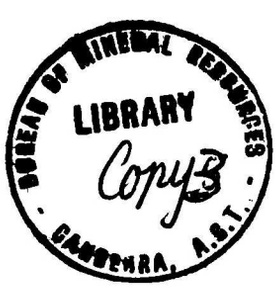
COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

RECORDS 1956, No. 154

GEOPHYSICAL SURVEY AT CORONATION HILL, NORTHERN TERRITORY



by

A. J. BARLOW and R. J. de GROOT

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GEOPHYSICAL SURVEY AT CORONATION HILL, NORTHERN TERRITORY

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CONTENTS

ILLUSTRATIONS

1. INTRODUCTION

Coronation Hill uranium prospect, which is located on the Jimbat property about 80 miles east of Pine Creek in the Northern Territory, was discovered by B.P. Walpole (geologist) in June, 1953. The prospect is close to the South Alligator River from which an ample supply of fresh water is obtainable. The area is accessible from Pine Creek by a graded dry weather track through Goodparla Station (see Plate 1).

The first part of the geophysical survey, comprising radioactive gridding and profiling, was done in July, 1953, under the supervision of R.J. de Groot. This was followed in September, 1953, by magnetic and self-potential surveys, the object of which was the location of any concealed geological structures. This part of the work was done by A.J. Barlow (party leader) and L.V. Hawkins. A limited area only was surveyed in detail to delineate small scale geological structures which may give information on the conditions of ore deposition.

Routine diamond - drill sludge assays, bore-logging and core-logging were done concurrently with the magnetic survey.

Location, geology, and geophysical grid are shown in Plate 1.

2. GEOLOGY

The area of interest lies on the northern slope of Coronation Hill, between cliffs of Buldiva quartzite to the south and a copper-bearing, quartz-filled shear 600 feet further north. Sediments of the Buldiva Group of Upper Proterozoic age occur to the north of the quartz-filled shear and appear to be down-faulted.

Chloritic schists and slates occur in a discontinuous outcropping belt along the north-eastern side of the area, and also crop out sporadically on the hill slope further to the south-east. The south-western side is extensively covered by soil and scree, but pit sinking and costeaning have shown that a kaolinised angular conglomerate or breccia occurs as the underlying rock. Slate and quartzite fragments are present in the breccia which is considered to be part of the acid volcanic rocks occurring at the base of the Buldiva Group.

The geology of the area has been described in detail by Matheson (1953).

3. RADIOMETRIC SURVEY

The instrument used was a "Cintel" portable Geiger-Muller ratemeter, type 1011C, serial No. 2, fitted with three G24H G.M. tubes. This instrument measures the intensity of the gamma radiation in the immediate vicinity of the probe. The readings are quoted as multiples of the background count on a barren quartz outcrop as this gives the lowest recorded count of any of the rocks in this area.

The background reading of the instrument used was 6 microamps on the "C" scale. The scale was assumed to be linear, with interscale conversion factors as follows:-
4 times "B" scale reading equivalent to "C" scale reading.
10 times "A" scale reading equivalent to "C" scale reading.

The grid used for this survey had as its base-line that used for the geological investigation, and differed from the grid used for the later magnetic and self-potential surveys. Eleven traverses, ranging in length from 300 to 1,000 feet, were surveyed with tape and compass at right angles to the main geological north-south base-line. Traverses were spaced at 50 or 100 feet intervals over a length of 700 feet. Readings were normally taken at intervals of 25 feet along each traverse, but where changes in radioactivity were large the intervals were reduced to as little as 1 foot.

Additional readings were taken some feet to either side of the traverses to delineate anomalous areas. The results are shown as iso-rad contours and profiles of surface radioactivity in Plate 2.

Some anomalies, small in area but possibly high in intensity, may have been missed between traverse lines, but this type of anomaly is generally of no structural geological interest in this area, e.g. anomalies "A" and "B" in Plate 2, which were on or close to traverse lines, were later found to be due to large rubble boulders, practically soil-covered and containing uranium mineralization in the fracture planes. Other similar rubble boulders were found but the isolated radiometric highs due to them were not plotted. These boulders and contamination by radioactive material derived from shaft sinking and costean digging may have distorted the contours slightly in places.

Readings were taken along the centre of the bottom of six costeans totalling 440 ft. in length. These readings were taken at intervals ranging from 5 feet to 1 foot, the closer spacing being used where changes in gamma ray intensity were large. The results are shown as profiles of gamma ray intensity and costean depth in Plate 3. The estimated profile of gamma ray intensity before costeaning is also shown. These estimated values were deduced from nearby surface measurements, surface contours, profiles and the geologist's notes. The results show a marked increase in radioactivity with depth.

Readings taken on all walls of a 15 ft. shaft sunk in costean No. 5 are also shown in Plate 3, together with readings taken over anomaly "A" during excavation.

4. MAGNETIC SURVEY

The base line for the magnetic and self-potential surveys was laid at a bearing of 140° magnetic. In the magnetic survey, readings were taken at 12½ ft. intervals along traverses 50 ft. apart, in both NW-SE and SW-NE directions. To simplify the diagram, only the 100 ft. traverses are shown on Plate 1.

The instrument used was an Askania Vertical Force Variometer, which measures the local variation of the vertical component of the earth's magnetic field. This variation is caused by differences in magnetic susceptibility between the various types of rocks.

Magnetic profiles for both the NW-SE and SW-NE traverses are shown in Plate 4, and from these the magnetic contour map in Plate 5 has been drawn. No detailed interpretation is possible, but the following features are apparent:-

(i) The quartz-filled shear can be traced by a line of weak anomalies, mostly negative but with a parallel

positive anomaly, particularly at the eastern end. The positive anomaly may indicate some local magnetic mineralization.

(ii) The trend of the contours in the S.W. portion of the area is approximately parallel to the strike of the beds and some correlation between the magnetic profiles and drill hole data may be possible.

(iii) In the northern part of the area a relatively steep magnetic gradient was obtained over the edge of a sandstone outcrop. Unfortunately, time did not permit further investigation of this anomaly.

5. SELF-POTENTIAL SURVEY

The self-potential method of survey indicates the presence of sulphides by measuring, at the earth's surface, electro-potentials caused by the oxidation of the sulphides. Only a small part of the area was covered by the self-potential survey, namely that bordered by traverses 100 N.W., 50 N.E., 100 S.E. and 400 S.W. Results are shown as profiles on Plate 6. A broad indefinite anomaly was obtained over the quartz "blow" and the copper mineralization, but poor surface conditions and erratic readings prevent reliable evaluation of the results.

6. SLUDGE ASSAYS

Sludges from diamond drill holes Nos. 1 and 2 were radiometrically assayed using an Austronic ratemeter, Type VRM2 with a B12 Geiger tube. The values have been plotted on Plates 7 and 8 as equivalent U_3O_8 percentages. Further work done in the Bureau's geophysical laboratory at Footscray indicates that some of these samples are in equilibrium and the equivalent and actual U_3O_8 percentages are in close agreement.

7. BORE LOGGING

The two diamond drill holes were radiometrically logged with an Austronic ratemeter, Type X1, and probe. Towards the end of the logging some water apparently seeped into the probe under pressure and readings below 250 feet in hole No. 1 and below 350 feet in hole No. 2 are unreliable and probably low. It was not possible to rectify this fault on the field. Profiles are shown in Plates 7 and 8.

8. CORE LOGGING

The drill-hole cores were logged with a Type 1011C ratemeter. No correction has been made for different core diameters and core losses. Results are shown as profiles in Plates 7 and 8, for comparison with sludge assays and bore logs.

9. CONCLUSIONS AND RECOMMENDATIONS

Results of the magnetic and self-potential surveys show that detailed work is not warranted at the present stage and magnetic work should be confined to tracing definite anomalies which may be indicated on test traverses. Should any further self-potential work be done, it is possible, but

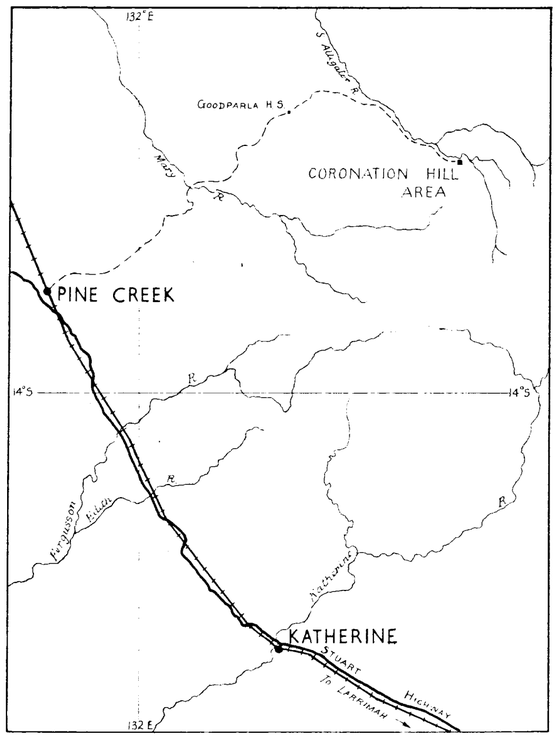
by no means certain, that improved results would be obtained by using a high impedance self-potential meter. Watering of contact points may have introduced stray potentials and should be avoided if possible.

Results of sludge assays and logging show quite good agreement. The bore-logging results in the deeper parts of the drill holes are unreliable due to faulty operation of the equipment.

10. REFERENCE

Matheson, E.S., 1953 - Progress Report on the Coronation Hill Prospect at 31st October, 1953. Bur. Min. Res. Geol. & Geophys., Records 1953, No. 124.

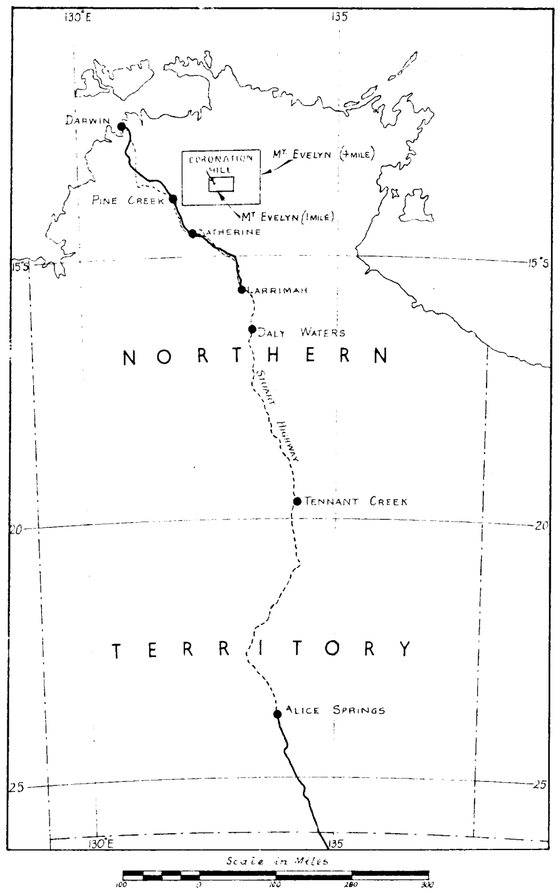
PLATE I



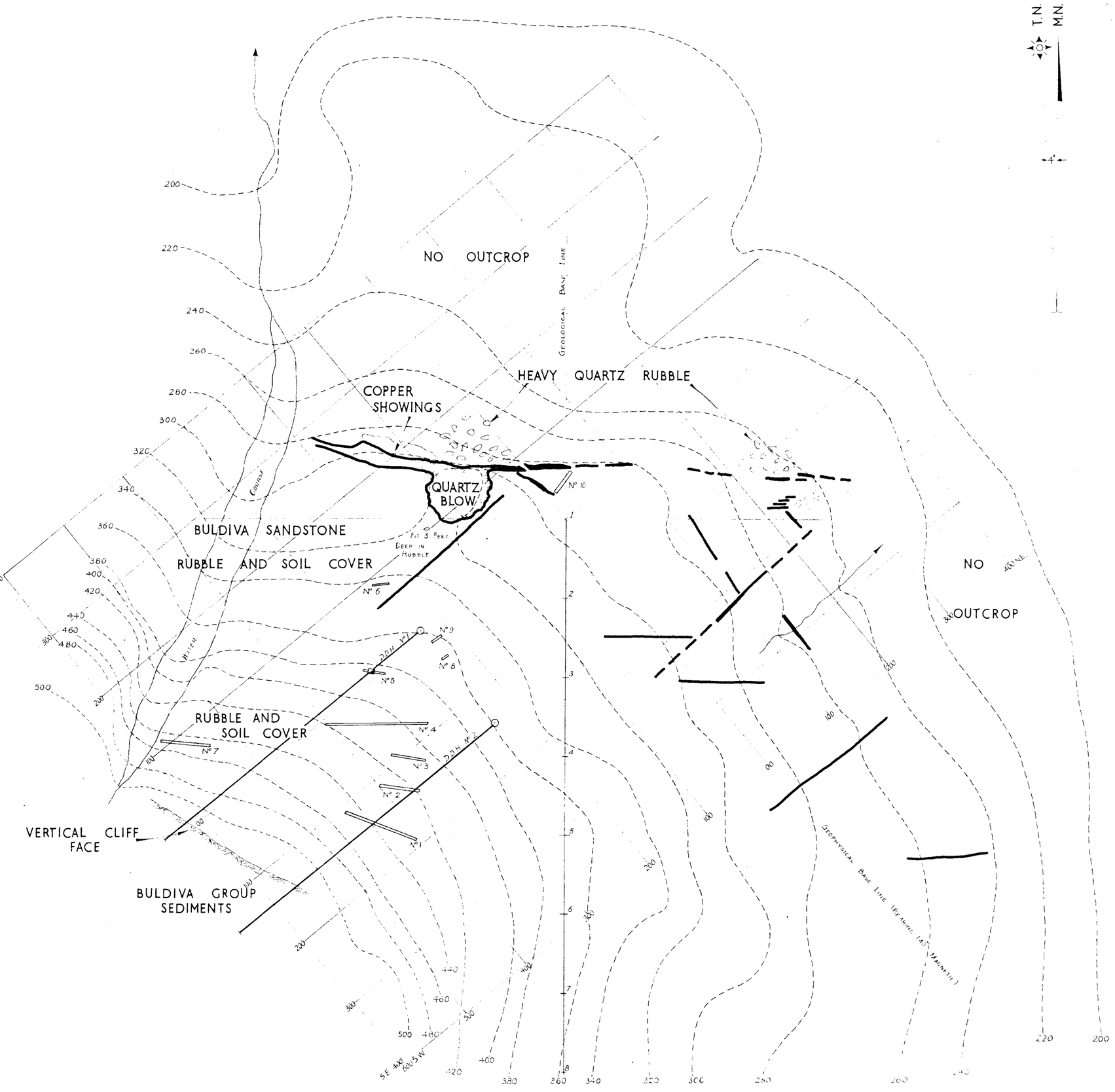
Scale in Miles

10 5 0 10 20 30 40

LOCALITY PLAN



POSITION OF AREA DEALT WITH IN REPORT AND REFERENCE TO AUSTRALIAN 4 MILE AND 1 MILE SERIES



SCALE IN FEET

100 0 100 200 300 400 500

LEGEND

- QUARTZ VEIN
- No 1 COSTEAN
- WATER COURSE
- 360 APPROXIMATE CONTOUR

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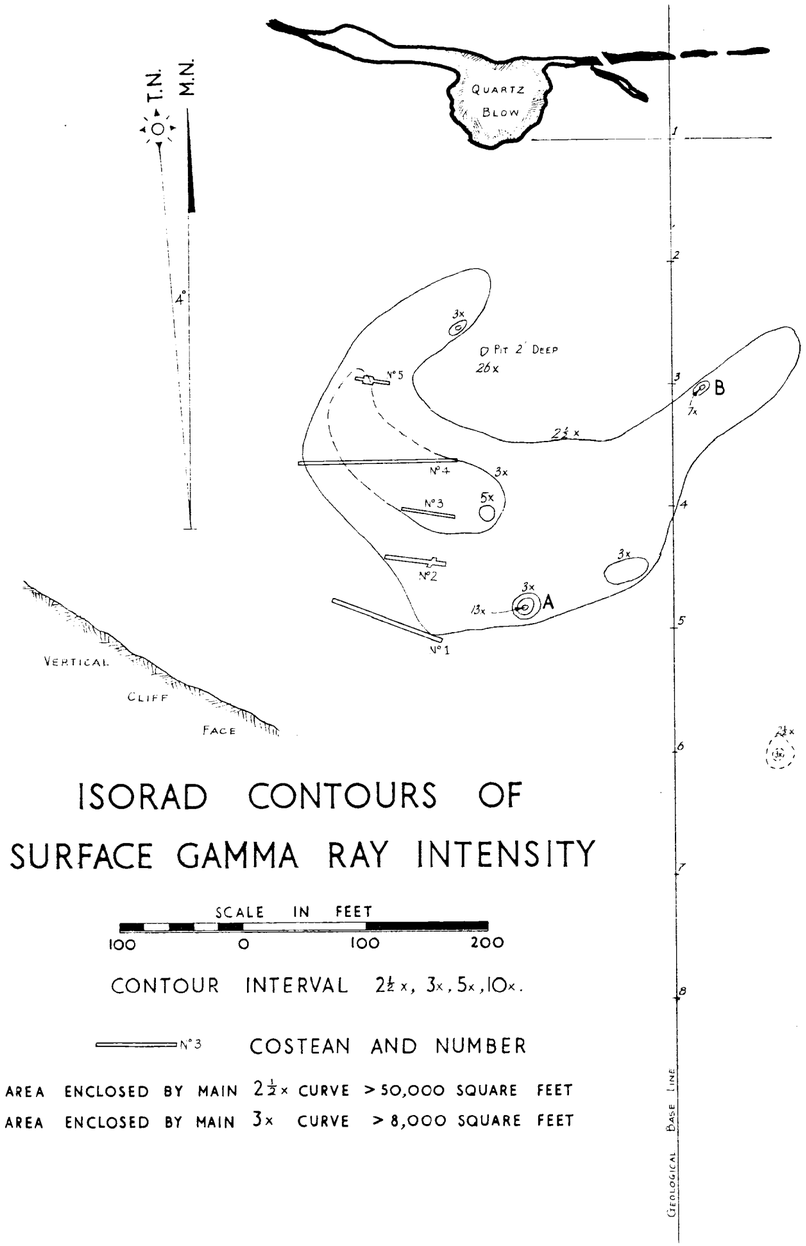
GEOPHYSICAL SURVEY AT

CORONATION HILL, N.T.

LOCATION AND GEOPHYSICAL GRID

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics

G 140-5



ISORAD CONTOURS OF SURFACE GAMMA RAY INTENSITY

SCALE IN FEET

100 0 100 200

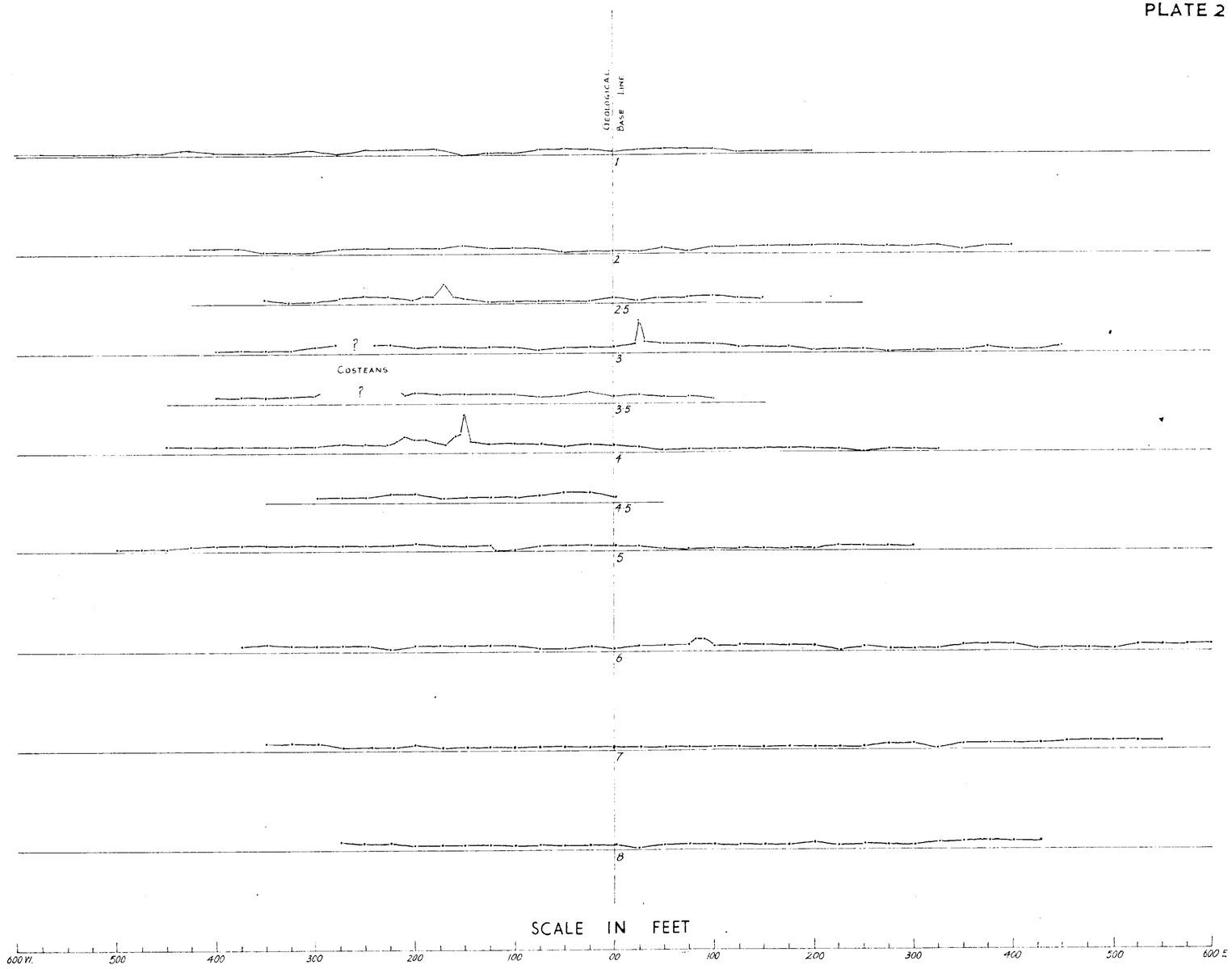
CONTOUR INTERVAL 2½x, 3x, 5x, 10x.

N°3 COSTEAN AND NUMBER

AREA ENCLOSED BY MAIN 2½x CURVE > 50,000 SQUARE FEET

AREA ENCLOSED BY MAIN 3x CURVE > 8,000 SQUARE FEET

Measurements taken with "Cintel" portable Geiger-Müller ratemeter Type 101 C, using Type G 24 H tubes.
Background taken as 6 microamps on "1" scale, equivalent to reading on barren quartz outcrop.



PROFILES OF SURFACE GAMMA RAY INTENSITY

VERTICAL SCALE $\frac{1}{10}$ INCH = 2 TIMES BACKGROUND COUNTS APPROXIMATELY

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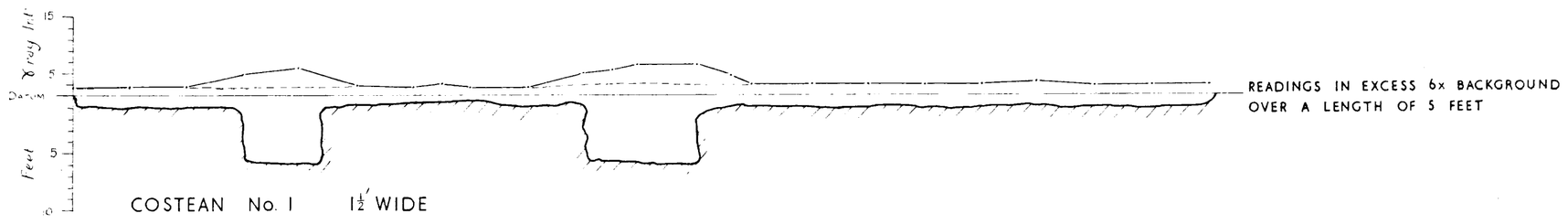
GEOPHYSICAL SURVEY AT CORONATION HILL, N.T.

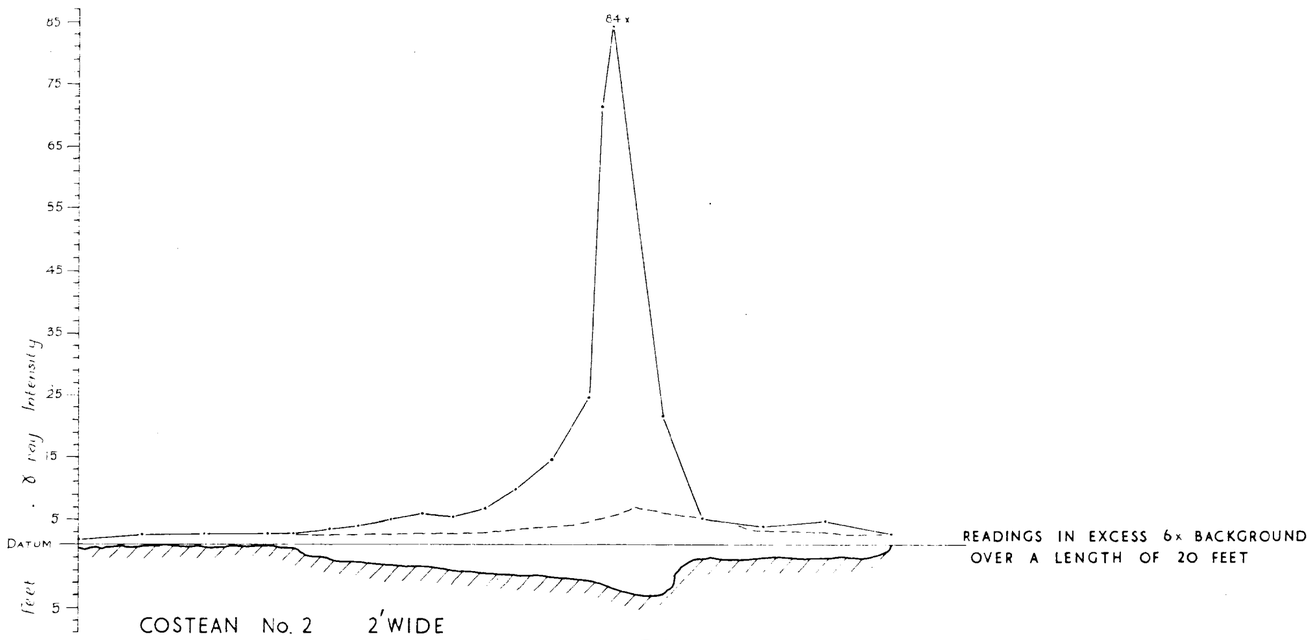
ISORAD CONTOURS AND PROFILES OF GAMMA RAY INTENSITY

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics

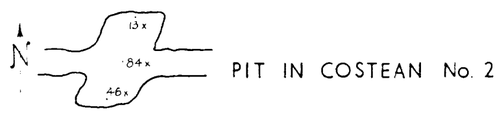
G140–8



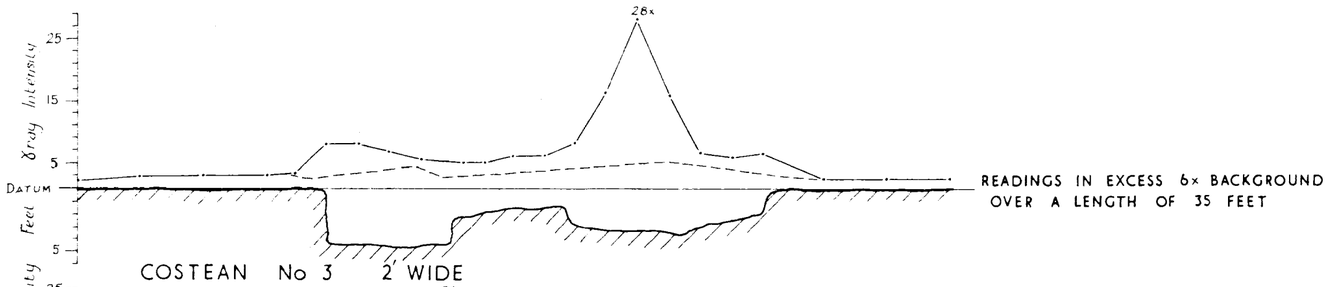
COSTEAN No. 1 $1\frac{1}{2}'$ WIDE



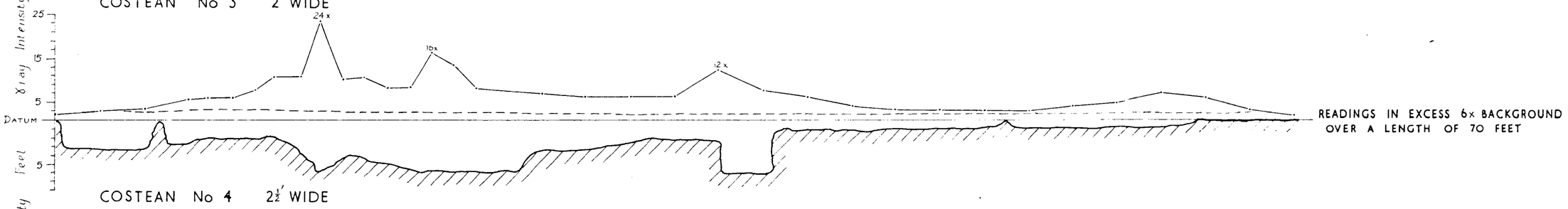
COSTEAN No. 2 2'WIDE



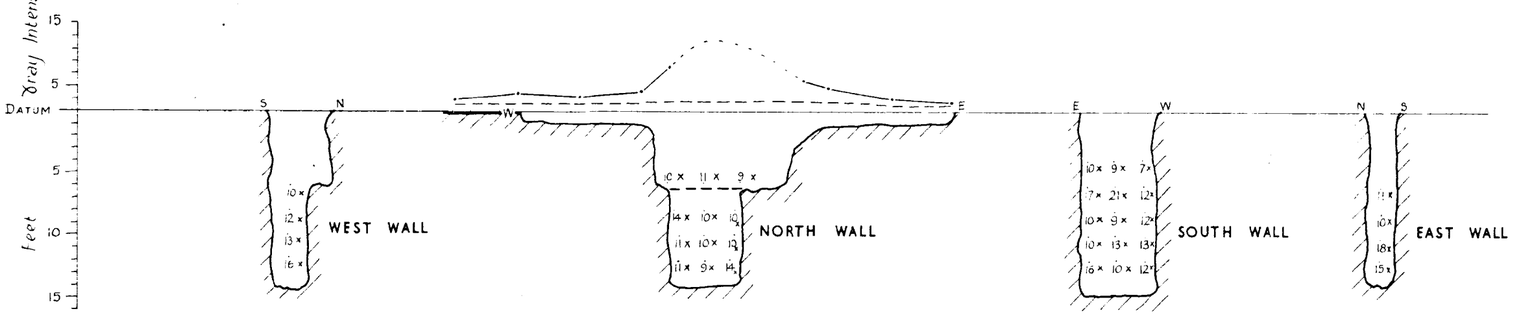
PIT IN COSTEAN No. 2



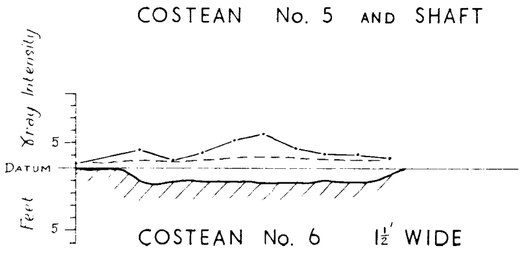
COSTEAN No 3 2' WIDE



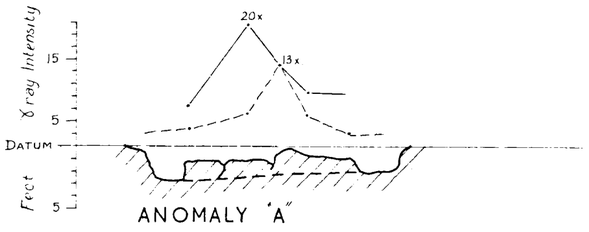
COSTEAN No 4 $2\frac{1}{2}'$ WIDE



COSTEAN No. 5 AND SHAFT



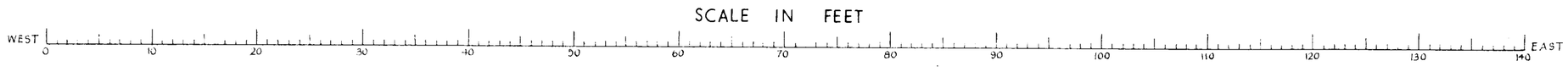
COSTEAN No. 6 $1\frac{1}{2}'$ WIDE



ANOMALY "A"

PROFILE OVER PARTLY EXPOSED BOULDERS
CONTAINING URANIUM MINERALISATION
AT POINT "A" (PLATE 2)

SCALE IN FEET



VERTICAL SCALE –: FOR EACH COSTEAN $\frac{1}{10}$ INCH = 2 TIMES BACKGROUND COUNTS (APPROX) ABOVE DATUM AND 1 FOOT DEPTH BELOW DATUM

·—·—·—· RADIOMETRIC PROFILE ALONG BOTTOM OF COSTEAN – – – – – ESTIMATED RADIOMETRIC PROFILE ALONG SURFACE BEFORE COSTEANING

Measurements taken with "Cintel" portable Geiger-Müller ratemeter Type 10W C, using type G 24 H tubes.
Background taken as 6 microamps on "C" scale, equivalent to reading on barren quartz outcrop.

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AS AT JULY 1953.

GEOPHYSICAL SURVEY AT CORONATION HILL, N.T.

RADIOMETRIC PROFILES OF COSTEANS

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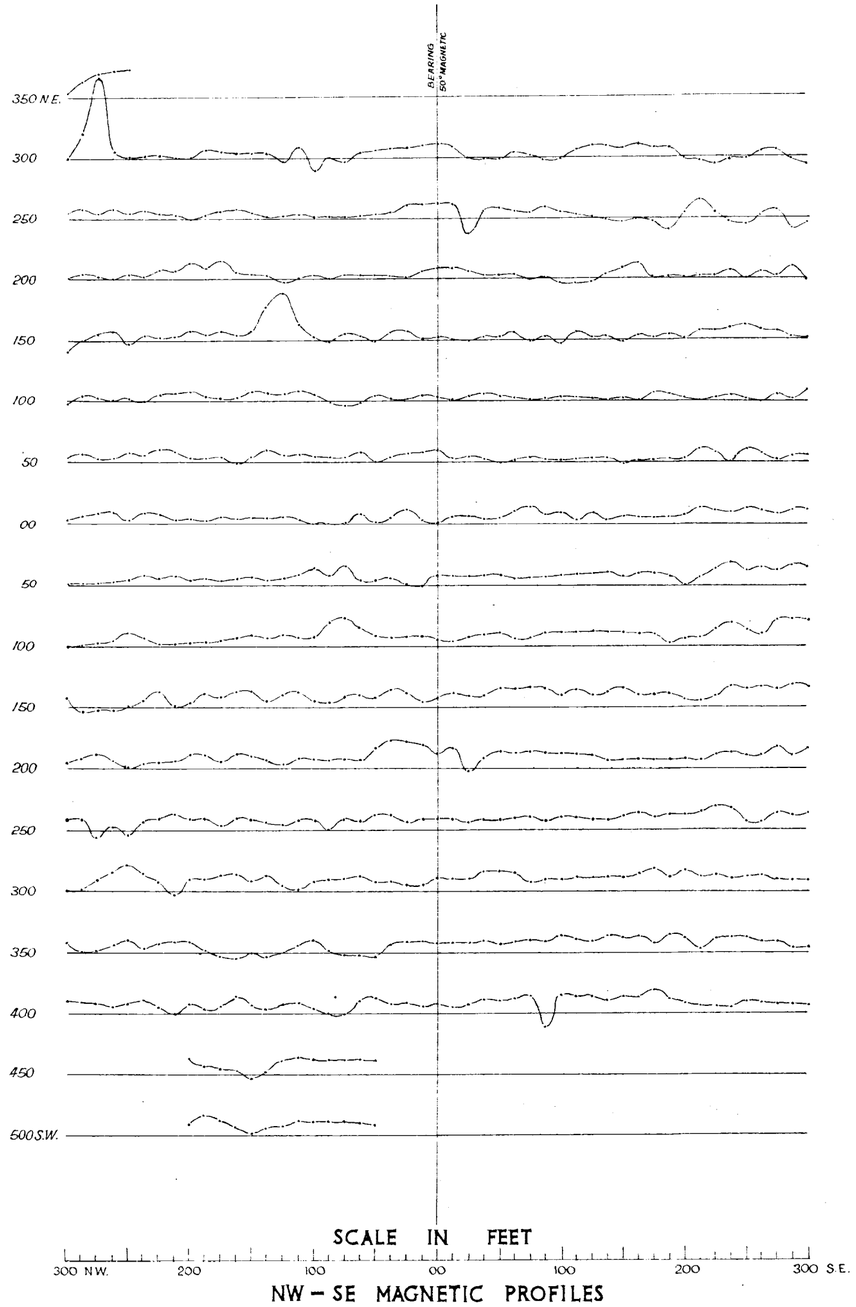
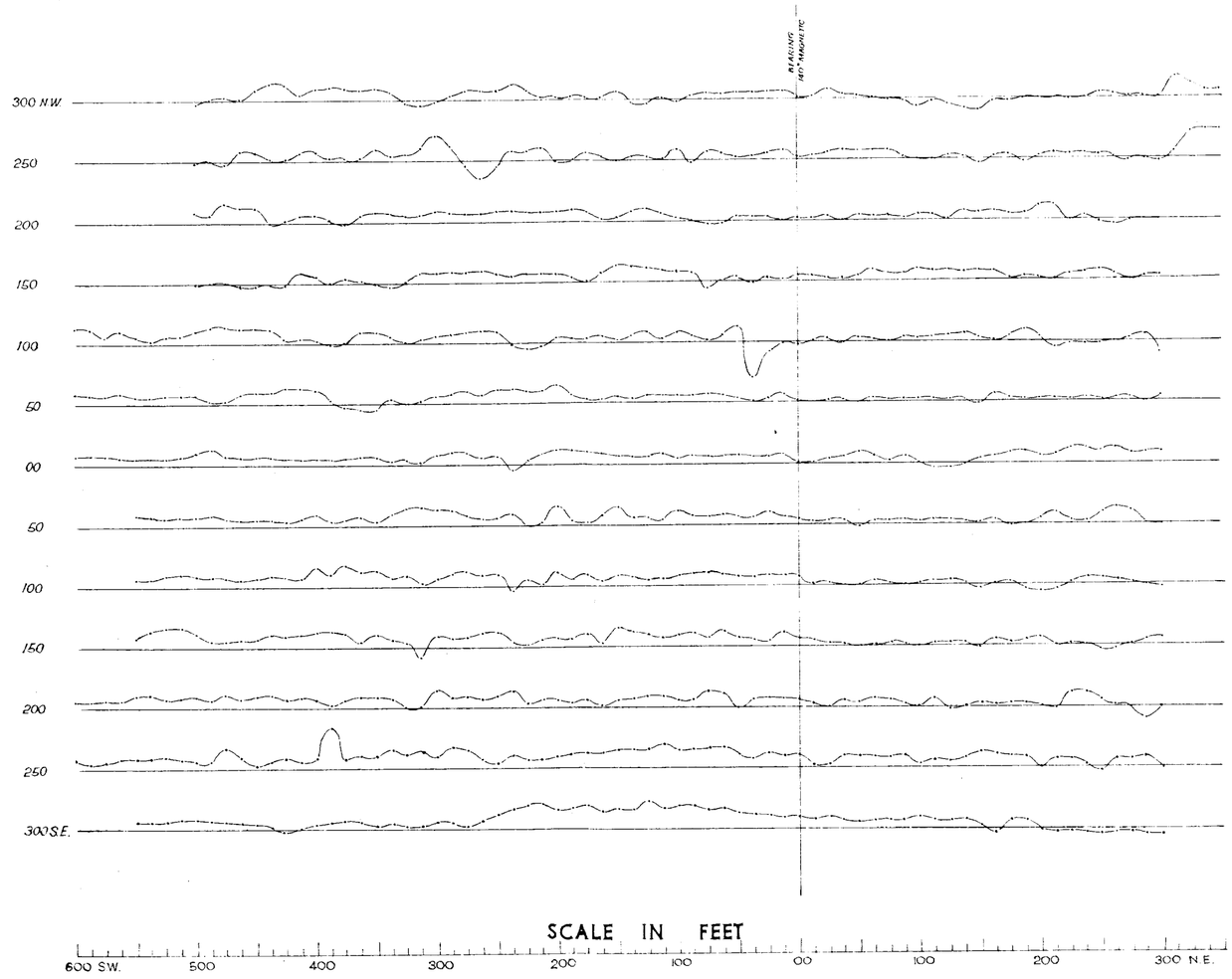
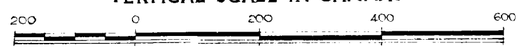


NW – SE MAGNETIC PROFILES



SW – NE MAGNETIC PROFILES

VERTICAL SCALE IN GAMMAS



GEOPHYSICAL SURVEY AT CORONATION HILL, N.T.

MAGNETIC PROFILES

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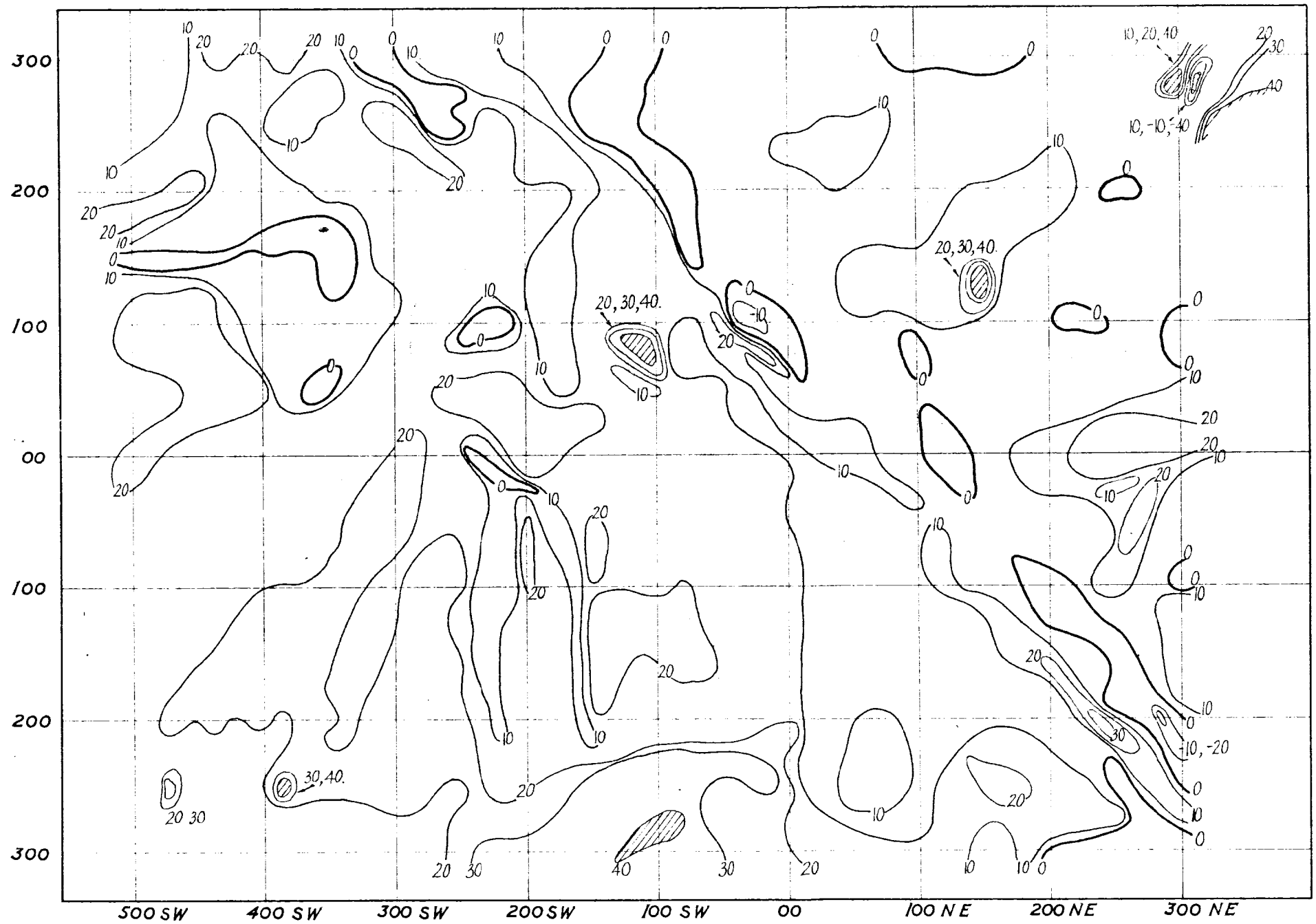
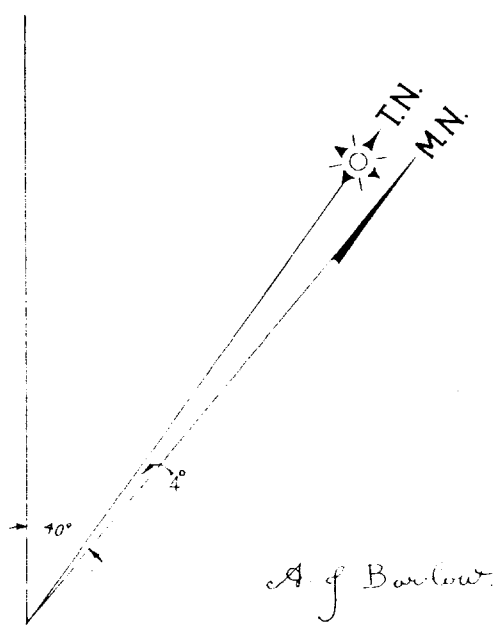
G140–6

PLATE 5





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GEOPHYSICAL SURVEY AT

CORONATION HILL N.T.

SHOWING

MAGNETIC CONTOURS

CONTOUR INTERVAL 10 GAMMAS

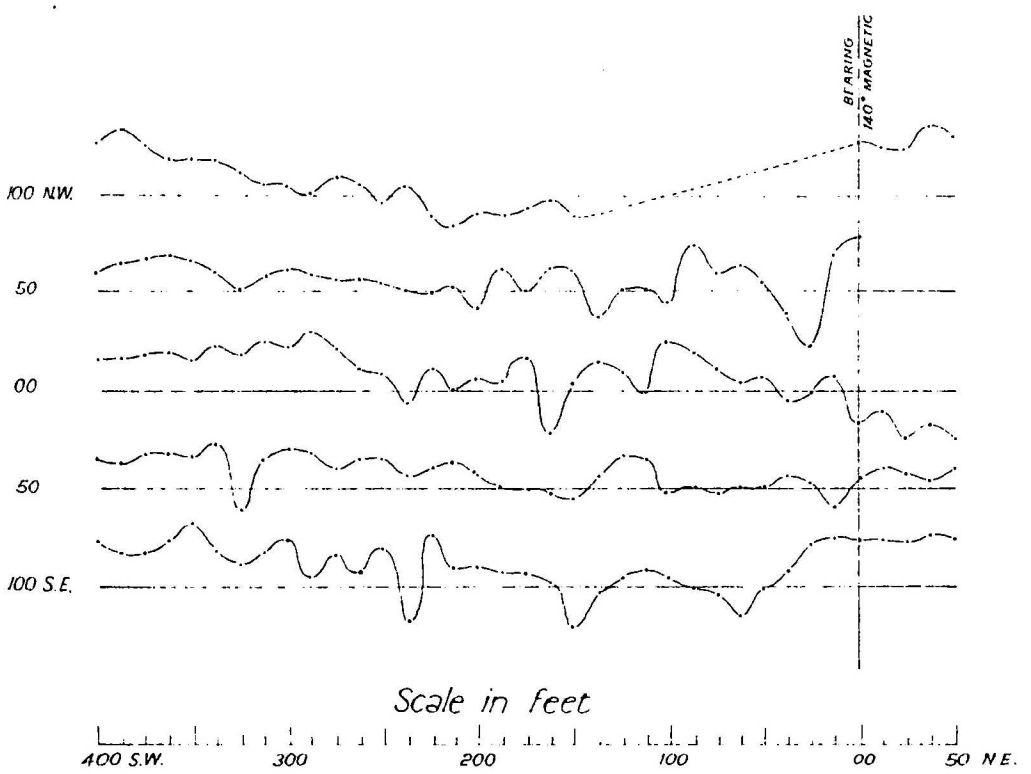
SCALE IN FEET

0 100 200 300 400

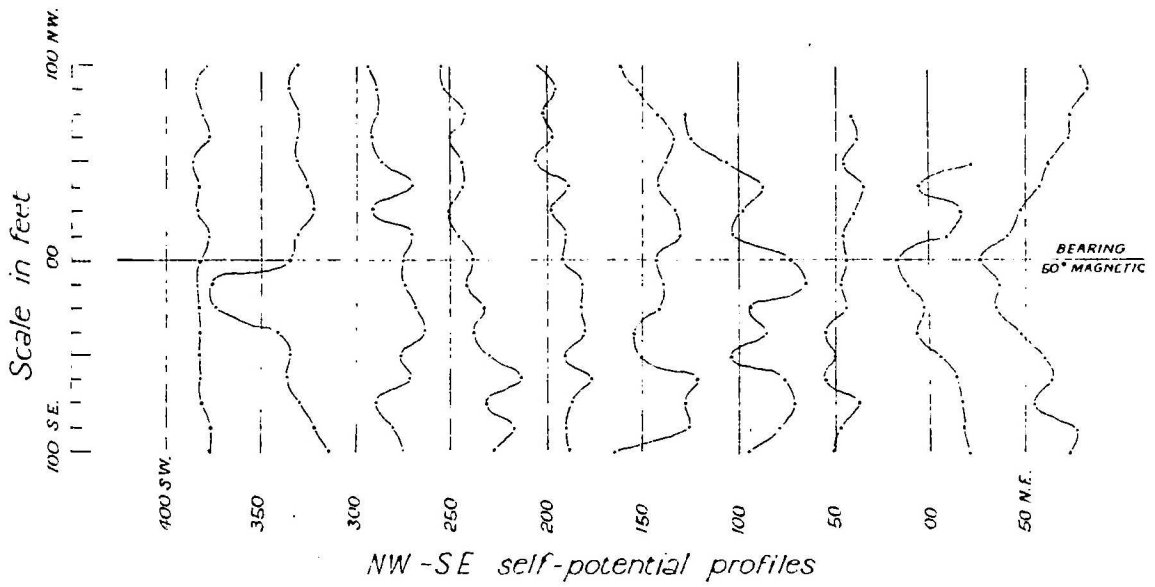
Magnetic High

G 140—4

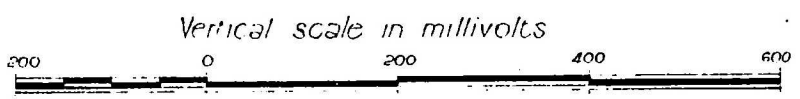
GEOPHYSICAL SECTION, BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS



S.W. - N.E. self-potential profiles



NW - SE self-potential profiles



GEOPHYSICAL SURVEY AT CORONATION HILL, N.T.

SELF-POTENTIAL PROFILES

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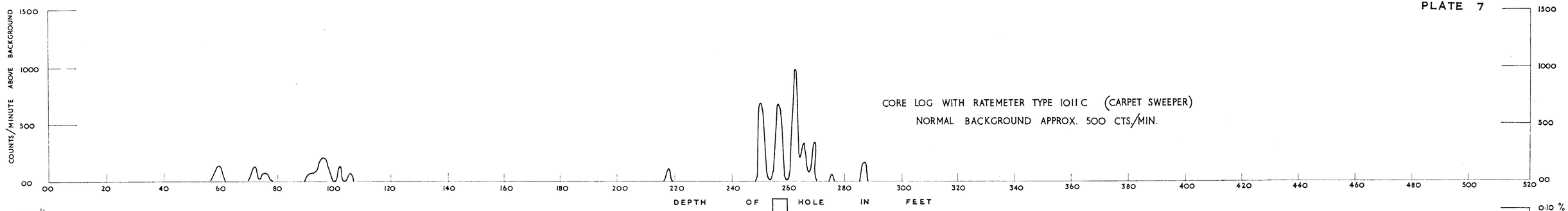
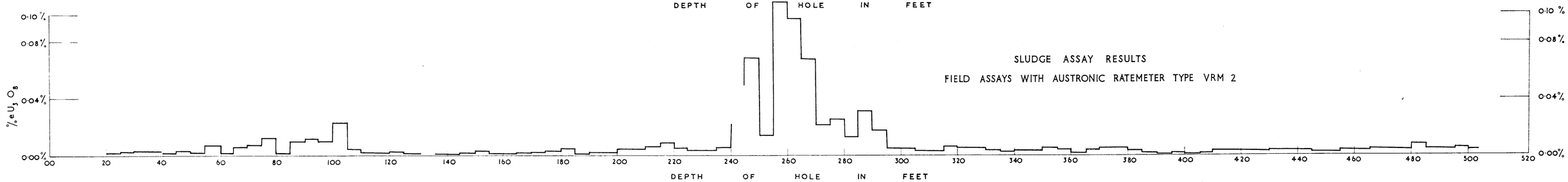
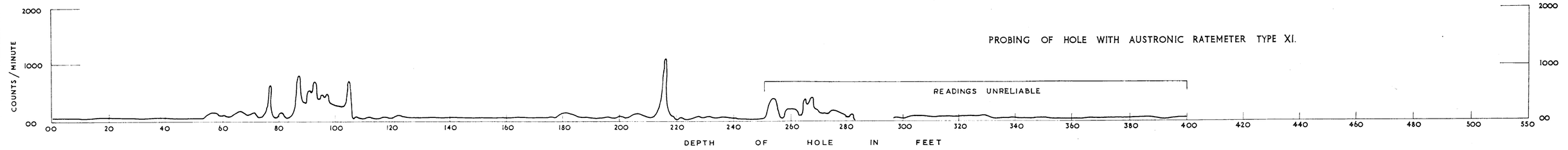
PLATE 7







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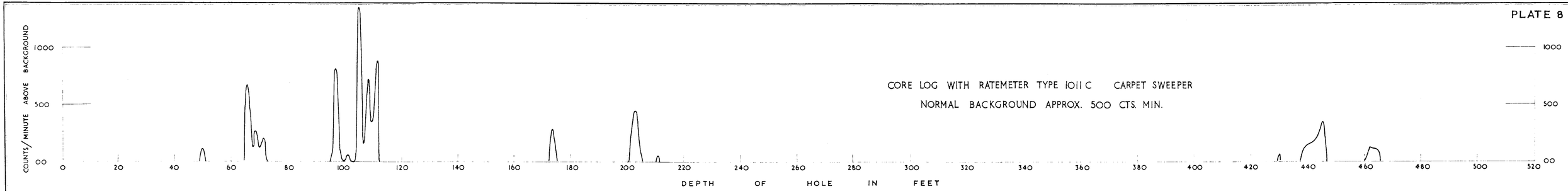
GEOPHYSICAL SURVEY AT CORONATION HILL N.T.

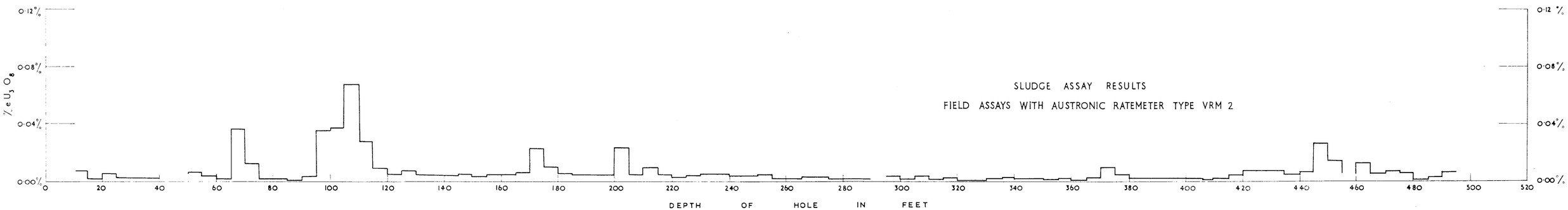
RADIOMETRIC PROFILES

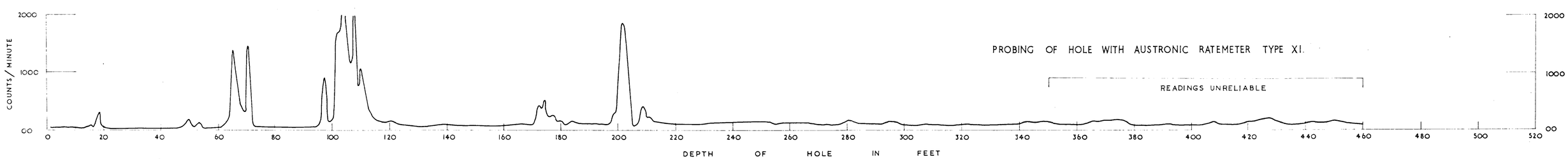
DIAMOND DRILL HOLE No. 1

Geophysical Section: Bureau of Mineral Resources, Geology and Geophysics. G 140-10

PLATE 8







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GEOPHYSICAL SURVEY AT CORONATION HILL N.T.

RADIOMETRIC PROFILES

DIAMOND DRILL HOLE No. 2

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