EL 29048

2nd ANNUAL REPORT

FOR THE PERIOD

3 July 2013 to 2 July 2014

By

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&

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20 August 2014

Target Commodities: Cu

MAP REFERENCE

NT 1:250 000 VICTORIA RIVER DOWNS, SE 5204
NT 1:100 000 KILLARNEY, 5265 & MONTEJINNI 5264

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Abstract

Exploration Licence EL29048 was granted to GRIGM Resources Pty Ltd by NT Department of Mines and Energy on 3 July 2012 for a period of six years. This report summarises work carried out during the period July 3, 2013 to July 2, 2014.

EL29048 license area locates in Kalkarindji Continental Flood Basalt Province, within the outcrop area of Kalkarindji Suite. Kalkarindji Continental Flood Basalt is characterised by very low concentration of Platinum Group Elements (PGE). This was considered (Glass et al) to be comparable with that of Siberian Traps Large Ingeous Province at Noril’sk in northern Siberian, which is host to World-class nickel mineralization.

The licensed area is considered to be prospective for Cu, as there are two copper occurrences in the area, Crowson’s Prospect Cu in the south and an unnamed Cu occurrence near Shoe Tool Bore in the north.

Work completed in the last twelve months include:

1 General ground inspection and check the mineral occurrences;
2 Ground check stream sediment geochemical anomalies;
3 Ground check the gravity anomalies in and around the licensed area.

In the south part of EL29048, traces of secondary copper minerals have been identified in weathered basalts along the contact zone between basalt and the Montejinni Limestone. In the north part, near Shoeing Tool Bore, fine-grained malachite was identified in weathered basalts in the vicinity of intercalated chert and limestone.

Positive Cu stream sediments geochemistry anomaly locates in the immediate vicinity of Crowson’s Prospect (Cu). A few weak positive copper anomalies within EL29048 license area locate near the areas where basalts are in contact with intercalated chert and/or limestone. Copper enrichment could be related to fluid activities along the contact zone.

Due to thick Quaternary cover, ground check gravity anomaly has failed to get any meaningful results. Ground geophysical survey may be needed to clarify the anomalies.
Introduction

Exploration Licence EL29048 was granted to GRIGM Resources Pty Ltd by NT Department of Mines and Energy on 3 July 2012 for a period of six years. This report summarises work carried out during the period July 3, 2013 to July 2, 2014.

Tenure details

EL29048, total of 84 units (Table 1), is located about 275km southwest of township of Katherine, accessing by Buntine Highway, Buchanan Highway, and local 4WD tracks (Figure 1).

<table>
<thead>
<tr>
<th>Table 1 EL29048 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD52 355 O, P, T, U, Y, Z</td>
</tr>
<tr>
<td>SD52 356 L, M, Q, R, V, W</td>
</tr>
<tr>
<td>SD52 427 D, E, J, K, O, P, T, U, Y, Z</td>
</tr>
<tr>
<td>SD52 428 A, B, F, G, L, M, Q, R, V, W</td>
</tr>
<tr>
<td>SD52 499 D, E</td>
</tr>
<tr>
<td>SD52 501 F, L, Q, V</td>
</tr>
<tr>
<td>SD52 572 C, D, E, H, J, K, N, O, P, S, T, U, X, Y, Z</td>
</tr>
<tr>
<td>SD52 473 A, F, L, Q, V</td>
</tr>
<tr>
<td>SD52 644 C, D, E, H, J, K, N, O, P</td>
</tr>
<tr>
<td>SD52 645 A, F, L</td>
</tr>
</tbody>
</table>

Figure 1 EL29048 location diagram
Geological Setting

EL29048 license area locates in Kalkarindji Continental Flood Basalt Province, within the outcrop area of Kalkarindji Suite (Figure 2).

During the early Cambrian, a widespread outpouring of sub-aerial basaltic lava covered a large area of northern Australia, central Western Australia, northwestern South Australia and possibly South East Asia that have subsequently been rifted from Australia (Glass, et al, 2013). These include the Antrim Plateau Volcanics, Nutwood Downs Volcanics, Helen Springs Volcanics, et, al. in the Northern Territory and equivalent exposures in Western Australia. Based on geochemical and isotopic similarities, Glass (2002) included all of these coeval mafic igneous units within a new province and named it Kalkarindji Continental Flood Basalt Province.

Late early Cambrian volcanic units of the Kalkarindji flood basalt province in northern Australia were previously formalized as the Kalkarindji Volcanic Group (Kruse in Rawlings et al 2008), this definition also included various minor intercalated and immediately underlying sedimentary units. However, given the dominance of the igneous component, the formal stratigraphic definition for this province is now redefined as Kalkarindji Suite, so as to include volcanic and intrusive constituents. Minor intercalated sedimentary components of the formal Kalkarindji Volcanic Group are not included within the formal definition of the Kalkarindji Suite, but are included within the constituent formations (Glass et al 2013).

![Figure 2 Map of Australia showing outcrop extent of Kalkarindji mafic rocks (green areas). Dashed line shows possible minimum original extent of Kalkarindji Large Igneous Province. (map taken from Glass L M, Ahamad M and Dunster L N, 2013)]
The recorded K-Ar dating results for Kalkarindji basalts sit between 511+/-12 Ma and 500+/-12 Ma (Bultitude 1972). U-Pb SHRIMP dating result at 513+/-12 Ma (Hanley and Wingate, 2000).

Glass et al (2013) state that the Kalkarindji basalts consist of a series of 20-250m thick lava flows of mostly fine-grained massive basalt with conspicuous vesicular flow tops and less common plagioclase-phryic basalt. The basalt mineral assemblage comprises plagioclase, clinopyroxene (augite or pigeonite), rare orthopyroxene with lesser ilmenite, titanomagnetite, primary and secondary quartz and K-feldspar. Olivine, mica and hornblende are accessory components. Glass (2002) described the petrology of the Kalkarindji basalts in detail and this is cited here. Texturally the basalts vary from extremely fine-grained aphanitic rocks to porphyritic and coarse-grained rocks approaching doleritic textures. The primary phenocryst and microphenocryst phases are subhedral clinopyroxene, near-euhedral plagioclase feldspar and, in the most evolved rocks, abundant quartz. Secondary phases include chlorite, albite, K-feldspar, quartz and titanite. Rocks that have undergone hydrothermal alteration are commonly chloritic and haematitic, and have amygdales filled with secondary prehnite, malachite, calcite and silica. Groundmass phases are mostly coarse to medium-grained, ophitic to granular and intergranular (euhedral plagioclase laths and subhedral pyroxene).

Geochemical features for the Kalkarindji Province basalts were described in detail by Glass (2002) and Glass and Phillips (2006). The most distinctive feature for the Kalkarindji Province basalt is the overall geochemical homogeneity across the entire province. The basalts are low-Ti tholeiites, MgO wt% values are variable and range from ca 9 to 3 wt% with a mean of ca 6 wt%. Mg# (molar100%Mg/(Mg+Fe2+) for Fe2O3/FeO=0.15) varies from 72 to 34; however, values for most basalts cluster between 65 and 50. The Kalkarindji basalts are distinguished by low high-field-strength element (HFSE) abundances, eg low elemental abundances of Ta, P, Ti and Nb relative to the incompatible elements. The basalts and dolerites further show extreme enrichment in the most incompatible elements, such as Th, U and Light Rare Earth Elements (LREE), far removed from normal basaltic compositions and more similar to continental crustal compositions. These distinctive geochemical characteristics serve to distinguish the Kalkarindji basalts from all other large igneous provinces worldwide (Glass et al 2013).

Platinum Group Elements (PGE) abundances are extremely low, in most cases below the detection limit (Glass 2002) and may indicate sulphide saturation at some stage in the basalt petrogenesis. Depletion in the PGE may indicate sulphide segregation associated with crustal contamination, which would have resulted in the sequestering of chalcophile elements; this has implication for nickel prospectivity for the Kalkarindji Suite (Glass et al 2013). Similar depletions in PGE patterns to Kalkarindji volcanic rock occur in Siberian Traps Large Igneous Province at Noril’sk in northern Siberian (eg Brugmann et al 1993), which is host to World-class nickel mineralization.

In and around EL29048 area, thickness of the flood basalts is up to 243 meters. BMR drilling project in the Victoria River region resulted in nine stratigraphic drillholes (Bultitude 1971). Three drillholes locate in and in the immediate vicinity of EL29048 licensed area (Victoria River Downs 1, 2, and three in Figure 3, and VR1, 2 and 3 in Figure 4). Lithological drill logs are shown in Figure 4. Drillhole Victoria River Downs 2 encountered 243.8 meters of basalt (VR2 in Figure 4).
Figure 3 Location of BMR stratigraphic drillholes (drill log shown in Figure 4) (from Glass et al 2013)

Figure 4 Lithological logs of stratigraphic drillholes in Victoria River region. TD= Total Depth (from Glass et al 2013)
In southern part of EL29048 licensed area, Kalkarindji basalts are unconformably overlain by early middle Cambrian Montejinni Limestone of Wiso Basin (Randal and Brown 1967). Kruse and Munson (2013) described Montejinni Limestone as limestone and dolostone, include maroon-green siltstone, minor dolomitic quartz sandstone and local basal polymict breccia.

Mineral resources

The recorded mineral resources within Kalkarindji Province include copper and nickel.

Work carried out by BMR in 1950s and 1960s, and later by the Northern Territory Geological Survey identified widespread, but not economically significant copper mineralization in the upper most units of the Antrim Plateau Volcanics, near and along the contact with the overlying limestone. A total of 19 recorded occurrences are
known in Northern Territory (NTGS MODAT record, Glass et al. 2013). Extensive exploration for copper was conducted in the Northern Territory by a joint venture led by Metals Exploration NL. Glass summarized the various style of copper mineralization distinguished in early studies (Erskine et al 1970, Burt et al 1970, Miguel 1974) as follows:

* Structurally controlled copper mineralization in fault and shear zones (eg malachite and chalcocite associated with fault and shear zones at the Cave prospect)
* Copper mineralization in the basal three metres of the overlying Headleys Limestone (chalcolite, malachite and azurite).
* Copper mineralization associated with secondary vesicle infills in basaltic flow tops, or disseminated in massive basalt in the upper Antrim Plateau Volcanics (native copper, chalcopyrite, cuprite, chalcocite and malachite).
* Copper mineralization associated with agglomerate (chalcolite, malachite associated with barite veins).
* Finely disseminated native copper and chalcopyrite in massive basalt flows (eg at Blackfella Rockhole, about 12km southwest of Mount Barton in LIMBUNYA).
* Copper mineralization linked with black manganiferous limestone mounds of possible fumarolic origin (hot seeps).

The Kalkarindji flood basalts have been considered analogous to continental flood basalts in other parts of the world, most importantly the basalts at Noril'sk in Russia, which are host to large Ni-Cu-PGE deposits. Drilling to date has failed to find any economically significant deposit.

EL29048 licensed area is considered to be prospective for Cu, as there are two copper occurrences in the area, Crowson’s Prospect Cu in the south and an unnamed Cu occurrence near Shoe Tool Bore in the north (Figure 5).

**Work completed in the last 12 months (July 3, 2013 to July 2, 2014)**

Work completed in the first 12 months please refer to the first annual report (Jiang Z and Lu J 2013). It can be summarized as follows:

1. A detailed review of the previous exploration work have been conducted;
2. Analyse the existing aero-geophysical images of the area;
3. Preliminary field reconnaissance trips have been undertaken to the area.

Work completed in the last twelve months include:

1. General ground inspection and check the mineral occurrences within the licensed area,
2. Ground check stream sediment geochemical anomalies.
3. Ground check the gravity anomalies in and around the licensed area.
Results

Ground check copper mineral occurrences in the license area

Two copper mineral occurrences were reported in the license area, Crowson’s Prospect in the south and an unnamed Cu prospect in the north.

![Figure 6 Geological setting of south part of EL29048, showing location of Crowson’s Prospect Cu](image)

Crowson's Prospect locates about 10 kilometres west of Montejinni homestead, in the south part of EL29048 license area. Copper mineralization was found by W and B Crowson of Montejinni Station in the late 1960s. Native copper, cuprite, malachite, chalcocite and traces of covellite were reported from the Antrim Plateau Volcanics near the contact with the Montejinni Limestone (Zimmerman 1968, Sweet 1973). Malachite also occurs as a fine dissemination in the limestone, or forms thin (up to 1mm) veinlets following silty laminations in the limestone. Specimens better than 20% Cu were said to have been collected from the surface (Sampey Exploration Services 1968), but individual costeans returned best assays of 4.5% to 7.24% Cu (Sakurai 1991).

In addition to Crowson’s Prospect, traces of secondary copper minerals have also been identified in weathered basalts along the contact zone between basalt and the Montejinni Limestone. Photos in Figure 7 show fine-grained malachite developed on the surface of pebbles with size about 1 to 3 cm in the weathered basalt.
Figure 7  Show fine-grained malachite developed on surface of quartz pebbles contained in weathered basalt (52K 782693  8154494)

Handheld XRF analyzer has been used to check soil chemical variation cross contact zone between basalt and the Montejinni Limestone. Table 2 lists analyzing results of soil samples collected along a line cross contact zone. MJ1 to MJ3 locate in limestone and MJ4 to MJ10 locate in weathered basalt. Sample location listed in Table 3. It should be aware that Handheld XRF analyze results are only semi-quantitative and preliminary, and only be used here to indicate a rough range of the element concentration in the analyzed samples, and show concentration variation trend. Figure 8 shows Cu, Mn, Pb, and Zn concentration variation. It is fairly obvious that Cu, Mn, Pb and Zn concentration are higher near the contact.

Table 2  Handheld XRF analyzing results for soil samples

<table>
<thead>
<tr>
<th>No</th>
<th>Mode</th>
<th>V</th>
<th>V +/-</th>
<th>Mn +/-</th>
<th>Mn</th>
<th>Ni +/-</th>
<th>Cu +/-</th>
<th>Zn +/-</th>
<th>Pb +/-</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJ1</td>
<td>Soil</td>
<td>76</td>
<td>14</td>
<td>5656</td>
<td>174</td>
<td>&lt;LOD</td>
<td>33</td>
<td>719</td>
<td>19</td>
<td>140 8 59 4</td>
</tr>
<tr>
<td>MJ2</td>
<td>Soil</td>
<td>97</td>
<td>14</td>
<td>6777</td>
<td>173</td>
<td>65</td>
<td>12</td>
<td>1074</td>
<td>22</td>
<td>308 10 54 4</td>
</tr>
<tr>
<td>MJ3</td>
<td>Soil</td>
<td>116</td>
<td>9</td>
<td>5850</td>
<td>98</td>
<td>&lt;LOD</td>
<td>28</td>
<td>1752</td>
<td>22</td>
<td>333 8 64 3</td>
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<tr>
<td>MJ4</td>
<td>Soil</td>
<td>121</td>
<td>10</td>
<td>543</td>
<td>18</td>
<td>&lt;LOD</td>
<td>27</td>
<td>791</td>
<td>13</td>
<td>119 5 11 2</td>
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<td>MJ5</td>
<td>Soil</td>
<td>200</td>
<td>15</td>
<td>2006</td>
<td>45</td>
<td>&lt;LOD</td>
<td>31</td>
<td>343</td>
<td>10</td>
<td>163 6 18 3</td>
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<tr>
<td>MJ7</td>
<td>Soil</td>
<td>97</td>
<td>10</td>
<td>176</td>
<td>15</td>
<td>&lt;LOD</td>
<td>28</td>
<td>38</td>
<td>6</td>
<td>66 4 10 6</td>
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<tr>
<td>MJ8</td>
<td>Soil</td>
<td>144</td>
<td>17</td>
<td>617</td>
<td>31</td>
<td>&lt;LOD</td>
<td>35</td>
<td>369</td>
<td>13</td>
<td>76 6 10 8</td>
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<tr>
<td>MJ9</td>
<td>Soil</td>
<td>116</td>
<td>9</td>
<td>1142</td>
<td>25</td>
<td>&lt;LOD</td>
<td>25</td>
<td>572</td>
<td>11</td>
<td>123 5 18 2</td>
</tr>
<tr>
<td>MJ10</td>
<td>Soil</td>
<td>123</td>
<td>12</td>
<td>912</td>
<td>28</td>
<td>&lt;LOD</td>
<td>30</td>
<td>624</td>
<td>13</td>
<td>135 6 19 3</td>
</tr>
</tbody>
</table>

Table 3  Soil sample location

<table>
<thead>
<tr>
<th>No</th>
<th>Lat</th>
<th>Long</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJ1</td>
<td>52 K 782664</td>
<td>8154512</td>
</tr>
<tr>
<td>MJ2</td>
<td>52 K 782676</td>
<td>8154504</td>
</tr>
<tr>
<td>MJ3</td>
<td>52 K 782693</td>
<td>8154500</td>
</tr>
<tr>
<td>MJ4</td>
<td>52 K 782700</td>
<td>8154499</td>
</tr>
</tbody>
</table>
In the north part of EL29048, Randal and Brown (1967) reported that native copper was identified in basalt of the Antrim Plateau Volcanics from the BMR Shoeing Tool Replacement Bore (Figure 9). Field inspection has failed to locate any primary native copper in basalts in the nearby area. Only very fine-grained malachite was identified in weathered basalts. In the vicinity there are outcrops of intercalated chert and limestone (Figure 10).
Ground check stream sediment geochemistry anomalies

Existing stream sediments geochemistry survey results of the EL29048 and surrounding area by previous exploration companies have been extracted from the Northern Territory Geological Survey Database and displayed as Figure 11. Ground check throughout the EL29048 licensed area has been carried out. Distribution of positive copper stream sediment geochemistry anomalies is in consistence with copper mineral occurrences identified in the area. In the south, positive Cu anomaly locates in the immediate vicinity of Crowson’s Prospect, nearby secondary copper
minerals are identified in the weathered basalts near the contact zone between basalts and Montejinni Limestone.

In the north, positive copper anomaly locates near Shoeing Tool Bore, where fine-grained malachite is identified in the weathered basalts, and report show that native copper was identified Randal and Brown (1967). Apart from the positive copper anomalies at Shoeing Tool Bore in the north, and the one near Crowson’s Prospect in the south, there are a few weak positive copper anomalies within EL29048 license area. Ground check found that these positive anomalies locate near the areas where basalts are in contact with intercalated chert and/or limestone. Copper enrichment could be related to fluid activities along contact zones.

In the north part of EL29048, both Ni and Pb stream sediments anomalies distributed along a northwest direction, in consistence with that of Cu (Figure 11). This might
reflect that Cu-Ni and Pb were enriched during the same and/or closely related mineralization process. On the ground, the relative higher Ni and Pb concentration appears in the locations not far from the contact between basalts and intercalated chert and/or limestone. In the south part of EL29049, only couple of very weak positive Ni anomalies exist, and these weak positive anomalies locate far from positive Cu anomalies. Stream sediment Ni concentration is very low in the vicinity of Crowson’s Prospect, near background value.

**Ground check gravity anomalies**

![Regional gravity image](image)

**Figure 12 Regional** Aero-gravity image around EL29048
(From NTGS Web-page, STRIKE)

Figure 12 is regional aero-gravity image around EL29048 area. There is a northwest extending gentle positive anomaly in the center of the north part of 29048, which is roughly in consistence with positive nickel stream sediment geochemistry anomalies. The gentle positive gravity anomaly could indicate existence of mafic dykes. Ground check has failed to get any meaningful results as the Quaternary cover is very thick in the area. Ground geophysical survey may be needed to further clarify the anomalies.

**Conclusion and recommendation**

1. In the south part of EL29048, in addition to Crowson’s Prospect, traces of secondary copper minerals have been identified in weathered basalts along the contact between basalt and the Montejinni Limestone. In the north part of EL29048, in the area near Shoeing Tool Bore, fine-grained malachite was identified in weathered basalts in the vicinity of intercalated chert and limestone.
2. Positive Cu stream sediments geochemistry anomaly locates in the immediate vicinity of Crowson’s Prospect, where copper minerals are identified in the weathered basalts near the contact zone between basalts and Montejinni Limestone.

3. A few weak positive copper anomalies within EL29048 license area locate near the areas where basalts are in contact with intercalated chert and/or limestone. Copper enrichment could be related to fluid activities along contact zones.

4. In the north part of EL29048, both Ni and Pb stream sediments anomalies distributed along a northwest direction, in consistence with that of Cu. This might reflect that Cu-Ni and Pb were enriched during the same and/or closely related mineralization process. On the ground, the relative higher concentration appears in locations not far from the contact between basalts and intercalated chert and/or limestone. Fluid activities along contact zone might have played a role in the mineralization process.

5. Due to thick Quaternary cover, ground check gravity anomaly has failed to get any meaningful results. Ground geophysical survey may be needed to clarify the anomalies.

Following works have been recommended for the next stage exploration:

1. Small scale mapping in the areas near contact zone between Antrim Plateau Volcanics and Montejinni Limestone.

2. Ground geophysical survey to target buried sulphide-bearing ore bodies in the vicinity of the contact zone.

3. Soil geochemistry survey sampling along the ground geophysical survey lines.

4. RC drilling to test the targets outlined by geological, geochemical and geophysical study if it is necessary.

Block reducing

After two years exploration in the prospect area of EL29048, GRIGM Resources Pty Ltd would like to relinquish 44 blocks out of total 84 blocks as follows.

Reduced Blocks in EL29048
A total of 44 blocks

SE52 427  J, K, O, P, T, U, Y, Z
SE52 428  F, G, L, M, Q, R, V, W
SE52 499  D, E
SE52 501  F, L, Q, V
SE52 572  C, D, E, H, J, K
Retain Blocks in EL29048
A total of 40 blocks

- SE52 573: A, F
- SE52 355: O, P, T, U, Y, Z
- SE52 356: L, M, Q, R, V, W
- SE52 427: D, E
- SE52 428: A, B
- SE52 573: L, Q, V
- SE52 644: C, D, E, H, J, K, N, O, P
- SE52 645: A, F, L

**References**


Burt D, Erskine J and Hart J, 1970. Antrim Copper Project, Joint Venture progress report No. 3 (Final Report), Metals Exploration NL, Freeport of Australia Inc,


