

**AUSQUEST LIMITED**  
**(ABN 35 091 542 451)**

**FIRST AND FINAL REPORT**

**WATERLOO EL22647**

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## **1.0 SUMMARY**

The Cambrian Kalkarinji Continental Flood Basalts located in the east Kimberley region of Western Australia and the Northern Territory are contaminated by crustal material and are strongly depleted in Ni, Cu and PGE in a similar manner to the basalts associated with the giant Noril'sk Ni sulphide deposits. EL22647 forms part of a larger exploration project exploring for mineralised sub-volcanic intrusions within Proterozoic sedimentary sequences underlying the Antrim basalts.

Interpretation of geological and geophysical data over the western part of the Kalkarinji Province has identified several major ENE-trending structures as potential fissure eruption sites for vast volumes of basaltic magma that formed the Kalkarinji Continental Flood Basalts. Results from recent deep drilling through the Kalkarinji basalt pile 150 km to the south of the EL22647 tenement coupled with new aeromagnetic data within the region has further highlighted the potential of the ENE-trending faults as being a possible feeder structures to Kalkarinji basalts. Magnetic anomalies located close to these structures are thought to reflect feeder-related intrusions near the base of the basalt pile. Such intrusions are likely trap sites for Ni-Cu-PGE sulphides that the geochemistry of the Kalkarinji basalts suggests has been removed from vast volumes of mafic magma (Gole and Ashley, 2003).

EL22647 covers aeromagnetic anomalies that could be shallowly buried sills within the Proterozoic sedimentary sequence immediately below the basalts. It is thought that these could be part of feeder conduits for the basalts that were intruded along or adjacent to a ENE-trending fault that acted as a conduit for magma transfer through the crust.

No fieldwork was undertaken on EL22647 during the reporting period and it is recommended that the tenement be dropped.

## **2.0 INTRODUCTION**

AusQuest has secured title in both the Northern Territory and Western Australia over potential feeder systems to the Kalkarinji Continental Flood Basalts that have been interpreted from available geological and geophysical data. Physical trap sites such as irregularities within the system of feeder dykes and sills represent prime target locations for the accumulation of massive Ni-Cu-PGE sulphides that may have been stripped and concentrated from through-going basaltic magma. The geochemistry of the Kalkarinji basalts indicates that they have been contaminated by crustal material providing a potential trigger for sulphur-saturation. Significantly they are strongly depleted in chalcophile elements (Glass, 2002; Gole and Ashley 2003). These characteristics and the related igneous processes are similar to those that have affected parts of the Siberian flood basalts and which are thought to be related directly to the formation of the giant Ni-Cu-PGE sulphide deposits at Noril'sk.

The Waterloo Exploration Licence (EL 22647) forms part of a larger Antrim Ni-Cu-PGE Project that covers tenements in both the Northern Territory and Western Australia.

### **3.0 TENEMENT ACCESS**

The tenement is located approximately 130 kilometres directly southeast of Kununurra. Access is along the Duncan Highway then, within the tenement, via station tracks or cross-country traversing (Figure 1).

### **4.0 EXPLORATION CONCEPT**

The Kalkarinji Province of northern Australia is a poorly known Continental Flood Basalt terrain of middle Cambrian age (~505 Ma: Glass (formally Hanley), 2002; Glass and Phillips, 2001; Hanley and Wingate, 2000). Early geological work on the basalts was undertaken in the 1960's (Bulitude, 1971, 1976) but it was not until very recently that any substantive geochemical research was undertaken (Glass, 2002).

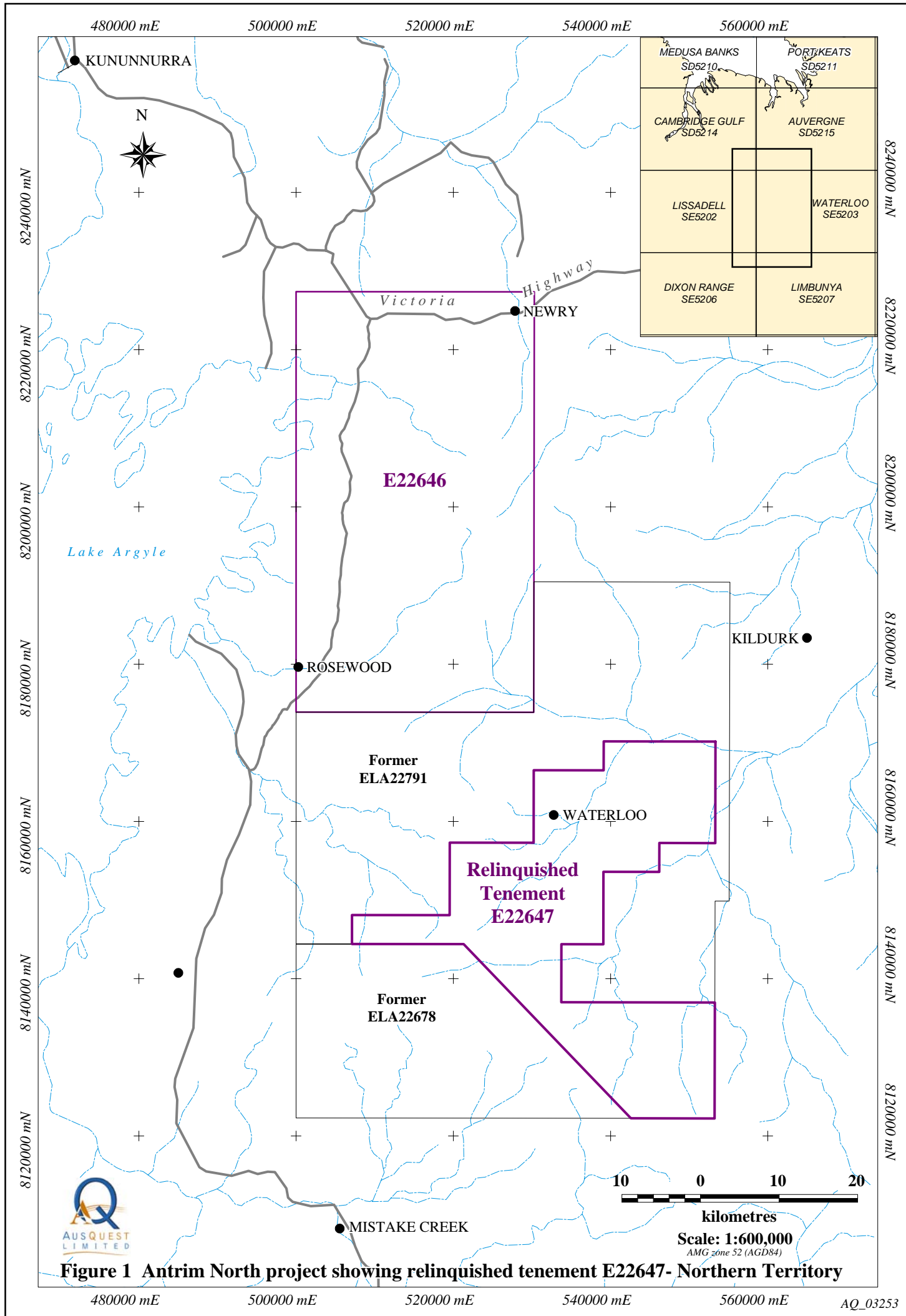
Unpublished geochemical data (Glass, 2002; personnel communications 2000) show strong and unambiguous geochemical evidence for contamination of the extruded magma by crustal material. Further the basalts show marked depletion in Ni, Cu, and PGE contents throughout the province and throughout the stratigraphic section (Glass, 2002; Gole and Ashley, 2003). Basalts associated with the Noril'sk Ni-Cu-PGE sulphide deposits in Russia also have these characteristics, which are intimately related to the magmatic sulphide forming processes (Naldrett et al., 1995; Lightfoot and Hawkesworth, 1997; Naldrett and Lightfoot, 1999).

### **5.0 PREVIOUS EXPLORATION**

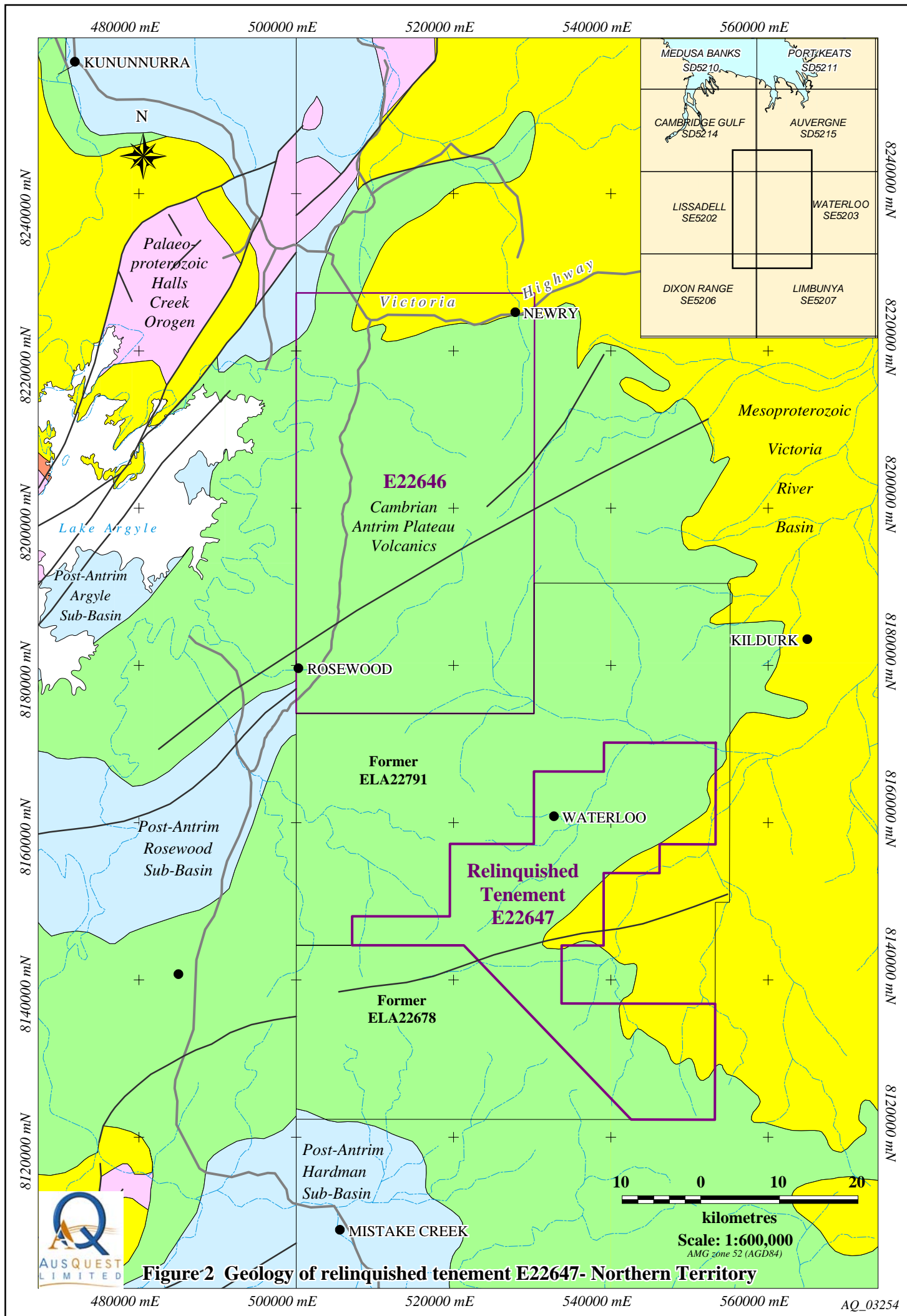
No previous on-ground exploration directly relevant to the search for Noril'sk style Ni sulphide deposits has been undertaken in the area. Most previous exploration was directed towards diamonds. A summary of previous exploration is given in Appendix I.

### **6.0 LOCAL GEOLOGY**

The geology of the tenement area consists of Cambrian basalt and underlying Mesoproterozoic sedimentary rocks of the Victoria River Basin (Figure 2). Immediately underlying the basalts the latter consist of mudrocks, minor sandstone and limestone although deeper within the basin sequence the sediments are highly variable and contain evaporites, carbonaceous and in places sulphide-bearing shales, siltstones and other highly reactive sedimentary rocks.



**Figure 1 Antrim North project showing relinquished tenement E22647- Northern Territory**



AusQuest has focused its attention on potential feeder systems to the Kalkarinji basalts, which based on the genetic model for Noril'sk (e.g. Naldrett et al, 1995; Naldrett and Lightfoot, 1999) are the most likely loci for major sulphide deposits. One such feeder system is interpreted within the Waterloo tenement where a ENE-trending fault, the West Baines Fault, cuts the basalt pile. This fault is sub-parallel to other major faults in the region such as the Neave Fault to the south and the Blackfellow Creek Fault to the north. On regional scale geology and aeromagnetic maps (Figure 3) these faults represent major structures that can be traced into the Halls Creek Orogen suggesting that they may be long-lived regional-scale structures. As such they are likely to have been active during Kalkarinji basalt extrusion and may have acted as conduits for the passage of magma through the crust.

Drilling to the north and south of the Neave Fault through the basalt pile shows that flows on either side are geochemically distinct strongly suggesting that the Neave Fault was present as a marked scarp and thus was active prior to extrusion of the Kalkarinji basalts (Gole and Ashley, 2002).

These ENE faults have been reactivated during the Alice Springs Orogeny that occurred after emplacement of the Kalkarinji basalts. The sense of movement of these faults was north-block up (Mory and Beere, 1988) and thus they have uplifted and in places exposed the sedimentary sequence underlying the basalts. This uplift has brought possible intrusive targets within the basement sedimentary sequence to within explorable depths.

However inspection of the aeromagnetics suggests that if there are any sills along the West Baines Fault they are buried at too great a depth to warrant exploring based on current data.

## **7.0 EXPLORATION ACTIVITY**

No fieldwork was undertaken on EL22647 during the reporting period.

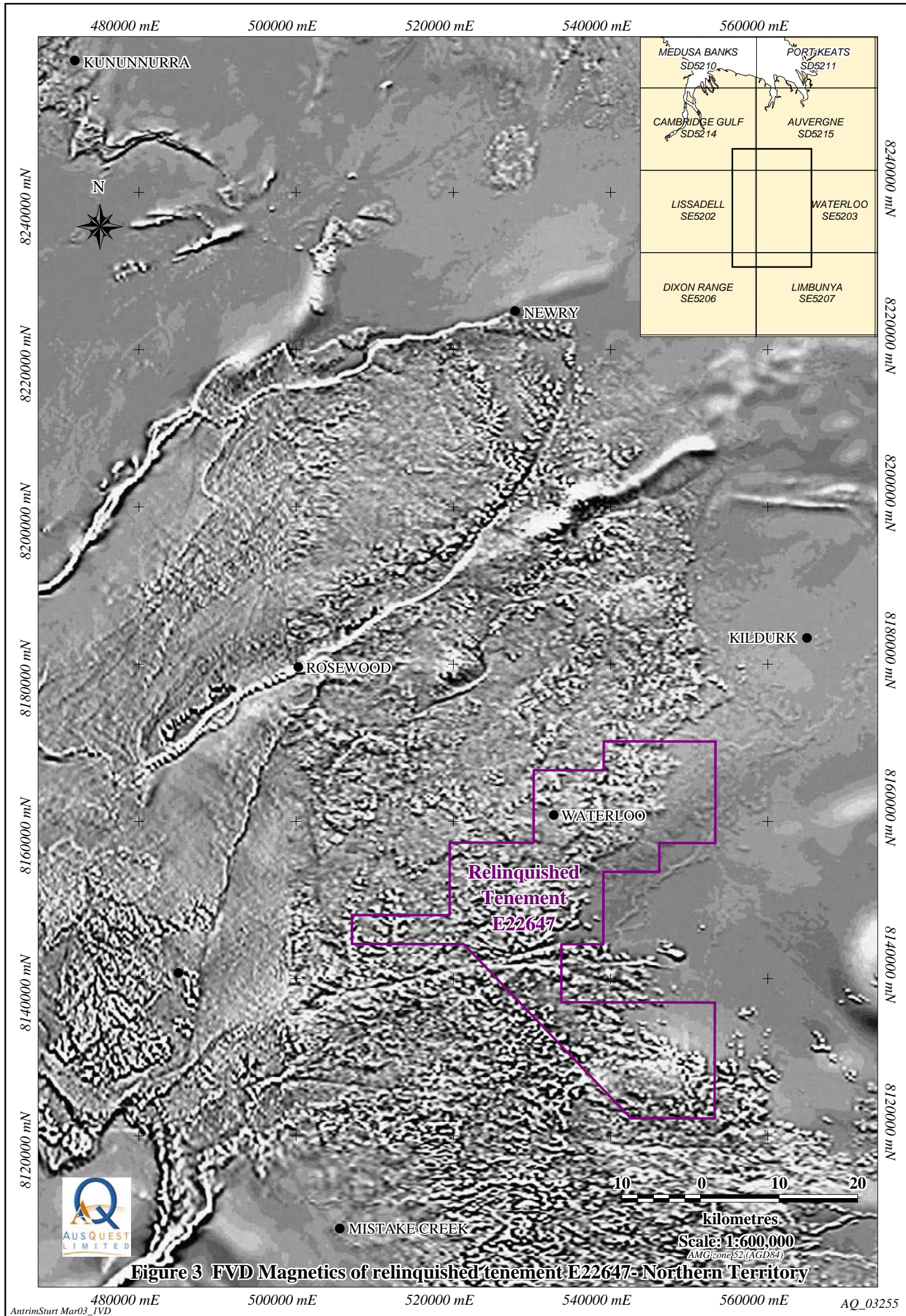
## **8.0 REHABILITATION**

No rehabilitation was required as there was no groundwork undertaken on EL22647 during the reporting period.

## **9.0 RECOMMENDATIONS**

Because of the lack of any obvious aeromagnetic anomalies along the West Baines Fault that could be sills related to the feeder system of the Kalkarinji basalts it is recommended that the tenement be surrendered.







## 10.0 REFERENCES

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## **APPENDIX I**

### **Antrim Project Area**

Historical Review

of

Open File Exploration Reports

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### **Aberfoyle-Ashton Mining-AOG Minerals**

***Final report EL 2235, 7/5/1980 to 5/3/1981. CR1981-0108***

The tenement was explored in 1980-1981 for diamonds by collecting 89 gravel samples (density of 1 per 14.5 km<sup>2</sup>). Chromite was found in 41 samples but these were non-kimberlitic and the area was surrendered.

### **Aberfoyle-Ashton Mining-AOG Minerals**

***Final report EL 2237, 7/5/1980 to 5/3/1981. CR1981-0111***

The tenement was explored in 1980-1981 for diamonds by collecting 69 gravel samples (density of 1 per 18.7 km<sup>2</sup>). Chromite was found in 21 samples but these were non-kimberlitic and the area was surrendered.

### **Aberfoyle-Ashton Mining-AOG Minerals**

***Final report EL 2236, 7/5/1980 to 5/3/1981. CR1981-0178***

The tenement was explored for diamonds by regional gravel sampling during 1980-1981. During 1982 a photogeology interpretation was conducted and an INPUT EM survey completed to guide follow-up sampling. In total 117 gravel and loam samples were collected. Chromite was found in 61 samples but these were non-kimberlitic. The tenement was surrendered in 3/19982.

### **Aberfoyle-Ashton Mining-AOG Minerals**

***Final report EL 2238, 7/5/1980 to 3/2/1982. CR1982-0179***

The tenement was explored in 1980-1982 for diamonds. In the first year 133 gravel samples were collected with 15 follow-up samples. A photogeology interpretation was conducted and anomalous features followed up by loam sampling (3 samples). The follow-up found that the photo features were not related to kimberlites. No indicator minerals were found in 55 of the gravel samples. Chromite, olivine and pyrope garnets were found in the remainder but were not kimberlitic. Two of the 15 follow-up gravel samples and 2 of the loam samples contained non-indicator chromites. The area was surrendered in 2/1982.

## **Aberfoyle-Ashton Mining-AOG Minerals**

### ***Final report EL 2294, 7/5/1980 to 14/4/1982. CR1982-0356***

An intensive exploration for kimberlite between 1980 and 1982. A large airphoto study was conducted over the area but as the area is covered mostly by Antrim basalt no high priority features were recognised although several lower features were recognised and field checked and loam samples. No positive results arose from this data. Part of the tenement was covered by a regional scale aeromagnetic survey. Eight magnetic anomalies were located and field checked and none found to be related to kimberlite – most were related to lateritised basalt within depressions within the underlying sediments. An INPUT survey was also conducted and 6 low priority anomalies located and none whereof sufficient interest to follow-up. A gravel sampling program collected 91 samples, 76 of which contained no indicator minerals. The other samples contained non-kimberlitic chromites and one diamond was recovered from sample WAT 509. Re-sampling of this site and up-stream trap sites failed to any further indicators. Table concentrates from 45 selected gravel samples were also assayed for 14 trace elements indicative of kimberlite but no anomalies found.

## **Murchison Mining**

### ***Summary Report ELs 4785-87, 4789-91. CR1992-0563***

Poorly documented report of reconnaissance exploration done for a prospectus covering 16 ELs. It involved airphoto geological interpretation of a 900 km<sup>2</sup> area which consists mainly of sedimentary sequences of the Victoria River Basin. A stream sediment sampling program was undertaken (no of samples not given) and assayed for Au, Cu, Pb, Zn and Ag. Some weak anomalies were located but the highest Au value was 0.007 ppm. It was recommended that more detailed exploration should be undertaken on 6 of the ELs. It is not known whether this was carried out.

## **Lewis**

### ***Final report of EL8471 (Ord Basin, NT Project), 5/11/1995 to 5/11/1996. Lewis PG. CR1997-0110***

Exploration on this tenement was a JV between Lewis and CRA. It involved a regional stream sediment sampling program targeting the Nelson Shale and its contact with the underlying Headleys Limestone. The program was based on a White Pine stratabound model Cu mineralisation. A total of 46 –80 mesh stream sediments were collected. They were assayed for 19 elements. Geochemical results are all generally low with the highest Cu value returned being 116 ppm (background was 40 ppm Cu). No further work was undertaken.

## **Aberfoyle-Ashton Mining-AOG Minerals**

### ***Final report EL 2293, 23/6/1980 to 26/1/1983. CR 1983-0230***

Exploration was run by Ashton and involved 63 regional gravel samples (1 sample per 19.5 km<sup>2</sup>), airborne magnetic and EM, photo geology studies and follow-up loam sampling as well as geochemical assay.

From the gravel samples 2 diamonds were recovered in WAT765 and 805. 65 follow-up gravel samples in the area of diamond occurrences recovered 3 additional diamonds (WAT 1241, 1247, 1260) in the WAT779 drainage. No diamonds were recovered from original diamond sites.

Airphoto study over the whole of tenement located only 2 low priority features. These were field checked, loam sampled (1 sample each) with negative results.

Aeromagnetic survey with 300 m spaced lines covered eastern ½ of tenement. Two loam samples were collected over 2 magnetic features with negative results.

INPUT survey found no anomalies worth follow-up and no sampling was undertaken.

Assays of 14 element were obtained from 23 table concentrates. No anomalies of significance detected. Method was not considered useful sampling medium. (-80 mesh better).

## **Peko-BP-Design and Construction**

### ***Final report (EL 2417), 4/1980 to 4/1983. CR1983-0149***

Exploration by Peko for diamond and base metals using stream sediment and bulk sampling. Table concentrates were assayed for 11 elements. No indicators for diamonds or any base metal anomalies were detected. Ashton then re-sampled the area for diamonds using regional gravel sampling by collecting 40 samples (1 per 5.2 km<sup>2</sup>) but found no indicator minerals.

## **Negri River Corporation**

Final exploration report on surrender of licence, summary of activities. Marshall B. CR1985-0157 Diamond exploration based on previous results which indicated kimberlitic source north of EL2093. Program was part of large tenement holding (ELs 3457, 3458, 3459, 2092, 2093). Large scale (20-50 tonne) bulk sampling of sediment along Nergi River and tributaries. No indicators recovered and the tenements relinquished.

## **Poseidon Exploration**

*Annual report YE 18/11/1991 EL 7035 Keep River. CR1993-0009*

*Annual report EL 7035 Keep River. CR1993-0017*

Multi-commodity exploration with emphasis on diamonds. Previous exploration by Ashton (their EL 1628, CR1981-0179) located diamond indicators and identified mag targets. However declaration of the Keep River NP did not allow follow-up. Airphoto study found several photo features and mag anomaly locations marked for ground follow-up sampling. Follow-up involved 114 samples (1 per 4.2 km<sup>2</sup>) consisting of 100 heavy mineral drainage samples, 10 loam and 3 rock chip samples from photo features and mag anomalies. Stream sediment samples also collected and assayed for 24 elements.

## **Stockdale Prospecting**

*Final report EL 7134 Bullo River area. CR1993-0124*

Exploration during the period 16/1/1991 to 20/11/1992. Only four samples collected from the eastern portion of the tenement as west side not amenable to conventional sampling. Results were negative, the area re-evaluated and dropped.

## **Rescan**

*EL7876 Final report. Begg J. CR1995-0554*

During year 1 'straintherm' mapping from airphotos was completed and 4 anomalies defined. The EL was cancelled by the Department of Mines due to lack of expenditure.

## **Stockdale Prospecting**

*Rosewood project exploration licences 9457 & 9459 final report. Winzar DJ. CR1998-0795*

264 heavy mineral stream sediments collected (1 per 8 km<sup>2</sup>). Samples contained chromite from Antrim basalts but no diamond indicator minerals. Area was dropped.

## **Stockdale Prospecting**

Exploration licence 9458 final report. Millikan MI. CR1999-0242

In the first year 195 heavy mineral stream sediments were collected (1 per 8 km<sup>2</sup>) and processed. Samples contained chromite from Antrim basalts but two samples (BT3136, 3140) contained chromites with anomalous compositions. In the 2<sup>nd</sup> year 21 follow up stream sediment samples were collected with a 1 km spacing. Again 2 samples were



found with anomalous chromites (BT8483, 8500) but these did not provide a trail to the source. A further follow up program of 41 samples found only one anomalous chromite (BT2952) just down stream of BT8483 and again no trail was provided to a source. The source was thought to be secondary or otherwise unrelated to diamondiferous kimberlite as no diamonds were recovered in this high-quality and high-density sampling. No further work was recommended.