PARTIAL RELINQUISHMENT REPORT

ON

EL 27365

12/01/2010 TO 11/01/2014

PINE CREEK, NORTHERN TERRITORY

TITLE HOLDER: Element 92 Pty Ltd

Target Commodities: Gold, Copper and Uranium

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SUMMARY

Exploration Licences (EL) 27365 is situated approximately 160 km SE of Darwin, and about 30 km east of Pine Creek. It is a part of amalgamated annual reporting group GR204-11. The Licence was applied for on 27 May 2009 and was granted on 12 January 2010 to Element 92 Pty Ltd, which is a wholly owned subsidiary of Thundelarra Exploration Ltd. To meet Northern Territory Mining Act requirements, 7 westerly blocks were surrendered on 13 November 2013.

The project area is located within central part of the Pine Creek Orogen which is a folded sequence of Palaeoproterozoic pelitic and psammitic sediments, with interlayered cherty tuffaceous units. These rocks have been intruded by the late-orogenic Palaeoproterozoic granites, causing widespread contact/thermal aureole which contains most of the gold and other mineralisation in the Orogen. Geology of the project area is dominated by the Palaeoproterozoic rocks of the Namoona Group, Mt Partridge Group and the Allamber Springs. Main lithologies are tightly folded dolomites, sandstones, ferruginous shales and quartz-andalusite schists which have been intruded by the Zamu Dolerite and Allamber Springs Granite.

During the period under review, the relinquished part of the EL was explored by historical exploration data appraisal and analyses, geological mapping, high resolution airborne magnetic and radiometric survey along with ground truthing. Relinquished part of EL 27365 was flown by high resolution geophysical survey (magnetic and radiometrics) during 2010 by Thompson Aviation. East-west lines were spaced 70m apart, with 445 line-kms flown over EL27365. A technical review of the geological and geophysical data of the relinquished part of EL 27365 indicated that the area has very low potential for gold, uranium and base metal mineralisation. As a result of that 7 westerly blocks of the Licence were surrendered on 13 November 2013.
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1.0 INTRODUCTION

Exploration Licences (EL) 27365 is located about 30 km east of Pine Creek and is a part of amalgamated annual reporting group GR204-11. The Licence has been explored for uranium, gold and base metals mineralisation. This is the partial relinquishment report on the 7 blocks of EL 27365 which were surrendered on 13 November 2013.

2.0 LOCATION AND ACCESS

EL 27365 is situated approximately 160 km SE of Darwin and about 30 km east of Pine Creek (Figure 1). The project area can be accessed from Darwin by Stuart Highway up to Pine Creek and then along the Kakadu Highway that connects Pine Creek with Jabiru, which is located in the heart of the World-heritage listed Kakadu National Park.

The license area can be accessed via the Frances Creek Road, turning north off the Kakadu Highway approximately 3km east of Pine Creek. The EL can also be reached via Kakadu Highway – A track coming off from the Kakadu Highway about 27 km from Pine Creek and leads towards NE and passes though the tenement. Access within the tenement is by station or bush tracks which may be impassable during the wet season.

3.0 TENEMENTS DETAILS

EL 27365 was applied for on 27 May 2009 and was granted on 12 January 2010 to Element 92 Pty Ltd, which is a wholly owned subsidiary of Thundelarra Exploration Ltd. The tenement was granted for a period of 6 years and will expire on 11 January 2016. Currently, it has 10 blocks and covers about 33.37 Km². To meet Northern Territory Mining Act requirements, 7 westerly blocks (SD521439E, SD521440A, SD521440B, SD521440C, SD521439J, SD521439K, SD521440F) were surrendered on 13 November 2013.

Underlying cadastre is covered by three pastoral leases and those are PPL 1134 held by Mary River Wildlife Ranch Pty Ltd, PPL 1111 held by Ban Ban Springs Station Pty Ltd and PL 815 held by Adicrest Pty Ltd.
4.0 GEOLOGICAL SETTING

The project area is located within central part of the Pine Creek Orogen which is a folded sequence of Palaeoproterozoic pelitic and psammitic sediments, with interlayered cherty tuffaceous units (Needham and Stuart-Smith (1984) and Needham et al. (1988). These rocks have been intruded by the late-orogenic Palaeoproterozoic granites, causing wide spread contact/thermal aureole which contains most of the gold and other mineralisation in the Orogen (Bajwah, 1994). Some uranium mineralisation is also confined to contact areoles. Less deformed Mesoproterozoic sedimentary and volcanic sequences unconformably overlie the Palaeoproterozoic rocks and is overlain by Cambrian-Ordovician lavas, sediments and Cretaceous strata. Cainozoic sediments, laterite and recent alluvium may obscure parts of the Orogen lithologies.
Geology of EL 27365 is dominated by the folded rocks of Namoona Group, Mount Partridge Group (Figure 2), and intruded by the Allamber Springs Granite which was emplaced during 1820 – 1850 Ma. The members of the Cullen Batholith/Cullen are predominantly I-type (Chappell and White, 1974), but some may also have S-type characters.

Figure 2: Geological Setting of the Project Area

The oldest formation exposed in the project area is the Masson Formation (Namoona Group) shown in Figure 2. It conformably underlies the Mundogie Sandstone (Mount Partridge Group). It predominantly contains greywacke, carbonaceous shale, sandstone and beds of dolomite with minor quartzite, massive ironstone and rare tremolite marble. They are commonly exposed as ferruginous rubble on low rises, in creek beds (Stuart-Smith et al. 1987). It is intruded by several sills of Zamu Dolerite and is extensively hornfelsed by the intrusion of the Allamber Springs Granite towards the south of the project area (Figure 2). Due to thermal metamorphism, beds have been metamorphosed to carbonaceous chiastolite hornfels, spotted grey cordierite-andalusite-muscovite
hornfels and biotite-muscovite-quartz hornfels. Contact relation relationship between the Masson Formation and intruding Allamber springs is mainly discordant (Stuart-Smith et al. 1987)

Towards east, the Masson Formation host a number of uranium deposits (e.g. Cleo, Dams, Twins) where mineralisation is present in contact metamorphosed rocks such graphitic schist, Zamu Dolerite and tongues of the Allamber Springs Granite (Figure 2). Here, mineralisation is confined to fault structure/shear zone within a northwest-trending embayment at the margin of the Allamber Springs Granite.

The Mundogie Sandstone is another rock type exposed in the project area. The formation overlies the Mason Formation and structurally appears conformable with the Masson Formation. The contact between the two rock units is obscured by scree or alluvium or may have been displaced by the emplacement of the Zamu Dolerite. In the project area, the unit is truncated by the emplacement of the Allamber Springs Granite and is responsible for contact metamorphism, hornfelsing the sediments extensively. The contact is mostly discordant and very irregular with the Allamber Springs Granite.

It is mainly composed of coarse pebbly sandstone with lenses of conglomerate and shale. Beds are generally about 1 – 5 meters thick and are massive with laminated tops in places. Sedimentary structures present include graded bedding, lenticular cross-bedding and load-cast (Stuart-Smith et al. 1987). In the contact zone with the Allamber Springs Granites, beds are generally tourmalinised and silicified and contact metamorphosed to micaceous hornfels, Cordierite-mica hornfels and black carbonaceous hornfels.

In the project area, the Palaeoproterozoic meta-sedimentary sequence is intruded by quart dolerite sills of the Zamu dolerite. Due to poor exposure, contact effects are not well known. Dolerite is poorly exposed in valleys as rounded rubbles and pebbles.

Towards south project area is intruded by the Palaeoproterozoic Allamber Springs Granite (Figure 2) which is one of the significant plutonic bodies, genetically related to gold, uranium and base metals mineralisation in the adjacent contact zone. It is mainly massive and largely homogenous and even-grained, although porphyritic marginal variants occur in several restricted localities. Mafic inclusions in low abundances occur particularly towards the margin of the pluton. It crops out as expanses of bare rock, boulders and tors separated by alluvial flats. The marginal fine-grained porphyritic variety is light grey and characterised by the presence of quartz and/or K-feldspar phenocrysts. It is mainly composed of quartz (25-35%), K-feldspar (30-35%), plagioclase (20-25%), biotite (5-8%) and accessories such as magnetite, allanite and sphene. Hornblende (>10%) is generally confined to medium to coarse-grained varieties which form greater part of the pluton and shows a progressive increase in grain size from the marginal to the core of the granite body. In coarse-grained variety K-feldspar could be up to 50%. The Allamber Springs show weak pervasive
hydrothermal alteration (sericitisation, chloritisation) throughout but towards griesenisation of the granitic rock may occur towards the margins.

The Allamber Springs is characterised by a variable SiO$_2$ range (66.10-78.10 wt%), K$_2$O contents range from 4.20-7.0 wt% and are predominant over Na$_2$O. In terms of trace elements, the granite body has high concentrations of Th (2-90), U (3-30) and Rb (141-336). Rb increases when plotted against SiO$_2$ and indicate crystal fractionation as supported by RRE contents of the pluton (Bajwah, 1994). During ascent magma experience differentiation and fractionation which led to the evolution for hydrothermal system, responsible for gold, uranium and base metal mineralisation in the adjacent meta-sediments.

5.0 PREVIOUS EXPLORATION ACTIVITY

EL 27365 has been explored since 1960’s when first edition of the Pine Creek (1:250 00) map was prepared by BMR (now Geoscience Australia). Second Edition Pine Creek map was published by NT Geological Survey in 1993 (Ahmad et al, 1993) which incorporated metallogenic data and provided a framework for exploration. A regional geophysical cover (WGC, 1999) which includes the project area is available from Northern Territory Geological Survey. Following these programs on ground exploration activities commences for the discovery of uranium, gold and base metals mineralisation.

In and around the current EL 27365, area has been explored for gold, base metals and uranium since 1970’ and that record is kept as historical exploration reports with Northern Territory Geological Survey. Following summary is based on that data base.

In 1972, most of the project area was explored for uranium and base metal deposits by a consortium of exploration companies led by Australia Geophysical Survey Pty Ltd (Cotton et al. 1973). Airborne radiometric survey identified several uranium anomalies which were drilled tested. However, assaying of drill samples did not reveal any significant uranium or base metal mineralisation and eventually tenement was surrendered.

CRA Exploration Pty Ltd explored most of the project area under tenure of EL1093 for base metals (Ickstrums, 1979). It involved geological mapping, geochemical sampling and assaying and results yielded low base metal values. Ultimately, tenement was surrendered due to lack of any significant anomaly.

In 1985, CSR Limited under EL 3174 conducted Photogeological mapping, geochemical sampling program for gold and base metals (Heyworth, 1986), and result were not encouraging. In the following year, airborne magnetic survey was flown together with geochemical sampling program.
Results were not encouraging and further exploration in the area was not recommended (Heyworth, 1987). Under EL 6336, Scriven et al (1991) conducted drainage sampling program to test the previous outlined anomalies which failed to trace the anomalies. The EL was considered to have little potential for gold mineralisation.

In 1993, Dominion Gold Operation Pty Limited under the tenure of EL 7486 collected panned concentrates and -80# and -200# stream sediments samples in the area. No significant results were reported (Pooley, 1993). In addition RAB drilling failed to identify any gold mineralisation below surface. Aztec Mining Company under the tenure of EL 8032 carried out a stream sediment sampling program for gold and base metals (Butler, 1994). Sample collected were -20# and -200# fraction as well as panned concentrates. Results obtained did not warrant any further work.

Most of the current project area was explored as part of expired EL 9436 (Omotosho, 1998). A total of 69 BLEG samples were taken and were assayed for gold and arsenic and results were not encouraging. 3 rock chip samples collected did not reveal any significant sign of mineralisation.

From 1996 to 1998, north-western part of the project area was explored under EL 9369 (Corporate Development Pty Ltd, 1998). During this period, search for previous exploration data was done and structural interpretation was completed on Landsat data. Although some geochemical samples were undertaken but no results were reported.

Southern part of the tenement was explored under EL 9104 over 6 years and that involved a desktop study, geological mapping, RAB drilling, assaying for barite, base metals and uranium mineralisation (Earthrowl, 1996; Earthrowl, 2002). Stratigraphic comparison with the Rum Jungle geological setting was made and results revealed no significant zone of mineralisation.

6.0 EXPLORATION DURING THE PERIOD UNDER REVIEW

During the period under review, the relinquished part of EL was explored by historical exploration data appraisal and analyses, geological mapping, airborne magnetic and radiometric survey along with ground truthing. Exploration index map of the project area is shown in Figure 3.

The Licence covers the Palaeoproterozoic rocks of the Masson Formation and Mundogie Sandstone, intruded by the Allamber Springs towards south. Geological setting of the project area is similar to that of Cleo group of uranium deposits located further east, where Allamber Springs Granite appears to have played a role for providing hydrothermal fluids responsible for mineralisation.
Figure 3: Exploration Index map of the project area
Mineralogical and geochemical characters of Allamber Springs Granite show that it is an I-type, fractionated and high heat-producing granite. In the final stages of magma emplacement, hydrothermal fluids were released and a variety of mineralisation such as gold, uranium and base metals were deposited in structurally prepared sites in the contact aureoles (Bajwah, 1994). Important examples for gold are Pine Creek goldfield, Union Reefs gold mines and Spring Hills, whereas for uranium Cleo group of deposits are noteworthy, which are located east of the project area. Some additional mineral occurrences are also located in the NW of EL 27365 mainly hosted by the Masson Formation.

An appraisal of the Masson Formation showed that it could be an important rock unit for localisation of gold, uranium and base metal mineralisation, particularly where it is intruded by the Allamber Springs Granite. Greisenised part of the Allamber Springs Granite is indicative of generation of hydrothermal system responsible for mineralisation in the adjacent sediments.

In the light of above discussion, following exploration strategy can be derived:

- Shear zones act as conduits, transporting uranium from the hot granite into the sediment package.
- Local structural settings and/or rheological contrast (shale/dolomite contact) leads to an area where high fluid flow and wall-rock interaction takes place.
- A suitable reductant interacting with the fluid leads to the precipitation of uranium (graphitic or sulphidic shale or dolomite).

Relinquished part of EL 27365 was flown by high resolution geophysical survey (magnetic and radiometrics) during 2010 by Thompson Aviation. East-west lines were spaced 70m apart, with 445 line-kms flown over EL 27365. The GDF formatted data of 7 relinquished blocks are given in Appendix 1.

Processing and interpretation of radiometric data has shown some radiometric anomaly in the southern part of the project area (Figure 4). However, further evaluation of this radiometric anomaly revealed that it is not strong enough for further exploration. Similarly magnetic data revealed NW-trending magnetic ridges of the Masson Formation and Mundogie Sandstone with magnetic recessive valleys. Further evaluation of these magnetic ridges did not provide any encouragement for further perusal and it was decided to surrender 7 easterly blocks of EL 27365.
7.0 CONCLUSIONS AND RECOMMENDATION

A technical review of the geological and geophysical data of the relinquished part of EL 27365 indicated that the area has very low potential for gold, uranium and base metal mineralisation. As a result of that 7 westerly blocks of the Licence were surrendered on 13 November 2013.

8.0 REFERENCES


Stuart-Smith, PG., Needham, RS., and Wallace, DA., 1987, Pine Creek, Northern Territory, 1:100 000 geological map and explanatory notes. *Bureau of Mineral Resources, Australia and Northern Territory Geological Survey*.