EXPLORATION LICENCE EL 24372
NABARLEK PROJECT – NORTHERN TERRITORY

Final Surrender Report for the Period 01/09/2004 to 31/8/2008

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SUMMARY

The exploration licences EL10176, 24371 and 24372, which form the Nabarlek Project, were granted to Cameco Australia Pty Ltd (Cameco) on 1st September 2004 for a period of six years. When the project was established in 2004, it covered 155 blocks with a total area of 423.07 km² over the three exploration licences.

In August 2008, Cameco surrendered EL24372 (approximately 6 blocks). This report describes exploration work undertaken on the surrendered EL34372 between 2004 and 2008.

The exploration objective of the Nabarlek Project is to discover economic ‘unconformity-style’ uranium mineralization within a geological setting similar to the known deposits of the Alligator Rivers region of Northern Territory, and the concealed high-grade deposits of the Athabasca Region in the Saskatchewan Province of Canada.

Exploration activities in the relinquished area between 2004 and 2008 included field reconnaissance, and a TEMPEST survey conducted in 2006. The survey did not identify any encouraging targets and assay results from the field sampling program did not encourage any follow-up work.
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INTRODUCTION

Nabarlek is a uranium exploration project covering exploration licences EL10176, 24371 and 24372. The project is managed and operated by Cameco Australia Pty Ltd (Cameco) in joint venture (JV) with Uranium Equities Limited (UEL). In 2008, Cameco was granted a partial waiver for EL10176 (9 blocks of 134 relinquished), surrendered EL24372, and retained all blocks of EL24731 (Figure 1).

This report details exploration work completed on the surrendered licence EL24372 between 2004 and 2008.

Figure 1: Location of EL24372 - Nabarlek Project

The exploration objective of the project is to discover economic uranium mineralization within a geological setting similar to the known deposits of the Alligator Rivers region of the Northern Territory, and the concealed high-grade deposits of the Athabasca region of Saskatchewan Province in Canada.

Tenure

The Nabarlek project area included EL’s 10176, 24371 and 24372, which were granted on 1st September 2004 for an initial period of six years and covered an area of 423 km².

In early December 2006, Cameco entered into a Joint Venture agreement with Uranium Equities Limited (UEL) allowing UEL to earn 40% interest in Nabarlek project, with Cameco continuing to operate and manage the project.

In August 2008, Cameco sought and was granted a partial waiver of relinquishment for EL’s 10176 and 24371, as Cameco had not fully evaluated the mineralization potential of the ground. Cameco relinquished 9 out of 134 blocks from EL10176, retained all blocks for EL24371, and surrendered EL24372 (approximately 6 blocks).

Location and Access

The Nabarlek project is located in the western part of Arnhem Land and within Aboriginal Land (Figure 2). The project is approximately 50 km east-northeast of Jabiru and is centred on the rehabilitated Nabarlek mine site. Darwin is located approximately 250 km to the west.

The project tenements are located on the Alligator Rivers (SD-5301) and Milingimbi (SD-5302) 1:250 000 map sheet areas, and on the Oenpelli (5573) and Goomadeer (5673) 1:100 000 map sheet areas.

Figure 2: Project Location Map

Access to the area is via the sealed Arnhem Highway to the Oenpelli-Maningrida road turnoff just west of Jabiru, and then north-east along the Oenpelli-Maningrida road past Oenpelli to the Nabarlek Road, and along the Nabarlek Road to the Myra Camp access track turnoff just west of the old Nabarlek mine site.
Access within the project tenements is variable and dependent upon topography. In general, most of the country is flat lying and can be traversed by four-wheel drive during the dry season. Exceptions are the heavily dissected sandstone escarpments, such as much of EL24372, that are best traversed by foot and accessed by helicopter. Several pre-existing tracks in variable condition cut north-south and east-west across the project tenements.

The exploration work was based out of Cameco’s Myra base camp.

Work is undertaken in the area under the terms of the consent documentation agreed upon with the Northern Land Council on behalf of the Traditional Owners, pursuant to the Aboriginal Land Rights Act of the Northern Territory legislation.

**Physiography**

The project tenements contain several outliers of dissected sandstone plateau of Kombolgie Subgroup, which form the eastern extension of the “Oenpelli Massif”. The remainder of the project consists of gently undulating colluvial and alluvial plains covered by open woodland with patches of open grassland and low shrub. Thin remnants of weathered and lateritized flat-lying sedimentary rocks form tablelands in the northeastern portion.

The main drainage systems are Birraduk and Cooper Creeks, which flow to the northwest.

**Regional Geology**

This section is largely based on the work by Needham et al. (1988), Needham (1998, 1990), and Needham and Stuart-Smith (1980). Information that is not based on these references is indicated below.

The Nabarlek project area is located within the eastern margin of the Neoarchean and Paleoproterozoic Nimbuwah Domain of the Pine Creek Orogen.

The Bureau of Mineral Resources (BMR, now Geoscience Australia) completed 1:250 000-scale geological maps of the Pine Creek Orogen between the 1940s and 1960s following the discovery of uranium at Rum Jungle. The Alligator Rivers region was systematically mapped by the BMR and the Northern Territory Geological Survey (NTGS) between 1972 and 1983. This later work produced 1:100 000-scale geological maps and reports for the region from Darwin to Katherine to the Alligator Rivers region.

*Figure 3: NTGS 1:250,000 Regional Geology*

The oldest exposed rocks in the Alligator Rivers region are included in the Neoarchean (ca. 2500 Ma) Nanambu Complex. The complex consists of paragneiss, orthogneiss, migmatite, and schist forming domical structures that are unconformably overlain by Paleoproterozoic metasedimentary and metavolcanic rocks, which were formerly included in the Pine Creek Orogen. Paleoproterozoic rocks in the Alligator Rivers region are amphibolite-facies psammites assigned in the Mount Howship Gneiss and the Kudjumarndi Quartzite. These formations are included in the Kakadu Group and are
probably correlatives of the Mount Basedow Gneiss and Munmarlary Quartzite, respectively (Ferenczi et al., 2005). The group appears to on-lap Neoarchean basement highs, but gneissic variants are also thought pass transitional into paragneiss of the Nanambu Complex.

The Cahill Formation of the Namoona Group conformably overlies the Munmarlary Quartzite. The lower part of the Cahill Formation (informally referred to as the Lower Cahill Formation) hosts the Nabarlek, Ranger and Jabiluka uranium deposits. The Lower Cahill Formation consists of a structurally lower calcareous marble and calc-silicate gneiss, which is overlain by pyritic, garnetiferous and carbonaceous schist, quartz-feldspar-mica gneiss, and minor proportions of amphibolite.

The informally named Upper Cahill Formation is psammitic and consists of feldspar-quartz schist, quartzite, lesser proportions of mica-feldspar-quartz-magnetite schist, and minor proportions of metaconglomerate and amphibolite. The Cahill Formation is magnetic and significantly so at the base of psammitic unit in what is informally known as ‘hangingwall sequence’. The magnetic characteristic of this unit is due to the presence of mafic sills or magnetite and it is a useful characteristic used to distinguishing the Cahill Formation from surrounding less magnetic rocks (Kendall, 1990). Mafic sills and dykes assigned to the Goodparla and Zamu dolerites intrude the Upper Cahill Formation.

The Nourlangie Schist overlies the Cahill Formation and consists of argillaceous to quartzose phyllite, and quartz-mica schist that locally contain garnet and staurolite.

The supracrustal rocks of the region are structurally complex, having been affected by at least three deformation event before deposition of the late Paleo- to Mesoproterozoic Kombolgie Subgroup (e.g. Thomas, 2002). The rocks have also been locally migmatisation during the ca. 1847-30 Ma Nimbuwah Event. In addition, there is a broad trend of increasing grade from southwest to northeast in the Nimbuwah Domain. This gradient is thought to reflect the synchronous emplacement of ca. 1865 Ma granites in the Nimbuwah Complex.

The Kombolgie Subgroup is the basal unit of the late Paleo- to Mesoproterozoic Katherine River Group of the McArthur Basin (Sweet et al., 1999a, b). The subgroup consists of sandstone units called the Mamadawerre Sandstone (at the base), Gumarrirnbang Sandstone, and Marlgowa Sandstone (at the top), which are divided by thin basaltic units called the Nungbalgarri Volcanics, and Gilruth Volcanics. The Mamadawerre Sandstone has a minimum age of ca. 1688 Ma, which is also the minimum age of intrusive mafic rocks assigned to the Oenpelli Dolerite. Detrital zircon SHRIMP data from the Geoscience Australia OZCRON database constrain the maximum age of the sandstone at ca. 1810 Ma.

The Oenpelli Dolerite is the most pervasive mafic intrusive suite to affect the Alligator Rivers region and is the youngest Paleoproterozoic rock unit known in the region. It intrudes various Neoarchean and Paleoproterozoic units (including the Mamadawerre Sandstone). The Oenpelli Dolerite consists of magnetic sills, dykes, lopoliths, and laccoliths.
The age of the Oenpelli Dolerite is still in doubt. The combination of total rock and mineral data for the formation gives a well-constrained Rb-Sr age of 1688 ± 13 Ma with an initial $^{87}\text{Sr}/^{86}\text{Sr}$ value of 0.7044 ± 0.0004 (Page et al., 1980). This age cannot be ignored and is considered here to be the minimum age for the Oenpelli Dolerite in the Nabarlek area. The formation also has a SHRIMP U-Pb baddeleyite date of 1723 ± 6 Ma (Ferenczi et al., 2005), however, geochemical and geophysical data suggest several phases of intrusion throughout the region and is here regarded as the maximum age for the Oenpelli Dolerite.

Emplacement of the Oenpelli Dolerite had a pronounced thermal effect within the Kombolgie Subgroup, with the promotion of fluid flow and aquifer or aquitard modification. Localised effects in the sandstone include silicification, desilicification, chloritisation, sericitisation, and pyrophyllite alteration. A characteristic mineral assemblage of prehnite-pumpellyite-epidote has formed in the quartzofeldspathic basement rocks adjacent to the intrusions.

**Tenement Geology**

Almost half of the Nabarlek project area is part of the Myra Inlier and is covered with outcropping Mamadawerre Sandstone, which forms the sandstone escarpments and dissected pavements. In the absence of outcropping Mamadawerre Sandstone, the underlying metamorphic basement rocks or Oenpelli Dolerite are largely obscured by sandy colluvium or are heavily lateralized.

The Kudjumarndi Quartzite is the oldest unit in the Nabarlek tenements and crops out in the central to northern part of the project area. The quartzite is overlayn by the Cahill Formation near the Nabarlek mine and in the Myra Inlier. These formations are intruded by the granites included in the Nimbuwah Complex, the Nabarlek Granite, Tin Camp Granite, Zamu Dolerite, Oenpelli Dolerite, and Maningkorirr Phonolite (listed in decreasing age). Amphibolite in the basement is commonly observed in drill holes in the project area, and is assigned to the Zamu Dolerite.

The unconformity between the Mamadawerre Sandstone and underlying rocks is sharp and generally flat-lying, although localised channels cut underlying rocks. Such channels tend to be filled with pebble to cobble conglomerate consisting of rounded to sub-rounded quartz pebbles, cobbles and rare boulders, quartzite, and rare clasts of schist and gneiss.

**Exploration Target**

The focus of exploration on the Nabarlek project area is the discovery of unconformity-style uranium deposits. The prospective nature of the Alligator Rivers region is demonstrated by the presence of economic uranium occurrences at Ranger, Jabiluka, Koongarra and Nabarlek. In addition, significant gold, and platinum group elements (PGEs) occurrences are present in uranium deposits such as at Ranger, Jabiluka, Koongarra and Coronation Hill, which suggesting that economic Au and PGEs could be present in the project area.

Despite local variations in structural fabrics, host rocks, element associations, all the known uranium deposits in the Nimbuwah Domain of the Pine Creek Orogen are located close to the unconformity between basement rocks and the Kombolgie.
Subgroup. In several examples, down-faulted blocks of the subgroup, such as at the Ranger No 3 orebody and the Hades Flat Prospect, are present adjacent to the mineralization. This characteristic of the mineralization is considered to be indicative of a favourable setting for the concentration of mineralizing fluids, irrespective of the deposit-style model being invoked in understanding the uranium mineralization in the region mineralization.

EXPLORATION WORK ON SURRENDERED EL24372 FOR 2004-2008

Outcrop sampling and processing was performed using Cameco standard exploration methodology, as outlined in Appendix 1, which describes laboratory techniques and methods, reflectance spectroscopy techniques used, and lists the elements assayed. All outcrop samples were submitted to Northern Territory Environmental Laboratories (NTEL) in Darwin for geochemical analysis. The laboratory sample preparation, analytical methods and techniques and analysed elements can also be found within Appendix 1.

Appendix 1: Cameco Standard Outcrop Sampling and Processing Procedures

Stream sediment samples were submitted to Amdel Laboratory in Adelaide.

All relevant digital data is included in the data directory of the CD containing this report.

Outcrop Sampling and Reconnaissance

During the period of exploration, helicopter-supported outcrop sampling, stream-sediment sampling and reconnaissance investigations were conducted. A total of 15 outcrop and four stream-sediment samples were collected and one mapping site was recorded during the period of tenure. A summary of the outcrop sample locations is presented in Table 1 and a location map is given in Figure 4.

Table 1: Outcrop Sample Locations

Figure 4: Outcrop Sample Locations

The following tables details the data and results for the outcrop and stream-sediment samples collected during the term of exploration tenure.

Table 2: Outcrop Sample Descriptions and Properties
Table 3: Outcrop Sample Geochemistry Results
Table 4: Stream Sediment Geochemistry Results

The best results were obtained from ferricrete samples NA07019 and NA073004 with 23.7 and 7ppm U³O₈, respectively, and associated elevated base metals (sample NA07019 contains 95ppm Cr, 126ppm Cu, 30.2ppm Ni, 54ppm Zn, and 608ppm V; NA073004 contains 575ppm Cr, 23.2ppm Ni, 28ppm Zn and 460ppm V). The results, while anomalous within the data-set are not indicative of any economic mineralizing hydrothermal processes, and no further work is recommended.
The results of the stream-sediment sampling were not above expected background levels.

**Geophysics**

In June 2006, Fugro Airborne Surveys Pty Ltd (Fugro) conducted a TEMPEST survey over the surrendered EL24372 and surrounding areas (refer to Appendix 2 for the logistics report and Figure 5 for location of the survey). The survey was designed to complete coverage over the entire Nabarlek project area by adding to previous surveys. The survey was conducted at a flight height of 120 m and line spacing of 200 m (Appendix 2).

No TEMPEST anomalies requiring further work were identified within the surrendered EL24372.

**Appendix 2: TEMPEST Logistics Report**

**Figure 5: TEMPEST Survey**

All relevant digital data is included in the data directory of the CD containing this report.

**CONCLUSIONS**

The TEMPEST survey conducted in 2006 did not help in the identification of possible geophysical targets.

Outcrop and stream-sediment sampling did not identify any anomalous uranium or hydrothermal alteration that indicated proximity to economic uranium mineralising processes.
BIBLIOGRAPHY


