

**Final Report**  
**EL 22167 Wonarah**  
For the term 4.8.00 - 19.6.03  
Frew River SF53-03, Avon Downs SE53-04,  
Alroy SE53-15, Ranken SE53-16  
Northern Territory

Tenement Holder: AKD Limited

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Development – Northern Territory  
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<b><u>Title</u></b>	<b><u>Scale</u></b>
Wonarah Location Plan	1:10,000,000
Drill Hole Location Plan	1:250,000

## **1 SUMMARY**

This final report summarises exploration activities completed on EL 22167 during the period 4<sup>th</sup> August 2000 to 19<sup>th</sup> June 2003. The tenement formed part of a project area held by AKD Limited being explored for large tonnage phosphate deposits. Since March 1999, Rio Tinto was AKD's joint venture partner and spent AUD\$2.4 million in exploration over the project tenements. Rio Tinto withdrew from the JV in December 2002.

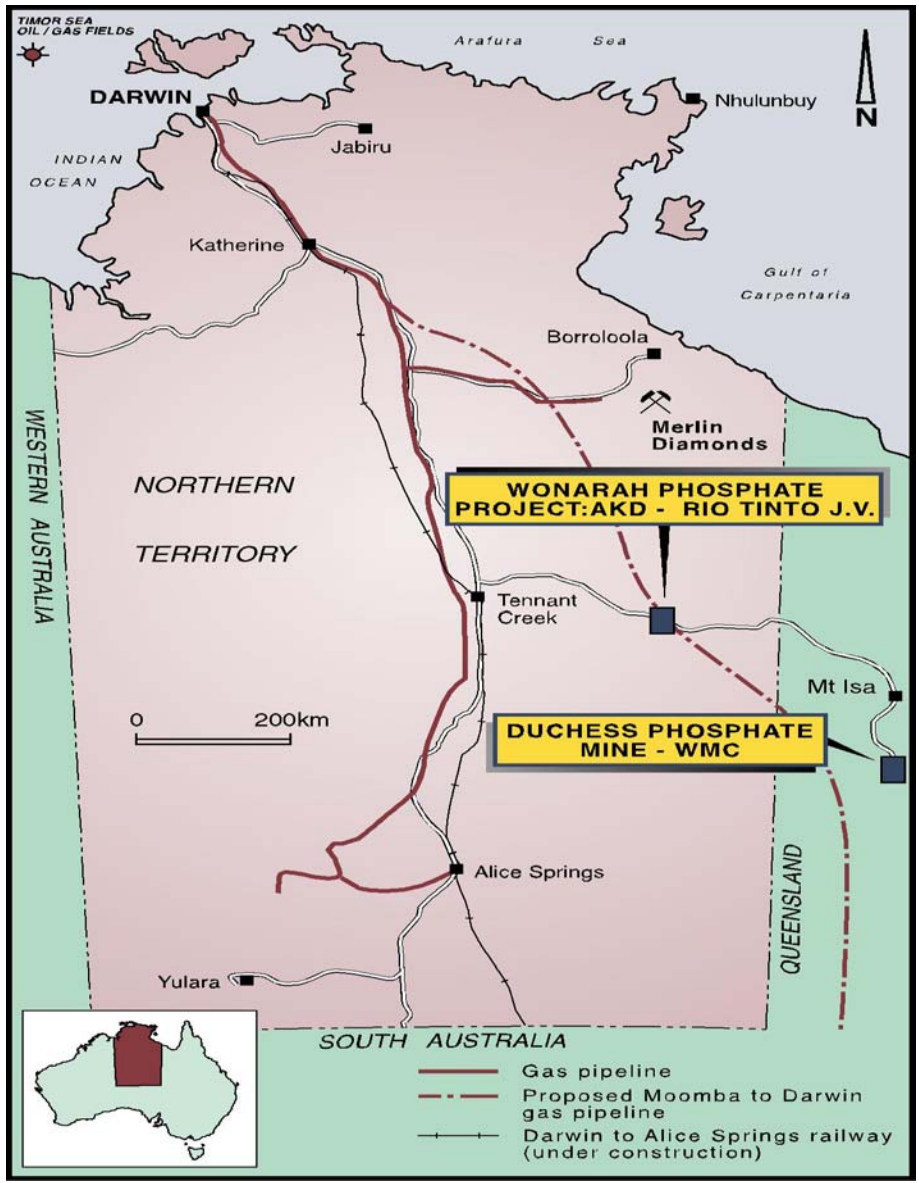
One hole, RC 17, was drilled by Rio Tinto on EL 22167 in 2001 but failed to intersect phosphorite mineralisation of any significance. The excessive overburden and poor grade rules out any potential for economic phosphate resources in this area.

## **2 INTRODUCTION**

EL 22167 Wonarah is located ~250 km east southeast of Tennant Creek in Northern Territory, Australia (see Location Plan). This tenement (and EL's 9976, 9977, 9978, 9979, and 22168) is the subject of an exploration effort for large tonnage phosphorite deposits suitable for production of DAP fertiliser.

EL 22167, totalling 7 sub-blocks, was granted to Rio Tinto on 4 August 2000 for a period of 6 years. The tenement was incorporated into the Rio Tinto – AKD Wonarah phosphate JV which commenced on the 4<sup>th</sup> March 1999 and terminated on the 3<sup>rd</sup> December 2002. Rio Tinto, on behalf of AKD Limited, surrendered the tenement on the 19<sup>th</sup> June, 2003. The underlying land tenure was Arruwurra Aboriginal Corporation NT freehold for which an exploration agreement was negotiated in August 2000.

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### 3 GEOLOGY

The tenements cover Middle Cambrian sediments of the Georgina Basin, a large late Proterozoic to early Palaeozoic basin extending across the eastern Northern Territory and northwestern Queensland.

Basement in this part of the Georgina Basin are Mesoproterozoic sediments and volcanics overlain by the Early Cambrian Peaker Piker Volcanics. The volcanics are tholeiitic and comprise amygdaloidal and porphyritic basalts, and dolerite. The volcanics form an east-northeast trending basement high, part of the northeast-southwest trending Alexandria-Wonarah Basement High. Lower Middle Cambrian (late Templetonian) phosphorite deposits occur along the basement high. These are hosted by marginal transgressive sediments of the Burton Beds (Alroy, Alexandria) and the Upper Gum Ridge Formation (Wonarah), which are equivalent to the Beetle Creek Formation (Phosphate Hill, Ardmore, and Lady Annie-D-Tree) on the eastern margin of the basin (Southgate & Shergold, 1991; Gravestock & Shergold, 2001).

The lower Middle Cambrian sequence at Wonarah has been divided into distinct units based on logged geology, geochemistry, and stratigraphic relationships (Figure 1; Lilley & Andrews, 2001). The basement high is flanked by onlapping dolomitic rocks equivalent to the lower Middle Cambrian Thornton Limestone (Figure 2). Overlying basement is dolostone, mudstone, and phosphorite of the lower Middle Cambrian Upper Gum Ridge Formation, and mudstone, siltstone, and dolostone of the Middle Cambrian Wonarah Beds.

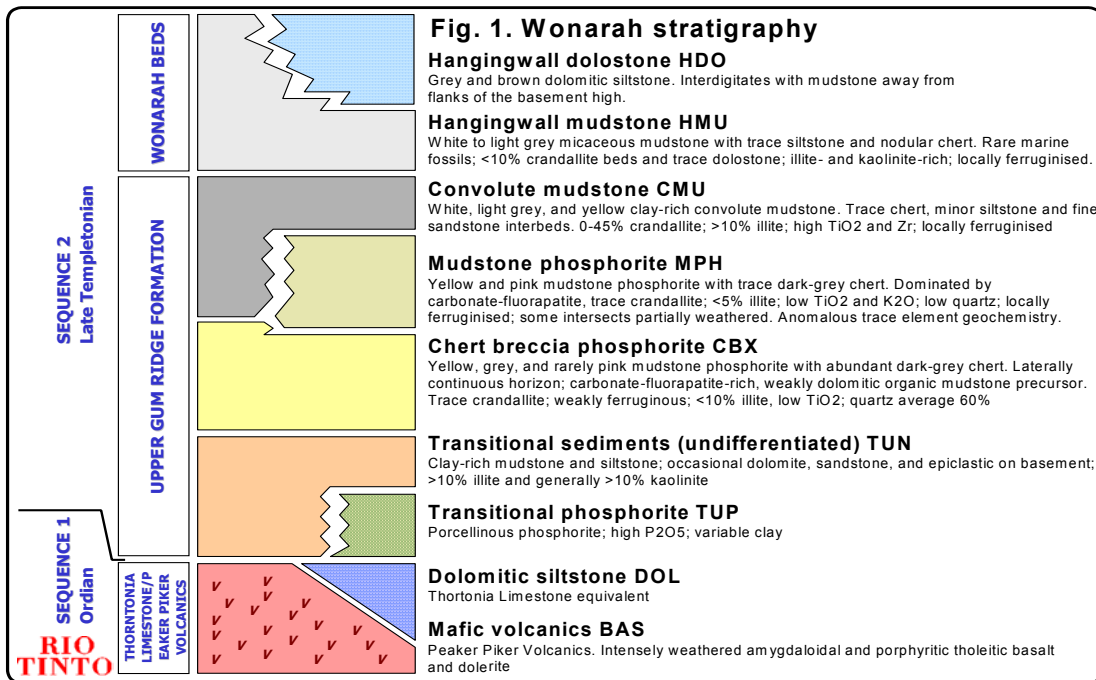


Figure 1: Wonarah Stratigraphy

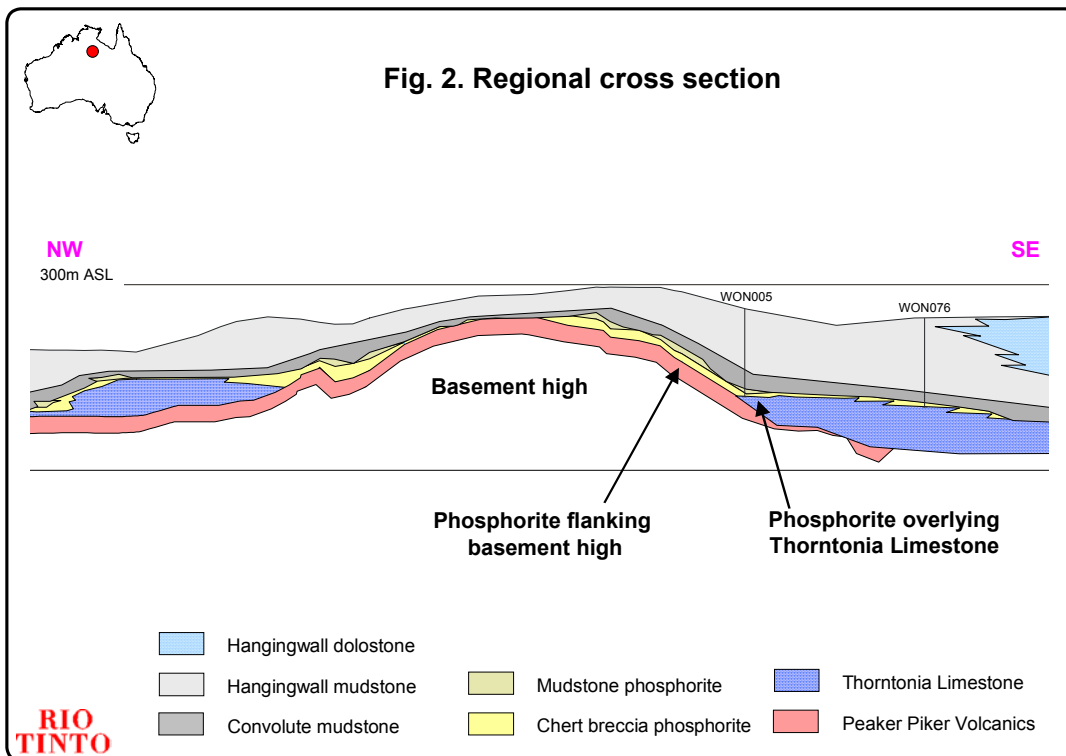


Figure 2: Diagrammatic Regional Cross Section

The Upper Gum Ridge Formation is divided into four main units (from the base; Figure 1): undifferentiated transitional sediments (**TUN**), chert breccia phosphorite (**CBX**), mudstone phosphorite (**MPH**), and convolute mudstone (**CMU**). Where the stratigraphic relationships are poorly understood, the phosphorite horizon has been modelled as undifferentiated phosphorite (**PUN**). The chert breccia phosphorite and mudstone phosphorite are collectively termed the phosphorite horizon, and locally contain ore-grade ( $>15\%$   $P_2O_5$ ) intervals. The phosphorite horizon is overlain by clay-rich light grey and yellow convolute mudstone, with minor interbeds of siltstone and fine sandstone (**CMU**). The convolute mudstone typically contains an average 2%  $P_2O_5$  as crandallite.

The Wonarah Beds, comprising mudstone and siltstone with minor nodular chert overlie the convolute mudstone. In the tenement area these rocks are grouped as hangingwall mudstone (**HMU**). Laterally equivalent dolomitic mudstone facies are assigned to hangingwall dolostone (**HDO**).

Intensely weathered Peaker Piker Volcanics subcrop and occur beneath thin transported cover in parts of EL 22167. In this area the phosphorite horizon is interpreted not to be present, due either to erosional stripping, or because it was stratigraphically above the limit of phosphorite deposition.

In EL 22167, the Upper Gum Ridge Formation and Wonarah Beds overlie the Thornton Limestone (**DOL**), which is capped by a karst weathering surface. Dolomitic rocks outcrop in parts of EL 22167 and may represent an up-faulted block of Thornton Limestone or a carbonate facies that laterally interdigitates with the Wonarah Beds.

### **3.1 Regolith**

An interpretation of Landsat 5 Thematic Mapper (TM) multispectral data mapped the distribution of regolith types including silcrete, ferricrete, calcrete, and a range of colluvial, alluvial, and aeolian deposits.

The lower Middle Cambrian rocks are intensely weathered and covered by stabilised Cenozoic aeolian sand sheets and longitudinal dunes trending  $310^\circ$  -  $320^\circ$  across the region. Silcrete and ferricrete duricrust underlies much of the sand cover and outcrops sporadically as low rises. Calcrete and black soil overlie dolomitic rocks. The distribution of duricrust outcrops is



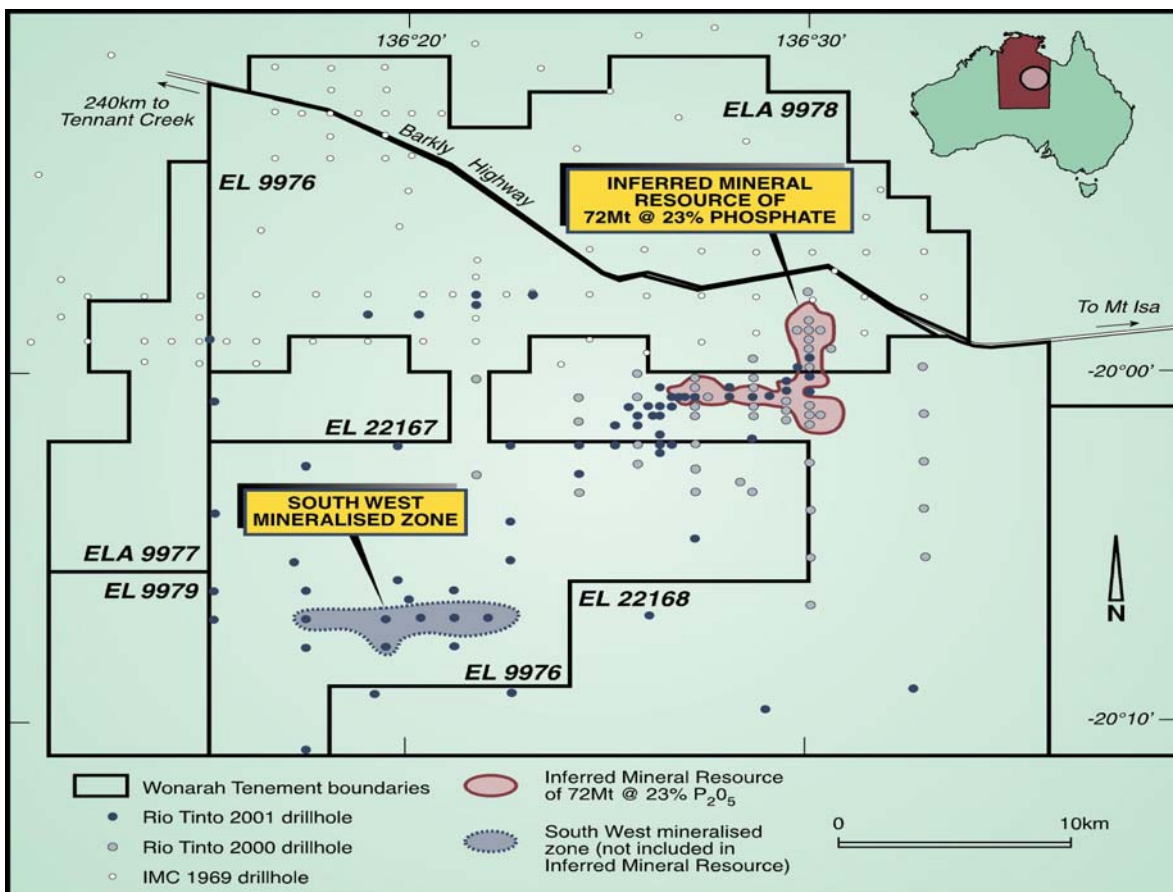
structurally controlled along linear trends, possibly implying minor Cenozoic reactivation of basement fault structures.

#### 4 DRILLING

Former JV partner, Rio Tinto drilled one hole, RC 17 (total 34m), in 2001 in the western area of EL 22167.

The hole was geologically logged on site for geologic description, including estimates of chert, clay, iron oxide, and phosphate (strength of ammonium molybdate response). A riffle splitter was used to split samples to obtain ~ 1.5 kg sample. Samples were submitted to Amdel Laboratories in Mount Isa. On receipt of assays, interpretation using geochemistry and geologic logs assigned each sample to a lithologic unit. All RC samples were weighed on site. Estimated recoveries for each meter have been calculated from sample bag weights using a density of  $2.0 \text{ g cm}^{-3}$ .

Only traces of phosphorite were intersected in RC 17. The economic potential of the area was reviewed by Rio Rinto and it is not considered to contain any significant areas of phosphorite mineralisation.



#### **4.1 Drill Hole Collar Surveying**

Drill hole collars were surveyed in July 2001 using Trimble 4000 SSI differential GPS equipment. Survey data and comments are tabulated in Appendix 2.

#### **4.2 Geochemical Analysis**

Results for the percussion chip samples of drill hole RC 17 are provided in Appendix 1.

Samples were submitted to Amdel Laboratories preparation facility in Mount Isa where they were dried at 110°C, crushed to -2 mm, and a 100 g split pulverized to -106 µm. A 20 g split of the pulverized sample was then sent to Amdel Laboratories in Adelaide for analysis. All samples have been assayed by inductively coupled plasma optical emission mass spectroscopy (ICP-OES; method IC4 (4.2.1)).

##### 4.2.1 Method IC4

A 0.1 g subsample is fused with a mixture of lithium meta and tetra borates. The resultant glass is dissolved in a 5% HNO<sub>3</sub> solution and assayed for major element oxides (P<sub>2</sub>O<sub>5</sub>, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub> (total Fe), CaO, K<sub>2</sub>O, MgO, MnO, Na<sub>2</sub>O, SiO<sub>2</sub>, and TiO<sub>2</sub>) by inductively coupled plasma optical emission spectroscopy (ICP-OES).

### **5 ENVIRONMENT**

Drill hole RC 17, located in the western portion of EL 22167, has been rehabilitated. All access tracks within EL 22167 have been rehabilitated.

A Rehabilitation Report for the Wonarah project, including the holes drilled, has been separately submitted to the DBIRD by former JV partner Rio Tinto and is not reproduced here.

### **6 CONCLUSIONS AND RECOMMENDATIONS**

EL 22167 is not considered to contain any significant areas of phosphorite mineralisation, and therefore was recommended for surrender.

## **REFERENCES**

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Shergold, J.H. & Southgate, P.N., 1988. Timing and distribution of Middle Cambrian phosphogenetic system in Australia. *In: Notholt, J.G. & Jarvis, I. (eds.). A decade of phosphorite research and development. 11<sup>th</sup> International Field Workshop and Symposium, International Geological Correlation and Programme Project 156, Extended Abstracts, 27-28.*

## **LOCALITY**

Frew River	SF53-03	1:250 000
Avon Downs	SE53-04	1:250 000
Alroy	SE53-15	1:250 000
Ranken	SE53-16	1:250 000

## **DESCRIPTOR**

One RC hole was drilled by Rio Tinto on EL 22167 in 2001 but failed to intersect phosphorite mineralisation of any significance.

## **KEYWORDS**

Wonarah, phosphate, phosphorite, Cambrian, Frew River, Avon Downs, Barkly Tableland, Gum Ridge Formation, Wonarah Beds, RC drilling.

## **APPENDIX 1**

### **Downhole Geochemistry**

## **APPENDIX 2**

### **Drill Collar Survey Data**

## **APPENDIX 3**

### **Normative Mineralogy**