



**FINAL AND ANNUAL REPORT ON**  
**EL 24549**  
**PINE CREEK, NORTHERN TERRITORY**  
**FOR THE PERIOD**

**23 SEPTEMBER 2017 - 15 June 2018**

**TENEMENT HOLDER: ELEMENT 92 PTY LTD**

Pine Creek SD52-08 1:250,000 Geological Map Sheet

Pine Creek 5270 1:100,000 Geological Map Sheet

McKinley River 5271 1:100,000 Geological Map Sheet

**TARGET COMMODITIES: Uranium, Base Metals, Gold, Graphite**

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## SUMMARY

Exploration Licence 24549 is located about 30 km NE of Pine Creek, Northern Territory. The Licence was granted on 23/09/2005 to Imperial Granite and Minerals Pty Ltd and was expected to expire on 22/09/2018. However, due to lack of mineral potential, the tenement was surrendered on 15 June 2018. Originally, It had 136 blocks and after successive reductions now the EL consists of 18 blocks. Element 92 Pty Limited (a wholly owned subsidiary of Thundelarra Limited) purchased the Licence from Atom Energy Limited/Excelsior Gold Limited in 2012.

The project area is located within the central part of the Pine Creek Orogen (PCO) which is a tightly folded sequence of Paleoproterozoic rocks, 10km to 14km in thickness, laid down on a rifted granitic Archaean basement during the interval ~2.2-1.87Ga. In the project area, rocks of the Masson Formation, Mundogie Sandstone, Mount Bonnie Formation along with members of Cullen Batholith (Allamber Springs, Frances Creek, McCarthy's and Minglo granites) are exposed. During the Top End Orogeny (1870 – 1780 Ma), the sequence was tightly folded and pervasively altered with metamorphic grades averaging greenschist facies to phyllite.

Exploration work undertaken by Thundelarra Limited/Element 92 during the reporting period consisted of comprehensive geological, structural and lithostratigraphic assessment of the previous data. This exercise downgraded the mineral potential of the project area. During the term of the License, the project area was explored by collecting and interpreting historical exploration data, which identified mineral potential for uranium, base metals and graphite mineralisation. The project area was explored by geological mapping, geochemical sampling, airborne and ground geophysical surveys, several campaigns of drilling, data processing and interpretation. In the final year of the tenure, assessment of the project area downgraded the potential for finding any economic size mineral deposit for mining. As a result, EL 24549 was surrendered on 15 June 2018. Rehabilitation was completed for previous and current drill holes. They were plugged and the drill pads and access roads (total approximate length of 1.7km) were ripped by a grader.

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## **1. INTRODUCTION**

Exploration Licence 24549 is located approximately 30 km NE of Pine Creek, Northern Territory (Figure 1). Element 92 Pty Limited (a wholly owned subsidiary of Thundelarra Limited) purchased the Licence from Atom Energy Limited/Excelsior Gold Limited in 2012. EL 24549 was granted on 23/09/2005 and after successive renewals it was expected to expire on 23/09/2018. However, due to lack of mineral potential the tenement was surrendered on 15 June 2018. This is the final and annual report for EL 24549.

## **2. LOCATION AND ACCESS**

EL 24549 is located approximately 175 km SSE of Darwin and approximately 30 km NE of Pine Creek (Figure 1). The tenement can be approached by roads and tracks leading off the Kakadu Highway. It can also be accessed from the Mary River Homestead Road which leads off from the Kakadu Highway. Vehicle access within the tenement is possible by station tracks which may be impassable during wet season.

## **3. TENEMENT DETAILS**

EL 24549 was applied for by Imperial Granite and Minerals Pty Limited on 17 January 2005, and was granted on 22 September 2005 for a period of 6 years. It originally had 136 graticular blocks with an area of approximately 451.7 km<sup>2</sup>. The tenement changed hands in 2008 and was purchased by Excelsior Gold Limited/Atom Energy Limited. In 2009, Element 92 Pty Ltd, acquired uranium exploration rights. In 2012, Element 92 purchased the tenement along with other assets in the Allamber area. The licence has been subjected to several reductions and now has only 18 blocks.

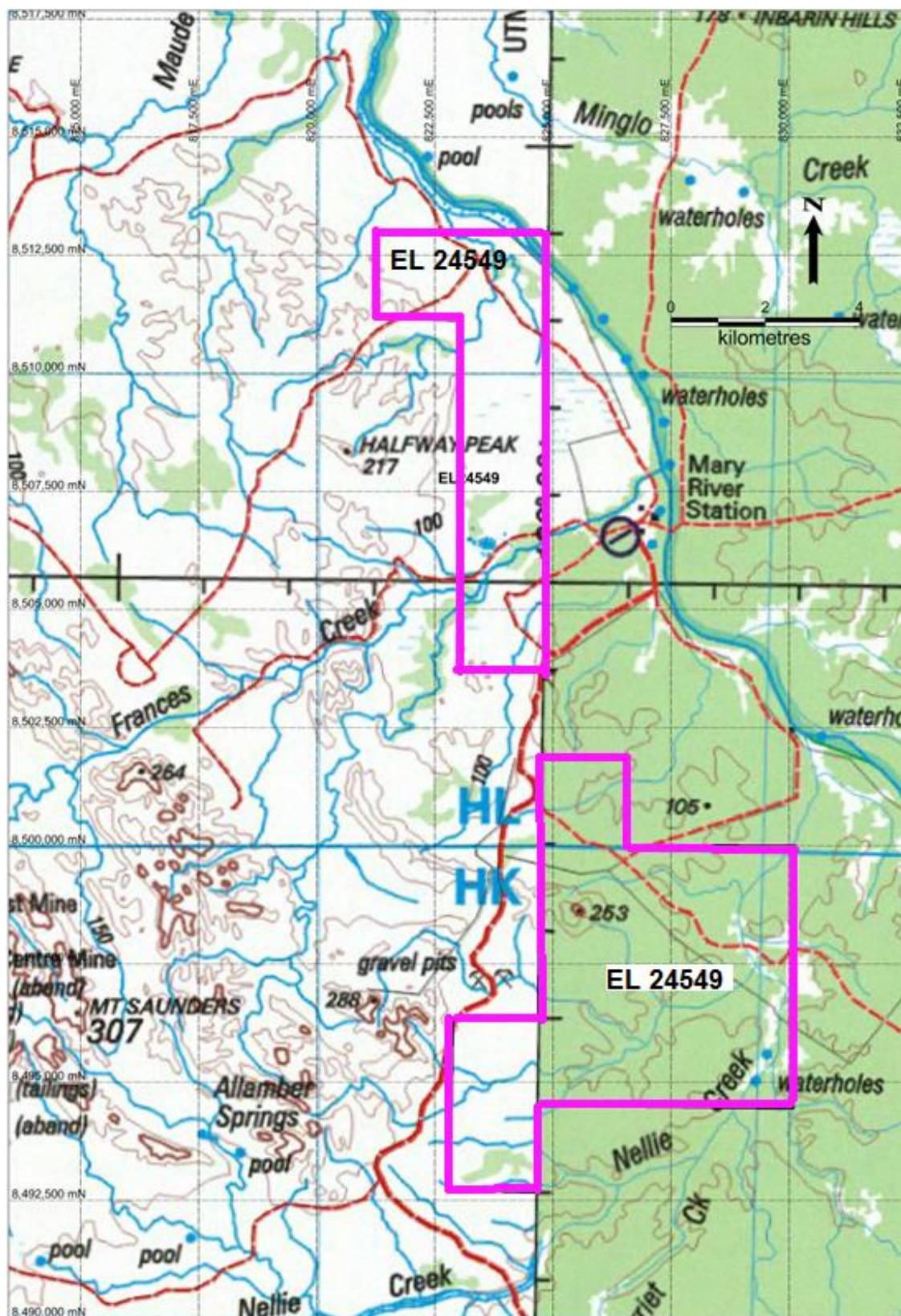


Figure 1: Location of Project Area, current EL24549

## 4. GEOLOGICAL SETTING

The project area is located within the central part of the Pine Creek Orogen (PCO) which is a tightly folded sequence of Paleoproterozoic rocks, 10km to 14km in thickness, laid down on a rifted granitic Archaean basement during the interval ~2.2-1.87Ga (Ahmad et al. 1993). The sequence is dominated by pelitic and psammitic (continental shelf shallow marine) sediments with minor inter-layered tuff units. Pre-orogenic mafic sills of the Zamu Dolerite intruded the sequence prior to regional metamorphism and deformation.

During the Top End Orogeny (1870 – 1780 Ma), the sequence was tightly folded and pervasively altered with metamorphic grade averaging greenschist facies to phyllite. The Cullen intrusive event introduced a suite of fractionated calc-alkaline granitic magma into the sequence in the period ~1.85-1.78Ma. These high temperature I-type intrusives induced strong contact metamorphic aureoles ranging up to (garnet) amphibolite facies to more extensive biotite and andalusite hornfels facies.

Figure 2 shows geology of the project area where lithologies of Namoon Group (Masson Formation), Mount Partridge (Wildman Siltstone, Mundogie Sandstone), South Alligator Group (Koolpin Formation, Gerowie Tuff and Mt Bonnie Formation) and Finniss River Group (Burrell Creek Formation) are exposed. These meta-sedimentary sequences have been intruded by members of the Cullen Batholith and Zamu Dolerite at places (Bajwah, 1994).

The Masson Formation is the oldest rock unit which is exposed in the NE corner of EL 24549, and has been intruded by the Minglo Granite. It is a thick sequence of carbonaceous phyllite, slate, siltstone and dolomite. The dolomitic sediments are exposed towards the base of the formation. Some massive ironstone and muscovite-tremolite marble horizons are also present. The Masson Formation hosts significant uranium mineralisation in the south at Cleo's, Twin and Dam. In addition, it also contains some occurrences of base metals mineralisation, including malachite-bearing schist at Hatrick.

Much of the relinquished part of the project area has at least 2 members of the Cullen Batholith. These are Minglo Granite and Frances Creek Granite (Figure 2).

The Paleoproterozoic Allamber Springs Granite is one of the significant plutonic bodies, genetically related to gold, uranium and base metals mineralisation in the adjacent contact zone (Bajwah 1994). 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.

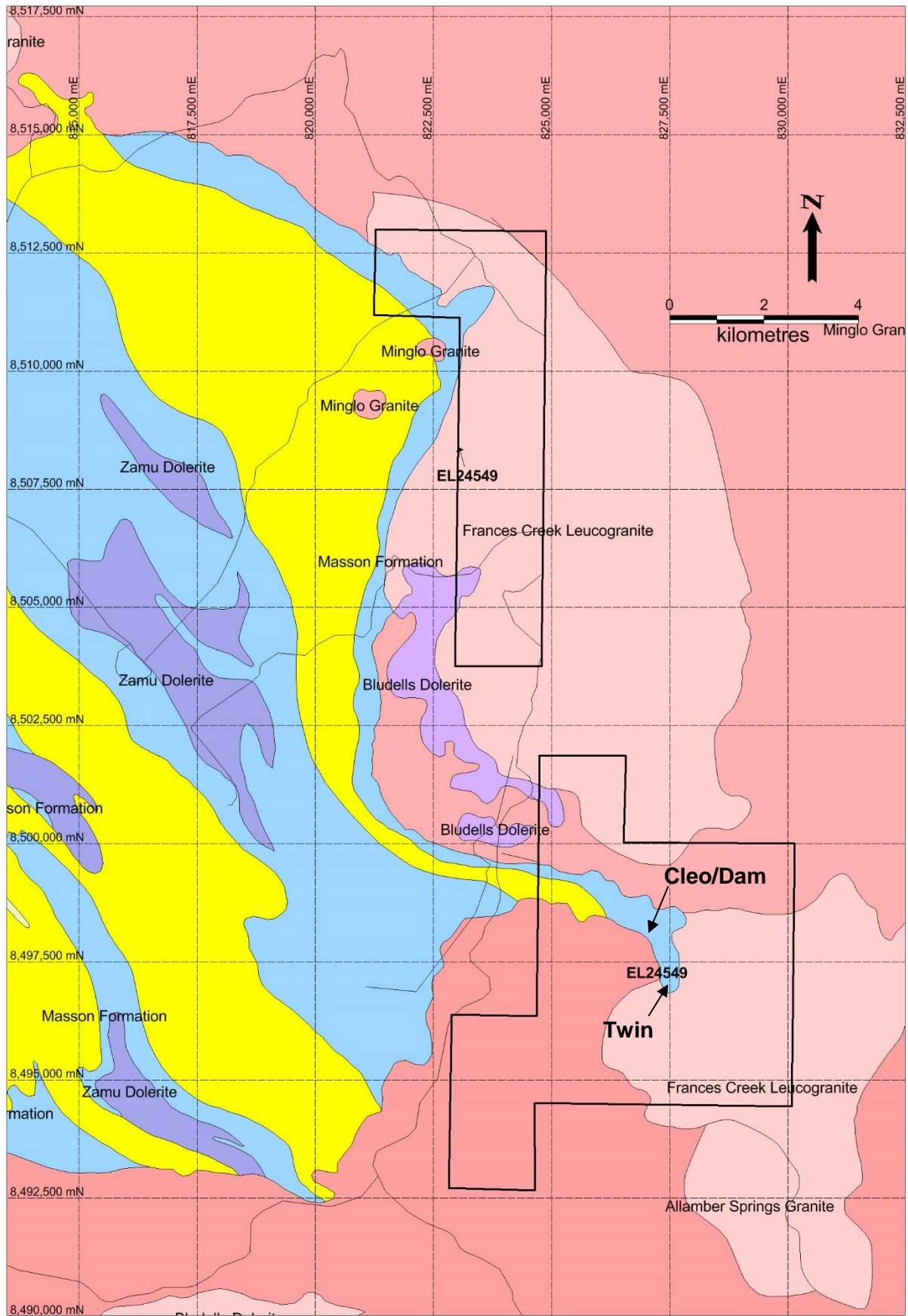


Figure 2: Geological setting of the project area (EL illustrated in black)



## 5. PREVIOUS EXPLORATION HISTORY

The project area has been explored since 1960's when first edition geological map of the Pine Creek was produced, documenting the geology and mineral potential of the project area. Between 1987 – 1993, metallogenic study of the Pine Creek (1: 250,000) sheet was undertaken (Ahmad et al.,1993) which provided detail geological and geochemical investigations of part of the project area. Bajwah (1994) published a report on the Cullen Batholith which investigated details of petrological and geochemical characters of the members of the Cullen Batholith and its relation with gold, base metals and uranium mineralisation in the adjacent meta-sediments.

Total Mining Australia (formerly Minatome Aust Pty Ltd) carried out a reconnaissance survey of the Pine Creek Orogen in 1981-82, covering part of the project area. Anomalous radiation in the area led to the discovery of Cleo's uranium deposits. The Cleo's group of uranium deposits/prospects (Figure 2) are located in the central of EL24549. EL4414, covering the anomaly and surrounding area, was applied for on 12 August 1983 and subsequently granted in January 1984.

Total Mining Australia commenced exploration on EL4414 in 1984. In 1987/88 a joint venture with PNC (Australia) Pty Ltd was formed and in 1988 the joint venture applied for Exploration Retention Lease 84 to cover the known uranium mineralisation at the Cleo, Dam and Twin prospects. This licence was granted on 16 December 1988 for a period of 5 years. The area of the licence was 300 hectares and it was granted on the grounds that ERL 84 contained an anomalous zone of possible economic importance.

The Twin and Dam uranium deposits were discovered in the mid 1980's by Total Mining. From 1984 to 1988 Total Mining carried out an extensive exploration program which included geological mapping, ground radiometric surveys, soil radon (Alphacard) determinations, ground magnetic surveys, EM conductivity surveys, a stream sediment orientation survey, trenching and drilling. A total of 15,369m of drilling was completed in 367 holes and included 682m of auger drilling, 13,569m of percussion drilling and 1,118m of diamond drilling. Based on this drilling, Total Mining estimated the two deposits contained pre-resource mineralisation of 740 tonnes of  $U_3O_8$ .

Exploration activity was suspended when Total Mining's French parent company withdrew from exploration in Australia and no uranium exploration has been carried out on the project since the late 1980's.

Other anomalies, including Cleo's East, Lunch Creek, Cliff, Theatre, Theatre East, Mercedes, Twin South, Dam North and Dam South anomalies were located by geophysical prospecting methods. Preliminary drilling to test these anomalies encountered only minor mineralisation, with hole ALL-P-353 intersecting 0.10m of 0.119% U<sub>3</sub>O<sub>8</sub> at a depth of 20.2m.

In April 2007 Atom Energy Ltd ('Atom') acquired the tenement from Imperial granite and Minerals Pty Ltd and Robert Bruce Cleaver. Atom raised \$10 million dollars and listed on the ASX on 26 June 2007. During 2007-8, Atom Energy Ltd carried out 5,291m of reverse circulation drilling in 88 holes. Of this 3,356m in 56 holes were drilled at the Twin Prospect and 1,192m in 32 holes were drilled at the Dam project. A further 580m in 9 holes were drilled at the Hill 20 (Cliff) prospect area, some 350m to the north of Twin. A second stage of drilling conducted in late 2008 comprised one diamond drill hole for 236m, located on the eastern margin of the Twin prospect.

## **6. EXPLORATION ACTIVITY DURING THE TERM OF THE LICENCE**

Exploration work undertaken by Thundelarra Limited/Element 92 during the reporting period consisted of comprehensive geological, structural and lithostratigraphic assessment of the previous data. This exercise downgraded the mineral potential of the project area. During the term of the License, the project area was explored by collecting and interpreting historical exploration data which identified mineral potential for uranium, base metals, gold and graphite mineralisation. The project area was explored by geological mapping, geochemical sampling, airborne and ground geophysical surveys, several campaigns of drilling, data processing and interpretation. Rehabilitation was completed for previous and current drill holes. They were plugged and the drill pads and access roads (total approximate length of 1.7km) were ripped by a grader.

### **2005 – 2006**

In the first reporting period, a desktop study was undertaken to assess the mineral potential of the project area (Benger, 2006). A field trip was undertaken along with a consultant geologist for ground checking and assessing uranium potential of the project area. Previous investigations undertaken by Total Australia indicated narrow, sub-vertical zones of uranium mineralisation within an arcuate N-S to NW-SE trending, steeply dipping zone of brecciated siliceous dolomite and black shale (Figure 3). Some planning for drilling was also undertaken.

### **2006 – 2007**

Atom Energy Limited acquire the rights to explore the project area and commenced mineral assessment of the tenement (Hackett, 2007). Exploration activities within the tenement included:

- Compilation of historical data into database
- Validation of historical assays and logs
- Digitising and translation of historical downhole gamma logs into digital format for use in resource estimation.
- Surveying of existing historical drill holes for inclusion in database
- Generation of targets for RC drilling program comprising some estimated 90 holes to be targeted in the Twin and Dam areas.

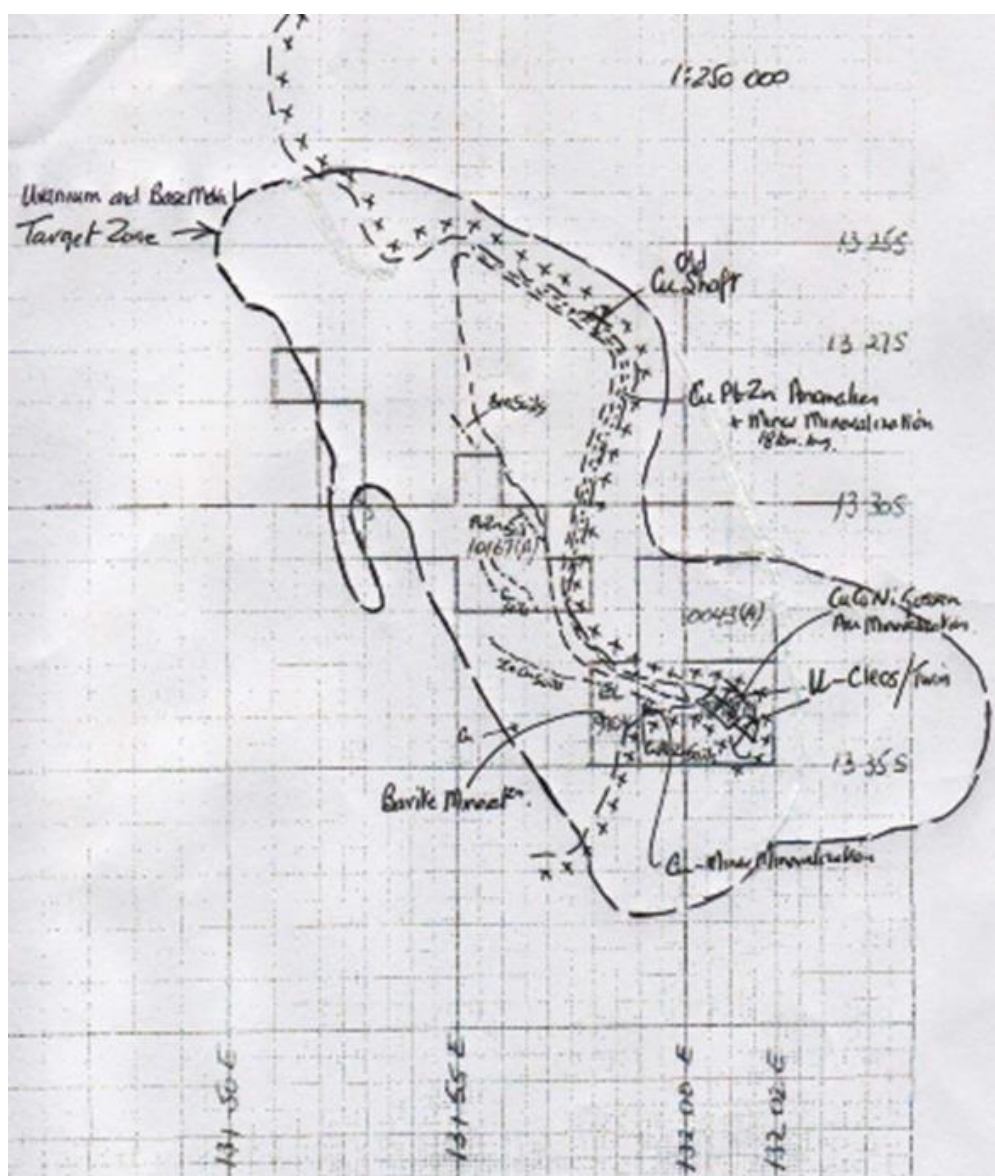
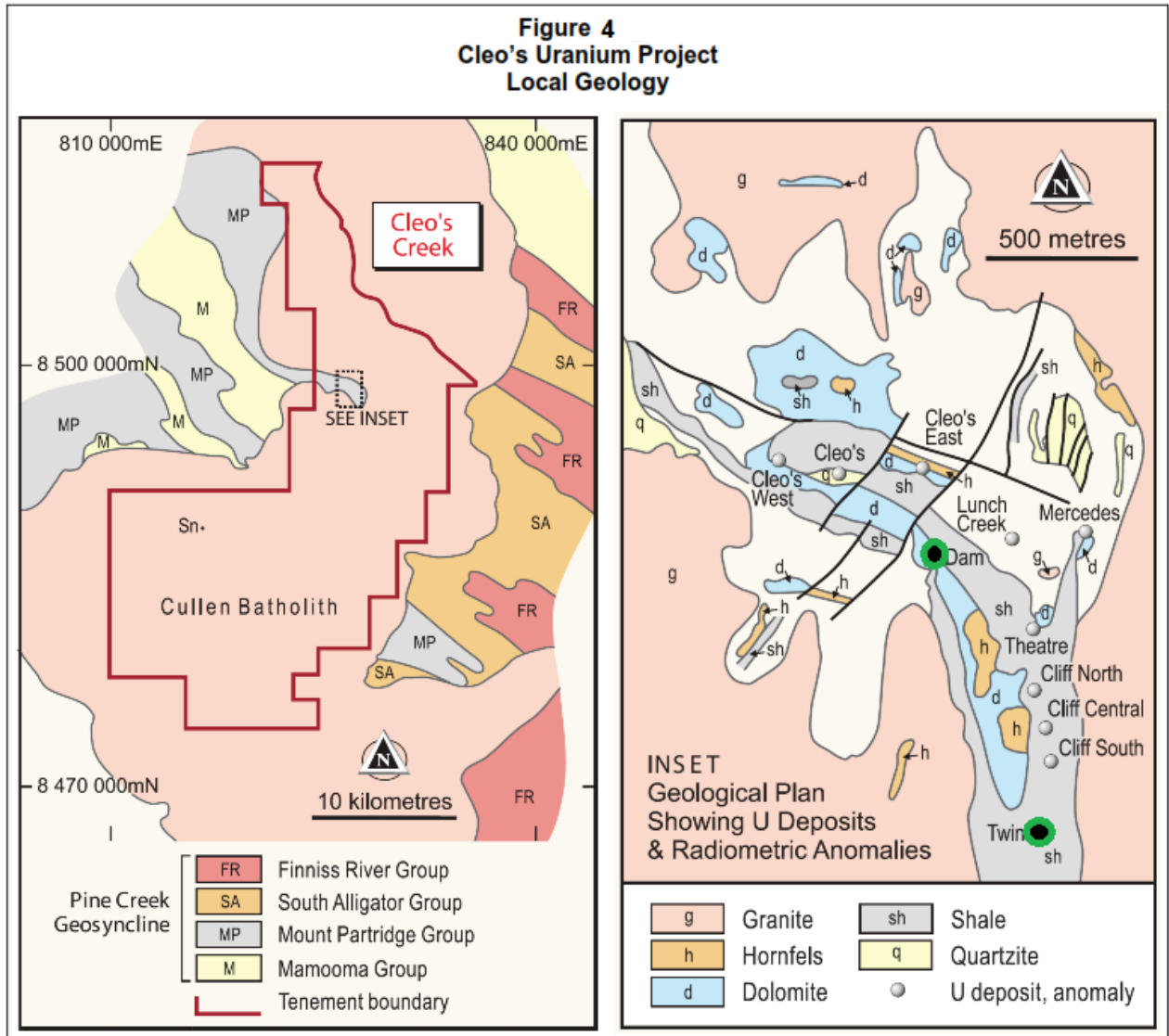


Figure 3: Possible style of mineralisation in the project area (Benger, 2006)

**2007 – 2008**

During the year under review, Atom Energy Limited commenced drilling program at Cleo’s project area located within EL 24549 covering Dam and Twins prospects. It included 88 RC drill holes for 5291 m. Of which 56 holes for 3356 m were drilled at the Twin prospect and 32 holes for 1,192m were drilled at the Dam Prospect. Figure 4 shows the location of the Cleo’s uranium project with local geology. A further 580m in 9 holes were drilled at Hill 20, some 350m to the north of Twin. All the data are given in (Lennartz, 2008).



**Figure 4: Geological setting of the Cleo’s uranium project area (from Lennartz, 2008)**

Based on this drilling program, Coffee Mining was commissioned to conduct uranium resource estimate for the Cleo’ project area (Twins and Dam prospects). Table 1 represent the Total Resource to 100 ppm U<sub>3</sub>O<sub>8</sub> lower cut-off for the mineralisation of the Cleo’s Project (Twins and Dam prospects).

**Table 1: Cleo's Uranium project Inferred Resource estimate**

<b>Table Cleo's Uranium Project Dam and Twin Deposits – Inferred Resource Estimate</b>		
<b>Prospect</b>	<b>kt</b>	<b>Grade (U<sub>3</sub>O<sub>8</sub> ppm)</b>
Dam	585	286
Twin	824	316
<b>Total</b>	<b>1,409</b>	<b>304</b>

Resources are reported at a lower cutoff of 100ppm U<sub>3</sub>O<sub>8</sub>

All zones were estimated by Ordinary Kriging in 40m NS by 10m EW by 10m RL panels

Note: Figures have been rounded

### 2008 – 2009

During this period, Element 92 Pty Ltd, a wholly owned subsidiary of Thundelarra Limited took control of EL 24549 and commenced exploration program under JV agreement. This program focused on identifying new uranium anomalies and targets. Geological reconnaissance and mapping was complimented by geophysical surveying (ground magnetics and radiometrics, and airborne Tempest EM), to provide a basis for future exploration within the tenement. During ground magnetic survey, a total of 130 line kilometre data were capture. Ground radiometric survey identified a number of anomalous areas (Figure 5), including the known Twin, Dam and Hill 20 (Cliff) prospects (Atwell, 2009). A number of anomalous areas around the Cleo's prospect were also identified.

### 2009 – 2010

After a technical review of all available data, Element 92 Pty Ltd conducted a dedicated exploration program to test the mineral potential of the project area. It included geological mapping, petrography, RC drilling and a detailed airborne radiometric/magnetic survey. During geological mapping around the Twin prospect, a sequence of metasedimentary ridges (arenite, schist, silicified dolomite) and north-south striking fault zones (marked by cockscomb texture quartz or quartz breccia with iron matrix) appear to be offset by north-easterly trending faults. These faults, together with late stage microgranite intrusions (which crop out near the western sediment/granite contact) are thought to play an important role in controlling uranium mineralisation. Slickensides were noted on the western contact of the meta-sediments with the Allamber Springs Granite, while hornfels was noted near the eastern contact (De Keever, 2010).

A magnetic/radiometric airborne survey was completed in August 2010 over some of the most prospective areas of the Allamber Project, including the Cleo's area.

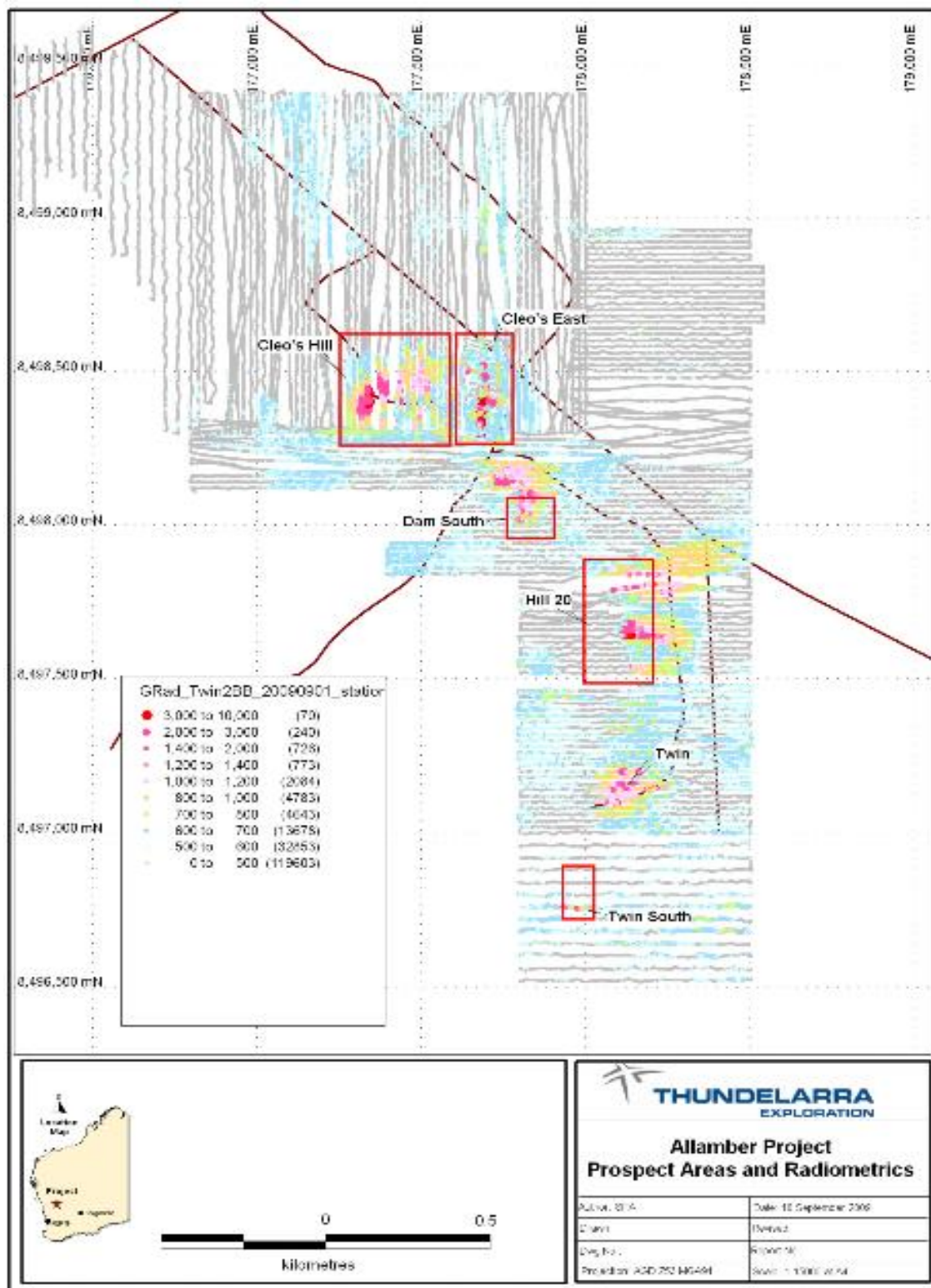
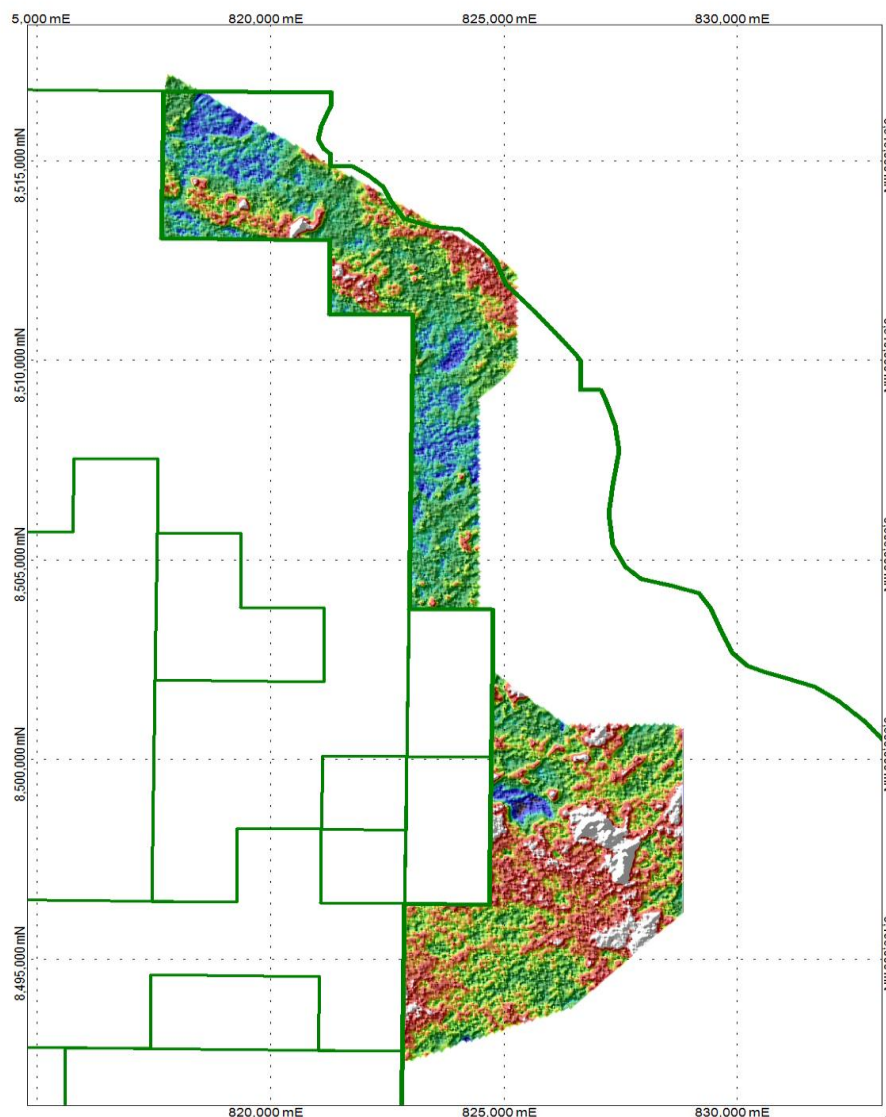


Figure 5: Ground Radiometrics (CPS) of the project area

The survey was designed to improve the Company's understanding of the geology including structures controlling uranium mineralisation and to identify new uranium targets. Figure 6 display radiometric image of the project area.



**Figure 6: EL24549 2010 Radiometric Survey (preliminary data). U\_NW Shade\_L.**

The Cleo's, Dam, Hill 20 / Cliff, Twin and Big Buff prospects were selected for drill testing and a reverse circulation (RC) drill program commenced in September 2009. Drilling was carried out by Johannsen Drilling from Darwin, and 15 holes for 1519m were completed. Several holes were abandoned due to difficulty in drilling through highly weathered magnesium clays after dolomite. Further drill testing in these areas may require diamond drilling technique.

## 2010 – 2011

Thundelarra Limited/Element 92 Pty Ltd continued exploring the tenement for uranium and base metal mineralisation during the reporting period. Main activities included detailed geological mapping, geochemical sampling, RC drilling and high resolution geophysical survey (radiometric and magnetic), together with historical data compilation. Detail mapping of Twin and Dam prospects revealed a southerly plunging anticline contrary to the previous interpretation which indicated presence of syncline with most drilling angled at perpendicular to the interpreted bedding. A number of fault zones consisting of brecciated quartz veins (+/- cockscombe texture quartz infilling vughs) were identified (Figure 7). These outcrops were previously identified by Total as silicified dolomite lenses (Bajwah and de Keever, 2011).

In the light of the significant copper intersection returned from TAL024RC, a detailed soil sampling program (100m x 25m and 100m x 50m) was conducted in June 2011 over the Twin-Dam (Cleo's project) area. Sampling was completed on EW lines in order to identify mineralisation which may have moved along NE trending structures, in addition to NS and NW trending lithological contacts and faults. A total of 716 samples were collected and assayed for uranium and base metals mineralisation. In the project area, a total of 18 RC holes were drilled for 1667 m (Figure 7). A number of intersections returned significant uranium and copper mineralisation (Bajwah and de Keever, 2011). Thundelarra Limited/Element 92 also undertook rehabilitation of approximately 90 drill pads which were constructed during drilling undertaken by Atom Energy Limited as previously reported.

## 2011 – 2012

During the year under review, a dedicated exploration program was undertaken to test the mineral potential of the project area, with specific focus on minerals systems along the contacts with the granitic bodies. Exploration program involved geological mapping, high resolution geophysical survey, soil/rock chip sampling, drilling and assaying. A total of 23 reverse-circulation (RC) holes for 2,877 metres were drilled within EL 24549 and around Hatrick Prospect in the north, and Dam, Cleo's, Cliff, South Cliff, Twin and Lucas Prospects to the south. All data are given in Bajwah and Mill (2012). Geological mapping was undertaken at Hatrick and South Cliff Prospects. Ground geophysical surveys (magnetic, radiometric and gravity) were completed at various prospects within this EL.

Drilling at Hatrick intersected significant copper mineralisation in several holes within the prospect with a peak intercept of 19 metres at 1.94% copper. Drilling at Cliff South intersected ore-grade uranium mineralisation in several holes with a peak intercept of 8 metres at 1579 ppm U<sub>3</sub>O<sub>8</sub> (Bajwah and Mill (2012)). At Cliff South, apparently significant graphite mineralisation was also encountered.



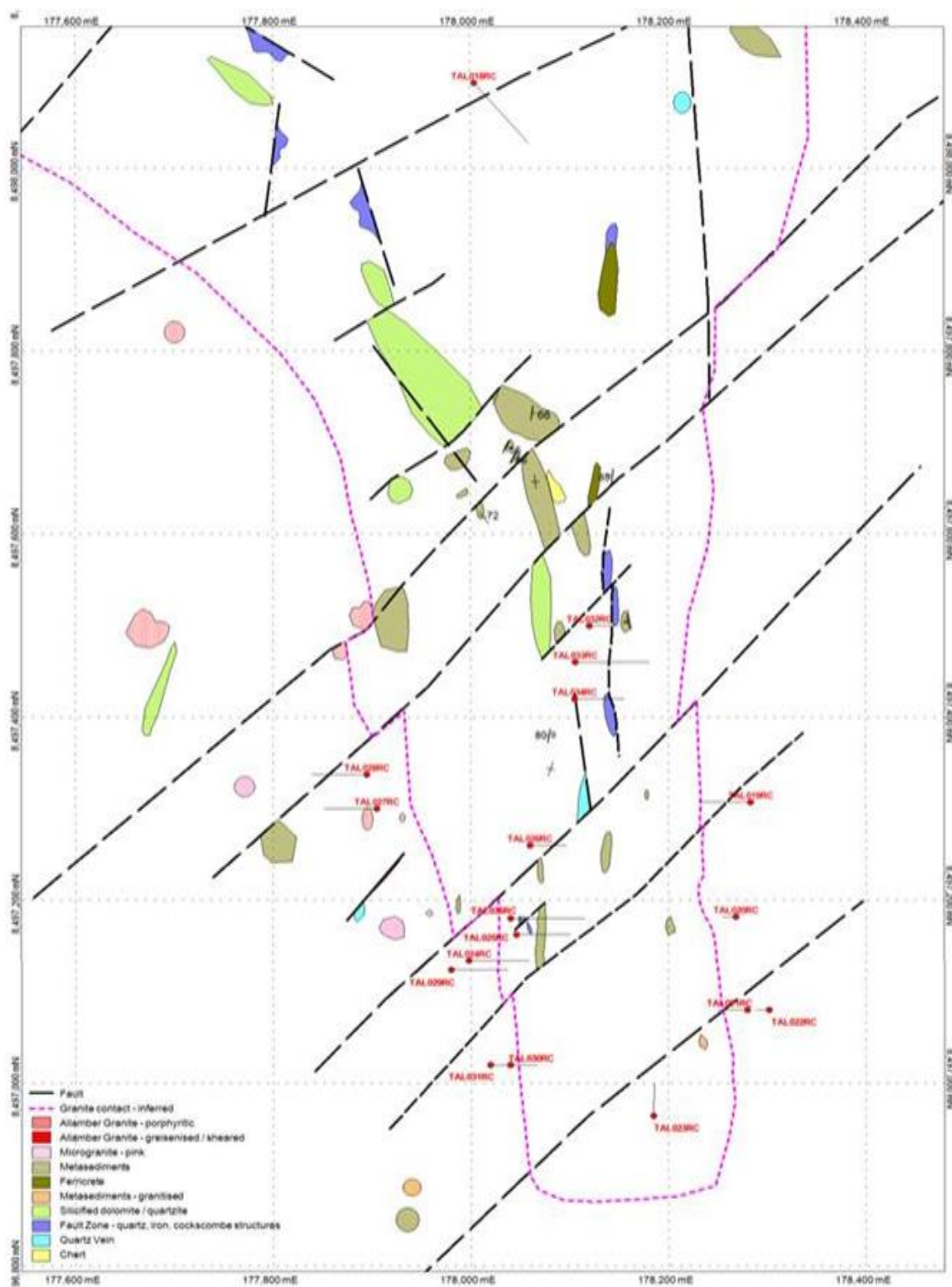


Figure 7: Geological mapping of Allamber Embayment area with collar location

### 2012 – 2013

During the reporting period exploration consisted of soil sampling, auger soil sampling, prospect mapping, rock chip sampling, down-hole geophysical surveys and RC drilling. 20 conventional soil samples were collected at The Lead Prospect, 96 Auger soil samples at Hatrick Prospect and 13 rock-chip samples were collected in The Allamber Embayment. Down-hole EM was undertaken in one hole at Cleo's Prospect (Mees, 2013). In addition, down-hole gamma logging was completed or attempted in 17 holes in the Cliff South and Lucas prospect areas. 7 RC holes for 889m and 251 samples were collected for assaying from Cliff South, Lucas and The Lead Prospect (Figure 8). Significant uranium mineralisation was intersected at Cliff South prospect.

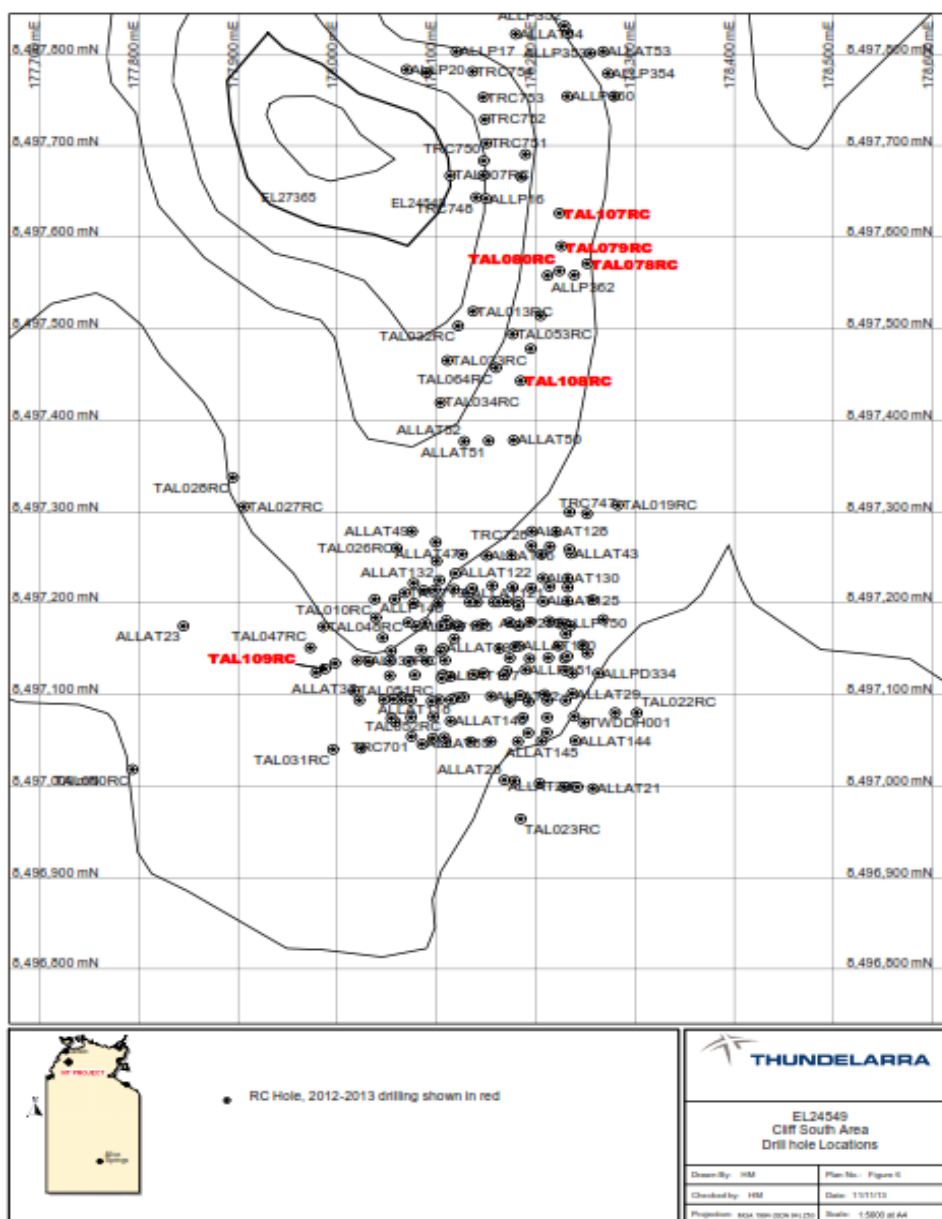
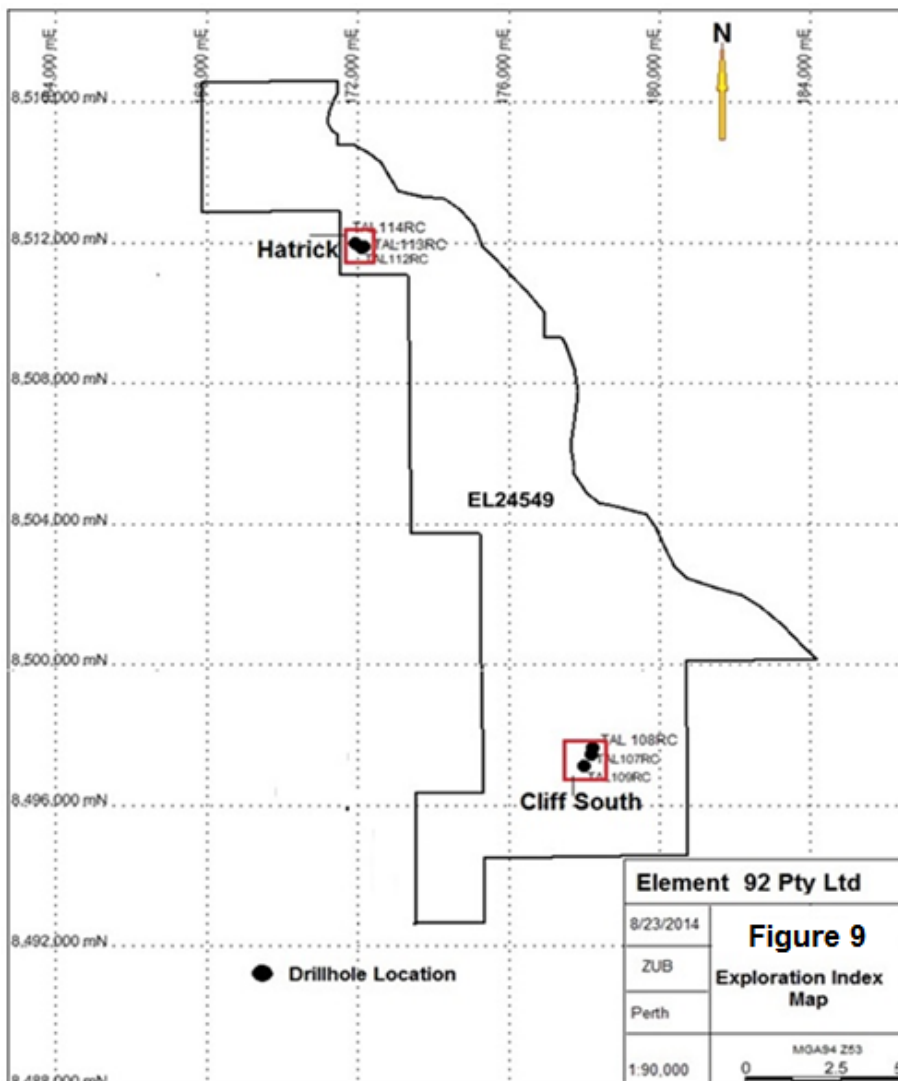


Figure 8: Location of RC drill hole (red) drilled during 2012 – 13 reporting period

**2013 - 2014**

The main activities during the reporting year included appraisal of available data, prospect scale mapping and modelling and drill-testing of exploration targets. It involved drilling of 6 RC holes for 552 m at Hatrick and Cliff South prospects (Figure 9). Much of the exploration efforts in this report have been directed at Hatrick and South Cliff prospects to identify new uranium and copper resources. Drilling at South Cliff and Hatrick intersected new areas of uranium and copper with 49 m at 787 ppm (1.17 lb/t)  $U_3O_8$  from 58 m to 107 m; including 17 m at 1286 ppm (2.8 lb/t)  $U_3O_8$  and 0.06% Cu from 78 m to 95 m in drillhole TAL107RC.



**Figure 9: Location of drill holes with in EL 24549**

To date, exploration programs undertaken in the Allamby Project area has shown significant potential for base metals, gold and uranium mineralisation. EL 24549 has returned good intersections of uranium and Cu mineralisation, and appraisal of exploration data demonstrates that mineralisation is open along strike and with depth. Geological, geochemical and geophysical data support the mineral potential of the project area. Therefore, it was recommended that company continues exploring EL 24549 to define new areas of uranium and base metals mineralisation.

### 2014 – 2015

Exploration work undertaken by Element 92 during the reporting period consisted of comprehensive geological, structural and lithostratigraphic assessment of the previous data. Existing petrology, geochemistry and geophysical data sets were also used to delineate potential graphite targets along the granite contact within metapelitic units.

Six reverse circulation holes were drilled at Hatrick and Cliff South during the reporting period. All drill holes details are shown in Figure 10. Drilling was targeted base metals mineralisation at Hatrick and uranium at Cliff South.

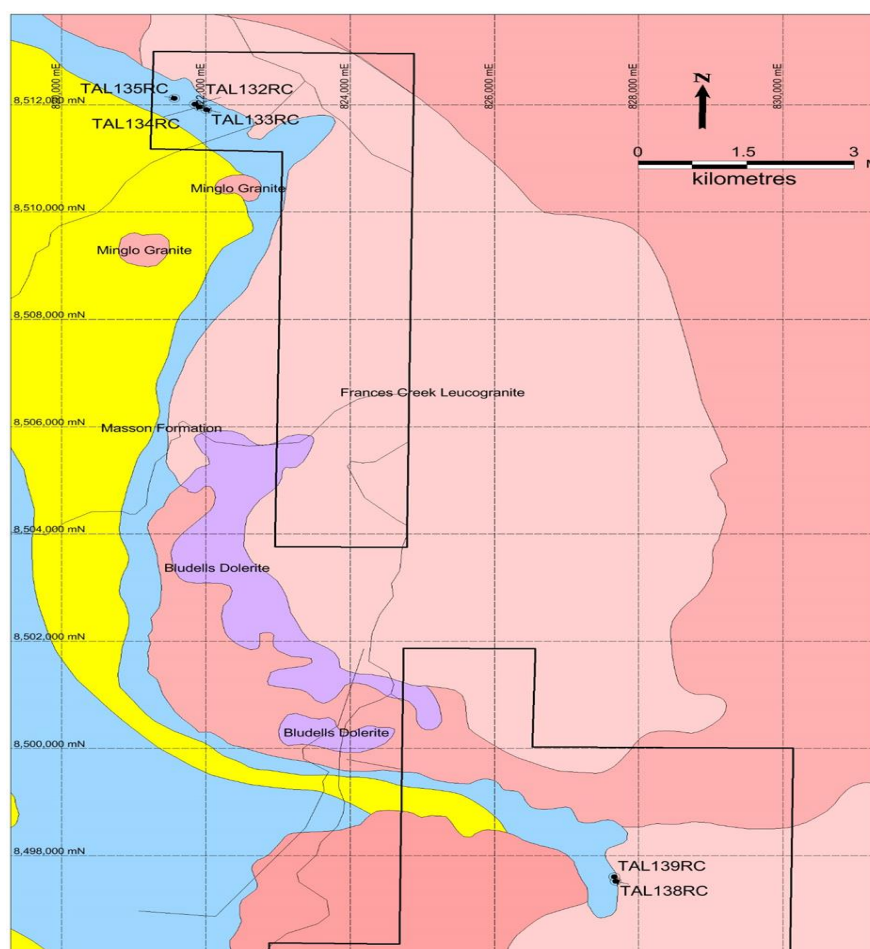


Figure 10: Location of the 6 RC holes drilled during 2014 – 2015 reporting period

The best intersect was 3m at 1.56% Cu from 204-207m at Hatrick downgrading its economic mineralisation potential (Petrella et al., 2015). Uranium have been intersected at Cliff South but not in economic quantities. A review of existing geological, structural, lithostratigraphic, petrological and geochemical data was undertaken in order to define graphite targets for potential drilling in the next reporting period. Holes TAL132-135RC were drilled at Hatrick to test the potential for copper/silver in inferred cross-cutting veins within the graphitic schists hosting the known secondary copper mineralisation. Although numerous granitic dykes and veins associated with quartz veining were intercepted, copper values were low. Again, no magnetite and alteration is present. The highest intersection recorded was 3m at 1.56% Cu from 204-207m in TAL135RC. The magnetic mineral is pyrrhotite, formed during the contact metamorphic process. High arsenic values are present on the selvages of the quartz veins, but gold appears to be absent in the system.

### **2015 - 2016**

Exploration work undertaken by Element 92 during the reporting period has consisted of comprehensive geological, structural and lithostratigraphic assessment of the previous data. Access on the ground was constantly denied by the station owner due to the interference with the hunting activities which are the core of his business. Consequently, only rehabilitation was undertaken towards the end of the hunting season when the site access was allowed. Rehabilitation was completed for all previous 56 holes. They were plugged and the drill pads and access roads (total approximate length of 1.7km) were ripped by a grader (Petrella and Costica, 2016).

### **2016 – 2017**

During the period under review, Thundelarra Limited/Element 92 undertook the reinterpretation of the existing geological data. Element 92 believes that the tenement has potential for graphite mineralisation along the contact between the Masson Formation and Frances Creek Leucogranite. The future exploration will be directed to delineate potential high grade graphitic units around the granitic contact and the extension of the current uranium resource and extension of the base metals mineralisation, along with graphite mineralisation within the project area (Petrella and Vieru, 2016). In addition, some rehabilitation activities were undertaken.

### **2017 – 2018**

In the final year of the EL 24549, Thundelarra Limited/Element 92 Pty Ltd undertook a thorough review of comprehensive geological, structural and lithostratigraphic assessment of the project area, whether further renewal of EL 24549 is feasible for the discovery of any economic mineral deposit of sufficient size to warrant further exploration. After careful data review management reached to the conclusion that it is no more feasible to continue exploring

EL 24549 and the possibility of finding any economic mineral deposit remained remote. As a result of that EL 24549 was surrendered on 15 June 2018.

## 7. CONCLUSIONS AND RECOMMENDATIONS

Exploration work undertaken by Thundelarra Limited/Element 92 during the term of the Licence consisted of comprehensive geological, structural and lithostratigraphic assessment of the previous data. In addition, the project area was explored by collecting and interpreting historical exploration data which identified mineral potential for uranium, base metals, gold and graphite mineralisation. EL 24549 was explored by geological mapping, geochemical sampling, airborne and ground geophysical surveys, several campaigns of drilling, data processing and interpretation. In the final year of the tenure, assessment of the project area downgraded the potential for finding any economic size mineral deposit for mining. As a result, EL 24549 was surrendered on 15 June 2018. Rehabilitation was completed for previous and current drill holes.

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