AFMECO MINING AND EXPLORATION PTY LTD

Exploration Retention Licences

150 & 151

Arnhem Land, Northern Territory

Third Annual Report

20 May 2001 – 19 May 2002

DARWIN NT

JUNE 2002

Alligator River
1:250,000

D. J. Ewington & A. Bisset
AFMEX Report 2002/13

Verified by:  Authorised by:

XAVIER MOREAU  PIERRE HEEROMA
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Summary

The Exploration Retention Licences are located in Arnhem Land about 250 kilometres east of Darwin. Exploration is being conducted by a joint venture that consists of AFmeco Mining and EXploration Pty Ltd (operator), Cameco Australia Pty Ltd and SAE Australia Pty Ltd.

This report describes the results of the third year of exploration on the tenements.

Eight drillholes were completed during the year comprising 143 metres RC percussion and 1512.0 metres diamond drilling. Two holes were drilled on ERL 150, and six on ERL 151.

Airborne electromagnetic (Tempest), magnetic and radiometric surveys were flown over the tenements. Modelling indicates that the Tempest survey appears to resolve the unconformity on both ERL’s, and has highlighted zones of conductivity along the unconformity and within the metamorphic basement.

Although weak radioactivity was detected, the drilling failed to indicate any targets to mineralisation on either tenement.
1. INTRODUCTION

The Exploration Retention Licences (ERL’s) are being explored in joint venture by AFmeco Mining and EXploration Pty Ltd (operator), Cameco Australia Pty Ltd and SAE Australia Pty Ltd.

The tenements are located within the Arnhem Land Aboriginal Reserve and are shown on figure 1.

This report details the work carried out during 2001 and 2002, as required by the Northern Territory Department of Business, Industry and Resource Development (DBIRD).

2. LOCATION AND ACCESS

The tenements are located in West Arnhem Land approximately 250 km east of Darwin in the Northern Territory of Australia.

Access is either by air to the Nabarlek airstrip, which is located close to the tenements, or by road via the Arnhem Highway to Jabiru and then via Cahill’s Crossing and unsealed roads to Nabarlek.

Parts of ERL 150 and all of ERL 151 are accessible by 4WD. The sandstone escarpment that covers the majority of ERL 150 is only accessible with helicopter. Access to the tenements is limited during the wet season from November to April, hence all of the fieldwork is conducted between May and October.

3. TENURE

ERL’s 150, 151 and 152 were granted on 20th May 1999 for a period of five years. ERL 152 was relinquished on 28th May 2001. ERL’s 150 & 151 are currently being explored in joint venture by AFmeco Mining and EXploration Pty Ltd – operator (25%), Cameco Australia Pty Ltd (50%), and S.A.E. Australia Pty Ltd (25%).
The ERL’s replace parts of Exploration Licence (EL) 2508, which expired on 28th June 1998.

4. **Geology**

The regional geology of West Arnhem Land has been described in detail in many previous reports and only a brief overview will be given here. The regional geology is shown on figure 2 and a stratigraphic chart is shown on figure 3.

The oldest rocks exposed in the area are gneisses belonging to the Mount Howship Gneiss of the Kakadu Group of lower Palaeoproterozoic age. Further to the west in the Alligator Rivers uranium field, similar rocks overlie the Archaean Nanambu complex. The Kudjumarnadi Quartzite, one of the main marker horizons in the region, overlies the Mount Howship Gneiss.

The psammitic rocks of the Kakadu Group are overlain by the Cahill Formation also of lower Palaeoproterozoic age, which is the host of the main uranium ore bodies in the area. The Lower Cahill Formation consists of a basal calcareous unit, which is overlain by a sequence of pelitic schists, meta-arkose and amphibolite. A well-defined amphibolitic unit at the top of the Lower Cahill Formation hosts the Nabarlek uranium deposit. The Upper Cahill Formation and Nourlangie Schist consist of a monotonous sequence of meta-arkose, schist and amphibolite.

East and south of the area of the Palaeoproterozoic sediments lie the granitoid rocks of the Nimbuwah Complex. These granitoids are the result of an extensive migmatisation during the Top End Orogeny, which is dated at about 1800my. The relationship between the Cahill Formation and the Nimbuwah Complex is little known. Limited field observations show the contact to be gradational and migmatitic in nature.

Later post-orogenic Proterozoic granites (1780-1750My), such as the Nabarlek and Tin Camp Granites have intruded the meta-sediments in the east of the area.
The upper Palaeoproterozoic Kombolgie Subgroup overlies the older rocks unconformably. This formation consists of sandstones with a prominent basaltic horizon (Nungbalgarri Volcanic Member). These flat-lying sandstones form the Arnhem Land escarpment.

The Oenpelli Dolerite (1700 my) intrudes the early Palaeoproterozoic metasediments and the Kombolgie Subgroup, and forms large lopolithic bodies. It is the youngest Precambrian rock outcropping in the area.

5. **Previous Work**

Exploration has been conducted under the current licences since 1999 and has included conventional truck-mounted RC and Diamond drilling, and various ground geophysical surveys. Further details of this work can be found in the First and Second Annual Reports, submitted to the Department of Mines and Energy (DME*) in May 2000 and May 2001, respectively. A Final Report for ERL 152 was submitted to the Department of Mines and Energy* in July 2001.

Queensland Mines Ltd (QML) explored the area in the early 1970’s. During this time the Nabarlek prospect was discovered via an airborne survey and over a period of approximately 15 years, QML defined the resource, mined and processed the ore.

No exploration was carried out in the area from September 1973 until June 1988 when EL 2508 was granted. EL 2508 was extensively explored for ten years until its expiry on 28th June 1998.

Further details of the work completed in the past can be found in previous annual reports submitted to the DME* and in the final report on EL 2508 (areas retained under tenure), submitted to the DME* in 1998.

* As at 13 November 2001, the Department of Business, Industry and Resource Development (DBIRD)
6. **WORK COMPLETED DURING 2001-2002**

Work completed in the third year of tenure has included a detailed airborne magnetic and radiometric survey, an airborne electromagnetic (TEMPEST) survey, and truck-mounted RC and diamond drilling. Prior to the end of the reporting period, one diamond drillhole had been drilled during the 2002 field campaign. Further details and results of the 2002 field campaign will appear in the Fourth Annual Report, to be submitted in 2003.

ERL 150 covers an area of approximately 21 km$^2$, and is situated immediately to the northwest of the Nabarlek mine site. Much of the tenement requires helicopter access. ERL 151 covers an area approximately of 4.6 km$^2$, and is situated immediately to the southeast of the Nabarlek mine site. The tenement is entirely accessible with 4WD vehicles.

### 6.1 Geophysics

During 2001, airborne electromagnetic, magnetic and radiometric surveys were flown over the tenements. The magnetic and radiometric surveys were much more detailed (see specifications in table below) than those previously flown over the area (during the EL 2508 tenure). The airborne electromagnetic survey was trialling the effectiveness of a new technique called Tempest at resolving the topography of the mid-Proterozoic unconformity and associated hydrothermal alteration.

#### 6.1.1 Airborne Magnetic and Radiometric Survey

UTS Geophysics were contracted to fly an airborne magnetic and radiometric survey over the tenements, as shown in the flight path diagram (Figure 4). Survey specifications are detailed below.
The survey focussed on a structural corridor considered prospective for hosting Nabarlek style unconformity related uranium deposits. The purpose of the survey was to highlight these structures in magnetic data in more detail than during previously flown surveys. Overall the survey provided much needed detail, however remained unsuccessful at resolving basement structures beneath the sandstone on ERL’s 150 & 151. Some weak radiometric features have been detected, and will be followed up in the 2002 field season.

### 6.1.2 Airborne Electromagnetic Survey (TEMPEST)

Fugro Airborne Surveys were contracted to fly a Tempest airborne electromagnetic and magnetic survey. Data was acquired over the tenements as shown in the flight path diagram (Figure 5). Survey data was acquired in mid July 2001.
Tempest digital time domain electromagnetic system characteristics are detailed below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base frequency</td>
<td>25Hz</td>
</tr>
<tr>
<td>Transmitter Area</td>
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</tr>
<tr>
<td>Transmitter Turns</td>
<td>1</td>
</tr>
<tr>
<td>Waveform</td>
<td>Square</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>50% (equal on and off times)</td>
</tr>
<tr>
<td>Transmitter Pulse Width</td>
<td>10ms</td>
</tr>
<tr>
<td>Transmitter off-time</td>
<td>10ms</td>
</tr>
<tr>
<td>Peak Current</td>
<td>300A</td>
</tr>
<tr>
<td>Peak Moment</td>
<td>55,800 Am²</td>
</tr>
<tr>
<td>Average Moment</td>
<td>27,900 Am²</td>
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<tr>
<td>Receiver Sample Rate</td>
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<tr>
<td>Receiver Sample Interval</td>
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</tr>
<tr>
<td>Receiver Samples per half-cycle</td>
<td>1500</td>
</tr>
<tr>
<td>System Bandwidth</td>
<td>25Hz to 37.5kHz</td>
</tr>
<tr>
<td>Flying height</td>
<td>130 - 150m</td>
</tr>
<tr>
<td>EM sensor</td>
<td>Towed bird with 3 perpendicular dB/dt coils</td>
</tr>
<tr>
<td>Transmitter-Receiver horizontal separation</td>
<td>121m (nominal, actual measured)</td>
</tr>
<tr>
<td>Transmitter-Receiver vertical separation</td>
<td>39m (nominal, actual measured)</td>
</tr>
<tr>
<td>Stacked data output interval</td>
<td>200ms (~12m along line)</td>
</tr>
<tr>
<td>Number of output windows</td>
<td>15</td>
</tr>
<tr>
<td>Window centre times</td>
<td>From 13 microseconds to 16.2 ms</td>
</tr>
<tr>
<td>Magnetometer</td>
<td>Stinger-mounted caesium vapour</td>
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<tr>
<td>Compensation</td>
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</tr>
<tr>
<td>Magnetometer Resolution</td>
<td>0.001nT</td>
</tr>
<tr>
<td>GPS cycle rate</td>
<td>1 second</td>
</tr>
</tbody>
</table>

The aim of the survey was to accurately resolve the depth to unconformity and highlight other areas of interest, including basement conductors and elevated conductivity in hydrothermally altered sandstone. Fugro generated conductivity depth image (CDI) plots for all flight lines, and these indicate a narrow conductive horizon interpreted to
represent the alteration surrounding the unconformity. A number of EM targets have been selected, some of which will be tested during 2002.

6.2 Truck-mounted Dual-purpose Drilling

Drilling on ERL 150 during the 2001 field season was designed to follow up untested minor mineralisation along a Boundary Fault parallel structure in the southeastern corner of the tenement. Utilising a conventional truck-mounted dual-purpose (RC/DDH) rig, two holes were drilled in the tenement, totalling 42m RC and 466.7m diamond. The ERL 151 drilling programme tested a number of anomalous features indicated by previous drilling or geophysical surveys. Five truck-mounted RC/diamond holes were drilled for a total of 101m RC and 759.7m diamond. The drilling locations are included in figures 6 and 7.

Details of the drillholes can be found in tables 1 and 2. Diamond drillhole logs are presented in appendix A.

Most of the holes were probed with a downhole natural gamma tool, manufactured by Auslog Pty Ltd. Drillhole N147-16 was unable to be gamma probed due to hole collapse – total count radiometric measurements were instead measured with a SPP2 scintillometer over 1m intervals. Drillhole N147-17 was not probed.

PIMA mineralogical analyses were conducted on sandstone and basement core at regular intervals, and results are shown in table 3. A description of the PIMA method has been detailed in previous reports submitted to the DBIRD.

Composite geochemical samples were collected from the entire drillhole, in varying sampling intensities and testing for certain chemical suites. All samples were analysed by Ultra Trace Pty Ltd in Perth, and results are presented in table 4. A breakdown of elements analysed is presented below:
| SANDSTONE | Composite Sampling at 10m and 2m (proximal to unconformity) intervals | Mixed Acid | ICP-OES | Majors | Al, Ca, Fe (total), K, Mg, Na, P, Ti |
| BASEMENT | Composite Sampling at 10m and 2m (proximal to unconformity) intervals | Mixed Acid | ICP-MS | Traces | As, B, Ni, Pb, Sr, Th, U, V, Zn |
|           | Sodium Peroxide Fusion | Mixed Acid | ICP-MS | REE’s | Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sm, Tb, Tm, Yb |
|           | Aqua Regia | Mixed Acid | ICP-MS | B | |

**SMLB03** was collared within the Mamadewerre Sandstone and was drilled at -75° towards 210°. The hole was completed at a depth of 255.1m, and the unconformity was intersected at a downhole depth of 188.4m.

The sandstone is moderately to strongly silicified throughout much of the upper sequences. The sandstone is poorly to moderately sorted, and is coarse grained to pebbly throughout. Minor chlorite alteration and associated brecciation occurs approximately 30m above the unconformity, and is separated from the unconformity by a moderately to strongly illite altered sandstone. Creamy white phosphatic nodules occur in this zone, as well as detrital tourmaline. The unconformity is undisturbed.

Strongly illite altered and quartz removed micaceous meta-arkose occurs immediately beneath the unconformity. The remainder of the basement lithologies comprise garnet-mica schist, micaceous meta-arkose and amphibolite, with scattered mobilisates and pegmatites. Narrow silicified cataclastic and faulted zones were intersected. Minor radiometric anomalies occur at 206m (associated with chloritised amphibolite) and 225m (a narrow zone of tightly folded mica schist). The basement lithologies are interpreted to be part of the upper arkosic unit, Upper Cahill Formation.
**SMLB04** was collared within the Mamadewerre Sandstone and was drilled at -75° towards 210°. The hole was completed at a depth of 253.6m, and the unconformity was intersected at a downhole depth of 182.25m.

Similarly to SMLB03, the sandstone comprises poorly sorted, fine to coarse grained pebbly sandstone throughout. Detrital tourmaline is scattered throughout much of the sandstone. Chlorite-illite fluid-assisted breccias were intersected between 158 and 169m, along with drusy quartz veins and fracturing. Above the unconformity, the sandstone is moderately to strongly illite altered and partially fractured. Drusy quartz veining (rarely containing pyrite) occurs at the unconformity.

Pervasively illite altered (and showing evidence of quartz removal) meta-arkose and mica schist occurs immediately beneath the unconformity. Similarly to SMLB03, the remainder of the basement comprises micaceous meta-arkose, mica schist (rarely garnetiferous) and amphibolite, along with scattered mobilisates and pegmatites. Narrow silicified cataclasites and illite-chlorite filled fault gouges at an acute angle to the foliation occur at depth. Minor isoclinal folding was observed at various intervals. The basement lithologies are interpreted to be part of the upper arkosic unit, Upper Cahill Formation. No radiometric anomalies were detected.

**N147-15** was collared within the Mamadewerre Sandstone and was drilled at -70° towards 210°. The hole was completed at a depth of 249.3m, and the unconformity was intersected at a downhole depth of 159.45m.

The sandstone in the upper sequences is strongly silicified and fine grained. The sandstone is moderately to strongly fractured throughout most of this section, and a clay filled fault gouge was intersected at 113m. From this depth to the unconformity, the sandstone is coarse grained to pebbly, and has been intruded by numerous narrow dolerite dykelets, pervasively chloritising and brecciating the sandstone. The unconformity is undisturbed.

A narrow zone of intense quartz removal, minor folding (isoclinal) and narrow foliation parallel dolerite dykelets occurs immediately beneath the unconformity. The basement
lithologies comprise quartz mica schist, meta-arkose and scattered mobilisates. Narrow amphibolite bands within the schists were observed, and are associated with above background radioactivity at 208m. A number of fractures and fault gouges were intersected, one fracture at 209m containing weakly anomalous radioactivity. The basement lithologies are interpreted to be part of the upper arkosic unit, Upper Cahill Formation.

**N147-16** was collared with the Mamadewerre Sandstone and was drilled at -70° towards 240°. The hole was completed at a depth of 207.2m, and the unconformity was intersected at a downhole depth of 105.3m.

The core recovery was very poor in the first 90m of this hole. The sandstone is strongly to completely broken and fractured, and moderately to strongly kaolinite altered. Towards the unconformity, the sandstone is intruded by pervasively chlorite altered dolerite dykelets, chemically and hydraulically brecciating the surrounding sandstone. The unconformity is at a low angle to core axis.

The basement lithologies comprise amphibolites, micaceous meta-arkoses and quartz-mica (±garnet) schists. Narrow mobilisates and pegmatite bands are common. The meta-arkoses and mica schists have been isoclinally folded in places, and kink fold bands within the mica schists were observed at various intervals. Narrow fractured and brecciated zones are scattered throughout the basement. A zone of mild to moderate quartz removal extends from the unconformity to approximately 160m, and affects all major basement lithologies. No anomalous radioactivity was detected. The basement lithologies are interpreted to be part of the upper arkosic unit, Upper Cahill Formation.

**N147-17** was abandoned at a depth of 28m, as a result of the RC hammer becoming bogged downhole. **N147-17R** was drilled immediately to the northwest, collared within the Mamadewerre Sandstone and was drilled at -80° towards 210°. The hole was completed at a depth of 187.0m, and the unconformity was intersected at a downhole depth of 95.3m.
The sandstone is moderately to strongly silicified and fine grained initially, grading into a coarser grained pebbly sequence from approximately 40m to the unconformity. Stylolites and drusy quartz veinlets are present throughout the package. Moderate chlorite and illite alteration is present in the basal sequences above the unconformity – brecciation was rarely observed. Basement rip-up clasts and possible detrital mica are both present immediately above the unconformity.

The basement lithologies comprise quartz-mica schist (rarely garnetiferous), micaceous meta-arkose, foliated and massive amphibolite, and scattered mobilisates and pegmatites. Kink fold bands are common. Few fractures or fault gouges were observed. Anomalous radioactivity was not detected. The basement lithologies are interpreted to be part of the upper arkosic unit, Upper Cahill Formation.

N147-18 was collared within the Mamadewerre Sandstone and was drilled at -70° towards 214°. The hole was completed at a depth of 189.2m, and the unconformity was intersected at a downhole depth of 107.45m.

Moderately to strongly silicified, fine grained sandstone was intersected to a depth of approximately 60m. From this depth to the unconformity, the sandstone is moderately to strongly broken, has undergone selective silicification, and coarse grained to pebbly. Kaolinite filled fault gouges are present at 86m. Immediately above the unconformity, the sandstone is strongly hematite altered (possibly after chlorite) and fractured.

A strongly illite altered cataclastite was intersected immediately beneath the unconformity, accompanied by intensely quartz removal and chlorite altered alternating meta-arkose and amphibolite. The remainder of the basement comprises quartz-mica (±garnet) schist, micaceous schist and foliated amphibolite. Narrow zones of intense fracturing and kink fold bands were observed. No anomalous radioactivity was detected. The basement lithologies are interpreted to be part of the upper arkosic unit, Upper Cahill Formation.
6.3 Helicopter-supported Drilling

During the 2002 field season (still ongoing), one helicopter-assisted diamond drillhole was completed prior to the end of the reporting period, for a total depth of 285.6m. The drilling in 2002 is designed to target specific anomalies highlighted in the 2001 geophysical surveys. This drillhole is located with ERL 150, as shown in figure 4.

Various analyses (detailed in section 6.2) have been performed on the drillhole. The results of the PIMA and geochemical sampling are outstanding. Results on petrophysical analyses (sampling conducted during the 2002 field season) are also outstanding. All results will be presented in the Fourth Annual Report in 2003.

SMLB05 is collared within the Mamadewerre Sandstone and was drilled at -80° towards 150°. The hole was completed at a depth of 285.6m, and the unconformity was intersected at a downhole depth of 234.6m.

The sandstone has undergone bedding controlled selective (patchy), moderate silicification throughout. The clay content is relatively high throughout much of the sandstone, especially at depth. The sandstone is poorly to moderately sorted, and clasts of various origins (quartz, lithic, basement rip-up, and possibly felsic volcanic) are commonly observed. Narrow dolerite dykelets (~4cm thick) crosscut the sandstone, and mild to moderate chlorite alteration and hydraulic/chemical brecciation is associated with these intrusions. The extent of the chlorite alteration is limited, and disconnected from the unconformity. Illite, hematite, and possibly interstratified illite/smectite clays are present in the sandstone package immediately above the unconformity. Mild above background radioactivity is associated with this package. The unconformity is flat and undisturbed.

The basement sequences are dominated by chloritic meta-arkoses, however narrow chlorite-mica schists and biotite amphibolites are also present, as are rare mobilisates and pegmatites. Tourmaline and sillimanite were also observed. The basement lithologies are moderately chlorite altered throughout. Faulting is rare, and the limited folding observed is dominantly isoclinal. No elevated radioactivity was recorded in the
basement sequences. The basement lithologies are interpreted to be part of the upper arkosic unit, Upper Cahill Formation.

7. CONCLUSIONS

Exploration within the ERL’s during the third year of tenure has focussed upon confirming the presence of targets during previous campaigns, and identifying new targets beneath largely untested sandstone escarpment.

Truck-mounted drilling in 2001 designed to follow-up on previously defined targets proved unsuccessful: although zones of significant alteration were intersected, mineralisation was not detected in significant proportions.

The geophysical surveys provided an insight into the metamorphic basement beneath the sandstone escarpment, and have highlighted a number of targets, some of which are being tested in 2002. The first of these geophysical targets was tested prior to the end of the reporting period with drillhole SMLB05, and the preliminary results indicate that the airborne electromagnetic survey correctly predicted an approximate depth to unconformity.