COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS

1958, NO.112

GEOPHYSICAL INVESTIGATIONS AT THE BRODRIBB RADIOACTIVE PROSPECT, N.T.

by

I.A. MUMME

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ILLUSTRATIONS

1. INTRODUCTION

The Brodribb Prospect is about 6 miles west of Brodribb Camp, which is about 40 miles from Darwin along the Stuart Highway (Plate 3). A first order radioactive anomaly was recorded over the prospect by the Geophysical Section of the Bureau of Mineral Resources during an airborne scintillograph survey of the area in 1952. A preliminary inspection of the area was made in September, 1952, by R.S. Matheson and D.F. Dyson, and a combined geophysical and geological survey was completed by the end of October, 1952. The results of the geological survey are contained in a report by Frankovitch (1953). The present report describes the geophysical work which was done.

The radiometric survey was carried out by W. Compston, and the remainder of the geophysical investigations by the author.

2. GEOLOGY

The following brief description is summarised from the report by Frankovitch (1953).

The Brodribb Prospect occurs in an area of slates and quartzites of the Brocks Creek group which strike east-west and dip steeply to the north. The deposit is on the northern flank of the Rum Jungle domal structure and is about 3 miles north of the granite contact.

The area is covered by alluvium, laterite and red slate detritus. The only outcrops are some resistant quartzite ridges which contain scattered veinlets of quartz.

The location of this and other airborne anomalies in the vicinity suggests that the radioactivity is associated with one particular stratigraphic horizon.

3. RADIOMETRIC INVESTIGATIONS

A. Radiometric Survey.

A baseline, 1800 feet in length, was laid parallel to the axis of the radioactive zone, which is elongated in an east-west direction (Plate 3). Survey pegs were placed in position at intervals of 300 feet and traverses 300 feet in length were set out from each peg southwards from the baseline. In certain areas of high radioactivity, additional traverses were surveyed, the interval between traverses being 25 or 50-foot. The grid was extended later short distances to the north and to the west.

A smaller area was surveyed about 900 feet south-east of the eastern end of the main baseline. The baseline was 800 feet long and traverses 200 feet long were run southwards from the baseline

at intervals of 25 feet. This grid covers an extension of the anomaly found during the preliminary investigations.

A Ratemeter Type 1011 ("carpet sweeper") was used in the survey. This registers the average count rate in microamperes; normal background count was taken as 5 micro-amperes.

All readings were converted to multiples of background count, after corrections had been made for slight changes in sensitivity of the instrument caused by variations in temperature, battery voltage, etc.

In the larger area readings were taken at 25-foot intervals along the baseline and traverses, and at smaller intervals where the radiation was most intense. Profiles of the radiation intensity along individual traverses are shown on Plates 1 and 2, and from these the radiometric contour map on Plate 3 was prepared. In the smaller area, some costeaning was done before the initial surface readings were taken, thus masking a certain area; the profiles thus affected are shown as broken lines on Plate 2.

Readings taken in Costeans A, B and C (see Plate 3) at intervals of 2 feet, and at intervals of one foot where necessary, are shown as profiles in Plate 4.

B. Logging of Diamond Drill Holes.

Six diamond drill holes, B1 to B6, were drilled to intersect the radioactive zones. The geological logs of these holes are discussed in detail by Smith (1953). With the exception of B2, which caved in, the drill holes were radiometrically logged using Bore-Logging Equipment, Type EA191, manufactured by Electronic Associates Ltd., Toronto. This equipment consists essentially of a special Geiger counter circuit with enclosed battery supply, and a special probe containing a Geiger tube (type NE51) enclosed in a brass shell with a rubber cover. The equipment is designed to be waterproof at pressures likely to be encountered in drill holes. The results of the radiometric bore logging are shown on Plate V of the report by Smith (1953), and are reproduced here as Plate 5.

C. Calibration of Bore Logging Equipment, Type EA191

A correlation was attempted between the percentage of equivalent U_3O_8 from radiometric logging and from sludge and core assays. The logging equipment was standardised and a curve was prepared of counts per minute against pounds of uranium oxide per ton (Plate 6). Comparison between this curve and the drill-hole logs on Plate 5 shows that the equivalent U_3O_8 content of the rock formations logged was generally less than 0.01 per cent.

The results from field assays are compared in Table 1 below with those calculated from calibrated bore logging in D.D.Hs. Nos.B1, B3 and B4.

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TABLE 1.

Drill Hole	Footage	Calibrated bore logging (eU_3O_8%)	Field assay (eU_3O_8%)
B1	30-35	<0.01	0.01
	85-90	0.01	0.01
	115-120	<0.01	0.01
	135-140	<0.01	0.013
B3	25-30	0.01	<0.01
	35-40	0.01	<0.01
	60-65	<0.01	0.01
B4	45-50	0.013	0.013
	50-55	0.017	0.019

D. Beta-Gamma Ratio Tests.

Beta-gamma ratio tests made by Territory Enterprises Pty. Ltd., at Rum Jungle, yielded the following results :-

TABLE 2.

Specimen No.	Description	$\frac{\beta+\gamma}{\gamma}$ ratio
1	Radioactive hematite rock from Brodribb	5.8
2	Ditto	6.3
3	Uranium oxide (in equilibrium with disintegration products)	11.0
4	Ditto	
5	Thorium mineral (in equilibrium with disintegration products)	5.3
6	Ditto	5.2

A beta-gamma tube was used to determine the beta and gamma count. An aluminium shield to screen the beta rays was then placed between specimen and tube and the gamma count was recorded.

The results lead to the conclusion that the radioactivity at Brodribb originates from a thorium mineral. It is believed that this mineral is dark and finely disseminated and that its presence is masked by the dark colour of the hematite.

Fluorimeter tests for uranium were made by fusing the radioactive rock with sodium fluoride and viewing the bead under ultra-voilet light. No fluoresence was obtained thus indicating that uranium was not present.

4. CONCLUSIONS.

Beta-gamma and fluorimeter tests strongly indicate that the radioactivity at the Brodribb Prospect originates from a thorium mineral. Uranium may occur in trace amounts, but not in any significant quantities.

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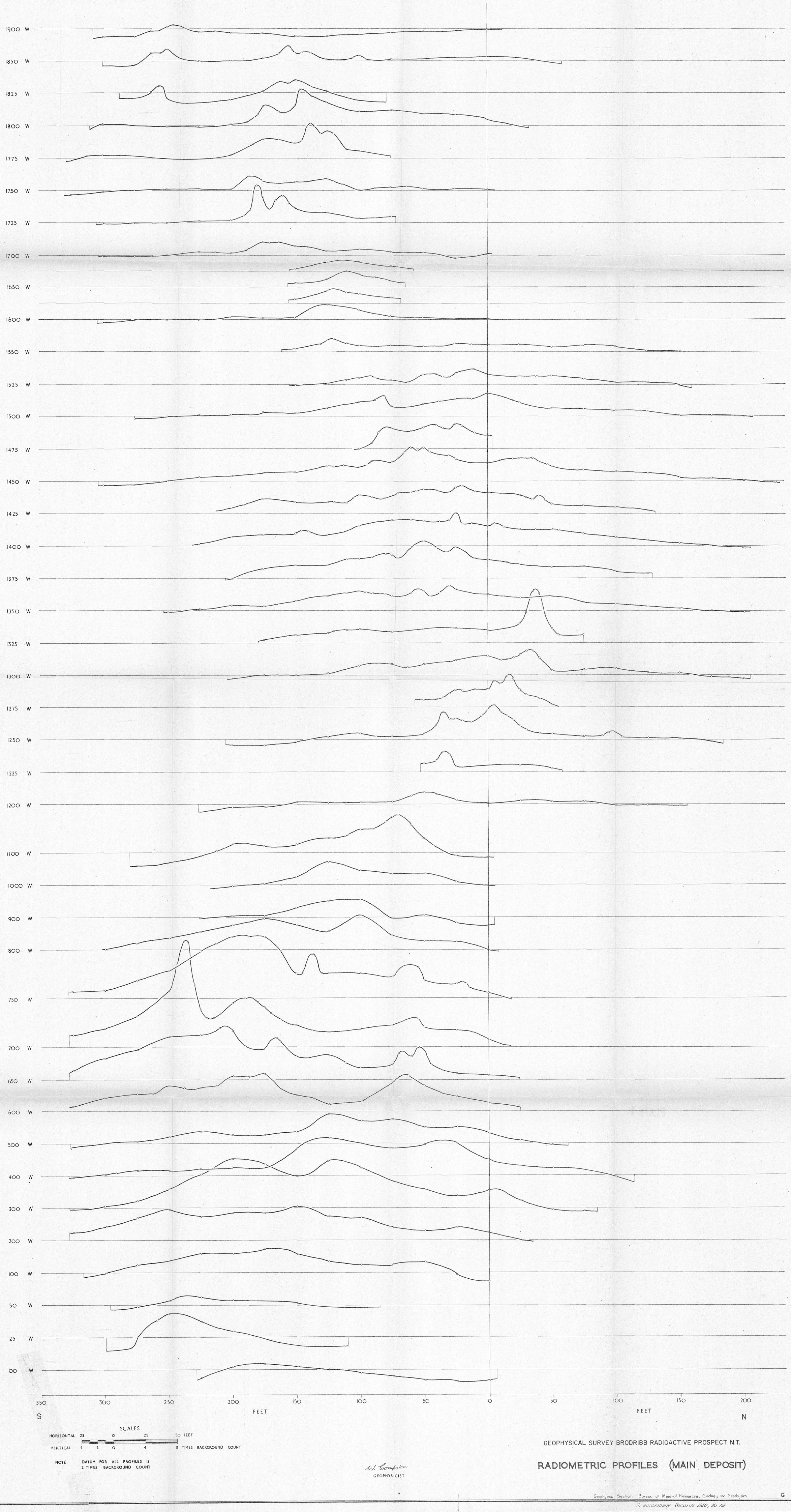
No further work is warranted at the prospect at the moment.

5. REFERENCES

Frankovitch, F.J., 1953 - Preliminary Report on the Brodribb Uranium Prospect, N.T. Bur. Min. Res. Geol. & Geophys., Records 1953, No.23.

Smith, D.N., 1953 - Preliminary Report on Diamond Drilling at the Brodribb Prospect, N.T. Bur. Min. Res. Geol. & Geophys., Records 1953, No.143.

PLATE I



SCALES

HORIZONTAL 25 0 25 50 FEET

VERTICAL 4 2 0 4 8 TIMES BACKGROUND COUNT

NOTE : DATUM FOR ALL PROFILES IS 2 TIMES BACKGROUND COUNT

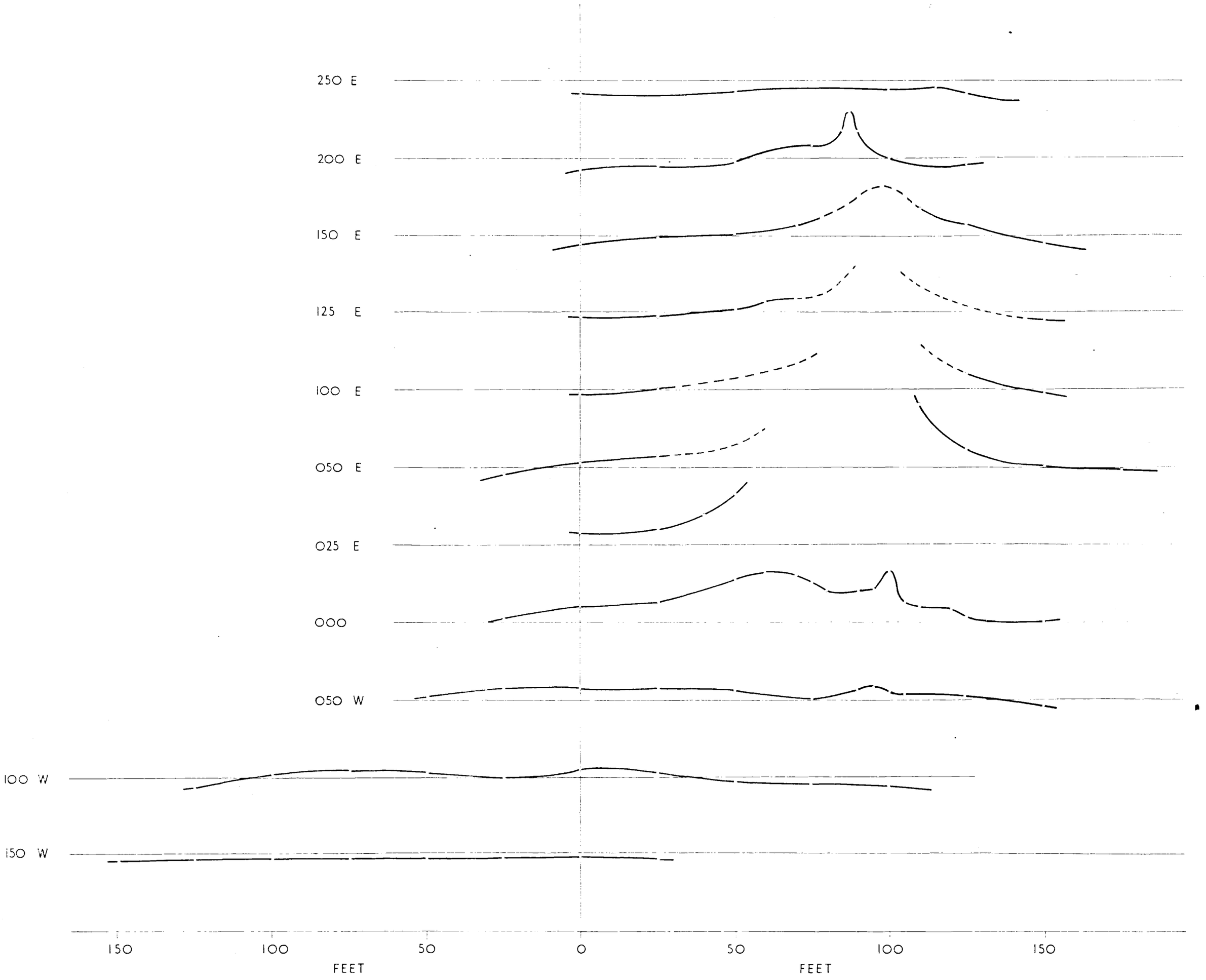
W. Compston
GEOPHYSICIST

GEOPHYSICAL SURVEY BRODRIBB RADIOACTIVE PROSPECT N.T.

RADIOMETRIC PROFILES (MAIN DEPOSIT)

Geophysical Section: Bureau of Mineral Resources, Geology and Geophysics. G 130-1

To accompany Records 1958, No. 112



SCALES

HORIZONTAL 25 0 25 50 FEET

VERTICAL 4 2 0 4 8 TIMES BACKGROUND COUNT

NOTE: DATUM FOR ALL PROFILES IS 2 TIMES BACKGROUND COUNT

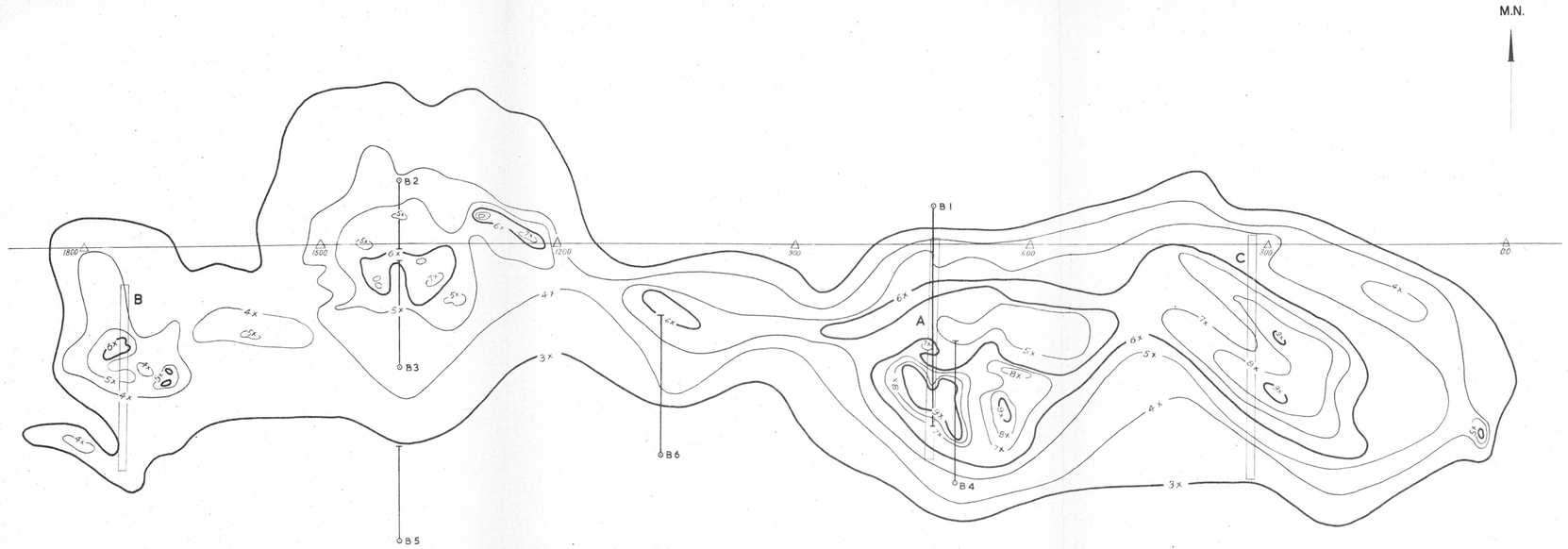
W. Compston

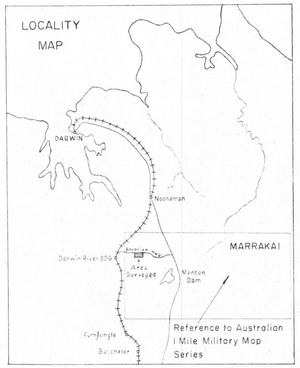
GEOPHYSICIST

GEOPHYSICAL SURVEY BRODRIBB RADIOACTIVE PROSPECT N.T.

RADIOMETRIC PROFILES (EAST DEPOSIT)

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics





SCALE
16 0 16 32

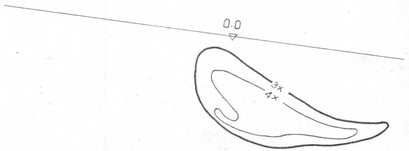
SCALE
100 0 100 200 300 FEET
CONTOURS IN MULTIPLES OF BACKGROUND COUNT

W Compston
GEOPHYSICIST

LEGEND
B2 DRILL HOLE
A COSTEAN

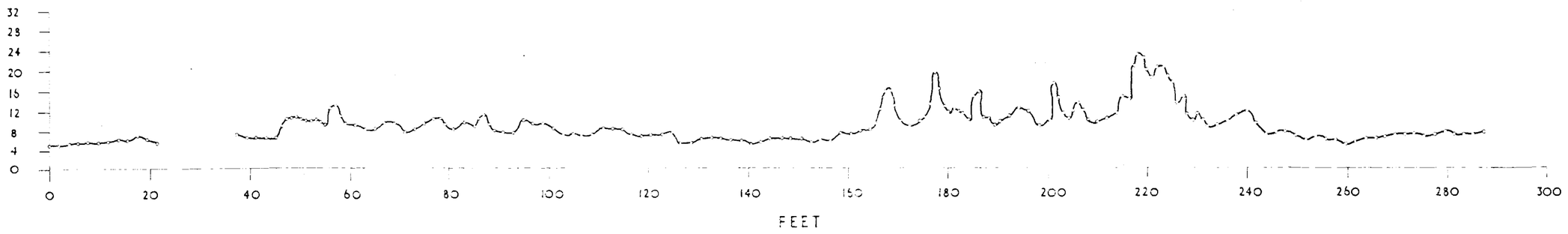
GEOPHYSICAL SURVEY BRODRIBB RADIOACTIVE PROSPECT N.T.

ISOCOUNTS OF GAMMA RAY INTENSITY

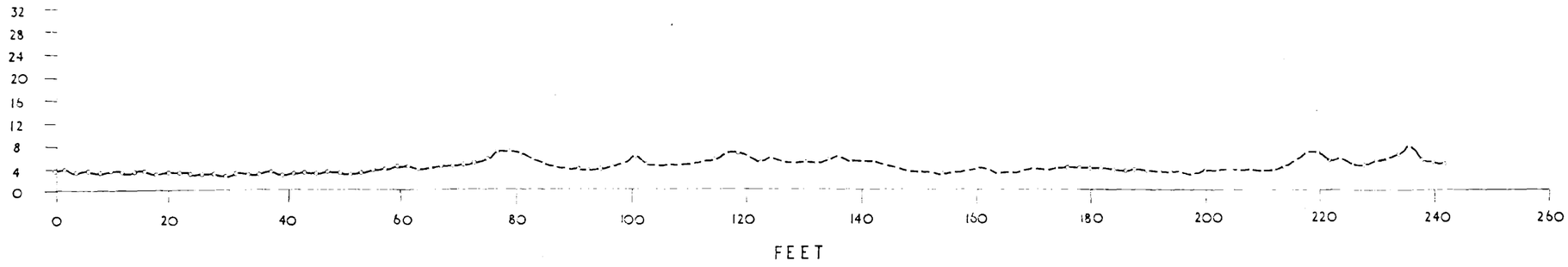


Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

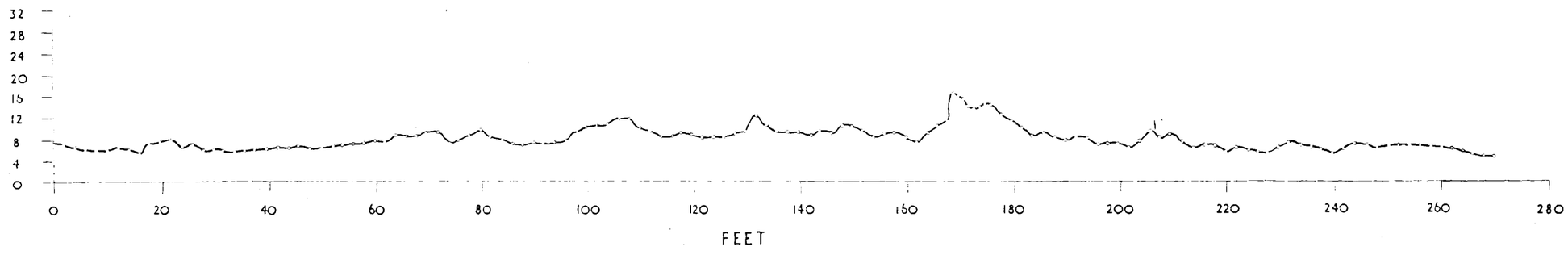
COSTEAN A 730' W



COSTEAN B 1800' W



COSTEAN C 300' W



SCALES

HORIZONTAL 20 0 20 40 FEET

VERTICAL 20 10 0 20 40 TIMES BACKGROUND COUNT

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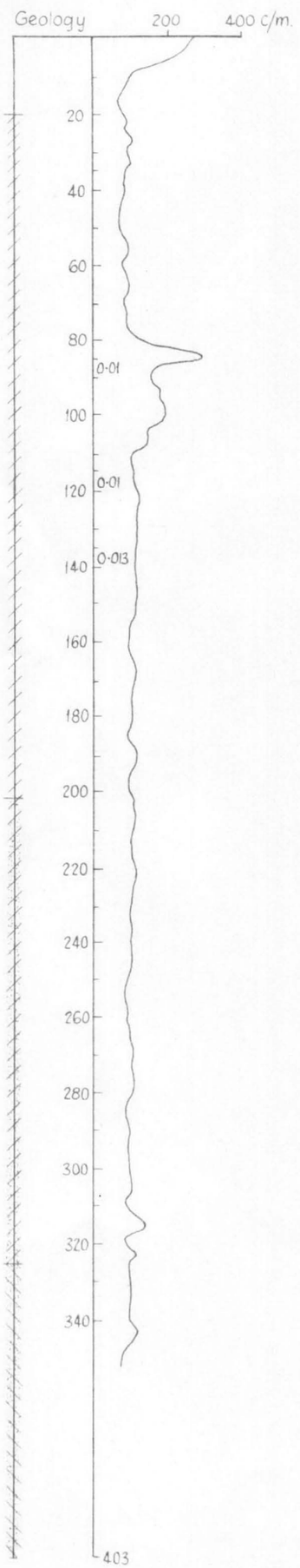
GEOPHYSICAL SURVEY BRODRIBB RADIOACTIVE PROSPECT N.T.

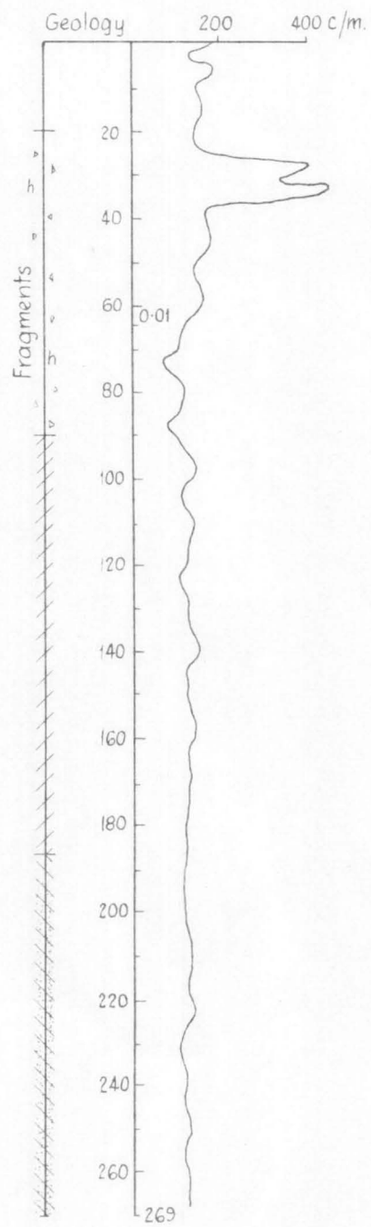
RADIOMETRIC COSTEAN PROFILES (MAIN DEPOSIT)

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics

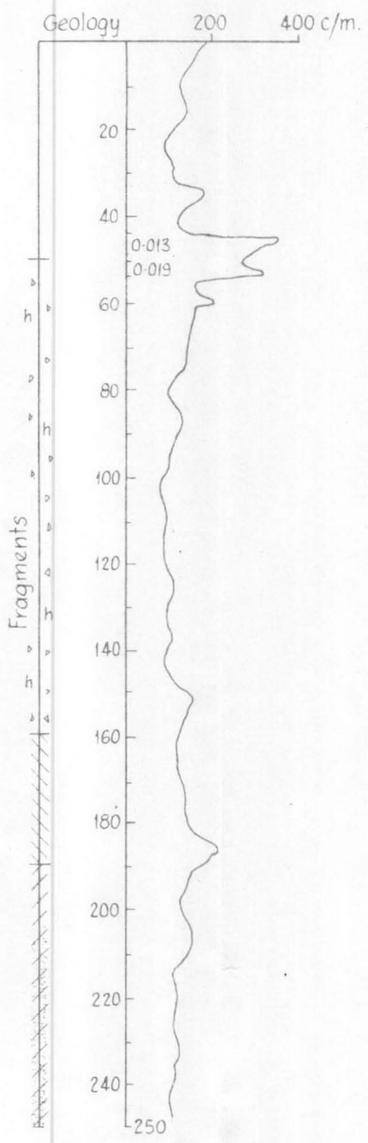
DRILL HOLE B1



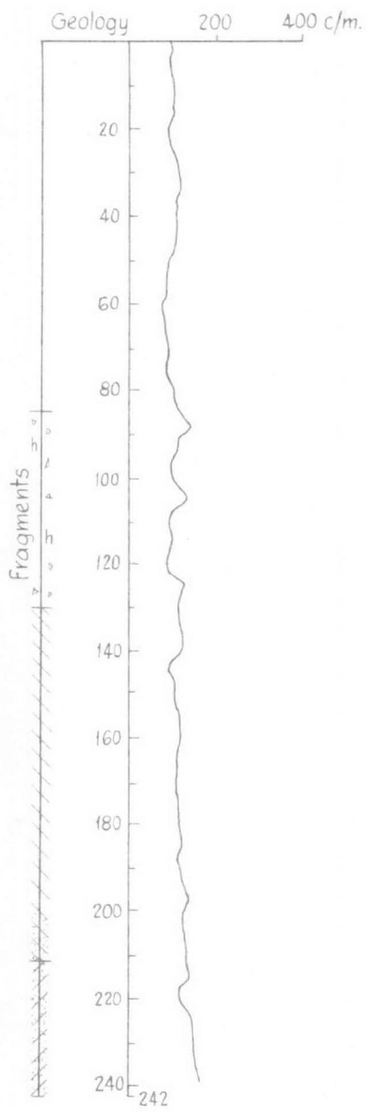
DRILL HOLE B3



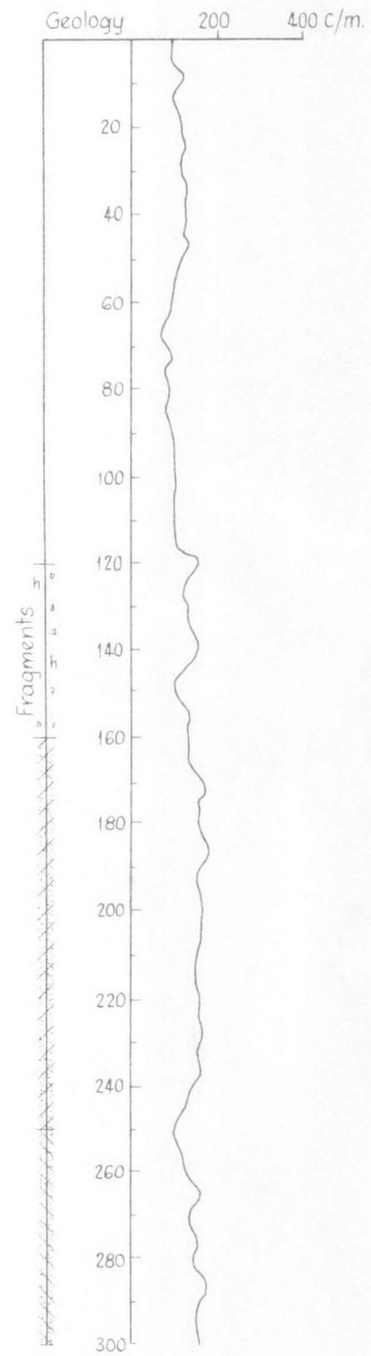
DRILL HOLE B4



DRILL HOLE B5



DRILL HOLE B6



LEGEND

- Grey Slate (Sericitic)
- Carbonaceous Slate
- Vuggy Quartz and Quartzite (Hematized)
- Sulphide Zone
- c/m — Counts per minute
- 0·02 — % U_3O_8
- Tan and Grey Slates

Prepared by D.N Smith.
November 1953

GEOPHYSICAL SURVEY, BRODRIBB RADIOACTIVE PROSPECT, N.T.

RADIOMETRIC DRILL HOLE LOGS

40 0 40 80

Scale in feet

G130-5

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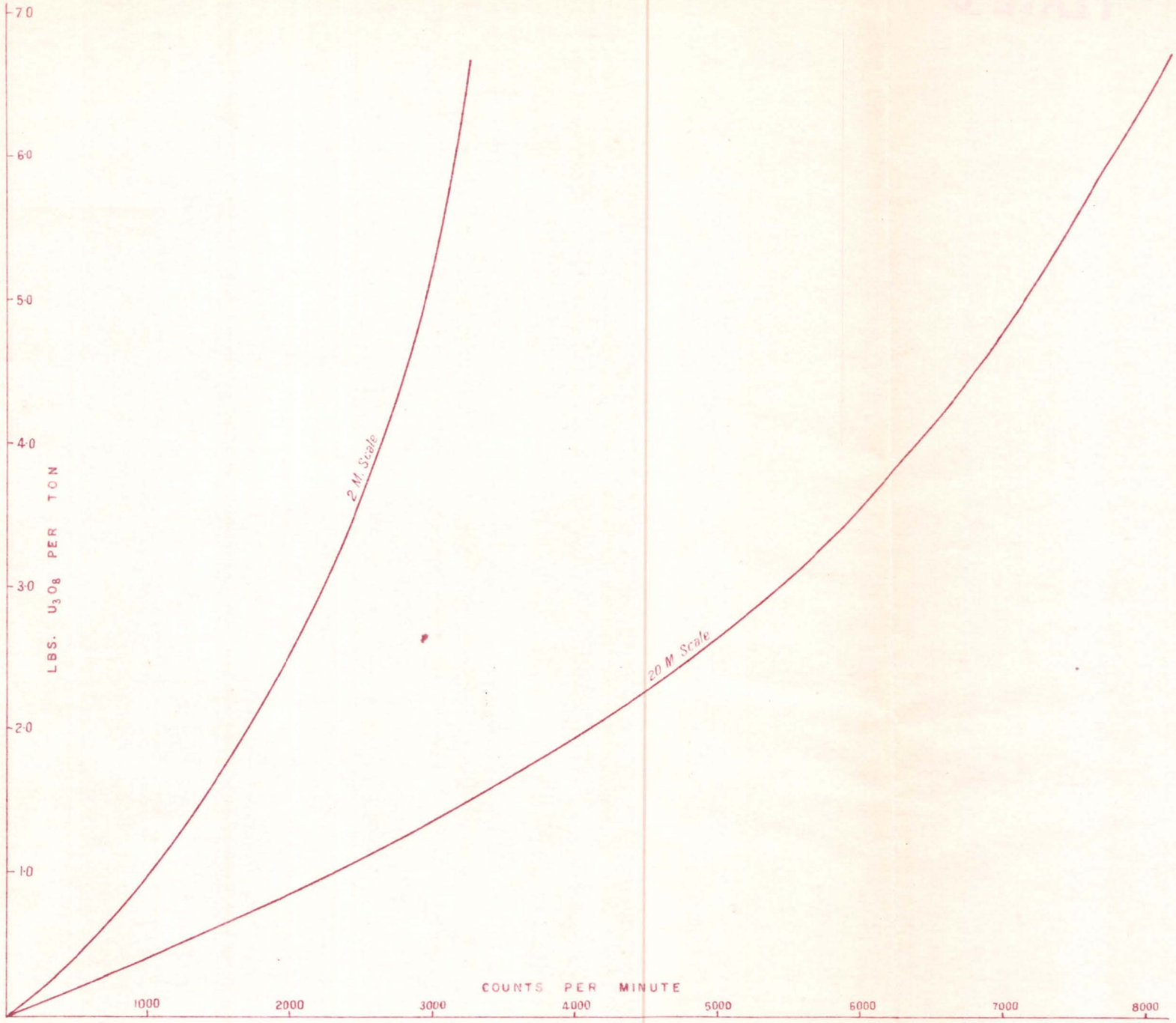
PLATE 6



GEOPHYSICAL INVESTIGATION AT THE BRODRIBB RADIOACTIVE PROSPECT N.T.

CALIBRATION CURVES FOR BORE LOGGING EQUIPMENT, TYPE EA 191

A. Compston

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Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics. G 130-6

To accompany Records 1958, No 112.