COMMONWEALTH OF AUSTRALIA.

MINISTRY OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS.

1952/68

THE GEOLOGY OF AN AREA SURROUNDING THE FERGUSSON RAILWAY SIDING, NORTHERN TERRITORY.

by

E.K. Carter.

CANBERRA.

THE GEOLOGY OF AN AREA SURROUNDDING THE FERGUSSON RAILWAY SIDING, NORTHERN TERRITORY

by

E.K. Carter.

RECORDS 1952/68

CONTENTS

PLATES

SUMMARY

The area which is the subject of this report totals approximately 100 square miles around the Fergusson* railway siding and includes the Ferguson* River Crossing uranium deposit discovered in 1950. The investigation was carried out to locate any possible further occurrences of uranium near this prospect, which itself does not warrant further work.

Mapping was carried out in June and July, 1951, by examination of representative sections and the tracing of portions of the lithological boundaries. This was supplemented by photo-geological interpretation. Data were plotted on aerial photographs of scale 1" = 2,500' and, for a small area, 1" = 400'. Owing to the rough terrain access is difficult.

The sediments and meta-sediments belong to the Brock's Creek Group of Lower Proterozoic age and form a roof pendant in the Cullen Granite. They are generally argillaceous; greywacke is common, They have a possible thickness of 15,000 feet. Cleavage is slight to intense in narrow zones of shearing. The granite has produced a wide area of hornfels. In places the granite has a margin of greisen. Granitization has also occurred in places along the granite-sediment boundary. Open folding on approximately meridional axes has taken place. Faulting is extensive and has persisted over a long time interval in Pre-Cambrian time.

The granite and the sediments have been intruded by dykes and a sill of porphyry. From the latter a flow of lava, which has been named the Ferguson Toscanite, has emerged. In age, it may belong to the lower part of the upper Proterozoic.

The Ferguson River area lies near the margin of a large and diverse mineral province but gold is the only mineral to be won in any appreciable quantity from the area under consideration. An unknown quantity was taken from the Woolngi mines, 1½ miles west of the Fergusson railway siding, between approximately 1895 and 1908. Copper, alluvial tin and wolfram deposits have also been worked.

The uranium prospect, which is 30 feet east of the Stuart Highway and 240 feet north of the Ferguson River crossing, is in granitized sediments at the margin of the granite. A syndicate, with Commonwealth assistance, sank a shaft to a depth of 20 feet on the prospect in 1950, exposing a 2 inch vein which contains uraninite, chalcopyrite, pyrite, cobaltite and native bismuth. The vein is localized by a minor shear which strikes north-40° west. Torbernite, malachite and erythrite are present at the surface.

The continuation of the shear and other structural and lithological elements in the vicinity of the uranium deposit were tested by Geiger-Muller counter by D.F. Dyson, geophysicist, but no significant radiometric anomalies were located. Test checks of the faults, the zones of silicification, the granite-sediment margins and of the various igneous rock types present throughout the whole area were also made but results were negative.

It is concluded that further occurrences of uranium in economic quantities are unlikely to be found at or near the surface in the area mapped, though two old copper workings west of the Cullen River were not located for testing and may be worth investigation.

---

* Early maps and literature show the spelling of the name of the river as "Fergusson", but the Property & Survey Branch, Northern Territory Administration, which is the authority for the Territory on nomenclature of natural features, now use "Ferguson". The older spelling is preserved in the name of the railway siding.

INTRODUCTION

The area covered by this investigation, totalling approximately 100 square miles, surrounds an occurrence of radioactive minerals which was discovered in 1950. The deposit is 30 feet east of the Stuart Highway, 21 miles south-east of Pine Creek, Northern Territory, and 40 miles north-west of Katherine. It is one third of a mile north-east of the Fergusson railway siding.

The Stuart Highway and the North Australia Railway pass through the area, but otherwise vehicular access is very limited. There are six miles of very rough disused tracks. Most parts of the area are too rough or inaccessible for vehicles and have to be examined on foot.

Mapping of the area was undertaken consequent upon an examination of the Fergusson River Crossing Deposit by H.J. Ward in September 1950 and by Ward and R.S. Matheson in November 1950. Although the prospect itself was not considered to warrant further work, it was thought that further occurrences might exist in the area, particularly along the shear which had localized the known deposit. Mapping and prospecting of the area was therefore recommended. This report records the results of that investigation.

HISTORY

PREVIOUS GEOLOGICAL WORK

The area was touched upon in the course of wide traverses in 1894 by H.Y.L. Brown (1895) and reference is made to mining activities on the Woolngi goldfield (situated 1½ miles west of Fergusson railway siding, and south of the Fergusson River-refer to Plate I) in several of the Chief Warden's reports from 1898-1908, which are included in the Annual Reports of the Government Resident for those years. The northern portion was mapped in 1915-16 by H.I. Jensen (1919), during a reconnaissance geological survey of the Agicondi Mining Province.

GENERAL MINING HISTORY

Gold and copper have been worked in the area (see Plate I). Complete records are not available but production of gold appears to have commenced about 1896. The copper shows proved not to be of economic value; only a few tons of copper, as malachite, were obtained from shallow pits in quartz veins.

Extensive work was done on the Woolngi gold reefs. Several underlay and vertical shafts were sunk; the deepest probably exceeded 100 feet in depth. In addition the quartz reefs were mined in open-cuts. The Chief Warden's report for 1898 records the production of 20 ounces of gold from 82 tons of ore. The remains of a ten-head battery and of two stores show that activity was appreciable. The writer was informed that, at one stage, 1000 Chinese were employed on the field. By 1908 only a few fossickers remained; no production is recorded in that year.

Jensen (1919) examined the Woolngi gold reefs. He described the structure of the main reef as a saddle in an overfolded anticline.

In July 1951 a prospector sank two pits east of the highway on quartz veins and stringers containing small, sparse crystals of wolfram, but the mineral is not present in economic quantities.

HISTORY OF THE URANIUM DISCOVERY

The uranium prospect near the Ferguson River crossing was found in 1950 by J. Johnson and A. Hawker of Katherine, in a pit which had been sunk for copper by a prospector many years previously. After a syndicate had been formed by Messrs. Johnson, Hawker and S. Tennyson, also of Katherine, specimens of radioactive material were forwarded to the Mines Branch, Alice Springs, N.T. and to the Bureau of Mineral Resources, Canberra, A.C.T. and a request was made for technical advice and assistance. As a result financial assistance was given to the syndicate, enabling it to sink a 20-foot shaft. The shaft is 250 feet north of the river crossing and 30 feet east of the highway. Uraninite, chalcopyrite, pyrite, cobaltite, tennantite and native bismuth were exposed in a 2-inch vein at a depth of 20 feet but the quantity and grade did not justify further development.

MAPPING

The region was mapped by traverses across the strike of the sediments and metasediments during June and July 1951. These were supplemented by the tracing of igneous-sediment boundaries where deemed advisable. Aerial photographs on a scale of approximately 1:30,000 taken by an R.A.A.F. Unit in 1948, were used for mapping. Photographs used were from:-

Lewin Springs series, Runs 2-4
Mount Todd series Runs 2-3A

Owing to the density of tree cover the amount of photo-geological interpretation possible was limited. The granite boundary was generally clear but required ground mapping to obtain the necessary detail in places. The map of the area is based on a compilation of the aerial photographs by slotted template method, made by National Mapping Section, Department of Interior, Canberra in 1950.

A more detailed map of a small area adjacent to the uranium occurrence was made on a scale of 1" = 400' (Plate 2), using an enlargement to that scale of the appropriate photograph.

Heights were determined with two pocket aneroid barometers in the field. Corrections for changes in atmospheric conditions were obtained from the three-hourly readings of the Fortin barometer at Katherine Post Office, 40 miles distant. Datum level used was based on the railway survey height of the roadbed at milepeg 166, corrected to mean sealevel.

TOPOGRAPHY

The topography of the area is largely a function of the lithology. The granite has generally a mature surface, lower than the general level of the sediments, hornfels and lava. It is more lightly timbered than elsewhere. In places, however, notably in the southern body of granite, the country is rough in the extreme due to piled masses of blocky granite, with large tors.

The sediments, lava, porphyry and hornfels which occupy the centre of the area (see Plate 1), have a generally young topography with deeply incised narrow gullies and sharp broken ridges and spurs. The less resistant claystone, shale and argillaceous sandstone have reached a later stage of the erosional cycle with the formation of drainage basins which empty into the Ferguson River.

The main drainage channel is the Ferguson River which trends south-west and is joined by the south-flowing Cullen River 3 miles west of the railway. The Cullen River, upstream from its junction with the Ferguson River, and the latter where it passes through the main body of lava, flow through broad gorges.

Both streams normally flow for only 7-8 months each year but the Ferguson, in particular, has large permanent waterholes. The south-eastern portion of the area is drained by watercourses flowing south into the Edith River, which joins the Ferguson River south-west of the area mapped.

The highest point in the area is Mt. Giles whose altitude was determined by barometric means as 1018 feet above mean sealevel.

GEOLOGY

GENERAL GEOLOGY

The sediments and meta-sediments in the area belong to the Brock's Creek Group of Lower Proterozoic age. They form a roof pendant in the Cullen Granite also, according to Noakes (1949), of Lower Proterozoic age. The greater portion of the roof pendant is roughly rectangular in shape and has an area of approximately 50 square miles (refer to Plate 1). It is connected on its eastern side by an "isthmus", 4,000 feet wide, to the main body of sediments in that direction. To the west, the sediments extend in a narrow belt some 4-5 miles from the "rectangle" before being engulfed by the granite.

Both the granite and sediments have been intruded by dykes of porphyry. A large sill of porphyry has become extrusive and poured out a sheet of toscanite which at the present time covers 22 square miles of the area mapped.

Extensive faulting has occurred and ranges over a considerable time interval (see Section on faulting). Many of the faults are quartz-filled. Associated with the quartz veins occur small mineral deposits, including those of copper, wolfram and gold. These generally do not occur in economic quantities.

BROCK'S CREEK GROUP

The rocks which belong to this Group and which occur in the area under consideration are sediments and derivatives therefrom by both regional and contact metamorphism. The sediments are generally argillaceous, with an appreciable proportion of felspar; purely arenaceous beds are almost entirely absent. Some tuffaceous material was observed. Cross-bedding is present in some of the hornfelses and the arenaceous strata. The rock types are indicative of a rather shallow-water geosynclinal environment of deposition.

The sediments, in general, are fine-grained, but a broad stratigraphic zoning by grain-size, reflecting variations in conditions of sedimentation, can be established. The total thickness of sediments represented in the area is possibly in the vicinity of 15,000 feet, though the effect of the extensive faulting, which may have produced repetitions of beds, is not fully known. Furthermore, the structure of the eastern portion of the area mapped has not been determined.

An approximate stratigraphic table, arranged from youngest to oldest, is as follows:-

Claystone, shale, siltstone, fine argillaceous (sericitic) sandstone and greywacke.	5,000 feet
Medium to coarse-grained quartz greywacke, greywacke argillaceous (sericitic), sandstone, with some finer bedded sandstone, tuff, Generally poorly bedded.	2,500
Claystone, shale, siltstone, fine-grained bedded argillaceous (sericitic) sandstone, greywacke and tuffaceous siltstone.	2,000

Rather coarse quartz greywacke, greywacke, argillaceous (sericitic) and micaceous sandstone, commonly quartzitic. Bedding poor. This group, being the lowest, is more extensively hornfelsed than the others and the original character of the sediments is not everywhere readily discernible.	+1,000(possibly 6,000)

Regional metamorphism is slight and has resulted in the imparting to the sediments of a discernible fracture cleavage, which however, is not sufficient in the writer's opinion, to warrant the name slate being applied to the rocks so affected. In local zones, however, shearing stresses have produced narrow belts of slate and in the shear zone south of Mt. Giles (see Plate 1) phyllite has been formed. This last-mentioned region of relatively high grade metamorphism extends westward from the main shear to the toscanite and is most pronounced south of the Ferguson River.

The Cullen Granite has produced a large area of outcropping hornfels. The wide extent of the latter shows that the granite occurs at no great depth below a large part of the roof pendant. No attempt was made to map all outcrops of the hornfels; those shown in Plates 1 and 2 merely represent outcrops observed in the course of traverses.

In thin section, under the microscope, many of the hornfelses appear largely quartzose with subordinate sericite but some sections show tourmaline and others, cordierite. Selective hornfelsing of favourable beds has taken place. This can be seen ¾ mile south-east of the Fergusson railway siding, where 200 feet of well-developed hornfels it separated from the granite margin by 60 feet of relatively unaltered sediments. The belt of hornfels 1/3 mile west of the siding may also be due to selective hornfelsing, or alternatively, to the granite penetrating farther along a particular bed, bringing it nearer to the present-day surface along the strike of that bed than elsewhere in the immediate vicinity.

CULLEN GRANITE

The granite in the Agicondi Province is classified by Jensen (1919) into two groups:- Cullen granite type - a biotite-hornblende granite.
Mt. Davis type - a greisen-rich, white-mica-rich granite.

In the Ferguson River area under consideration, it is clear that the greisen granite is but a marginal phase of the main Cullen Granite body. The Cullen Granite in the area is very variable in character. It is generally a coarse-grained porphyritic rock but some occurrences show a relatively even, fine-grained texture. It is a biotite granite with hornblende subordinate to absent. West-north-west of the area mapped there is a large body of very coarsely porphyritic granite with a dark groundmass. This is more hornblende-rich than elsewhere and contains iron oxides. It may be a hybrid type of granite. Thin sections of granite examined under the microscope show that the felspar content ranges from that of a granite to that of a granodiorite. Based on the limited number of sections examined, the correct name would appear to be adamellite. (These determinations were made in conjunction with W.B. Dallwitz, petrologist of the Bureau).

Most of that portion of the granite margin shown in Plate 2, and also, in general, the small isolated bodies of granite in the sediments, are greisen-medium to coarse-grained, muscovite-rich, with felspar absent to subordinate.

Hornfelsing is rare in the vicinity of the greisen.

Granitization has taken place, but it is by no means typical of the margin of the granite. The transition from granite through granitized sediments to unaltered sediments is most noticeable around the uranium deposit. Under the microscope, thin sections show ragged, corroded quartz crystals which lack crystal outlines, and a large quantity of interstitial sericite. The granitization probably represents an end phase of the granite intrusion.

The granite, in the numerous shears which occur in it, is commonly altered with the development of new minerals, e.g. microcline, chlorite and sericite (damourite?). Hydrothermal solutions may be responsible, in part, for the alteration.

FERGUSON TOSCANITE.

Description. A sill and several dykes of porphyry exist in the area. The sill has a maximum width of 1,100 feet and appears to be the source of a flow of lava which at the present time covers approximately 22 square miles of the area mapped. There is no evidence of more than one flow and it is thought that the dykes contributed little, if anything, to the outpouring. The lava, and its associated intrusives, has been named the Ferguson Toscanite. A typical exposure of the toscanite is at the eastern edge of the main body, one mile south-east of the Ferguson River. A typical section of the sill is that normal to the sill axis, 2/3 mile south-east of Mt. Giles. Clear flow lines occur along the western margin of the intrusion at this point.

The lava originally covered a much wider area than it does today. However it probably did not completely bury the land surface existing at the time of extrusion as "flow tops" have been observed at measured altitudes of 884 and 898 feet. All points higher than 900 feet would appear not to have been buried - and some much lower than this. The flow had a maximum thickness of approximately 350 feet. It probably had only a very small extension east of the highway.

The lava, of composition ranging from that of toscanite to that of dacite, commonly has a very fine, though crystalline, groundmass and euhedral crystals of felspar and quartz. In the body of the flow the groundmass is relatively coarsely crystalline. Chilling of the bottom of the flow is noticeable. The sediments over which the lava was poured out are usually little altered by the toscanite. Near the top of the flow small "drawn-out" vughs up to 2" in length are common. These do not appear to be vesicles, but do show the pattern of flow of the lava. They are probably due to the weathering out of minerals particularly susceptible to chemical attack. The toscanite which forms a capping to the high hill ¾ mile west of the highway and 2½ miles south of Fergusson siding contains thin veinlets of pyrite. These are thought to be syngenetic with the lava.

The intrusive phase is commonly panidiomorphic with, in places, large phenocrysts of felspar and, to a lesser degree, quartz. Quartz, plagioclase, orthoclase, and biotite are the main constituents. Hornblende is not uncommon. The composition and texture, at least in the coarser phases, are suggestive of adamellite, though field evidence clearly shows the rock to be hypabyssal: it could be described as adamellite porphyry.

In the dyke north of the uranium prospect the felspar crystals have a preferred orientation parallel to the long axis of the intrusive body.

The age of the Toscanite. The toscanite unconformably overlies the Brock's Creek sediments; it is clearly post-granite in age since dykes of porphyry occur within the granite; and furthermore lava directly overlies the granite.

This indicates an appreciable time interval between the emplacement of the granite and the extrusion of the lava, during which the sediments over the granite were eroded away.

So far as the writer can ascertain, quartz reefs do not occur in the Buldiva quartzite of Upper Proterozoic age (Noakes, 1949), so that the presence of a large quartz reef in the toscanite suggests that the latter is older than the Buldiva Quartzite. The age suggested for the outpouring of toscanite is therefore basal Upper Proterozoic.

GEOLOGICAL STRUCTURE.

Folding. The folding pattern for the whole area is not clear because of the paucity of bedding in certain formations; but folding in general is moderate, with broad open folds, the axes of which are approximately meridional. West of the highway the pitch is to the south; a minor axis of anticlinal pitch change passes through the Woolngi goldfield and the uranium prospect; and a small, impersistent, synclinal pitch change 600 yards farther north restores the general south pitch in the northern portion of the area. Local reversals of pitch also occur elsewhere.

Between the two parallel faults (inferred in part), the one west of the highway and the other approximately two miles east of it, the sediments in the south dip strongly north-west, suggesting a north pitch.

This is believed to be caused by tilting along a hinge fault. East of the second of the two faults mentioned above, the folding pattern has not been determined.

In the wedge of sediments between two faults south of Fergusson railway siding, strong, nearly isoclinal folding on an east-west axis has been developed. This is believed to have been superimposed on the earlier folding by the stresses which produced the faulting and by movement along the faults. East- striking cleavage has been developed in this area.

The main toscanite flow has a system of flat joints which dip in various directions at low angles, up to 15°. These suggest that gentle folding has taken place since the extrusion of the lava. Some of the joint dips may be due to the lava's having flowed over an uneven land surface, but it is thought that not all can be attributed to this factor. The "flow-tops" near the eastern margins of the main body dip west at 25-45°.

Faulting Evidence indicates that faulting occurred over a wide interval of time. The north-south trend of the granite-sediment contact along the Cullen River is suggestive of a fault, but the granite margin is undisturbed. The adjacent sediments are hornfelsed. Apparently this faulting was pre-granite in age and the granite stopped at the fault. Other similar trends, apparently marking faults, can be recognised on the air photos; and in the position of some of these trends hornfelsed breccia has been found in the field.

Minor faulting, indicated by displacement of the granite margin and by shears in the granite, is common. These faults are best developed along the granite margin between the highway and the Cullen River. Here they are generally quartz filled. They are obviously post-granite in age but do not appear to have affected the toscanite. Also, porphyry has entered along some of these faults, e.g., 1¼ miles east of the highway. These faults must therefore be pre-toscanite in age.

An exception to this is the quartz-filled fault, west of the Cullen River, which has sheared and fractured the toscanite. This must be post-lava in age. Probably, however, only a final movement took place along a pre-established fault line, since the granite-sediment contact is displaced by the fault while the toscanite-sediment margin is not noticeably affected.

The shear zone south of Mt. Giles, referred to in the section titled Brock's Creek Group, is probably related to a pre-granite fault, but little quartz occurs in the shear zone. It is not mineralized.

Insufficient evidence is available to infer the nature of the forces which produced the faulting, but the pattern of the faults and shears in the granite suggests a shearing couple. Other faults appear to be normal faults. That near the highway is a hinge or rotational fault. The relationship of the east-west faults to the others is not clear. The post-granite faults may be due, in part at least, to foundering of the roof pendant in the granite.

ECONOMIC GEOLOGY

GENERAL.

The portion of the Ferguson River area under consideration lies in the south-western section of a large mineral province, from which many different minerals have been obtained. The nearest localities from which minerals in economic quantities have been produced are: Yenberrie, six miles south-east of Fergusson siding, (wolfram, copper and molybdenum); Mt. Todd goldfield, eight miles east-south-east; Mt. Todd tinfield, nine miles east-south-east: Horseshoe Creek, eight miles east (tin); and Copperfield, twelve miles north-west, (copper, silver, lead). In addition alluvial tin is reported to have been won from the Cullen River, and gold, wolfram and tin have been won from unidentified points on the Ferguson River west of the area under discussion.

Within the area mapped, gold and copper have been worked (see section on Mining History), and pits have been sunk on indications of wolfram. All workings which could be located were examined and tested radiometrically without significant result. Unfortunately, copper workings west of the Cullen River, shown on early maps, could not be found. (All the adjacent mineral fields mentioned above and many others in the Pine Creek and Katherine districts were visited in the course of a radiometric reconnaissance with D.F. Dyson, geophysicist of the Bureau, in the second half of July, 1951. No significant radiometric anomalies were located.)

The Woolngi gold deposits, 1½ miles west of Fergusson railway siding, occur in strong quartz reefs which follow the bedding around the western and southern sides of a dome. Less regular reefs occur to the east.

The first mentioned reefs therefore parallel the sill of porphyry. This fact, and the presence of pyrite in both the gold-bearing reefs and in the toscanite, suggest that the gold is genetically related to the toscanite and porphyry. Subordinate galena also occurs in the quartz, and a "shoot" of tin has been recorded (A.R.G.R.,N.T., 1908). The copper and wolfram are probably related to the granite, as is the uranium. The occurrence of uranium is described in the next section.

THE FERGUSON RIVER URANIUM PROSPECT

The prospect discovered by Messrs. Johnson and Hawker lies in granitized sediments near a greisen marginal to the granite, at the southern end of a narrow body of granite and granitized sediments, (see Plate 2).

Sediments or meta-sediments outcrop on three sides of the occurrence.

Those to the west are fine-grained argillaceous sandstone and hornfels; those to the east are quartzite and hornfels. A small granitic dyke appears in the road cutting south of the prospect. Porphyry occurs 600 feet to the west, and a zone of silicification lies 200 feet to the east. The zone of silicification appears to be due to the introduction of a siliceous solution along a line of weakness. Near the granite this zone is felspathic also, probably because of resolution of felspar in the granite.

Extensive faulting has taken place in the general area, but there is no evidence of faulting (apart from a weak shear, mentioned below) in the immediate vicinity of the deposit. The prospect lies on the line of an anticlinal pitch change.

The secondary mineralization in the prospecting shaft occurs between two west-dipping shears which strike N40°W and are 40" apart at the surface. These shears meet or intersect near the bottom of the shaft.

At this point primary minerals are encountered. They are confined to a sulphide-bearing vein in, one of the shears. At a depth of 20 feet the vein is 2" wide.

Minerals recorded in the shaft, as determined by mineragraphic investigation (Stillwell, 1951a and b) are: Secondary: malachite, torbernite, autunite, covellite and erythrite; primary: chalcopyrite, pyrite, uraninite, cobaltite, tennantite, native bismuth, and probably lollingite and enargite. The mineral-bearing solution was probably a late stage fraction from the granite and was concentrated in the region of anticlinal pitch change. It was localised by the shears which occur in the shaft. There is no evidence that any other of the nearby faults contributed to the localization or introduction of the minerals.

Radiometric Findings Radiometric testing of the vicinity of the deposit by D.F. Dyson showed two significant anomalies, both of such small extent that the plotting of iso-count contours was impracticable.

The points giving high Geiger-Muller counter readings are: (a) the site of the prospecting shaft, and (b) a point 54 feet north of the shaft.

Both points gave readings of ten times background.

Radiometric assays of four samples from the shaft were made by the Geophysical Section of the Bureau. Results were as follows:

Sample	Equivalent U_3O_8
North wall of shaft at 14 ft, over 11 inches	0.02%
20 ft. level, north wall of shaft	0.13%
20 ft. level, south wall of shaft	0.07%
20 ft. level, 2" seam of sulphides	0.24%

Local Prospecting The shear in which the uranium deposit occurs is very poorly defined: it differs from the numerous other shears in the granite only in being mineralized. It does not appear to persist into the sediments to the south. Throughout its length on the surface, the shear is in exposed rock or very shallow soil which would have a negligible effect in masking any radioactivity present. The shear was traced for 2/3 mile to the north-west, and two small areas were found where the counter gave a reading of twice background. A third point, south of the porphyry and east of the highway, also gave a reading of twice background (see plate 2). These findings do not indicate the presence of payable ore.

The granite and granitized sediments which occur east of the highway and west of the "tongue" of sediments generally have a higher than normal background count. The sediments, the porphyry, the silicified zone, the main body of the granite and the fault zones all showed normal geiger readings.

REGIONAL RADIOMETRIC INVESTIGATIONS

Radiometric testing of other parts of the area was carried out by (a) tests of all copper showings located: (b) radiometric traverses along portions of the granite-sediment contact, particularly that between the highway and the Cullen River, which has been extensively faulted; (c) check traverses along the major faults, except that west of the Cullen River; (d) check tests made of the various lithological elements: granite, quartz, porphyry, and silicified sediments.

A reading of 1½ times background was obtained in a pit, from which a few tons of malachite had been dug. This pit is 2 miles east of the highway, near the granite-sediment contact. With this exception, no radiometric anomalies were found.

CONCLUSIONS

1. The uranium prospect on which the shaft was sunk does not warrant further development.

2. No associated near-surface uranium deposits likely to prove of economic value were found.

3. The area mapped is not likely to furnish any further uranium deposits of significance. The two copper shows west of the Cullen River, shown on old mineral and geological maps, are the most likely prospects for a further discovery. In the event of additional radiometric reconnaissance of old mining areas being undertaken, an attempt should be made to locate and test these old workings.

ACKNOWLEDGMENTS

Acknowledgment is made of the assistance rendered to the author in carrying out the survey by the manager, North Australia Railway, Darwin, in making available a railway hut at Fergusson fettler's camp; by the Director, National Mapping Section, Department of the Interior, Canberra for the loan of aneroid barometers; by the Postmaster, Katherine, for the supply of barometric data; by the Senior Draughtsman, Property and Survey Branch, Northern Territory Administration, Darwin for data about railway level and other information; and to various local residents for historical information about the area.

REFERENCES

Brown, H.Y.L., 1895?- Government geologist's report on explorations in the Northern Territory. Office of the Minister controlling the Northern Territory.

Jensen, H.I., 1919 - Report on the geology of the Agicondi Province of the Northern Territory. Bull. North.Terr. 19.

Noakes, L.C., 1949 - A geological reconnaissance of the Katherine-Darwin region, Northern Territory.Comwlth. of Aust.Bur.Miner.Res.Geol.&Geophys.Bull.16.

Stillwell, F.L.1951(a)- Uraninite from Rum Jungle and Fergusson River, Northern Territory C.S.I.R.O. Mineragraphic Investigations, Rpt.No.473.

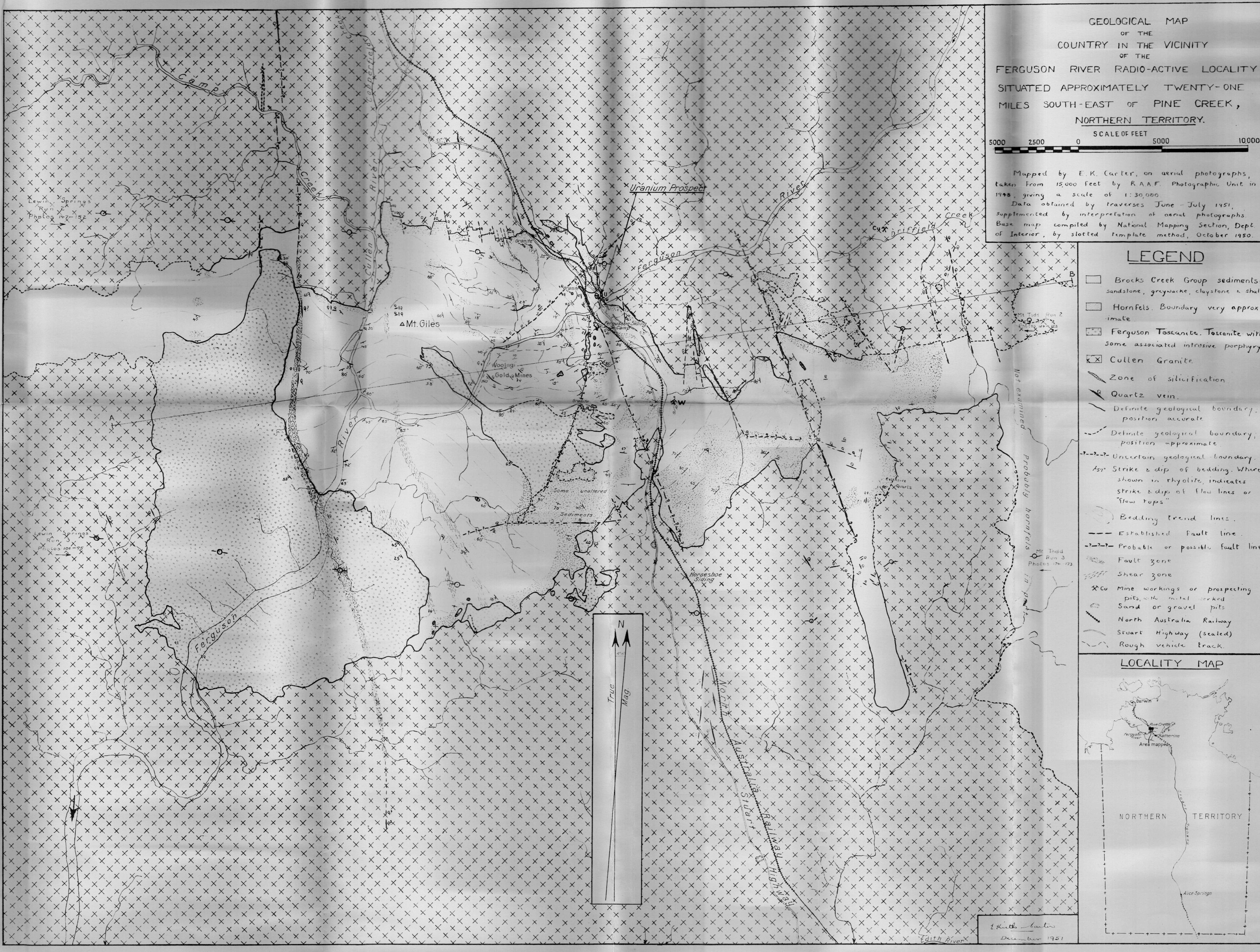
____________ (b)- Note on specimens containing oxidised uranium minerals from Rum Jungle and

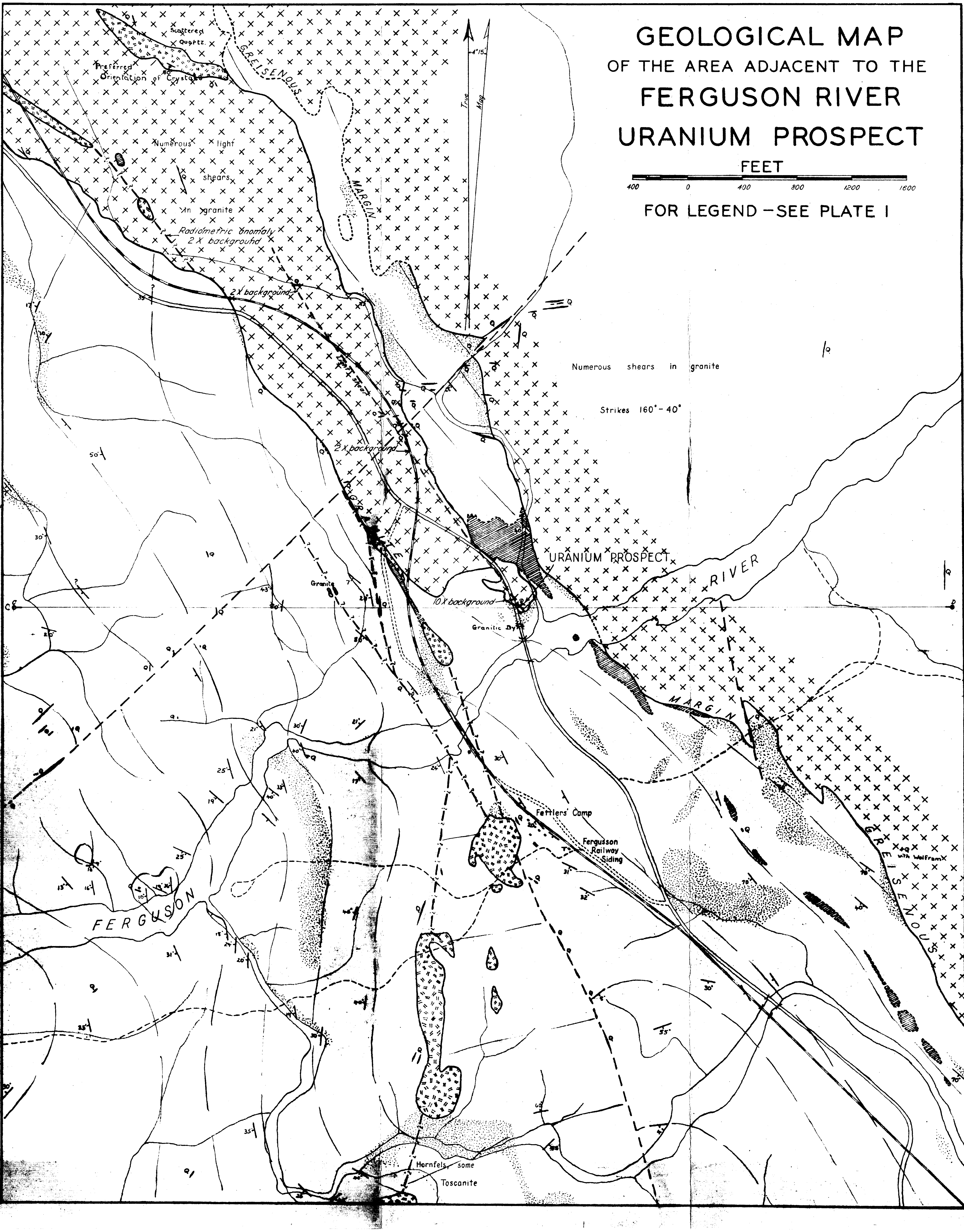
References (cont.)

Fergusson River, Northern Territory. C.S.I.R.O. Mineragraphic Investigations. Rpt. No. 474.

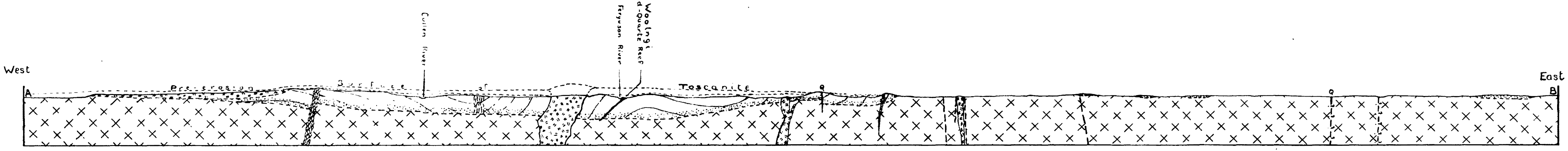
A.R.G.R.N.T., 1910 - Annual reports of the Government Resident in Northern Territory 1896-1910. Office of the Minister controlling the Northern Territory.

Record of mining in the Northern Territory of South Australia. (1900). Office of the Minister controlling the Northern Territory.


GEOLOGICAL MAP
OF THE
COUNTRY IN THE VICINITY
OF THE
FERGUSON RIVER RADIO-ACTIVE LOCALITY
SITUATED APPROXIMATELY TWENTY-ONE
MILES SOUTH-EAST OF PINE CREEK,
NORTHERN TERRITORY.
SCALE OF FEET
5000 2500 0 5000 10,000
Mapped by E.K. Carter, on aerial photographs, taken from 15,000 feet by R.A.A.F. Photographic Unit in 1948, giving a scale of 1:30,000
Data obtained by traverses June - July 1951, supplemented by interpretation of aerial photographs.
Base map compiled by National Mapping Section, Dept of Interior, by slotted template method, October 1950.
LEGEND
Brocks Creek Group sediments - sandstone, greywacke, claystone & shale
Hornfels. Boundary very approximate
Ferguson Toscanite. Toscanite with some associated intrusive porphyry
Cullen Granite
Zone of silicification
Quartz vein
Definite geological boundary, position accurate
Definite geological boundary, position approximate
Uncertain geological boundary
Strike & dip of bedding. Where shown in rhyolite, indicates strike & dip of flow lines or "flow tops"
Bedding trend lines
Established fault line
Probable or possible fault line
Fault zone
Shear zone
Mine workings or prospecting pits, with metal worked
Sand or gravel pits
North Australia Railway
Stuart Highway (sealed)
Rough vehicle track
LOCALITY MAP
Darwin
Pine Creek
Katherine
Area mapped
NORTHERN TERRITORY
Alice Springs
Uranium Prospect
Camp
Creek
Cullen River
Ferguson River
Driffield Creek
Mt. Giles
Wooings Gold Mines
Ferguson Siding Camp
Some unaltered Sediments
Horseshoe Siding
Lewin Springs Run 2 Photos 147-152
Lewin Springs Run 3 Photos 101-95
Mt Todd Run 2
Mt Todd Run 3 Photos 174-173
Not examined
Probably hornfels in part
North Australia Railway
Stuart Highway
True
Mag
N
A
B
Edith River
December 1951

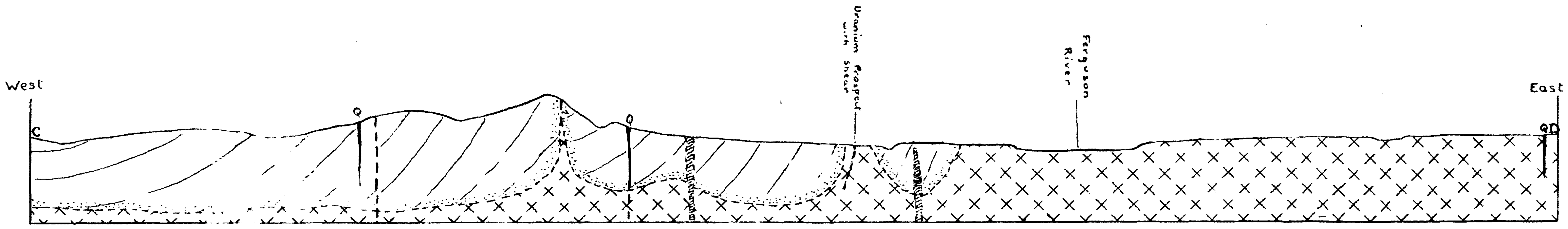


GEOLOGICAL MAP
OF THE AREA ADJACENT TO THE
FERGUSON RIVER
URANIUM PROSPECT
FEET
400 0 400 800 1200 1600
FOR LEGEND – SEE PLATE I
True
Mag
Scattered Quartz
Preferred Orientation of Crystals
GREISENOUS
MARGIN
Numerous light shears in granite
Radiometric anomaly 2 X background
2 X background
2 X background
Numerous shears in granite
Strikes 160° - 40°
URANIUM PROSPECT
RIVER
10 X background
Granite
Granitic Dyke
MARGIN
GREISENOUS
Q with Wolfram
Fettlers' Camp
Fergusson Railway Siding
FERGUSON
Hornfels, some Toscanite



SECTION THROUGH AB-PLATE 1. SCALE 1" TO 2,500'

FOR LEGEND SEE PLATE I



SECTION THROUGH CD - PLATE 2. SCALE 1" TO 400'