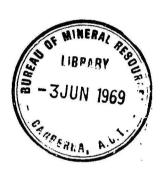
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DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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THE GEORGE CREEK RESERVE

AND URANIUM PROSPECT NORTHERN TERRITORY

by

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GEGPHYSICAL LIERARY
Ref.

Records No. 1956/67

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SUMMARY

The George Creek Reserve, situated adjacent to the Stuart Highway 80 miles south of Darwin, encloses the area surrounding a uranium prospect discovered in 1954. The reserve was investigated by geological mapping, radiometric gridding, and diamond drilling. Westerly dipping Depot Sandstone crops out in the west, unconformably overlying folded greywacke and siltstone of the Burrell Creek Formation, which occupies the greater part of the reserve. No indications of uranium were discovered outside the original prospect area.

Seven holes were drilled on the prospect. One of these intersected 54 feet of mineralized rock. The radiometric assays of this section averaged 0.09% e U308. The mineralization is in the form of pitchblende, torbernite and autunite in or adjacent to fractures and is associated with quartz veining.

The surface geology and the diamond drilling results do not give a clear picture of the outline of the mineralized zone at depth. In preference to further diamond drilling, the sinking of a prospecting shaft on the zone of mineralization is recommended

INTRODUCTION

The George Creek Reserve is a rectangular area of 2 square miles astride the Stuart Highway south of Darwin between the 80 mile peg and George Creek (Plate I), where uranium mineralization was discovered by J. Rade, a geologist of the Bureau of Mineral Resources, in September 1954. This report deals with the results of geological mapping and radiometric gridding carried out during an investigation of the area, and discusses the results of 7 diamond drill holes bored to test the mineralization at the shallow depth.

The greater part of the geological mapping of the Reserve was carried out by the author during the months of November-December 1955, following some preliminary mapping around the prospect area undertaken by Bureau field staff a year earlier prior to the start of diamond drilling. Radiometric gridding was carried out by P. M. Stott who compiled the radiometric contour map (Plate 2) and examined the areas of slightly increased radioactivity with the author. K. W. A. Summers supervised the plane-tabling and drilling at the prospect.

During the 1954-1955 wet season geological mapping, radiometric gridding and self-potential traversing were carried out, and four holes were diamond-drilled to test the extent of mineralization below the surface. The results of this work has been discussed in earlier reports (Firman and Clarke 1955 and Rade and Clarke 1955). Subsequently three additional holes were drilled, and the results are discussed in detail in this report.

The prospect is in the north-east quarter of the reserve near the foot of the steep eastern slope of a line of rugged hills. It is reached by an all-weather track running westwards for 400 yards from a point 300 yards south of the 80 mile peg on the Stuart Highway. The grid reference for the prospect on the Burnside one inch military map is 148027.

The eastern part of the reserve consists of alluvial flats, through which rubble-covered rises appear in places. The terrain of the central strip is rugged and consists of a succession of steep spurs, V-shaped valleys, and small cliffs which follow the meridional trend of the rocks of the George Creek Formation. More gentle undulations are evident in the west, where the Depot Creek Sandstone cmps out.

· Water is available from George Creek, one mile along the highway south from the prospect during the dry season. A creek adjacent to the prospect provides water during the wet season.

THE RESERVE

GEOLOGY

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On the western side of the Reserve westerly dipping Depot Creek Sandatone of Upper Proterozoic age unconformably overlies greywacke and siltstone of the Lower Proterozoic Brocks Creek Group (Walpole and White, 1955). The Lower Proterozoic sediments are sharply folded along north-trending axes. The regional pitch is north but reversal of pitch occurs about two miles north of the Reserve. To the west, beyond the boundary of the Reserve, the Depot Creek Sandatone is unconformably overlain by sub-horizontal Lower Cretaceous rocks of the Mullaman Group (Noakes, 1949) which cap the higher hills.

STRATIGRAPHY

The Depot Creek Sandstone was named by Walpole and White (1955). On the Reserve it consists of ferruginous quartz sandstone with irregular lenses of conglomerate near the base. Ripple marks and current bedding are common features. The rocks are considered to be Upper Proterozoic in age.

D. A. White and others carried out regional mapping in the George Creek area in 1955. They subdivided the rocks of the Lower Proterozoic Brocks Creek Group in the Reserve area into two formations - the Burrell Creek Formation and the George Creek Formation (Plate I). The boundary between these units is shown passing north-north-east through the prospect: the writer, however, has not been able to make any lithelogical distinction between the two groups in the area of the accompanying map. In this report the Lower Proterozoic rocks of the Reserve are considered to belong to the George Creek Formation. They consist of interbedded greywacke and siltstone. Individual beds vary in thickness from six inches to ten feet.

STRUCTURE

The Depot Creek Sandstone on the Reserve dips to the west at about 18 degrees, and overlies the Burrell Creek Formation with a strong unconformity. The rocks of the Burrell Creek Formation are folded into steep-limbed, north-plunging folds. A syncline, which plunges north at angles ranging from 25 to 40 degrees, occupies the north-west part of the reserve. The dip steepens towards the axis of the fold. Vertical dips were measured in a cliff-section near the northern boundary of the reserve. A dragged anticline occurs near the baseline (Plate 2). The axial plane of this fold dips to the east. The articlinal structure is best exposed in the south, where the axis appears to be plunging north at a low angle. The mineralized zone at the prospect is a few hundred feet to the west of this axis.

The greywacke contains well-developed fractures in two directions. These are at right angles to the bedding, one parallel to the strike, and the other at right angles to it.

MINERALI ZATION

ovidence of shearing. Quartz ramifies the greywacke, both in the form of veinlots and lenses. Quartz veining and fracturing are less apparent in the siltstone. Some bands are silicified.

Secondary uranium minerals were seen in fractures in the vicinity of the prospect but no macroscopic radioactive minerals were found in the reserve outside the prospect.

RADIOMETRIC INVESTIGATIONS

The reserve was radiometrically gridded along parallel traverses 100 feet apart. Austronic PRM. 200 Ratemeters were used and readings taken at intervals of 100 feet along the traverse lines. The instrument background of the PRM Ratemeter was 50 counts per minute and was recorded at the Botanical Cardens, Darwin.

The radiometric contour plan (Plate 2) shows no radioactivity in the reserve comparable with that at the prospect itself. Areas where counts exceed twice background were further investigated. In general these were found to be associated with siltstone outcrops. The highest radioactivity outside the immediate prospect area was recorded in ferruginous sandstone rubble. A pit was dug to a depth of three feet in this rubble. The radioactivity increased from 3 times background on the surface to 5 times background at the bottom of the pit. Radiometric assays of samples of the rubble taken at vertical intervals of one foot are given below:

Depth in feet		Percentage e U308
1	· · · · · · · · · · · · · · · · · · ·	0.01
2	200 CE	0.01
3		0.01

These results indicate that the source of the radioactivity is disseminated in negligible quantities in the rubble in this area.

THE PROSPECT

SURFACE GEOLOGY

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 The rocks at the prospect are similar to those of the George Creek Formation found elsewhere on the reserve. The beds lie on the east limb of a north-plunging syncline (Plate 2) and dip to the west at about 25°. An anticlinal axis lies about three hundred feet to the east of the mineralized zone at the prospect.

The main fracture pattern is composed of two sets of joints, approximately at right angles to each other and to the plane of bedding

MINERALI ZATION

A set of small easterly-dipping quartz veins occur in the greywacke on the eastern side of the prospect (Plate 3). Uranium mineralization, mainly in the form of flakes of torbernite, is well exposed along joints and fractures in the plts and trench to the north-west of Diamond Drill Hole No.5 (Plate 3). It is also visible in the two pits hear the creek to the west of the datum peg. About seven tons of secondary ore containing about 0.2 percent e USOS has been taken from these openings and sent to fam Jungle for treatment.

A shear, striking at 350°, exposed in the trench probably provided a suitable channel-way for mineralizing solutions. Six small, steeply dipping shears occur close to the siltstone-greywacke boundary west of the trenches.

The surface radiometric anomalies trend in the same direction as the main mineralized shear. The area of anomalous radioactivity enclosed by the three times background contour extends along the strike of the beds, and is extended down the slopes by surface creep.

DRILLING

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Four diamond drillholes were bored during the 1954-1955 wet season. They have been previously described (Firman and Clarke 1955). Traces of pitchblende were found in two of them, and torbernite occurred in a third. Two more holes, Nos. 5 and 6, were drilled for the purpose of defining a mineralized shear suggested by surface mapping and drill holes Nos. 2 and 4. As a result a linear mineralized zone striking at 170 degrees and dipping at 75 degrees east was inferred from the centres of the most highly mineralized zones of Nos. 2,4, and 5 boreholes. To test for an extension of this zone No.7 drillhole was bored to the south.

Plates 4, 5, and 6 show diagrammatic sections of Diamond Drill holes Nos. 5, 6, and 7 respectively. An attempt has been made to orientate the bedding and fractures in the core, using information from the surface: as the measurements were the angles of bedding and fractures to the borehole, the direction shown on the plates can only be regarded as the most probable one.

DIAMOND DRILL HOLE NO.5 (PLATE 4)

Siltstone, greywacke and quartz greywacke were the only rocks intersected in this hole. The siltstone in the first 30 feet was colour-banded. At 53 feet, 110 feet, and 145 feet hole depth the bedding was crumpled, and the siltstone and greywacke were intermingled, indicating probable contemporaneous slumping.

Quartz-filled fractures, in places vuggy, were common in the greywacke: these were mainly less than a quarter of an inch wide, but ranged up to two inches wide. Mineralization occurred between 55 and 101 feet hole depth. The minerals were mainly confined to fractures, although in some cases they could be seen in greywacke adjacent to fractures. Small specks of pyrite were rost common. Fractures coated with pitchblende occur at 55 and 65 feet. These correspond to peaks in the radiometric log. Pitchblende, associated with quartz and pyrite, occurred in fractures at 75 feet, 76 feet, 76 feet, 76 feet 4 inches, 77 feet, and 81 feet, and could be seen in the greywacke close to quartz veinlets. Small flakes of autunite were visible close to the quartz and pitchblende.

Assay samples of the core were taken between 50 feet and 110 feet, also between 130 and 135 feet. Where the radiometric probe indicated peaks of radioactivity, core assays were made at one foot intervals. (Plate 4 and Appendix II). An absorption test was performed on some of the samples (see Appendix II) and the results showed that the radioactive mineral at the prospect is out of equilibrium, with a slight enrichment in uranium. This means that the actual uranium content of the sample would be greater than that indicated by radiometric assay. Uranium assays for ore and sludge are shown in Table A.

TABLE A Assay Results from No.5 Drillhole

		· ·	
Drill depth in feet	Core % e UzO8	Sludg e % e Uz0g	Core Recovery
5 - 10	No sample	0.01	
10 - 15	11	0.01	* ,
15 - 20	a	0.015	
20 = 25	a	0.01	# **
25 - 30	18	0.02	
30 - 35	16	0.01	
35 - 40	11	0.02	
40 - 45	tt	0.02	w # *
45 - 50	Ħ	0.05	
50 - 51	0.04		
51 - 52	0.05	* ,	
52 - 53	0.04	0.05	100%
5 3 - 54	0.05		
54 - 55	0.09)	, .	
55 - 56	70.26 }	*	
56 - 57	0.05	,	
57 - 58	0.04	0.10	100%
58 - 59	0.03	. **	
59 - 60	0.04)	a a	
60 - 61	0.01)		
61 - 62	0.06		
62 - 63	0.03)	0.11	100%
63 - 64	0.09)		
64 - 65	0.03)		
65 - 66	0.83)	e e	*.
66 - 67	0.04)	•	
67 - 68	0.03)	0.08	100%
68 - 69	0.06		
69 - 70	<0.01)		*
70 - 71	0.06		
71 - 72	0.03)		

1.20m 1.21 2.21 2.22 2.22 2.22

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TABLE A CONTINUED

	Drill depth in feet	Core % e U308	Sludge % e U ₃ 08	Core Recovery
	72 - 73	0.02 }	0.38	100%
	73 - 74	0.01 }		;
	74 - 75	No sample)	*	
	75 - 76	0.11)		* *
	76 - 77	0.51 }		•
. •	77 - 78	0.22	0.52	100%
	78 - 79	0.10	×	
	79 - 80	0.03)	*	
٠	80 - 81	0.15 }	*	
	81 - 82	0.01 }		
	82 - 83	0.03	0.12	100%
	83 - 84	0.02)		, ,
	84 - 85	(0.01)		. *
	85 - 90	(0.01	0.09	100%
	90 - 95	Ø.01	0.10	100%
	95 - 100	(0.01	0.17	95%
	100 - 101	0.04)		
	101 - 102	(0.01 }	,	
	102 - 103	(0.01)	0.11	95%
	103 - 104	(0.01 }		
•	104 - 105	0.015)		*
•	105 - 106	0.01)		
	106 - 107	0.015		
	107 - 108	<0.01)	0.04	100%
	108 - 109	(0.01)		
	109 - 110	(0.01)		* .
	110 - 115	<0.01	0.07	100%
	115 - 120	No sample	0.04	•
	120 - 125	a .	0.04	
	125 - 130	a .	0.02	w.
	130 - 135	<0.01	0.03	100%
	135 - 140	No sample	0.04	,
	140 - 145	ន	0.04	

TABLE A CONTINUED

Drill depth in feet	Core % e U ₃ 0 ₈	Sludge % e U ₃ 0 ₈	Core Recovery
145 - 150	No sample	0,08	
150 - 155	R.	0.02	
155 - 160	11	0.02	
160 - 165	n	0.02	•
165 - 170	tt	0.02	
170 - 174	'n	0.02	*

The highest sludge assays occur at a greater depth than those in the core, and extend over a greater drill distance. Higher assay results were obtained from the sludge compared with the same lengths of core except between 65 and 70 feet. Here the high core assay is mainly due to a pitchblende-coated fracture, and this appears to affect the succeeding 5 feet of sludge.

Probe results indicated a zone of radioactivity between 52 feet and 107 feet drill depth, with maxima at 55 feet, 65 feet, and 78 feet.

Diamond Drill Hole No.6 (Plate 5)

The core consisted entirely of colour-banded siltstone, similar to that at the top of No.5 drillhole. The main sets of fractures were parallel and at right angles to the bedding. A shear zone 9 inches wide was intersected at 40 feet 9 inches. The mean consisted of shattered dark grey talcose siltstone and compound fractures filled with coarsely crystalline pyrite. No uranium minerals were visible in the core.

Core samples were taken between 45 and 50 feet hole depth and radiometrically assayed with results as shown in Table B.

TABLE B
Assay Results from No.6 Drillhole

Core in	depth feet	% o U308	
45	- 46	0.02	
46	- 47	0.01	
47	- 48	0.02	
48	- 49	0.01	
49	- 50	0.01	

The probe results showed two small maxima at 24 and 48 feet drill depth (Plate 5).

Diamond Drill Hole No. 7 (Plate 6)

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The rocks intersected in this hole were mainly micaceous greywacke with some bands of siltstone and quartz greywacke similar to those in No. 5 borehole. Between 60 and 90 feet hole depth pyrite was commonly associated with vuggy quartz veins and fractures. No uranium minerals could be seen in the core.

Core samples were taken between 45 and 50 feet drill depth and radiometrically assayed with results as shown in Table C.

TABLE C
Assay Results from No.7 Drillhole

Core depth in feet	% e U308
45 - 46	0.02
46 - 47	0.04
47 - 48	0.02
48 - 49	0.03
49 - 50	0.02

The probe registered a small maximum at 46 feet (Plate 6). Sludge samples taken between 50 and 55 feet assayed 0.06 and between 55 and 60 feet 0.05 percent e U308 (Appendix III)

CORRELATION OF DRILLING WITH SURFACE GEOLOGY

Drill holes Nos. 1, 3, 6 and 7 give no indications of uranium mineralization approaching economic grade (taken as 0.25 percent e U308), and none that would relate to known mineralization at the surface. Drill holes 2, 4 and 5, however, intersect zones of mineralized fractures which appear to lie on the downward extension of the zone of torbernite-coated fractures exposed in the trench (Plate 3). From each of these holes core samples exceeding 0.2 percent e U308 have been taken (see Table D), and ore containing about 0.2 percent e U308 has been extracted from the trench at the surface.

TABLE D
Selected Drillhole Assays

Diamond Drill Hole No.	Depth of Core	% o U ₃ 0 ₈
2	4813" - 4916"	0.34
4	831 - 8516"	0.21
5	55' - 56'	0.26
e e e e	63† - 67° 75° - 79°	0.26 0.24

It seems probable from the drilling results that any uranium ore body would be confined to the zone of fractures exposed in the trench and intersected by Nos. 2, 4 and 5 boreholes. As mineralization is absent from No.7 along the line of mineralized fractures and reduced in No.4, it appears that the horizontal extent of the mineralized zone here is not more than 100 feet, and probably over this length averages less than three feet wide. No hole has yet been drilled to intersect the mineralization below 100 feet.

The association of pitchblende with quartz and pyrite indicates that it is hydrothermal in origin.

OTHER OCCURRENCES OF URANITM-BEARING MINERALS

A small surface radiometric anomaly, caused by specks of torbernite in a steep-dipping shear, occurs about 300 yards north of the northern boundary of the reserve, and about 300 yards west of the base line (Flate 2). This has been investigated by a prospector who sank a shaft to 20 feet and three small pits (Plate 2). The rock types are similar to those of the Burrell Creek Formation on the reserve. The occurrence is similar to that at George Creek but is on a smaller scale.

The Adelaide River uranium mine is five and a quarter miles north-north-west of the George Creek Prospect. The predominent uranium mineral is pitchblende localized in steeply dipping shears which strike approximately north. The shears occur in siltstone and greywacke similar to those at George Creek. The radioactive minerals persist in the shears to several hundred feet vertical depth. The main ore occurrences are below the zone of weathering, which extends down to nearly a hundred feet.

CONCLUSIONS AND RECOMMENDATIONS

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No uranium minerals were found in the mapping of the reserve other than those at the prospect.

Numerous torbernite-coated joints and fractures have been exposed in pits and trenches. No significant uranium mineralization was intersected in drill holes 3, 6 and 7. In drill holes 2 and 4, pitchblende or torbernite mineralization is confined to narrow fractured zones. The best grade of mineralization was intersected by drill hole No.5, where radiometric assay results of the core gave 0.11 percent e U₂O₀ between 53 and 57 feet, 0.21 percent e U₃O₃ between 63 and 67 feet, and 0.28 percent e U₃O₃ between 75 and 78 feet drill depth. From the present data it appears that the mineralized zone is not more than 100 feet long by 10 feet wide. The vertical extent is still unknown.

It is recommended that a prospecting shaft be sunk from a point on the shear indicated on Plate 3. The shaft should be designed to intersect Diamond Drill Hole No.5 at 70 feet drill depth. This will entail 85 feet of inclined shaft sinking, and should be followed by driving along the mineralized zone to determine the tenor of the mineralization. Alternatively, a vertical shaft could be sunk to a depth of 71 feet, to intersect Diamond Drill Hole No.5 at the same point. It may be possible to recover part of the cost of shaft sinking from the sale of ore. While this work is being done it is possible that the reserve should be abandoned and a mineral lease pegged to extend over the mineralization at the prospect.

Detailed geological mapping and radiometric surveying of the strip of country between Adelaide River Mine and George Creek Prospect is also recommended, as the alignment of the anomalies and shears indicates that this is an area in which further uranium mineralization may occur.

REFERENCES

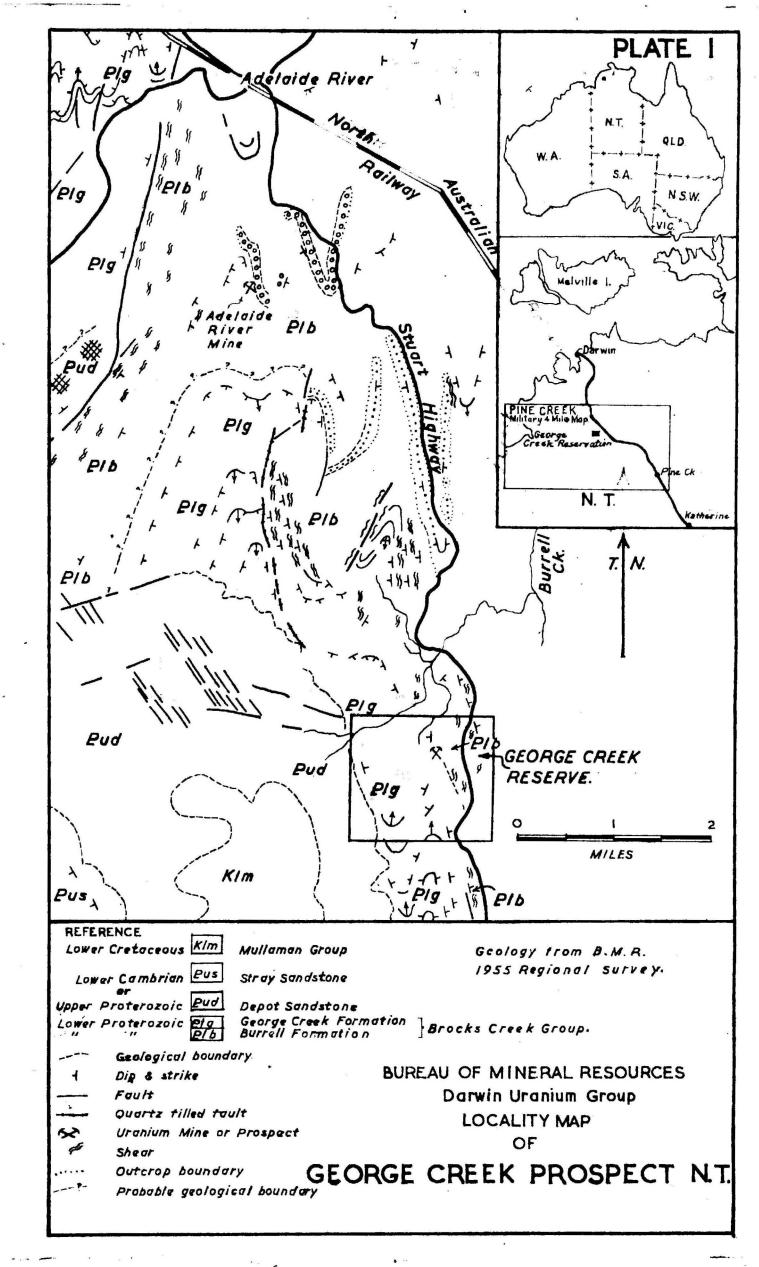
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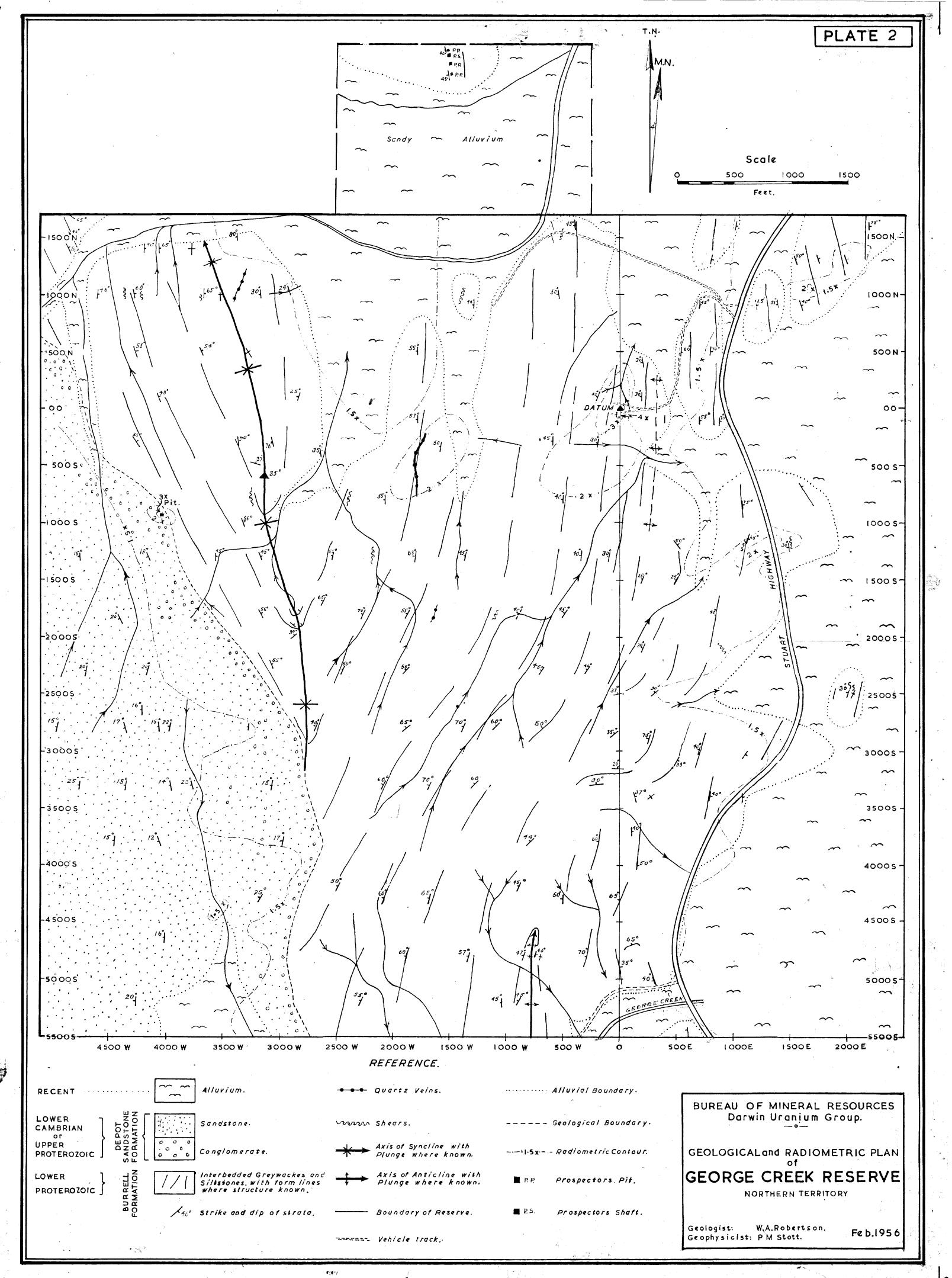
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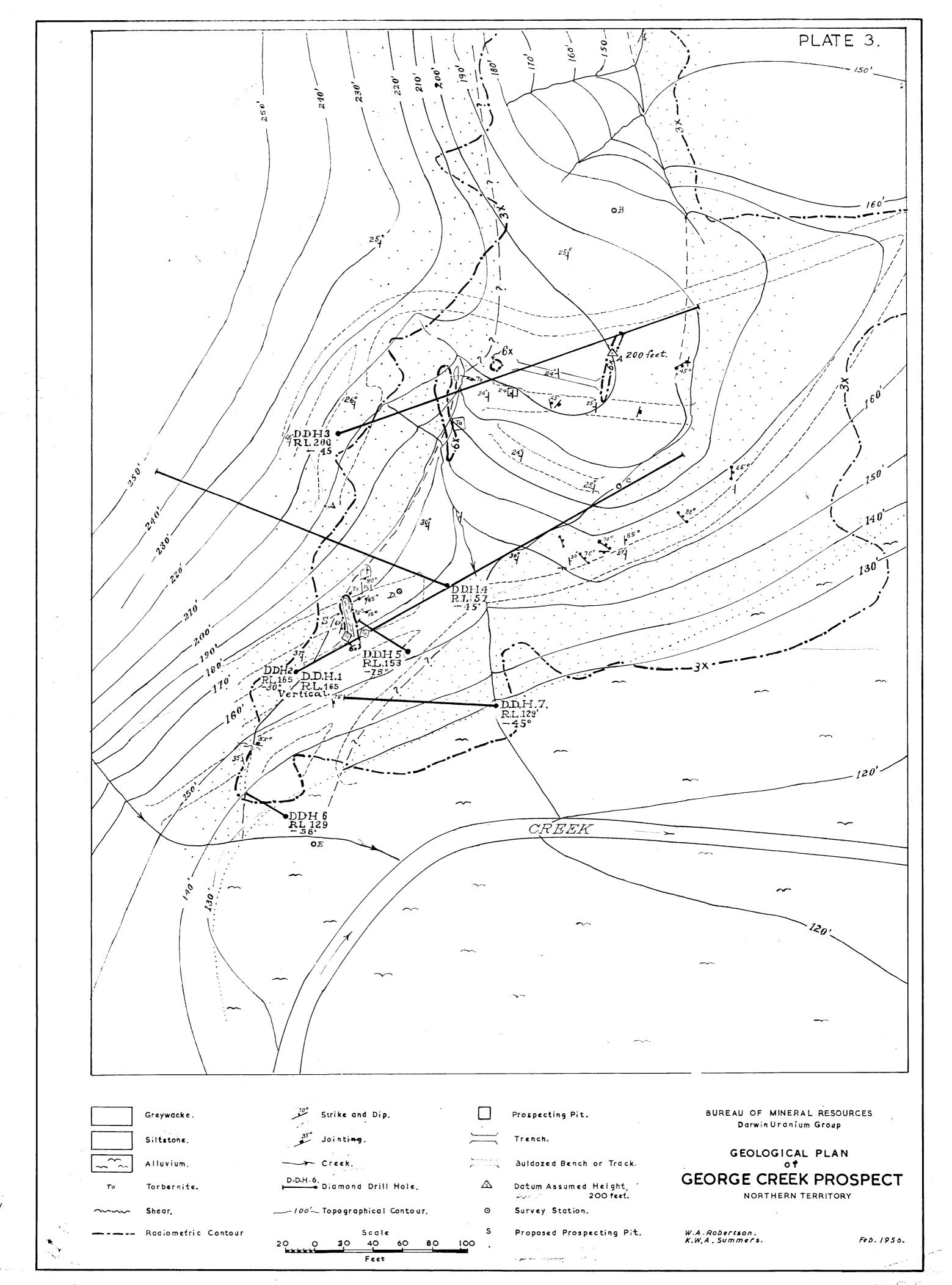
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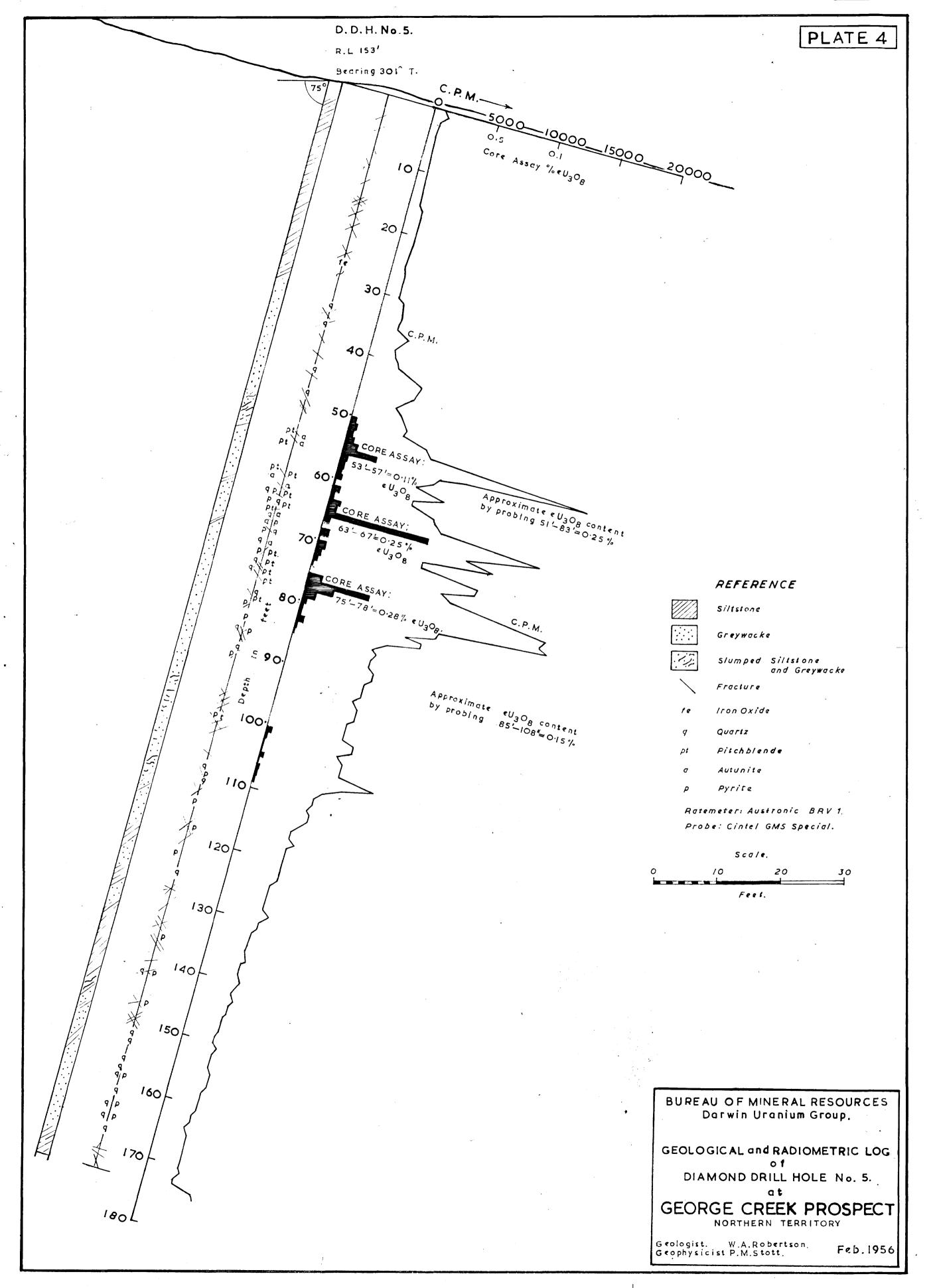
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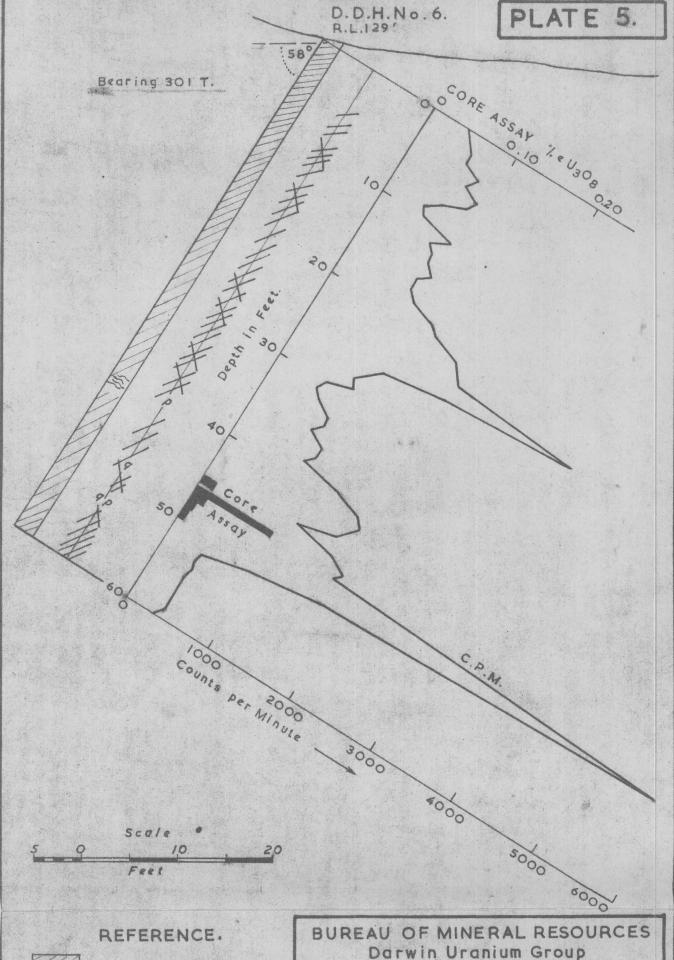
- Firman J. B., and Clarke G. F., (1955). Geological and geophysical investigations at the George Creek Uranium Prospect, N.T. Bur.Min.Resour.Aust.Rept. No. 55/83
- Noakes L. C., (1949). A geological reconnaissance of the Katherine-Darwin Region, Northern Territory, with notes on mineral deposits. <u>Eur. Min. Resour. Aust. Bull. No.16</u>.
- Rade J., and Clarke G. F., (1955). George Creek Uranium Prospect progress report, December 1954. <u>Bur.Min.Resour.Aust.</u>
 Rec. No. 1955/3.
- Walpole B. P., and White D. A., (1955). Progress report on regional geological mapping Katherine-Darwin Region 1954. Bur. Min. Resour. Aust. Roc. No. 1955/49.













Banded Siltstone

Fracture

Quartz

Pyrite



Shear

Ratemeter: Austronic BRV 1 Cintel GMS, Special. Darwin Uranium Group

GEOLOGICAL and RADIOMETRIC LOG DIAMOND DRILL HOLE No. 6

at GEORGE CREEK PROSPECT

NORTHERN TERRITORY

W.A.Robertson. Geologist: Geophysicist P.M. Stott.

Feb. 1956

