Erl’s 150 & 151
Arnhem Land, Northern Territory

Fourth Annual Report
20 May 2002 – 19 May 2003

Perth WA

May 2003

Alligator River
1:250,000

D. Ewington
AFMEX Report 2003/03

Verified by:  Authorised by:

Andrew Bisset  Pierre Heeroma
# Table of Contents

List of Figures ii
List of Tables ii
List of Appendices ii
Summary iii

1. Introduction 1
2. Location and Access 1
3. Tenure 2
4. Geology 2
5. Previous Work 3
6. Work Completed During 2002-2003 4
   6.1 Helicopter-supported Diamond Drilling 4
7. Conclusions 9
List of Figures

1. Tenement Location Map
2. West Arnhem Land – Solid Geology
3. Correlation chart for Proterozoic rocks of the East Alligator River area
4. ERL 150 – Drillhole Locations

List of Tables

1. ERL 150 – 2002-2003 Drilling Summary
2. Downhole PIMA Results
3. Downhole Geochemical Sampling Results

List of Appendices

A. 2002-2003 Diamond Drillhole Logs
B. Mason Geoscience Pty Ltd – Petrographic Descriptions for rock samples from SMLB05, 07 & 09
C. Systems Exploration (NSW) Pty Ltd – Petrophysical Results
Summary

The Exploration Retention Licences are located in Arnhem Land about 250 kilometres east of Darwin. Exploration was conducted by a joint venture that consisted of AFmeco Mining and EXploration Pty Ltd (operator), Cameco Australia Pty Ltd and S.A.E. Australia Pty Ltd.

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

Four drillholes were completed during the year comprising 1039.7 metres diamond drilling. All holes were drilled on ERL 150, and no work was conducted on ERL 151 during the reporting period.

Although weak radioactivity was detected, the drilling failed to indicate any vectors to mineralisation.
1. **INTRODUCTION**

During most of the reporting period, the Exploration Retention Licences (ERL’s) were explored in joint venture by AFmeco Mining and EXploration Pty Ltd (operator), Cameco Australia Pty Ltd and S.A.E. 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 2002 and 2003, 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 Cahills Crossing and unsealed roads to Nabarlek.

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.

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. The ERL’s replace parts of Exploration Licence (EL) 2508, which expired on 28th June 1998. ERL 152 was relinquished on 28th May 2001.

During the reporting period, ERL’s 150 & 151 were 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%).

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 in figure 2 and a stratigraphic chart is shown in 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. Kudjumarndi 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 (1700my) 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 and airborne geophysical surveys. Further details of this work can be found in previous annual reports, submitted to the Department of Business, Industry and Resource Development (DBIRD) since May 2000. A Final Report for ERL 152 was submitted to the DBIRD 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 DBIRD and in the final report on EL 2508 (areas retained under tenure), submitted to the DBIRD in 1998.

6. **Work Completed During 2002-2003**

Work completed in the fourth year of tenure focussed around helicopter supported diamond drilling on ERL 150. No work was conducted on ERL 151 during the reporting period.

6.1 **Helicopter-supported Diamond Drilling**

The 2001 airborne TEM survey (TEMPEST) highlighted a number of conductive targets, and selected anomalies were chosen for follow-up drilling. Drilling on ERL 150 during the reporting period focussed upon these targets. Utilising a helicopter-supported Boart-Longyear LF70 rig, four diamond drillholes for a total of 1039.7m were completed. The drillhole locations are shown in figure 4.

Details of the drillholes can be found in Table 1. Diamond drillhole logs are presented in Appendix A.

Mason Geoscience Pty Ltd performed a petrographic study of selected drillhole samples, and the report is included in Appendix B. Systems Exploration (NSW) Pty Ltd performed various petrophysical measurements on selected drillhole samples, and the results are included in Appendix C.

All of the holes were probed with an Auslog Pty Ltd downhole natural gamma tool.

PIMA mineralogical analyses were conducted on sandstone and basement core at regular intervals, and results are shown in Table 2. 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 3. A breakdown of elements analysed is presented below:

<table>
<thead>
<tr>
<th>SANDSTONE</th>
<th>Composite Sampling at 10m and 2m (proximal to unconformity) intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Acid</td>
<td>ICP-OES</td>
</tr>
<tr>
<td></td>
<td>ICP-MS</td>
</tr>
<tr>
<td>Mixed Acid</td>
<td>ICP-MS</td>
</tr>
<tr>
<td>Sodium Peroxide Fusion</td>
<td>ICP-OES</td>
</tr>
<tr>
<td>Aqua Regia</td>
<td>ICP-MS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BASEMENT</th>
<th>Composite Sampling at 10m and 2m (proximal to unconformity) intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Acid</td>
<td>ICP-OES</td>
</tr>
<tr>
<td></td>
<td>ICP-MS</td>
</tr>
</tbody>
</table>

SMLB006 is sited in the north of the tenement and approximately 500m southwest of SMLB005. The hole was drilled at -80° towards 150° and completed to a depth of 275.8m. The unconformity was intersected at a down-hole depth of 247.7m.

The hole is collared within the Mamadawerre Sandstone. The sandstone, apart from the upper sequences, is coarse grained to pebbly and poorly sorted. The sandstone has undergone moderate to strong, patchy silicification, and is accompanied by moderate to strong hematite alteration or bleaching. The clay content is more abundant than observed elsewhere, and ranges up to 15% (estimated) rock volume in places. Clasts of various origins are common, and include subrounded quartz and subangular to angular lithic clasts. Pale yellow green illite alteration occurs with patchy hematite alteration and bleaching in the coarse grained basal sequences of the sandstone, which has also
undergone immature solution brecciation – proto-breccias are also commonly observed. The solution breccias comprise a pale yellow-green illitic matrix with sub-rounded to rounded matrix supported and moderately corroded sandstone clasts. Chlorite occurs only as a fracture coating. The unconformity is un-sheared.

The basement lithologies comprise meta-arkose, quartz mica schist and scattered mobilisates and pegmatites. A narrow hematite altered zone immediately beneath the unconformity trends into weakly illite altered and regionally chlorite altered meta-sediments. Narrow sillimanite rich bands occur rarely. Folding is rare, and is restricted to open isoclinal folds. One brittle fracture was intersected towards the end of the hole. No anomalous radioactivity was detected.

**SMLB007** was drilled at -80° towards 040°, and completed to a depth of 284.6m. The unconformity was intersected at a down-hole depth of 218.4m.

The hole is collared within the Mamadawerre Sandstone, and is coarse grained to pebbly throughout the majority of the drillhole. The sandstone is poorly sorted, and contains pebbles of varying origin, as above. Silicification intensity varies from moderate to strong, however is patchy throughout. Alternating bands of hematite alteration and bleached sandstone are commonly observed. Stylolites are common, as are narrow moderately to strongly fractured zones. Both planes are commonly coated with mixtures of kaolinite and hematite. Illite alteration (varying from earthy white to pale yellow green) becomes more prominent with depth, however rarely becomes pervasive – hematite alteration persists to the unconformity. Brecciation is rarely observed, and is restricted to strongly silicified tectonic proto-breccias. Trace disseminated pyrite occurs immediately above the unconformity. The unconformity is un-sheared.

The basement lithologies comprise para-amphibolite (rarely garnetiferous), meta-arkose, quartz-mica schist, and scattered mobilisates and pegmatites. This unit is interpreted as belonging to the amphibolite member of the Lower Cahill Formation, whereas all other basement lithologies intersected in the 2002 drilling are interpreted as belonging to the upper arkosic unit of the Upper Cahill Formation. Immediately
beneath the unconformity, the amphibolite is moderately to strongly hematite and illite altered, and partially friable in places. Quartz-carbonate veining/fracture infill is common in the upper sequences of the basement. Minor open isoclinal folding was observed. The intense illite and hematite alteration in the upper basement sequences trends into more regional chlorite and illite alteration with depth. A narrow brittle fracture was intersected at depth, along with minor tectonic brecciation. Aside from minor 2x, 3x background radioactivity immediately beneath the unconformity, anomalous radioactivity was not detected in this drillhole.

**SMLB008** is sited within the centre of the tenement. The hole was drilled at -80° towards 180° and completed to a depth of 245.6m. The unconformity was intersected at a down-hole depth of 192.9m.

The hole is collared within the Mamadawerre Sandstone. The sandstone is medium to coarse grained and pebbly throughout the majority of the drilled sequence, and is poorly sorted. Alteration is similar to that observed in other 2002 drillholes, and comprises patchy, though moderate to strong silicification, alternating hematite alteration and bleaching, and mild to moderate illite alteration. A relatively wide broken and strongly fractured zone was intersected within the coarse basal sequence – kaolinite, hematite and limonite alteration and fracture coating is common within this broken zone. Mild chlorite alteration and fracture coating occurs above the unconformity (associated with tectonic brecciation), and illite content increases slightly. The unconformity is mildly sheared, and contains specular hematite.

The basement lithologies comprise meta-arkose, quartz-(garnet) mica schist and scattered mobilisates and pegmatites. Apart from a narrow hematite altered zone immediately beneath the unconformity, the basement lithologies display regional chlorite alteration. Narrow illite altered zones are scattered throughout the basement. The chlorite alteration becomes weaker with depth. Narrow sillimanite-rich bands are observed in the mica schist. Micro-folded intervals were intersected.
Apart from minor 3x background radioactivity associated with a clay-filled fault gouge in the sandstone (possibly associated with phosphates), no anomalous radioactivity was detected in the drillhole.

**SMLB009** is sited in the east of the tenement. The hole was drilled at -80° towards 219° and completed to a depth of 233.7m. The unconformity was intersected at a downhole depth of 181.45m.

The hole is collared within the Mamadawerre Sandstone, which is a poorly sorted, medium to coarse-grained pebbly sandstone throughout much of the sequence – the sandstone is fine to medium grained for the first 40m. Alteration throughout much of the sequence is similar to other 2002 drillholes. The coarse basal sequences of the sandstone have been intruded by narrow dolerite dykelets, and the surrounding sandstone has been moderately chlorite altered. Immediately above the unconformity, the sandstone is moderately chlorite and illite altered, and displays hydraulic protobrecciation. Drusy quartz veinlets, later partially infilled with gypsum, are also observed in this section. The unconformity is un-sheared.

The basement lithologies comprise meta-arkose, para-amphibolites and quartz-mica schist, with scattered mobilisates and pegmatites. Immediately beneath the unconformity, the meta-sediments are moderately to strongly hematite and illite altered, and are crosscut by numerous ‘brick-red’ hematite veins. This drillhole displays the most significantly hematite altered basement profile intersected in the 2002 drilling, extending for approximately 20m beneath the unconformity. Narrow zones of mild quartz removal were also intersected. The remainder of the basement comprises variably chlorite and illite altered meta-sediments. Intense fracturing is restricted to the hematite-altered zone immediately beneath the unconformity. Micro-folding was observed throughout the basement, however in insignificant proportions.

Mild radioactivity is associated with (and restricted to) the brick-red hematite alteration and breccia-infill beneath the unconformity.
7. **CONCLUSIONS**

Interpretation of the 2001 airborne TEM survey provided approximate location of the unconformity, and also highlighted a number of conductive anomalies proximal to, or below, the interpreted unconformity. Drilling during this reporting period was designed to target these anomalies. All drillholes intersected the conductive body they were targeting, and apart from minor radioactivity, significant mineralisation was not encountered.