COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

RECORDS.

1953/94

c3

THE TENNYSON URANIUM PROSPECT, EDITH RIVER, NORTHERN TERRITORY.

By

D.E.Gardner.

DARWIN, N.T.

THE TENNYSON URANIUM-PROSPECTS, EDITH RIVER NORTHERN TERRITORY.

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C O N T E N T S.

PLANS.

SUMMARY.

The Tennyson Uranium prospects, six in number and referred to as prospects 1 to 6, include 15 deposits all apparently too small and too low in grade, at the surface, to be worth working. Five of them (1A, 1F, 2A, 3, and 5) could be expected to yield 9, 25, 8, 15, and 5 to 18 tons of ore per foot of depth. Assay results are available for prospect 2 only. The extimated average grade of the surface material in deposits 2A and 2C, down to a depth of approximately 3 inches, is 0.21 and 0.13 per cent U_3O_8 respectively. However, the near surface material may be impoverished by leaching, and the grade may improve at depth. The country is hard, and the width of the ore body ranges from 10 inches in deposit 1F to 16 inches, and possibly 52 inches, in deposit 5. Drilling of a typical deposit should establish the type of mineralization, and indicate the change in grade of ore that might be expected below the surface. It is recommended that any drilling undertaken by the Bureau should be on a deposit, discovered by a Bureau party, 1¼ miles south-east of Tennyson's No. 1 prospect. In any case, the commencement of drilling in the Edith River area should be deferred until after inspection of some, at least, of any anomalies indicated by the proposed air-borne survey of 1953.

INTRODUCTION.

The Tennyson Uranium Prospects, Edith River, were discovered between October, 1952 and April, 1953 by Mr. S.B. Tennyson of Katherine. They have been inspected by R.S. Matheson, Senior Geologist, and in part mapped in plane-table surveys and sampled by Geologists D.E. Gardner and M.O.Jones.

SITUATION AND ACCESS.

The prospects, six in number, are situated in an area 2½ to 4 miles south-west and south-southwest of the Edith Siding on the Darwin-Birdum railway. They are shown on plate 1 of this report. Their co-ordinates on air photo No. 38, Run 5, Lewin Springs, Survey 330, are:

Prospect.	Co-ordinate with respect to Centre Point of Photo. Inches	Diagonal inches
1 (deposit A)	0.58/1.45W	1.54
2 (deposit A)	3.31S/0.26W	3.33
3	1.04S/1.26W	1.64
4	0.98/0.83E	1.16
5	1.45S/2.04E	2.49
6	1.53S/3.06E	3.42

They are reached by travelling southwards, for distances ranging from 600 feet to 2½ miles, from the Florina track, which runs westwards from the Stuart Highway at a point ¼ mile south of Edith River bridge. The track is not passable in the wet season, but probably an alternative route could be found over the table-land country a few miles to the south.

GENERAL GEOLOGY.

The area lies within the Lower Proterozoic Cullen granite (Noakes, 1949), near its southern extremity. In texture the

granite ranges from fine grained in the southern part through medium grained and porphyritic to coarse grained and porphyritic in the northern part, towards the Edith River. In the intermediate portion, fine grained granite tends to make up the hills and ridges, and porphyritic granite crops out in the gullies. The impression is gained that the boundary between them, broadly speaking, lies in a horizontal plane.

The prospects occur within a broad fracture belt that contains numbers of parallel shear zones trending approximately 340 degrees. Recorded dips are 78 to 87 degrees west, vertical, and 70 degrees east. The earliest movements seem to have developed a platy jointing along the strike, and commonly slight greisenization or silicification took place along the joints. Later fracturing resulted in brecciation of siliceous bands on at least two occasions, and repeated re-cementation by silica, mainly in the form of quartz. The resulting silicified bands in the shear zones form hard, resistant structures that have been little affected by later shearing. Some are slightly cavernous, suggesting that small quantities of sulphide minerals may be present below the surface.

Subsequent fracturing along the shear zones appears to have taken place in the absence of great compression. In some, it has resulted in narrow openings, along their strike, which were filled by a material that appears, for two reasons, to be acidic dyke-rock. Firstly, it appears to post-date all movements along the shear zone, and, generally, the only fracturing has been the development of jointing across it. Some dykes, however, are partly brecciated. Secondly, it appears to consist of small phenocrysts of quartz, or of quartz and felspar, uniformly distributed in an aphanitic ground mass. The absence of signs of brecciation and of accompanying heterogeneity of composition and texture, and of linear structures that could be attributed to earlier shearing, argue against its being a hard band formed by crushing and silicification. The dyke-rock, if such it is, is almost invariably reddish-coloured, presumably because of a relatively high content of finely-divided ferric oxide, and it appears to be associated with the introduction of hematitic material into the shear zones. Over short lengths, the dykes contain a relatively high proportion of hematite, which apparently has replaced former constituent of the ground-mass, and occasional small, irregular, crystalline masses of it are seen. The hematitic material may extend outwards for several inches into the sheared granite, where it appears to replace felspathic and femic constituents. In places, silicified bands within the shear-zones have been coarsely brecciated over short lengths, apparently because of a cross-fracturing, and some of them appear to be intruded by a stockwork of acidic dyke-rock. At the same time, or shortly afterwards, hematite has been introduced, and has formed small, crystalline masses in cavities, and entered as a replacing material into the fragments of host-rock. Apart from those which seem to be closely associated with acidic dyke-rock, two additional types of hematitic bodies occur within the shear-zones. The first is in the form of a short lens in which hematitic material has replaced some of the constituents of sheared granite. This type appears to be a comparatively late introduction into the shear zone, because it does not seem to have participated in any shearing. The second additional type is the occurrence of the hematitic material as a matrix in brecciated hard-bands within shear zones viz. as the matrix of brecciated siliceous-bands or of brecciated dyke-rock. Commonly, the breccia forms a coating a few inches thick along one side of the hard band, and this widens out to about 12 or 18 inches, in small lenticular masses. In many shear zones, the granite is slightly reddish in colour, and this suggests that some of the hematite in the shear zones could have been introduced when active shearing was in progress, and much earlier than has been postulated in the discussion above.

URANIUM MINERALIZATION

High Geiger counts indicative of uranium-minerals have been found over hematitic masses of each of the types described above. All the known radioactive deposits occur within such hematitic material, but the converse relationship does not hold: Some hematitic deposits contain little more radioactive material than the surrounding country. It was suggested (Gardner & Jones, 1953) that hematite was introduced during and after the intrusion of the acidic dykes, and later, hematite and uranium were introduced together. Hematitic bands, apparently inactive along the greater part of their length, gave high Geiger counts where intersected by a late cross-fracturing trending 039 to 044 degrees, and this suggested that the uranium-mineralization could be contemporaneous with these cross-fractures. However, other lenticular, radioactive deposits along the shear zones have no apparent relationship to cross fracturing, and it must be concluded that the uranium-mineralization, although apparently quite a late event in the history of the shear zones, probably took place in two stages. firstly, it was introduced in places along with the replacing hematite. Later additions of uranium and hematite accompanied the cross-fracturing at 39 to 44 degrees.

The uranium-bearing mineral near the surface is autunite, which may occur disseminated through the hematitic lode-material, and as micaceous films coating fracture-surfaces or joint-planes. Under ultra-violet light, it gives a bright green fluorescence. In ordinary light, it is not readily seen in the hematitic lode-material. A little torbernite occurs together with autunite at two localities, viz. deposits 6F and 5. Examination of the prospects by ultra-violet light generally shows little fluorescence mineral at the surface, although considerable amounts of it may be seen when a few inches of surface-material are chipped away. It is clear that the radioactive mineral has been almost completely leached from the surface. The depth to which leaching has gone is not known. The nature of the primary minerals is not known.

INDIVIDUAL PROSPECTS.

General. The 6 prospects are shown in plates 2 to 6. They include 15 small deposits, 10 of which are tabular or lenticular masses along the strike of shear zones, 1 is in a tension-fracture adjacent to a shear zone, 1 is in a stockwork in silicified sheared granite, brecciated by cross-fracturing, 1 is in a brecciated mass formed at the intersection of two competent silicified bands, 1 is in granitic rock traversed by narrow quartz-veins, and slightly brecciated by cross-fracturing or jointing, and 1, surrounded by detritus, is probably a small lenticular body in a shear zone. The tabular or lenticular bodies include brecciated dyke-rock with hematitic matrix, and hematitic replacements of acidic dyke-rock and of sheared granite.

The uranium content of a lode formation has a maximum value at the deposit, and grades off in either direction along the strike. The depsoit has been regarded as that portion which gives a Geiger count more than 3 times the local background count. All the deposits have been sampled. In general, grab samples were taken from the smaller ones, and channel samples were cut across the larger ones, at or a few inches below the surface.

Deposit 1F has been found to be north of the area pegged by Mr. Tennyson.

Tabular or Lenticular Bodies along Shear Zones. These include all the deposits (A,B,C,F, and M) of prospect 1, four or five of the six deposits in prospect 2, and the single deposits at each of prospects 3 and 4. Details of size and grade are tabulated below. Deposit B1, B2, B3, and C of prospect 2 are too

small to be worth including.

Prospect.	Length feet	Width inches	Geiger count, per minute.	Assay U_3O_8 %	Remarks.
No. 1					
A	20'	12"(Av.)	400 - 700		Three lenses along tabular body.
	6'	12" "	400 - 500		
	3'	12" "	400		
B	3'	18	500		
C	3'	6"	400 - 500		
	6'	8"	400 - 700		
	4'	5"	400 - 500		
F	70' (Probable	10"	300 - 550 700 at depth 9"		In part soil-covered.
M	6'	2"	400 - 1000		
No. 2					
A	13'	15"	400 -1250	0.18to	Est.Av. U_3O_8 to depth 3" - .13
	3'	8"	400	0.05	.06
D	5'	5"	300 - 1100	0.03 to .11	
No. 3	26'	17"	No tested	.07	Av. assay of 3 channel samples.
No. 4	7'	20" Av.	Range 600-1110 Av. 690		

Tension-Fracture Adjacent to Shear Zone. Deposit C in prospect 2 is a small lens, apparently of altered dyke-rock, cutting across a quartz-vein. It is shown in Plates 3 and 4. The initial opening was probably a tension-fracture, and may have been due to a slight movement along shear zone NS/1. The lens is 6 feet long and averages 8 inches wide. Geiger counts over it range from 600 to 1250 per minute. A grab sample broken from the place where the count rate was 1250 per minute contained 0.25 per cent U_3O_8. The estimated uranium-oxide content of the superficial part of the deposit is 0.21 per cent, but this figure is based on inadequate sampling and may be too high.

Brecciated Mass at Intersection of Siliceous Bands. At prospect 5, cross-fracturing at the intersection of two siliceous bands has caused brecciation within the acute angle, facing southwards, between them. The hematitic matrix of the breccia, near the surface, contains autunite and a little torbernite. The deposit is 9 feet long and has an average width of 16 inches. Geiger counts range from 1000 to 1550 per minute. A band of siliceous, sheared and fractured granite containing vein quartz, on the northern side of the hematitic breccia, is 2 feet to 3 feet wide, is slightly brecciated, and contains hematitic material in fractures. This, and a mass of similar material 4 feet long and 2 feet wide to the east of the hematitic lode give a count equal to 4 times the background count.

Granite Intersected by Quartz Veins, and Slightly Brecciated. This is Tennyson's No. 6 Prospect, which is shown in Plate 6. It has been sampled and described in an inspection report. It is not considered to be profitably workable.

CONCLUSIONS AND RECOMMENDATIONS

The deposits are too small, and, at the surface, too low in grade to be worth working. However, they have probably been impoverished by leaching near the surface, and if so, the grade may improve sufficiently at depth to warrant small scale mining. This can be decided only by sinking a shaft or drilling on a typical deposit. The site recommended for this work is a lenticular deposit discovered by a Bureau party. It is 1½ miles south-east of prospect 1, 1 mile north-east of prospect 2, and is centrally placed with respect to prospects 4 and 5. Only a very limited programme of drilling can at present be recommended in the Edith River area, but this may be considerably increased if good anomalies are found during the proposed airborne scintillometer survey of 1953. It is recommended that drilling in the Edith River area by the Bureau be deferred until after this airborne survey.

REFERENCES.

Gardner D.E. & H.O. Jones. 1953: Preliminary report on Tennyson's No. 2 Uranium Prospect, Com. Min. Res. Records 1953/94.

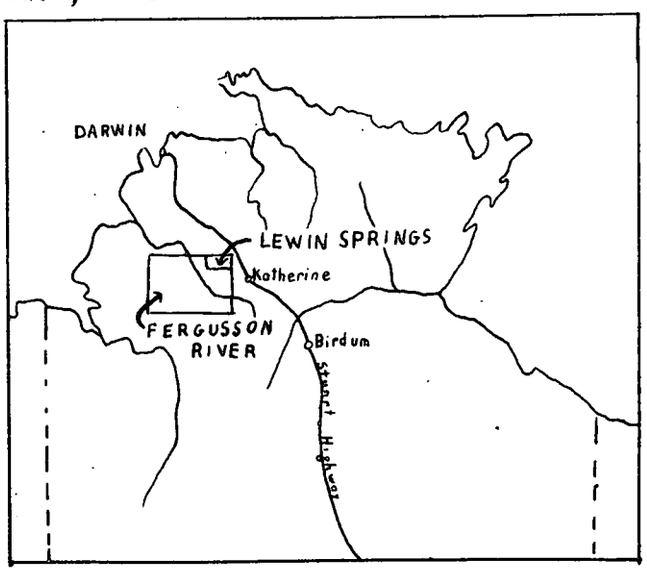
Noakes, L.C. 1949: A Geological Reconnaissance of the Katherine-Darwin region, Northern Territory. Com. Min. Res. Bull.16.

PLATE 1

THE TENNYSON URANIUM - PROSPECTS, EDITH RIVER.

LOCALITY MAP.

Showing Position of Area Dealt with in Report and reference to Australian Four Mile and One Mile Series.



MAP SHOWING LOCALITIES OF PROSPECTS

(Traced from photo mosaic)

Scale

1 ½ 0 1 2 miles

Reference

Age

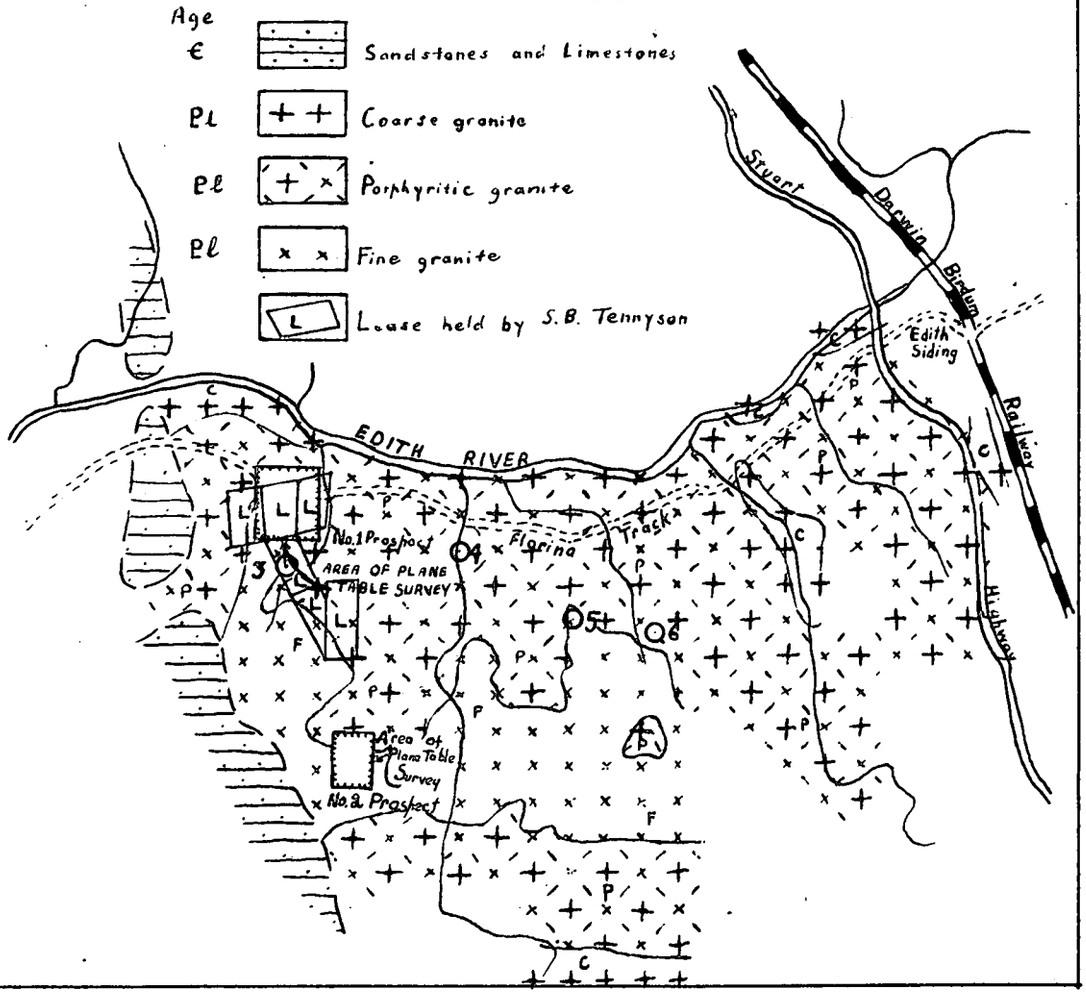
€ Sandstones and Limestones

Pl Coarse granite

Pl Porphyritic granite

Pl Fine granite

L Lease held by S.B. Tennyson



NT 58-3

PLATE 2

THE TENNYSON URANIUM PROSPECT N°1.

EDITH RIVER, N.T.

Reference

?Pl — Fine granite

Porphyritic granite

Coarse granite

Acidic dyke

Quartz-fluorite-carbonate vein

Quartz vein

Lode formation

Shear zone

300N — Baseline and pegs for radiometric survey

Geiger readings more than 4 times background

A5966 — Specimen nos. on main map only

A5951 5" — Assay samples nos (width sampled or grab), on insets only

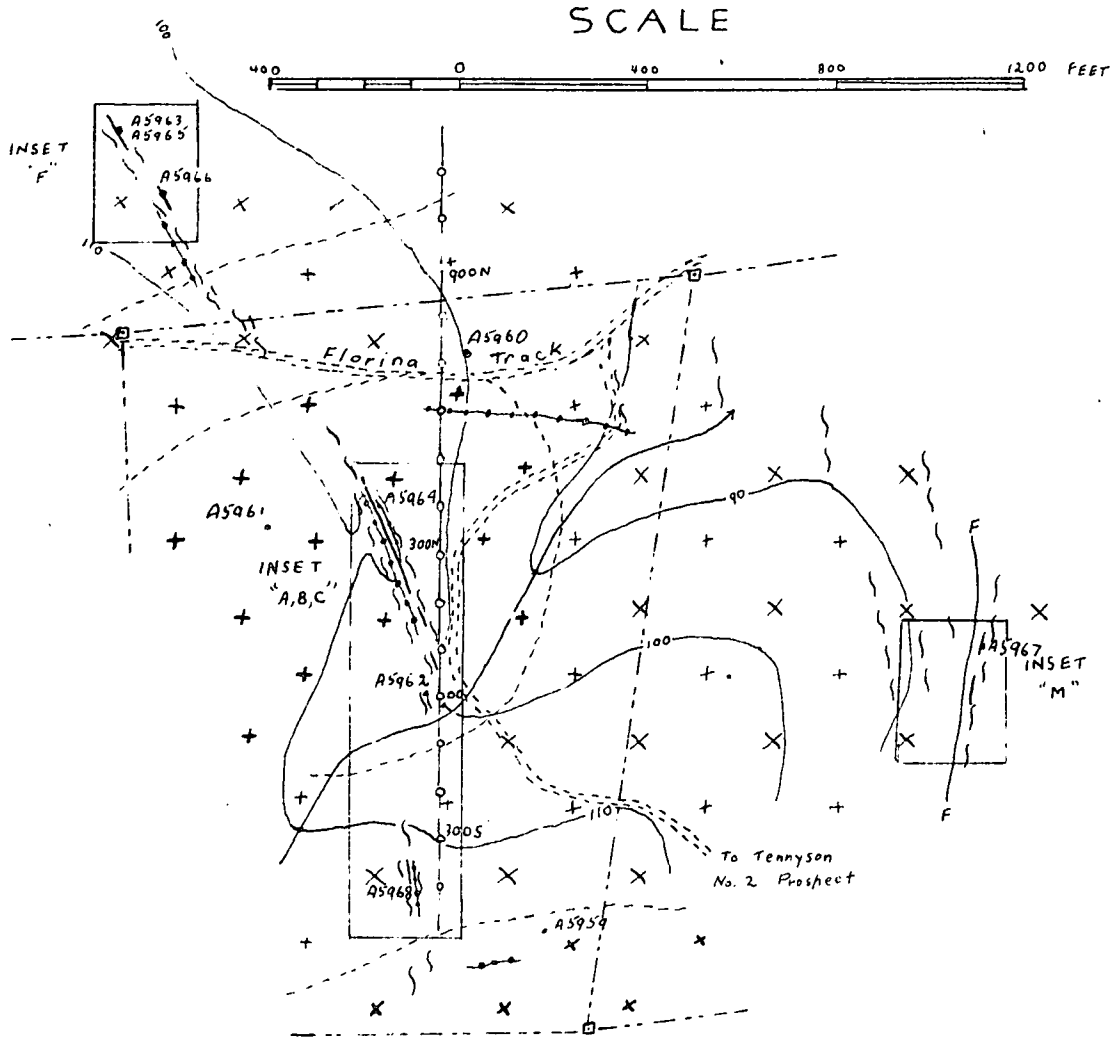
90 — Contours (assumed datum 100 ft at peg 00)

Corner pegs and boundaries of leases held by S.B. Tennyson

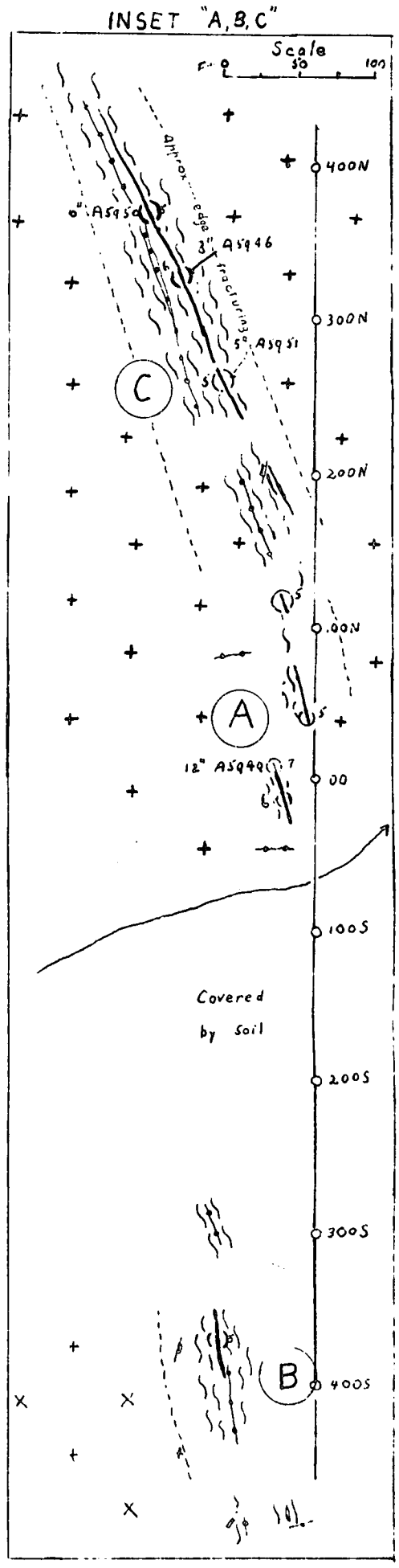
T.N. M.N.

SCALE

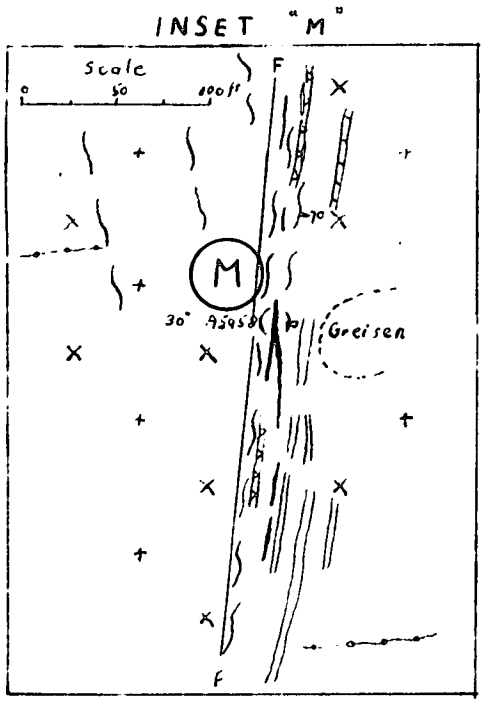
400 0 400 800 1200 FEET



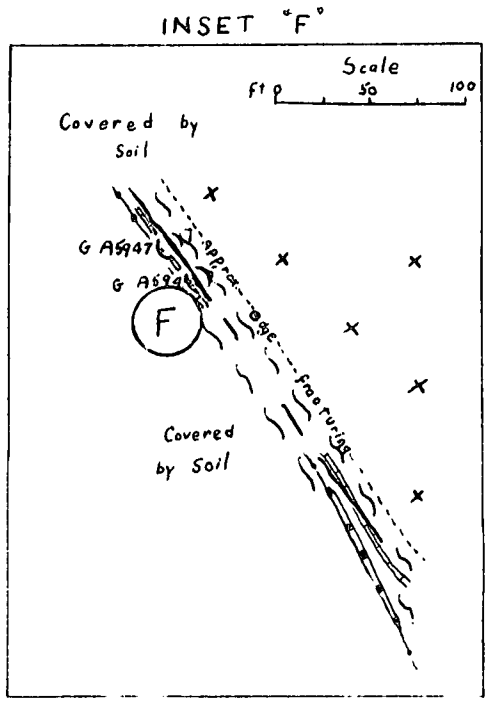
INSET "A,B,C"



INSET "M"



INSET "F"



NT 58-4

PLATE 3

THE TENNYSON URANIUM PROSPECT No2.

EDITH RIVER, N.T.

Reference

- Fine-grained granite (Lower Proterozoic?)
- Quartz-fluorite-(?)Carbonate vein
- Quartz vein
- Lode formation
- Shear zone
- 200N — Baseline and pegs for radiometric survey
- A5907 15" A5909 G A5915 — Sample nos (width sampled or "grab" if for assay and U_3O_8 %)
- ×4 — Geiger readings greater than 3 times backgd.
- 90 — Contours (assumed datum 100 ft at peg 00

SCALE

100 0 100 200 300

Shear zone NS/4
A5913
300N
Shear zone EW/3
Shear zone NS/3
Ahrox. edge
A5934
A5912
A
A5907 15" .05
A5908 18" .18
A5935
A5936
100N
A5916
NE Fracture zone
Fracture zone EW/2
A5933
B3
Fracture zone EW/4
B1
A5905 G .10
A5932
Shear zone NS/2
200S
B2
A5906
A5904 G .134
Shear zone NS/1
300S
400S
C
A5903 G .25
A5931
Fracture zone EW/1
A5901 G .11
A5909 G .03
A5930
D
600S
A5915
Fracture zone EW/5
A5917
700S
A5902

NT 58-5

PLATE 4.

TENNYSON'S No 2 URANIUM - PROSPECT

EDITH RIVER, NORTHERN TERRITORY.

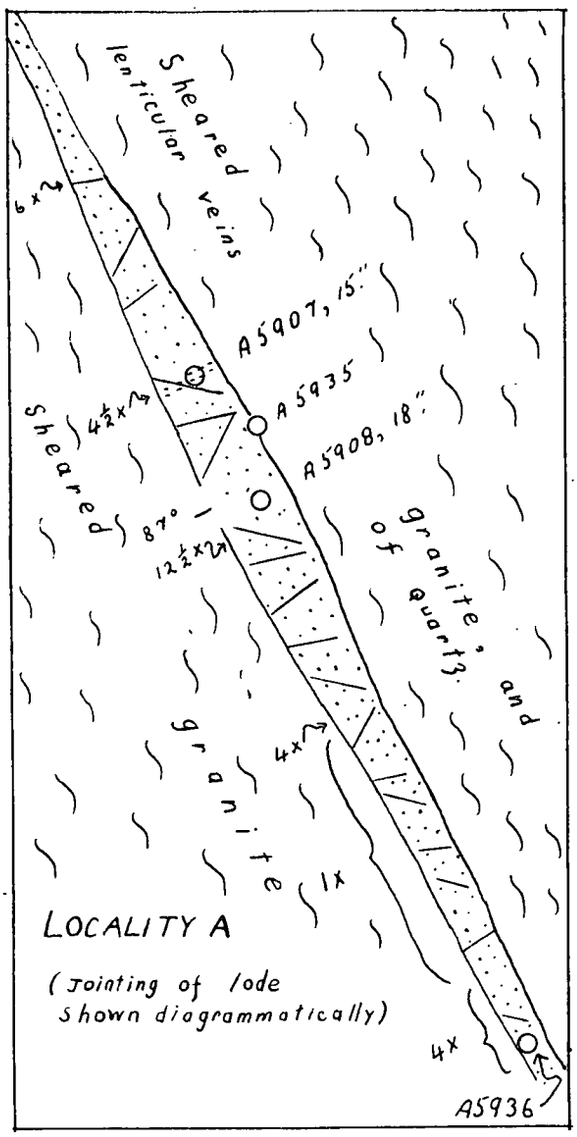
SKETCH PLANS OF LOCALITIES A, D, AND C.

Scale of feet

0 2 4 6 8 10

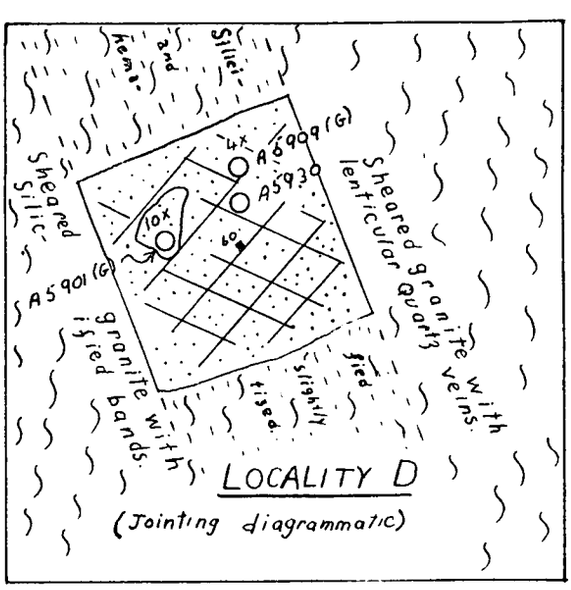
Reference

- Hematitic lode.
- ○ A5907, 15" Sample for assay and sample width.
- ○ A5909(G) Grab sample for assay
- ○ A5935 Specimen No
- 6x Geiger count 6 times local background count.



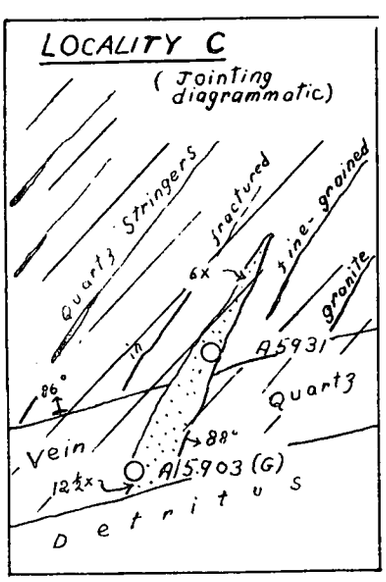
LOCALITY A

(Jointing of lode shown diagrammatically)



LOCALITY D

(Jointing diagrammatic)

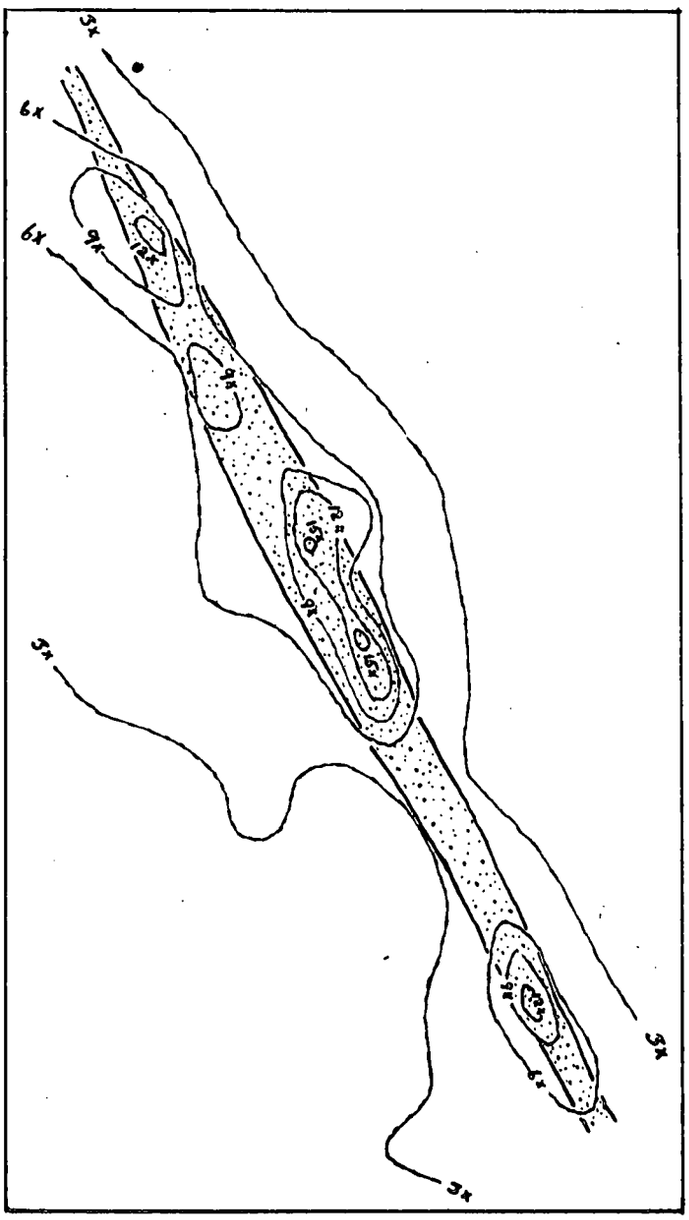


NT58-6

PLATE 5.

THE TENNYSON No. 2 URANIUM - PROSPECT.

EDITH RIVER,
NORTHERN TERRITORY.



Sketch Maps of Deposits A, D and C, Showing Radiometric Contours.

(Contours traced from Original drawn by A. de Groot)

Scale of feet.

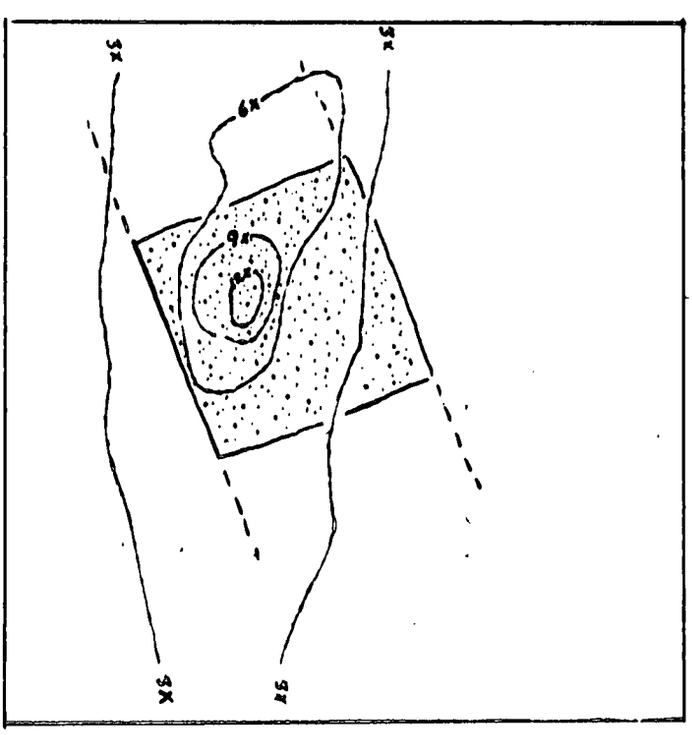
0 20 40 60 80

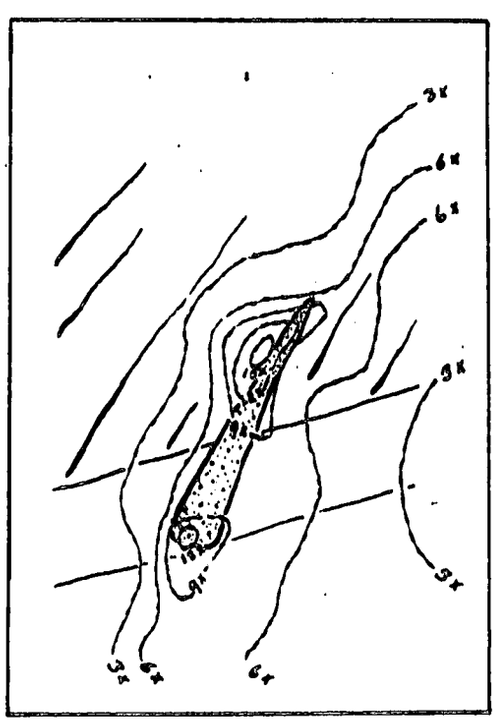
Reference

Hematitic lode.

6x Geiger count 6 times background count of sediments.

Contour interval 3 times background.





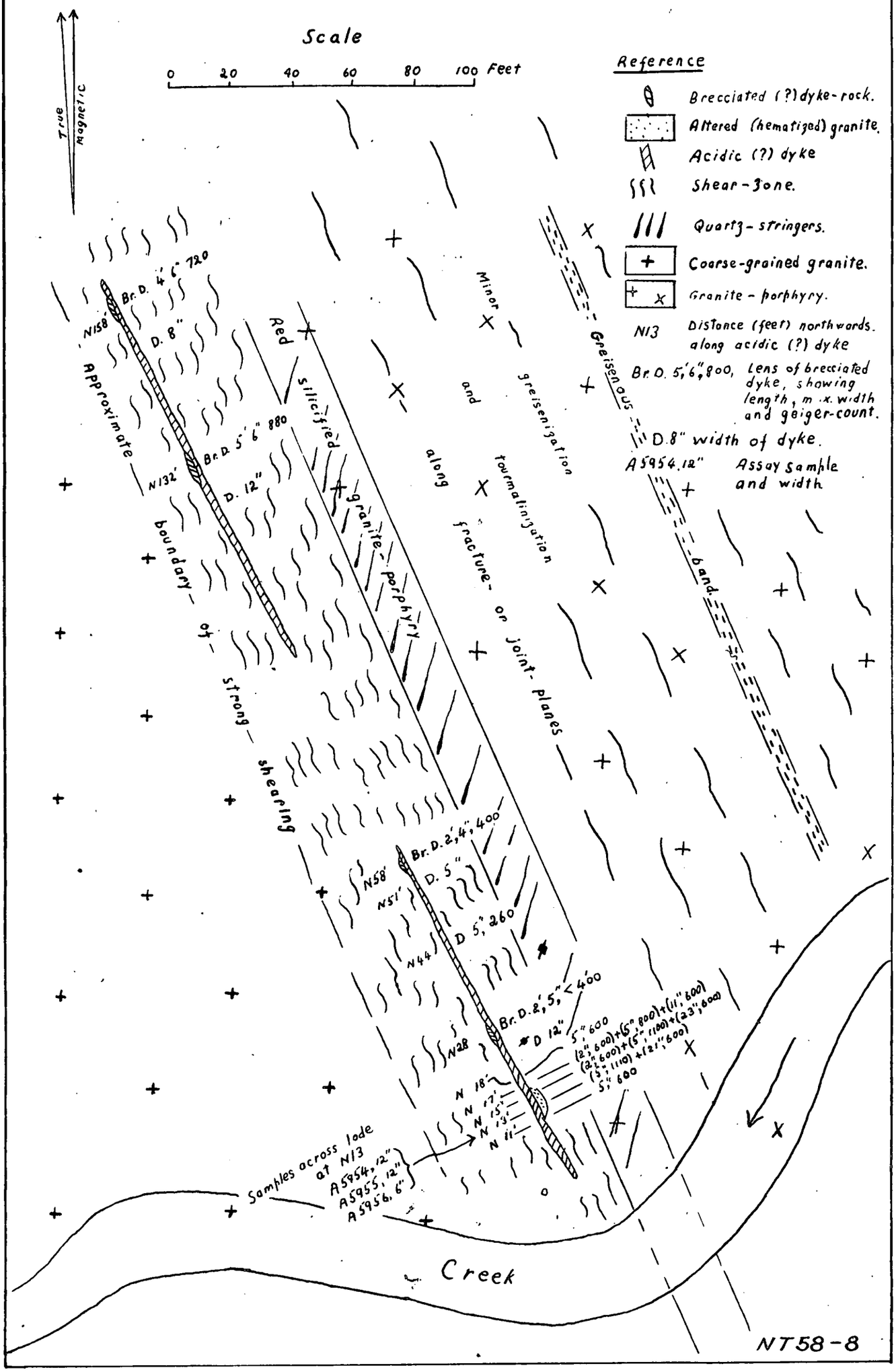
NT58-7

PLATE 6

SKETCH MAP

TENNYSON'S No4 URANIUM-PROSPECT.

EDITH RIVER.



NT58-8

PLATE 7

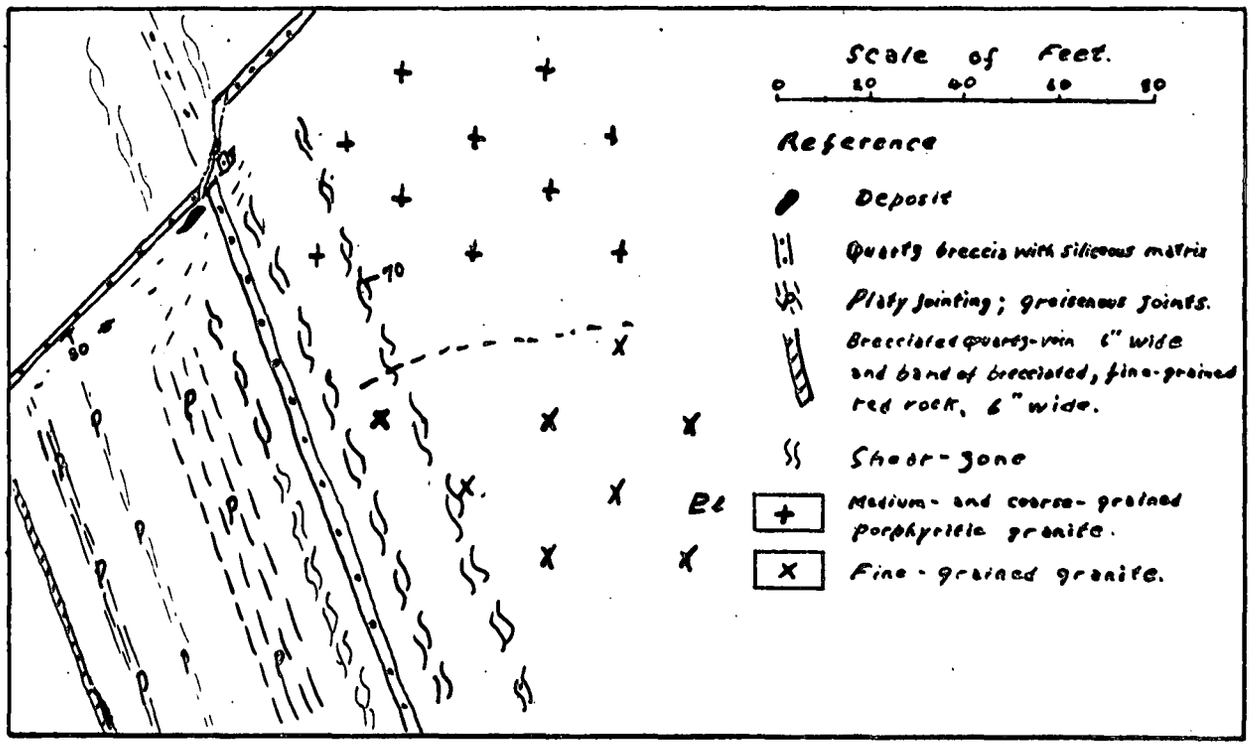
SKETCH PLANS

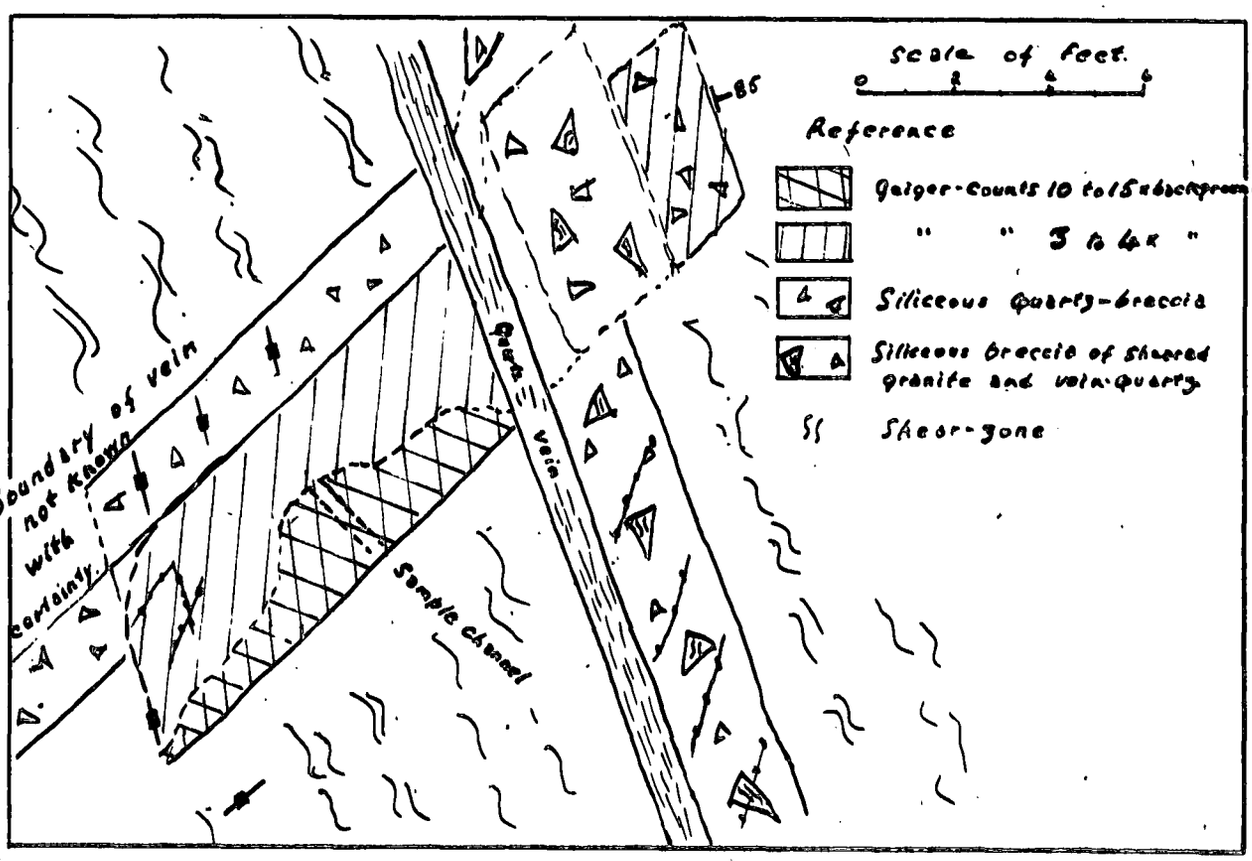
OF

THE TENNYSON No. 5 URANIUM - PROSPECT.

EDITH RIVER.

NORTHERN TERRITORY.





NT58-9

PLATE 8

SKETCH MAP

TENNYSON'S No 6 URANIUM - PROSPECT

EDITH RIVER.

Scale

0 10 20 Feet

Reference.

Boundary of area containing hematite in fractures.

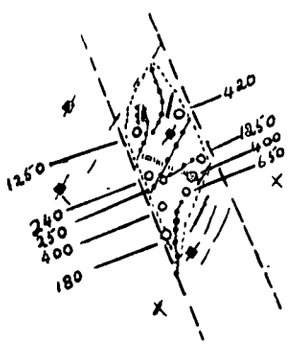
Fracture, and shear approx. 1-inch wide.

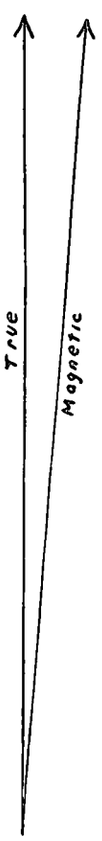
Quartz veins and stringers, maximum width 4 inches.

Lower Proterozoic — Fine-grained granite.

0—620 Geiger-count 620 per minute

Sample channel.





NT58-10