COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

PRELIMINARY REPORT ON DIAMOND DRILLING AT THE BRODRIBB PROSPECT, NORTHERN TERRITORY.

by

D.N. SMITH.

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RECORDS

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PLANS AND SECTIONS.

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INTRODUCTION.

The Brodribb anomaly was first detected by the Bureau of Mineral Resources' aerial scintillometer survey over the Rum Jungle area in 1952.

The prospect lies six miles due west of the 40 mile peg on the Stuart Highway and can be reached easily in the dry season by means of the Brodribb track. However, for several months during the wet season the track is quite impassable to heavy vehicles necessary to maintain drilling operations.

Ground parties made a preliminary inspection of the area in September, 1952 and by the end of October a combined preliminary detailed geological and geophysical survey was completed. (Frankovich, 1952).

The results of the surveys and the consequent costeaning indicated that drilling should be carried out for a complete investigation.

GENERAL STATEMENT ON DRILLING.

The Brodribb radioactive anomaly occurs in an area of slates and quartzites which have an easterly strike and a steep northerly dip. (Frankovich, 1952).

The anomaly is approximately 1800 feet in length (Plate 1).

With little other information about the regional structure available, the first two holes were drilled on a bearing of 180 degrees magnetic depressed at 45 degrees in the plane of coordinates 730 W and 1400W. The object was to pass under the highest radiometric contours and to cut the vuggy quartz and quartzite occurring along the axis of the anomaly in the primary zone.

Although it was not possible to orientate the core, these first two holes suggested that the slate may be dipping to the south and as a result the remaining four holes were drilled in a northerly direction, two depressed at 60 degrees and two at 45 degrees.

The following is a summary of the reasons for the positioning of the six drill holes in the Brodribb area.

DRILL HOLE NO. B1.

Position: 50N 726W. Bearing 180 degrees magnetic. Depression 45 degrees.

Assuming a regional north dip, B1 was sited to drill at 45 degrees under the highest radiometric contours at the southern end of costean A. It was hopedto cut the vuggy quartz and quartzite in the primary zone.

DRILL HOLE NO. B2.

Position: 80N 1402W. Bearing 180 degrees magnetic. Depression 45 degrees.

This hole commenced before the completion of B1 was positioned to intersect the radiometric anomaly (1400W) in the primary zone.

DRILL HOLE NO. B3.

Position: 1508 1400W. Bearing 360° magnetic. Depression 60°.

The southerly dip as indicated from B2 was taken into consideration and B3 was selected to intersect the radiometric anomaly (1400W) in the primary zone.

DRILL HOLE NO. B4.

Position: 3008 711W. Bearing 360° magnetic. Depression 45°.

In selecting the site for B4, the very shallow dip (20 degrees) at the southern end of costean A was taken into account, the axis of the radiometric anomaly (700W) being intersected theoretically at a vertical depth of 50 feet.

DRILL HOLE NO. B5.

Position: 3708 1412W. Bearing 360° magnetic. Depression 60°.

The geological section in the plane of B3 (Plate 111) suggests that the zone of vuggy quartz and quartzite referred to by Frankovich, dips approximately 30 degrees south. Hence B5 was positioned to drill north depressed at 60 degrees and intersect it in the primary zone.

DRILL HOLE NO. B6.

Position: 2568 1075W. Bearing 360° magnetic. Depression 45°.

The geological results of the previous bore holes show that none has cut the axis of the radiometric anomaly in the carbonaceous slates. Hence B6 was collared to explore this possibility.

The first Bureau drill, a Sullivan H.D.22, became available early in March 1953, but due to adverse road conditions, the drill could not be transported to the prospect until early April. Towards the end of May a second Bureau drill commenced operations at the prospect, but this was withdrawn in September to undertake drilling at Coronation Hill.

The performance of these drills has been very satisfactory, there being a marked increase in core recovery as compared with that obtained in the Rum Jungle area during the 1951-1952 season. There were some minor breakdowns, but no serious delays in drilling occurred.

The water supply for the first six weeks was available from a costean dug close to the creek near the eastern end of the anomaly, but on arrival of the second drill, it was necessary to cart water seven miles from the Darwin water supply main, which follows the Stuart Highway.

A total of 1583 feet of drilling was completed at Brodribb by the two drills during the season.

DRILLING RESULTS.

The details of the diamond drilling done during the 1953 season and also information regarding core recovery are given in the following tables:

TABLE I.

SURFACE DIAMOND DRILLING - BRODRIBB PROSPECT.

Drill Hole No.	Coords.	R.L.	Bearing (Mag.)	Depression (degrees.)	Bore depth. (feet)	Inst. Assay % eU_3O_8.	Remarks.	Date.	Drill.
B1	50N 726W	196'	180°	45	403	30-35 0.01% 85-90 0.01% 115-120 0.01% 135-140 0.013% Remainder <.01%	Sulphides (Pyrite) from 200 feet on.	1953	Sullivan 22.
B2	80N 1402W	207'	180°	45	118'10"	40-45 0.015% Remainder <.01%		1953	Sullivan 22.
B3	150S 1400W	205'	360°	60	269	60-65 0.01%	Pyrite from 200 ft.	1953	Sullivan 22.
B4	300S 711W	187'	360°	45	250	45-50 0.013% 50-55 0.019%	Pyrite from 200 ft.	1953	Sullivan 22.
B5	370S 1412W	198'	360°	60	246'6"	All less than 0.01%.	Pyrite from 200 ft.	1953	Sullivan 22.
B6	256S 1075W	186'	360°	45	300	Incomplete	Pyrite from 160 ft.	1953	Sullivan 22.

TABLE II.

DRILL.	HOLE.	DEPTH	CORE RECOVERED.	PERCENTAGE CORE RECOVERY.	DATE COMMENCED.	DATE COMPLETED.	RATE PER WEEK.
1	B1	403	314.7'	78.1	7.4.53.	3.7.53	31.0'
1	B4	250	94.5'	37.8	7.7.53	30.7.53	62.5'
1	B6	300	270'	90.0	11.8.53	29.10.53	25'
2	B2	118'11"	91.8	77.4	21.5.53	12.6.53	36'
2	B3	269'	167	62.1	18.6.53	17.7.53	54.0'
2	B5	242.5'	201.3	83.0	21.7.53	24.8.53	48.5'

Average core recovery 71.9%

Average rate per week 42.8 feet.

Total drilling 1583 feet.

GEOLOGICAL LOGS.

General practice has been to log the core at the drill site after which it was transported back to the base camp for storing and further examination if necessary.

The better core recovery this year has been obtained by using the larger bit sizes as far as possible e.g. NX, NM and BX sizes, and also by experimenting with various core catching devices. It was found necessary, at most times to pull the rods every two feet.

Table III summarizes the geological information gained from the diamond drilling of the Brodribb Prospect. The detailed field log sheets showing assay results, lengths of runs etc. are available if required.

TABLE III.

Bore No.	Footage.	Geological Summary.
B1	0 – 25.	Weathered tan and grey slates.
	25-200.	Folded carbonaceous slates and schists. Cleavage averages 45° to hole with small irregular hematitic boxworks sometimes parallel to cleavage and sometimes parallel to bedding.
	200-325	Folded carbonaceous slates with pyrite veins up to ¼" wide on cleavage and small shears.
	325-403	Sericitic schists with thin veinlets of pyrite; rest is finely disseminated.
B2	0-30	Tan and grey slates with abundant small hematitic boxwork.
	30-38	Vuggy quartz with hematite.
	38-118	Grey slates with small gossanous shears and small pittings filled with hematite parallel to cleavages.
B3	0-20	Lateritised tan and grey slates.
	20-90	Vuggy quartz and quartzite fragments with abundant red hematite.
	90-180	Pitted carbonaceous slates. Pittings which parallel cleavages and bedding are filled with red hematite and quartz.
	180-185	Sandy carbonaceous slate.
	185-269	Sericitic schist with thin bands of ferruginous sandstone. Pyrite is finely disseminated and also occasionally as a thin vein on cleavage.

TABLE III Cont.

Bore No.	Footage.	Geological Summary.
B4	0-50	Hematized and brecciated slate with vuggy quartz.
	50-160	Vuggy quartz and quartzite with red hematite.
	160-190	Sericitic schists with few boxworks of hematite.
	190-250	Carbonaceous slates with pyrite in cleavage and thin shears.
B5	0-85	Highly sheared ferruginous slate.
	85-110	Vuggy quartz and hematite.
	110-130	Hematitic sandstone with cherty lenses.
	130-195	Grey pitted slates with occasional thin bedded ferruginous shale.
	195-210	Sericitic schists with thin vein pyrite in cleavage planes.
	210-242	Carbonaceous slate and schist with few small seams of pyrite. Slate is graphitic on cleavages.
B6	0-95	Ferruginous slates and shales with quartz and quartzite fragments.
	95-100	Slate breccia.
	100-120	Sheared white and grey slate with occasional hematitic boxwork.
	120-150	Vuggy quartz and quartzite with hematite.
	150-160	Banded fine-grain sandstone with black cherty bands.
	160-250	Carbonaceous slate with ferruginous lenses. Small vugs or pittings are partially filled with pyrite and hematite. Pyrite also occurs on thin bedding planes.
	250-300	Sericitic schists with disseminated pyrite only.

PETROLOGY AND MINERALOGY.

A suite of specimens has been prepared to represent the main rock types intersected at the prospect, and the remainder of the core will be kept at the base camp for future reference.

Two specimens from hole B1, No. A5404 from 231 feet (bore length) and No. A5405 from 236 feet (bore length) were sent to Canberra for mineragraphic work and W.M.B Roberts' reports as follows:-

"Specimen A5404 is a highly ferruginous sandy shale with silicified bands along which the main mineralization appears to have taken place.

Specimen A5405 is a grey banded slate with a ¼" wide band of pyrite replacing one of the lighter grey bands; traces of pyrite mineralization occur parallel to these bands as small circular areas up to ¼" diameter and of negligible thickness. Some of these show partial breakdown to limonite.

The ore minerals present in the two specimens are Pyrite, Pyrrhotite, Hematite and Limonite. The Pyrite occurs as euhedral crystals and as irregular areas with a grainsize up to 0.5 mm. across. In places it is weathering to limonite. The euhedral crystals occur in a finely crystalline iron oxide (Hematite and Goethite) which shows a medium anisotropism. These crystals have the pyritohedron face well developed in many cases; therefore they are probably the original crystal, and not replacement of an earlier formed mineral.

Pyrrhotite is present as very small irregular areas up to 0.1 mm. in length in the pyrite, and is noticeable for its strong anisotropism and pleochroism. Its relationship to the pyrite is obscure.

The Hematite (var. Martite) occurs as pseudomorphs after Magnetite, which are enclosed in pyrite (spec.A5405), and as large irregular areas which enclose the crystals of pyrite (spec. A5404). The mineral is not pure, but shows stages in the breakdown to limonite. Etching with $SnCl_2$ plus HCl darkens some areas of the crystals developing a mottled texture. These areas which darken with etching are probably the hydrated oxide Goethite; they show a moderate anisotropism. The areas which remain unaffected by etching show a very strong anisotropism, and have the characteristics of Hematite. The fact that the iron oxide in one case is enclosed by Pyrite, and in another case is enclosing the Pyrite, would suggest that the magnetite was deposited first; this was followed by Pyrite which was followed in turn by primary hematite.

The gangue mineral present is quartz, which occurs in large irregular areas, and in specimen A5404 appears to be replacing Hematite."

In the summary of the geological logs, the only sulphide referred to is pyrite. However, as shown in W.M.B. Roberts' mineragraphic report, "Pyrrhotite is present as very small irregular areas up to 0.01 mm. in length in the pyrite". It must then be assumed at this stage that pyrrhotite occurs where ever pyrite has been recorded.

GEOPHYSICAL LOGGING.

Diamond drill holes B1,B3,B4,B5,B6 were radiometrically logged by Geophysicist I.A. Mumme with the bore hole logging equipment (Geiger type) E.A.191. Since the cable with this equipment is only 350 feet in length, there is no graph available for the last 53 feet of drill hole B1. Drill hole B2 had collapsed before logging could be done.

The graphical representation of the logging is shown in Plate ~~IV~~, where the results can be compared with the geological section of each hole.

Although the results are as poor as the sludge assays indicated, it is interesting to note that there can be some correlation between geology, sludge assay, and radiometric logging. For instance, in bore holes B1,B3,B4 a slight fluctuation was recorded at 80 to 100 feet in B1, 20 to 40 in B2, and 40 to 60 in B4.

The highest radiometric assay recorded in each bore is shown in TableIV.

Small as they are, it is considered that results are significant, since in B3 and B4 they occur approximately where the drill hole first intersects the vuggy quartz zone.

SAMPLING.

Sludge samples were collected at five feet intervals and the dried samples were sent to Territory Enterprises Pty. Ltd., Rum Jungle, for radiometric assay. The sludge is quartered in a special quartering device, only one quarter being kept for uranium assay. The remaining three quarters are returned to the Bureau for storing in case further testing, such as chemical assaying, is warranted.

A sludge sample was taken every ten feet from 230 feet to 403 feet in hole B1 and sent to the Mines Department Alice Springs for gold assay, but at the time of writing no results have come to hand.

Since the sludge assay results have generally been less than 0.01% e U_3O_8, it has not been necessary to send away split core samples for chemical or radiometric assay. Split core samples had to be taken from 190 feet to 300 feet in hole B6, because there was no return of water during the last 110 feet of drilling.

It was found necessary to do Geiger and scintillometer work at the base camp to avoid the back ground effect of the surface material at the prospect itself.

ASSAY RESULTS.

Preliminary field assays were carried out by I.A. Mumme at Brodribb, but the final field assays were determined by the radiometric section of Territory Enterprises Pty.Ltd., at Rum Jungle.

Generally, the assay results have been less than 0.01% e U_3O_8 but Table IV indicates where radioactivity was detected in each bore hole.

The radiometric logging agrees broadly with the sludge assays and it has been shown that the particular rock type concerned is the vuggy quartz and quartzite belt.

The drill hole intersections of this zone suggest that it dips away to the south.

TABLE IV.

ASSAY RESULTS.

BORE HOLE.	FOOTAGE.	FIELD ASSAY.
B1	30 - 35	0.01% e U_3O_8
	85 - 90	0.01% "
	115 - 120	0.01% "
	135 - 140	0.013% "
B2	40 - 45	0.015% "
B3	60 - 65	0.01% "
B4	45 - 50	0.013% "
	50 - 55	0.019% "

CONCLUSIONS.

The diamond drilling has proved to be very disappointing and no primary uranium mineralization of importance has been located.

All possibilities of locating a primary mineralization have been exhausted by the diamond drilling, but it has been suggested that the drilling may have passed completely under a mineralized horizon, which at present is represented by the almost eroded outcrop of the synclinal portion of a drag fold. It was thought that this drag fold existed in the sediments which dip regionally north from the northern flank of the Rum Jungle granite (Matheson 1952). The airborne scintillometer failed to locate any similar anomalous area to the north where it would be expected to find the mineralized horizon folding back into the regional structure. There is little to substantiate this theory at present.

It appears then, that the high radioactivity at the surface in this area is due to superficial enrichment in laterite from an original low grade source in the underlying Brocks Creek meta-sediments.

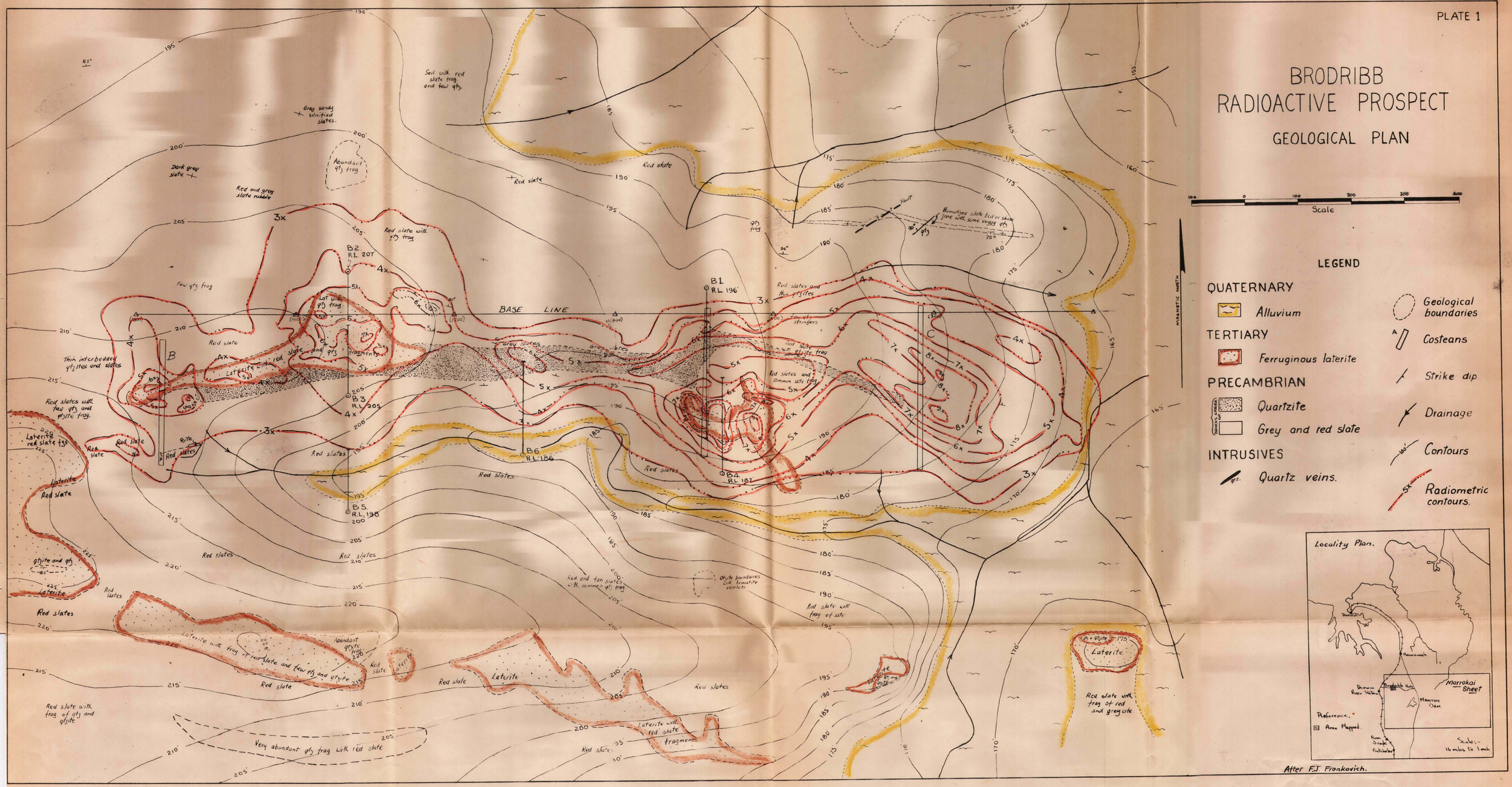
REFERENCES.

Frankovich F.J.	1953:	Preliminary Report on the Brodribb Uranium Deposit, N.T. Bur. Min. Res. Geol. Records Report 23/1953.
Matheson, R.S.	1953:	Rum Jungle Investigation 1951 and 1952. Progress Report. Com. Bur. Min. Res., Geol. Records Rept 24/1953.

PLATE 1

BRODRIBB RADIOACTIVE PROSPECT

GEOLOGICAL PLAN



Scale

LEGEND

QUATERNARY
- Alluvium

TERTIARY
- Ferruginous laterite

PRECAMBRIAN
- Quartzite
- Grey and red slate

INTRUSIVES
- Quartz veins.

- Geological boundaries
- Costeans
- Strike dip
- Drainage
- Contours
- Radiometric contours.

After F.J. Frankovich.

PLATE II

Limits of anomaly

9X background

200'

100'

00

00'

B1

B4

0.01

0.01

0.01

0.013

0.01

0.01

0.01

Red brecciated slate

quartz fgs.

Fragments only

200N

100N

00

100S

200S

300S

400S

BRODRIBB PROSPECT

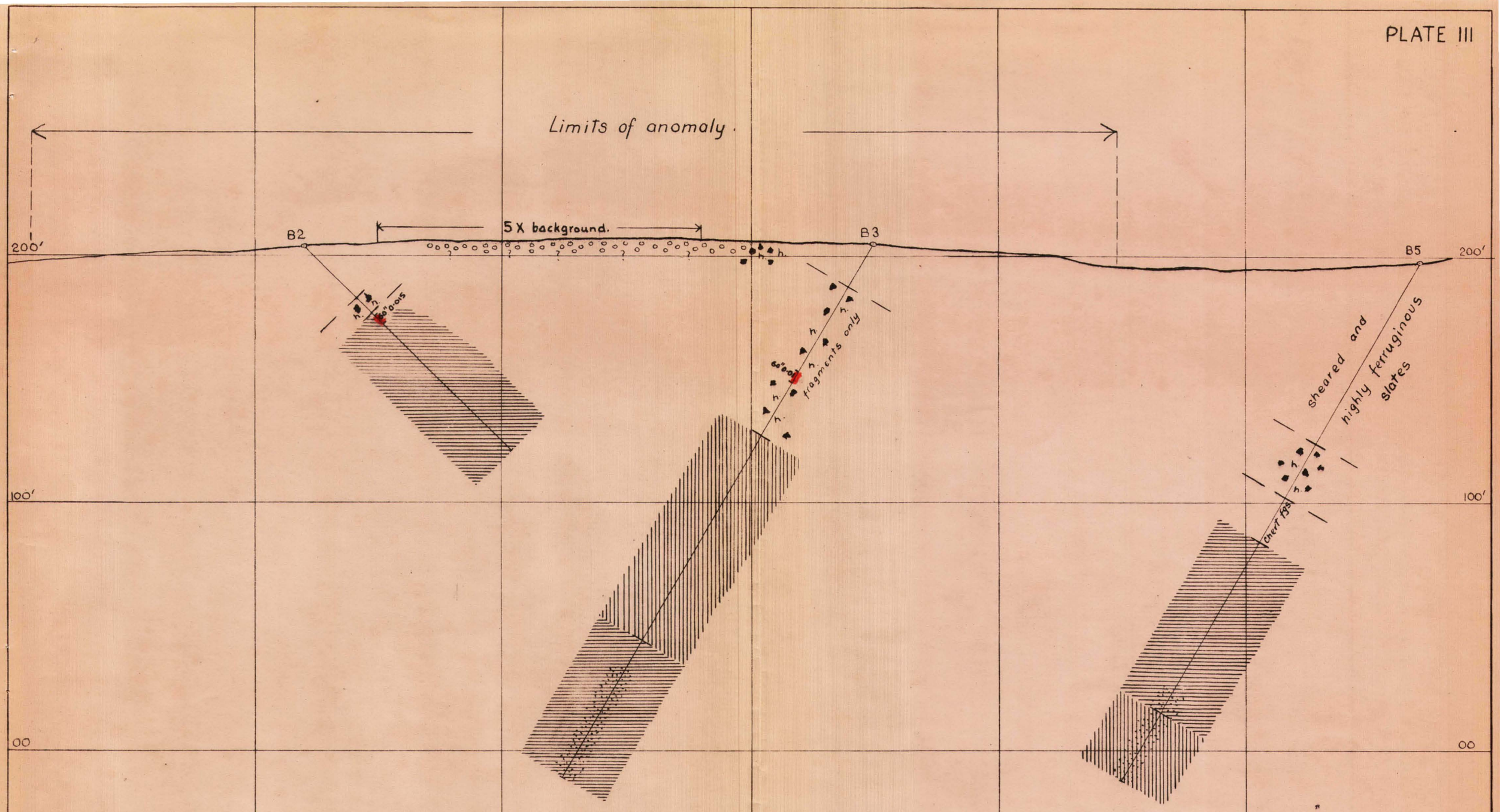
SECTION IN PLANE OF D.D.H. B1, B4.

Scale 0 40 80

LEGEND

- Laterite
- Grey slate
- Carbonaceous slate
- Vuggy Quartz + Quartzite
- Sericitic schist
- Sulphide Zone
- 0.01 % e U_3O_8

PLATE III



BRODRIBB PROSPECT

SECTION IN PLANE OF D.D.H. B2, B3, B5.

SCALE 0 40 80

LEGEND

- Grey and tan slate
- Carbonaceous Slate
- Vuggy Quartz & Quartzite (hematized)
- Sericitic schist
- Sulphide Zone
- 0.01 % e U_3O_8
- Laterite

PLATE IV

Limits of anomaly

200'

100'

0

200'

100'

0

B6

h.

Slate breccia

Sandstone & chert

500'

200S

300S

400S

200N

100N

0

100S

BRODRIBB PROSPECT

SECTION IN PLANE OF D.D.H. B6

Scale 40

LEGEND

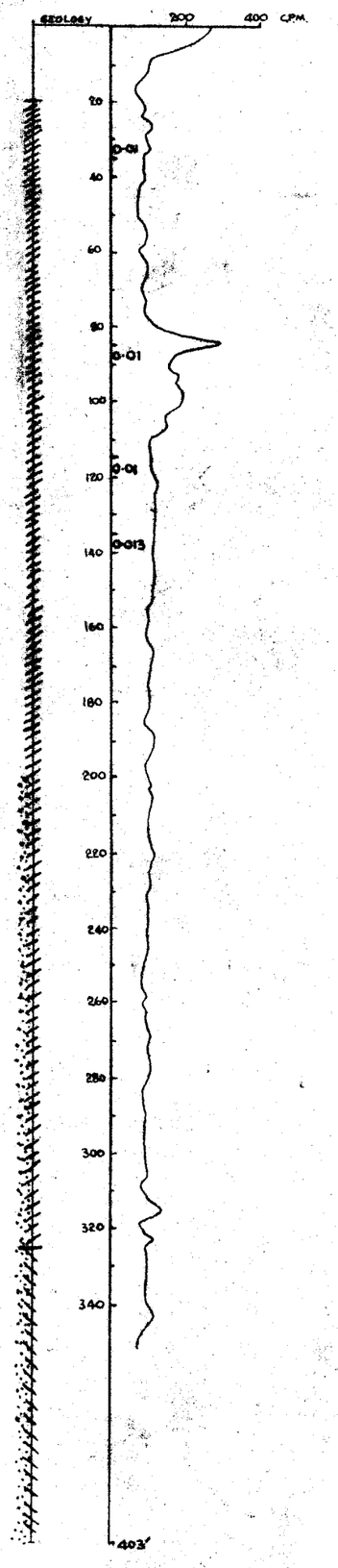
- Ferruginous Slate
- Carbonaceous Slate
- Vuggy Quartz and Quartzite (hematized)
- Sericitic schist
- Sulphide Zone
- 0·01 % eU_3O_8

PLATE

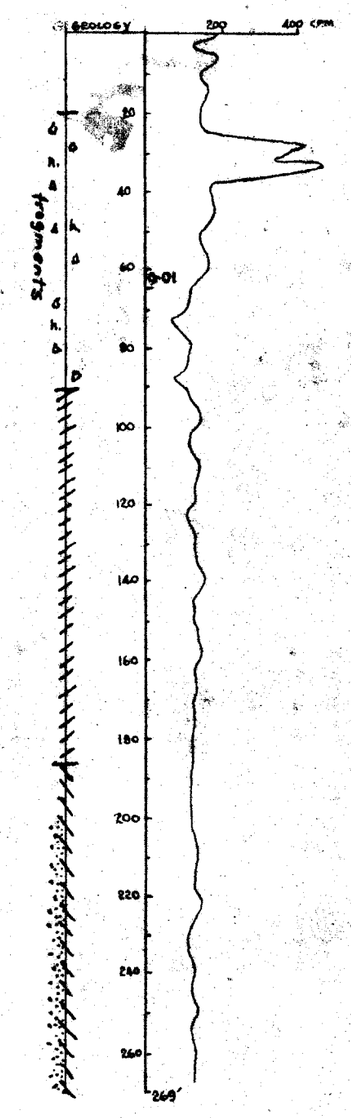
BRODRIBB RADIOACTIVE PROSPECT
RADIOMETRIC DRILL HOLE LOGS

Scale — 1 inch = 40 feet.

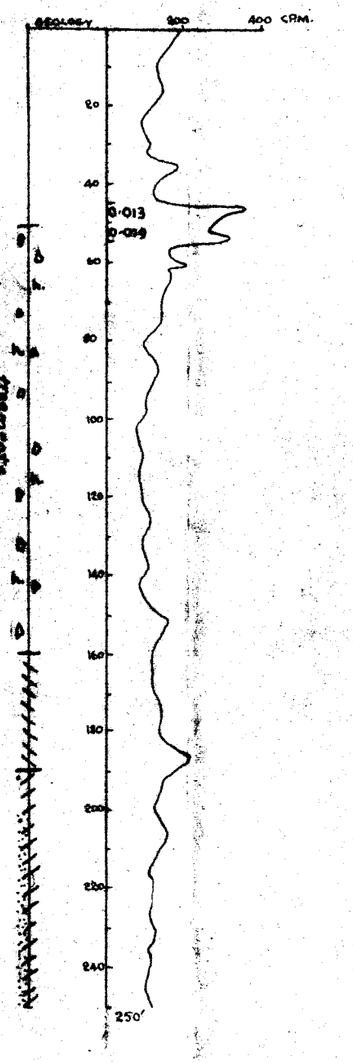
DRILL HOLE B1



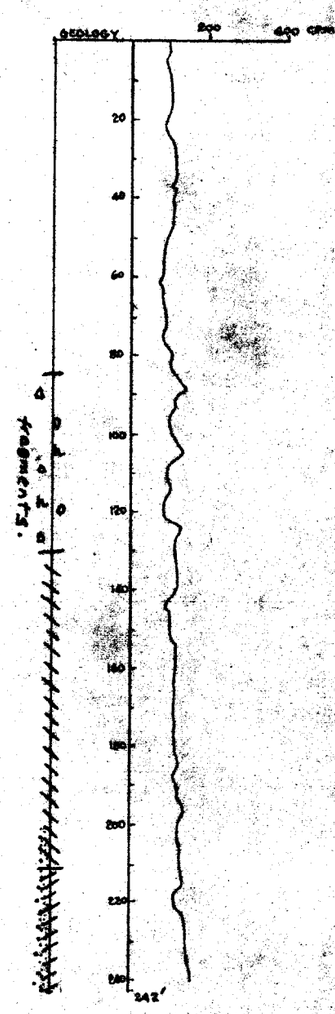
DRILL HOLE B3



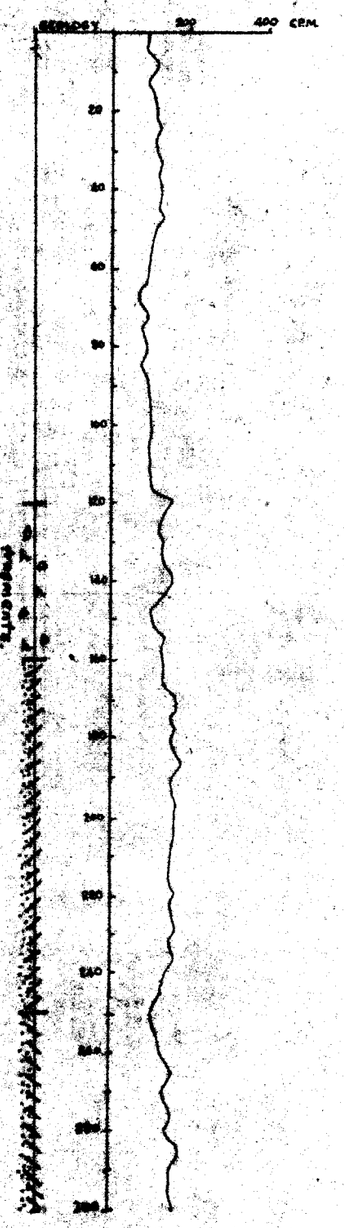
DRILL HOLE B4



DRILL HOLE B5



DRILL HOLE B6



REFERENCE

- Grey Slate (Sericitic)
- Carbonaceous Slate
- Vuggy Quartz & Quartzite (hematized)
- Sulphide Zone
- CPM. Counts per minute
- 0·02 $\%U_3O_8$
- Tan and grey slates

Prepared by D.N. Smith
November 1953