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Report prepared by
INTERNATIONAL GEOSCIENCE PTY LTD

On behalf of
UNIVERSAL SPLENDOUR INVESTMENTS PTY LTD
Final Report: EL 27308, Relinquished Blocks

12 December 2011

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EXECUTIVE SUMMARY

Universal Splendour Investments (USI) was originally granted EL 27308 in October 2009. It is located in the Borroloola region in the Northern Territory. 50% of the tenement is now being relinquished, following NTGS guidelines. This is the Final Report for those relinquished blocks, highlighting all work completed by USI since October 2009.

Initial work carried out for EL 27308 consisted of a background desktop study, completed by Karl Lindsay-Park from CSA Global in March 2010. This report covered all of USI’s tenements in the Gulf of Carpentaria region.

In 2010, International Geoscience completed a full background review for the Gulf Project, including an assessment of previous exploration, manganese mineralisation model, data compilation and a preliminary interpretation of the tenements. Accompanying the background review was a 10 day field visit which; assessed the tenement access, mapped geology and collected rock-chip samples (This was reported in the “Tenement Summary Report for the period November 13 2009 to November 13 2010” for EL 27308). The area of relinquishment however was not visited during this field campaign.

During the 2011 field season no ground activity was completed on the tenement. This is due to USI’s commitments to other more prospective tenements in the region. An airborne EM survey was planned (by International Geoscience), for the 2011 season however due to other significant expenditure commitments this was put on hold. (This was reported in the “Tenement Summary Report for the period November 13 2010 to November 12 2011” for EL 27308.)

EL 27308 is located in the McArthur Basin, and consists of a lower unit of Mesoproterozoic Roper Group unconformably overlain by Cambrian Bukalara Sandstone which is unconformably overlain by Cretaceous ‘Mesozoic Material’. Undifferentiated Cenozoic Material overlies a large region of the lease and it is this covered area that needs further assessment for manganese mineralisation.

The tenement is prospective for manganese mineralisation, particularly Cretaceous deposits of the style seen at Groote Eylandt.
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1 OVERVIEW

Universal Splendour Investments (USI) was originally granted EL 27308 in October 2009, located southeast of Borroloola, southwest of the Gulf of Carpentaria (Figure 1).

When granted, the tenement consisted of 160 blocks (521.8km²). In October 2011, after holding the lease for 2 years, USI applied to retain only 50%, a total of 80 blocks, due to expenditure commitments not being reached during 2011 reporting period.

![Location of EL 27308 within the Gulf of Carpentaria region, NT. The tenement is overlaid on an orthorectified image from BingTM, 2010. Black hash indicates area being retained by USI.](image)

Figure 1: Location of EL 27308 within the Gulf of Carpentaria region, NT. The tenement is overlaid on an orthorectified image from BingTM, 2010. Black hash indicates area being retained by USI.

1.1 Relinquishment

Figure 2 displays the relinquished area of EL 27308 as of December 2011. The black hash indicates the area being retained by USI.

This area relinquished includes the majority of outcropping Mesoproterozoic to Cambrian units. Much of the area covered by Cenozoic sediments has been retained, as these areas have not been fully evaluated for manganese mineralisation by USI.
1.2 Access

Access into EL 27308 is very good as the Carpentaria Highway runs along the northwest boundary of the tenement. There are also a number of tracks that traverse the northern tenement area accessible to 4WD vehicles. Access to other regions of the EL may require helicopter support.

1.3 Geology

The geology of EL 27308 consists of a lower unit of Mesoproterozoic Roper Group unconformably overlain by Cambrian Bukalara Sandstone which is unconformably overlain by Cretaceous ‘Mesozoic Material’ (Figure 2).

The Roper Group was divided into three formations; the Abner Sandstone, Crawford Sandstone and the Mainoru Formation. In portions of the EL’s the Abnre Sandstone and Crawford Sandstone were unable to be separated. Overall, the Roper Group is concentrated to the northern and eastern portion of the EL’s.

Other units in these leases include; the overlying Bukalara Sandstone (laterally extensive unit in the south-western region); cretaceous sandstone units (forming areas of high relief in central and northwest areas); and undifferentiated Cenozoic material, covering approximately 50% of the EL’s.
1.4 Target Commodity

Manganese has been and continues to be the target commodity for this tenement.

Originally in 2010 Cretaceous lithologies were the main focus for the EL as it is this period which is reported to correlate to the age of the Groote Eylandt Mn deposit. Outcropping lithologies were visited in the 2010 field season, however geological mapping of the priority areas returned disappointing results (full results are listed in the "Tenement Summary Report for the period November 13 2009 to November 13 2010 for EL 27308").

As Figure 2 shows, a large portion of the lease is covered by Cenozoic sediments which may have preserved Cretaceous material deposited within a palaeo-inlet. It is this palaeo-shoreline that is of interest and needs to be fully evaluated for manganese mineralisation. In addition, if the basement is not too deep (<200m) then an AEM survey may be able to identify basement conductors of potential interest for base metals and/or diamonds. Therefore these areas are recommended to be the focus of any activity in 2012.
2 PAST ACTIVITIES OF RELINQUISHED BLOCKS

EL 27308 has been held by USI for 2 years since 13th October 2009. The following sections describe all work completed for the tenement during this period.

2.1 October 13th 2010 - October 12th 2011

2.1.1 Desktop activities

Within September 2011 an AEM survey plan was designed by International Geoscience. Due to other significant expenditure requirements on USI's other tenements the acquisition of AEM was postponed for another season. The geophysical survey was planned based on the expected area to be relinquished after October 2011.

The survey was planned over the remaining areas in order to evaluate any possible targets below cover (Figure 4). International Geoscience recommended an electromagnetic survey to be the most suitable, using the Tempest system.

The complete survey (covering both EL27308 and EL27305) would be a total of approximately 637 line km at 1000m line spacing, flown at 100m flying height (costing approximately $125,000).

The survey would provide stratigraphic information of the upper ~200m below cover, and aims to target palaeo-shorelines and conductive horizons within the Cretaceous and basement conductors within the Proterozoic.

Figure 4: September 2011 planned EM survey of EL 27308 (and 27305) including the planned relinquished areas (hashed area). Eastings and Northing provided in GDA 94 Zone 53.
2.1.2 Field studies

EL 27308 was not visited during this field season due to other more prospective tenement commitments. No samples were collected or assay results received.

2.2 October 13th 2009 – October 12th 2010

Significant work was undertaken during this reporting period including detailed desktop studies, field visit and data analysis.

2.2.3 Desktop activities

**International Geoscience** completed a highly detailed desktop study included regional and local geology and mineralisation models; past exploration activities within the region; data compilation of all freely available geospatial data; landscape and environment study; initial integrated interpretation of surficial geology within the tenement. This was originally included within ‘Tenement Summary Report for the period November 13 2009 to November 13 2010 for EL 27308’, and a summary of this study can be found in Appendix A.

**CSA Global** provided a background desktop study for the Gulf project area, in March of 2010 (Lindsay-Park, 2010). The report has been included as Appendix B in this report

2.2.4 Field studies

**International Geoscience** members completed a 10 day field trip between October 6th and October 15th 2010, visiting USI’s tenements within the Gulf of Carpentaria region, including EL 27308. EL 27308 was visited on the 4th day of the field campaign. The field campaign was completed by car (4WD).

The focus of the field visit was to:

1. Identify access to tenements, including road access / conditions, air strips and helicopter access.
2. Investigate local geology within and surrounding the tenements.
3. Collect rock samples of potentially mineralised areas.
4. Consult with local persons and other key members in the tenement areas.
5. Discuss the current exploration strategy and future plans for exploration in the Gulf project area with the NTGS.

Two Localities were visited during the field trip within the north eastern corner of the tenement (Figure 5), however neither of these are located within the relinquished area of EL 27308. (The geological observations of these localities have been included below Figure 5.)

2.2.5 Sampling

No samples were collected from the relinquished southern region of EL 27308 therefore no assays are reported.
Figure 5: Location of sites visited within EL 27308 during 2010 field season; neither is located within the relinquished area.

Area 1
The general stratigraphic sequence for Area 1 consisted of a cap rock of white to grey fossiliferous sandstone. This unit appeared to lack any sign of bedding and appeared bioturbated. Burrows and track were common and largely void of sediment and gave the unit
an overall vuggy appearance. Bivalves were also observed (Figure 5 A). Pervasive haematite staining was noticed in areas but did not dominate this unit (Figure 5 B).

Underlying the fossiliferous sandstone was a cross-bedded sandstone, approximately 5-10m thick. The base of the Cretaceous was difficult to observe due to significant scree but one location observed a patch of shale scree which may be Proterozoic in age.

Area 2

The Cretaceous outcrop to the east of Area 1 was investigated on foot. In the south, the Cretaceous/Proterozoic contact was observed. The Cretaceous in this area consisted entirely of the same caprock of fossiliferous sandstone observed in Area 1. The Proterozoic in this area consisted of a pervasive haematite stained well bedded sandstone with common ripple marks.

Although no other outcrop lithologies were observed in this part of the Cretaceous, several clasts of quartzite were noticed within the scree around the Cretaceous ridge.

Further to the north within Area 2 was a 20cm thick section of silicified mudstone which was folded in areas (Figure 5D). Folds were considered to be soft sediment deformation and not due to tectonic activity.

An attempt was made to access the eastern side of Area 2.

Although Area 1 and 2 outcrop represents a shallow marine environment, which is the ideal environment for Mn deposition, these two outcrop areas appear to be devoid of Mn mineralisation. No further work is recommended for Mn mineralisation within these outcrop areas.
3 REFERENCES


MANGANESE MINERALISATION MODELS

One of the world’s largest deposits of manganese oxides is located on Groote Eylandt off the coast of Australia, approximately 200km north of Borroloola. Groote Eylandt lies to the north and northwest of the Gulf project area owned by Universal Splendor (Figure 6).

Several other smaller manganese deposits to the northwest of the Gulf project area have been identified by Brumby Resources, BHP and Mineral Resources Limited/Sandfire Resources. The deposit styles at these locations are similar to that at the Groote Eylandt deposit and can be expected to be the similar for any deposit located within the Gulf project area, but further investigation into the local geology needs to be undertaken in order to confirm this relationship.

The manganese ore deposit style is sedimentary in origin and consist of pisoliths and oolites rich in Mn minerals such as pyrolusite, cryptomelane, romanechite, todorokite and vernadite. Figure 7 is a representative cross-section displaying the Mn mineralization with respect to the lower Cretaceous and basement Proterozoic quartzite for the Groote Eylandt deposit.
The genesis of the Groote Eylandt deposit is considered to have taken place in three major stages. The first stage involved the deposition of primary Mn minerals in sediments in a shallow-marine near-shore environment, producing thick layers of Mn-bearing pisoliths and ooliths. The second stage, diagenesis, produced pyrolusite that cemented the pisoliths and ooliths. The third stage was a supergene and pedogenic process that modified the deposit in a terrestrial environment due to intense chemical weathering (Figure 8). The manganese mineral cryptomelane is thought to have formed during this third stage as a result of a large potassium influx into the ores from ground waters during the Tertiary.

**DEPOSITIONAL ENVIRONMENT**

The concentration of manganese in the region may have resulted from anoxic conditions in shallow seas surrounding the island during the Cretaceous Period (Frakes and Bolton, 1984). The oxide orebody consists essentially of flat-lying strata of primary sedimentary manganese oxide pisoliths and ooliths, up to 9m thick, in claystones and sandstones. A number of textural types exist including uncemented pisoliths and ooliths, (the primary sediment), cemented pisoliths and ooliths (resulting from diagenesis) and textureless/concretionary ores (dominated by cryptomelane and essentially the results of secondary supergene processes).

Anoxic conditions in a shallow intra-cratonic basin, which is possibly closed to the main ocean, leads to concentration of Mn and Fe in saline water. Towards the deeper parts of the basin Fe is precipitated as pyrite in carbonaceous mud. Opening of the basin to the sea results in increased oxidation particularly in more turbid conditions close to shorelines and development of manganese rich nodules.
At Groote Eylandt the manganese mineralisation is on the western and southwestern shore line. An embayment of the Carpentaria Basin is envisaged which at times may have been cut off from the ocean (Figure 9). The ore lies within the youngest strata of the Carpentaria Basin. The ore-zone sits at the top of a shallow-marine, glauconitic clay succession of Albian age. The primary ore is pisolithic and oolitic but secondary enrichment and weathering has occurred in later phases.

![Figure 9: Groote Eylandt and related intracratonic basins. Palaeogeographic map shows location of oxide and carbonate ores, palaeoshoreline at time of manganese accumulation (heavy line) and approximate location of 90m palaeoisobath (dashed line) (Frakes and Bolton, 1984).](image)

The time of formation of the Groote Eylandt manganese orebody was probably late Albian to early Cenomanian or around the boundary between Lower and Upper Cretaceous. The NTGS consider Groote Eylandt and Rosie Creek mineralisation to be contemporaneous.

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<tr>
<td>Albian</td>
<td>112 to 99.6 Ma</td>
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Figure 10: Cross section through ore deposit at Groote Eylandt showing gentle dip of sequence and location of elevation of benches interpreted as wave cut (From Frakes and Bolton, 1984).

**BIOLOGICAL ACTIVITY**

There is some speculation that these nodules were formed by biological activity as reported by Ostwald (1990):

“The sedimentary manganese ore deposit of Groote Eylandt, Australia, is an orthoquartzite-glaucnite-clay association, and was formed during a short Cenomanian Age transgression and regression across the Middle Proterozoic sandstone basement of the island. The primary sediment consisted of pisoliths and ooliths of manganese oxide in sandy clay. Petrological studies have shown that these structures are accretions, not concretions. Microscopic studies indicate that these pisoliths and ooliths satisfy specific criteria for biogenic origin and thus they appear to be manganese oxide oncolites. This deduction is consistent with the presence of a variety of manganese-oxide biogenic structures (stromatolites) in the orebody.”

Marine origin of the Groote Eylandt manganese deposits is confirmed by the presence of marine foraminifera in sediments beneath, within and above the ore (Smith and Gebert, 1969).

**GEOCHEMISTRY**

At Groote the ore is primarily oxides (pyrolusite and cryptomelane) and minor carbonate (manganocalcite). Maximum thickness is around 9m and it occurs as a stratiform body thinning to westward (or away from palaeoshore) with slight regional dip.

Ostwald (1975) described the mineralogy of the manganese oxides at Groote Eylandt.

“The manganese ores on Groote Eylandt occur in a flat-lying horizon in a series of Lower Cretaceous sands and clays which overly unconformably the Middle Proterozoic sandstone basement. The ore horizon exhibits a variety of textural and compositional ore types. Textural types include pisoliths and concretions, either free or cemented into massive, bouldery or pebbly horizons. Compositional variations result from varying degrees of admixture of the manganese materials with the sands and clays of the formation. Six manganese minerals have been identified from Groote Eylandt, pyrolusite, cryptomelane, lithiophorite, psilomelane, nsutit and todorokite. The ore minerals are pyrolusite and cryptomelane, and other minerals in minor amounts. Gangue minerals include kaolinite, quartz and goethite. Mineralogical studies indicate that three microtypes of cryptomelane occur. Low levels of cobalt, nickel and zinc in certain of the ore types are associated with the mineral lithiophorite.”

Pyrolusite is a common manganese mineral on Groote Eylandt, where it occurs as:
• Zones in the finely layered pyrolusite and cryptomelane pisolites;
• Zones in the cemented pisolites of the pebbly and bouldery facies;
• Zone replacements of the pisolites, at the expense of the cryptomelane;
• A cementing medium for pisolites. Under these conditions the prisms may attain a size of some millimetres;
• Surface crusts on pisolites and to a lesser degree as surface crusts on pisolitic pebbles; or
• Soft wad - finely divided crystals of pyrolusite mixed with fractured shells of pyrolusite - replaced pisolites.

The pyrolusite at Groote is essentially MnO2 with minor amounts of Fe, K, Ba, Ni Co and P as oxides (Ostwald, 1975).

Cryptomelane at Groote Eylandt is a manganese oxide with partial replacement of Mn^{2+} by K^{+} and minor substitution by Ba^{2+} and Na^{+}.

Cryptomelane occurs as:

• layers in the pyrolusite;
• zones and layers in the cemented pisolitic pebbles and cobbles;
• the primary colloidal precipitate of the concretionary ore type. In this form it is often full of ore impurities, as well as quartz grains and clay.
• reticulate veins filling syneresis cracks in the concretions. These veins are purer than host with higher Mn

Lithiophorite is also reported from Groote with Lithium content up to 0.2%

Figure 11: Alternating zones of granular pyrolusite (P) and cryptomelane (C) in Groote Eylandt pisolites. Reflected light 89x (Ostwald, 1975).

PREVIOUS MN EXPLORATION IN THE REGION

GROOTE EYLANDT

Groote Eylandt lies on the eastern margin of the Proterozoic Gulf Basin and contains several Mn occurrences and operating mines (Figure 6).
Groote Eylandt, the site of the Broken Hill Proprietary Company Limited manganese ore quarries, is in the Gulf of Carpentaria, off the eastern coast of Arnhem Land. Brown (1908) first reported the presence of manganese mineralization. Investigation by Dunn (1962) indicated areas of high grade manganese ore near the Angurugu Mission in the central west of the island. The BHP Co. Ltd. began investigating the area in 1962, and in May 1963 a programme of pitting and drilling was commenced to test the nature and extend of the manganese formation. In 1964 the Groote Eylandt Mining Company was incorporated as a wholly owned subsidiary of the BHP and production of manganese ore commenced in 1965 (Ostwald, 1975). The manganese mineralisation extends over an area of 150 square kilometres on the western side of Groote Eylandt. The deposit occur as a single relatively flat bed of cryptomelane and pyrolusite in a sandy clay matrix deposited during a Cretaceous epeirogenic marine transgression (McIntosh et al., 1975), and is the largest known manganese ore body in Australia. Stanton (1972) describes Groote Eylandt is a sedimentary manganese deposit formed by precipitation on manganese oxide and carbonates from seawater.

The manganese sediments occur in a series of basins in the west and southwest of the Proterozoic quartzite island, which, during the Cretaceous period, were occupied by an epicontinental sea depositing sandy claystones and manganese carbonates (in a deeper water environment to the south termed the Southern Basin) and pisolithic manganese oxides (in a shallow water Northern Basin). The manganese sedimentation was restricted in time, and associated with a short, Cenomanian age (95my) marine transgression and regression.

The northern basin contains un-fossiliferous quartz sandstones derived from the basement quartzites, overlain by a shallow marine glauconitic claystone, the top of which bears the primary pisolithic and oolitic manganese ores, and which are followed by the secondary ores, concretionary manganese and weathering products of variable age. The oxides of the North Basin are either exposed or at shallow depths and are extensively mined.

The southern basin sequence is dominated by sandy siltstone which is calcareous in part and contains manganese carbonate oolites at a deeper stratigraphic level and minor manganese oxide cemented sandstones near surface.

Geologically the uncemented pisoliths and ooliths form the bulk of the deposit. Manganese ores belong chiefly to the cemented and secondary types. Grades are high, with typical analyses being

- **Premium lump ore -** 50.7% Mn total, 3.1% Fe total, 3.9% SiO2, 4% A12O3, 0.2% MgO, 0.2% CaO, 1.9% BaO, 1.5% K2O, 0.16% P2O5 and 3.3% H2O + and
- **Premium fines -** 51.5% Mn total, 2.8% Fe total, 3.3% SiO2, 314% A12O, 0.2% MgO, 0.1% CaO, 2.2% BaO, 1.0% K2O, 0.2% P2O5 and 3.2% H2O +.

Irvine and Barents (2000) studied the geophysical characteristics of the manganese ore at Groote to determine whether it would respond to AEM surveys.

Table 1 lists the drill hole conductivities for the two main ore minerals of pyrolusite and cryptomelane. No consistent differences in conductivity between the two minerals are apparent, suggesting that the degree and/or style of supergene alteration are more important than mineralogy in determining the level of EM response.
Table 1: Conductivity (mS/m) for dominant minerals at Groote Eylandt.

<table>
<thead>
<tr>
<th>Location</th>
<th>Pyrolusite (mS/m)</th>
<th>Cryptomelane (mS/m)</th>
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<tbody>
<tr>
<td>F3 Quarry</td>
<td>860-1990</td>
<td>1000-2470</td>
</tr>
<tr>
<td>F4 Quarry</td>
<td>370-1980</td>
<td>960</td>
</tr>
<tr>
<td>C Quarry</td>
<td>500-5050</td>
<td>690-6830</td>
</tr>
<tr>
<td>D Quarry</td>
<td>860-3100</td>
<td>12-3060</td>
</tr>
<tr>
<td>B Deposit</td>
<td>530-9010</td>
<td>70-5550</td>
</tr>
</tbody>
</table>

Irvine and Brents (2000) concluded that;
The airborne and drillhole EM surveys demonstrated that the manganese ores at Groote Eylandt are significantly conductive and all the known mineralised areas produced significant responses. These responses were clearly defined because of the resistive nature of the host rocks and the sandstone basement, except where sea water incursions are present.

**ROsie Creek and Tawallah Deposits (Sandfire Resources)**

The Rosie Creek deposit sits on the western side of a ridge of outcropping McArthur Basin quartzite (Figure 12). BHP explored along the west side of basement outcrops possibly seeking a replica of Groote Eylandt geological setting with mineralisation located in a basin west of an island. Reanalysis of the data from Rosie Creek suggests the mineralisation dips toward the east from a subsurface basement ridge detected by airborne EM surveys. A small basin lies between the subsurface rides and the present day outcropping basement ridge.

![Figure 12: Sandfire Resources licences in the Gulf Region.](image-url)
Sandfire drilled 435 RAB holes at five prospects west of Borroloola in the 2008 field season (Rosie Creek, Rosie SW Reconnaissance Area, Tawallah 1 and 2, Yiyintyi Range and Eastern Creek).

The selection of these targets was based on:

- Testing previous work by BHP at Rosie Creek
- Testing previous work at Rosie Creek South with new interpretation of palaeogeography based on airborne electromagnetic surveys.
- Tawallah 1 and 2 were conductive bodies towards the centre of an interpreted palaeobasin
- Yiyintyi was a conductor along the edge of the Yiyintyi Range and considered analogous to Grote Eylandt.
- Eastern Creek was a test of another interpreted palaeobasin.

Nodular manganese mineralisation, interpreted to be at the base of the Cretaceous, was intersected at the Rosie Creek and Rosie SW Reconnaissance prospects where previous drilling by BHP had intersected manganese layers. In total 163 holes intersected Mn mineralisation at the base of the Cretaceous sedimentary sequence. The manganese intervals varied from 1 to 4 metres thick in loose manganiferous sandy and clayey sediments typically at shallow depths. The manganese rich horizon was intersected around 35m below surface.

![Figure 13: Nodules of Manganese oxides from Rosie Creek](image)

West of Rosie Creek on the Tawallah prospects Sandfire drilled flat lying conductors detected by airborne electromagnetic surveys. Coarse pyritic horizons in clay were intersected and were considered to be the cause of the conductivity anomaly. The pyrite in clay possibly represents deposition from more anoxic conditions towards the centre of the basin. No manganese was indicated at Tawallah and no analysis of samples was carried out.

The AEM surveys did not directly detect manganese mineralisation but could be used to recreate the depositional environment by detecting the anoxic basin and concealed basement ridges.
Sandfire estimated volumes of manganese mineralization of;

*Rosie Creek: 2.1 million cubic metres*

*Rosie Creek SW Reconnaissance: 1.1 million cubic metres*

Assays ranged from 37.7% to 45.6% Mn (average 40.6% Mn) from hand-picked nodules.

No description of minerals were provided but in hand-specimen appeared to be oxides and mostly likely pyrolusite and/or cryptomelane.

Sandfire ceased exploration and laid off staff after the Global Financial Crisis and did no more work for manganese. In September 2009 Sandfire entered into an agreement with Mineral Resources Limited (MIN) where MIN would sole fund all exploration and feasibility costs prior to a decision to mine. In returning for funding all exploration, MIN will effectively secure a 70% interest in the manganese rights at Borroloola. SFR will retain a 30% interest in the manganese rights and 100% interest in all other metals. MIN has indicated it plans to undertake further drilling to target the Rosie Creek, Brumby, L4 and Yiyintyi deposits with a view to commencing a 500ktpa mining operation within 12-18 months. MIN have not reported any activity at Borroloola Prospects and there is no mention of any activity in Annual Report.

The deposits around Rosie Creek appears to be similar geological setting to Groote Eylandt. A shallow basin probably cut off from the sea with anoxic conditions (west at Tawallah). Epeirogenic subsidence resulted in marine transgression, increasing oxygen particularly along the palaeoshoreline where oxygenated, turbid conditions result in deposition of manganese oxides and carbonates.

**BATTEN CREEK DEPOSIT (BRUMBY RESOURCES)**

The Batten Creek Manganese Project is located approximately 40km north of EL 27308 (Figure 14). Historical drilling by BHP during 1995 returned a best intersection of 6 metres at 15 per cent manganese from between 30 and 36 metres. The manganese mineralisation is hosted within the younger Cretaceous sedimentary rocks overlying the older Proterozoic rocks, which host the McArthur River Pb-Zn-Ag deposits.
figure 14: location of manganese mineralisation surrounding universal splendour's EL's.

http://www.brumbyresources.com.au/userfiles/image/mcarthur2.jpg Brumby Resources completed a VTEM survey over the Batten Creek Manganese Project in July 2008 to better delineate the extent of the manganese mineralisation. The survey detected 11 near surface sub-horizontal target zones between surface and 80 metres depth which are targets for manganese mineralisation. The historical BHP intersection from drillhole BCP010 was located in one of the VTEM conductors. Two other BHP holes, BCP009 and BCP011 did not intersect the currently defined VTEM anomaly and did not return any manganese intersections. The controls on the mineralisation at Batten are unclear.

The VTEM survey was undertaken to better define the extent of the known manganese mineralisation and also to identify any basement conductors that may be associated with base metal mineralisation. A total of eleven near surface sub-horizontal manganese-clay target zones (BCMN-01 to BCMN-11) between surface and 80 metres depth were delineated by the VTEM survey.

First pass Reverse Circulation (RC) drilling was undertaken in August 2009 on two of the eleven VTEM conductors. Fourteen vertical RC holes for 898 metres were drilled into the
‘Batten Creek’ prospect conductor and three vertical holes for 369 metres were drilled in to the ‘Three Brumbies’ prospect conductor.

A total of 12 drill holes out of 14 returned anomalous manganese intersections at the Batten Creek prospect. Drilling intersected multiple stacked sub-horizontal manganese lenses varying in thickness from 1 to 6 metres above 50 metres depth. The manganese lenses are hosted within Cretaceous manganiferous shales, siltstones and associated clays.

The anomalous manganese intersections were wet and associated with clay and are open in all directions, with only 1050 metres of the entire 4000 metre strike length of the conductor being drill tested to date.

Figure 15 shows the location of all the Batten Creek prospect drill holes and selected manganese intersections in relationship to the outline of the Batten Creek prospect VTEM conductor boundaries.

The best intercepts are tabulated below.
<table>
<thead>
<tr>
<th>Hole</th>
<th>East</th>
<th>North</th>
<th>From</th>
<th>To</th>
<th>Interval</th>
<th>Mn</th>
<th>SiO2</th>
<th>P2O5</th>
<th>Fe2O3</th>
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**Table 2:** Results from Brumby resources drilling at Batten prospect in 2009.
Figure 15: VTEM survey over Brumby manganese prospect.

OTHER DEPOSITS
Surficial manganese deposits are present in the eastern McArthur (eg Masterton No2) and northern Dunmarra (eg McLeans). These deposits are small in tonnage, but may contain patchy high-grade ore material.

Genesis Resources in ASX announcements reported

- **At Masterton No.2**, manganiferous lenses up to 1,320 metres in length and averaging 10 metres in width have assayed up to 53% manganese and averaged approximately 50% manganese with outcrops assaying up to 63.32% Mn, 7.37% SiO2, 1.53% Fe, 0.43% P and 0.51% Al2O3.

- **Between 40,000 and 50,000t of high grade Mn (50%) material present over the Masterton No.2 prospect**

- **Recent reconnaissance in the central portion has delineate rock chip assay up to 41% Mn within moderate EM anomalies.**

- **Over approx 7,990m strike length by averaging 600 m in width over strong EM anomalies remain untested and are of high priority. All elements required for the formation of dolomite hosted, high grade manganese deposits are present in the area**

- **Follow-up drilling of high priority zones around the high grade manganese outcrops-potential not fully explored**

![Massive dolomite hoisted Mn from Masterton No2 deposit](https://www.genesisresources.com.au)

Figure 16: Massive dolomite hoisted Mn from Masterton No2 deposit (Genesis Resources website www.genesisresources.com.au)
Figure 17: Regional AEM (QUESTEM) survey flown to south of EL 27304.
Figure 18: VTEM survey over Masterton 2 prospect. Genesis has interpreted conductors as possible Mn targets but they are more likely to be conductive clay areas.

DATA COMPILATION

To compile all freely available geospatial data, the NT government was contacted and provided a large amount of data. In addition to the NT data, orthorectified images from Bing Maps (www.bing.com/maps/) were used. Below is a summary of the acquired geospatial data.

MAGNETICS

Several individual and regional magnetic airborne surveys cover the EL’s. These surveys consisted of the regional surveys, Batten Trough, Bauhinia and Robinson River surveys. All were in GRID format and were able to be imaged to produce the reduced to pole total magnetic intensity image sharpened with the 1st vertical derivative (Figure 19).

At this stage of exploration the magnetic data was not use but further stages of exploration may require its use. If this is the case advanced processing of the magnetic data may need to be undertaken in order to fully utilise the freely available data.
Figure 19: Magnetic image (RTP_1VD) for various airborne surveys over the USI's EL's.

**RADIMETRICS**

Radiometric data was also freely available as grids of the potassium, thorium, uranium and total count. Figure 20 is a radiometric ternary image representing potassium, thorium and uranium as red, green blue respectively. Although the resolution of the data is not as good as the landsat, ASTER or Bing Maps, it was useful for mapping the outcrop and transported material. Higher resolution radiometrics data may prove useful in later stages of exploration.

Figure 20: Radiometric ternary image representing potassium, thorium and uranium as red, green and blue respectively.

**LANDSAT**

The NT government provided various forms of Landsat data including; merged grids, merged images, and individual tiles. In an effort procure the best possible and freely available data, other sources of Landsat were acquired and used in the interpretation phase of exploration. The Landsat bands were imaged to produce various composite images which best enhance the geology of the area. For this interpretation two image were most useful, these were 742 (Figure 21) and 741, which are represented by red, green and blue respectively.
Because the resolution of Landsat (30m) is better than the radiometric data (variable but >30m) it was chosen as the primary dataset, except in areas where ASTER data was available as the resolution of this data set was 15m.

Figure 21: Landsat image representing bands 7,4,2 as red green and blue respectively.

ASTER DATA

The NT government has ASTER data for a large portion of the state, although only 3 tiles were within the region of the EL’s (Figure 22). The ASTER data was processed to produce a 321 image which is represented by red, green and blue respectively. During the interpretation the ASTER data was used in preference to the Landsat as it’s spatial resolution was greater.

Figure 22: Freely available ASTER data within the US EL’s. Images represent bands 3,2,1 and red, green, blue respectively.

GEOGRAPHIC

All geographic data was provided by the NT government. Figure 23 shows the main and minor roads, tracks, main and minor watercourses, airstrips and main and minor localities. This information will be useful for field planning. Any additional information acquired during field visits will be added to this geographic database.
A considerable amount of geochemical data are available for the NE corner of NT (Figure 24). Unfortunately the bulk of the samples lie outside the EL’s but they provide a regional overview and may prove useful throughout exploration. All samples with recorded Mn assays were extracted from the database and coloured from green to red to represent low to high Mn values (Figure 21).

Figure 23: Geographic data for the NE corner of NT. Base image is an orthorectified image from Bing Maps.

Figure 24: Geochemical sample locations for the NE corner of NT.
Figure 25: Manganese geochemical assay values for the NE corner of NT.
APPENDIX B
Review of Previous Exploration and Work Proposal
Universal Splendour Investments
Gulf Group Project
Northern Territory, Australia

By

Karl Lindsay-Park

10/3/10

Introduction
Universal Splendour Investments (USI) Gulf Group project lies along the western side of the Gulf of Carpentaria in the Northern Territory. The majority of the licences were applied for by USI on the 20th April 2009 and granted on the 13th October 2009. The table below shows the location of the licences and their identity number.

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<th>Grant Date</th>
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</table>

An Aboriginal Areas Protection Authority clearance has been undertaken for the granted licence areas. Several sites have been registered with the Authority. Most of the sites identified appear to be associated with waterholes and do not present a problem. The recorded sites will be plotted on maps so the field party will know their location and be able to avoid them.

**Location, Landform and Climate**

The exploration Licences can be divided in to two groups referred to as the eastern and western.

The western group consists of ELs 27305, 27308 and the yet to be granted EL 27483. Access to the area is via the Carpentaria Highway that runs to the east from the Stuart Highway. From Darwin it is necessary to travel 560km south along the Stuart Highway and then east along the Carpentaria highway for 360km to reach the Western edge of the licences.

Examination of the Google image, below, shows the area of the western group is dominated by abundant very rugged hills and escarpments. The creeks are deeply incised and rocky outcrops are common. In the mountainous areas vegetation is very sparse and limited to grassland. Vehicle access into these areas is impossible without substantial earthworks. The eastern half of EL 27305 is by contrast very flat and swampy. Several shallow lakes appear in the area on
The eastern group consists of ELs 27304, 27309, 27310, 27311 and 27312. The licences lie much closer to the Gulf of Carpentaria and will require considerable travel to reach. The most direct method to reach the licence area is to proceed as for the western group but continue on past Borroloola along the Wollogorang road for other 160km. The image above shows the Google imagery for the licence area with some of the tracks highlighted. The condition of the tracks is not known but at least they indicate that vehicle access to most of the licences is possible. Access to the area is also possible via the Dunmarra Group licences and it is proposed to use this method for the first field trip.

The licence area, located approximately 50km from the Gulf coast is subject to heavy seasonal rain. During the monsoon months between October and April vehicle access in the area is extremely limited. During the dry period the ground dries out completely and large desiccation cracks develop in the black soil areas. Cross country travel at this time is easy but very rough.

Figures 2 and 3 shows a few tracks and fence lines in the area but it appears they have not been used regularly nor well maintained. Travel within the licence area maybe problematic.

**Accommodation**

For the western group of licences accommodation and meals are available from the Cape Crawford (heartbreak) roadhouse which is about 60km to the west of the licences. Accommodation is also available at Borroloola which is located to the north of the western licences. Accommodation options for the eastern group of licences appear to be very limited. For the initial trip camping by the road side may be the only option. Fuel and potable water
supply will be an issue. If a project is developed in the area the accommodation and logistics will need to be revisited.

**Geology**

At least 50% of the area of EL 27305 is outcrop. The most widely distributed units are sandstones belonging to the Mesoproterozoic Roper Group and the Cambrian Bukalarra Sandstone. Unconformably overlying the Roper Group and the Bukalarra sandstone in the east of the licence are further Sandstones of Cretaceous age. Cainozoic sand, soil, laterite and ferricrete overlies the Cretaceous in the eastern area.

Exploration licence 27308 is essentially all out crop. In the north of the area lies the Abner Sandstone which belongs in the Mesoproterozoic Roper Group. The southern two thirds of the licence consist of the Bukalarra Sandstone. There is very limited Cainozoic cover in the north of the licence.

The geology of EL 27438 is very complex. Fault bounded blocks belonging to four different Groups are present. The oldest material present belongs to the lower half of the Palaeoproterozoic Tawallah Group which is unconformably overlain by the lower members of the Palaeoproterozoic McArthur Group. Fault bounded blocks belonging to the Nathan group and the Mesoproterozoic Roper Group are also present. There is only a small amount Cainozoic cover in the licence area.

The geology of the eastern 5 licences is distinctly different from the western group mentioned above.

EL 27304 is the largest licence in the eastern group and consists of a central ridge of Palaeoproterozoic, Echo Sandstone. On both the eastern and western flanks of the ridge lies the Mesoproterozoic Karns Dolomite which is unconformably overlain by Cainozoic sand, soil, ferricrete and silcrete. The Karns Dolomite is known to host several Manganese occurrences The largest of which is close to USI’s Dunmarra Group tenements.

Essentially the same geology is located in EL 27309 which adjoins EL27304 to the north.

The geology of EL 27310 is dominated by outcrops of the Palaeoproterozoic, Echo Sandstone. Several Members of the Sandstone are recognised. The members vary in composition from fine-grained siltstone and dolomite through to coarse boulder conglomerates. The high-energy deposition environment is the more typical for the unit. There is a minor amount of Cainozoic cover present in the central and southern part of the licence.

Based on the geological mapping compiled by the NTGS the only outcrop in EL 27311 belongs to the Gold Creek Volcanics. These are described as Palaeoproterozoic, vesicular to massive basalt, dolomitic sandstone, mudstone and peperite. The Gold Creek Volcanics have been extensively explored for copper-cobalt mineralisation hosted in breccia pipes. The Redbank mine is the typical example in the area. The out cropping Gold Creek Volcanics is restricted to the west of the licence area. Most of the area is masked by Cainozoic cover.

The entire area of EL 27312 is comprised of Cainozoic cover.

The Groote Eylandt-style of manganese mineralisation has the ore lying directly on the Palaeoproterozoic sandstone unit of the Alyangula Sub-group. The mineralisation is considered to be Cretaceous in age and covered by Cainozoic sediments. A similar situation occurs within some parts of the eastern group licences and the eastern half of EL 27305 in the western group. Detailed study of the manganese deposits in the Gulf region has shown that the underlying rocks have no influence on the formation of mineralisation. It is the topographic and marine situation that plays a role in ore formation.

Whilst manganese is the primary commodity sought and is the reason the licences were applied for there is the potential to locate copper-cobalt and potassium mineralisation.
Geophysics

Examination of the NTGS regional geophysical data sets for the western group licences has failed to identify any areas of anomalism. The radiometric data, $\frac{U^2}{Th}$, $U$, $Th$ and $K$ shows responses due to the distribution of outcrop or drainage. There is no record of any electrical surveys being flown over any of USI’s western group tenements. In a similar fashion the regional magnetic data responds to the rock types but no anomalous areas are present.

The Google imagery available for the western group of tenements has been thoroughly interrogated and four areas of interest have been defined. One area is located in the northwest corner of EL 27308. The area appears as a dark red-black area near the outwash of a small creek. The site is very small but is close to the main road so a quick inspection is warranted.

The three other areas of interest lie in EL 27305, one in the north and two in the south. It is difficult to say what the features are. They appear as black zones in a generally pale background but there is no obvious suggestion they are related to geology. A field visit is required to resolve the situation.

The regional NTGS geophysical data for the eastern group of licences is similar in its value to the western licences. The radiometric data contains a few highs and lows but these reflect the underlying geology or drainage and are not considered as anomalous. The airborne magnetic data shows some variation in response to geology, structure and the thickness of the Cainozoic cover. No discrete magnetic anomalies are present. The magnetic data can be revisited if prospect scale areas are defined.

There are no records of any airborne electrical surveys being flown in the area.

Detailed examination of the Google satellite imagery has not located many areas of interest which is not unexpected given that most of the area is either outcropping sandstone or obscured by Cainozoic cover. In all 6 areas that appear distinctly different from their surrounds have been identified. One area lies in the west of EL 273112, it appears to be a small iron and manganese? Rich outcrop on the side of a small hill. Five other areas of interest have been defined all of which are in or near to EL 27310. Four of the areas appear as black or black and white patches which may be related to geology. The fifth area lies in the southern part of EL 27310 and is a distinctly round feature. There are many possible explanations for the feature ranging from a meteor crater to an intrusive dyke or a simple topographic effect. A fiend inspection may shed some light on the cause of the feature.

Previous Exploration

The western group of three tenements lie close to the Emu Fault and Battern Trough which is the host setting for the McArthur River base metal deposit. As such the tenements have been explored, by way of stream sediment and rock chip sampling for base metals. Copper mineralisation has been located by prospectors in EL 27483. Carpentaria Exploration drilled the area with poor results. Some exploration for diamonds has also been completed.

The eastern group of tenements have been subject to exploration for a wider range of commodities. Principle amongst these is, manganese, copper, base metals, uranium and diamonds. Fortunately for USI most of the work has been poorly performed of very limited scope.

BHP has conducted manganese exploration in the area immediately to the north of EL 27309. There work consisted of several fences of drill holes running from the outcropping Proterozoic sandstone out into the areas covered by Cainozoic aged sediments. They only obtained modest results, several holes with 1 to 2 % manganese, but it is enough to show the manganese forming processes have been active in the region. They have done no work in ELs 27309 or 27304 both of which contain the same geological setting. Several prospectors have searched
for manganese mineralisation in the Karns Dolomite. Numerous deposits have been located but all are too small for USI's interest.

Dampier Mining Company undertook similar drilling on long lines across the area of EL 27312, there work was sufficiently detailed that little prospectivity for manganese remains.

Exploration for uranium has been undertaken by several companies. The most impressive results came from some phosphatic horizons located within the sandstone intervals. None of the material came close to being economically significant.

The Redbank copper mine is located approximately 50km to the south of USI’s eastern tenement group. The Redbank deposit formed in a breccia pipe and is hosted by the Gold Creek Volcanics. These rock units extend to the north and can be found in ELs 27310 and 27311. CRA Exploration drilled four RC and three diamond holes in the vicinity of ELs 27310 and 27311. The holes were drilled to measure the thickness of the sediments overlying the Gold Creek Volcanics. There work failed to produce the results CRA were expecting and they abandoned the project. Fortunately, they did assay their RC holes and one of the diamond holes for a wide range of elements.

Inspection of the assay results from CRA Exploration’s hole DD95GC007, located within EL 27310 shows very high levels of potassium almost from surface. Several intervals contain over 5% potassium with the best individual sample returning over 7%. This is potentially ore-grade (potash) material however; a lot of work needs to be done to verify this. Interrogation of the NTGS database shows the core from DD95GC007 is stored in the Darwin core library and is available for inspection and sampling. All of the CRAE data needs to be captured and incorporated into the GIS system.

Conclusions

The compilation of the existing geophysical, geological and previous exploration data has demonstrated that despite the number of licences held the amount of land with the potential to host manganese is limited. The attractive areas are the eastern half of EL 27305 in the western group of licences parts of EL’s 27309, 27304 and 27311 in the eastern group. The work done by BHP has shown that the manganese precipitation process has been active and it is now a question of finding the correct deposition site. The embayments in the Echo Sandstone located to in the north and east of EL 27304 are considered to be ideal locations.

The exploration work completed for base metals in the western group of licences and uranium in the eastern group appears to have been fairly comprehensive and it is unlikely that additional work for those commodities would meet with success.

The exploration work completed mainly by CRA Exploration and some others for Redbank style copper deposits has partially tested the potential of the eastern group licences. There work has highlighted the areas very high potassium content. It will be necessary to confirm CRA Exploration data prior to assessing the potential of their results.

Proposed Exploration

As for the Dunmarra Group the exploration of the Gulf Group can proceed along two lines. The licences were acquired because of their potential to host manganese mineralisation and this is still the primary focus of USI. The work done to date has identified the areas that have potential for manganese and the next step in the exploration process is either flying airborne geophysics (Electromagnetics) or drilling.

The discovery of the very high potassium values in the CRA Exploration core is not a key of USI’s exploration strategy but may be highly significant. The first step in the assessment of the new information is to accurately capture the drill hole locations, geological logs and the assay data. The core for at least one hole, DD95GC007, is stored in the NTGS’s Darwin core library
and can be inspected and sampled. The second phase of the data assessment is to collect samples and have them re-assayed to confirm the previous results. If the results are the same a detailed exploration program for potassium will have to be designed and implemented. The key facet of which will be to collect samples (drill) to see if the potassium can be separated from the host rock cost effectively.

The decision to use EM or drilling as the next phase of the exploration for manganese may depend on the results of re-sampling the CRA Exploration core.

As part of the overall assessment of the area a field trip is proposed to visit the sights identified in the examination of the Google satellite imagery ant to assess the level of support available to field workers in the area.

### Timing and Budget

A tentative budget has been prepared to cover the cost of the first visit.

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<th>Activity</th>
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<th>Description</th>
<th>Total $</th>
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<td>Assay samples for element concentrations</td>
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| Total                         |           |      |                                                  |

| Contingency 5%                |           |      |                                                  |

| Rounded Total                 |           |      |                                                  |