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TIN CAMP CREEK EXPLORATION LICENCES
(ELs 2505-07, 2516, 2517, 7029, 9354)
ARNHEM LAND
NORTHERN TERRITORY

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1. INTRODUCTION

Exploration Licences 2505-2507, 2516-17, 7029 and 9354 (figure 1) were granted to Queensland Mines Pty Ltd (QMPL) on the 12th of September 1995. These ELs lie approximately 250 km east of Darwin in West Arnhem Land and south of the now mined out Nabarlek mine site.

Exploration activities carried out in 1996 and 1997 include reverse circulation, diamond and RAB drilling, as well as stream sediment sampling, ground radiometrics and geophysical surveys (the results of the ground geophysics are not yet available) and geological mapping.

Cogema Australia Pty Ltd is participating in the activities of QMPL by means of a farm-in agreement. Cogema Australia's subsidiary, Afmeco Mining and Exploration Pty Ltd, provided contract geological services to QMPL for segments of 1997 field work.

2. TENURE

The Tin Camp Creek ELs, 2505, 2506, 2507, 2516, 2517, 7029 and 9534, were granted on the 12th September 1995 for a period of six years and occupy a total area of 670 square kilometres.
LOCATION AND ACCESS

The ELs are located in Western Arnhem Land (figure 1) in a belt stretching from 10 to 50 kilometres south of the Nabarlek mine site. Access to the ELs from Darwin is either by air to the Nabarlek airstrip or via the sealed Arnhem Land Highway to Jabiru, then via the in part unsealed road over Cahill's Crossing to Nabarlek and south to Myra Camp. Access within the ELs is restricted to tracks which become impassable during the wet season from December to April. Most sandstone escarpment areas are not accessible by vehicle and must be traversed by foot.

4. GEOLOGY

4.1 Regional Geology

West Arnhem Land (figure 2) is underlain by granitic and tonalitic migmatitic gneisses of the Nimbuwah Complex, which has an "I-type" pedigree and crystallisation ages of 1866 Ma. Nevertheless, field relationships suggest that the Nimbuwah Complex could contain older elements as it forms the basement for the overlying Kakadu Group and Cahill Formation sediments, which were metamorphosed in the 1870 to 1800 Ma Top End Orogeny. Recent work by exploration companies in West Arnhem Land has enabled an informal subdivision of the metasediments into four units: the calcsilicate unit (base), the lower arkosic unit, the amphibolitic unit (Zamu Dolerite) and the upper arkosic unit (top). The calcsilicate unit is considered equivalent to the calcareous unit of the Lower Cahill Formation. The Nabarlek uranium deposit occurs in the amphibolitic unit, and the upper arkosic unit is interpreted as equivalent to the Upper Cahill Formation.

The metamorphic sequences of West Arnhem Land have been intruded by several post-orogenic granites, with minimum intrusion ages of 1750 and 1780 Ma. The very extensive, generally flat-lying gabbroic intrusion, the Oenpelli
Dolerite, intruded the Palaeoproterozoic rocks of the region around 1688 Ma. Recent field observations have revealed that the Oenpelli Dolerite has also intruded the Kombolgie sandstone cover sequence.

The Kombolgie Formation is a widespread, several thousand metre thick sequence of late Palaeoproterozoic sandstones which unconformably overy the older metasediments. A thin basic volcanic member (Nungbargal Volcanics) divides the sandstones into two units in West Amher Land.

4.2 Geology of the Caramal and South Horn Area

Within the Caramal (and possibly South Hom) area (figure 3), rocks of the Lower Cahill Formation and Kakadu Group have been identified in outcrop and drill core. The general sequence of the Lower Proterozoic stratigraphy is reasonably defined, though much detail is obscured by the structural complexity of the area, with variable lateral unit thickness attributable in part, to at least three recognisable generations of deformation. The following is a description of the interpreted local stratigraphy;

4.2.1 Lower Cahill Formation

Calc-silicate Unit - Three main lithologies have been identified within this unit, the contacts between them being generally gradational. The fragmental sequence consists of polymict breccias with angular to sub-rounded fragments and nodular rocks composed of quartz, illite, hematite and chlorite. The rocks are sedimentary and possibly volcano-sedimentary in origin.

The meta-arkosic sequence underlies the fragmental sequence and consists of alternating fragmental rocks and brecciated or tuffaceous meta-arkoses with chlorite schists and chlorite rocks, meta-arkoses become bedded towards the
bottom of the sequence. The sequence is often strongly chloritised and hosts most of the mineralisation.

The bottom part of the unit is comprised of the carbonate sequence and consists of massive pink and cream carbonates, calc-silicate gneisses and chlorite rocks.

4.2.2 Kakadu Group

Kudjumarndi Quartzite - within the Caramal area the unit is composed of mainly meta-arkoses with intercalations of para amphibolites (mudstones) and mica schists. Thorium-rich micro conglomeratic upward fining meta-arkoses occur as a basal marker bed.

Mount Howship Gneiss - consists of coarse grained meta-arkosic rocks, muscovite-biotite schists, leucogniess and quartz-feldspar gneiss.

5. PREVIOUS WORK

Over and beyond the actual ELs area (2505, 2506, 2507, 2516, 2517, 7029 and 9354), QMPL commenced exploration for uranium in Arnhem Land in 1970 and due to government policy ceased exploration in September, 1973. The 1970 'Hunting' airborne radiometric survey led to the discovery of the Nabarlek Uranium Deposit and the recognition of several other anomalies including Caramal, Gorrunghar and Gurrigarri which are located on the Tin Camp Creek Tenements (figure 1). Both Caramal and Gorrunghar were tested by drilling in the early 1970s.

During the 1995-96 field season, an airborne helicopter Dighem (EM, magnetic and spectrometric) survey was carried out over the Tin Camp Creek area. Newly detected anomalous areas as well as the Caramal prospect were checked in the field by ground radiometry, geological mapping and a stream
sediment orientation survey. At Caramal, a drilling program was executed to determine if the mineralisation extended to the north under the sandstone plateau. The major new anomaly located by the 1996 airborne survey was at South Horn (EL 2506) (figures 2 and 3).

6. WORK COMPLETED DURING 1996 - 1997

Exploration efforts during the period September 1996 to September 1997 were concentrated on: geological mapping, diamond drilling at Caramal (EL2505), and in the Algodo area (ELs 2515 and 9354), ground geophysics on the Caramal plateau, a ground radiometric survey and RAB drilling over the South Horn anomalies and a stream sediment survey over most of the ELs.

From early August to early September 1997, three ground geophysics survey tests: MaxMin, Protem and gravity were completed on the plateau, north east of the Caramal prospect (figure 7). The results of these surveys are still being processed: the surveys will be described and the results reported in the 1997/98 Annual Report.

Ten percussion and diamond drill holes, in two (2) fences, were completed at Caramal during October and November 1996 (figures 4 to 6), for a total of 2109.5 m (295 m percussion precollar, 1814.5 m NQ diamond). Drilling details are at appendix 1. The geological mapping at Caramal is presented at plate 1.

In the Algodo area, four NQ diamond drill holes were drilled from the sandstone escarpment into the basement between mid May and late June 1997, for a total of 1108.5 m (figures 8 and 9). Algodo drill data are at appendix IV.

All Kombolgie sandstone drill core from Algodo was sampled for major and selected trace elements (U, Th, Pb, Mo, Cr, Ni, Co, V, Zn, Cu, As, Se, B). The samples and listed and assay results presented in appendix V.
Petrography and some electron Microprobe Analysis have been carried out for selected grab or drill core samples by Mason Geoscience Pty Ltd, South Australia. Some XRD analyses and autoradiographs were done by Amdel Ltd, for Mason (and appended to the Mason reports). All the petrography reports are included in appendixes III and VI.

In the South Horn area, ground reconnaissance of 1996 airborne anomalies delineated several radioactive anomalies (figure 10). One of them, anomaly 6 was studied (in 1996) by systematic radiometric readings along grid lines (figure 11). These encouraging results were followed up in the period late June to the end of August 1997 by a RAB drilling program with systematic surface and outcrop radiometric measurements over most of the South Horn prospect area (figure 12 and plates 2 to 6). A total of 8669 m was drilled along grid lines within 443 vertical RAB holes (Appendix VII). RAB cutting samples of top of bedrock and all anomalous zones were systematically analysed for uranium and gold: assay results are at Appendix VIII.

A total of 220 samples was collected during a regional stream sediment survey (figure 13 and plate 7) of all major drainage within the Tin Camp Creek tenements. This survey was initiated over areas reasonably accessible by 4WD or on foot (1996) and completed by helicopter (1997). Minor drainage on the Kombolgie sandstone plateau was not covered by this survey.

6.1 Caramal Prospect Drilling

At the Caramal prospect in October - November 1996, a total of ten RC and NQ diamond drill holes (numbered CA38 to CA47) were completed by Gaden Drilling of Batchelor NT, along 2 fences. The holes totaled 2109.5 m (295 m percussion, 1814.5 m diamond). Drilling was specifically designed to test the eastward extent of strong alteration defined by previous drilling in the zone between CA27 and CA37 (figure 4). Two NNW-aligned drill fences were located perpendicular to the interpreted anomalous alteration zone (figures 5 and 6,
and Appendix I). Each hole was collared in the Kombolgie sandstone, and was stopped either in the metamorphic basement (Kakadu Group or Mount Howship Gneiss) or in the Oenpelli dolerite.

The thickest Kombolgie sandstone intersection was 70.2 m in hole CA41, with core showing the typical medium grained and well bedded sandstone grading into a micro-conglomeratic unit near the unconformity with the underlying metamorphic basement.

Holes CA40, 46 and 47 ended in Mount Howship semi-pelitic to psammitic meta-sediments, showing that the Lower Cahill Formation carbonates sequence does not extend that far north. CA40 intersected weak radiometric anomalies (90 c/s Mt. Sopris or 61 ppm U) at the base of the Kombolgie sandstone and in a strongly illitised zone within the metamorphic basement.

Holes CA38, 39, 41, 42, 43, 44 and 45 intersected the chloritised or illitised Lower Cahill Formation (meta-arkoses or carbonates). All of them, except holes CA41 and 42 intersected fine to medium grained, weakly to strongly altered Oenpelli dolerite sills and interpreted dike. Both the dolerite and basement rocks adjacent to the dolerite margins are strongly chloritised.

Kudjumardmi Quartzite of the Kakadu Group was observed in holes 40, 43, 46 and 47. Holes CA46-47, located at the north end of the drill fences, intersected weak to moderately chloritised and sericitised Cahill and Kudjumardmi meta-arkosic gneiss. All the radiometric anomalies in Kudjumardmi quartzite are related to thorium.

Interpretation of results shows a 400m elongated body or altered chloritised zone bearing moderate to trace mineralisation, extending N 060-070° from holes CA 2 to CA 35 (figure 4). Along that zone, the carbonate appears to be lensing out at the margins, while the meta-arkosic schists are thickening towards the centre of the Caramal synform. Some albitic to silicic alteration is adjacent to the strong chlorite zone associated with weak U anomalies in the
meta-arkoses; this feature is well developed in CA40 and 46, and is less evident but still present in CA41-42.

To the south, drill holes CA44 and 45 drilled from the same site, confirmed the thickening of the Oenpelli dolerite, and the lensing or inter-fingering of the carbonate unit with the dolerite. Weak uranium anomalies continue to occur within the chloritised and deformed meta-arkosic schists above the carbonate in this area.

Most holes have intersected weak gamma anomalies in the range of 100-150 cps. The interpreted mineralisation at Caramal seems to be controlled by a north east plunging synformal structure that needs further investigation.

Forty three (43) drill core and grab samples have been analysed for Au, Pt, Pd, U, Th, Cu, Pb, Zn, Ca, Mg, K, Fe, Na, Al, Mn, Ni, Cr and P on an elemental ICP package by Ultra Trace Analytical Laboratories (Perth). Results are located in appendix II.

Some of the above-listed samples were subjected to petrography studies by Mason Geoscience (Adelaide). XRD and specific autoradiographs were prepared by Amdel Ltd, Mineral Services Laboratory (S.A.) for Mason These studies are included in reports number 2251, 2259, 2270 and 2282, are presented in Appendix III.

6.2 Mapping and Geophysical Surveys.

General reconnaissance style prospecting and 1/10000 photo interpretation mapping was carried out in the general area of the Caramal prospect. Some reconnaissance and grab sampling was also performed at Gurrigarri (figure 2).

In the general Caramal area, mapping was extended 2 km north towards the "Gibbon" anomaly (figure 2), previously described as a WNW-striking quartz
breccia zone with associated chlorite in muscovite (sillimanite)-feldspar-quartz gneiss (plate 1). The hematite-quartz breccia zone was found to extend north towards the Kombolgie sandstone unconformity, and was transected by a series of E-W quartz veins. Spot radioactivities of 300 to 1000 c/s SPP2 are scattered along the hematite-quartz breccia. Further east occurs sheared (N330°) Tin Camp Creek Granite, intruded by small dolerite dikes. Mason describes these fine grained dolerites as illitised continental K feldspar basalts. Mapping along the escarpment from “Gibbon” anomaly towards Caramal, outlined the occurrence along the unconformity of arkosic Kudjumardji quartzite with local spot radioactivities reaching up to 1400 c/s SPP2. These radioactivities are inferred to be due to thorium.

On the escarpment, “hydraulic” quartz breccias with centimetric druzy quartz were observed close to a major NNW-striking structural. This type of breccia with druzy quartz was also observed north and south of the north-easterly Caramal synform itself, in particular at the north end of line 20900N. Occurrence of the Caramal synform was confirmed by mapping the edges of the Caramal plateau (plate 1).

The Caramal area was chosen to test various geophysical methods, because the sandstone cover is relatively thin, diamond drill holes exist to make depth and physical calibration, and uranium mineralisation occurs in the area in the underlying metamorphic formations. A 14.5 km grid was pegged on the plateau east of Caramal prospect (figure 7 and plate1). It is tied to hole CA27 where the base line 10000E starts and extends 1.7 km to the east. The geophysical methods tested, HL EM MaxMin (50m and 100m spacing), Protem 47 and Gravity, were conducted by Geoterrrex Pty Ltd, from August 7 to September 5, 1997. The processing of these survey results is in progress: detail of the surveys and results will be included in the next statutory report.
6.3 Algodo Diamond Drilling

The main purpose of this helicopter supported drilling program was geological: to test the airborne geophysics survey interpretation, to determine the thickness of the Kombolgie sandstone in the area, and find out which basement rocks occur below the sandstone (eg, Cahill Formation, Nourlangie Schist, Oenpelli Dolerite).

Gaden Drilling of Batchelor performed the program with a Longyear LF 70 heli-portable diamond drill supplied with 450 m of NQ size rod, and operated by 4 men working two 12 hours shifts. Mason Geoscience Pty Ltd (Adelaide) and Ultra Trace Analytical Laboratories (Perth) completed the petrographic studies and analytical work respectively.

One hole (299.6 m) was drilled on EL 2517; three holes (totalling 808.9 m) were drilled on EL 9354 (figure 8). Drill hole orientation was measured every 50m with an Eastman deviation probe, down hole logging was done with an Auslog probing unit and natural gamma probe. No uranium mineralisation or strong significant geological indicator of probable mineralization was intersected although indications of hydrothermal activity were observed in the sandstone of hole ALG004. All these holes show background radioactivities. Schematic sections through the holes are illustrated in figure 9; drill logs are at appendix IV; assay results are listed in appendix V; and petrographic reports for the Algodo drilling are at appendix VI.

Hole ALG001 (236.0 m deep), cut 206 m of fine to medium grain pitted, bleached and silicified sandstone before entering into and ending in, massive fresh dolerite.

Holes ALG002 and 003 (250.6 and 281.6 m deep respectively) were sited close to the Beatrice Fault. They intersected Kombolgie sandstone with some silicified zones showing local reverse faulting, druzy quartz and minor pyrite along fracture walls. In both holes the underlying basement rocks are generally
fresh biotite-muscovite schist, with narrow bands of meta-arkose and amphibolite, of the Nourlangie Schist.

Hole ALG004 (299.6 m) intersected the unconformity at 174.5 m. The Kombolgie sandstone’s upper part is mostly fresh. Close to the unconformity with the underlying basement, a zone affected by hydraulic brecciation shows druzy quartz, carbonate and pyrite on fracture walls. Carbonate also occurs as cement in the breccias. In the Nourlangie Schist at 269 m, a reverse fault breccia contains some graphite and pyrite. Down hole logging shows a 640 Auslog API reading (125cps SPP2) at 169 m in the basal conglomerate.

6.4 South Horn Prospect, RAB Drilling.

Follow-up of the 1996 airborne spectrometric survey over the South Horn Prospect outlined several radiometric uranium anomalies (figure 10). A 4.8 line km grid for detailed radiometric and mapping surveys was placed over anomaly number 6 (figure 11 and plates2, 3, 4) in late October 1996. Strong radiometric highs (> 150cps) broadly correspond to the medium to coarse grained dolerite and red-brown soils derived from this rock. To the SE, the basement (Nimbuwah Complex) felsic orthogneiss shows radiometric background of 75-100 cps SPP2. To the NW, the anomalous zone is bounded by the Beatrice Fault escarpment behind which occurs unaltered Kombolgie Sandstone (15-25 cps SPP2). Spot readings shows radiometric values as high as 10000 cps on N70° quartz veinlets within dolerite and 7500 cps on silicified, tilted (45° to NW) sandstone close to a N140° structure. These observations warranted follow-up by RAB drilling.

A RAB drilling programme was carried out from the 24th of June until the 31st of August 1997. Gaden Drilling Pty Ltd, the contractors, used a Rotary Air Blast (RAB) Exploration Rig which was supported by a 4x4 Isuzu 2.5 tonne truck with fuel and water tank. Drill rig specifications are Edson 3000
with a 175 psi @ 450 c.f.m compair compressor. Drill rods are 65 mm Reimet RAB rods with a mast length of 7.6 metres.

The survey was done over the Oenpelli dolerite, Kombolgie sandstone and the Nimbuwah Complex Metamorphics. Thirty two (32) lines were drilled to investigate the uranium radiometric anomalies identified during the 1996 spectrometric airborne survey and ground reconnaissance on EL 2506 (figure 12).

Four hundred and forty three (443) holes were completed, 8669 metres were drilled.

A summary of the RAB drilling logs and the assay results are located in appendices VII and VIII. The average depth of the drill holes was 21.0 metres, with a maximum of 84.0 metres. Each hole was drilled vertically every 10 or 20 metres along 50 or 100 metre spaced lines. The holes were geologically logged (Appendix VII) and the activity of the cuttings was measured with an SPP2 scintillator. Samples were taken in the lowermost 3 metres of the bedrock as a composite sample for assaying. Some samples were taken at 1 metre intervals when enhanced radioactive readings were encountered.

The approximately 2 kg sample was placed in a calico bag and dried, and analysed for U and Au by Inductively Coupled Plasma Mass Spectrometry (ICPMS) after aqua regia digestion (results in appendix VIII).

The RAB survey refined the delineation of uranium anomalies particularly at Anomalies 3, 4 and 6 (figure 12 and plates 4, 5 and 6). Further follow up investigations such as ground geophysics and percussion-diamond drilling will be considered.
6.5 Tin Camp Creek Stream Sediment Sampling

The stream sediments survey started in 1996 was completed by August 1997: 220 samples were collected. All samples were analysed by Ultra Trace Laboratories of Perth for U, Th and Au. The 1996 samples were also analysed for other selected trace elements. Assay results are at appendix IX. This survey was conducted over areas reasonably accessible by 4WD vehicle or helicopter. Minor drainage on the Kombolgie sandstone plateau was not sampled. Anomalous zones indicated by samples bearing more than 5 ppm U and / or 5ppb Au are outlined on figure 13 and plate 7. Several uranium or uranium-gold anomalies have been detected in drainage close to previously known anomalies. However, some anomalies in the south east and central part of EL 2516 remain unexplained. Six samples returned anomalous zinc assays east of the "Robbies" minor uranium anomaly.