OTTER EXPLORATION NL

Exploration Licence 4088

FINAL REPORT

Period: June 18, 1983 - August 23, 1984

Chris Kojan,
December, 1984

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SUMMARY

Exploration Licence 4088 (Mallee Hill) was granted to Otter Exploration NL on June 18, 1983 as one of a group of three ELs; the others were ELs 4229 and 4230.

The three ELs were considered to have good potential for uranium, gold and base metal mineralisation. A gold prospect with significant reserves is currently being developed at 'the Granites', about 190 km southeast of Mallee Hill. A uranium prospect was discovered in 1980 by the American based Energy Reserves Group. This prospect is located about 25 km west-northwest of Mallee Hill.

Otter and Cultus Pacific NL (operator) planned to explore EL 4088 on a joint venture basis with an overseas utility taking a substantial equity. However, the three parties were unable to reach agreement for a venture. Attempts by Otter to interest other potential venturers have been unsuccessful. The economic and political climate for uranium exploration has deteriorated and neither Otter nor Cultus has been prepared to commit a significant proportion of exploration funds to a bilateral venture. EL 4088 was terminated on August 23, 1984.

Prior to termination no field-based exploration was carried out. This report contains details of all work which consisted of a review of geology and mineralisation and previous exploration results, and some photogeological interpretation. The work indicates good potential for uranium mineralisation in areas where Lower Proterozoic Mt. Charles and Killi Killi Beds are faulted against sandstones of the Middle Proterozoic Lower Gardiner Formation. Significant gold and base metal mineralisation is likely to be confined to the Lower Proterozoic rocks which exhibit strong magnetic anomalism.

Four areas with potential for uranium mineralisation can be outlined, three in the western part of the Licence and one in the northeast corner. The first is an area of Lower Gardiner Sandstone outcropping north of Mallee Hill and the second, Lower Gardiner Sandstone outcropping at Mallee Hill itself and extending west towards the ERG uranium prospect The third is a poorly exposed area located along the southeast extension of the Buffalo Creek fault in the vicinity of radiometric anomaly '223'. The fourth area includes an outcrop of Lower Gardiner Sandstone, located in the northeast corner of the Licence. The first and third localities also exhibit strong magnetic anomalism and are thus considered to have some potential for gold and base metal mineralisation.

Total expenditure incurred by Otter Exploration NL in relation to EL 4088 amounts to $6,749.00.

INTRODUCTION

Exploration Licence 4088 consists of 300 blocks (966 sq km) and was granted to Otter Exploration NL on June 18, 1983 for a six year term. It was intended to explore the Licence on a joint venture basis with Cultus Pacific NL as operator.

The chief minerals in order of interest were uranium, gold and base metals.

The exploration program was designed by Cultus Pacific and required a first year expenditure commitment of $52,000. The proposed program consisted of aerial photography, an airborne geophysical survey using 'Input' magnetics and radiometrics, and data interpretation.

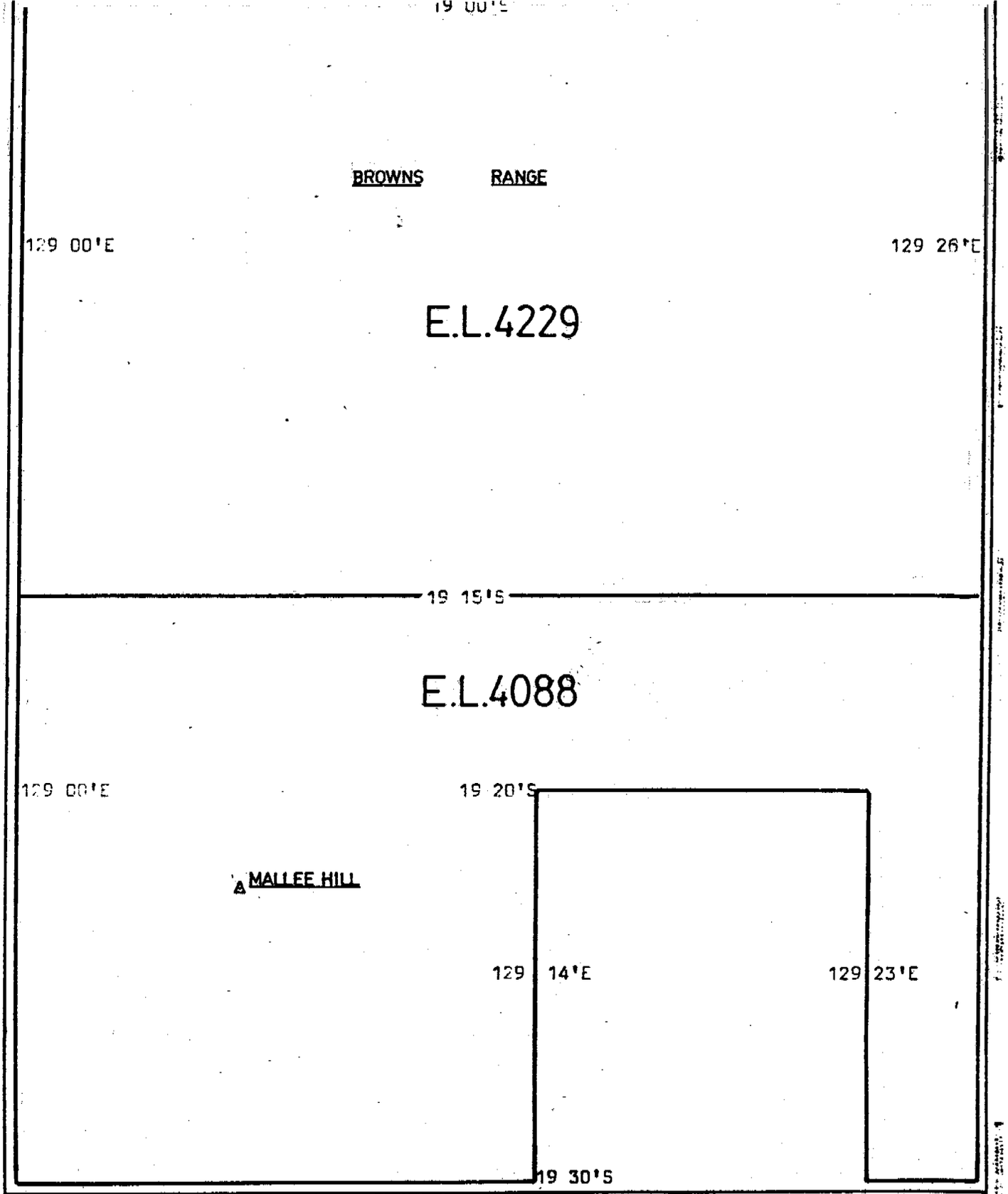
Insuperable problems were encountered in negotiating a three party joint venture and alternative options were considered. Neither Otter nor Cultus was prepared to commit a significant proportion of their respective exploration funds to a bilateral venture and attempts by Otter to interest other potential 'farmin' partners were unsuccessful. Eventually a decision was made to relinquish the Licence. The Licence was formally terminated on August 23, 1984.

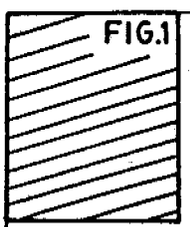
The Final Report contains a review of geology and mineralisation, previous exploration results and some photogeological interpretation, which outlines specific target areas for uranium and gold/base metal mineralisation.

LOCATION AND ACCESS

Exploration Licence 4088 is located on the West Australian border, on the western margin of the Tanami 1:250,000 map sheet SE 52 15 (see Fig. 1).

Mallee Hill, in the western part of the Licence, is situated about 260 km by road from Halls Creek via Slatey Creek and Sturt Creek station. Alternatively the Licence area can be reached, from the south, via Mt. Frederick and the main road from Halls Creek to Alice Springs. There are no roads or usable tracks within the Licence, the nearest access point being the track to Slatey Creek about 25 km west of Mallee Hill. Fuel and some other supplies are generally available from the Rabbit Flat roadhouse about 120 km from Mallee Hill on the Alice Springs road. Water may be available occasionally from rockholes located in the various ranges. There is no other readily available source of water in the Licence area.





Tanami 1:250,000 Sheet SE 52-15

▲ Trigonometrical station

Exploration Licence(E.L) boundary

FIG.1

OTTER EXPLORATION NL.

LOCATION PLAN

SCALE 1:250,000

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GEOLOGY AND MINERALISATION

Figure 2 was intended to serve as a base map for planned fieldwork. The main features of the geology are reproduced from the Bureau of Mineral Resources 1:250,000 geology maps SE 52 15 (Tanami) and SE 52 14 (Billiluna). Additional faults and photolinears and other details were derived from a study of 'RC 9' Commonwealth aerial photography. The airborne magnetic anomalies represent the more magnetic units of the Lower Proterozoic Mt. Charles and Killi Killi Beds and originate from the BMR 1962 airborne survey. A useful general reference for the geology and mineralisation of the Granites/Tanami region is provided by Blake, 1979.

Blake (1979) refers to several occurrences of "acid volcanic rocks...interbedded with greywacke" of the Killi Killi Beds. Two such occurrences are plotted in Figure 2. "Acid porphyry" outcrops "8 km east of Mt. Stubbins" and "9 km north of Jellebra Rockholes". The second location plots within EL 4088.

Following the practice of the geologists of the Energy Reserves Group (ERG) in adjacent parts of Western Australia, an attempt has been made to differentiate the lowest formation of the Middle Proterozoic (Carpentarian) Birrindudu Group - the Gardiner Sandstone - into Lower, Middle and Upper members. By analogy with the Alligator Rivers region of the Pine Creek Geosyncline, areas of outcrop of Lower Gardiner Sandstone may be prospective for uranium mineralisation. The thickness of this unit is reported to be highly variable, ranging from 50 to 200 metres.

There are no known mineral occurrences within the Licence area. Minor uranium and gold mineralisation has been discovered in recent years at the ERG prospect which is located about 25 km west-northwest of Mallee Hill (see Fig. 2). According to McDonald (1981) trenching and drilling at this prospect have defined a number of small mineralised zones, consisting of quartz filled tension gashes and fractures, cemented in part with uraninite and fine-grained hematite. The host rock is a fine-grained siltstone of the Lower Proterozoic Killi Killi Beds. Green and yellow secondary uranium minerals were noted following excavation of surficial rubble. Other minerals from the mineralised zones include carbonate, goethite, pyrite, chalcopyrite, covellite and galena. Anomalous amounts of gold, cobalt, nickel and arsenic have been recorded from core samples. Graphitic shale beds occur in close proximity to the mineralised zones. Sandstone of the Lower Gardiner member outcrops nearby and is evidently faulted against the Killi Killi Beds. Two major east-southeast trending faults have been mapped in the area of the prospect.

There are some similarities between the mineralisation found at the ERG prospect, and the mineralisation occurring at 'the Granites' which was described recently by Ireland and Mayer (1984). The host unit for gold at 'the Granites',"consists of a variably silicified sequence of cherty metasediments with probable volcanic exhalative affinities". The principal host

unit lithologies are reported to include hornblende/cummingtonite/almandine/quartz schist, clinopyroxene/grossular schist, calcite rich marble and recrystallised chert. Sulphide content at 'the Granites' is low, "the principal sulphides being pyrrhotite, pyrite and arsenopyrite with trace amounts of chalcopyrite and sphalerite". Gold is reported to be preferentially associated with chert and those schists containing hornblende, pyroxene and garnet. Graphite/pyrrhotite and magnetite-rich schist occur within the Hanging Wall Schist and give rise to a strong magnetic anomaly.

Several important differences between the ERG and 'the Granites' prospects are apparent. These include absence of uranium and structural control at 'the Granites' and absence of a nearby granite intrusive at the ERG prospect. There is no obvious host unit at the ERG prospect, however the occurrence of carbonate, hematite and goethite within the mineralised zone may have significance. C. Kojan (1979) has observed an association of anomalous base metal values with lenses of quartz goethite rock at Officer Hill in the central part of the Granites sheet area. This rock is described in thin section as an oxidised pyritic chert breccia of possible volcanic origin. Officer Hill also gives rise to a strong magnetic anomaly.

PREVIOUS EXPLORATION

Reconnaissance geological and geophysical investigations have been undertaken by the BMR. The geophysical surveys produced several radiometric anomalies in areas adjacent to the Licence (refer Fig. 2). These anomalies comprise 'BMR 3', just outside the northwest corner of the Licence; 'BMR C1', on the west side of Slatey Creek (west of Fig. 2) and BMR anomalies 'M3' to 'M6' in the Buffalo Creek area. With the possible exception of 'BMR 3', all BMR anomalies have been investigated by company geologists and results are detailed below.

Private sector exploration has been very limited within the Licence area. In 1972 Pechiney undertook an airborne radiometric survey of the western Licence area centred on Mallee Hill. Several anomalies were detected within the Licence and these are shown in Figure 2. None of the anomalies was followed up on the ground.

Some very limited ground geological and scintillometer reconnaissance was undertaken by Pechiney geologists in the central and eastern parts of the Licence. Details of the results of this reconnaissance are from the Pechiney report [1]. The observation points are plotted in Figure 2 ("SPP2" refers to a handheld scintillometer).

1 Refer to Valsardieu C. and others, 1973

JMT 1 - Silicified, compact pink sandstone - some feldspar".
"JMT 2 - Silicified, compact violet to pink, homogenous isogranular sandstone, normal bedding".
"JMT 5 - Intercalations of siltstone and fine grained micaceous 'deltaic' sandstone. Sample 3486 - 150 cps SPP2", yielded these results:-

U	= 7	ppm
Th	= 25	ppm
Cu	= 10	ppm
Pb	= 20	ppm
Zn	= 30	ppm
C	= 0.09	%

Private sector exploration in Western Australia in the area adjacent to 4088 has been relatively intensive. Part of the adjacent Western Australia area is covered in Figure 2. A section of this West Australian area was flown by Pechiney (1972 op. cit.). Three radiometric anomalies ('212', '213' and '215') were detected and all fieldchecked.

Anomaly '212', located at latitude 19° 13' 18"S longitude 128° 55' 24"E, was found to consist of outcrops of "tightly folded sheared subgreywacke, fine grained micaceous sandstone (120 - 150 cps)" of the Killi Killi Beds, surrounded by near horizontal "medium-coarse grained quartz sandstone, conglomerates (50 cps)" of the Lower Gardiner Sandstone. A sample of Killi Killi Beds (7669) assayed 5 ppm uranium and 20 ppm thorium.

Anomaly '213' (Fig. 2) consists of Killi Killi Beds comprising:-

> "(1) Fine grained subgreywacke (90 cps) (2) Limonitic breccia and quartz (Fault zone, 95 cps) (3) Dark purple shale (90 cps) (4) Fine grained lithic sandstone, occasionally limonitised (105 cps)".

Two samples were taken. The best result (7668) was obtained from the fault zone with values of 20 ppm uranium and 30 ppm thorium.

Anomaly '215' (Fig. 2) occurs on an outcrop of "coarse laterite, ferruginous gravel and a scree of Gardiner Beds (conglomerate pebbles)". Scintillometer values of 50 - 90 cps were noted at surface. One sample (7666) assayed 10 ppm uranium and 30 ppm thorium.

Four of the BMR anomalies ('M3' to 'M6' inc.) were also checked during this program. The observations made appear to relate to 'M4'. Cross bedded and ferruginous sandstone and conglomerate (SPP2, 40 - 45 cps) were observed resting unconformably on Killi Killi Beds comprising greywacke, shale and lithic sandstone.

A sample of greywacke (7664) assayed less than 5 ppm uranium and 5 ppm thorium. A sample of shale (7665) assayed less than 5 ppm uranium and 40 ppm thorium.

In addition to the airborne anomaly follow-up, Pechiney geologists completed a total of four scintillometer traverses in the neighbouring West Australian area. The four traverses, Slatey Creek (northern section), Buffalo Creek to Larranganni Bluff, Gardner Range and "Mt. Stubbins", are shown in Figure 2. Full details of the traverses are contained in the report by Valsardieu and others, 1973. Some of their observations are cited in the following paragraphs.

Slatey Creek (northern section)

> "The Killi Killi Beds as exposed throughout this traverse consist of an interbedded series of shales, siltstones, greywackes and possibly tuffs, which have been severely folded and faulted. During tectonism the sediments have undergone metamorphism to the lower greenschist facies. Outcrop except in the vicinity of the overlying Gardiner Beds is poor and is generally restricted to the coarser and more siliceous beds. Quartz "blows", probably representing remobilization and concentration of the silica during tectonism, are common".

Scintillometer counts in this northern section range from 60 - 80 cps. Anomalous radiometric values were noted at two locations, both of which are situated to the west of the Figure 2 area. At BMR anomaly 'C1' on the west side of Slatey Creek, latitude 19° 16' 44"S longitude 128° 47' 07"E:-

> "It was seen to consist of higher radiometric counts in ironstone overlying Killi Killi Beds and the highest counts seemed to be concentrated, "(not?) "in the ironstone but along a shear in the underlying beds".

Maximum counts observed - 675 cps.

At a second location ("LT 29/32", latitude 19° 18' 30"S longitude 128° 47' 46"E) also on the Slatey Creek traverse:-

> "Significant radiometric values were found in several places...usually associated with ironstones which in turn were associated with what could be construed as faults and shears".

Sample 5304 from 'LT 32' assayed 120 ppm uranium. Sample 5301 from 'LT 29'("some ferruginous shaley siltstone enclosed in a quartz reef") assayed 50 ppm uranium, 60 ppm thorium, 100 ppm copper, 80 ppm lead and 160 ppm zinc.

The Buffalo Creek to Larranganni Bluff traverse with observation points 'LT 55 - LT 66' is shown in Figure 2. The main rock types within the Killi Killi Beds include shale, lithic greywacke and siltstone with low radiometric values of 20 - 25 cps. Higher values of up to 50 cps are reported from 'LT 61 - LT 63'. Rock specimens (5311 - 5313) from these locations are described in thin section as "Metamorphosed Sandstone"; minor feldspar and opaques and possible acid igneous rocks are noted. The best scintillometer result (300 cps) was obtained from 'LT 66'. A sample (5314) of "ironstone on shale" assayed 50 ppm uranium.

The following observations were made on the Gardiner Range scintillometer traverse:-

> "The sequence consisted of metamorphosed, argillaceous sandstone, siltstone, shale, slate, phyllites and quartzite, indicating low grade metamorphism of greenschist facies. Some intrusive quartz veins are also evident".

Average background scintillometer readings are significantly higher than those observed on other traverses. "Average radioactivity on Killi Killi rocks was 110 cps SPP2. Two uranium assays (4613 and 4614) on sandstone and shale gave 9 ppm uranium and 3 ppm uranium respectively".

Notes relating to the 'Mt. Stubbins' scintillometer traverse were as follows:-

> "Northern end of section ('LT 100 - LT 107') consists of fine grained greywacke, kaolinitic in places, with a few siltstone and shale beds".

Rocks are generally finer grained, i.e. cherty, towards the southern end of the traverse. Faulting and brecciation occur locally. Average scintillometer readings range from 60 - 80 cps. The main feature of interest is the "Mt. Stubbins" anomaly which plots between airborne anomalies 'B 17' and 'B 19' in Figure 2. Highest counts of 150 cps were obtained "in massive ferruginous rock believed to be laterized Plk siltstone. Definite linear trend to the radiometric high which follows strike of bedding right through center of ferruginised outcrop". No sample results are reported.

In 1978 and 1979 the area adjacent to EL 4088 was again explored for uranium by a joint venture consisting of Cultus Pacific NL and E&B Explorations Ltd. The main work consisted of an airborne (helicopter) radiometric survey. A total of 205 anomalies was discovered of which 147 were fieldchecked using the helicopter (Fig. 2). The follow up program yielded 65 rock samples which were analysed for U, Th, Cu, Pb, Zn, Ag and Au. According to Gilfillan and Pratt (1979) there were six anomalies or groups of anomalies which warranted further work.

Anomaly 'A 191' corresponds to the BMR anomaly 'C1' previously investigated by Pechiney in 1973. According to Gilfillan and Pratt (op. cit):-

> "This is represented by a small hill some 250 m by 200 m which is capped by a massive haematite-limonite body...Rock samples assayed a maximum 290 ppm U, with 480 ppm Cu and 4 ppm Th". (Also 160 ppm Zn).

Anomaly 'D 183' corresponds to Pechiney observation point 'LT 29/32'. The anomaly is located about 1500 m west of anomaly 'A 146' (refer Fig. 2).

> "This anomaly is represented by a narrow zone of haematitic-limonitic shale interbedded with metasandstone. The ferruginous unit may represent oxidised black shale...with an assay of 220 ppm U". (Also 20 ppm Th, 150 ppm Cu and 260 ppm Zn).

Anomaly 'A 146-B 161-D 132' This is shown on Figure 2.

> "This is a group of anomalies represented by outcrop and suboutcrop of massive haematite-limonite exposed discontinously over more than 1 km in a background of sand...maximum assay was 280 ppm U, 15 ppm Th, 900 ppm Cu, and 210 ppm Zn".

Anomaly 'B 105' (Refer Fig. 2)

> "An area where the basement schists are themselves anomalous and from experience in other project areas may be significant".

Assay results are quoted as 9 ppm U, 7 ppm Th, 30 ppm Cu and 130 ppm Zn.

Anomaly 'D 148-C 162' D 148 is shown in Figure 2.

> "Again an area of anomalous basement schists which may be significant in the same manner as anomaly B 105".

Assay results are quoted as 30 ppm U, 6 ppm Th, 250 ppm Cu, and 145 ppm Zn.

Anomaly 'D 177' It is assumed that 'D 177' plots close to 'D 178' (Refer Fig. 2). 'D 178' is located about 500 m southeast of 'D 183' and can be considered an extension of that anomaly. Assay results are quoted as 50 ppm U, 20 ppm Th, 275 ppm Cu, and 150 ppm Zn.

In addition to the five or six anomalies considered significant by Gilfillan and Pratt, there appear to be several others that warrant further consideration; notably 'B 61' (50 ppm U, 20 ppm Th, 20 ppm Cu and 110 ppm Zn), 'D 102' (5 ppm U, x ppm Th, 160 ppm Cu and 175 ppm Zn) and 'C 116' (10 ppm U, 10 ppm Th, 230 ppm Cu and 660 ppm Zn). These are also plotted in Figure 2.

It should be pointed out that not one of the Cultus/E&B anomalies, which plot in the area of the ERG uranium prospect were field-checked. Only about 50% of the anomalies located between the uranium prospect and the western boundary of E1 4088 have been investigated on the ground and, of these, only eight have been sampled. Results were as follows:-

Anomaly	U	Th	Cu	Zn	Description
'C 5'	3	15	10	5	Lateritic alluvial sediment
'D 11'	x	50	20	25	Lateritic alluvial sediment and outcrop of basement schist
'D 41'	8	25	10	10	Lateritic alluvial sediment
'B 61'	50	20	20	140	Lateritic alluvial sediment
'D 62'	5	15	5	110	Silcrete and topography
'D 64'	7	20	20	65	Not provided
'C 65'	5	10	10	10	Gardiner Sandstone
'D 66'	x	15	10	10	Outcrop of basement schist

The most recent exploration of the adjacent West Australian area was undertaken by Mineral Reserves Group ('MRG'), a subsidiary of Energy Reserves Group of North America. This Group conducted a very thorough search for uranium using a variety of techniques including an airborne (helicopter) radiometric survey, an airborne 'Input' survey, biogeochemical (leaf) sampling rock sampling, geological mapping, ground prospecting and some drilling. This work resulted in the discovery of uraninite mineralisation in the headwaters of Slatey Creek (the uranium prospect shown in Fig. 2).

Detailed results of MRG's exploration are contained in two reports, McDonald (1980) and McDonald (1981). Relevant features of these reports are as follows:-

The airborne EM 'Input' survey "outlined numerous elongate bedrock conductors of probable graphitic origin in the basement", in the area extending from south of Buffalo Creek north to Slatey Creek. "The basement", (Killi Killi Beds), "and sandstones are cut by numerous ESE trending fractures, some of which are coincident with prominent bedrock conductors and are consequently considered prime targets for uranium mineralisation". Some of these conductors are associated with gossans, as for example the conductors along the Buffalo Creek Fault and its extension to the NW. Other conductors are associated with uranium biogeochemical anomalies.

> "Airborne total count readings over the Gardiner Formation generally range from 40 - 70 cps while those over Killi Killi Beds varied from 100 - 140 cps".
> (McDonald, 1980)

A number of the better anomalies in areas of outcrop of Killi Killi Beds relate to mineralised faults. Such faults show a variety of alteration features including pervasive silicification, hematite veining, chloritisation and gossans. The gossans, which show extensive supergene ferruginization, appear to represent brecciated, oxidised and ferruginized quartz/pyrrhotite /pyrite veinlets contained in a sericitic siltstone host rock. Uranium and thorium analyses on samples of typical Killi Killi Beds range from 7 - 15 ppm uranium and 15 - 35 ppm thorium. Uranium values are much higher in radioactive samples ranging from 30 - 225 ppm uranium. In contrast thorium values in 'radioactive' samples are relatively low ranging from 0 - 30 ppm thorium. Results up to 1950 ppm uranium and 70 ppm thorium were obtained from samples taken from trenches at the uranium prospect.

Sampling by MRG at the uranium prospect and the various 'hot' gossans indicates that the uranium mineralisation and uranium geochemical anomalies are accompanied by anomalous concentrations of Cu, Co, Ni, V, Pb and As and, locally, Au. Previous work indicates that Zn is likely to form part of this association. A sample (R 80 20) taken from the Cultus/ E&B anomaly 'A 146' assayed 225 ppm U, 0 ppm Th, 195 ppm Ni, 155 ppm Co, and 60 ppm As. Uranium and thorium values on samples of typical Gardiner Formation range from 0 - 6 ppm uranium and 10 - 45 ppm thorium. Samples of 'radioactive' (monazite rich) Gardiner Formation assay from 3 - 9 ppm uranium and 45 - 730 ppm thorium. The highest uranium results in the Gardiner Formation were obtained from fault brecciated, silicified or ferruginised samples. Values range from 0 - 25 ppm uranium and 4 - 35 ppm thorium. Gardiner Formation sandstones with "a thin veneer of Tertiary silcrete" are reported to be generally more radioactive than sandstones elsewhere. Outcrops of Middle Gardiner Sandstone are also reported to show enhanced radioactivity.

CONCLUSIONS

On the evidence available it appears that there is some potential for structurally controlled uranium mineralisation in areas where Lower Proterozoic Killi Killi or Mt. Charles Beds (possibly containing suitable host rocks) occur in association with outcrops of Lower Gardiner Sandstone. Suitable host rocks include siltstone and chert containing carbonate, graphite and hematite, goethite, or pyrite. The occurrence nearby of volcanic rocks such as ignimbrites, chert breccias and tuffs may be significant and structurally, faults with an ESE/WNW trend are favoured.

Four areas with potential for uranium mineralisation can be defined. Three of these localities are situated in the western part of the Licence. The first is an area of Lower Gardiner Sandstone outcrop to the north of Mallee Hill and the second is that area of Lower Gardiner Sandstone outcrop which includes Mallee Hill and extends west toward the ERG uranium prospect. The third is a poorly exposed area located along the southeast extension of the Buffalo Creek Fault in the vicinity of radiometric anomaly '223'.

The fourth area includes an outcrop of Lower Gardiner Sandstone located in the northeast corner of the Licence.

Two of the areas with potential for uranium also exhibit strong magnetic anomalism and on that basis are also considered to have some potential for gold and base metal mineralisation. These are the first and third areas noted in the preceding paragraph.

The most cost effective initial techniques for exploring for uranium and associated mineralisation in the outlined areas comprise airborne magnetic and airborne EM 'Input' surveys. These surveys should define favourable structures and conductors beneath the basement 'cover' rocks, i.e. the Lower Gardiner Sandstone and/or superficial deposits. The airborne 'Input' method is reported to be effective where up to 150 m of Gardiner Formation is present. Reconnaissance geological mapping should also be undertaken at the initial stage within the outlined areas.

Conductors generated during the airborne phase should be further investigated by a combination of techniques appropriate to the type and degree of 'cover'. Such techniques would include detailed geological mapping, rock sampling, biogeochemical (leaf) sampling and ground geophysical surveys (EM, magnetic and scintillometer). Biogeochemical sampling of leaves for uranium is a relatively unproven technique. However, anomalies were obtained in the area of the ERG uranium prospect and anomalies of smaller magnitude were obtained in areas of sandstone 'cover'. Rock samples showing evidence of possible mineralisation should be analysed for a variety of elements including U, Th, Au, Cu, Pb, Zn, Ni, Co, As and V.

Drill testing of targets located in or beneath sandstone 'cover' rocks would require diamond drilling equipment and an assured water supply. The ERG experience indicates that percussion rigs are not effective when drilling sandstones of the Lower Gardiner Formation.

EXPLORATION EXPENDITURE

There is no intention to apply for an exploration expenditure certificate so no distinction has been made between expenditure incurred inside and that incurred outside the Northern Territory.

Salary (Admin. research & report preparation)	$4,924.81
Direct office costs (phone calls, stationery and airfreight)	$ 357.91
Meals & Accommodation	$ 85.12
Administration Travel	$ 472.92
Maps & drafting	$ 475.72
Subtotal	$6,316.48
Indirect office costs (Head Office)	$1,263.30
Total	$7,579.78

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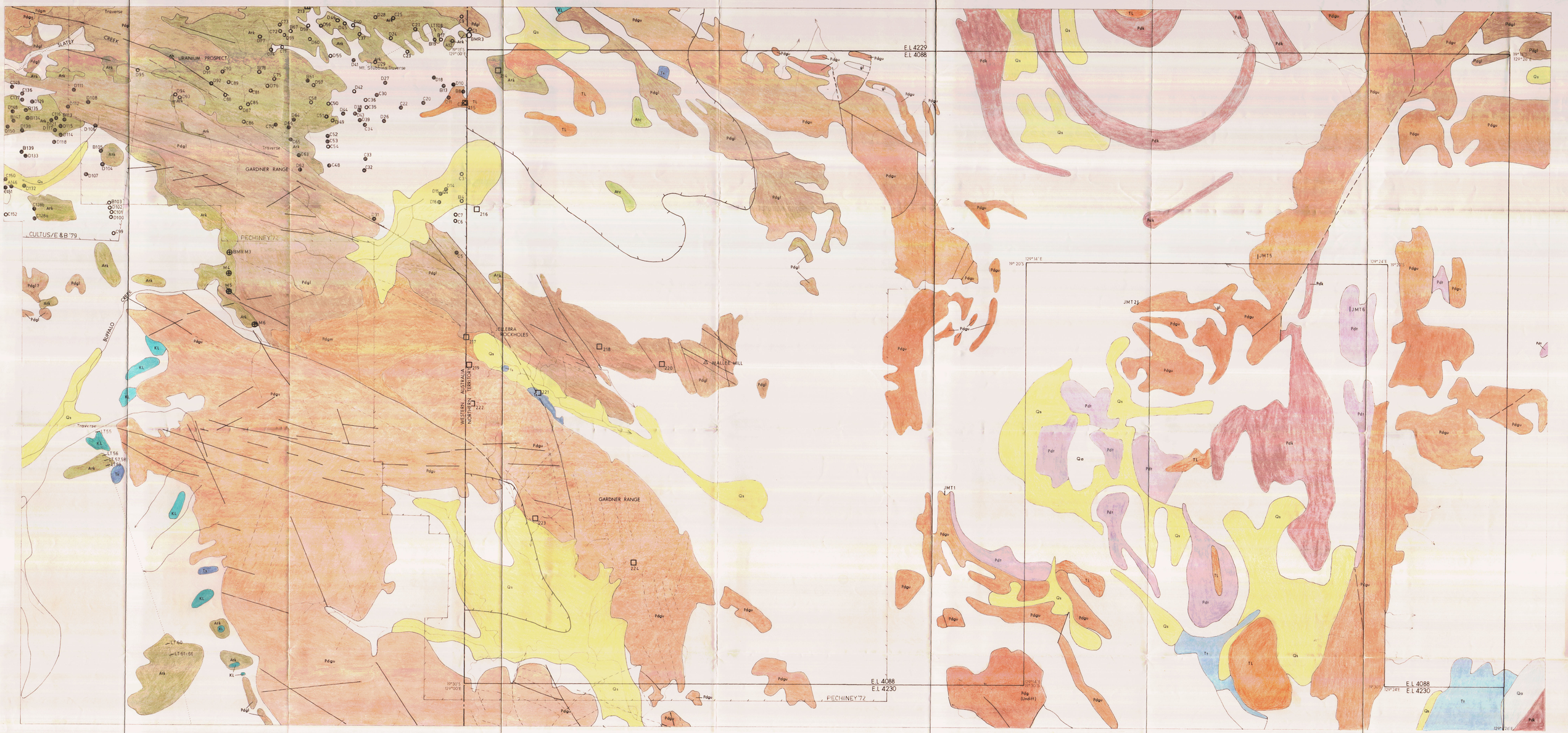

GEOLOGY REFERENCE

QUATERNARY	Qa — Sand, silt, clay. Minor gypsum and halite (Claypans)	TERTIARY	Tr — Calcrete, partly silicified
	Qs — Sand, silt, alluvial and aeolian		Ts — Silcrete
	Qz — Sand, gravel, aeolian and piedmont		TL — Laterite capping
CRETACEOUS	LARRAGANNI BEDS		KL — Sandstone, siltstone, conglomerate

CARPENTARIAN (Birrindudu Group)

COOMARIE SANDSTONE	Pdk	Sublithic arenite, minor quartz arenite, siltstone and shale
TALBOT WELL FORMATION	Pdt	Stromatolitic chert, cherty arenite, siltstone, mudstone, limestone, sublithic arenite
UPPER GARDINER SANDSTONE	Pdgu	Medium grained, well sorted quartz arenite, ripple marks. Glauconite beds (gl)
MIDDLE GARDINER SANDSTONE	Pdgm	Thinly interbedded fine grained micaceous sublithic arenite, shale and siltstone
LOWER GARDINER SANDSTONE	Pdgl	Medium to coarse grained quartz and sublithic arenite crossbedded. Basal polymictic conglomerate
GARDINER SANDSTONE (UNDIFFERENTIATED)	Pdg	Predominantly Upper Gardiner Sandstone

LOWER PROTEROZOIC

PARGEE SANDSTONE	Pdg	Sublithic arenite
MT CHARLES BEDS	Arc	Laminated chert, silicified siltstone and phyllitic siltstone, locally banded iron formation
KILLI KILLI BEDS	Ark	Schistose greywacke and lithic arenite, locally chert, iron formation and acid volcanics

Geology adapted from B.M.R

GENERAL REFERENCE

- Geological boundary
- Anticline — Anticline concealed
- Syncline — Syncline concealed
- Fault — Fault approximate location — Fault concealed
- B.M.R airborne magnetic anomaly
- Trend line (airphoto interpretation)
- Strike/dip
- Photolineor (airphoto interpretation)
- Mineral prospect
- Ephemeral stream
- Waterhole
- Trigonometrical Station
- Exploration licence boundary
- Limit of airborne radiometric survey
- LT108 — Ground scintillometer traverse, Pechiney with observation point
- Airborne radiometric anomaly B.M.R / Pechiney / Cultus - E & B + = Fieldchecked

Fig 2

OTTER EXPLORATION N.L.

E.L. 4088 & PART OF E.L. 4230

REFERENCE PLAN

SCALE 1:50,000

0 1000 2000 3000 4000 5000

SCALE IN METRES

NORTHERN TERRITORY GEOLOGICAL SURVEY

CR85/073

SHEET SE 52 15 (TANAMI)

COMPILED: Chris Kojan

DATE: November, 1984