COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

RECORDS.

1955/83

GEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS AT THE GEORGE CREEK URANIUM PROSPECT, N.T.

by

J. B. Firman and G. F. Clarke

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CONTENTS.

SUMMARY

This report deals with geological and geophysical investigations of the George Creek Uranium Prospect, which is 80 miles by road south of Darwin, N.T.

The rocks, sandstone and siltstone, which form part of the east limb of a large north-plunging syncline, belong to the George Creek Formation of Lower Proterozoic Age.

The radioactive anomaly within the 3-times-background contour covers an area of 4 acres. Torbernite is found in weak shears, joints, and bedding-plane fractures at the surface. Torbernite and uraninite have been intersected by diamond drill holes. The uranium mineral intersected is below ore grade. Two more diamond drill holes have been recommended; one to test for primary uranium mineral vertically below the most highly mineralized outcrop, the other to test for an extension of uranium mineral below alluvium south-west of the most highly mineralized outcrop.

INTRODUCTION

The George Creek Radioactive Prospect is 80 miles by road south of Darwin, N.T. The nearest townsite is Adelaide River which is 7 miles north-north-west of the prospect. An all-weather track runs west for 400 yards from the Stuart Highway to the prospect.

The prospect was discovered by J. Rade, Geologist, Bureau of Mineral Resources, Geology and Geophysics, on 13th September, 1954. It was geologically mapped, and a radiometric grid and self-potential traverses were run, in the 1954 and 1955 field-seasons. J. B. Firman is responsible for the geology and G. F. Clarke for the geophysics.

GEOLOGY AND GEOPHYSICS.

The rocks in the prospect area belong to the George Creek Formation of Lower Proterozoic Age, and form part of the east limb of a large north-plunging syncline. The contact between the George Creek Formation and the underlying Burrell Formation lies east of the prospect.

Rock-types and structures

The rocks are part of a conformable sequence of sandstone and siltstone which strikes north-east and dips north-west at a moderate angle. The sandstone (quartz greywacke ?) is greyish-brown in outcrop and contains small amounts of mica and clay in some places. The siltstone is dark grey with light grey bands and is micaceous in places.

A complex joint system with a dominant north-east trend and a steep dip is the most prominent structural feature. Steeply dipping shears which are thin, irregular, and discontinuous form a shear zone which trends north-east for a distance of 320 feet. Uranium mineral occurs in and adjacent to the shears (Plate 2).

Radioactivity and mineralization

A radiometric contour map shows a radioactive anomaly over the area contained within the 3-times-background contour (Plate 3). Within this area there are four high spots. Pits and costeans put down on "highs" 1, 2, and 3 revealed torbernite on shears, joints, and bedding-plane fractures.

Self-potential traverses

The graph of self-potential traverses is shown on Plate 8. The profiles are so irregular that no reliable interpretation can be made. However, they are comparable to results obtained in an area in which accumulation of salts or ions in the rubble causes near-surface disturbances.

Diamond drilling and radiometric logging

Diamond Drill Hole No. 1 (Plate 4). Three relatively high counts were recorded during probing. The first extends from 29 to 37 feet where counts equivalent to 0.04 percent eU_3O_8 were recorded. Tight unmineralized fractures were intersected at this depth. The second extends from 69.5 feet to 70.5 feet where counts equivalent to 0.13 per cent eU_3O_8 were recorded. A tight fracture coated with torbernite was intersected at 67 feet. The third extends from 108 feet to 109 feet where counts equivalent to 0.3 percent eU_3O_8 were recorded. Irregular fractures coated with pitchblende, pyrite, chalcopyrite, and quartz were intersected at this depth.

A mineragraphic report on some mineralized portions of the drill core is included as Appendix 2. No lode which could be profitably mined was intersected in this drill hole.

Drill core assay results are listed in Appendix 1.

Diamond Drill Hole No. 2 (Plate 4). Relatively high counts equivalent to 0.16 percent eU_3O_8 were recorded between 48 feet and 56 feet. The counts between 48.5 and 49 feet are equivalent to 1.00 percent eU_3O_8. A weak fracture containing torbernite and iron oxide was intersected at 49 feet and another containing torbernite at 54 feet. No lode which could be profitably mined was intersected in this drill hole.

Diamond Drill Hole No. 3 (Plate 5). Relatively high counts were recorded between 142 and 149 feet. These counts are equivalent to 0.04 percent eU_3O_8. The weak fractures intersected at this depth contain quartz and iron and, on one weak fracture, small platy crystals of a pale green mineral which may be torbernite. Relatively high counts were recorded between 310 feet and 313 feet. These counts are equivalent to 0.05 percent eU_3O_8. No lode which could be profitably mined was intersected in this drill hole.

Diamond Drill Hole No. 4 (Plate 6). Radiometric probing indicates two places in the drill hole with relatively high radioactivity. The first extends from 60 to 101 feet, where counts equivalent to 0.06 percent eU_3O_8 were recorded. The portion from 80 feet to 85 feet gave counts equivalent to 0.23 percent eU_3O_8, but the drill core shows a thin irregular fracture containing pitchblende, torbernite, pyrite, quartz, and clay gouge extending from 83 feet to 85.5 feet. The fracture is sub-parallel to the drill hole and the true width of the mineralized fracture is probably less than 2 inches.

The second high count, which extends from 272 feet to 273.5 feet, is equivalent to 0.11 percent eU_3O_8. A thin quartz-filled fracture was intersected at 273 feet. No lode which could be profitably mined was intersected in this drill hole.

CONCLUSIONS AND RECOMMENDATIONS

Geological mapping, radiometric gridding, pitting and costeaning, and diamond drilling of the shear zone at shallow depth show that the secondary uranium mineral torbernite occurs in bedding-plane fractures, joints, and shears adjacent to the north-east trending shear zone. The areas of secondary mineralization correlate closely with the three radiometric "highs".

A shallow shaft could be put down on radiometric "high" No. 3 to define the type and persistence of mineralized structures in the secondary zone.

The irregularities of the self-potential profiles may indicate near-surface disturbances, but no definite conclusions can be drawn.

The diamond drill holes did not intersect strong fractures or uranium mineral which could be profitably mined. However, the intersections in the mineralized zone are all close to the surface and more drill holes are required to test for primary uranium at depth. Drill intersections to test the deposit at depth and to test for an extension of uranium mineralization under alluvium south-west of the prospect are shown on Plate 7. Proposed Diamond Drill Hole No. 5 intersects the shear zone at a vertical depth of 165 feet below the most highly mineralized outcrop. Any uranium mineral at this depth should be primary because weathering decreases below 100 feet in the drill core and because primary mineral has been found in the drill core at a vertical depth of 108 feet. This drill hole has first priority. Proposed Diamond Drill Hole No. 6 intersects the shear zone at a vertical depth of 50 feet beneath alluvium 145 feet south-west of the most highly mineralized outcrop.

Systematic radiometric prospecting of the entire reserve is desirable.

If the recommended programme of drilling, shaft-sinking, and radiometric prospecting is carried out definite conclusions can be made regarding the future of the reserve.

APPENDIX 1

DRILL CORE ASSAY RESULTS

Drill Hole No.	Depth From Feet	Depth From Inches	Depth To Feet	Depth To Inches	Percent eU_3O_8
1	29	-	33	-	0.02
2	42	-	42	7	0.02
"	42	7	43	-	0.01
"	43	-	43	9	0.02
"	43	9	44	8	0.02
"	44	8	45	2	0.01
"	45	2	45	10	0.04
"	45	10	46	10	0.02
"	46	10	47	3	0.05
"	47	3	48	3	0.03
"	48	3	49	2	0.33
"	49	3	49	6	0.37
"	49	5	49	9	0.08
"	49	9	51	-	0.05
"	52	-	53	9	0.1
"	53	9	56	9	0.12
3	109	-	110	6	0.01
"	151	8	153	9	0.01
4	80	-	83	-	0.03
"	83	-	85	6	0.21

APPENDIX 2

EXAMINATION OF DRILL CORE SPECIMENS FROM GEORGE CREEK, N.T.

by

W. M. B. Roberts

D.D.H.1 60 feet Sample B7643:

A scraping of the pinkish material from the surface of this specimen was tested for cobalt, and gave a negative result. However, the material gave a strong test for iron, and is probably one of the hydrated oxides of this element.

D.D.H.1 108 feet Specimen B7645:

A test on the greyish coating in the vertical fissure in this sample gave a negatige result for cobalt and manganese, and a very faint positive test for copper and iron. The black veins on the less fractured end of the core gave a very strong sodium uranyl acetate test and this, coupled with a counter of 3,500 on the Austronic B.G.R.I. Geiger Counter, definitely indicates sooty pitchblende.

D.D.H.1 108 feet 6 inches Sample B7644:

Contains elongated irregular areas of a black, rather brittle material, measuring up to 3.0 cm. in length. The polished section showed these to be isotropic, a medium bluish grey, showing in some cases a brownish internal reflection, and a medium reflectivity.

Etched with HNO_3, the material effervesced and stained black; $FeCl_3$ stained slightly and pitted the surface. A grain taken from the surface was brought into contact with a mixture of sodium and zinc acetates and a large quantity of sodium uranyl acetate tetrahedra separated from the solution; this, the behaviour of the mineral to HNO_3 and $FeCl_3$, and its optical characteristics, show the mineral to be pitchblende I.

Enclosed within the pitchblende are small euhedral crystals of pyrite, measuring from 0.016 to 0.18 mm.

APPENDIX 3

GEOPHYSICAL METHODS

by

G. F. Clarke

Radiometric Grid Survey

A base line 600 feet long and bearing 350°M was laid along the estimated strike of the beds. Cross traverses were run at 25' intervals for a total distance of 600 ft. By carrying a Harwell Carpet Sweeper type 1011B Geiger Counter along these traverses integral multiples of the background count of the instrument were recorded. This background was 250 cpm. A radiometric contour map was drawn and superimposed on a geological map of the area (Plate 3).

Self-Potential Survey

Using the baseline of the radiometric grid, cross tranverses were run at 100 feet intervals, and readings taken every 10 feet. The instrument used was the standard potentiometer circuit as supplied from the Footscray Laboratory.

Difficulty was experienced in obtaining constant readings from day to day, so it was decided to run six cross traverses at 100-foot intervals and one traverse along the baseline, and complete the work in one day. As was expected the results were erratic and do not agree with those obtained by Barlow (Plate 3) towards the end of the 1954 field season.

This is understandable if the conclusions reached in the text regarding near-surface disturbances are correct.

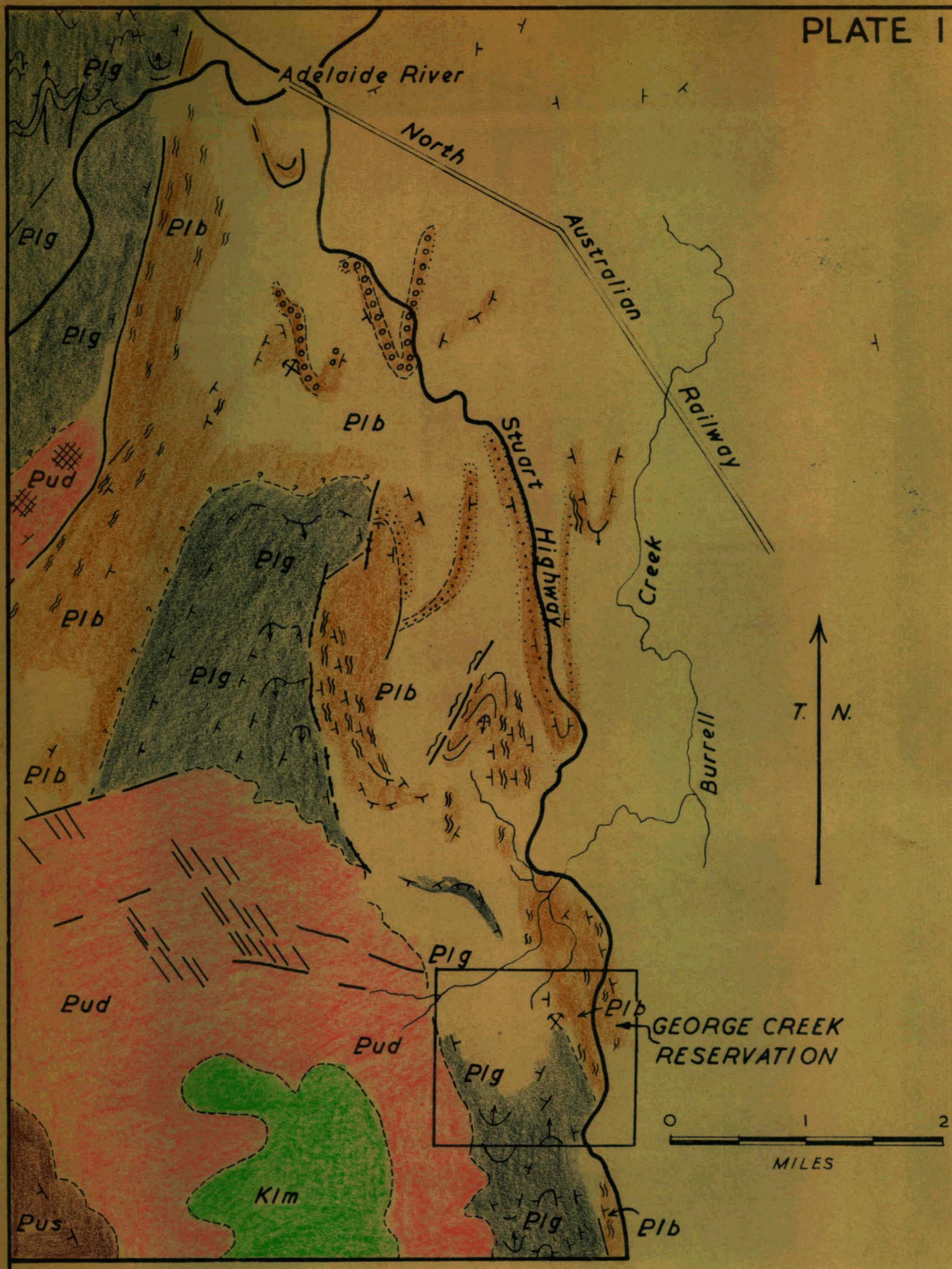
APPENDIX 4

DRILL DATA.

DRILLING DATA GEORGE CREEK, N.T. 1955 (EDECO DRILLS)

Drill Hole No.	R. L. (Feet)	True Bearing	Depression (Degrees)	Drill Depth (Feet)	Footage Drilled (Per week)
1	162	-	Vertical	143	71
2	162	060	30	351	58
3	202	070	45	367	60
4	160	290	45	301	75

PLATE 1



Lower Cretaceous	Klm	Mullaman Group
Lower Cambrian or Upper Proterozoic	Pus	Stray Sandstone
	Pud	Depot Sandstone
Lower Proterozoic	Plg	George Creek Formation
" "	Plb	Burrell Formation. Brocks Creek Group

- Geological boundary.
- Dip & strike
- Fault
- Quartz filled fault
- Uranium Mine or Prospect
- Shear
- Outcrop boundary
- Probable geological boundary

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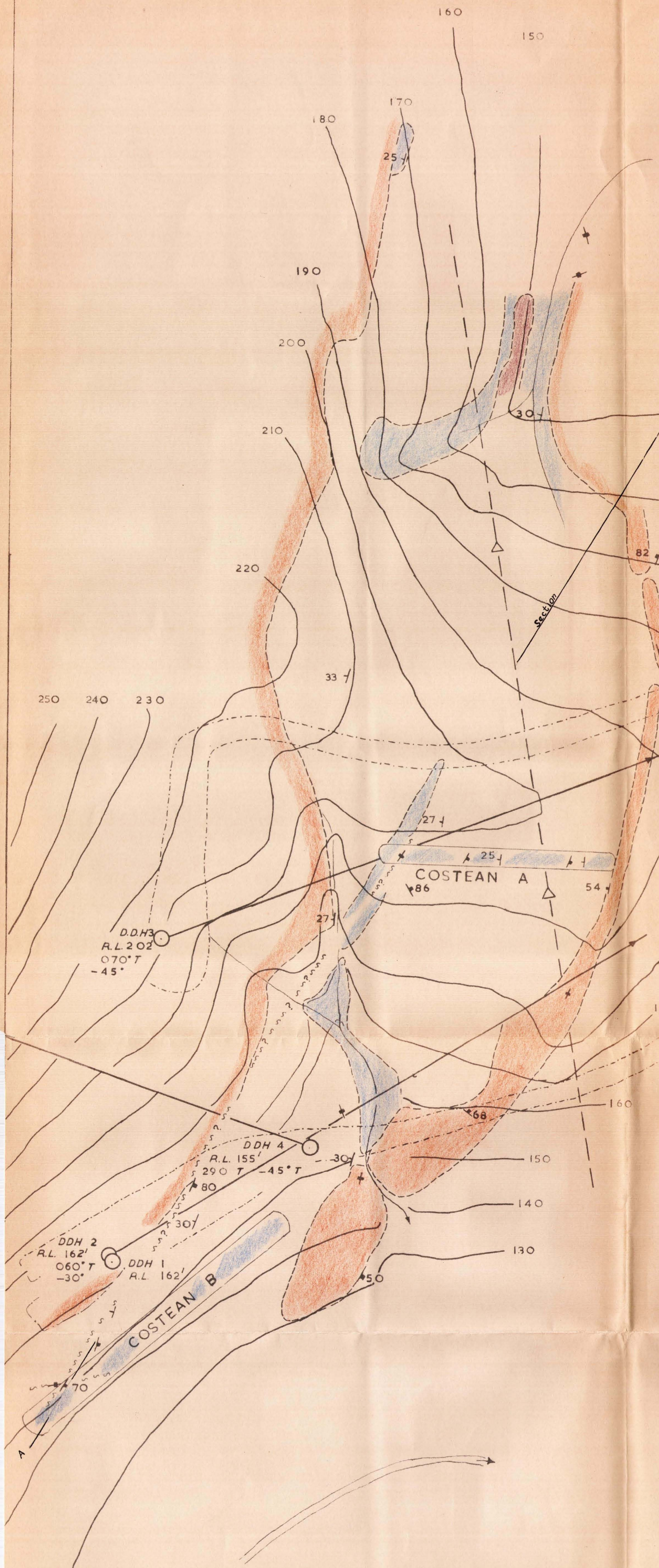
LOCALITY PLAN
OF

GEORGE CREEK PROSPECT N.T.

PLATE 2



GEORGE CREEK FORMATION

REFERENCE

- GREYISH BROWN SANDSTONE_MICACEOUS IN PLACES
- DARK GREY SILTSTONE WITH LIGHT GREY BANDS
- GREYWACKE
- GEOLOGICAL BOUNDARY
- STRIKE & DIP
- BED
- FRACTURE—INCLINED
- " VERTICAL
- SHEAR
- 200 TOPOGRAPHIC CONTOUR
- BASE - LINE
- COSTEAN
- DIAMOND DRILL HOLE
- TRACK
- CREEK

4° 15'

T M

FEET

0 40 80 120 160

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GEOLOGICAL PLAN

Radioactive Prospect near

GEORGE CREEK N.T.

DEL. J.B.F.

JUNE 1955

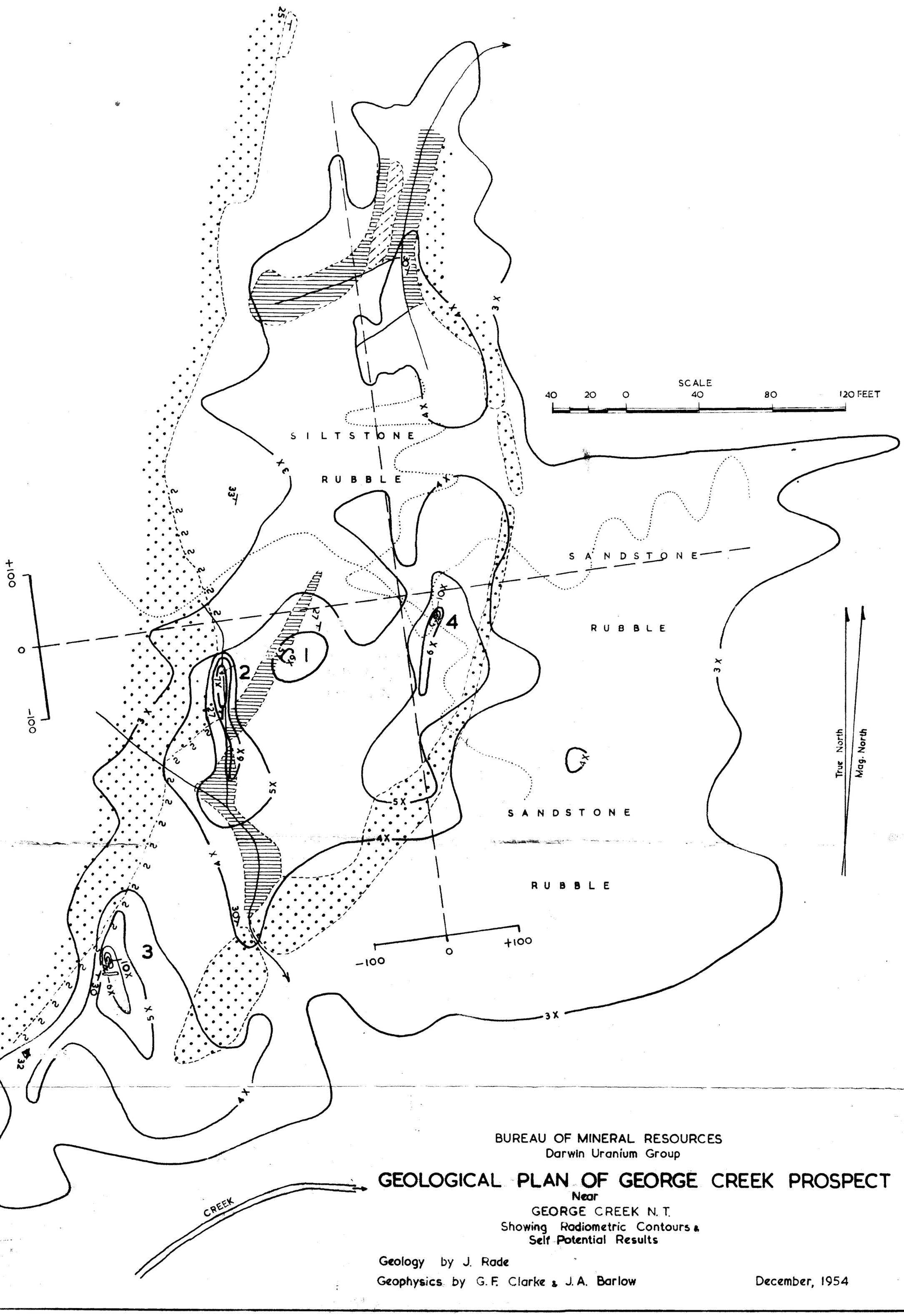
PLATE 3

REFERENCE

—6X— RADIOMETRIC CONTOUR

..... SELF POTENTIAL PROFILE

| RADIOACTIVE HIGH



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GEOLOGICAL PLAN OF GEORGE CREEK PROSPECT

Near

GEORGE CREEK N. T.

Showing Radiometric Contours & Self Potential Results

Geology by J. Rade

Geophysics by G. F. Clarke & J. A. Barlow

December, 1954

PLATE 4

060° T

240° T

D.D.H. 1
R.L. 162'
VERTICAL
&
D.D.H. 2
R.L. 162'
-30°

C.P.M.
1000 2000 3000 4000 5000

DEPTH IN FEET

Shear

6' WIDE
45° TO HOLE

brecciated

TO 14500

TO 10100

TO 8200

pt. p. ch. q

DEPTH IN FEET

REFERENCE

- SOIL
- DARK GREY SILTSTONE WITH LIGHT GREY BANDS
- GREY SANDSTONE
- GREY SANDSTONE WITH BANDS OF SILTSTONE

pt PITCHBLENDE
t TORBERNITE
p PYRITE
ch CHALCOPYRITE
fe IRON OXIDE
q QUARTZ

FRACTURES

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SECTION THROUGH DIAMOND DRILL HOLES 1 & 2

at

George Creek
N.T.
Geology J.B. Firman
Geophysics J.B. Misz

0 10 20 30 Feet

July 1955

PLATE 5

250T°

070T°

D.D.H. 3
R.L. 202
-45°

Costean exposing dark grey siltstones with light grey bands

Sandstone outcrop

Shear

Sandstone outcrop

←C.P.M.→ 2000

0

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330

DEPTH IN FEET

fe fe fe fe fe fe, q q q, fe q t q, fe q q, fe q, fe q, fe q q q q

REFERENCE

- Grey sandstone
- Siltstone
- Dark grey siltstone with light grey bands
- Grey sandstone with bands of silstone
- Fracture
- t Torbernite
- p Pyrite
- fe Iron oxide
- q Quartz

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SECTION THROUGH DIAMOND DRILL HOLE No. 3

AT
George Creek
N. T.
Geology J. B. Firman
Geophysics G. F. Clarke

0 10 20 30
FEET
July, 1955.

4000 C.P.M.
q, p

←C.P.M.→ 1000

330 340 350 360

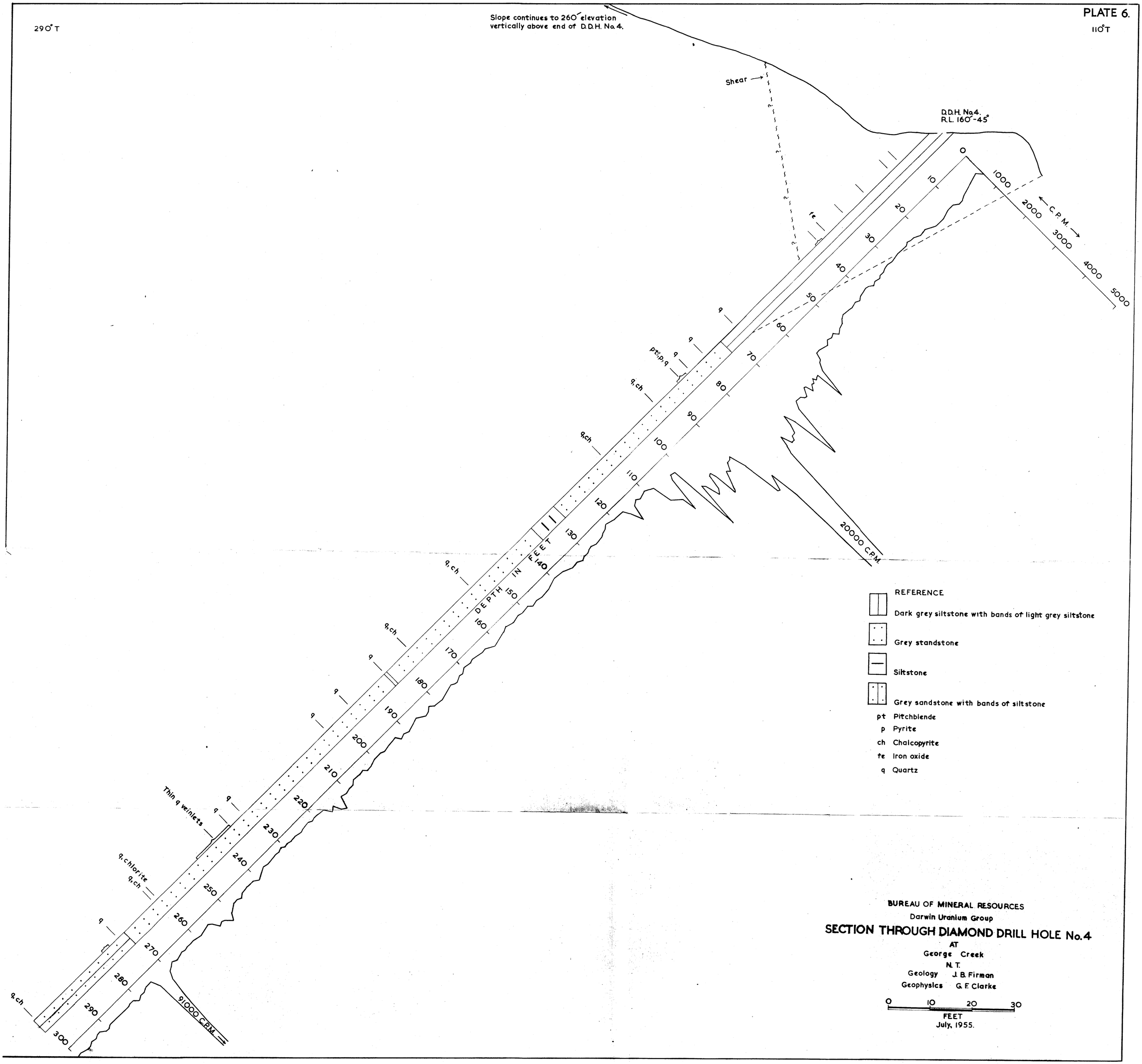
q

PLATE 6.

290°T

110°T

Slope continues to 260' elevation vertically above end of D.D.H. No. 4.



REFERENCE

- Dark grey siltstone with bands of light grey siltstone
- Grey standstone
- Siltstone
- Grey sandstone with bands of siltstone

pt Pitchblende
p Pyrite
ch Chalcopyrite
te Iron oxide
q Quartz

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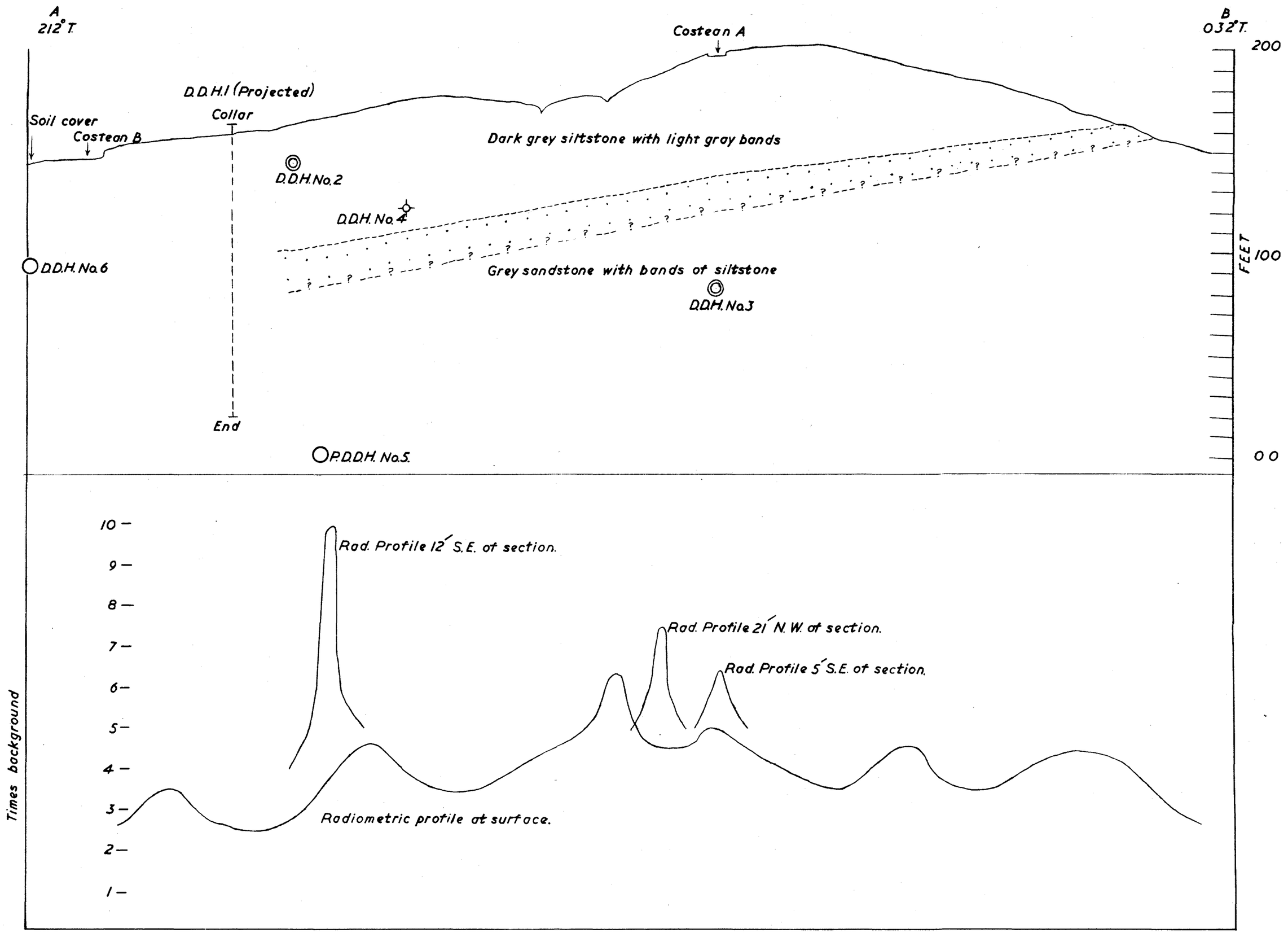
SECTION THROUGH DIAMOND DRILL HOLE No.4

AT
George Creek
N. T.
Geology J. B. Firman
Geophysics G. F. Clarke

0 10 20 30
FEET
July, 1955.

PLATE 7



Grey sandstone (lower bed)

Drill hole intersection from N.W. side

Drill hole intersection from S.E. side

Intersection of proposed D.D.H.

Vertical longitudinal section A-B along shear zone (shear zone assumed vertical) showing lithology, drill hole intersections and proposed drill holes.

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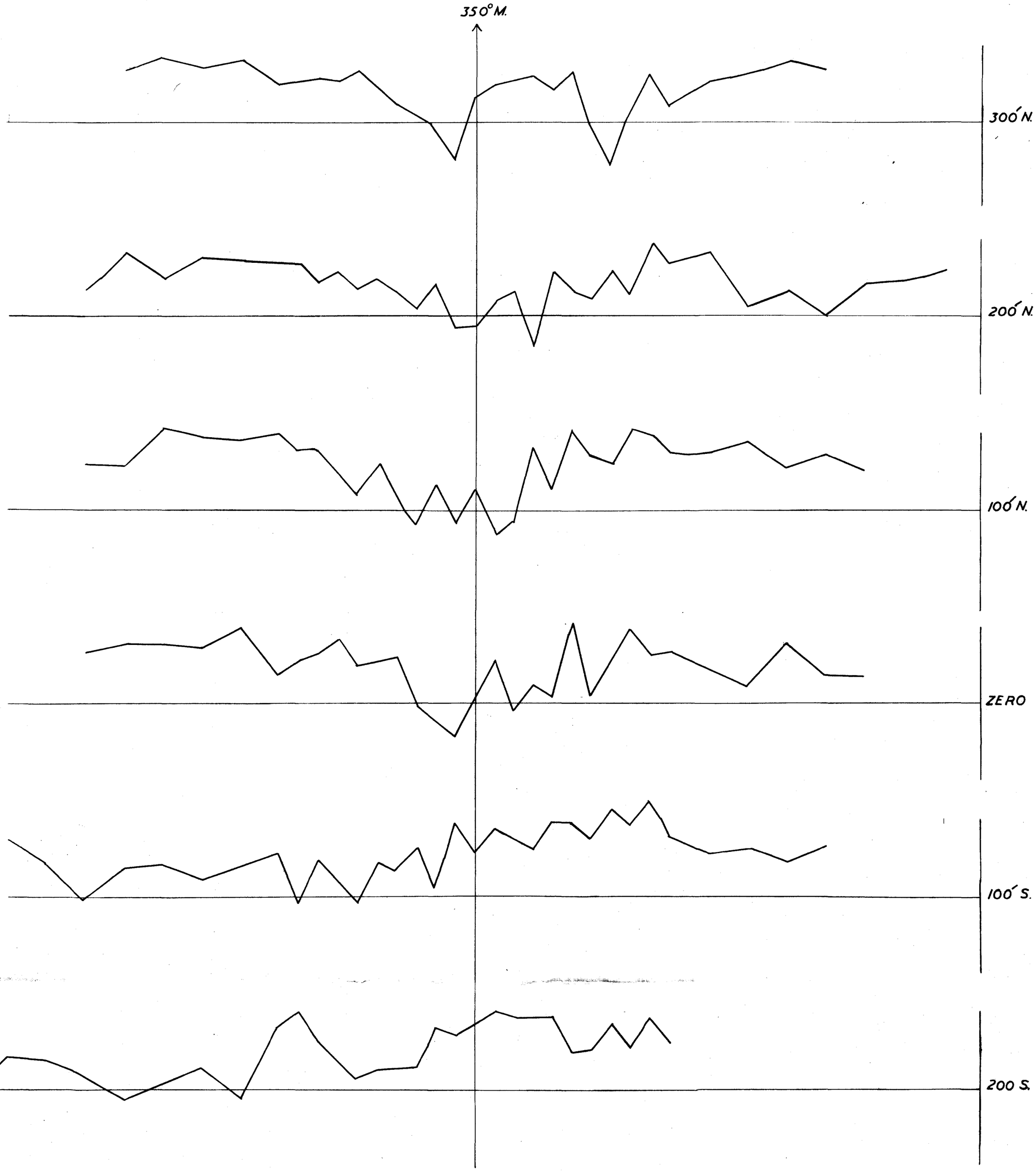
Darwin Uranium Group
J. B. Firman. July, 1955.

40 0 40 80
FEET

PLATE 8



Self potential profile
George Ceek Prospect N. T.

Horizontal scale 1"= 40'
Vertical scale 1"= 100' millivolts

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Darwin Uranium Group
G. F. Clarke April, 1955.