FINAL REPORT
E.L.2140

Otter Exploration NL.

C.J.Kojan. Nov.'81

CR 81/284

EwR noted.

CR 81/284

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LIST OF FIGURES

EL 2140

INTRODUCTION

Exploration Licence 2140 was granted on August 1, 1980. Otter were originally granted a total of four Exploration Licences, Nos. 2140, 2141, 2149 and 2247 , in the Litchfield Region of the Northern Territory. The licences cover areas of Middle Proterozoic sandstone, (Tolmer Group) and adjacent areas of basement rocks, (Litchfield Complex and Finiss River Group, including the Burrell Creek Formation).

The Licences were considered to have good potential for Alligator Rivers type uranium mineralisation.

Scintrex Pty. Ltd. were given the contract to fly an airborne magnetometer and spectrometer survey of the licence area. Preliminary results were made available June, 1980 and processed results in January, 1981.

Fieldwork, with emphasis on evaluation of airborne anomalies, was undertaken in the period June-September 1980. Only one possibly significant uranium channel anomaly resulted from the airborne work. The anomaly corresponds to a section of heavily vegetated creek in an area of granite outcrops and quartz 'reefs'.

Results of a comprehensive evaluation of the anomalous area are discouraging. Very high gamma activity evidently relates to concentrations of uranium or thorium daughter products in black soil and water. No significant uranium or thorium values were obtained.

No further work on the Licence is warranted and no application for renewal will be submitted at the end of this term.

LOCATION (Refer Fig. 1)

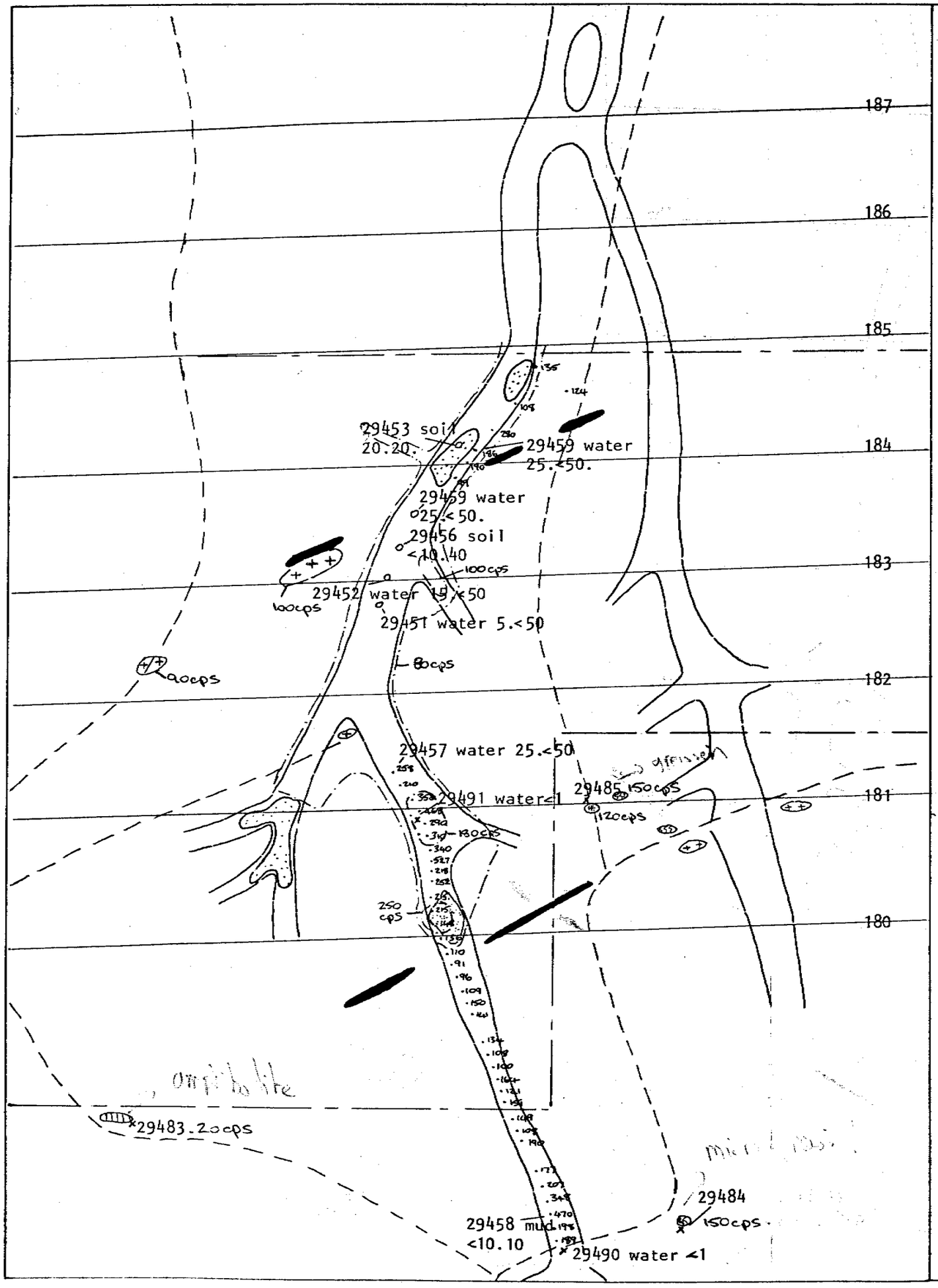
The Licence area is located about 130 kilometres by road southeast of Darwin. Access is via the Stuart Highway, and the Mandorah and Woolanning tracks. The Licence area covers low-lying ground to the west of the Tabletop Range and is only accessible during the dry season (May - October).

GEOLOGY (Ref. Fig. 2)

Granite (Litchfield Complex) underlies most of the licence area. Amphibolite (Litchfield Complex) outcrops along the southern margin of the Licence. Microgneiss (Burrell Creek Formation) outcrops in the southeast part of the area; outcrops of granite and pegmatite, intrusive within the microgneiss were noted in the area of the sandstone scarp to the south of the Licence area. Sandstone (Tolmer Group) underlies the southeast extremity of the Licence area.

No mineralisation of economic interest has been reported from the area, or encountered in the course of the present program.

Greisenised granite has been mapped in the vicinity of the strong uranium channel anomaly, BC-1, in the southeast of the Licence. This area also contains 2 prominent quartz 'reefs' (Refer Fig. 3). Sandstone, to the south of the Licence at M.R.3 (refer Data Sheet) shows sedimentary features, analogous with the Kombolgie Sandstone. The Kombolgie Sandstone is host to uranium mineralisation in the Alligator Rivers region. ?



REFERENCE

×	sample location. C.Kojan(BGS-ISL)
80 cps	sample location/scintillometer reading, and contours. T.Barker(BGS-ISL)
.258	sample location/scintillometer reading. G.Plaisted.(BGS-2)
29453 20.20.	sample number and uranium and thorium results.(ppm soil and rock, ppb water)
	rock outcrop, + granite, # greisen, ~ schist, " amphibolite, • quartz
	creek
	black soil and paperbark swamp
	track
187	flight line and number, airborne survey
	fence

FIGURE 3

OTTER EXPLORATION N L

E.L. 2140

ANOMALY BC-1
REFERENCE PLAN

SCALE 1:40,000

0 1 2

KILOMETRES

COMPILED & DRAWN :- C.J. KOJAN

WORK COMPLETED AND RESULTS

This has consisted of an airborne magnetometer and spectrometer survey, reconnaissance scintillometer traversing and detailed sampling and scintillometer traversing in the area of Anomaly BC - 1.

Airborne Work

A strong linear uranium anomaly designated BC - 1 was recorded from the southeast Licence in an area of granite outcrop. 3 other smaller uranium anomalies were recorded to the west and east of the Licence. One of these anomalies is associated with thorium anomalism (Refer Fig. 6). The magnetic contours indicate that the granite has a lower background than the rocks of the Burrell Creek Formation. A series of magnetic anomalies located generally east of the Licence are thought to represent minor basic intrusives. A well defined linear feature heading ENE across the centre of the Licence most probably represents a dolerite filled fault (Refer Fig. 2).

Groundwork

Scintillometer counts in the areas of granite outcrop range from 50 - 90 cps for scintillometer BGS-ISL and 90 - 140 for scintillometer BGS-2. Counts of up to 470 cps BGS-2 were recorded in the area of Anomaly BC - 1. Three soil/mud samples and 7 water samples were collected from BC - 1 and submitted for uranium and thorium analysis with disappointing results (Refer Fig. 3). The greisening observed at 29485 may relate to the formation of a quartz 'reef' nearby. High background counts up to 150 cps BGS-ISL were recorded from outcrops of microgneiss situated east of BC - 1. Zircon and monazite have been identified in thin section. The sandstone outcropping along the scarp in the southeast of the Licence (Refer M.R. 3 Data sheet) has been described in thin section as an orthoquartzite, with sedimentary features analagous to the Kombolgie Sandstone of the Alligator Rivers region. Counts in the sandstone are low however, about 30 cps BGS-ISL. Amphibolite (Ref. 25483 Fig. 3), outcropping along the southern margin of the Licence, can probably be correlated with the Archaean Hermit Creek Metamorphics.

CONCLUSIONS AND RECOMMENDATIONS

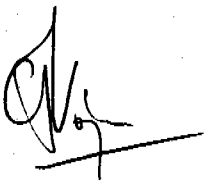
Most of the Licence is underlain by granite and amphibolite comprising the Archaean Litchfield Complex. Microgneiss of the Proterozoic Burrell Creek Formation is present in the extreme southeast part of the Licence, where it is overlain by sandstones of the Tolmer Group. Oval-shaped magnetic anomalies within the microgneiss may represent basic intrusives.

A strong uranium anomaly has been recorded in the course of the airborne survey. The anomaly corresponds to part of the headwaters of Burton's Creek. Sampling indicates that the radiation emanates from concentrations of uranium or thorium daughter elements, in soil or water. Counts of up to 6 x background were obtained but uranium and thorium values were insignificant.

No further work is warranted in the area and the Licence should be allowed to expire.

EXPENDITURE DETAILS(EL.2140)

Airborne radiometric and magnetic survey and data processing, 241km. @ $12/km.	$2892
Preparation of ortophotographic mosaic, one fifth of total charge for the 4 ELs.	850
Salaries and Wages	500
Assays	500
Maps and Drafting	300
Mobilisation	300
	$5342
Head Office	1200
Total	$6542



APPENDIX

ANOMALY DETAIL SHEETS

RADIOMETRIC ANOMALY DETAILS

ANOMALY NUMBER: BC-1

TENEMENT: EL 2140

1:250,000 MAP SHEET: Pine Creek

ANOMALY LOCATION: 130° 39'E 13° 04'S

INVESTIGATED BY: G. Plaisted, T. Barker, C. Kojan

DATE: June and August 1980

GENERAL GEOLOGY:

Creek with black soils and locally, heavy vegetation. Granite and quartz veins outcrop nearby.

PROBABLE ANOMALY SOURCE:

Radium and/or radon in black soils and/or water. No anomalous amounts of uranium were detected. Occurrence of greisen outcrop to the east of creek possibly significant.

RADIOMETRIC DATA: (Refer Fig.3)

Instrument type: Scintrex Scintillometers BGS-ISL and BGS-2

BGS-ISL - Background 30-80 cps Max. 250 cps (soil)
BGS-2 - Background 70-131cps Max. 527 cps (water)

ASSAY DATA: (Refer Fig. 3)

Sample No.	U	Th	Cu	Pb	Zn

PETROGRAPHIC DESCRIPTION:

Sample No.s	
29483	Para-amphibolite with contact metamorphic overprint
29484	Biotite-Sillimanite microgneiss
29485	Greisened microgranite. Traces carbonate. Rare zircon. Cloudy? anatase.

SAMPLE DATA SHEETS

Exploration Licence: 2140

Date: 1980 Program

Fieldwork: G. Plaisted, C. Kojan

Compiled by: C.J. Kojan

Scintillometer:

1 G. Plaisted - BGS-2
2 C. Kojan - BGS-ISL

*Petrography

MAP REF:	SAMPLE REF:	DESCRIPTION	SCINT COUNT	ANALYTICAL RESULTS					COMMENT
				U	Th	Cu	Pb	Zn	
1	29462	Quartz ridge in granite hematite		<10	-	10	<10	<10	
				Au		Ag			
				<10	ppb	<2			
2		Sandstone	30^2						Crossbedding from NW
3	29482	Orthoquartzite*							Rare felsite clasts and zircon. limonite after authigenic pyrite
4	29486	Ferruginous chert breccia and veined sandstone	90^2			100	20	30	
				Au	Ag	Sn			
				<3	2	10			
		Granite and schist outcrop to west.	150^2						
5		Silicified Sandstone							
6		Contact schist and sandstone							
7		Sandstone	50^2						

PETROGRAPHY

Central Mineralogical Services

Sample No.	Classification - Composition	Fabric	Accessories	Comments
29481 (T.S. 34131)	Ferruginised Arkose. Framework (65 %) quartz and alkali feldspars, minor shale fragments, sericite pellets, conspicuous tourmaline. Matrix Fe-stained sericitic authigenic feldspar/overgrowth.	Well-sorted, weakly bedded fine-sand with sporadic megaclasts of vein-type quartz.	Clastic muscovite flakes, traces chert, felsite (sericitic), thinly disseminated leucox. opaques, zircon.	Limonite pervades matrix and weakly sericitised clastic feldspar grains. Cavities after shale pellets (mega-clastic in part), with matrix also locally leached. Unstressed.
29482	Orthoquartzite. Framework (70 %) sub- to well-rounded quartz, disseminated chert, orthoquartzite, stressed metaquartzite and stressed vein-quartz clasts. Matrix overgrowth and intergranular quartz.	Bimodally sorted (gritty-pebbly, fine to medium sandstone), weakly bedded.	Rare silicified felsite clasts. Very rare zircon. Pervasive (limonite) films on grain-boundaries.	Sedimentary features analogous to Kombolgie sandstone. Limonite in part represents oxidised ultrafine authigenic pyrite films on detrital grain-boundaries.
29483	Amphibolite. Yellowgreen hornblende with slightly subordinate quartz, untwinned andesine, poikiloblastic diopside in varying proportions. Pervasive, extremely fine, pale sphene.	Fine-grained, weakly banded, amphibolitic with late poikiloblastic clots, anhedra of diopside.	Minor traces epidote-clinozoisite, very fine rutile.	Essentially a para-amphibolite (metasediment) with contact-metamorphic (pyroxene hornfels facies) overprint, probably late syn- rather than post tectonic.
29484	Biotite-Sillimanite Microgneiss. Quartz and biotite, subordinate, but variable sericite-stained plagioclase (indeterminate), minor orthoclase, sparse microfoliae of fibrolitic sillimanite.	Fine-grained, sub- to millimetric, banded, gneissic.	Sparse muscovite, tourmaline, rare zircon, metamict ?monazite, oxidised opaques.	Amphibolite facies-metasediment, primarily arkosic to subarkosic; silt or fine sand. No polymetamorphic features.
29485	Greisen. Granular quartz and fine-grained, yellowish hydromuscovite in near-equant proportions. Disseminated muscovitised biotite flakes, patchy Fe-staining.	Vague relict medium-grained granitic, trend aplitic, poorly diagnostic.	Minor traces carbonate as micro-inclusions in quartz. Rare zircon, cloudy ?anatase.	Apparently a thoroughly greisened microgranite, but textural detail largely obliterated by partial re-crystallization of quartz.
29488	Quartz-Mica Schist. Quartz and muscovite in varying proportions, subordinate degraded (chloritised/Fe-stained) biotite, conspicuous fine-grained green schorl.	Medium-grained, schistose, weakly banded. Orientated tourmaline.	Rare degraded/ferruginised poikiloblastic garnets, sericitised porphyroblastic ?kyanite.	Amphibolite-facies with some retrogressive features (chlorite, sericite) implying greenschist overprint, although uncrenulated.
29490 (T.S. 34137)	Orthoquartzite. Framework (75 %) subangular to rounded quartz, minor chert fragments. Matrix overgrowth and intergranular quartz.	Well- to moderately-sorted, fine- to medium-grained, slightly megaclastic.	Semi-pervasive limonite films (sim. 29482), rare degraded/ferruginised mica flakes.	Affinities with 29482, but relatively mature and finer-grained. Limonite in part after ultrafine pyrite (authigenic). Weakly microfractured.

ANALYTICAL DATA

A.C.S. Laboratories Pty. Ltd.
50 MARY STREET
UNLEY, S.A. 5061
P.O. BOX 3
UNLEY, S.A. 5061
PHONE: 272 5733

4

ANALYTICAL RESULTS

Samples from: Otter Exploration N.L.

Area: Alice Springs. O/No.0819.

Samples of: Rock and water samples.

Preparation: Crush, quarter and pulverize.

Batch No.: A 3459.

EL 2141

2141

Sheet No.: 1.

Date: 10/7/80.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description		W ppm	Sn ppm	U ppm	Th ppm	Au ppb	Cu ppm	Pb ppm
Rocks:								
29453	2140			20	20			
54	2141			<10	10			
56	2140			<10	40			
58				<10	10			
61				10	20			
29462		<20	<20	<10		<10	10	<10

	Zn ppm	Ag ppm
29462	<10	<2

Waters:	pH	U ppb	Th ppb	E_H V Vs S.C.E.
29451	5.84	5	<50	0.151
52	5.73	15	<50	0.149
55	5.65	5	120	0.149
57	5.84	25	<50	0.149
59	6.03	25	<50	0.150
29460	5.99	15	50	0.151

A.C.S. Laboratories Pty. Ltd.
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ANALYTICAL RESULTS

Samples from: Otter Exploration N.L.

Area:

Samples of: Rocks and Waters.

Preparation: Crushed and pulverised as required. Sheet No.: 1.

Batch No.: A 3664. (Your O/N A 0747) Date: 16.10.80.

SAMPLES WILL BE DISPOSED OF AFTER TWO MONTHS UNLESS WE ARE OTHERWISE ADVISED

Sample Description	U ppb	Sn ppm	Ta ppm	Cu ppm	Pb ppm	Zn ppm	Ag ppm
29490	<1						
29491	<1						
29486				100	20	30	2
29487		40	60				

Sample Description	Snppm*	Au ppm
29486	10	<3

AIRBORNE SURVEY SPECIFICATIONS

AIRBORNE SURVEY SPECIFICATIONS

Magnetometer	Sonotex proton precession recording to 0.1 NT.
Spectrometer	Scintrex GAD-6 (minimum detector volume 33 L) differential recording TH.U.K. total count and cosmic.
Data Recording	All digital to magnetic tape: analog on RCM-6.
Data Recording Interval	I.0 Sec (Approx 46m linear sampling at mean ground speed of 90 knots)
Flight Path Record	VINTEN scientific 16mm tracking camera.
Detector Mean Terrain Clearance	Both detectors in aircraft at 100m.
Nominal Flight Line Spacing	Traverse lines at 500m, tie lines at 4km.
Flight Line Recovery	Visually to enlarged RC 9 photography at 1:20,000.

RADIOMETRIC STACKED PROFILES

URANIUM AND THORIUM

Profile vertical scale	100 CPS/CM
Profile Base Value	50.0 CPS

Profile plot overlays flight path plot for registration with the flight path plot align the reference crosses.

NOTES

Profiles are corrected for background, height, attenuation and Compton Scattering. Profiles are drawn based on a straight datum line between the first and last fid of each line. The horizontal position of profile is located from the flight path plot fiducial projected normal to the datum line.

MAGNETIC CONTOUR (Refer FIGS. 7C & 8C)

Contour interval	2 NT	
Intermediate Contours at	10 NT	10
Major Contours at	20 NT	140

- Contour plan overlays flight path plot.

NOTES

The total magnetic field intensity values are corrected for the base station diurnal magnetic variations and are tie line levelled. The IGRF field for May 1980 and 60.0 M A.S.L. has been removed.

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Fig. 1

OTTER EXPLORATION N.L.

LITCHFIELD URANIUM PROJECT

DATA COMPILATION

Scale 1:250,000

0 5 10 15 20 25
KILOMETRES

COMPILED BY: C.J. KOJAN

DRAWN: CARTOSCOPE

GEOLOGY: Adapted from 1:500,000 "Solid Geology of the Pine Creek Geosyncline." B.M.R. 1979.

LEGEND

Pgr	Roberts Creek Granite	Km	Petrel Formation
Pgs	Soldiers Creek Granite	P	Port Keats Group
Pdz	Zamu Dolerite and Ti-Tree Granophyre	C/O	Cambrian / Ordovician Sediments
Ph	Henschke Breccia	Cva	Antrim Plateau Volcanics
Pc	Chilling Sandstone	Clw	Witch Wal Conglomerate
Pui	Berinka Volcanics	Pf	Fitzmaurice Group
Pu	Burrell Creek Formation	Pt	Tolmer Group
Pm	Namoona Group equivalent?	Pgo	Allia Creek Granite
APh	Hermit Creek Metamorphics	Pgc	Cullen Granite
API	Litchfield Complex	Pgo	Koolendong Granite

Geological Boundary ——— Fault ———

Workings ⚒ Prospect/Drill Traverse ////

Occurrence • Stream Sediment Sample x

Mineralisation AU,CU Geochemical Anomaly au,cu

Uranium Channel Anomaly B.M.R. Airborne Survey ○

Uranium Channel Anomaly, Company Airborne Survey (inadequately reported in some cases) ⬡

Ground Radiometric Anomaly ●

Exploration Licence held or applied for by Otter Exploration (November 1979)* 2140

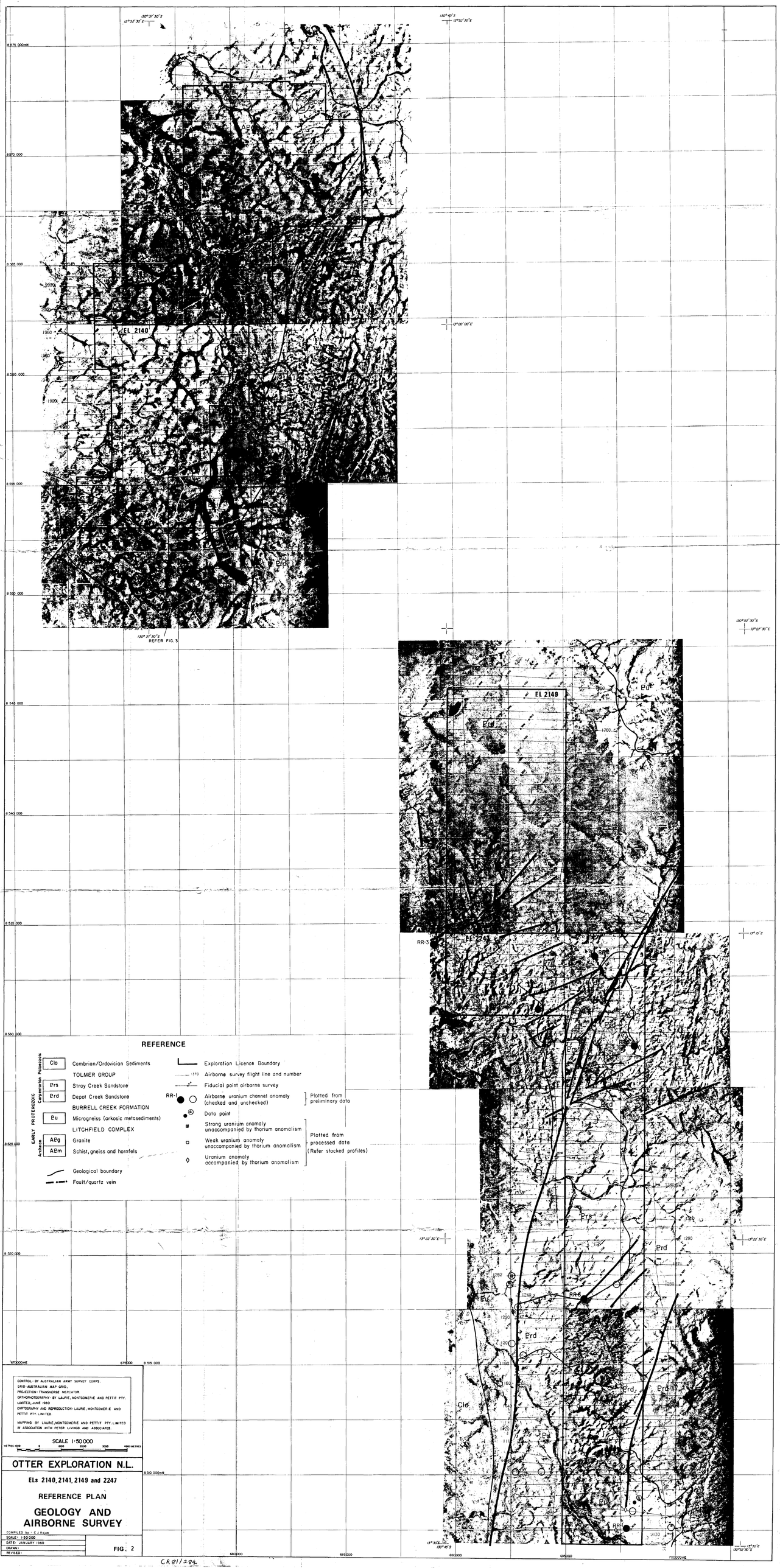
Former Exploration Licence for which data now available BHP

* Other current E.Ls and E.L.As not shown for clarity

Aboriginal Reserve Aboriginal Land Claim

Road, Track Airstrip

River



REFERENCE

EARLY PROTEROZOIC — Carpentarian Palaeozoic
- Clo — Cambrian/Ordovician Sediments
- TOLMER GROUP
- Prs — Stray Creek Sandstone
- Prd — Depot Creek Sandstone
- BURRELL CREEK FORMATION
- Pu — Microgneiss (arkosic metasediments)
- LITCHFIELD COMPLEX — Archaean
- AEg — Granite
- AEm — Schist, gneiss and hornfels

Geological boundary

Fault/quartz vein

Exploration Licence Boundary

370 — Airborne survey flight line and number

Fiducial point airborne survey

RR-1 — Airborne uranium channel anomaly (checked and unchecked) } Plotted from preliminary data

Data point

Strong uranium anomaly unaccompanied by thorium anomalism

Weak uranium anomaly unaccompanied by thorium anomalism } Plotted from processed data (Refer stacked profiles)

Uranium anomaly accompanied by thorium anomalism

CONTROL: BY AUSTRALIAN ARMY SURVEY CORPS, GRID AUSTRALIAN MAP GRID.
PROJECTION: TRANSVERSE MERCATOR
ORTHOPHOTOGRAPHY BY LAURIE, MONTGOMERIE AND PETTIT PTY. LIMITED, JUNE 1980
CARTOGRAPHY AND REPRODUCTION: LAURIE, MONTGOMERIE AND PETTIT PTY. LIMITED.
MAPPING BY LAURIE, MONTGOMERIE AND PETTIT PTY. LIMITED IN ASSOCIATION WITH PETER LIVINGS AND ASSOCIATES.

SCALE 1:50 000

METRES -1000 0 1000 2000 3000 4000 METRES

OTTER EXPLORATION N.L.

ELs 2140, 2141, 2149 and 2247

REFERENCE PLAN

GEOLOGY AND AIRBORNE SURVEY

COMPILED by: C.J. Kope
SCALE: 1:50 000
DATE: JANUARY 1980
DRAWN:
REVISED:

FIG. 2

CR81/284

E.L.2141

E.L.2140

FIG. 4A

RADIOMETRIC

STACKED PROFILES

URANIUM

SCALE: 1:50,000

CR 81/284

2210 2220 2200 2190 2180 2170 2160 2150 2140 2130 2120 2110 2101 2090 2080 2070 2060 2050 2040 2030 2020 2010 2000 1990 1980 970 1960 1950 1940 1930 1920 1910 1900 1890 1880 1870 1860 1850 1840 1830 1829 1819 1809

9010

9070

E.L.2141

E.L.2140

FIG. 4B

RADIOMETRIC

STACKED PROFILES

THORIUM

SCALE: 1:50,000

CR 81/284

E.L. 2141

E.L. 2140

FIG. 4C
MAGNETIC
CONTOUR
SCALE: 1:50,000

CR 811/284