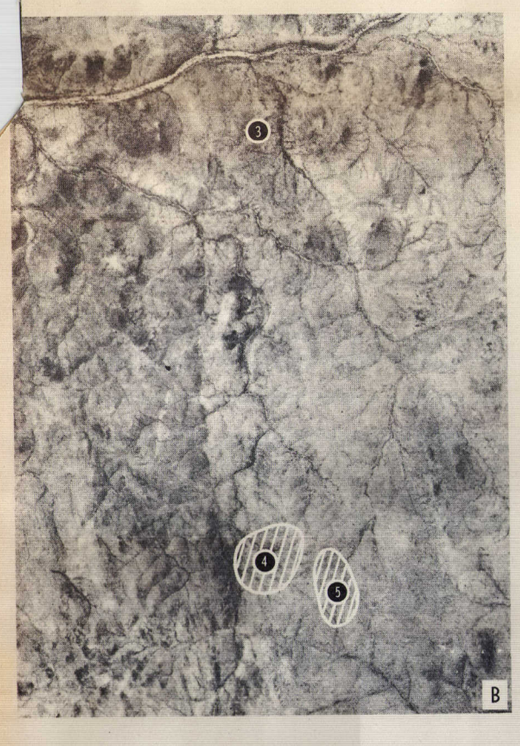
The remaining two anomalies (Nos. 1 and 2) were detected about 1 mile north of Butru railway siding. They occur over exposures of rock reported by Carter (1959) to be outcrops of Precambrian quartz-mica schist in an extensive soil-covered plain.

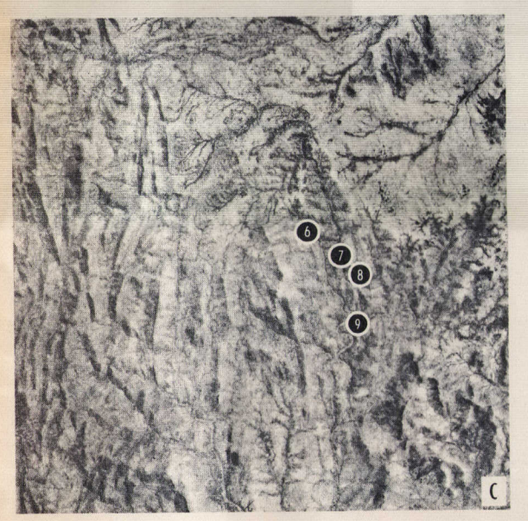
During the course of the survey and at its conclusion, aerial photographs showing the positions of the anomalies were displayed for public inspection at the Mining Warden's Office in Mt. Isa.

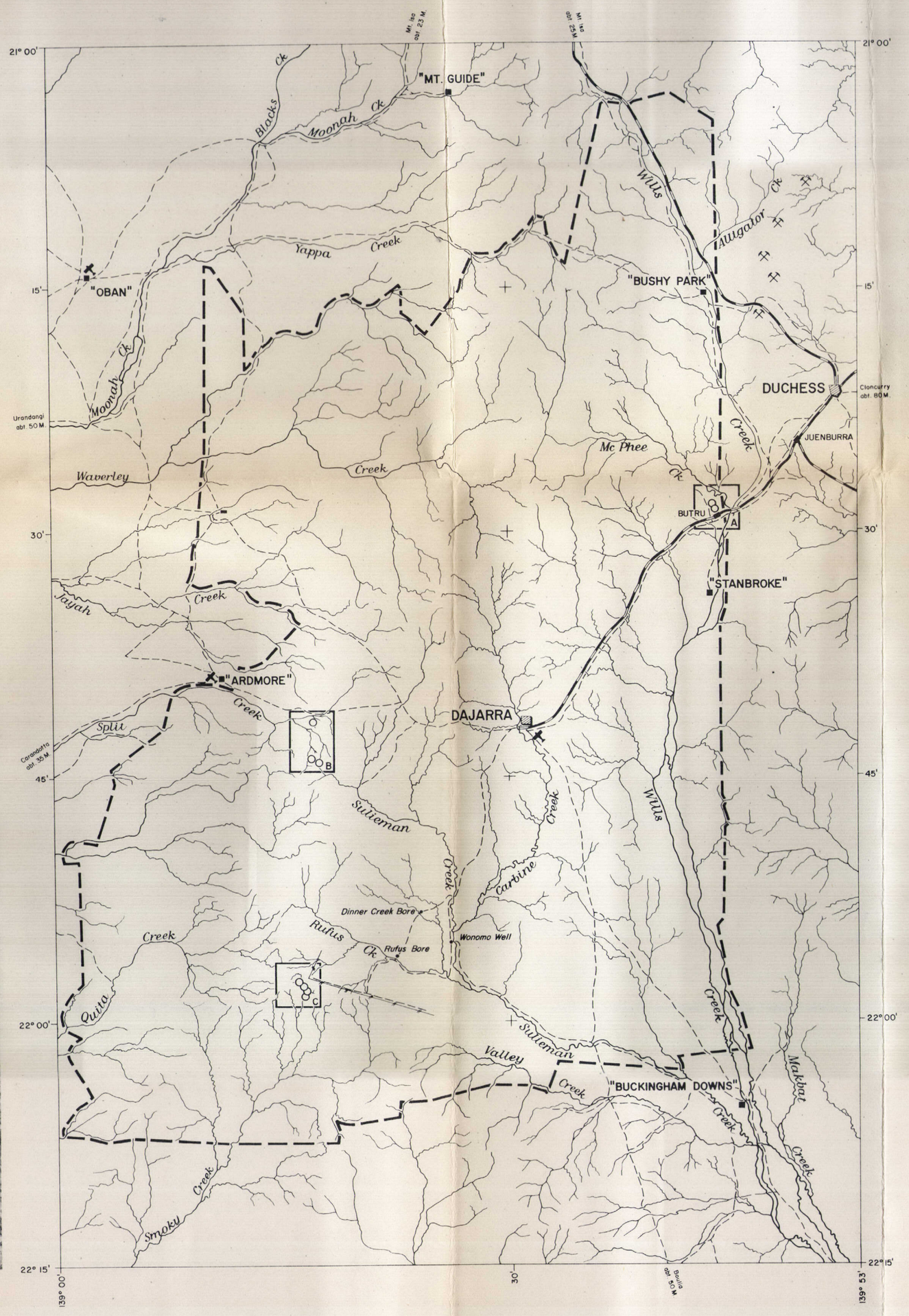
A ground inspection of the nine anomalies was carried out subsequently by E.K. Carter, geologist, of the Bureau. The report of this inspection (Carter, 1959) does not encourage further investigation of the anomalies. The results of the airborne survey were confirmed in that anomalies were detected on the ground in each case, but no uranium minerals were recognised or lode structures found.

6. REFERENCES

CARTER, E.K. 1959 Report of inspection of radiometric anomalies in Mount Isa Mineral Field, selected by Bureau of Mineral Resources airborne survey, 1958. Bur. Min. Resour. Aust. Records 1959/78.







MAP DATA

PROJECTION: TRANSVERSE MERCATOR, AUSTRALIAN SERIES

DETAIL: PLANIMETRIC DETAIL WAS COMPILED FROM PARTS OF **DUCHESS** 4-MILE AIR PHOTO MOSAIC. **URANDANGI** 4-MILE PLANIMETRIC MAP, BOTH PREPARED BY DIVISION OF NATIONAL MAPPING, AND AIR-PHOTO SCALE PLANIMETRIC MAPS OF **GLENORMISTON** AND **BOULIA** 4-MILE AREAS PRODUCED BY ROYAL AUSTRALIAN SURVEY CORPS.

ADDITIONAL DATA WERE COMPILED FROM PHOTO INTERPRETATION BY GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RELIABILITY: RELIABLE. EXCEPTING AREA IN **DUCHESS** 4-MILE SHEET WHICH IS SKETCH ONLY.

NOTE: IMPERFECTIONS ON AIR PHOTO MAPS ARE DUE TO FAULTS ON ORIGINAL NEGATIVES.

LEGEND

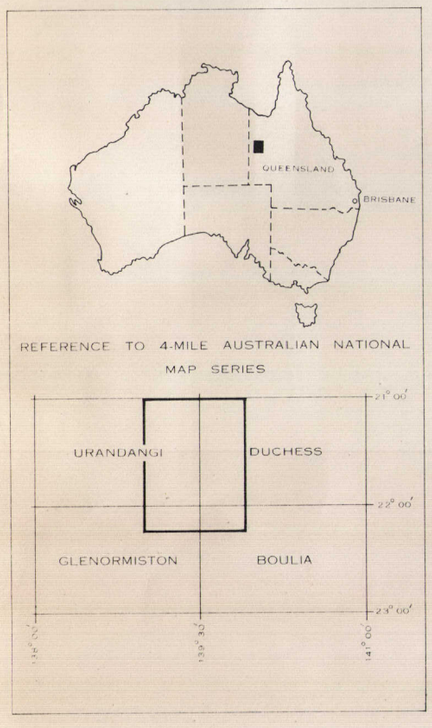
TOPOGRAPHICAL DATA

- RIVER OR CREEK
- RAILWAY WITH STATION OR SIDING
- HIGHWAY
- ROAD OR TRACK
- TELEGRAPH LINE
- FENCE
- AERODROME OR LANDING GROUND
- TOWN
- HOMESTEAD
- SHED OR HUT
- MINE

SCINTILLOGRAPH DATA

- ANOMALY (ANOMALIES ARE NUMBERED FOR REFERENCE ONLY)
- LIMIT OF THE 1958 AIRBORNE SURVEY

LOCATION DIAGRAM



QUEENSLAND

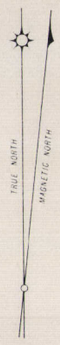
MT. ISA REGION

MAP SHOWING

RADIOMETRIC ANOMALIES

DETECTED BY AIRBORNE SCINTILLOGRAPH

SEPT.-DEC. 1958



APPROXIMATE SCALE OF PHOTO MAPS

MILES 1 0 1 2 3 MILES

SCALE OF PLANIMETRIC MAP

MILES 8 4 0 8 16 24 32 MILES

EXPLANATORY NOTES

The airborne scintillograph records continuously the intensity of gamma radiation from the ground over which the aircraft flies. This radiation is due to the presence of the naturally occurring radioactive elements, radium and thorium and their decay products, and to a lesser extent potassium.

The scintillograph was carried in an Auster aircraft which was flown at an average altitude of 200 feet above the ground. The scintillograph effectively scanned a strip of ground approximately 500 feet wide.

The gamma-ray intensity over an area may show considerable variations, depending on the geology and topography of the area. Anomalies of gamma-ray intensity have been plotted on the map where the intensity showed a significant and localised increase.

The map shows the position and grouping of the anomalies. To assist in making investigations on the ground, all the anomalies have been reproduced singly or in small groups on aerial photographs. The positioning of these anomalies is considered to be accurate to within 150 feet.

The higher intensities recorded by the scintillograph are not necessarily due to the presence of uranium deposits. Some of the higher intensities may be due to igneous rocks, which contain a slightly higher concentration of the radioactive elements, uranium, thorium and potassium, than other rocks. No claim is made that all, or even any, of the higher intensities correspond to uranium deposits of economic significance, but it is possible that some do.

It should be noted that it is virtually only the radioactivity of the surface of the ground that has been recorded, because the radiation from any buried deposit is substantially reduced by a few inches of soil or rock cover.

COMPILED AND DRAWN BY GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS, DEPARTMENT OF NATIONAL DEVELOPMENT, MELBOURNE