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COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

RECORDS.

1954/42

REPORT ON INSPECTION OF PORTION OF PROPOSED AUTHORITY TO PROSPECT.

(No. 151 (Sleisbeck), Northern Territory.

By

J. B. Misz.

REPORT ON INSPECTION OF PORTION OF PROPOSED AUTHORITY TO PROSPECT NO.151 (SLEISBECK), N.T.

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C O N T E N T S.

SUMMARY.

The following report concerns the geology and mineralization of two uranium prospects in the Gimbat - Snake Creek Area of the Northern Territory. One of these prospects, referred to as Sleisbeck, can be regarded as one of the most favourable yet discovered in the Northern Territory.

The radioactivity occurs in a quartzite breccia outcropping over a length of 1½ miles and with a width of as much as several hundred feet. Geiger counter readings of 2 - 100 times background, occur frequently along the entire length of the outcrop, visible mineralization being present at three separate localities. The state of this mineralization, its associations and the geological setting are favourable to the possible occurrence of uranium mineralization at depth.

Recommendations are made for further work, and problems in the regional geology are discussed.

The writer considers the sections of this report designated "Mineralization" and "Conclusions" to be the most important for a knowledge of the actual uranium occurrences. The remaining information is mainly geological, and, while highly pertinent, may not be of urgent interest to readers with a limited amount of time.

INTRODUCTION.

On July 14th, 1954, an inspection was made of two new radioactive prospects in the Katherine - Darwin Area, N.T. These will be referred to as Sleisbeck and Turn Off Creek, the former being 6 miles and the latter 15 miles south-west of the junction of the Gimbat and Katherine Rivers.

It is most important that the reader bear in mind that the contents of this report are the result of only one days field work covering an area some 20 miles long, and hence can only furnish a generalized or "qualitative" picture. Further work may well prove specific details to be in error.

LOCATION AND ACCESS.

Sleisbeck is situated on the west bank of the Katherine River, 6 miles south of Gimbat Creek. At present the prospect can be reached by road or aeroplane, a 1500 ft. airstrip having been cleared at Sleisbeck. This airstrip is 72 miles on a bearing of 81½ degrees from Pine Creek.

Road access, by rough bush track, is via Maranboy and Emu Creek Homestead. A road has been bulldozed from the latter, approximately 50 miles to the prospect. Four wheel drive is definitely to be recommended, although conventional drive vehicles can reach the prospect at present. It seems probable that development of thick "bull" dust will soon make travel for 2 wheel drive vehicles very difficult. The total distance from the prospect to Katherine is about 110 miles.

This road will be entirely impassable after the first rains, and it is planned to make another road into the area from Hidden Valley south of Pine Creek.

GEOLOGY.

Stratigraphy.

The radioactive prospects occur in rocks of undetermined age near the northern (Sleisbeck) and eastern (Turn Off Creek) rims of a broad basin of Mt. Callinan Group sediments and volcanics.

Lithologically this basin is very similar to the basin in which the ABC Prospect occurs, and also to the basin on the margin of which is situated the Coronation Hill Prospect. All three consist of a series of alternating sandstone and volcanic horizons (Upper Proterozoic a, b, c, d, e of Rattigan and Clark.)

The oldest of these formations in the Gimbat - Turn Off Creek area is a markedly cross-bedded series of thin sandstones, grits and pebble conglomerates. An extensive, well developed boulder conglomerate is first met with in approaching the basin from Sleisbeck, the boulders consisting largely of porphyry.

The Mt. Callinan formations half mile south of Sleisbeck dip 10° - 20° south. The dip steepens on the eastern edge of the basin to 20° - 50° east near Turn Off Creek and in places is almost vertical. The soil covered flats (on which Sleisbeck occurs) to the north of the Mt. Callinan basin are underlain by limestones and shales, which also dip about 20° south. In the Turn Off Creek area, east of the basin, limestones and shales are interbedded with acid-intermediate porphyry, which is often slightly radioactive. Dips here are variable but always steep.

The white to black limestone is often banded, contains shaley layers and is usually silicified near the surface. Brown chert is prominent. Small fresh pyrite crystals are sparsely disseminated through the limestone locally. The shales are buff to black, but the few outcrops seen cannot be termed carbonaceous or graphitic.

Porphyries are common and appear to be conformable to the limestones and shales. They may be sills associated with the post Brock's Creek - pre Mt. Callinan granitic intrusives, or (more probably) are interbedded volcanics. In some outcrops the texture is fine to medium-grained granitic, in other outcrops it is porphyritic with a reddish, glassy ground mass and resembles some of the fresh acid-intermediate volcanic in ABC drill cores. Quartz is occasionally present and the felspar is mainly the potash variety, placing the rock in the trachyte - latite porphyry classification.

Numerous outcrops of steeply dipping quartzite breccia occur both at Sleisbeck and Turn Off Creek. This rock is strikingly similar to the quartzite breccia at Rum Jungle with angular boulders of quartz and quartzite in a pink, fine-grain, sandy ground mass characterized by an abundance of hematite (much of it specular or micaceous.)

Topography.

The Mt. Callinan sandstones and volcanics weather differentially in a manner similar to the sequence at A.B.C, with the more resistant sandstones forming continuous, prominent ridges 10 - 15 feet high. The interbedded volcanics form long soil covered plains with few outcrops aside from those in stream beds.

The limestones and shales north and east of the Mt. Callinan syncline comprise very flat, soil covered plains, rising sharply above which are the prominent, elongated ridges of quartzite breccia, which may reach 50 feet in height. The

porphyries of Turn Off Creek also form marked ridges.

Structure.

The geological structure, especially of the rocks outside the Mt. Callinan basin, has not been determined, and the writer could do little during a one day inspection, apart from gaining a few impressions which are here enumerated for what they may be worth.

Although the strike and dip of the limestones at Sleisbeck correspond to the strike and dip of the north edge of the Mt. Callinan basin, it would appear that the former do not continue conformably and without break beneath the basin rocks. A strong west-northwest fault paralleling the present north edge of the basin separates the basin rocks from the limestone. Where the present basin edge swings to north-south, the fault becomes transgressive to the bedding, and for a distance of at least four miles it marks a fault contact between north-south striking Mt. Callinan formations and east-west striking limestones, the latter being on the north side of the fault. Were it not for the fault, the north-south striking basin rocks would swing to the east and would occur conformably beneath what are now the most northerly (oldest) Mt. Callinan rocks on the north edge of the basin.

Thus the age of the limestones relative to the basin formations is dependant on whether or not the limestones form the up-thrown or the down-thrown side of the fault.

At Turn Off Creek the limestone - shale - quartz breccia porphyry series forms a 7 by 1 mile strip east of the Mt.Callinan basin. These rocks have a variable, but generally north-south, strike with dips ranging from very steeply west to very steeply east. The structural relationship of these rocks to the basin formations is not clear.

The quartz breccias are an unsolved problem. The geological origin of those at Rum Jungle is still not definitely known. Hypothesis of origin range from an intrusive quartz breccia to a sandy sediment which has been strongly brecciated during post Brock's Creek folding. The quartzite breccias at Rum Jungle are restricted, perhaps significantly, to synclines in the Brock's Creek rocks, and considering this factor alone, they might well be younger than Brock's Creek in age regardless of whether or not they are sedimentary or intrusive. The geologists at Sleisbeck are of the opinion that the quartz breccia dips steeply northwards, thus transgressing the bedding, and it is worthy of note that its strike parallels that of the fault to the south.

Features noticed that are pertinent to the determination of the stratigraphic position of the limestones and shales are:-

1) The limestone - shale - quartzite breccia association is largely reminiscent of the Rum Jungle area, where these rocks belong to the Brock's Creek Group.

2) Limestone has to date been found in appreciable amounts only in B rock's Creek and post Mt. Callinan sections.

3) The steep dips of the limestones in the Turn Off Creek area are suggestive of Brock's Creek conditions and resemble somewhat the limestone at the Evelyn Mine. Dips at Sleisbeck, however, are mush flatter.

4) The normal regional trend of Brock's Creek rocks is northerly. The limestone at Sleisbeck trends east - west.

5) Volcanics, superficially resembling those in the Mt. Callinan and Daly River Groups, are interbedded with the limestones and shales at Turn Off Creek.

6) The limestones and shales do not appear to have suffered appreciable metamorphism or recrystallization.

7) The discovery of coral-like fossils at both Sleisbeck and Turn Off Creek is a major contribution to the stratigraphy of the Katherine - Darwin area. They may necessitate a complete reassessment of the age of the rocks. The fossils have been identified as Lower Cambrian.

These observations are most conflicting, however a solution could not be obtained in one day. Brief regional mapping of the area is necessary to decide the matter.

MINERALIZATION.

Sleisbeck.

Surface radioactivity is confined to a 1½ mile long linear series of quartzite breccia outcrops forming ridges as much as 50 feet high above the surrounding flat, soil-covered, limestone and shale country.

A large proportion of the breccia is not radioactive or only very slightly so. Local areas giving readings of 2 to 4 times background are numerous, in addition to which the following are known:-

1)	Two zones	30 feet by 5 feet	averaging 5 to 12	times background.
2)	" "	6 " " 10 "	" 6	" "
3)	" "	v. small	" 5 to 15	" "
4)	One "	20 feet by 40 "	" 5 to 20	" "
5)	" "	30 " " 150 "	" 2 to 10	" "
6)	" "	40 " " 5 "	" 5 to 100	" "
7)	" "	10 " " 10 "	" 5 to 20	" "
8)	" "	900 " " 40 "	sporadic readings 3 to 10 times background.	

Visible uranium mineralization occurs in three localised areas 40 by 5 feet, 20 by 40 feet, 30 by 10 feet. The best of these is the 40 by 5 feet area on Hill No. 2, where visible mineralization is spectacular and assays range to over 1% eU_3O_8. The other two areas assay (surface material) from a trace to perhaps . 25% eU_3O_8.

The company developing the prospect claims that eleven uranium minerals have been distinguished to date of which the writer noted tobernite, autunite, brown and yellow ochres, sklodowskite (?) and a soft white coating which flouresces green.

Inasmuch as only three weeks have elapsed since discovery of the prospect and access is a major difficulty, no systematic detailed sampling, costeaning or geological mapping has yet been undertaken. Hence it must be emphasised that genesis, mineralization conditions, and changes of grade and extent of mineralization beneath the surface can only be speculated upon. Relative to this point are the following:-

1) Visible uranium mineralization in the three areas mentioned occurs either on or within an inch of the surface of the rock, hence the rock (in these three areas, at least) has not been leached of its uranium content near the surface. There are no obvious variations in the physical condition of the breccia

which would suggest that significant differential leaching has occurred, removing uranium in some portions and not leaching it in others.

2) The readings of 2 to 4 times background (corresponding to an equivalent U_3O_8 content of the order of .001 to .006%) cannot be taken as a definite indication of stronger mineralization beneath. In addition to Point No. 1 above, there is evidence (inconclusive) that such levels of radioactivity in this rock type in this region may be "inherent", in a similar way to the widespread, low intensity radioactivity, possessed by many black shales, volcanics or coaly horizons both in the Northern Territory and elsewhere in the world. Such "inherent" radioactivity possesses no economic significance. At Sleisbeck, however, it may indicate mineralization in the adjacent soil-covered limestones (see below).

3) Some near surface redistribution of radioactivity by groundwater movements and creep of soil and rubble is to be expected, and has obviously occurred at Sleisbeck. Thus the extent of radioactivity on the undisturbed surface cannot be regarded as a definite measure of the extent of radioactivity at a shallow depth beneath the surface, or, even less, in the primary zone. Groundwater and creep have most probably extended the horizontal surface area of radioactivity beyond the dimensions obtaining at depth. This statement refers only to the quartzite breccia. (See below). Leaching, if it has been significant, would, ofcourse, be an off-setting factor.

4) Absorption tests on surface material indicate the surface mineralization is either in equilibrium or very nearly so, commonly with slight enrichment in uranium and less commonly with slight enrighment in radium. Once again the suggestion is that recent leaching has not been an important process, and also that the mineralization is not the result of recent deposition from groundwater which has obtained its uranium from a possibly remote source.

5) The visible uranium minerals tend to be concentrated along fractures in the quartzite breccia and in tiny vugs which are often lined or nearly filled with minute quartz crystals. Frequently the latter are smoky. In one case examined by the writer flourescence was entirely confined to fractures in translucent quartz fragments and augen from .5 mm to 2 cm. across, the ground mass in which these were set being non-flouresecent. Dissemination of uranium through the rock also exists, and sometimes is the main method of occurrence.

6) Nowhere is the limestone immediately adjacent to the quartzite-breccia or the limestone-breccia contact exposed. On geological grounds, it may well be that this contact is the focal point of important mineralization, remnants of the fringe of which are now exposed on the quartzite breccia. In the writer's opinion, this is an extremely important possibility, which must be investigated by drilling and costeaning.

7) Mineral associations:

   a) A greenish, botryoidal, translucent mineral resembling calamine (hydrous zinc silicate) occurs in small vugs associated with the visible uranium minerals.

b) Tiny (1 mm. or less) crystals of smoky to black quartz are intimately associated with the uranium. Sometimes small clusters of such quartz crystals are partially or entirely surrounded by secondary uranium minerals. Elsewhere in the world, smoky quartz has been noted as an associate of uranium, and additional research may prove smoky quartz to be an indicator of the presence, or former presence, of primary uranium mineralization.

c) Local gossan, sometimes of a boxwork nature, is not uncommon and may be used as evidence for primary mineralization at depth. Some very good gossans have been located about two miles from and on a line with Sleisbeck Prospect.

Coating the small quartz crystals which line the cavities in one boxwork gossan, the writer noticed tiny grains of a crystalline, translucent, vitreous, soft, deep ruby coloured mineral which could not be identified in the field. The quartz adjacent to these grains had been stained pale violet.

d) The quartzite breccia is characterized by a universal, but varying hematite content. Micaceous and specular varieties are common in small pockets and stringers. The nature of this iron in the primary zone needs investigation.

Turn Off Creek.

Radioactivity at Turn Off Creek occurs in tuffaceous, hematitic shales closely associated with thin bands of quartzite breccia and porphyry in a country rock of steeply dipping limestones and shales. The red host rock reminds one strongly of Dyson's Mine.

The limestones and porphries have background counts of 60 and 100 counts per minute respectively. Over a strip 600 feet long and up to 50 feet wide on tuffaceous shales and quartzite breccias a number of 200 counts per minute (4 times background) "highs" occur. Other "highs" also are found elsewhere in the Turn Off Creek rocks. Shallow pitting does not increase the counts beyond what is to be expected from "mass effect."

Hematization near the radioactive areas is general and often extreme, large masses of almost pure micaceous hematite and many thin ramifying veinlets occurring. There is no visible uranium or copper mineralization.

In view of these facts, no great importance can be assigned to the radioactivity at Turn Off Creek at present. However, the geological similarity to Sleisbeck and the occurrence of slight radioactivity makes the area most worthy of further detailed prospecting. Inspection of the now hidden limestone contacts adjacent to the surface radioactivity is also necessary.

CONCLUSIONS.

Sleisbeck is certainly one of the best uranium prospects found to date in the Northern Territory. Visible mineralization extends over an area of the order of 1300 square feet, although some of this may result from near surface redistribution. High assay values have been obtained in one area, and satisfactory values in at least another two. Many other "hot" spots and local areas occur, some of which probably have little significance as far as ore is concerned.

The quartzite breccia with which the surface radioactivity is associated extends for 1½ miles with gossans an additional two miles away on the same line. The uranium is in good equilibrium and does not appear to have suffered appreciable recent transportation or leaching.

The geological environment would appear to be such that ore in depth is a distinct possibility. The limestone-quartzite breccia contact is a most favourable position for the location of such ore. The many similarities to Rum Jungle are an encouraging feature, as are some of the mineral associations and gossan occurrences.

The Turn Off Creek area cannot at present be considered a good uranium prospect. However, it is an excellent locale for further detailed prospecting, especially along limestone-slate contacts adjacent to known surface radioactivity. The latter should, ofcourse, be thoroughly investigated. The structure and stratigraphy of the area is unknown and is deserving of considerable work.

RECOMMENDATIONS.

Development.

Detailed sampling, radiometric gridding, geological mapping, pitting, costeaning and drilling should be conducted to determine more accurately the extent and grade of surface mineralization and to test the deeper zones (especially quartzite breccia contacts) for primary mineralization.

It would be advantageous to have this work proceed at the quickest possible pace, not only to enable an assessment of Sleisbeck, but also to furnish guiding information for the many prospecting parties which are bound to enter the area in search of similar deposits.

Concentrated prospecting should also be undertaken in the Turn Off Creek area.

Geophysics.

1) Test self-potential traverses are most desirable over a number of the mineralized and gossanous areas. If successful, the method will be an invaluable guide to selection of drill hole sites most likely to intersect primary ore.

2) The large amount of micaceous and specular hematite in the quartzite breccia should result in a good magnetic contrast between the breccia and adjacent limestones and shales.

Thus a number of test magnetometer traverses should be run. If anomalies result, the method can be used to trace the Sleisbeck quartzite breccia where soil covered. It can also be used to locate similar horizons under soil cover possibly occurring elsewhere in the region. There may also be some relation between strength of magnetic anomalies and degree of mineralization.

3) The carborne ratemeter and airborne scintillometer would be most useful in gridding the limestone flats near the quartzite breccia and along its possible extensions to the east and west. Such instruments would also be of great use in regional prospecting of the area.

4) The Sleisbeck - Turn Off Creek area would appear to be well suited to successful geochemical prospecting to locate other soil covered zones of mineralization.

Regional.

It appears that the company developing Sleisbeck will have little time in the immediate future to devote to regional mapping. Nevertheless, this mapping is considered by the writer to be of the utmost urgency in order to assist the many prospecting parties that will undoubtedly enter the area. Major problems requiring regional mapping to enable solution are:-

1) The position of the limestone - shale - porphyry series of rocks in the stratigraphic column of the Katherine - Darwin area.

2) The implications of the recently found Lower Cambrian fossils.

3) The nature, age, and structural relations of the quartzite breccia which occurs extensively throughout the area, and in which surface mineralization occurs at Sleisbeck.

J.B. Misz.

Darwin. N.T.
July, 1954.

RECONNAISSANCE EXAMINATION OF PROPOSED AUTHORITY TO PROSPECT NO. 151 (SLEISBECK.)

SUMMARY.

After a brief inspection of the area now known as Sleisbeck, the author finds it to be the most promising radio-active area in the Northern Territory apart from Rum Jungle. This opinion is based on a few important observations. The 3 times background contour encompasses an area several hundred feet wide to slightly more than a mile and one half in length. Within this area are three separate occurrences of visible ore grade uranium mineral in addition to much scattered radioactivity.

The mineral occurs in a ferruginous brecciated sandstone almost identical with that found at Dyson's, Rum Jungle. If the deposit is similar, as is likely, in other ways to Dyson's, the best ore is not now visible but is covered by the thick rubble on the slopes. The impressive dimensions of this deposit make it worth intensive investigation.

DESCRIPTION OF PROPOSED AUTHORITY TO PROSPECT.

All that Crown Land in the Agriconda Goldfield in the Northern Territory of Australia containing an area of 65¼ square miles more or less: Commencing at the North-East corner of the Coronation Hill Temporary Reservation (proclaimed in Northern Territory Gazette 13A of 1st April, 1954) thence by a line bearing 90 degrees for a distance of about 24 miles to a point on the West boundary of the Arnhemland Aboriginal Reserve thence by a part of that West boundary bearing 180 degrees for a distance of 2½ miles thence by a line bearing 270 degrees for a distance of 6 miles thence by a line bearing 180 degrees for a distance of 7½ miles thence by a line bearing 270 degrees for a distance of about 18 miles to the South prolongation of the East boundary of the Temporary Reservation aforesaid then by that prolongation and the east boundary of the said Reservation bearing in all 360 degrees for a total distance of 29 miles to point of commencement. All bearings true.

LOCATION.

This deposit (named "Sleisbeck" by the owners) was discovered early in July, 1954, by George Sleis. It is located on the upper reaches of the Katherine River near the Arnhemland border. More exactly it is N. 81½° E and 72 air miles from Pine Creek. (See PLATE I.)

Access is at present long and difficult from the south through Maranboy and Yeuralba. A new road can be built with very reasonable cost over the tableland from Hidden Valley. This new road would be 83 miles long and much straighter than the 120 mile track from Maranboy.

GEOLOGY.

Regional: The uranium occurs in a series of rocks which appear to be the same as those called the Buldiva Group of Upper Proterozoic age. Coral fossils found by George Sleis underneath the Buldiva group indicate that it must be of post-Cambrian age.

The regional geology as seen from the air on the way into the deposit suggests that the sedimentary series at Sleisbeck, the A.B.C. and the Coronation Hill deposits are the same. At Sleisbeck the series consist of course conglomerates, volcanics, tuffaceous sediments, shales and limestones. It appears that the series is in excess of 10,000 feet thick.

The deposit is located on the north-western edge of a shallow, dish-shaped syncline. Dips on the edge of the syncline vary in short distances from vertical to nearly flat.

Geology of the Deposits.

All the radioactivity and uranium found to date occur in the same type of host rock, namely, a ferruginous, brecciated sandstone. This sandstone outcrops as a fairly high, rubble-covered, broken ridge surrounded by alluvium. The structure or even dip can be seen in the brecciated sandstone, but there is little reason to suppose that it is not in a general way conformable with the over and underlying beds. A black slate and siltstone overlie the host rock and limestones are found above and below.

The distribution of radioactivity is indicated on the accompanying sketch map (PLATE II-), together with the occurrences of uranium and the size of the mineralized outcrops. The three times background radiometric contour extends on both sides of the ridge along the entire length shown on the sketch. Except for minor breaks it is continuous over the soil covered flats between the larger hills. Along the entire length of one and one-half miles many spots of high count can be found. In places it is uniform, in others it is quite irregular. Some large outcrops of massive red sandstone count at least 20 times background but have no visible uranium.

Visible uranium occurs as ochres, autumite and torbernite in the surface rock. The maximum assay value so far on a good specimen is 1.4% eU_3O_8. No mineralization controls can be supposed at this time. No quartz is visible nor obvious copper. One small radioactive shear zone appears to be a real gossan but other than that the uranium has no obvious associations.

Radioactivity has been found scattered along the strike of the stratigraphic unit containing the uranium for about 15 miles. At Turnoff Creek (11 miles from Sleisbeck) the count reaches six times background in a hematitic sandstone breccia interbedded with tuffs and limestone containing abundant hematite blows. This area has been scarcely checked and is worth much careful work.

CONCLUSIONS.

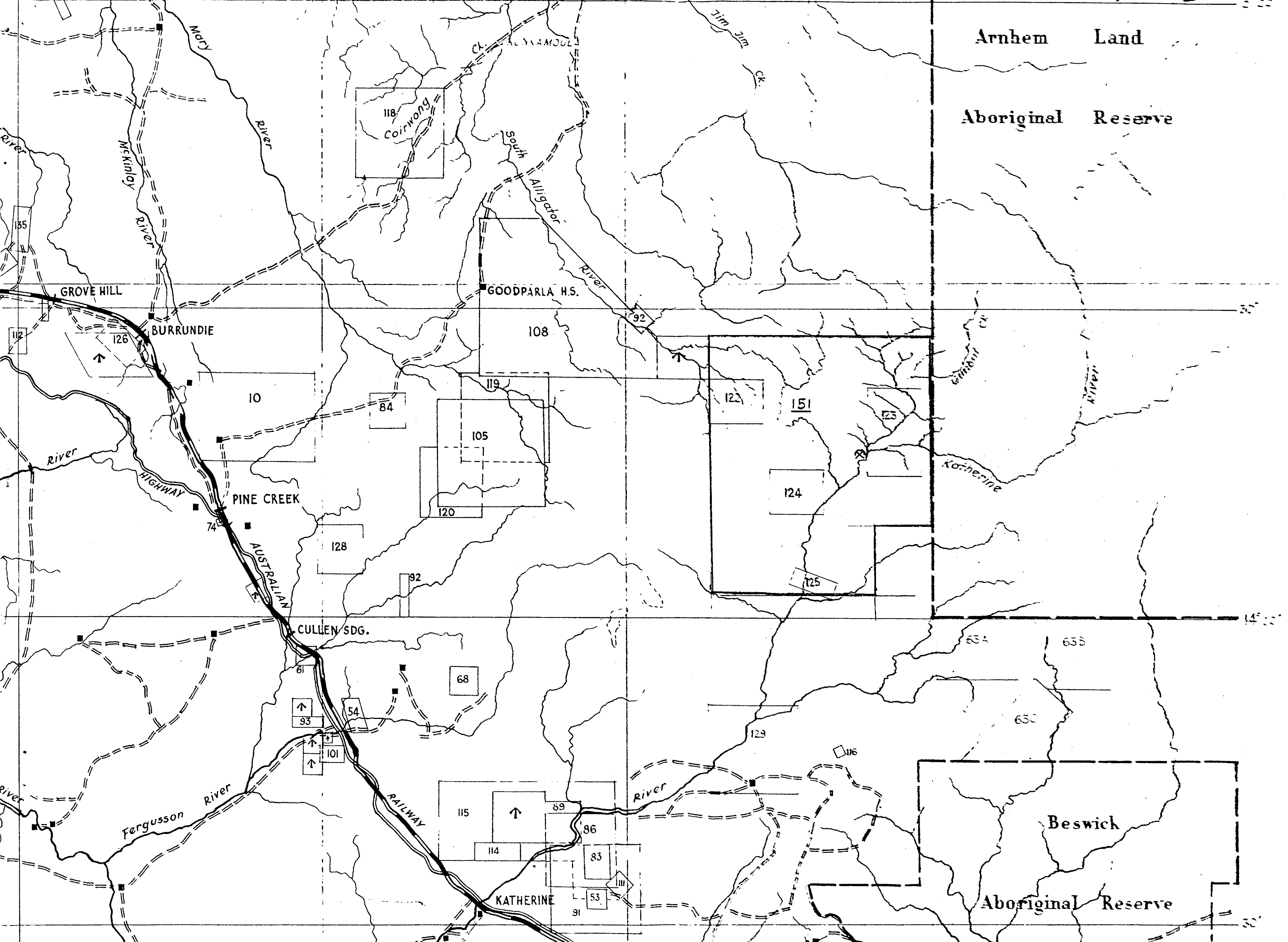
This deposit appears to have very good prospects of being a major ore body. The rubble from the sandstone breccia covers the adjacent rocks, and may, as was true at Dyson's, Rum Jungle, cover the real host rock and ore bodies.

There are no valid means of assessing the worth of this deposit without drilling and costeaning. However, a measure of its possibilities may be had by comparing it with the original outcrops at Dyson's, Rum Jungle, which it closely resembles in lithology. No visible uranium was found at Dyson's without digging. Sleisbeck has three areas widely separated with uranium ore. The maximum radioactivity was 20 times background over one

spot only at Dyson's. Sleisbeck has many spots counting over 20 times background. At Dyson's the original 3 times background contour encompassed an area in the order of 100 feet long; - at Sleisbeck it is in excess of one and one half miles.

The series of rocks in which this deposit occurs is worth prospecting for uranium where ever they outcrop. In places where the series is flat-dipping the aerial scintillometer can be used to great advantage.

14th July, 1954. F. Frankovich.


Arnhem Land
Aboriginal Reserve
Mary River
McKinlay River
Coirwong
118
South Alligator River
Jim Jim Ck.
135
GROVE HILL
BURRUNDIE
112
126
10
84
GOODPARLA H.S.
108
92
119
105
120
122
151
123
124
125
Katherine
River
HIGHWAY
PINE CREEK
74
AUSTRALIAN
128
92
CULLEN SDG.
61
68
54
93
101
RAILWAY
Fergusson River
River
115
89
86
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83
111
53
91
KATHERINE
129
116
634
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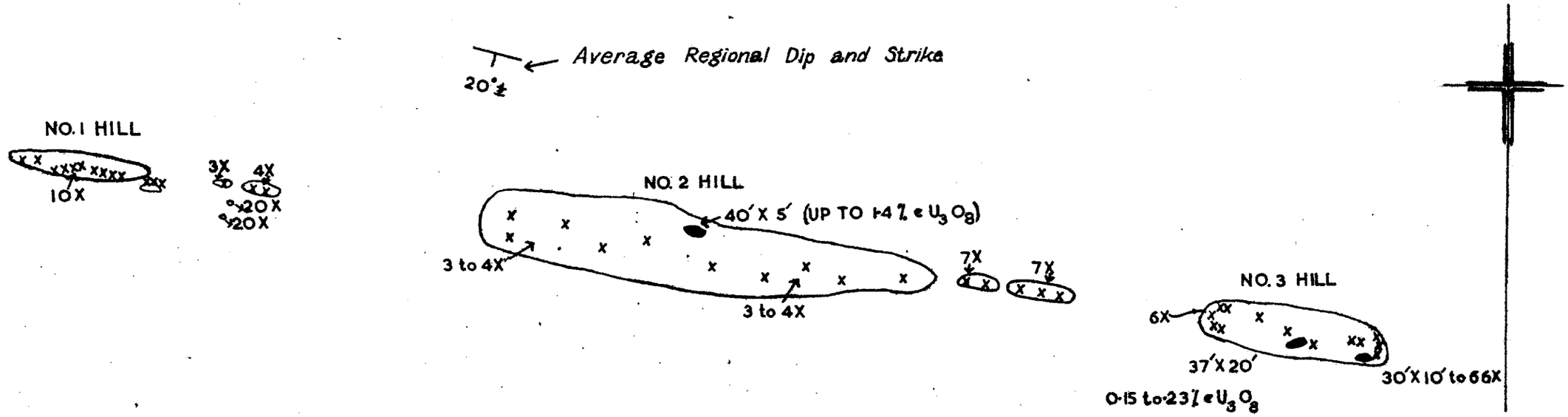
636
Beswick
Aboriginal Reserve

PLATE 2



LEGEND

- O — Outcrops of hematized, brecciated sandstone.
- 20X — Radioactivity in times background.
- X — Known sources of radioactivity.
- ← 4' X 3' — Areas of visible uranium with dimensions in feet.

BUREAU OF MINERAL RESOURCES
RADIOACTIVE SECTION

Sketch Map of Proposed Authority to Prospect Nº 151 (Sleisbeck)

Approximate scale: 800 feet to an inch

Geology by: F.J. Frankovich - July 1954