Report ARU-15/007

PARTIAL RELINQUISHEMENT REPORT FOR YEAR ENDING
11th AUGUST 2015,
EL28498 (FREELING),
NORTHERN TERRITORY, AUSTRALIA

By

Rodney A Dean BSc (Hons), GAIG

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**Reporting Details**

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<tr>
<td><strong>Personal author(s)</strong></td>
<td>Rodney Dean  BSc (Hons), GAIG</td>
</tr>
<tr>
<td><strong>Corporate author(s)</strong></td>
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| | Alcoota (SF53-10) |
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| | Aileron (5552)  
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| | Bushy Park (5652) |
| **Contact details** | Rodney Dean  
| | rdean@arultd.com |
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SUMMARY

This report documents exploration activities up to 11th of August 2015 for the recently relinquished area of Exploration Licence 28498 (Freeling tenement). The exploration licence was granted to Arafura Resources Limited (Arafura) on the 12th of August 2011 for a period of six years. The licence area was acquired by Arafura to explore for Rare Earth Element (REE) mineralisation to complement the nearby Nolans Bore REE-P-U deposit. It is one of six exploration licences surrounding Nolans Bore which make up Arafura’s Aileron-Reynolds project and the ground is deemed highly prospective for Nolans-style mineralisation due to its proximity to the deposit and favourable interpreted lithostructural characteristic.

The Freeling tenement is located in the Aileron Province of the Arunta Region. It encompasses the southeastern most section of the Reynolds Range which comprises a sequence of Paleoproterozoic metasedimentary and meta-igneous rocks, and an area of Cenozoic sedimentary deposits underlain by the same Palaeoproterozoic sequence.

Work associated with EL28498 began with the acquisition of 2.5m resolution satellite imagery over the Aileron-Reynolds project area in 2012. The imagery was used to aid reconnaissance and mapping of the region. Work in 2013 included a low level airborne geophysical survey which covered over half of the relinquished area of the Freeling tenement. The survey was flown at 100m spacing and the data was subsequently merged with previous Arafura-acquired data sets and open file regional data.

The merged geophysical data was then used to create a lithostructural map of the Aileron-Reynolds project area and to generate REE and base metal targets, with particular interest in in areas under Cenozoic cover as is the case in much of the relinquished area of EL28498. The magnetic data was also used for 3D inversion modelling to generate targets with Nolans-style geophysical signatures. The interpretation of the geophysics undertaken in 2013 identified four REE targets within the area of relinquishment of EL28498 and numerous zones with Nolans-style magnetic signatures. Two of these zones were subsequently investigated using biogeochemical sampling techniques; however no anomalous metal assays were returned.

After two years of tenure EL28498 was reduced in size from 158 to 144 blocks and after four years the tenement was further reduced by 72 blocks. The recently relinquished 72 blocks comprises the northwestern most six blocks and the eastern most 66 blocks of the tenement and are regarded as being the least prospective for REE mineralisation.
INTRODUCTION

Background

Arafura Resources Limited (Arafura) acquired EL28498 (Freeling tenement) to explore for rare earth element (REE) mineralisation to complement its nearby Nolans Bore project [total resource 56Mt @ 2.6% REO, 12% P₂O₅ and 0.42 lb/t U₃O₈ (ASX: ARU 30 October 2015)]. The rational of exploration is to identify Nolans-style or carbonatite-associated REE mineralisation under shallow Cenozoic cover. Historically the region proximal to the Freeling tenement has been explored for gold, uranium, tin, base metals, tungsten and diamonds. A number of small mineral occurrences have been identified within EL28498 including base metal, gold and iron however nothing of significance has been discovered. Prior to work undertaken by Arafura on EL28498, the REE potential of the area had not been investigated.

This report outlines the exploration undertaken by Arafura Resources on the recently relinquished area of the Freeling tenement.

Location and access

The Freeling tenement is located approximately 125 kilometres northwest of Alice Springs along the Stuart Highway (figure 1). The Stuart Highway and the Amadeus Basin - Darwin gas pipeline both pass through the tenement, whilst the Adelaide – Darwin Railway lies approximately 22km to the east of the tenement.

The tenement is located within the Aileron, Pine Hill and Napperby pastoral leases and the Aileron Station homestead is located approximately 20-30 km from the easterly and westerly extremities of the tenement. Adjacent to the homestead is the Aileron Roadhouse where accommodation and fuel are available.

Access to the tenement is via the Stuart Highway and from there via the network of station roads and tracks. It is also possible for light vehicles to access the tenement via the service road alongside the NT Gas pipeline; however a permit must be obtained from NT Gas before using this road.

Topography and drainage

The Freeling tenement is dominated by the Reynolds Range which forms a prominent barrier with mountains attaining heights over 400m above the flat-lying land of the project area. Mount Freeling, the project’s namesake and the highest mountain in the project area, has a height of 1006m above sea level. In the south and northeast of the project area the Reynolds Range gives way to plains of unconsolidated sediments with minor outcrop of low to moderate relief.

The project area is drained predominantly by the Woodforde River and Kerosene Camp creek to the north, Wallaby and Wickstead Creeks to the south, and Allungra Creek to the east of the project area. All drainages are ephemeral and only flow after very significant rain events often many years apart.
**Climate and Vegetation**

The region has a semi-arid continental climate, characterised by long hot summers when temperatures regularly exceed 40°C, and short mild winters. Average annual rainfall for the Aileron region taken from the Territory Grape Farm Bureau of Meteorology weather station is 305.4mm, most of which falls in the period of November to February. Average minimum and maximum temperatures in summer are 21.7°C and 37.6°C whilst the corresponding winter average temperatures are 4.9°C and 22.3°C.

Vegetation throughout the licence is extremely varied but dominated by open shrubland over the rocky ranges and open to closed woodlands on the plains. For a more detailed assessment of the vegetation within the project area the reader is referred to Connors (2004).
TENURE

Mining/Mineral Rights

Exploration Licence 28498 (Freeling) was granted 100% to Arafura Resources Limited (ACN 080 993 455) as 158 sub-blocks on the 12th August 2011 for a period of six years. After 2 years of tenure a reduction of 14 sub-blocks from the northeast of the tenement was applied. A further reduction of 72 sub-blocks occurred after four years of tenure. This reduction relinquished all sub-blocks to the east of the Stuart Highway along with the six most westerly sub-blocks of the tenement. This report covers the work undertaken over this ground during the four years of tenure.

Land Tenure

EL28498 coincides with part of three pastoral leases (figure 1) as outlined below:

- Aileron Station, PPL 1097 - NT parcel 00703 is owned by Aileron pastoral holdings Pty Ltd (Caason Group), (phone 08 8956 9705, fax 08 8956 8535).

- Napperby Station, PPL 1177/1178 – NT parcel 00748 is owned by Mr Roy Chisholm of Napperby Station (phone 08 8956 8666, fax 08 8956 8660).

- Pine Hill Station, PPL 1030 – NT parcel 00725 is owned by the Braitling Family of Pine Hill Station (phone 08 8956 9590, fax 08 8956 9841).

Native Title & Site Clearances

There are two applications for a determination on a Native Title Claim which coincide with EL28498 (figure 2). The first is termed “Aileron” and intersects approximately 56 km² of the northwest of the tenement. The second is termed “Aileron Pastoral Lease” and it intersects 324 km² of EL28498.

During 2002 an inspection of the Aboriginal Areas Protection Authority (AAPA) Register of Sacred Sites was undertaken by Arafura Resources over their entire Reynolds Range tenure. This inspection completely covers the Freeling tenement and all registered and recorded sites detailed have subsequently been avoided during field work. Prior to a significant field campaign in 2009 a work clearance was received from the CLC over a significant area of the Aileron-Reynolds, and much of it over EL28498. Exclusion zones were identified and have subsequently been avoided during all field work. As part of Arafura Resources water exploration program an AAPA work certificate was acquired over a large area to the south of the Reynolds Range of which a small region coincides with EL28498. Within this region restricted work areas were identified and these have been subsequently avoided in all field work.
Figure 2. Native Title claims, AAPA and CLC work clearances, registered and recorded sites and exclusion zones.
GEOLOGY

Regional Geology

The Freeling tenement is located in the Arunta Region, a complex basement inlier which has undergone a prolonged history of sedimentation, magmatism and tectonism extending from the Palaeoproterozoic to the Palaeozoic (Shaw et al., 1984). The Arunta Region covers more than 200 000 km² of the southern Northern Territory and can be subdivided into three, largely fault bounded geological provinces; the Aileron, Warumpi and Irindina Provinces. The Arunta Region is unconformably overlain by unmetamorphosed sedimentary rocks of the Neoproterozoic to mid-Palaeozoic Amadeus, Georgina, Ngalia and Wiso Basins (Walters et al., 1995). The Freeling Project is entirely located within the Aileron Province of the Arunta Region (figure 3).

Figure 3. Map of the Arunta and surrounding regions, their provinces, and the Neoproterozoic to mid-Palaeozoic sedimentary basins. Adapted from Claoué-Long et al., (2008).

The Aileron Province predominantly comprises Palaeoproterozoic greenschist to granulite facies metamorphosed sedimentary and igneous rocks. The oldest observed rocks within the province, the Lander Package, which the Aileron and Weldon Metamorphics are now considered to be contemporaneous with, are a widespread sequence of clastic sediments, now at various metamorphic grades (Pietsch, 2001). This meta-sedimentary sequence is affected by numerous tectonic and thermal events. The earliest of these is the ca.1810-1800 Ma Stafford Event. During this event bimodal magmatism intruded and metamorphosed the pre-existing sedimentary sequence (Claoué-Long et al., 2008). These intrusions during the Stafford Event impose a minimum age on the Lander Package and earlier tectonism. Bimodal magmatism of the ca.1790-1770 Ma Yamah Event is believed to be responsible for pervasive low-grade fabrics across much of the province (Scrimgeour, 2003).
The observed top of the Lander Package is a regional angular unconformity. Above this unconformity lies the Reynolds Package which is a shallow marine and intertidal succession of psammites and pelites with minor calc-silicate rock (Scrimgeour, 2003). Metamorphic grade of the Reynolds Package in the Reynolds Range varies from greenschist facies in the northwest to granulite facies in the south-east. The high grade metamorphism in the southeast is related to the ca. 1600-1570Ma Chewings Orogeny. Elsewhere throughout the Aileron Province metamorphic effects from the ca.1740-1690 Ma Strangways Orogeny are observed within the Reynolds Package.

Unconformably overlying the rocks of the Aileron Province to the south of the Freeling tenement is the sedimentary sequence of the Ngalia Basin. This package of rocks was deposited between the Neoproterozoic to the late Carboniferous (Wells & Moss, 1983). Ngalia Basin sedimentary rocks form the east west trending hills of the Hann Range to the south of the tenement and are interpreted to exist under Cenozoic cover in the west of the area and to a very minor extent in the east. The Ngalia sequence is composed of sandstone, siltstone, quartzite, conglomerate and minor clay (Stewart, 1982). The boundary between the Ngalia Basin and the Aileron Province in the vicinity of the tenement is a south direct shallow trust fault, much of which is under cover.

The Arunta region was subjected to a long-lived event from 450-300 Ma. The Alice Springs Orogeny is expressed in the Aileron Province as west-north-west trending greenschist to upper amphibolite shear zones. Large scale fluid flow during the Alice Springs Orogeny was responsible for Winnecke-style gold mineralisation and pegmatite associated REE mineralisation (Scrimgeour, 2003).

To the north and south of the Reynolds Range there exists an extensive area of Quaternary red soils, alluvial sands and gravels, aeolian and minor calcrite. This unconsolidated transported cover conceals Cenozoic sediments which form part an extensive basin and range province covering much of the southern part of the Northern Territory. Groundwater drilling by Arafura and mineral exploration drilling by Nu Power Resources into these basins has defined a Cenozoic succession that can be subdivided into three recognisable units (Hussey & Dean, 2014). Tertiary Unit 3 (T3) is the basal unit and varies considerably from massive, well-developed greasy reduced to black (carbonaceous) clays through to clayey and clean, angular sands and gravels. Sands within this unit are composed almost entirely of quartz and kaolinite. Tertiary Unit 2 (T2) varies considerably from massive, well-developed, greasy, occasionally micaceous, kaolinitic clays through kaolinitic to clean, angular sands and gravels containing prominent kaolinite chips and fragments. Tertiary Unit 1 (T1) is an alluvial fan deposit and is characteristically oxidised and feldspathic and is largely derived from the stripping of weathered regolith of the Reynolds and Anmatjira Ranges. These units have not been formally recognised.

The regional geology of the surrounding project area is illustrated in Figure 4. Geological details are drawn from digital copies of the Napperby (SF 53-9) and Alcoota (SF 53-10) 1:250,000 Geological Series published by the Bureau of Mineral Resources, BMR (now Geoscience Australia). Lithological units and labelling is derived from the published maps and the reader is referred to the published map legends and explanatory notes for additional details.
Figure 4. Freeling project area regional geology.

Local Geology

The oldest mapped rocks which outcrop in the relinquished area of EL28498, as interpreted by Stewart (1982), are the quartz-rich metasediment, cordierite gneiss, calc-silicate rocks, felsic granulite, mafic granulite and amphibolite of the Aileron Metamorphics. This package of rocks was assigned to Division One of the Arunta Region by Shaw et al., (1984), but is now considered to be contemporaneous with the Lander Package. The units mapped higher in the stratigraphy within the relinquished area of EL28498 are the Division Two Nolans Dam Metamorphics and the Mount Freeling Schist. The Nolans Dam Metamorphics consists of cordierite gneiss, garnet-biotite gneiss and sillimanite gneiss and the Mount Freeling Schist comprises quartz-rich schistose metasediment. In the western zone of the relinquished area of EL28498, the rocks of the Wickstead Creek Beds outcrop. This unit comprises calc-silicate rock, schist and minor granofels (Stewart et al., 1980).

This greater package of metasedimentary rocks is intruded by granitoids of the Harverson Suite on the northern side of the Reynolds range and granitoids of the younger Napperby Suite on the south. Contacts between units are often sheared and exact relationships can be difficult to determine.

Much of the eastern relinquished area of EL28498 is underlain by Cenozoic sediments known only from nearby drilling. The Cenozoic sequence is comprised of oxidised, weakly consolidated and poorly sorted sands, silts and gravels, kaolinitic sandstone and clay and clean to kaolinitic sands and gravels. Overlying this sequence exists there is a thin veneer of Quaternary aeolian sand, red earth, alluvium and minor calcrete.
PREVIOUS INVESTIGATIONS

REGIONAL

Records of systematic exploration in the Reynolds Range date back as early as 1948, but most investigations date from about 1965 (Stewart 1982). Base metals, tin and tungsten were mainly targeted prior to 1973 when uranium exploration gathered momentum. This commodity dominated the exploration in the area for the next 15 years, both in the metamorphic and granitic rocks of Reynolds Range and also in the sandstones of the Ngalia Basin to the south. After 1990, with the advent of the BLEG geochemical technique more attention was directed towards gold exploration though some uranium exploration activity still persisted.

In 1979, minor phosphate in apatite-mica schist was reported from Quartz Hill, 17 kilometres northwest of Napperby Station towards the western end of the adjacent Yalyirrimi Range; and REEs (+20% REE) were reported from a small lens (2x0.5 metres) of garnet-monazite rock in biotite gneiss at Mt Finniss, 6 kilometres north of Pine Hill Station (Stewart 1982).

The historic exploration activities have been reviewed for the Freeling project area and are summarised in Table 1 and briefly described further below.

Table 1: Summary of historic exploration

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<th>Years</th>
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<td>Uranium</td>
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<td>Tidegate Pty Ltd</td>
<td>Gold, Platinum &amp; Base Metals</td>
<td>CR1994-0589</td>
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<td>Uranium &amp; Base Metals</td>
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CRA Exploration Pty Ltd

AP2617 ran the entire length of the Reynolds Range and CRA Exploration was exploring the region for base metals and uranium (Tham 1971). Operations included field reconnaissance and investigation of geophysical anomalies, a helicopter-borne drainage geochemistry survey for base metal mineralisation, bore water investigation for uranium and the drilling of 10 shallow auger holes to test for uranium mineralisation in areas covered by consolidated sand. Two stream sediment samples were collected. No mineralisation of economic significance was identified in these or any samples and AP2617 was surrendered.

AP3360 intersected approximately half of the eastern relinquished zone of EL28498. Ap3360 was acquired by CRA exploration to explore the Cenozoic basin sediments to the east of the Reynolds Range for Uranium. An analysis of groundwater from pastoral bores was undertaken, along with gamma logging of bores, a shallow auger program and a carborne radiometric survey; however it appears that no follow-up work was undertaken.

Central Pacific Minerals NL

EL1384 was acquired to explore the region for carbonate hosted base metal mineralisation, tin-tungsten skarns, and uranium vein and skarn mineralisation in the Reynolds Range Group (Green 1977, 1978b). Field work included a stream sediment survey, rock chip sampling and minor ground radiometrics. The results were disappointing and the ground was surrendered.

EL1658 intersects the western part of the project area and was acquired to explore the Cainozoic basin sediments of the Ngalia Basin for secondary uranium mineralisation (Green 1978a). Exploration activities included an airborne and vehicle-borne radiometric survey and geological mapping. No anomalous radioactivity or favourable geological units, principally the Mount Eclipse Sandstone, were identified within the tenement and the ground was relinquished.

BHP Ltd

BHP explored the region covered by EL2942 for diamonds. Work included a helicopter-borne heavy mineral concentrate stream sediment survey for assay and kimberlitic indicator mineral assessment (Anon 1982, 1983). BHP surrendered the tenement after no kimberlitic indicator minerals or anomalous assays were identified.

Colchis Mining Corporation Pty Ltd

Colchis Mining was explored EL5511 for gold and base metal mineralisation based on similarities of the geological setting of the Arunta Region to the Granites-Tanami and Tennant Creek regions (Jockel 1988; Wilkinson, 1990). Exploration comprised ground reconnaissance and mapping, a rock-chip and stream sediment survey and structural interpretation of Landsat imagery. Stream sediment samples were collected but did no elevated gold or base metal values were found. The tenement was subsequently surrendered.

Track Minerals Ltd

EL5901 of Track Minerals was acquired to test the region for gold and base metal mineralisation in magnetite-rich units of the Aileron Metamorphics (Dashlooty 1989). Exploration included a stream sediment and rock chip survey. No assays from EL5901 returned elevated values for gold or base metals and the tenement was subsequently surrendered.

Poseidon Gold Ltd

EL7345 and EL7345 of Poseidon Gold intersect only the western half of EL28498, and only the western
most zone of relinquished ground. Poseidon Gold was targeting structurally controlled base metals and gold mineralisation (Price 1992, 1993). On ground work included a regional stream sediment and rock chip sampling survey. No anomalous assays were returned and hence the ground was surrendered.

**Tidegate Pty Ltd**

EL8117 was acquired to investigate the possibility of gold, platinum and base metal mineralisation associated with metamorphosed ultramafic rocks at the Native Gap Ni-Cr prospect and the “Harry’s Yard” amphibolite and the Aileron gold reefs (Fraser 1994).

The Native Gap Ni-Cr prospect is located about 2.5km east of the Stuart Highway, approximately 20km south of Aileron. The prospect was discovered in the 1960’s and further explored by NTGS geologist Jim Morlock in 1973. Assays of rock chip samples collected by Morlock showed highly anomalous Ni and Cr values in a circular body of amphibolite (500m diameter) intruded by pegmatite (no gold assaying was done). Interpretation of AGSO (BMR) regional airborne magnetic data speculates that the amphibolite is part of a large ultramafic intrusion on the southern side of the Hann Range. Tidegate collected nine loam BLEG samples, nine soil / sediment samples and five rock chip samples from the amphibolites and surrounding contacts. Gold values in BLEG ranged up to 1.05ppb Au with moderately anomalous Ni and Cr values. Tidegate dropped the ground after these disappointing results.

The Harry’s Yard amphibolite body was found to be mainly sheared and altered meta-gabbro with possible komatiite "Spinifex" textures, intruded by pegmatite and quartz veins on the perimeter. Nineteen loam BLEG samples, nineteen soil / sediment samples and three rock chip samples were collected on the intrusion, however, gold values were considered not to be anomalous and no further work was recommended.

The Aileron shear zone was discovered in 1939 and prospecting was abandoned in 1940 after the recovery of a single ounce from quartz-pyrite veins. Veins form lenticular bodies up to 30m long and 1.5m wide. McMahon Construction Pty Ltd and Lindsay Johannsen in 1990 briefly explored the prospect and sent a small consignment to Tennant Creek for processing (no data for gold grades or recovery). Tidegate collected four grab samples in January, 1994 from quartz vein and sheared granite with fresh sulphides, however, all gold results were below detection (0.008ppm Au) and no significant As, Ag or base metal values were detected (except Co, up to 104ppm). A reconnaissance BLEG loam and drainage survey was carried out along the shear zone westerly from Stuart Highway. Results were below level of interest in reasonably well-exposed country and the land was dropped.

**PNC Exploration Pty Ltd**

EL8411 of PNC Exploration intersects the north western part of the project area. PNC Exploration explored the Reynolds Range for various styles of uranium mineralisation including Mary Kathleen-style uranium occurrences hosted by metasomatised calc-silicate gneiss (Thevissen 1994, 1995). Using detailed airborne radiometrics, PNC located the Nolans Bore REE-P-U prospect and explored in some detail, three significant U prospects - at Mt Dunkin, 22 kilometres west-northwest of Nolans Bore; at Napperby Creek, 50 kilometres west-northwest of Nolans Bore; and at Mt Freeling, 15 kilometres west of Nolans Bore (Figure 1). They withdrew from the area in early 1996.

The Nolans Bore fluorapatite-hosted REE-P-U prospect which was deemed by PNC to be too low grade with respect to uranium to be viable is now recognised as a world class REE deposit and is of monumental importance to Arafura Resources.

PNC also sampled a minor occurrence of ‘apatite’ (reportedly similar to the Nolans Bore apatite) hosted by orthogneiss at their MB05 anomaly, 7 kilometres north of Nolans Bore. The sample assayed 3.9% P, 1.9% Ba, 2.1% La, 4.6% Ce, and 1.8% Nd but only 1.0% Ca which suggests that monazite rather than apatite hosts the REE.

**Aberfoyle Resources Ltd**

Aberfoyle Resources acquired EL9145 and EL9146 to assess the Early Proterozoic basement rocks for Granites/Tanami-style gold mineralisation. Work over the ground included the acquisition of a 250m-spaced airborne magnetic/radiometric survey and drilling of six RAB holes over magnetic targets identified within EL9146. Three of these drill holes are located within the eastern relinquished zone of EL28498. No
anomalous assays from the drilling were returned.

Homestake Gold of Australia Pty Ltd

Homestake Gold, the partner in the joint venture with McCleary Investments on EL9672, was exploring the region for gold with a secondary interest in base metals (Stewart 1997, Lindsay-Park 1998, Rea 1998). Exploration activities included an extensive regional BLEG stream sediment sample survey with an approximate density of one sample per 10 km². Only one sample returned an anomalous value for gold. A follow-up and infill BLEG stream sediment sampling survey was undertaken the following year but no anomalous gold was detected. Minor rock chip sampling was also undertaken with slightly elevated base metals detected in three samples. These results were very disappointing to Homestake Gold and the company ended its interest in EL9672.

Imperial Granite & Minerals Pty Ltd

EL24287 of Imperial Granite and Minerals intersects the entire Ryan tenement. Imperial Granite and Minerals acquired the ground to explore for base metals, gold and uranium (Benger 2006a, 2006b). A field reconnaissance trip was conducted in 2006 in which two rock chip sample were taken. Neither returned anomalous results for any metals.

Atom Energy Ltd

Atom Energy Ltd purchased EL24287 from Imperial Granite and Minerals to explore for uranium and base metals (Hackett 2008); however only desktop studies were undertaken.

NuPower Resources Ltd

NuPower Resources entered in a joint venture with Atom Energy Ltd to explore EL24287 for uranium (Rafferty 2009a, 2009b, 2010). Exploration activities included coverage of EL24287 as part of a larger regional airborne electromagnetic (AEM) survey to identify palaeochannel systems as potential host rocks for secondary mineralisation and a bore water sampling survey. It also included and a 409 station 2km x 2km infill gravity survey as part of the Geoscience Australia - NTGS Central Arunta Gravity Survey and minor biogeochemical sampling. NuPower Resources withdrew from the farm-in agreement in 2010.

Excelsior Gold Ltd (formally Atom Energy Ltd)

Excelsior Gold retained 100% interest in EL24287 and following retrieval of all exploration data from NuPower, a review of exploration activities was undertaken (Hamlyn 2011, 2012). The exploration highlighted potential for mineralised channels within the tenement and an application for extension of term of EL24287 was lodged to enable ongoing assessment of the palaeodrainage system; however no more work was undertaken and the ground was surrendered in 2012.

Arafura Resources Limited

Arafura Resources exploration efforts in the Aileron-Reynolds project area have principally focussed on Nolans Bore. Arafura’s non-Nolans Bore exploration activities on EL22384, EL23571 and SEL23671 have principally focussed on REE exploration. Activities have included some uranium exploration and the acquisition of an extensive HyMap hyperspectral survey with follow up reconnaissance sampling of prospective targets (Hallenstein and Goulevitch 2009, 2010; Hussey 2009, 2010). This led to the discovery of greisens and altered granites with anomalous Sn-W-Bi values but no significant REE. Systematic HMC samples were collected across drainages sources the ranges in the project area. Elevated REE were found in the HMC samples but the amounts in the primary samples were typically low. Arafura also participated in the Geoscience Australia - NTGS Central Arunta Gravity Survey with 2km x 2km infill gravity stations over the project area at that time.
NTGS

Detailed airborne magnetic and radiometric surveys were completed over the Reynolds Range area in 1997 as part of a more extensive survey which included all of the Napperby 1:250 000 Sheet area as well as the northern half of the adjacent Hermannsburg 1:250 000 Sheet to the south. All primary data and gridded data as well as some plotted products from this survey are available free of charge from the Northern Territory Geological Survey (NTGS). The survey over the Reynolds Range was flown at a line spacing of 400 metres and a mean terrain clearance of 60 metres.

A total count radiometric anomaly over the Nolans Bore fluorapatite deposits is clearly evident in the data as is a discrete magnetic low over the western half of the deposit.
INVESTIGATIONS BY ARAFURA RESOURCES

2012

Satellite Imagery

Arafura acquired a 2.5m resolution SPOTMaps satellite image over the greater Aileron-Reynolds project area. This gave 85% coverage over the Freeling tenement area and constituted approximately 13% of the total coverage. This was used to identify areas of recessive outcrop for reconnaissance and to aid in the production of maps.

2013

Airborne Geophysics

Arafura acquired a multi-tenement low-level detailed airborne magnetic and radiometric survey in 2013. A total of 8,915 line kilometres were acquired via a fixed wing aircraft in January-February 2013 using 100-metres spaced north-south flight lines 30 metres above the land surface. This survey covered 207 km² of the central eastern part of EL28498 and approximately 25% of the survey area was flown over the Freeling tenement (Hussey & Dean, 2014). The specifications and details of the Aileron East survey data are provided in Hussey (2013).

The Aileron East airborne survey was merged with Arafura’s Aileron and Sheppard surveys to provide a seamless detailed dataset. These surveys were also merged with the regional NTGS data to gain a more regional view. A reduced to pole magnetic intensity and a first vertical derivative magnetic intensity map along with a ternary radiometric map of the relinquished area of EL28498 are shown in figure 5, 6 and 7 respectively.

The 2.5m resolution SPOTMaps satellite imagery was extended during 2013 which gave 100% coverage over the Freeling tenement.
Figure 5.  Reduced to pole magnetic intensity map of the relinquished area of EL28498 with a north east shade and a non-linear stretch.
Figure 6. Reduced to pole first vertical derivative magnetic map of the relinquished area of EL28498 with a non-linear stretch.
Figure 7. Ternary radiometric map of the relinquished area of EL28498.

2014

Interpretation of Airborne Magnetic Geophysical Data

Southern Geoscience Consultants, (SGC), were commissioned to undertake an interpretation of the Arafura acquired and regional geophysics covering the Aileron-Reynolds project area. The interpretation was undertaken at 1:50,000 scale and focussed on the mapping of magnetic stratigraphy and structure. The lithostructural map produced for the area of relinquished area is shown in figure 8. REE and base metal targets were generated from the lithostructural map based on interpreted structures, rheology contrasts, magnetic and radiometric response and depth of cover. Three REE targets were generated which intersect the relinquished area of EL28498, but due to depth of cover, or previously investigated outcrop were not followed up.

The merged magnetic dataset was then used for Geosoft Voxi 3D inversion modelling with the aim of highlighting regions, primarily under cover, which have a similar magnetic signature to the Nolans Bore deposit. Numerous magnetic susceptibility values were modelled and shells for each were created. Numerous favourable zones were identified within the relinquished areas of EL28498 and two of them were subsequently investigated by the means of a biogeochemical sample traverse across them (figure 8). No anomalous assay values were returned from either traverse. The data and technical report for work undertaken by SGC were submitted to the Department of Mines & Energy along with the Aileron-Reynolds Group Report, GR261, (Hussey & Dean, 2014). The biogeochemical assay acquired over the relinquished
areas of EL28498 can be found in Appendix 2.
Figure 8. Lithostructural map of the relinquished area of EL28498 displaying generated REE target & modelled magnetic susceptibility isosurfaces (green).
CONCLUSION & RECOMMENDATIONS

Arafura Resources Limited acquired EL28498 (Freeling) on the 12th August 2011 for a period of six years to explore for REE mineralisation to complement the nearby Nolans Bore REE-P-U deposit. The tenement was granted as 158 sub blocks and after two years of tenure the exploration licence was reduced by 14 sub blocks. After 4 years tenure it was further reduced by 72 sub blocks to the current area of 72 sub blocks. Work undertaken over the relinquished area of EL28498 since being granted includes the acquisition of 2.5m satellite imagery for use in field mapping and other on ground exploration activities and the acquisition of airborne magnetic and radiometric data which was merged with previously flown surveys over the Aileron-Reynolds project area. This geophysical dataset was used to produce a lithostructural map and generate REE targets for subsequent investigation. This geophysical dataset was then used for 3D inversion modelling within the greater Aileron-Reynolds project area. Targets were generated from the magnetic susceptibility isosurface shells which had a similar characteristic to the Nolans Bore deposit. The two most prospective targets identified within the relinquished parts of EL28498 were subsequently investigated by means of a biogeochemical sampling traverse across them, both of which failed to identify any anomalous metal assays or Nolans Bore-style REE assay ratios.

The 72 sub blocks of EL28498 which have been recently relinquished are deemed to be the least prospective for REE mineralisation due to the abundance of non-favourable outcrop in the western most relinquished zone and within the southern part of the eastern most relinquish zone, and due to the lack of anomalous assays returned in areas under cover.
REFERENCES

Refer to Table 1 for open file company report references.


Hussey KJ, 2013. Combined group report for Aileron-Reynolds project area, GR261/12 (EL 27337, EL 28473, EL 28498 and EL 29509) for the year ending 4 October 2013. *Arafura Resources Limited unpublished report ARU-13/014.*

Hussey KJ and Dean, 2014. Combined group report for Aileron-Reynolds project area, GR261/12 (EL 27337, EL 28473, EL 28498 and EL 29509) for the year ending 4 October 2014. *Arafura Resources Limited unpublished report ARU-13/014.*


