Group Report: GR270/13 covering
ELs 28587, 28605, 28606, 28847, 28848, 28898

2nd Annual Report

For the period
13-02-2013 to 12-02-2014

By
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BSc (Hons) MAusIMM

GDA94 - Zone 53
Target Commodities: Heavy Minerals, Manganese and Iron Ore
1:250,000  Mount Young
1:100,000  Chapman, Flying Fox, Throsby

February 2014
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SUMMARY

This report covers second year exploration activities on Group Tenements GR 270/13 (ELs 28587, 28605, 28606, 28847, 28848, 28898) which were granted to Australian Manganese Resources Pty Ltd (AMR) at various dates in 2012. Group reporting applies from 12/02/2012. This report covers 13th February 2013 to 12th February 2014.

The Project lies within the Bauhinia Shelf of the Proterozoic McArthur Basin. The area has been historically subject to very limited exploration for manganese and other commodities by airborne geophysical methods at wide spacing that provides only basic information for an initial understanding.

The tenements are situated within the McArthur Basin, a major Proterozoic-aged sedimentary basin. In Cretaceous times a major marine transgression laid down a sequence of sandstone, siltstone and conglomerate unconformably over older rocks. Much of this sequence has been eroded with flat top mesas remnant in inland areas and cover (up to 100m thick) on coastal plains. Those portions of the tenements which are underlain by Cretaceous age sediments are considered to be prospective for manganese similar to that mineralization style found on Groote Eylandt.

No field exploration was carried out during the reporting year due to other commitments in the area. However a further review of data and deposit styles was undertaken as well as appropriate airborne geophysical methods that might apply to discovery of Manganese deposits under shallow cover.
INTRODUCTION

Background

Australian Manganese Resources Pty Ltd (AMR) holds eighteen granted exploration licenses and one exploration license application in the Gulf Country of the Northern Territory within the Bauhinia Shelf of the McArthur Basin Area.

This central group of AMR tenements that form GR270/13 include: ELs 28587, 28605, 28606, 28847, 28848, 28898. This group is considered highly prospective for base metals and for significant manganese discovery. The locations of these tenements in relation to Cretaceous occurrences are shown in Figure 1.

Tenements were selected on the basis of geological similarity to that at Groote Eylandt where economic manganese deposits are preserved under Cretaceous cover. It is noted that some of these tenements fall within The Limmen National Park.

This report covers activities on GR270/13 which was granted to Australian Manganese Resources Pty Limited on 20/02/2012.

Climate

The project area has an average annual rainfall between 600-800 millimeters with most falls between November and April. It presents a humid monsoonal climate, with mild dry winters and hot humid summers often with heavy monsoonal rains associated with tropical cyclones. During the wet season, portions of the area can be inaccessible for exploration activities.

Location and Access

The exploration lease is located close to the Roper Hwy (Figure.2). The north boundary of the GR 270/13 is situated close to the Roper Highway which passes through the north-east part of the group tenements. The access due south to the other tenements of the group, seems to be limited. Helicopter access may be required initially for any reconnaissance exploration to find out more about existing tracks that haven't been mapped.
Figure 1: AMR Group Tenements location (GR 270/13 in green color).
TENURE

Mining/Mineral Rights

Exploration Licenses within the current Group Reporting GR 270/13 were granted to AMR Pty Ltd (Australian Manganese Resources Pty Limited) for a period of 6 years covering 383 sub blocks and 1634 sq kms (Table 1; Figure 2).

Land Tenure

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<th>Title Type No.</th>
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<th>Expiry Date</th>
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<th>Current Sub Blocks</th>
<th>Annual Report</th>
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1634 383  206,750 314,250

Table 1: Exploration Licences: Details of Group tenements GR 270/13.

Aboriginal Secreted sites

No archaeological surveys have been carried out during the current reporting period. Should the need for ground disturbing exploration be justified then application will be made for AAPA Clearance Certificates to be obtained.
Figure 2: Central Group Tenements location plan (GR 270/13; 383 sub blocks).
GEOLOGY

Regional Geology

The tenements are situated within the McArthur Basin, a major Proterozoic-aged sedimentary basin. The Project lies within the Bauhinia Shelf of the Proterozoic McArthur Basin, close to the Batten Fault Zone (to the east) and the Urupunga Fault Zone (to the north). The basin consists of several northerly trending rifts separated by northwest-trending faults and transverse ridges, and was subject to repeated cycles of clastic and marine carbonate sedimentation interspersed with volcanic extrusion and sill emplacement in response to reactivation of older basement structures.

Figure 3: Regional Geology showing Project Location.
Local Geology

The Group tenements GR 270/13 lies between the Bauhinia Shelf and the McArthur Basin on the west edge of Batten Fault Zone which hosts a large number of base metal prospects including the McArthur River lead-zinc mine which is located on its east side. The Bauhinia Shelf include the Roper Group contains the oolitic-ironstones of the Sherwin Formation which could be prospective for Iron ore (Geology map in Figure 4).

The older rocks are covered in part by flat-lying Cambrian age sandstone, volcanic rocks and limestone of the Georgina Basin. In Cretaceous times a major marine transgression laid down a sequence of sandstone, siltstone and conglomerate unconformably over the older rocks. Much of this sequence has been subsequently eroded away leaving flat topped mesas inland and a thin cover (up to 100m) on the coastal plains.

The Tenement is located between the Bauhinia Shelf and the McArthur Basin on the west edge of Batten Fault Zone. The geology in this area consists of Palaeoproterozoic rocks related to the McArthur and Nathan Group often covered by Cainozoic sediment. Cretaceous sediments considered prospective for manganese mineralization at Groote Eylandt are only intermittently present only in the upper part of the group tenements. They may be covered by Cainozoic sediments also which needs to be checked. Those tenements within the north part of group tenements may be prospective for base metals based on their position along or close to the Batten Fault Zone, which may represent a source of mineralized volcanic fluids.
Figure 4: Local geology map of Group Tenements GR 270/13.
PREVIOUS EXPLORATION

Mining History

No mining has been conducted on the Group tenements.

Exploration by Previous Companies

Sporadic exploration over the western and southern margins of the Carpentaria Basin on the mainland has been conducted by various companies since 1964 (eg BHP 1964a, Chestnut et al 1967, Still 1971, Lockhardt 1977, Paterson 1997). A number of significant prospects (eg South Rosie Creek and Batten Creek) have been discovered in this region using the Groote Eylandt manganese model. Total production of manganese ore from the Northern Territory is about 50 Mt and is dominated by the Groote Eylandt operation. BHP Minerals undertook exploration for manganese in the area covered by the AMR tenements during the early 1990’s. The main techniques used were airborne and ground electromagnetic surveys (TEM) plus some drilling done. Many spurious TEM anomalies were generated by saline water incursions in the coastal sediments. Minor intersections of manganese were found at the Brumby, Rosie Creek South and Yiyintyi prospects. Rosie Creek South is located close to a prominent hill of Yiyintyi Sandstone. The manganese mineralization is hosted by Cretaceous claystone at the unconformity with the underlying Yiyintyi sandstone (Ferenczi 2001). The mineralization is represented as a stratiform, pisolitic manganese horizon within a glauconitic clay-stone which overlies a basal quartz sandstone. The Cretaceous sequence is up to 100m thick. The ore zone forms a sheet-like body up to 3m thick which occurs within a mineralized zone some 22km long and up to 6km wide. Current reserves are about 120Mt at 48% Mn.

Exploration completed by AMR

No field exploration was carried out on this area by AMR Pty Ltd, during the 2013 year. Enquiries were made with Fugro Geophysical on the possibility of flying aeromagnetics to locate manganese under shallow cover in a similar way to the discovery of Groote Eylandt.

In addition the intention to conduct helicopter based reconnaissance rock chip sampling and mapping was hampered by the lack of exploration funding. This was to be made available through the parent company Australian Ilmenite Resources. However that company was focused on trying to maintain its ilmenite Production from Sill 80 on the Roper Heavy Minerals Project. In that case there were no funds available to conduct the
proposed programme on this AMR Group of tenements.

**GEOLOGICAL MODEL**

As a result of the above work, remote sensing methods such as satellite imagery, airborne geophysics, and hyperspectral mapping can be used at a regional level for manganese exploration. Subsequently, geological activities and prospecting such as reconnaissance, mapping, and sampling need to be planned as a specific program.

**Satellite imagery**

Satellite imagery covers large areas and can be used to map outcropping or subcropping manganiferous zones and related vegetation types.

**Airborne geophysics**

Airborne geophysics is cost effective in locating flat-lying Mn oxide sheets at shallow depths in relatively resistant host rocks (Irvine and Berents 2001). Airborne electromagnetic (AEM) methods are able to detect manganese oxides when present in moderate amounts due to their conductive properties. Results from a Geotem AEM survey flown at 600-1000 m line spacing over the Groote Eylandt deposits outlined conductive areas that correlated well with defined manganese ore zones (Fig. 2). This Geotem AEM method has also been successfully used to locate subsurface manganese mineralisation on the mainland south of Groote Eylandt (Berents et al 1994) and in the Bootu Creek area to the north of Tennant Creek (Nunn 1997).
Hyperspectral mapping

Hyperspectral ground reflectance data can be collected from a conventional airborne geophysical platform (Hausknecht et al 2000) or satellite (eg JERS and ASTER). Commercial airborne sensors include OARS (Operational Airborne Research Spectrometer), HYMAP, GEOSCAN and AMS (Airborne Multispectral Scanner). Hyperspectral mapping allows the identification of most species of phyllosilicates, clays, carbonates and metal oxides that occur in regolith and parent rocks. Manganese oxides have a distinctive low reflectance signature (Fig. 3) relative to clay and iron oxide minerals. Ground-based electromagnetic (Nunn 1997) and gravity (Dentith et al 1994, p 70, Consolidated Minerals 2000) geophysical surveys can be used to gain a better understanding of the shape, size, depth and orientation of subsurface deposits.
Figure 6: Spectra of some manganese ore minerals, from USGS digital spectral library (after Clarke et al 1993).

PROPOSED EXPLORATION

The group tenements GR 270/13 is considered potentially prospective for manganese through geological comparison with Groote Eylandt and for base metals based on the position along or close to the Batten Fault as McArthur River style.

As a result of the 2013 exploration programme unable to be conducted for financial reasons it is proposed that this programme be implemented in Year 2 of the GR270-13 Group Reporting, with funding becoming available..
The following exploration work plan is recommended:

- A detailed review of historic exploration data including exploration and discovery of both the Macarthur River Pb/ Zn deposits and Groote Eylandt Manganese;
- Acquisition of all available geological and geophysical data including thermal imagery
- Helicopter reconnaissance and rock chip mapping sampling should be done initially
- In combination with the rest of the tenements consider an airborne EM or equivalent survey to assess potential for each commodity under shallow cover. (if approved as suitable, share the survey with Groote Eylandt operator who survey regularly next to the GR 270/13);
- Any exploration work should be done in collaboration with the other AMR tenements particularly EL28640, because of the proximity to the Batten Fault zone and similar geological association.