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ABSTRACT

EL 2031, Burnside Centre, was granted to Mines Administration on the 29th May 1979 for a period of twelve months. A twelve month renewal was granted on 29th May 1980 with a minimum expenditure covenant of $5,000.

During 1980 the project area was geologically mapped at 1:25,000 scale. Mapping in the relinquished portion of the EL delineated Lower Proterozoic rocks of the Kapalga and Burrel Creek Formations. Five (5) rock chip samples were assayed for Cu, Pb, Zn, U and W.

It is recommended that the following area of EL 2031 be relinquished.

Commencing at the intersection of latitude 13° 18' and longitude 131° 21' thence proceeding east to the intersection of latitude 13°18' and longitude 131°24' thence proceeding south to the intersection of latitude 13°19' and longitude 131°24' thence proceeding west to the intersection of latitude 13°19' and longitude 131°22' thence proceeding south to the intersection of latitude 13°21' and longitude 131°22' thence proceeding west to intersection of latitude 13°21' and longitude 131°21' thence proceeding north to commencement point.
1. **INTRODUCTION.**

EL 2031 was granted to Mines Administration Pty. Limited on the 29th May 1979 for a period of twelve months. The area was granted for all minerals. During the period ending November 1980, EL 2031 was subjected to an extensive exploration programme. This report summarizes the results of that programme with regard to the area to be relinquished.

1.1 **Location and Access**

EL 2031 is located approximately 125 kilometers south east of Darwin and 25 kilometers south east of Adelaide River in the Northern Territory (Fig. 1). It is located on the Pine Creek 1:250,000 and the Batchelor 1:100,000 geological sheets. A detailed description of EL 2031 is given below:-

ALL THAT piece or parcel of land in the Northern Territory of Australia containing an area of 11.57 square miles (29.96 sq km) more or less, the boundary of which is described as follows:-

Commencing at the intersection of latitude 13 degrees 18 minutes with longitude 131 degrees 21 minutes thence proceeding to the intersection of latitude 13 degrees 18 minutes with longitude 131 degrees 24 minutes thence proceeding to the intersection of latitude 13 degrees 21 minutes with longitude 131 degrees 24 minutes thence proceeding to the intersection of latitude 13 degrees 21 minutes with longitude 131 degrees 21 minutes thence proceeding to the intersection of latitude 13 degrees 18 minutes with longitude 131 degrees 21 minutes.

The area to be relinquished is described as:-

Commencing at the intersection of latitude 13°18' and longitude 131°21' thence proceeding east to the intersection of latitude 13°18' and longitude 131°24' thence proceeding south to the intersection of latitude 13°19' and longitude 131°24' thence proceeding west to the intersection of latitude 13°19' and longitude 131°22' thence proceeding south
LOCATION MAP.

E.L. 2031  BURNSIDE CENTRE

Figure 1
to the intersection of latitude 13°21' and longitude 131°22' thence proceeding west to intersection of latitude 15°21' and longitude 131°21' thence proceeding north to commencement point.

Access to EL 2031 is obtained via the sealed Stuart Highway from Darwin and thence by a combination of sealed and formed gravel roads to Ban Ban Station.

From Ban Ban Station a track heading west, passes approximately two kilometres to the south of the project area. This track intersects a north-south fence line which forms the western boundary of the EL. There are no tracks within the EL. All unsealed roads are trafficable only during the 'dry' season.

1.2 Topography and Climate

Most of EL 2031 consists of low rounded hills with rocky outcrops separated by broad flat 'black soil' plains. However, in the north-west and south-east corners steep sided ridges, rising up to 35 metres above the surrounding plains, occur.

The climate of the region is sub-tropical. The monsoonal season occurs from November to April, during which most of the annual rain falls in torrential storms. Rainfall averages more than 1 200 mm annually. Humidity is constantly high and temperatures range from 30-40°C. During the remainder of the year the humidity is lower with daily changes in temperature ranging from 30°C during the day to 10°C or less at night.

1.3 Tenement Situation.

Exploration Licence 2031 was granted to Mines Administration Pty. Limited on the 29th May 1979 for a period of twelve months. The title was granted for all minerals with a minimum expenditure requirement of $1,700.

An application for a further twelve months was submitted and granted on the 29th May 1980 for a period of twelve months with a minimum expenditure covenant of $5,000.
RELINQUISHERMENT MAP

EL. 2031 — BURNSIDE CENTRAL

SCALE — 1: 100,000

FIGURE 2
A 50% relinquishment is due on the 29th May 1981.

1.4 Previous Work.

The earliest geological investigations of the Pine Creek region resulted from the discovery of gold in 1872. A number of the mining fields and mines were mapped with aerial photographs by the Aerial, Geological and Geophysical survey of Northern Australia between 1935 and 1939.

The BMR has carried out a number of regional mapping programmes which have included the EL. The area was studied at 1:63,360 scale in the Burnside Geological Series and at 1:250,000 scale in the Pine Creek Geological Sheet (Malone, 1962).

Walpole et. al., (1968) compiled all the existing data pertaining to the Katherine-Darwin Region and proposed a geological evolution of the Pine Creek Geosyncline. More recently mapping of the Batchelor area at 1:100,000 scale (1977) and the entire Pine Creek Geosyncline at 1:500,000 scale (Needham et. al., 1980) has included the EL.

United Uranium and Australian Mining and Smelting tested the uranium potential of the Burnside area in the 1950's and 1960's. More recently Nord Resources (1978) tested an area to the south for uranium and tin. CRAE (1959, 1977-79) and Comalco (1975) also tested the carbonaceous shales for gold and base metal mineralization. The relevant references for this work are presented in the bibliography.

2. REGIONAL GEOLOGY.

Exploration Licence 2031 is located near the centre of the Pine Creek Geosyncline. Exploration Licence 2031 is located near the centre of the Pine Creek Geosyncline has been described in detail by Needham et. al., (1980) and will be discussed only briefly in this report.
By correlating a Tuffaceous sequence Needham et. al., (op cit) have now defined the Pine Creek Geosyncline as a single intracratonic basin containing a thick sequence of mainly pelitic and psammitic Lower Proterozoic sedimentary rocks with interlayered tuff units resting on an Archean granitic basement. Cover rocks, of Carpentarian and younger age, unconformably overlie all of these rocks and conceal the basin margins (Table 1).

2.1 Archean Basement.

The Archean Basement is represented by the domes of the Rum Jungle/Waterhouse and Nanambu Complexes. Possible Archean rocks outcrop in the Woolner area. All the complexes consist mainly of gneisses, migmatites and leucocratic granites with minor schists, metasediments and banded iron formations. All of the Archean Basement rocks have anomalous uranium concentrations and are possible source rocks for the deposits in the Pine Creek Geosyncline.

2.2 Lower Proterozoic Sedimentary Rocks.

The oldest known Lower Proterozoic rocks are those of the Batchelor and Kakadu Groups which rest unconformably on Archean basement. The Batchelor Group, which surrounds the Rum Jungle/Waterhouse complex contains arkosic rudites, psammites, conglomerates, and minor shales of the Beetsons and Crater formations interbedded with massive crystalline carbonates of the Celia and Coomalie Dolomites. The Kakadu Group is best developed adjacent to the Nanambu Complex and is comprised mainly of meta-arkose and paragneiss.

These two basal groups are overlain by the pelites and psammites of the Namoona Group. The dominant unit in this group is the Masson Formation which extends from west of the Rum Jungle/Waterhouse Complex almost to the South Alligator River. Further east it is thought to be equivalent to the lower member of the Cahill Formation, a partly calcareous and carbonaceous sequence of micaceous quartz-feldspathic schist, with lenses of massive carbonate. These two units are the hosts to the major uranium deposits in the Rum Jungle and Alligator Rivers areas. In the centre of the geosyncline the Masson Formation is unconformably
<table>
<thead>
<tr>
<th>AGE</th>
<th>GROUP</th>
<th>FORMATION</th>
<th>LITHOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cretaceous</td>
<td>Bathurst Island F.</td>
<td>Fine to medium grained marine sandstones.</td>
<td></td>
</tr>
<tr>
<td>Lower Proterozoic</td>
<td>Tolmer Gp.</td>
<td>Depot Creek Sandstone,</td>
<td>Massive cross-bedded quartz sandstone, pebble bands.</td>
</tr>
<tr>
<td>(Carpentarian)</td>
<td>Katherine River Gp.</td>
<td>Kombolgie Form.</td>
<td>Medium to coarse quartz sandstone, minor andesite basalt and rhyolite.</td>
</tr>
<tr>
<td></td>
<td>Gerowie Tuff.</td>
<td></td>
<td>Black-green cherty tuff, green argillite, green tuffaceous greywacke.</td>
</tr>
<tr>
<td></td>
<td>Koolpin Form.</td>
<td></td>
<td>Ferruginous siltstone with chert bands, pyritic carbonaceous shale, silicified dolomite minor jasper.</td>
</tr>
<tr>
<td></td>
<td>Mount Partridge Gp.</td>
<td>Nourlangie Schist</td>
<td>Quartz mica schist, mica quartz schist, minor quartzite.</td>
</tr>
<tr>
<td></td>
<td>Wildman Siltstone.</td>
<td></td>
<td>Siltstone, in places carbonaceous at depth, red and cream laminated siltstone, minor quartzite and quartz greywacke.</td>
</tr>
<tr>
<td>AGE</td>
<td>GROUP</td>
<td>FORMATION</td>
<td>LITHOLOGY</td>
</tr>
<tr>
<td>------------</td>
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<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Mount Partridge Gp. (Contd)</td>
<td>Acacia Gap Sandstone Member.</td>
<td>Quartz sandstone and feldspathic sandstone with pyritic carbonaceous siltstone and quartz siltstone interbeds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mount Hooper Sandstone.</td>
<td>Medium quartz sandstone and quartzite with some chert fragments, siltstone, phyllite, feldspathic quartzite, pebbly in places, chert pebble conglomerate cross-bedded.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mundogie Sandstone</td>
<td>Coarse medium quartz sandstone and orthoquartzite, commonly pebbly quartz pebble conglomerate, siltstone cross-bedded scoured and graded beds. Minor schist amphibolitic in places.</td>
</tr>
<tr>
<td></td>
<td>Namoona Group</td>
<td>Stage Creek Volcanics</td>
<td>Mafic volcanic breccia hawaiite, tuff, tuffaceous shale, tuffaceous greywacke.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cahill Formation</td>
<td>Mica feldspar quartz schist, quartz mica schist, with garnet, amphibole and kyanite in places, carbonaceous schist, crystalline dolomite-magnesite, and calc-silicate gneiss near base.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Masson Formation</td>
<td>Ferruginous shale (mostly pyritic and carbonaceous at depth) fine-coarse calcareous and volcanic greywacke, calcarenite, sandstone, limestone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crater Formation.</td>
<td>Feldspathic sandstone, pebble conglomerate, siltstone, pyritic in part, basal ferruginous conglomerate in places.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Celia Dolomite</td>
<td>Dolomite, magnesite, silicified or with algal structures in places, tremolite s-chist, minor sandstone, arkose, carbonaceous sediments.</td>
</tr>
<tr>
<td>AGE</td>
<td>GROUP</td>
<td>FORMATION</td>
<td>LITHOLOGY</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------</td>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Mount Howship Gneiss</td>
<td>Very coarse white feldspathic leucogneiss, minor schist, rare garnet and amphibole.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kudjumarndi Quartzite.</td>
<td>Orthoquartzite, quartz gneiss, minor schist, rare cross-bedding, rare amphibole.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mount Basedow Gneiss</td>
<td>White-grey-pink coarse muscovite biotite gneiss, granitoid gneiss, minor schist.</td>
<td></td>
</tr>
<tr>
<td>(Carpentarian)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Proterozoic</td>
<td>Zamu Dolerite.</td>
<td>Differentiated continental tholeiitic basalt sills, olivine dolerite, metamorphosed to amphibolite in places.</td>
<td></td>
</tr>
</tbody>
</table>
overlain by the Stag Creek Volcanics. Elsewhere the Masson Formation is overlain by the sandstone - siltstone assemblage of the Mount Partridge Group which contains the Mundogie Sandstone, Mount Hooper Sandstone and Wildman Siltstone and correlates with the Acacia Gap Sandstone in the Rum Jungle Area. East of the South Alligator River the Mundogie Sandstone correlates with feldspathic quartz schist of the upper Cahill Formation and the overlying Wildman Siltstone correlates with the Nourlangie Schist.

Overlying the older rocks is the South Alligator Group which comprises the Koolpin Formation, Gerowie Tuff and Kapalga Formation. Together with the Koolpin Formation, the overlying Gerowie Tuff provides the main evidence for correlating the strata of the western and central parts of the geosyncline. The Kapalga Formation is the youngest unit in the South Alligator Group and represents a transitional sequence between the South Alligator Group and the overlying Finniss River Group.

The Finniss River Group is the youngest Lower Proterozoic Group and consists of a monotonous sequence of siltstone, slate, shale and greywacke. The Finniss River Group is made up of the Burrell Creek Formation, the Fisher Creek Siltstone and the Chilling Sandstone. The Burrell Creek Formation grades laterally and upwards into the Chilling Sandstone. The Fisher Creek Siltstone is present in the South Alligator Valley area and is a correlative of the Burrell Creek Formation.

At or near the end of sedimentation in the Lower Proterozoic the rocks were intruded by a suite of dolerites, mainly sills, known as the Zamu Dolerites. At approximately 1 800 m.y. the sills and sedimentary rocks were deformed and regionally metamorphosed. Both the grade of metamorphism and degree of deformation increases towards the north east of the geosyncline. The metamorphics were then intruded and in places domed by early Carpentarian granite plutons. This was followed by the intrusion of a series of tholeitic lopoliths known as the Oenpelli Dolerites.
2.3 **Cover Rocks.**

The Lower Proterozoic rocks of the Pine Creek Geosyncline are unconformably overlain by the sandstone and minor volcanics of the Tolmer and Katherine River Groups. The northern and southern margins of the geosyncline are concealed by Palaeozoic rocks of the Daly River Group and Mesozoic strata of the Bathurst Island and Petrell Formations.

3. **RESULTS OF FIELD INVESTIGATIONS, 1980.**

Geological mapping of EL 2031, at a scale of 1:25,000 using colour aerial photographs was commenced in June, 1980 (Map 1). Base and airphoto interpretation maps had been prepared in August 1979 by Hunting Geology and Geophysics (Australia) Pty. Ltd.

3.1 **Geology.**

The geology of the relinquished section of EL 2031 consists of a sequence of Lower Proterozoic sedimentary rocks. The sequence was deformed and metamorphosed at approximately 1 800 m.y. (Needham et. al., 1980), and again at approximately 1 300 m.y. (Needham et. al., 1980) by the intrusion of early Carpentarian granites.

**Lower Proterozoic Sedimentary Rocks.**

The Lower Proterozoic sedimentary rocks outcropping within EL 2031 belong to two groups - the South Alligator Group and the Finniss River Group as defined by Needham et. al. (1980).

Faulted against the Gerowie Tuff is the Kapalga Formation which is the youngest unit of the South Alligator Group.

The youngest unit of the South Alligator Group - the Kapalga Formation outcrops in the relinquished part of EL 2031 as interbedded haematitic siltstones and sandstones. The haematitic siltstones are red-brown, purple or light red in colour and are fine grained and thinly bedded. The rocks are thinly to thickly bedded with the sandstones. The sandstones are lithic arkoses consisting of quartz and feldspar with detrital grains of chert, siltstone and quartzite.
Overlying the South Alligator Group rocks are the pelites and psammites of the Burrell Creek Formation, the youngest unit of the Finniss River Group. The sandstones of the Burrell Creek Formation are red-brown to black in colour, coarse grained, poorly sorted lithic arkoses consisting of a framework of quartz and feldspar grains with detrital fragments of chert, siltstone and quartzite in a clay matrix. (See Appendix 2 B.C. 4). Some minor polymictic conglomerate also occurs in the Burrell Creek Formation (Appendix 2 B.C. 13). Both the sandstones and siltstones are very fissile except for the variety of sandstone which occurs in the Burrell Creek Formation known as 'Tombstone' greywacke. This rock occurs as massive rounded slabs similar to tombstones. The siltstones are red-brown, fine grained and well sorted.

**Structure**

Within EL 2031 the rocks generally strike 220° and dip between 40° - 70° to the north west. The continuity of strike is due to the intrusion of the early Carpentarian Burnside Granite which also created a concentric mantle of Lower Proterozoic sedimentary rocks. In the north west portion of the relinquished area dips and strikes vary indicating that the structural overprinting of the granite intrusion has lessened. The rocks tend to show a north-south strike which was caused by the deformational event dated at 1 800 m.y. (Needham et. al., 1980).

3.2 **Geochemistry.**

In conjunction with the geological mapping a programme of rock-chip sampling was undertaken. Five (5) samples collected from the relinquished area were assayed for Cu, Pb, Zn, U and W.

**Assay**

results are presented as Appendix III.

4. **CONCLUSIONS AND RECOMMENDATIONS.**

Geological mapping of EL 2031, Burnside Centre, delineated rocks belonging to the South Alligator and Finniss River Groups. The Lower Proterozoic sedimentary rocks outcropping belong to the Kapalga Formation and Burrell
Creek Formation. Five rock-chip samples were assayed for Cu, Pb, Zn, U and W.

As a 50% relinquishment is due in May 1981 it is recommended that the area bounded by 131°22′13″19′ east to 131°24′13″19′ thence south to 131°24′13″21′ thence west to 131°22′15″21′ thence north to commencement point be kept and the rest of EL 2031 be relinquished (Figure 2).
5. **BIBLIOGRAPHY.**


Walpole, B.P., Crohn, P.W., Dunn, P.R. and Randall, M.A., 1968: Geology of the Katherine - Darwin Region, N.T. B.M.R. Bull. 82.
Willis, K.J.; 1977: Annual Report Burnside East EL 1137, and
Burnside West EL 1149, Pine Creek Basin N.T.
N.T. Open File CR 78/167 unpbl.

Willis, K.J., 1979: Final Reports Burnside East, EL 1137, and
Burnside West EL 1149, Pine Creek Basin N.T.
N.T. open File CR 79/56 unpbl.
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<tr>
<th>SAMPLE NO.</th>
<th>TOCK TYPE - COMPOSITION.</th>
<th>FABRIC</th>
<th>MINOR MINERALS</th>
<th>COMMENTS</th>
</tr>
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<tbody>
<tr>
<td>BC 4</td>
<td>Biotite Hornfels. Subangular Clastic grains of quartz, feldspar, chert, shale, felsite, granophyre; fine matrix of quartz, random biotite flakes.</td>
<td>Good clastic textures; distinct bedding; well-sorted/sized. Medium-grained.</td>
<td>Occasional magnetite, pyrite crystals. Detrital green tourmaline.</td>
<td>Rock was lithic arkose, subjected to mild contact-metamorphism; igneous components are all reworked.</td>
</tr>
<tr>
<td>BC 13</td>
<td>Conglomerate. Well-rounded pebbles of carbonaceous siltstone, ferruginous argillaceous sandstone; sandy quartz-sericite matrix/cement.</td>
<td>Parallel alignment of elongate pebbles. Well-cemented, indurated.</td>
<td>Carbonaceous shale and chert fragments, Muscovite flakes.</td>
<td>Polymictic conglomerate; matrix is sericitised, but no significant metamorphism.</td>
</tr>
</tbody>
</table>
## ASSAY RESULTS

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>Cu</th>
<th>Pb</th>
<th>Zn</th>
<th>U</th>
<th>W</th>
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<tr>
<td>BC 9</td>
<td>135</td>
<td>35</td>
<td>20</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>BC 10</td>
<td>45</td>
<td>50</td>
<td>10</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>BC 11</td>
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<td>10</td>
<td>4</td>
<td>470</td>
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All values in ppm.