



# Eneabba Mineral Sands Mine

Allied Tails Mining Proposal

October 2007



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## 1. PURPOSE

The purpose of this document is to outline proposed mining activities within the Allied Tails area as a continuation of existing mining at Iluka Resources Limited's (Iluka) Eneabba operations. This proposal is submitted under the *Environmental Protection Act (1986)* (EP Act) (as amended) to enable assessment under Part V (Section 51 – Clearing of Native Vegetation).

## 2. INTRODUCTION

The Eneabba mineral sand mine is located 10 km south of the town of Eneabba on the Brand Highway, approximately 280 km north of Perth and 150 km south east of Geraldton (Figure 1). Mineral sands have been mined at Eneabba since the 1970s. The operations were originally owned and operated by different companies - which through a series of mergers and acquisitions have resulted in Iluka owning and operating the mine since 1998. Mining environmental management is reported to the State via annual and triennial reports designed to cover the reporting requirements of both the Mineral Sands (Eneabba) Agreement Act 1975 (MSAA) and EP Act. These reports are submitted to the Mineral Sands Agreement Rehabilitation Coordinating Committee (MSARCC) which provides advice to the Minister for State Development on the implementation of the proposals under the MSAA.

Much of the footprint of the Eneabba operations has been revegetated. In the southern sections of the mine, including areas within the South Eneabba Nature Reserve (R31030), rehabilitation has been to native vegetation, and more recently agricultural land has been revegetated with native species. Historically, some areas of native vegetation in the northern section of the mine were rehabilitated to agricultural land post mining. Rehabilitation processes for both native vegetation and agricultural areas is based upon a long history of research and development.

The Eneabba operations have two heavy mineral concentrators, Newman and 03, which process ore from the North and South mine areas, respectively. There are currently two mining units in the North Mine area (at Depot Hill and Adamson) and three mining units in the South Mine area (at IPL Central and South Tails). The mining unit located near the 03 concentrator at IPL Central is to be relocated to Depot Hill. The overburden and ore is mined using a combination of dry mining methods. Ore is fed into the mining units which screen out oversize material, slurry the ore and pump the slurried material to the concentrator. The concentrator separates the heavy mineral concentrate (HMC) from the sand and clay fractions. Sand and clay fractions (tailings) are returned to the mining void. The HMC is further refined at the South Secondary Concentrator and then transported by rail to Narngulu.

Following completion of mining, pits are backfilled with sand and clay tails and overburden material. The surface is landscaped, topsoil replaced and the area mulched and seeded. Ongoing monitoring and management of rehabilitated areas is conducted.

Iluka proposes to continue the current mineral sands mining operations at Eneabba by mining additional remnant ore and mineralised tailings located to the southwest of the current mining at South Tails, in the area between the 03 Concentrator and the South Secondary Concentrator (Figure 2). This area is referred to as Allied Tails and involves re-mining rehabilitated areas (Figure 3). This area was previously mined under approval of the MSAA, shown on Plan B as the red and yellow shaded and hatched areas (Figure 4).

Re-mining within the Allied Tails area will be completed using existing equipment and processes and is considered to be a routine operation for Iluka. The processing facilities, pipelines, power and dams are already in existence and the intended mining would not increase the existing impact of this infrastructure.

Up to 350,000 tonnes of additional HMC will be mined from Allied Tails. The ore from Allied Tails will provide for approximately 12 months of mining. This time frame will enable Iluka to

mine at current rates and enable blending to meet market requirements. Mining is proposed to commence in January 2008.

442 hectares of rehabilitation completed between 1977 and 2005 will be disturbed (Figure 3). No additional areas of undisturbed native vegetation will be disturbed within the South Eneabba Nature Reserve, or other Reserves or private property, under this proposal.

The remaining areas (91ha) to be disturbed are open areas not yet rehabilitated following previous disturbance or areas that provide long-term access such as roads and dams. A summary of the proposed disturbance areas is provided below in Table 1.

**Table 1: Proposed disturbance of South Mine area under the Allied Tails Proposal**

<b>Allied Tails Additional Mining Areas</b>	
<b>Closed Areas (rehabilitated)</b>	442ha
<b>Open Areas (unrehabilitated)</b>	91ha
<b>TOTAL</b>	533ha



### **3. BACKGROUND**

#### **3.1 Location**

The Allied Tails Proposal is located within the Midwest Mineral Field and the Shire of Carnamah, approximately 15 km south of the town of Eneabba.

Allied Tails is located on mining tenement AM70/267 (Figure 5) and is on Vacant Crown Land (VCL) and Reserve 31030 (Figure 6).

#### **3.2 Approval Requirements**

The MSAA allows for mining to occur subject to proposals being considered and approved under Clause 5 (proposals submitted before September 1975), Clause 6 (proposal to mine in the green areas on Plan B) and Clause 7 (additional proposals). Clause 8 requires the preparation, submission and approval of interim and triennial environmental reports. The area to be re-mined is within the red and yellow areas both shaded and hatched on Plan B of the Amendment Agreement and was approved for mining as at the date of the Amendment Agreement (Appendix 1).

The information below is provided with reference to the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and the clearing of rehabilitation areas for the additional mining areas within the Allied Tails area. The clearing application form is provided as Appendix 2.

## **4. EXISTING ENVIRONMENT**

### **4.1 Background**

Mining is currently occurring in the nearby South Tails mining area, north-east of Allied Tails, which was approved in June 2007.

The rehabilitated areas within Allied Tails were mined in the late 1970's through to the early 2000's and rehabilitation ranges from 2 – 30 years old.

### **4.2 Native Vegetation**

No undisturbed native vegetation will be impacted by this Proposal. However the following information is provided for regional context.

The project is located within the Irwin Botanical District (Northern Sandplains Region), within the Southwest Botanical Province as defined by Beard (1990). Dominant plant families within the Irwin Botanical District include Proteaceae (Grevillea, Banksia), Myrtaceae (Eucalyptus, Melaleuca), Mimosaceae (Acacia), Casuarinaceae (Casuarina, Allocasuarina), Asteraceae (daisies), Chenopodiaceae (salt bushes) and Poaceae (grasses).

The Northern Sandplains Region covers the area along the coastline, extending to the Darling Fault in the east, to Shark Bay in the north and roughly Badgingarra to the south (northern limit of Banksia low woodland). Originally various types of Kwongan vegetation covered this area (mapped at 81.5% of the region before clearing), with Acacia scrub with or without scattered trees (14.3%) and Eucalypt woodlands (2%) being the other dominant vegetation associations (Beard 1990). Hnatiuk and Hopkins (1981) have defined the term Kwongan as 'sclerophyllous shrubland or sandplain vegetation'.

Ecological surveys of the Eneabba mine lease region since 1977 (Hopkins and Hnatiuk, 1981; Mattiske, 1999; 2000; 2001; 2002, 2003; 2005; Woodman, 2002; 2005a,b; 2006a,b; 2007) have highlighted that the vegetation contains a rich and varied flora of over 900 species including many endemic species.

The most recent survey work conducted at Eneabba has been completed by Woodman Environmental (Woodman Environmental Consulting 2002). Broad vegetation mapping to Floristic Community Type (FCT) level was conducted during 2001 over three areas within Iluka's mining tenements. These areas cover approximately 10,960ha, of which 4,860ha were native vegetation. The areas surveyed were Depot Hill/Brandy Flat, IPL North and IPL South. IPL North is located adjacent to the existing South Mine mining area and the Iluka administration buildings. It consisted entirely of native vegetation. A total of 512 vascular plant taxa belonging to 56 plant families were recorded within the lease areas during the survey period. Of these species, 32 were Priority Flora species, with no Declared Rare Flora (DRF) species recorded. A total of 41 plant communities and 7 disturbance units were mapped over the 3 lease areas during this project resulting from statistical analysis of data collected from 65 10m x 10m quadrats established in all identified structural plant communities.

Additional smaller areas have been mapped at the structural plant community level for interim mining approvals since 2002 (Woodman Environmental Consulting 2005, 2006a, 2006b, and 2007a in prep.). The complete vegetation mapping at Eneabba, including additional 2007 surveys, is currently undergoing review as part of future mining environmental impact assessments for Eneabba.

Searches of the DEC Rare and Priority Flora database and Western Australian Herbarium specimen records, combined with baseline vegetation surveys and rehabilitation monitoring within the region of the Eneabba mining leases have recorded 17 Declared Rare Flora

(DRF), seven of which have been recorded since 1999 (Mattiske, 1999; 2000; 2001; 2002; 2003; 2004; 2005; Woodman, 2002; 2005a, b; 2006a, b; 2007). Additionally, over 60 Priority Flora (PF) species have been recorded within the region of the Eneabba mining leases (Table 2).

**Table 2: Declared Rare, Priority and Threatened Flora in the Eneabba region**

Taxon Name	State Conservation Code	Commonwealth Classification
<i>Calectasia cyanea</i>	R	
<i>Conostylis drummondii</i>	R	
<i>Darwinia carnea</i>	R	
<i>Daviesia speciosa</i>	R	
<i>Eucalyptus crispate</i>	R	Endangered
<i>Eucalyptus johnsoniana</i>	R	Vulnerable
<i>Eucalyptus lateritica</i>	R	Vulnerable
<i>Eucalyptus rhodantha</i> var. <i>rhodantha</i>	R	Vulnerable
<i>Eucalyptus suberea</i>	R	Vulnerable
<i>Grevillea althoferorum</i>	R	Endangered
<i>Grevillea curviloba</i> subsp. <i>incurva</i>	R	
<i>Leucopogon obtectus</i>	R	Endangered
<i>Paracaleana dixonii</i> ms	R	Endangered
<i>Stawellia dimorphantha</i>	R	Vulnerable
<i>Tetralthea nephelioides</i> ms	R	
<i>Thelymitra stellata</i>	R	Endangered
<i>Verticordia albida</i>	R	Endangered
<i>Beyeria gardneri</i>	P1	
<i>Calectasia palustris</i>	P1	
<i>Hemiandra</i> sp. Eneabba (H. Demarz 3687)	P1	
<i>Malleostemon cooljarloo</i>	P1	
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	P1	
<i>Schoenus</i> sp Eneabba (F Obbens & C Godden 154)	P1	
<i>Verticordia blepharophylla</i>	P1	
<i>Verticordia fragrans</i>	P1	
<i>Acacia asepala</i>	P2	
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> Cockleshell Gully variant (E.A. Griffin 2039)	P2	
<i>Boronia ericifolia</i>	P2	
<i>Eremaea acutifolia</i>	P2	
<i>Hypocalymma gardneri</i>	P2	
<i>Hypocalymma xanthopetlum</i> var. <i>linearifolium</i>	P2	
<i>Hypocalymma xanthopetlum</i> var. <i>three springs</i>	P2	
<i>Persoonia filiformis</i>	P2	

<b>Taxon Name</b>	<b>State Conservation Code</b>	<b>Commonwealth Classification</b>
<i>Schoenus griffinianus</i>	P2	
<i>Stenanthemum limitatum</i>	P2	
<i>Stylidium aeonioides</i>	P2	
<i>Thryptomene</i> sp. Eneabba (R.J. Cranfield 8433)	P2	
<i>Tricoryne robusta</i>	P2	
<i>Verticordia argentea</i>	P2	
<i>Banksia micrantha</i>	P3	
<i>Beaufortia eriocephala</i>	P3	
<i>Beyeria similis</i>	P3	
<i>Calytrix chrysantha</i>	P3	
<i>Calytrix drummondii</i>	P3	
<i>Calytrix eneabbensis</i>	P3	
<i>Calytrix superba</i>	P3	
<i>Comesperma acerosum</i>	P3	
<i>Daviesia epiphyllum</i>	P3	
<i>Desmocladius elongates</i>	P3	
<i>Dryandra cypholoba</i>	P3	
<i>Dryandra stricta</i>	P3	
<i>Dryandra tortifolia</i>	P3	
<i>Eucalyptus diminuta</i> ms	P3	
<i>Geleznovia verrucosa</i>	P3	
<i>Grevillea uniformis</i>	P3	
<i>Haemodorum loratum</i>	P3	
<i>Hakea lissocarpha</i>	P3	
<i>Hakea polyanthema</i>	P3	
<i>Hensmania stoniella</i>	P3	
<i>Isopogon tridens</i>	P3	
<i>Lasiopetalum lineare</i>	P3	
<i>Lepidobolus quadratus</i> ms	P3	
<i>Myriocephalus appendiculatus</i>	P3	
<i>Nemcia axillaris</i>	P3	
<i>Olax scalariformis</i>	P3	
<i>Persoonia rudis</i>	P3	
<i>Pityrodia viscida</i>	P3	
<i>Pityrodia verbascina</i>	P3	
<i>Spyridium oligocephalum</i>	P3	
<i>Stylidium duiroides</i> subsp <i>paucifoliatum</i>	P3	
<i>Synaphea aephynsa</i>	P3	

Taxon Name	State Conservation Code	Commonwealth Classification
<i>Villarsia congestiflora</i>	P3	
<i>Banksia elegans</i>	P4	
<i>Banksia scabrella</i>	P4	
<i>Darwinia sanguinea</i>	P4	
<i>Daviesia chapmanii</i>	P4	
<i>Dasyogon obliquifolius</i>	P4	
<i>Eucalyptus macrocarpa subsp. elachantha</i>	P4	
<i>Georgeantha hexandra</i>	P4	
<i>Grevillea rudis</i>	P4	
<i>Stachystemon axillaris</i>	P4	
<i>Thysanotus glaucus</i>	P4	
<i>Verticordia aurea</i>	P4	
<i>Verticordia lindleyi</i> subsp <i>lindleyi</i>	P4	
<i>Banksia chamaephyton</i>	P5	

### 4.3 Fauna

A number of fauna surveys have been conducted in the Eneabba region over the course of the mining operations. These include baseline surveys of undisturbed vegetation to characterise existing fauna prior to mining works and also monitoring to evaluate the recolonisation of fauna in rehabilitated post-mining areas. A review of fauna surveys and monitoring was conducted by Bamford Consulting Ecologists and is summarised in the following section.

Of the 288 vertebrate species that may occur in the vicinity of the mining area, there were 26 species of conservation significance. This included 2 reptiles, 23 birds and one mammal. Eight of the conservation significant birds are waterbirds that are significant because they are listed as migratory under the EPBC Act. Given the limited wetland or aquatic habitats on the Iluka tenements, it is unlikely that these species will be present on a regular basis. Two invertebrate species were identified from the DEC Threatened Fauna database. The conservation significant species, excluding waterbirds, are listed in Table 3.

**Table 3: Conservation significant fauna that may occur at Eneabba (excluding waterbirds)**

Species	Common Name	Conservation Significance	Likelihood of presence at Eneabba
<i>Idiosoma nigrum</i>	Shield-backed trapdoor spider	Endangered <sup>2</sup>	Unlikely to occur based on habitat availability in the local area, size and extent of the proposal and available knowledge of this species in the local area.
<i>Austromerope poultoni</i>	Earwig fly /Scorpion Fly	P1	Unlikely to occur based on habitat availability in the local area, size and extent of the proposal and available knowledge of this species in the local area.
<i>Mormopterus planiceps (LPF)</i>	Western Free-tail Bat	Undergoing Review (not currently listed)	May occur on the Eneabba lease area, although this would be at the northern limit of its range.

Species	Common Name	Conservation Significance	Likelihood of presence at Eneabba
<i>Aspidites ramsayi</i>	Woma	Specially Protected <sup>2</sup> and P1	Suitable habitat does occur on site, however considered unlikely to be recorded.
<i>Morelia spilota imbricata</i>	Carpet Python	Specially Protected <sup>2</sup> and P4	Prefers rocky areas, where it may be present, but is unlikely to occur in the sandier areas of the site.
<i>Leipoa ocellata</i>	Malleefowl	Vulnerable <sup>1,2</sup>	Mounds of this species are conspicuous and as these have not been observed, the species is probably not present.
<i>Plegadis faclinellus</i>	Glossy Ibis	Migratory <sup>1</sup>	Likely only as a vagrant as there is little suitable habitat.
<i>Falco hypoleucos</i>	Grey Falcon	P4	Recorded in 1981 as breeding in reserve 31030, if still present in the area is most likely only to forage over the site.
<i>Falco peregrinus</i>	Peregrine Falcon	Specially Protected <sup>2</sup>	May occur sporadically in the vicinity of Eneabba but is unlikely to be solely reliant on the site.
<i>Ardeotis australis</i>	Australian Bustard	P4	Known as a regular summer visitor to region in small numbers so may be a seasonal visitor to the site.
<i>Burhinus grallarius</i>	Bush Stone-curlew	P4	Only likely to occur in woodland areas along drainage lines.
<i>Thinornis rubricollis</i>	Hooded Plover	P4	Unlikely to be suitable habitat for this species on site.
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	Endangered <sup>1,2</sup>	Previously recorded on site, likely to forage on heathland vegetation.
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	Specially Protected <sup>2</sup>	May occur as a vagrant in small numbers on site although is more common to the north or east.
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory <sup>1</sup>	Highly aerial vagrant that may pass over the site, but is unlikely to be dependent on the site.
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory <sup>1</sup>	Previously recorded from site. Suitable habitat is available and is likely to be a regular visitor and possibly breed on site.
<i>Hylacola cauta whitlocki</i>	Shy Heathwren	P4	May occur in dense heath.
<i>Calamanthus campestris montanellus</i>	Rufous Fieldwren	P4	Previously recorded and likely to be a permanent resident on site.
<i>Pomatostomus superciliosus</i>	White-browed Babbler	P4	There may not be enough taller vegetation on site to support a permanent population of this species.
<i>Oreocica gutturalis gutturalis</i>	Crested Bellbird	P4	Likely to occur in areas of taller vegetation.

1 = listed under the EPBC Act

2 = listed under the WA Wildlife Conservation Act

Species such as the Peregrine Falcon (*Falco peregrinus*), Grey Falcon (*F. hypoleucos*) and Fork-tailed Swift (*Apus pacificus*) may forage or pass over the Iluka Eneabba Lease, but are unlikely to be permanent residents or specifically dependant upon habitat within the lease. The conservation significant species that are most likely to be of concern are the heath-dwelling passerines (e.g. Shy Heathwren (*Hylacola cauta whitlocki*), and Rufous Fieldwren (*Calamanthus campestris montanellus*), and Carnaby's Cockatoo (*Calyptorhynchus latirostris*). Carnaby's Cockatoo can be expected to feed around the Eneabba area, but there appears to be no suitable breeding habitat either on the lease or sufficiently close for

breeding birds (Johnstone pers. comm., 2006). The only conservation significant mammal, the Western Freetail-bat (*Mormopterus planiceps*, long penis form) has been listed as significant (level CS3) as this genus is undergoing review.

#### 4.4 Rehabilitation

There are 442 ha of rehabilitation within the Allied Tails additional mining areas. This rehabilitation ranges from 2 to 30 years old with the majority of rehabilitation completed between 1977 and 1997. Over 100 rehabilitation blocks are contained within the proposed mining area and representatives of some of these are shown in Plate 1, Plate 2, Plate 3 and Plate 4.



**Plate 1: 1981 rehabilitation within Allied Tails Proposal**



**Plate 2: 1984 rehabilitation within Allied Tails Proposal**



**Plate 3: 1992 rehabilitation within Allied Tails Proposal**





**Plate 4: 2004 rehabilitation within Allied Tails Proposal**

Rehabilitation monitoring has been conducted in several of these rehabilitation blocks by Mattiske Consulting Pty Ltd (Table 4).

The rehabilitation data collected in the Allied Tails area was reviewed and summarised. The species recorded were assessed in a local and regional context, both with data as collected in other rehabilitation areas and control areas, as well as in a regional context against databases managed by the Department of Environment and Conservation and the Department of Environment and Heritage.

**Table 4: Summary of rehabilitation blocks and monitoring history within Allied Tails area**

<b>Year of Rehabilitation</b>	<b>Rehabilitation Blocks within Allied Tails Proposal</b>	<b>Monitoring History</b>
1977	7	Yes
1978	2	Yes
1979	1	Yes
1980	8	Yes
1981	10	Yes
1982	3	Yes
1983	10	No
1984	6	No
1985	4	Yes
1986	1	Yes

Year of Rehabilitation	Rehabilitation Blocks within Allied Tails Proposal	Monitoring History
1987	5	No
1988	1	Yes
1989	10	Yes
1991	9	Yes
1992	10	Yes
1993	9	Yes
1994	6	Yes
1995	5	Yes
1996	3	No
1997	9	Yes
1998	1	No
2001	4	Yes
2002	5	No
2004	4	No
2005	1	No

A total of 519 taxa from 59 families and 191 genera have been recorded in blocks that will be influenced by the Allied Tails Proposal. This total can be compared with the range of taxa recorded in the wider mining area as described in Section 4.2. No Declared Rare Flora (DRF) species were recorded in the rehabilitation blocks surveyed within the Allied Tails area.

Of the 519 taxa recorded, 24 taxa (including three introduced weeds) were only recorded in the blocks that form part of the proposed Allied Tails area. None of the nine native taxa are DRF and the majority of these taxa are relatively widespread.

Twenty-four Priority flora species were recorded in the rehabilitation blocks surveyed within the Allied Tails area, all of which have been recorded either in other rehabilitation areas or from nearby control areas, except *Banksia scabrella* (Table 5).

**Table 5: Priority flora species recorded within rehabilitation at Allied Tails**

Species	Rehabilitation Block (number of individuals in parenthesis)
<i>Hemiandra</i> sp. Eneabba (H. Demarz 3687)	04BS (1)
<i>Mesomelaena stygia</i> subsp. <i>deflexa</i>	81AS (3), 81ES (2), 81LS (1), 84AS (3), 86FS (2), 88CS (1), 91JS (2)
<i>Acacia lasiocarpa</i> var. <i>lasiocarpa</i> Cockleshell Gully variant (E.A. Griffin 2039)	04CS (1)
<i>Boronia ericifolia</i>	88CS (1)
<i>Eremaea acutifolia</i>	81FS (1), 88CS (1)
<i>Hypocalymma gardneri</i>	80AS (1), 81BS (1), 81FS (1), 81LS (1), 89IS (1), 97AS (1)
<i>Persoonia filiformis</i>	89IS (1)

Species	Rehabilitation Block (number of individuals in parenthesis)
<i>Schoenus griffinianus</i>	04BS (2), 04CS (1), 04HS (1), 78ES (3), 79CS (2), 80AS (2), 81LS (5), 85AS (3), 88CS (3), 89IS (2), 92GS (2), 94AS (1), 95AS (1), 97AS (1)
<i>Verticordia argentea</i>	02AS (1), 80AS (1), 85AS (1)
<i>Beyeria similis</i>	81LS (2), 88CS (1), 93CS (1)
<i>Calytrix chrysantha</i>	78ES (2)
<i>Calytrix drummondii</i>	93CS (1)
<i>Desmocladius elongatus</i>	81ES (1), 81LS (1), 88CS (1)
<i>Dryandra cypholoba</i>	95AS (1)
<i>Dryandra tortifolia</i>	77CS (1), 78ES (2), 81BS (1), 81ES (3), 86FS (3), 88CS (1), 89IS (1), 91JS (1), 94AS (1)
<i>Grevillea uniformis</i>	85AS (3)
<i>Isopogon tridens</i>	02AS (1), 77CS (2), 78ES (4), 81AS (1), 81ES (2), 81FS (2), 86FS (4), 88CS (2), 89IS (1), 91JS (1), 92GS (2), 94AS (1)
<i>Lepidobolus quadratus</i>	81LS (1), 95AS (1)
<i>Banksia scabrella</i>	95AS (1), 95BS (1)
<i>Darwinia sanguinea</i>	86FS (1), 94AS (1)
<i>Daviesia chapmanii</i>	85AS (1), 86FS (2), 89IS (1), 91HS (1), 94AS (1)
<i>Georgeantha hexandra</i>	78ES (1), 86FS (1), 91JS (1)
<i>Grevillea rudis</i>	04BS (1), 04HS (1), 86FS (1),
<i>Verticordia aurea</i>	02AS (1), 78ES (1), 79CS (1), 81LS (2), 86FS (1), 95AS (1)

Many of the rehabilitation blocks within the proposed Allied Tails mining area are infested with *Acacia blakelyi* which is a disturbance opportunist (Plate 4). In earlier rehabilitation practices this species was included in seed mixes and was able to proliferate in large numbers. Iluka is currently undertaking eradication trials with Greening Australia which target *A. blakelyi* and it is envisaged that these results and current rehabilitation practices, which aim to minimise *A. blakelyi* establishment will allow more successful rehabilitation the second time around.

## **5. PROJECT DESCRIPTION**

### **5.1 Mining**

Mining of the additional pits is proposed to commence in January 2008 and will add 12 months to the current life of the South Mine. Total additional overburden volumes to be mined are estimated at approximately 1.95 million bcm. Approximately 0.35 million tonnes of additional heavy mineral concentrate will be produced.

Mining methods will be same as existing Eneabba operations. Topsoil will be removed and placed on rehabilitation areas or stockpiled for later use. Rehabilitation and native vegetation topsoils will be stockpiled separately. Overburden is removed and replaced directly into mining voids or stockpiled for later placement. The ore is trucked to a mining unit which screens out oversize materials and converts the ore to slurry. The slurry is pumped to the 03 concentrator through pipelines. All infrastructure required for mining and processing already exists on site.

Sand and clay tails will be returned to the mining void along the same pipe corridors as are used for ore transport.

### **5.2 Support facilities**

No new support facilities are required for the mining of these additional pits. Existing support facilities at Eneabba will be utilised. The HMC will be transported to Narngulu via rail and, once further refined, exported through the Geraldton Port according to existing procedures.

### **5.3 Workforce**

No additional workforce is required for the mining of the additional pits. Existing personnel from Eneabba will be utilised.

### **5.4 Resource requirements**

No additional resources will be required for mining of the additional pits with operations able to continue under existing licenses and infrastructure. There will be no significant increase in water or power requirements.

## 6. ENVIRONMENTAL IMPACT ASSESSMENT

Environmental impacts at Eneabba have been identified over the life of operations. The interim and triennial reports prepared and submitted under the State Agreement Act outline environmental management activities for a range of environmental factors. These include clearing, dust, radiation, social, dieback, noise, water and rehabilitation. A copy of the latest annual report is provided in Appendix 3 for information. A brief description of existing management for each factor and the potential impact from the development of the additional Allied Tails mining pits is outlined below.

### 6.1 Land Clearing

Clearing of the vegetation is unavoidable as the orebody is directly beneath it. The total area to be disturbed is approximately 533 ha. This consists of 442 ha of mixed age and quality rehabilitation. Cleared rehabilitation will be returned to native vegetation following mining using existing rehabilitation procedures as outlined in Section 6.7. The application for a clearing permit (area permit) is attached in Appendix 2. Each of the clearing principles are assessed against the application below.

***Native vegetation should not be cleared if it comprises a high level of biological diversity.***

The Allied Tails area is within the Geraldton Sandplains bioregion, recognised as an area of high biodiversity. The clearing of these additional pits is unlikely to have any impact on the overall biodiversity of the Geraldton Sandplains as there is no clearing of undisturbed native vegetation. Rehabilitation of the cleared areas with native vegetation will help to mitigate impacts on biodiversity.

Iluka has historically made substantial contributions to an understanding of the Kwongan vegetation type through its investment in research and development activities and student projects. Iluka currently sponsors or conducts:

- Seed germination biology of native seed species (seed biology research by Kings Park)
- Rehabilitation of Kwongan vegetation ecology (response to fire)
- Induction of multiple environmental stress tolerance in Australian plants
- Control of *Acacia blakelyi* trials
- Pre-mine surveys
- Rehabilitation monitoring (including effects of mulching)
- Landcare works

***Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.***

Many of the fauna listed in Table 3 are unlikely to be present or only present as vagrants across the Eneabba area and are not expected to be reliant on the Allied Tails rehabilitation areas. Clearing of Allied Tails rehabilitation for mining is not expected to have a regional impact on any of the fauna listed in Table 3.

A Schedule 1 (fauna that is rare or likely to become extinct) species, Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) forages on heathland vegetation and has been recorded in the vicinity of the Eneabba mine. There appears to be a lack of apparent suitable breeding habitat, either on the lease or sufficiently close, for breeding birds to rely solely on the lease for foraging (Bamford 2006). A preliminary reconnaissance survey of the Eneabba minesite was undertaken in September 2006 by Consultant Ornithologist Ron Johnstone which suggested that no suitable nesting sites occur within the mining lease. During this preliminary survey a number of priority areas were identified and these have subsequently been surveyed, most recently in August 2007. The subsequent surveys have identified that birds recorded at Eneabba are most likely from the east or north-east (Carnamah – Three Springs region) where there are good stands of tall eucalypts for breeding. Possible breeding sites at Lake Indoon, Arrowsmith floodout, areas southwest of Eneabba between the Leeman Road and south to the Green Head-Warradarge Road, and patches of Wandoo on farmlands in the Eneabba region found very little vegetation suitable for nesting (Johnstone pers. comm.). This species is unlikely to be affected by the proposed activity.

The Peregrine Falcon (*Falco peregrinus*) is a Schedule 4 (fauna in need of special protection) species that may occur sporadically in the vicinity of the Eneabba mine but is unlikely to be solely reliant on the Iluka lease areas (Bamford 2006). The Peregrine Falcon is cosmopolitan but uncommon throughout Australia and prefers to inhabit sites that provide tall perching structures such as cliffs, gorges, timbered watercourses, and tall man-made structures such as power-poles and buildings (Bamford 2006). This species is unlikely to be affected by the proposed activity.

The Rainbow Bee-eater (*Merops ornatus*) and Fork-tailed Swift (*Apus pacificus*) are classified as migratory under the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA) and The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). Bird species listed under JAMBA are also protected under Schedule 3 of the WA Wildlife Conservation Act 1950. The Rainbow Bee-eater is a common breeding resident in northern Australia and a summer breeding migrant to southeast and southwest Australia (Pizzey and Knight 1998).

The Rainbow Bee-eater is an opportunistic species known to inhabit open woodlands with sandy, loamy soil; sandridges, sandpits, riverbanks, road-cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands and golf courses, where it prefers to nest in sandy ground, banks and cuttings (Pizzey and Knight 1998, M. Bamford pers. comm). It is an aerial feeder and is not likely to be directly impacted by the proposal (M. Bamford pers.comm).

The Fork-tailed Swift is a regular summer migrant throughout WA and SA that breeds in Siberia, the Himalayas, Japan and southeast Asia (Pizzey and Knight 1998). Although reported roosting on cliffs and large trees it prefers open country where it is an aerial feeder rarely landing, and known to spend nights on wing (Pizzey and Knight 1998). The Fork-tailed Swift populations are unlikely to be affected by the proposal.

DEC has recorded three Specially Protected and or Priority fauna species within 10 kilometres of the mining area (DoE 2005). They are the Shield-Backed Trapdoor Spider (*Idiosoma nigrum*) (Schedule 1), scorpion fly (Mecopteran *Austromerope poultoni*) (Priority 2, taxa with few, poorly known populations on conservation lands) and the Rufous Fieldwren (western wheatbelt) *Calamanthus campestris montanellus* (Priority 4, taxa in need of monitoring).

The Shield-backed Trapdoor Spider (*Idiosoma nigrum*) although once widespread is now restricted to a small area of Jam (*Acacia acuminata*) woodland, east of the northern part of the Darling Ranges to Murchison River, and then east to Paynes Find (Main, 1982). The spider makes its' burrow in heavy clay soils in open York Gum (*Eucalyptus loxophleba*), Salmon Gum (*E. salmonophloia*), wheatbelt Wandoo (*E. capillosa*) woodland, with Jam (*A. acuminata*) forming a sparse understorey (Main 1987, 1991, 1992). None of these

vegetation types are present in the Allied Tails area. A targeted survey of potential habitat for the spider was undertaken by Bamford Consulting Ecologists in December 2006 and none found.

The Scorpion Fly (*Austromerope poultoni*) is a very primitive relict invertebrate species; that has only ever been seen from pitfall traps and has never been seen alive. This species occurs in forested areas, and has been recorded from parts of the Darling Range near Boddington and Worsley, and areas further to the southwest, including Busselton, Yallingup and Manjimup. The wide variation in rainfall at these sites indicates that the species can tolerate a wide range of habitat moisture regimes and that the species maybe cryptic, living in the more moisture stable litter layer (Faithfull *et al.*, 1985). This species has been recorded in a wide range of vegetation association, including jarrah forest, wandoo woodland and heath, and displays no preference or dependence on plant physiognomy or vegetation composition.

The Rufous Fieldwren (*Calamanthus campestris montanellus*) is a priority sub-species not listed under any Acts. It is a species that inhabits very low heath; has previously been recorded at Eneabba; and is likely to be a permanent and widespread resident species. Although this species is likely to disappear from the directly impacted area for 2-3 years following activities, there is a significant proportion of habitat in the general area to support the displaced birds. This bird has been found to recolonise rehabilitation very well (M. Bamford pers. comm.), and therefore Iluka's historic and ongoing rehabilitation initiatives at Eneabba are important for this species.

Previous advice provided by the DEC for the Adamson 'A' and 'B' Proposals stated that:

"Provided the clearing is carried out in an incremental manner and actively rehabilitated directly after the cessation of mining activities, the Proposal is unlikely to have a major impact on the local fauna (DEC advice 2005). DEC has advised the advice given in relation to the two invertebrates of conservation significance for Adamson 'A' also applies to Adamson 'B' (DEC 2006b)."

***Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.***

No DRF species have been recorded in the Allied Tails rehabilitation blocks listed in Table 4 that have been monitored by Matiske Consulting Pty Ltd. All areas of rehabilitation will be surveyed for DRF prior to any clearing occurring. It is a requirement of internal clearing procedures that DRF surveys are completed prior to the approval of a ground disturbance permit. A flow chart showing the internal approval process for a ground disturbance permit is attached as Appendix 4

Mining within Allied Tails will impact on local populations of Priority flora but this impact is unlikely to be significant as these species are all represented elsewhere on the Iluka leases.

***Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.***

There are no Threatened Ecological Communities within the proposed mining pits or within a 100m buffer.

***Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.***

The clearing of 442 ha of mixed quality and aged rehabilitation will have a negligible impact on the overall vegetation extent. As this is clearing of rehabilitation it is considered that the impact has already been considered and is not additional clearing of remnant native vegetation. The areas of rehabilitation cleared will be rehabilitated to native vegetation.

***Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.***

No watercourses or wetlands are in or linked to the proposed mining areas. There will be no impact on watercourses or wetlands.

***Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.***

The area cleared will be mined and rehabilitated to native vegetation. The mining and rehabilitation process includes drainage and water run-off controls. There will be no land degradation resulting from the clearing of the additional mining pits.

***Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.***

The area is mostly within Reserve 31030, which is classified as an Environmentally Sensitive Area (ESA). Mining has occurred within this reserve since the 1970s under the MSA.

***Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.***

There are no adjacent surface water bodies that will be impacted by the clearing. Groundwater at Eneabba is below the ore-bodies and is not impacted by mining operations. Drainage mechanisms are put in place during operations and rehabilitation to control water flows. Clearing will not cause deterioration in the quality of surface or underground water.

***Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.***

Drainage mechanisms are put in place during operations and rehabilitation to control water flows. The clearing of vegetation will not cause, or exacerbate, the incidence or intensity of flooding.

## **6.2 Dieback**

A Dieback Management Plan is implemented at the Eneabba site. This strategy outlines the procedures adopted by Iluka at Eneabba for preventing the spread of any dieback and containing it within already identified areas. The Dieback Management Plan and associated mapping is currently undergoing revision with a draft reviewed by the DEC.

## **6.3 Water**

The groundwater table is below the mining pit and dewatering is not required. Groundwater is extracted from existing bores for processing. No surface water drainage systems will be impacted by the additional mining pits. There are not anticipated water impacts as a result of the additional mining pits.

## **6.4 Radiation**

A Radiation Management Plan is implemented at the Eneabba site, as part of Iluka's Midwest Operations. Radiation monitoring will continue in accordance with the plan. There are no anticipated further radiation impacts as a result of the additional mining pits.



## 6.5 Dust

Dust mitigation strategies and monitoring is conducted at Eneabba to ensure compliance with licence conditions. Dust levels are not expected to result in additional impact as a result of the additional mining pits.

## 6.6 Noise

It is not anticipated that there will be an increase in the existing noise levels as there is no increase the overall level of activity within the Eneabba site. The additional pits are not located any closer to noise sensitive premises than current mining.

## 6.7 Rehabilitation

Iluka proposes to rehabilitate the mining area to enable a final land use of conservation. All rehabilitation areas disturbed will be rehabilitated to native vegetation.

Rehabilitation will aim to fill the final mining void and achieve a safe, stable and resilient final landform similar to the pre-mining contours. The overall profile of the pit limits will be blended into the undisturbed level outside the proposed mining limits.

The mining void will be progressively backfilled with overburden and dewatered sand tailings. The landform will be reshaped to the design profile and the dry sand tailings will be covered with a layer of stockpiled overburden and subsoil. Finally, the topsoil will be replaced.

The rehabilitation process is shown in Figure 7.

Iluka's rehabilitation strategy for conducting second time rehabilitation is:

- Blending 1st time and reclaim topsoils
- Increasing seeding rates and number of species seeded
- Increasing infill planting; and
- Use of four types of topsoil
  - Top-cut – top 50 cm of weathered surface soil containing seed bank
  - Sub-soil – 20-50 cm under native vegetation, dependant on colour change
  - Reclaim topsoil – single cut removal over pre-mined areas or to colour change. Can be used as subsoil in native vegetation rehabilitation.

The topsoil stripped from rehabilitated areas (reclaim topsoil to be used as sub-soil) will be stockpiled separately to other topsoil from native vegetation areas. When rehabilitating areas the reclaim topsoil will be placed as a subsoil layer and covered with approximately 50 cm of top-cut topsoil. Sufficient additional topsoil is located at Eneabba to implement this strategy.

Areas rehabilitated the second time will have a seeding rate of 1 kg/ha allowing 30% survival of local vegetation type. Rehabilitation monitoring undertaken by Mattiske Consulting Pty Ltd in the second and third years will determine the requirement for additional infill planting of targeted species.

Iluka has rehabilitated approximately 2000 ha of land affected by mineral sand mining at Eneabba and conducts on-going biological monitoring of these areas. As part of the flora and vegetation monitoring program, Mattiske Consulting Pty Ltd has assessed a selection of

the flora and vegetation in areas revegetated since 1979. In recent years re-mining of rehabilitation in several areas has occurred adjacent to new mining and has allowed comparison of these areas following rehabilitation. Results from rehabilitation monitoring conducted in 2002, 2003 and 2004 indicate that plant species richness, plant density and foliage cover in areas of second time rehabilitation is comparable to rehabilitation undertaken on areas mined once (Mattiske Consulting Pty Ltd 2002, 2003 and 2004).

## **6.8 Social**

There are no European heritage sites or Aboriginal heritage sites within the Allied Tails area.

Iluka has good relationships with neighbouring residents due to its long history within the region. Ongoing consultation with the community is conducted.

The development of the Allied Tails area ensures the continuation of employment for current Iluka and contract personnel, and provides additional employment and business opportunities for the surrounding community. It will also assist in maintaining a continuity supply of mineral for Iluka, a large contributor to the local and state economy. Community consultation is conducted by Iluka about its activities on a regular basis.

## **7. CONCLUSION**

The Allied Tails mining area is a continuation of current mining operations at Eneabba involving re-mining of an old mine path. This approval is sought in accordance with the relevant provisions of the *Mineral Sands (Eneabba) Agreement Act 1975* (MSAA) and the *Environmental Protection Act (1986)* (EP Act) (as amended).

The area contains 442ha of native vegetation rehabilitation. No impacts on declared rare flora have been identified. Small numbers of plants of 24 Priority species will be disturbed. These are widespread across Eneabba and all of these species have been recruited into the rehabilitated areas. All areas of rehabilitation cleared will be rehabilitated to native vegetation.

Mining of the additional pits can be managed under existing environmental controls and procedures in place at Eneabba. Operations will be conducted in accordance with existing pollution prevention licence conditions (5646/8). Mining operations and environmental management activities will be reported to the MSARCC through the annual environmental reporting process currently in place.

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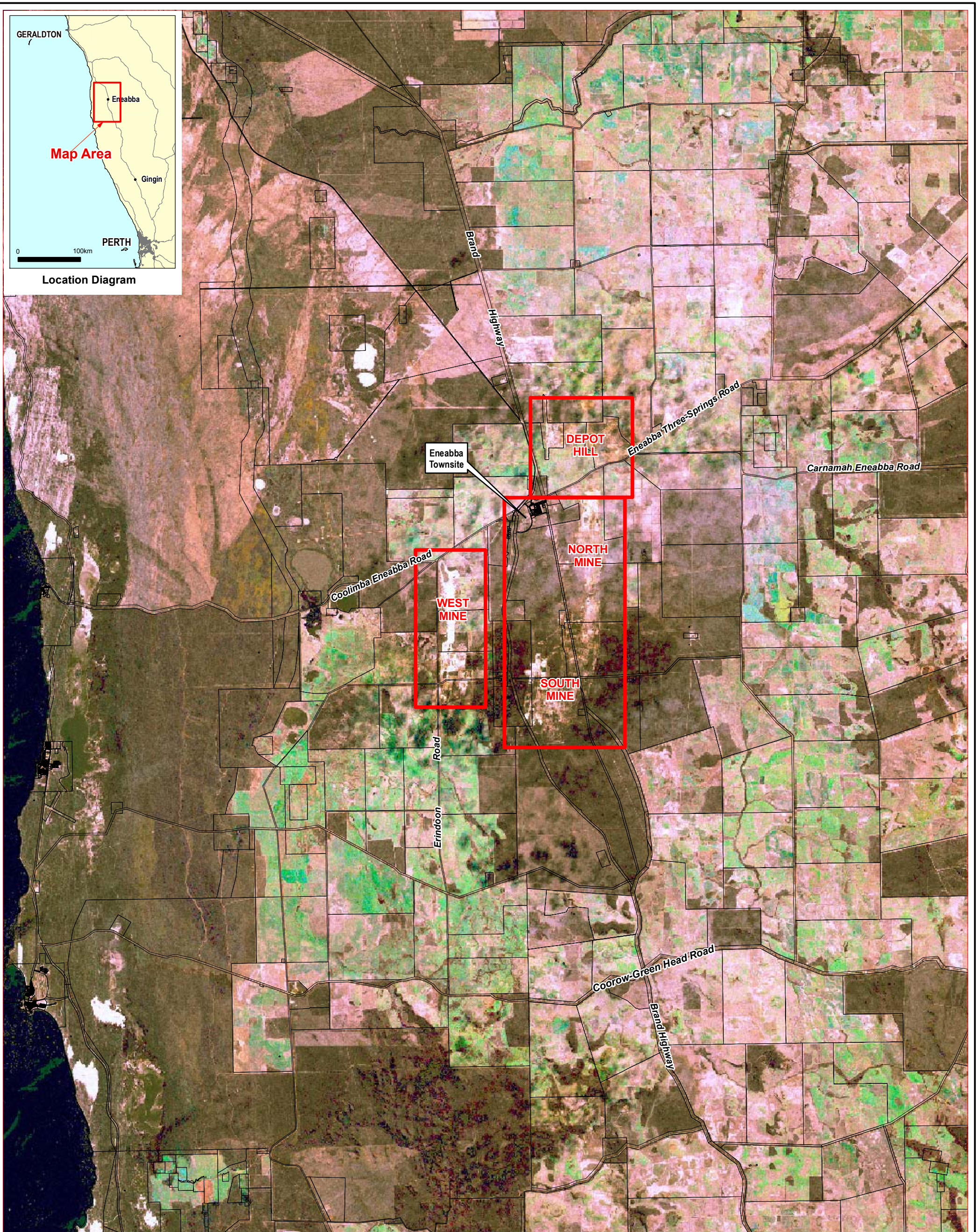
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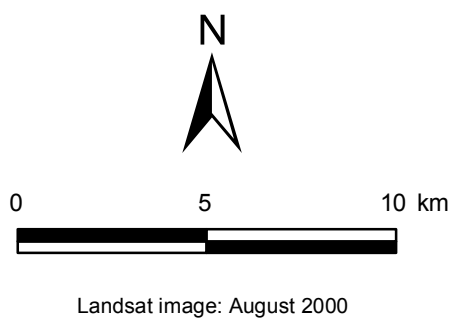
Woodman Environmental Consulting (2007). Allied Tails Project Area Flora and Vegetation Surveys. Unpublished report prepared for Iluka Resources Limited Eneabba Operations.

# FIGURES





Ver.	ORIG	DESIGN	DATE	COMMENTS
<b>REVISIONS</b>				



**ILUKA**  
ORIG: L.Sadler  
DRAWN: D.G.S.  
SCALE: 1:200 000  
DATE: 2 May 2005

**ENEABBA**

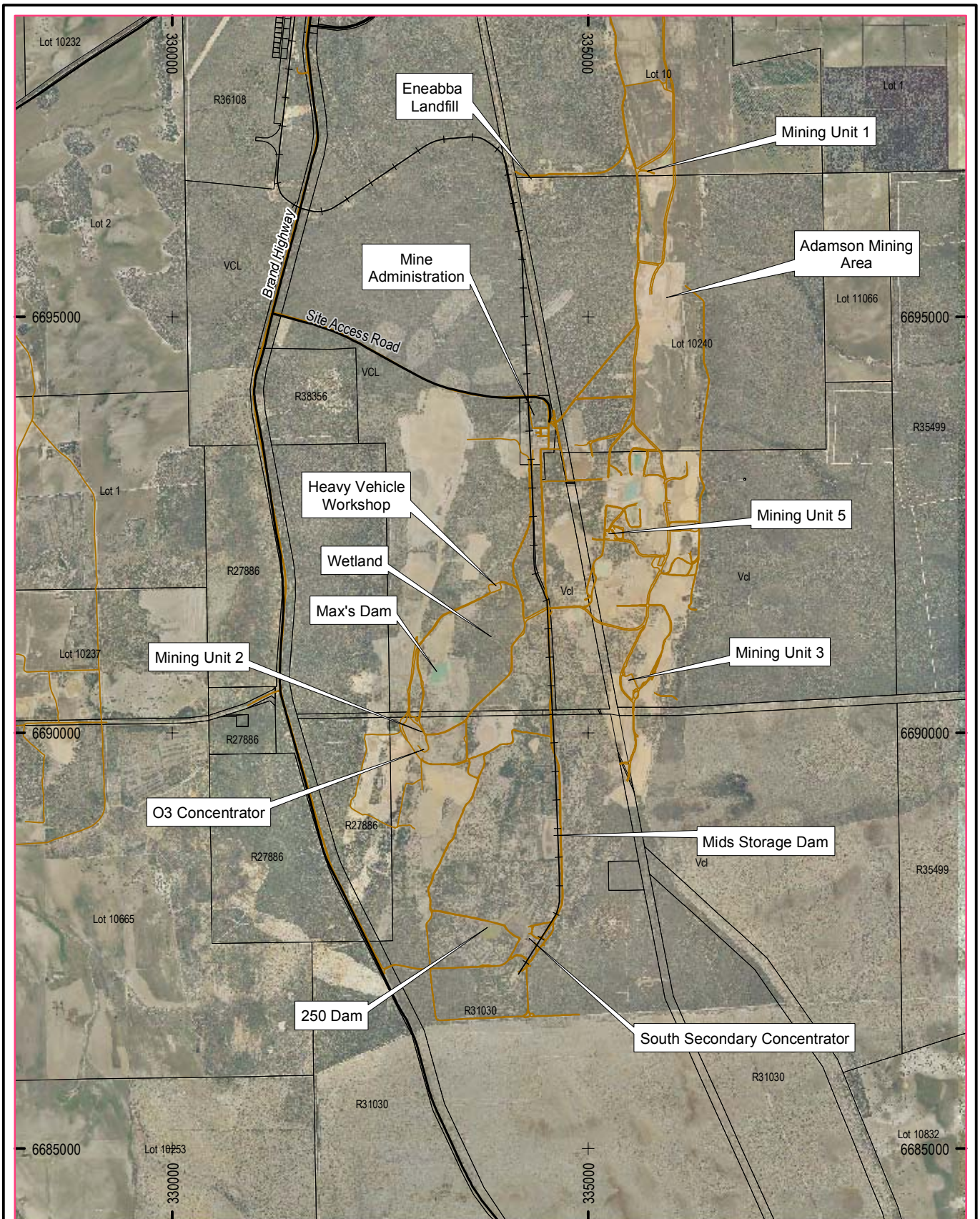
**REGIONAL MINING AREAS**

DWG No: 151938 ver.00



**FIGURE: 1**







**Legend**

-  Cadastre
-  Infrastructure - Site Roads

Aerial Photo dated Oct 2006



MGA Coordinates, GDA94



ORIG: S Barron  
 DRAWN: S.B./D.L.S.  
 SCALE: 1:65,000  
 DATE: Feb 2007

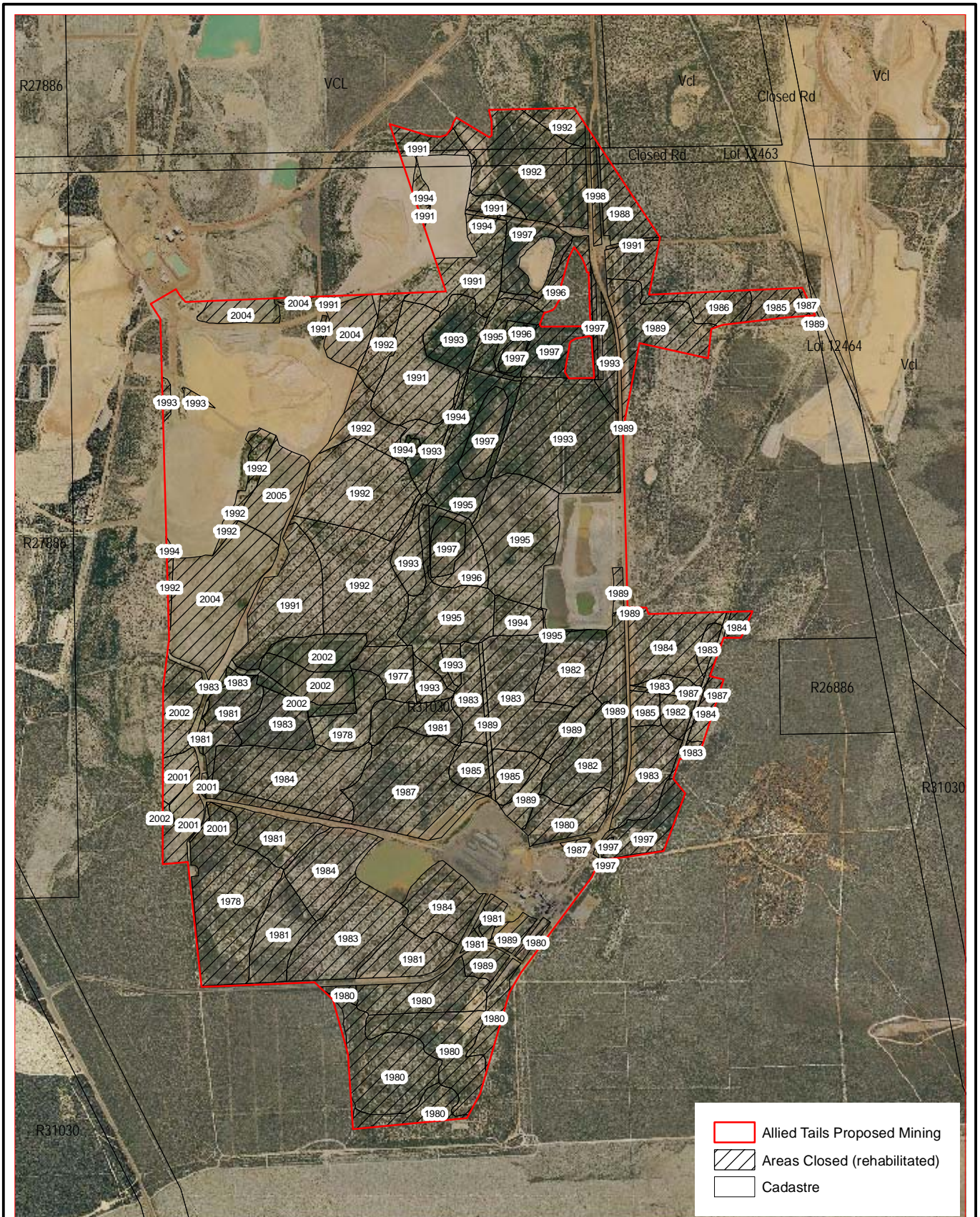
**SOUTH MINE OPERATIONS**




**Aerial Photograph and Major Infrastructure Layout**

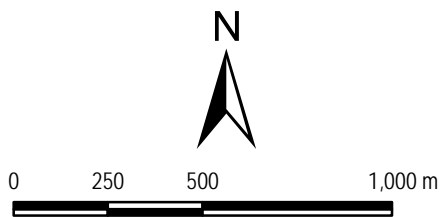
DWG No: 170782v00

A4 **FIGURE: 2**





	Allied Tails Proposed Mining
	Areas Closed (rehabilitated)
	Cadastre



MGA Coordinates, GDA94



ORIG: BGB  
 DRAWN: BGB  
 SCALE: 1:20,000  
 DATE: 05/09/07

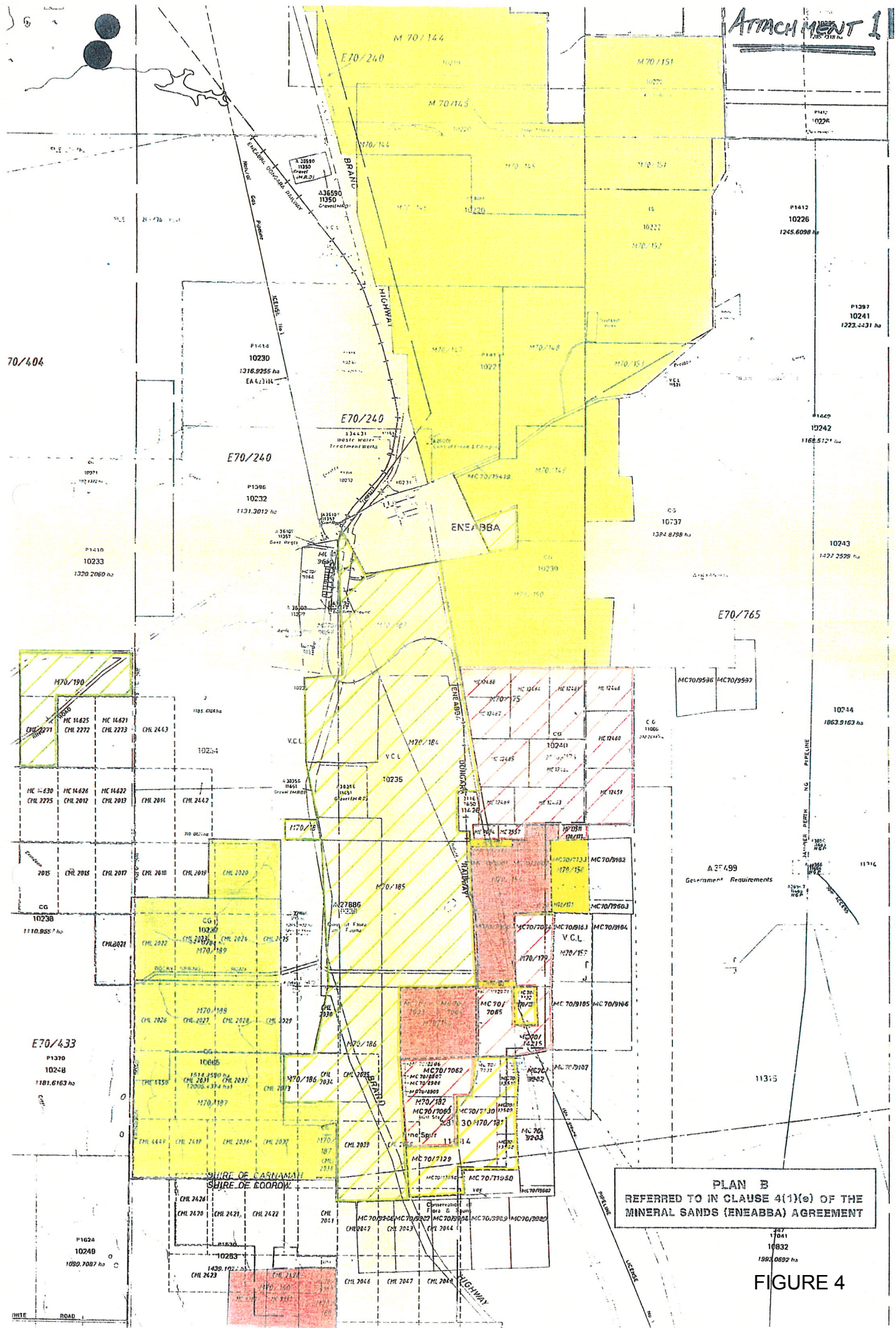
**ENEABBA**

# Allied Tails Proposed Mining

DWG No: Allied Tails v3

A4 **FIGURE: 3**

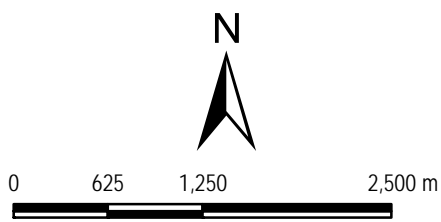
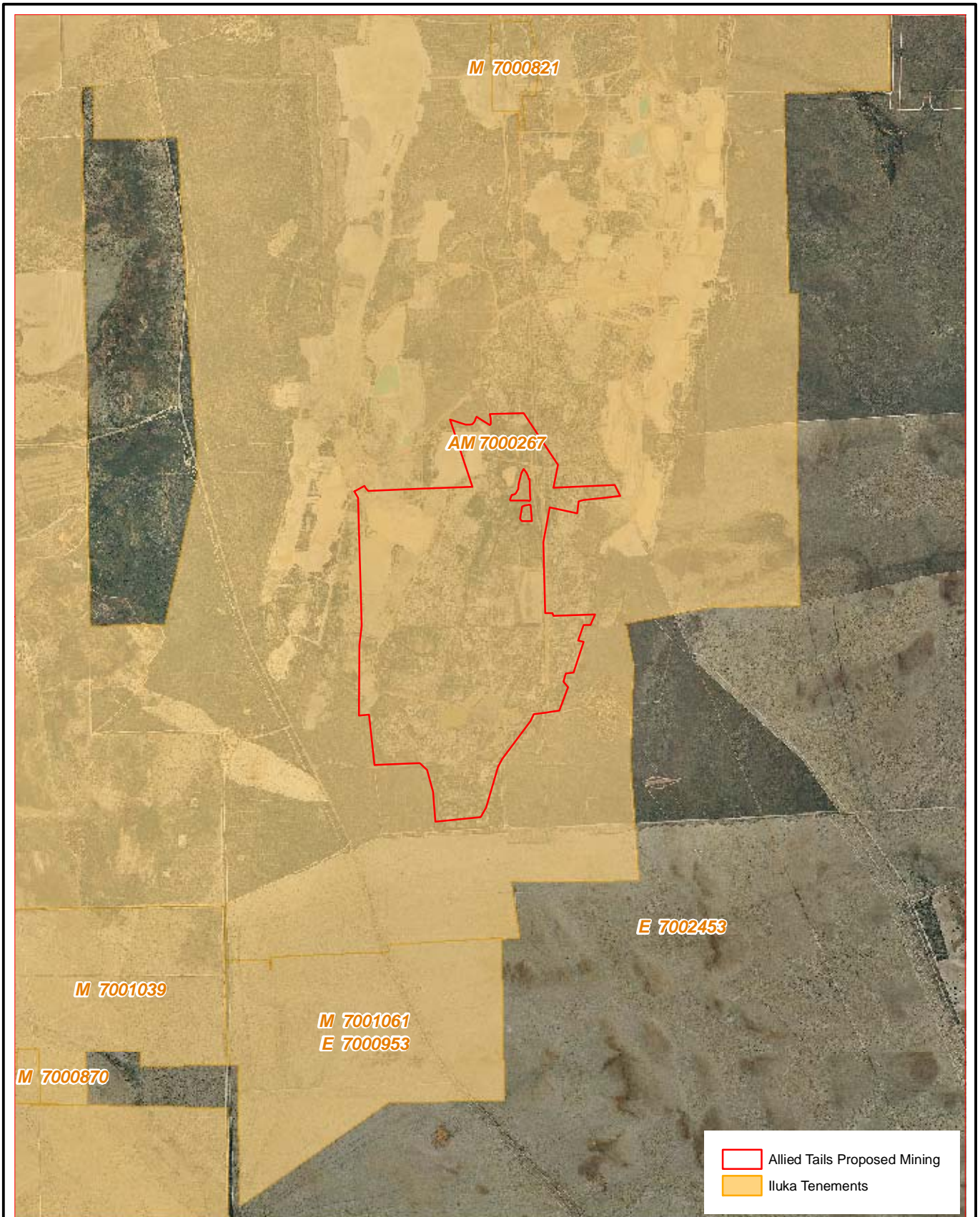




PLAN B  
 REFERRED TO IN CLAUSE 4(1)(e) OF THE  
 MINERAL SANDS (ENEABBA) AGREEMENT

FIGURE 4





MGA Coordinates, GDA94



ORIG: BGB

DRAWN: BGB

SCALE: 1:50,000

DATE: 05/09/07

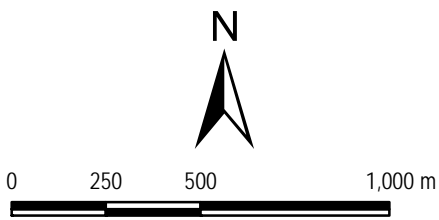
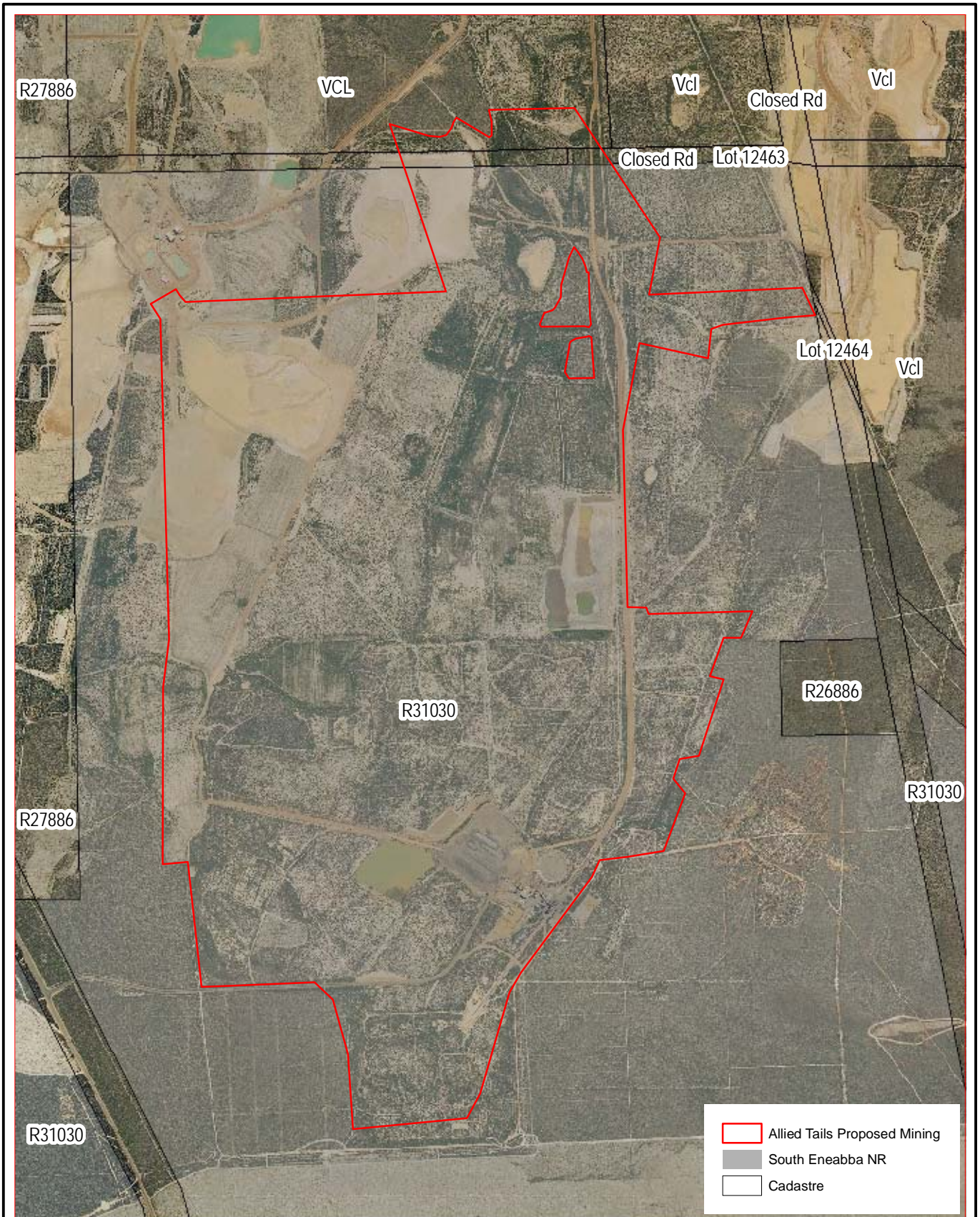
# ENEABBA Allied Tails Mining Tenure

DWG No: Cadastre

A4 FIGURE: 5







MGA Coordinates, GDA94



ORIG: BGB

DRAWN: BGB

SCALE: 1:20,000

DATE: 05/09/07

# ENEABBA Allied Tails Cadastrate

DWG No: Cadastrate

A4 **FIGURE: 6**



# Rehabilitation Process – Native Vegetation

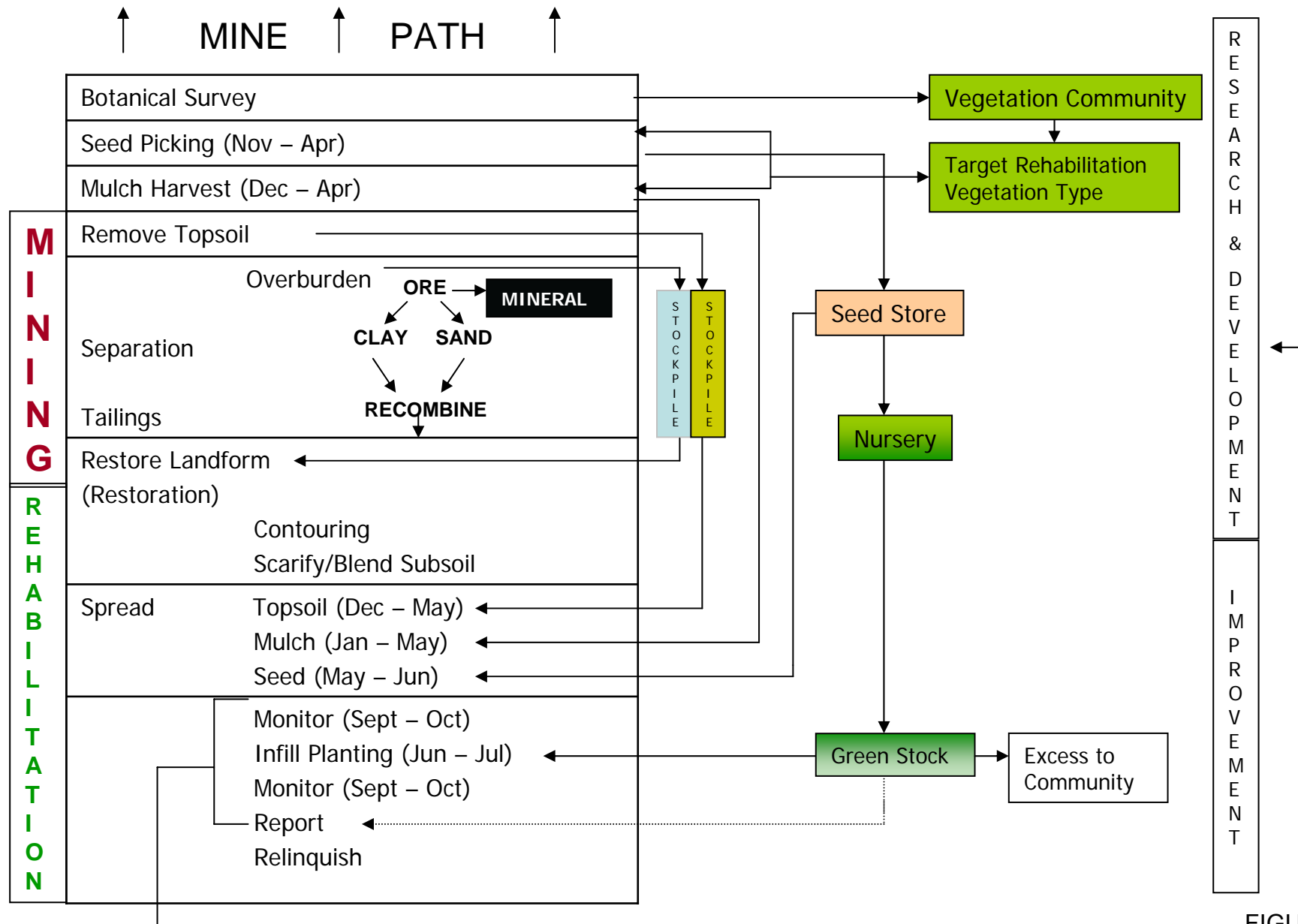


FIGURE 7



# **APPENDIX 1**



# **MINERAL SANDS (ENEABBA) AGREEMENT ACT 1975**

## **SUMMARY OF MINING ACTIVITIES APPROVED WITHIN THE AREAS SHADED AND HATCHED GREEN ON THE AGREEMENT PLAN B**

### **BACKGROUND**

The Mineral Sands (Allied Eneabba) Agreement Amendment Act 1988 contained provisions which served to:-

- amalgamate the Mineral Sands (Allied Eneabba) Agreement and the Mineral Sands (Western Titanium) Agreement by transferring the outstanding obligations set out in the Western Titanium Agreement into the Allied Eneabba Agreement;
- rename the Allied Eneabba Agreement to the Mineral Sands (Eneabba) Agreement; and
- repeal the Western Titanium Agreement.

Plan B was also introduced into the Agreement through Clause 4(1)(e) of the Agreement Amendment of 1988. (SEE ATTACHMENT 1)

Plan B superseded Plan A referred to in the Principal Agreement.

The Red and Yellow areas both shaded and hatched on Plan B are the areas that were approved for mining as at the date of the Amendment Agreement.

The Green shaded and hatched areas require proposals under Clause 6B, as detailed under Clause 6C, to be approved prior to mining.

The Green shaded areas comprise agricultural land which will have different rehabilitation requirements to the Green hatched areas which are lands of the Crown.

New Clause 15(1) enables additional areas to be brought under the Agreement from time to time. New areas approved for inclusion under the Agreement shall be regarded, for rehabilitation purposes, as Green areas and the status of shaded or hatched will depend on whether it is agricultural land or lands of the Crown.

### **PROPOSALS APPROVED FOR MINING WITHIN THE GREEN SHADED AND HATCHED AREAS**

#### **1. Proposal to Change Mining Methods of Eneabba South Operation from Dry Mining to Dredging at Eneabba - July 1987**

(DRD ref. MSENE 090)

The proposals sought approval to change from the dry mining method approved in previous proposals for mining within MC's 7003 and 7004.

The July 1987 document proposed that dredge paths and auxiliary dry mining areas would be located partially in VCL and partly in Class "C" Flora and Fauna Reserves (Reserves 31030 and 27886).

The proposal containing the attached plans detailing the Location Map, the dredge path and the auxiliary dry mining areas was approved by the Minister for Minerals and Energy by letter dated 16 October 1987. (ATTACHMENTS 2,3,4 AND 5)

Dredge mining was deferred in the South area during 1991 due to a downturn in world markets.

*The dry mining operation was the subject of joint (duplicated) approved proposal dated December 1985.*

(ATTACHMENT 6)

(DRD ref. MSENE 084 and MSENE 027)

*The July 1987 proposal was based on a three stage drilling program outlined in a document dated Feb. 1996 addressing additional information requested by the Minister. The First Stage involved the areas shown coloured yellow within MC's 7041, 7042 and 7043, the Second Stage involved the area shown coloured green and the Third Stage the area shown coloured red on the attached plan.*

(ATTACHMENT 7)

(DRD ref. MSENE 085)

## **2. Proposal for the Development of the Eneabba West Mine - 24 August 1989**

(DRD ref. MSENE 048)

The proposal related to the development of a dredge mining operation on private land situated within the western sector of project ML 267 SA.

ML 267 SA was a consolidation of tenements held the Allied Eneabba and Western Titanium Agreements as authorised under the Mineral Sands (Eneabba) Agreement Amendment Act 1988.

The approved revised mine plan and services is attached.

(ATTACHMENT 8)

The Minister for Resources Development approved the proposal by letter dated 12 October 1989.

(ATTACHMENT 9)

## **3. Proposal for Mining of the Jennings Area - 23 June 1992**

(DRD ref. MSENE 041)

The proposal relates to the continuation of dry mining beyond the original North mining area into the areas known as the "Jennings area" and shown shaded green on the Agreement Plan B.

The attached plan which forms part of the proposal illustrates the portions of the green area proposed for dry mining.

(ATTACHMENT 10)

In considering the proposal the EPA decided not to treat the proposal under the provisions of Part IV of the EP Act as the "... mining project could be considered to be an extension of its existing operations, and be subject to statutory requirements relevant to those operations".

(ATTACHMENT 11)

The proposal was approved by the Minister for State Development on 11 August 1992.

(ATTACHMENT 12)

## **CURRENT SITUATION**

### **1. Resumption of Mining in the South Areas**

RGC is currently seeking formal approval of Additional Proposals, submitted under the provisions of Clause 7 of the State Agreement, to resume dry mining operations in the South areas previously approved for dredge mining. Refer to Item 1 above. The proposal is of significant importance to the continued viability of the Company's mining operations at



Eneabba and has been supported by the Mineral Sands Agreement Rehabilitation Co-ordinating Committee.

Consideration of the proposal is currently underway. Mining is required to commence in October 1998.

**2. Proposal to Dredge Mine the "Jennings area" North of the Three Springs Road (Pharaohs Flat)**

RGC propose to dredge mine the former Jennings area mineral sands deposits north of the Three Springs Road at the completion of mining in the West area (approx. 18 months).

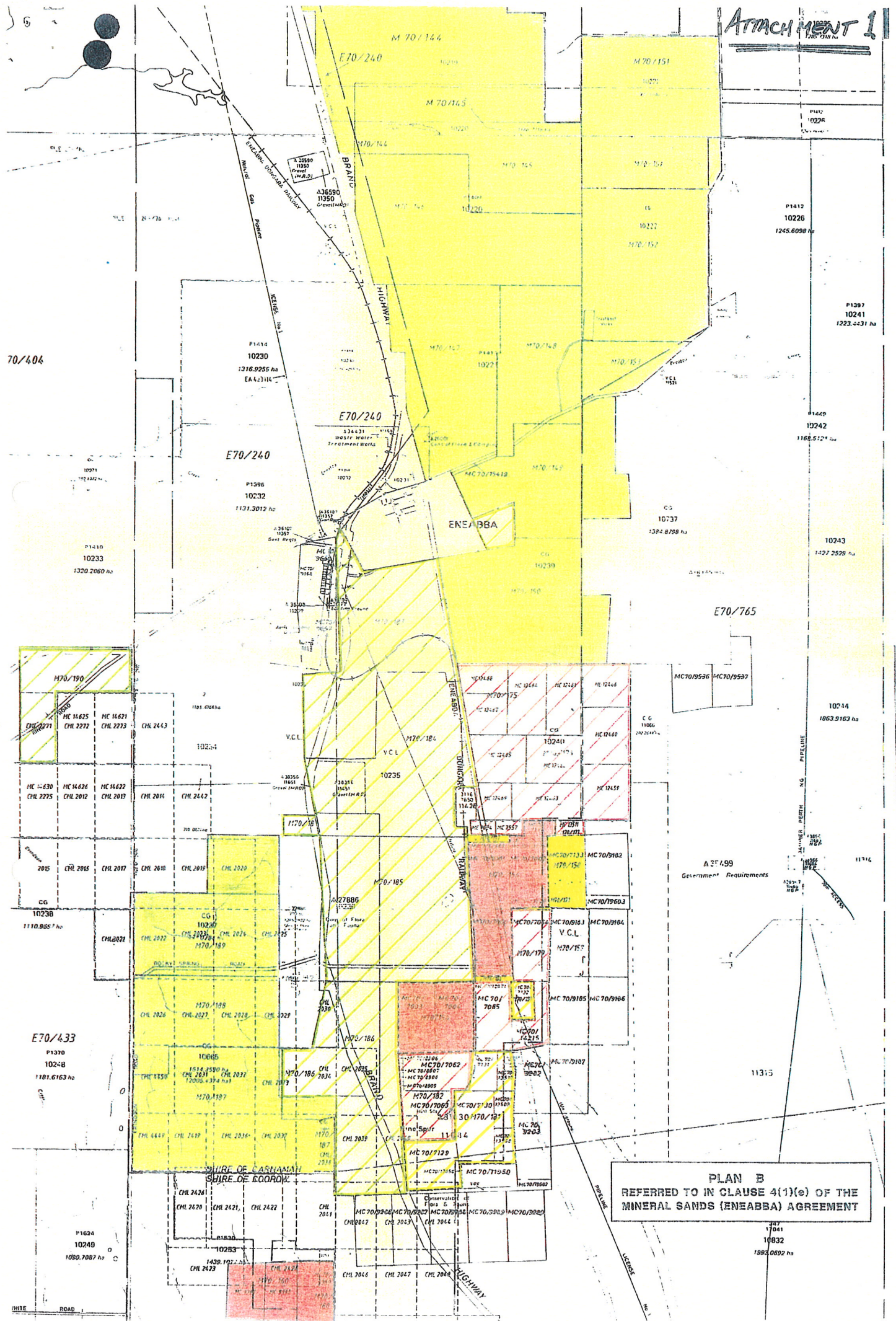
Formal approval for dry mining of the area was granted by the Minister for State Development in 1992. Refer to Item 3 above. However approval of Additional Proposals under Clause 7 of the Agreement will be required if dredge mining is to be undertaken.

**CURRENT AREA OF ML 267 SA**

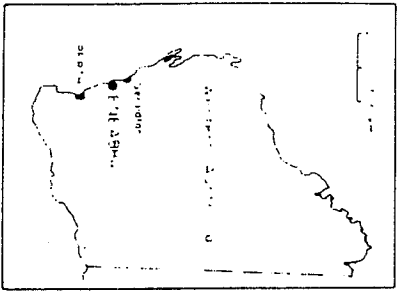
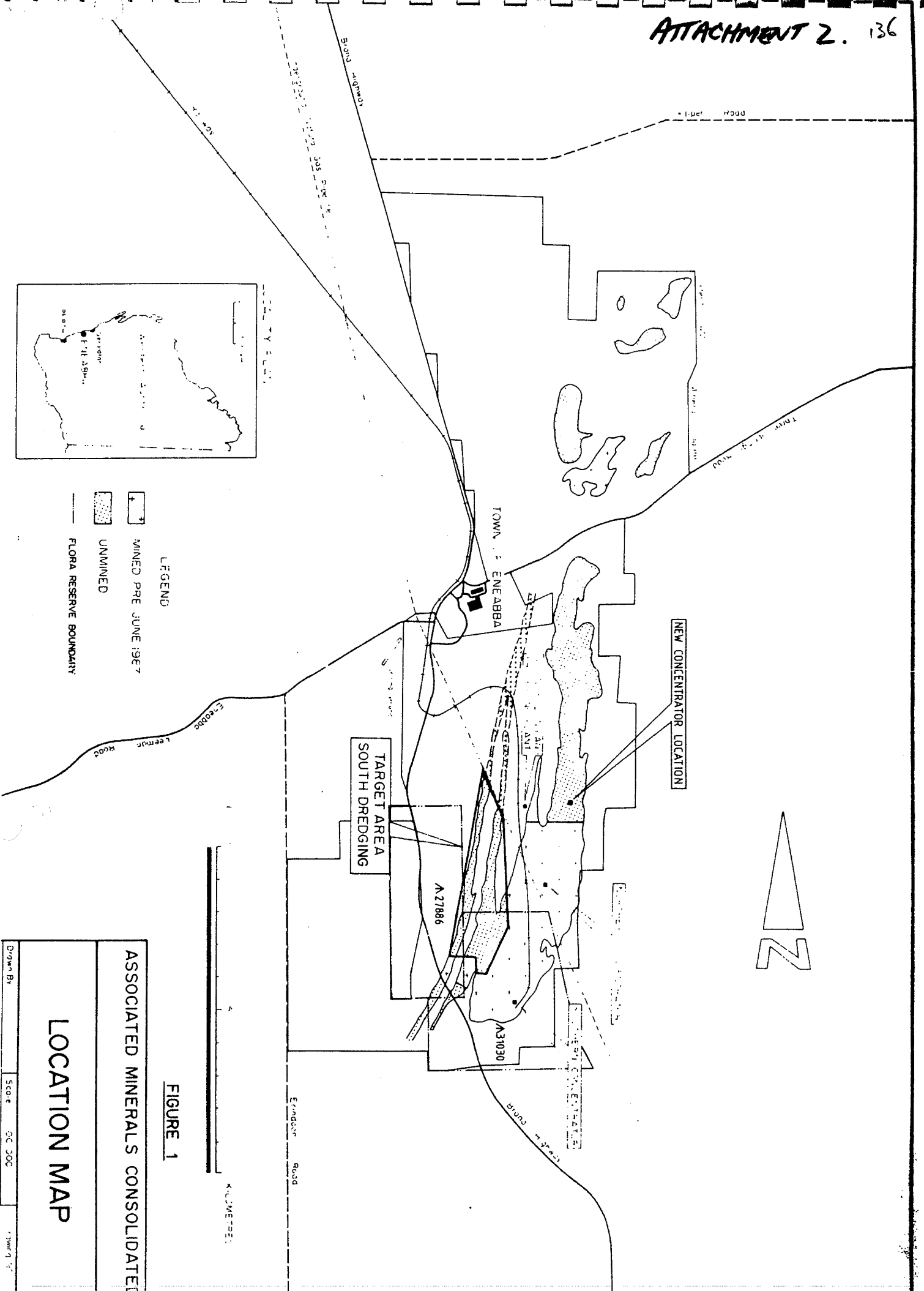
The attached plan illustrates the current area of ML 267 SA. The areas shown shaded blue on the plan area mining tenements held by the Company but are not included in the area of the ML. (ATTACHMENT 13)

Note: The green shaded and hatched areas may not be representative of the agricultural land and Crown Land for areas added to ML 267 SA since 1988.

Ken Weston  
SENIOR PROJECT OFFICER  
DEPARTMENT OF RESOURCES DEVELOPMENT  
6 August 1998.



PLAN B  
 REFERRED TO IN CLAUSE 4(1)(e) OF THE  
 MINERAL SANDS (ENEABBA) AGREEMENT



- LEGEND**
- MINED PRE JUNE 1987
  - UNMINED
  - FLORA RESERVE BOUNDARY

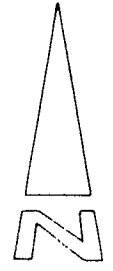


FIGURE 1

ASSOCIATED MINERALS CONSOLIDATED

LOCATION MAP

Drawn By	Scale	QC 300
<p>1:25000</p>		



- Legend
- DRY MINING
  - ▨ TAILINGS AREA
  - ▤ WATER STORAGE
  - ▧ EXCAVATION

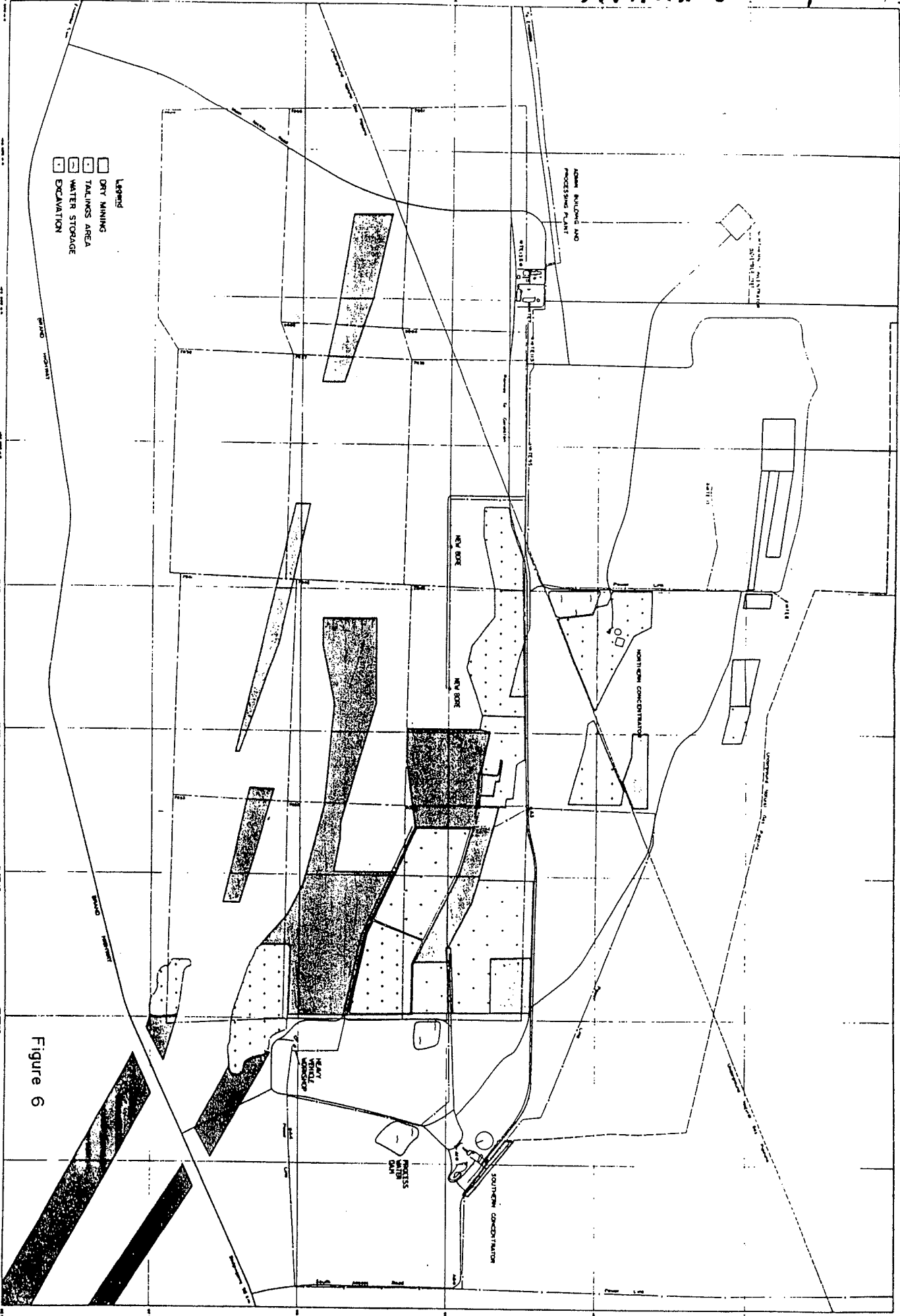


Figure 6

23-9  
**ATTACHMENT 5** 133

MINISTER FOR MINERALS AND ENERGY

CAPITA CENTRE  
197 ST GEORGES TERRACE  
PERTH 6000  
WESTERN AUSTRALIA  
TELEPHONE 2229699  
TELEEX AA95237  
FAX 4810223

Dr P.W. Cassidy  
General Manager  
Associated Minerals Consolidated Ltd  
45 Stirling Highway  
NEDLANDS WA 6009

Dear Dr Cassidy

**MINERAL SANDS (WESTERN TITANIUM) AGREEMENT  
NOTICE OF INTENT/ADDITIONAL PROPOSALS**

I refer to your initial correspondence dated 31 July 1987, that provided for my approval a detailed Notice of Intent/Additional Proposals to change the Eneabba south mine from dry mining to dredging. Subsequent correspondence extended the date for approval until 16 October 1987.

On the basis that you meet the conditions required by the Minister for the Environment in his letter dated 15 October 1987 to your Company, I hereby approve the Additional Proposals submitted under Clause 7 of the Agreement Act.

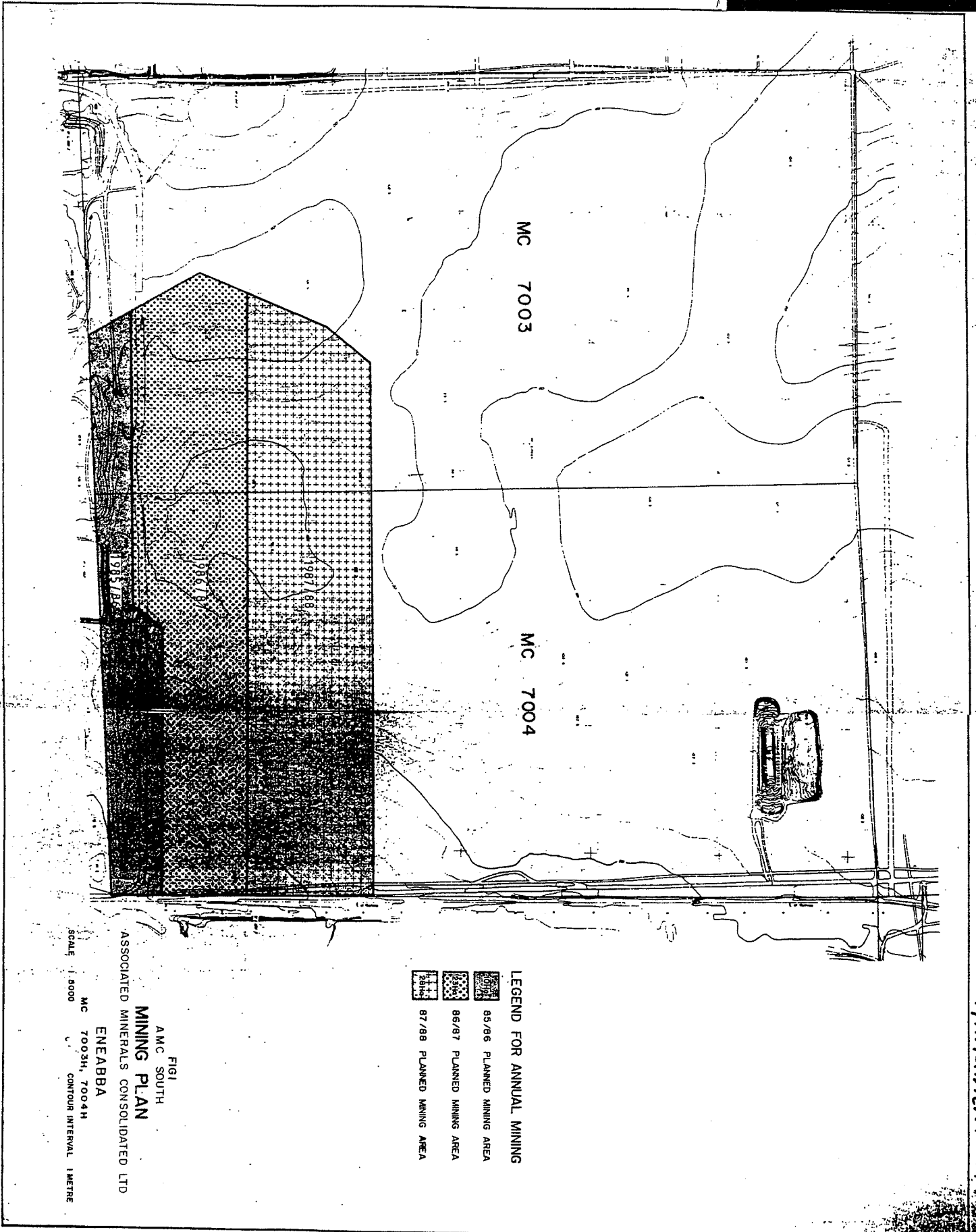
In implementing the change to your operations, you are to abide by all commitments made in the Notice of Intent/Additional Proposals and in your supplementary letter dated 4 September 1987. The Mineral Sands Agreements Rehabilitation Coordinating Committee will continue to monitor the project rehabilitation procedures and the progress being made by your Company.

Yours sincerely

SIGNED DAVID PARKER

DAVID PARKER, MLA  
MINISTER FOR MINERALS AND ENERGY

16 OCT 1987



ATTACHMENT 6

MC 7003

MC 7004




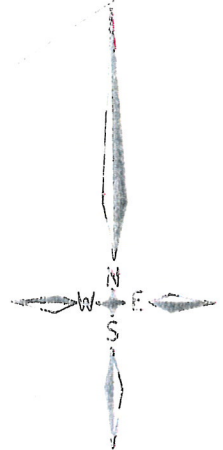
- LEGEND FOR ANNUAL MINING
-  85/86 PLANNED MINING AREA
  -  86/87 PLANNED MINING AREA
  -  87/88 PLANNED MINING AREA

FIG 1  
 AMC SOUTH  
**MINING PLAN**  
 ASSOCIATED MINERALS CONSOLIDATED LTD

ENEABBA  
 MC 7003H, 7004H  
 SCALE 1:5000  
 CONTOUR INTERVAL 1METRE

# PROPOSED DRILLING PROGRAMME

ENCABBA

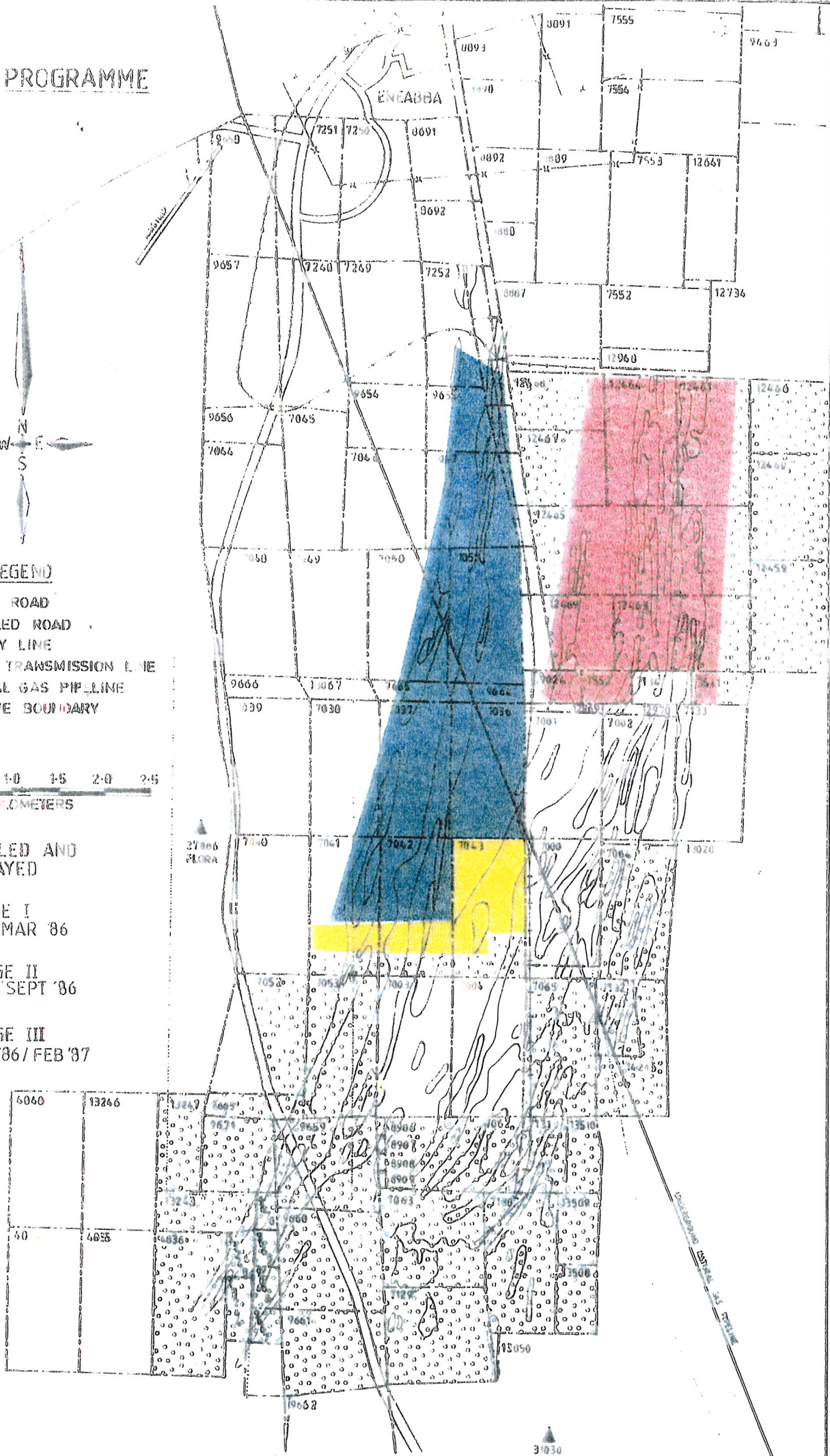


### LEGEND

- SEALED ROAD
- UNSEALED ROAD
- RAILWAY LINE
- POWER TRANSMISSION LINE
- NATURAL GAS PIPELINE
- RESERVE BOUNDARY

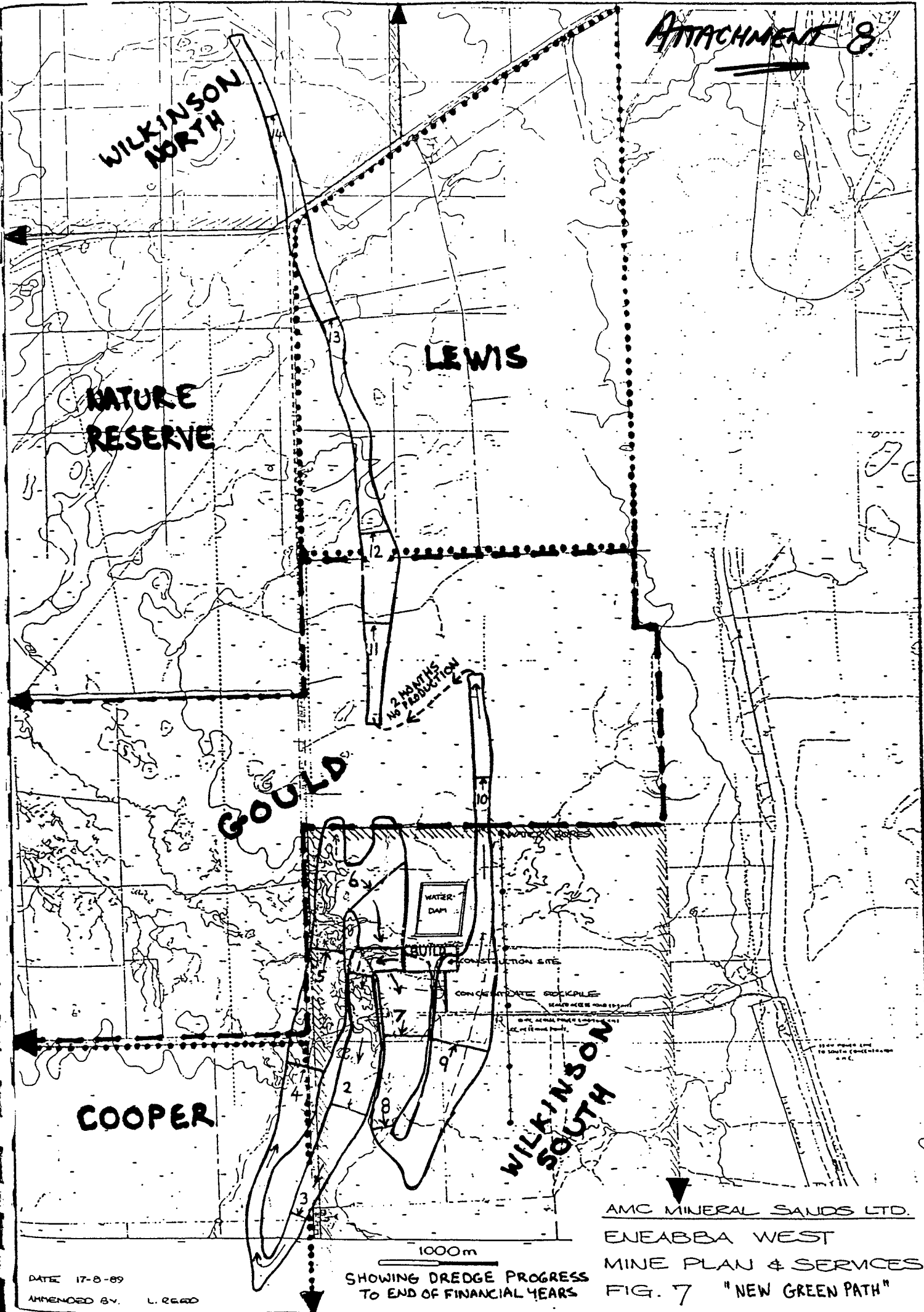


- DRILLED AND ASSAYED
- STAGE I  
FEB/MAR '86
- STAGE II  
APR. SEPT '86
- STAGE III  
OCT '86/ FEB '87





**ATTACHMENT 8**



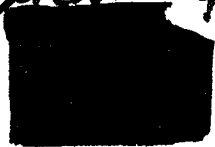
DATE 17-8-89  
AMENDED BY L. REED

SHOWING DREDGE PROGRESS  
TO END OF FINANCIAL YEARS

AMC MINERAL SANDS LTD.  
ENEABBA WEST  
MINE PLAN & SERVICES  
FIG. 7 "NEW GREEN PATH"



ATTACHMENT 7



129

**MSENE.048**

**OFFICE OF THE DEPUTY PREMIER**

Dr P.W. Cassidy  
General Manager  
AMC Mineral Sands Limited  
45 Stirling Highway  
NEDLANDS WA 6008

12 OCT 1989

Dear Dr Cassidy

**MINERAL SANDS (ENEABBA) AGREEMENT ACT 1975 - ENEABBA WEST PROJECT**

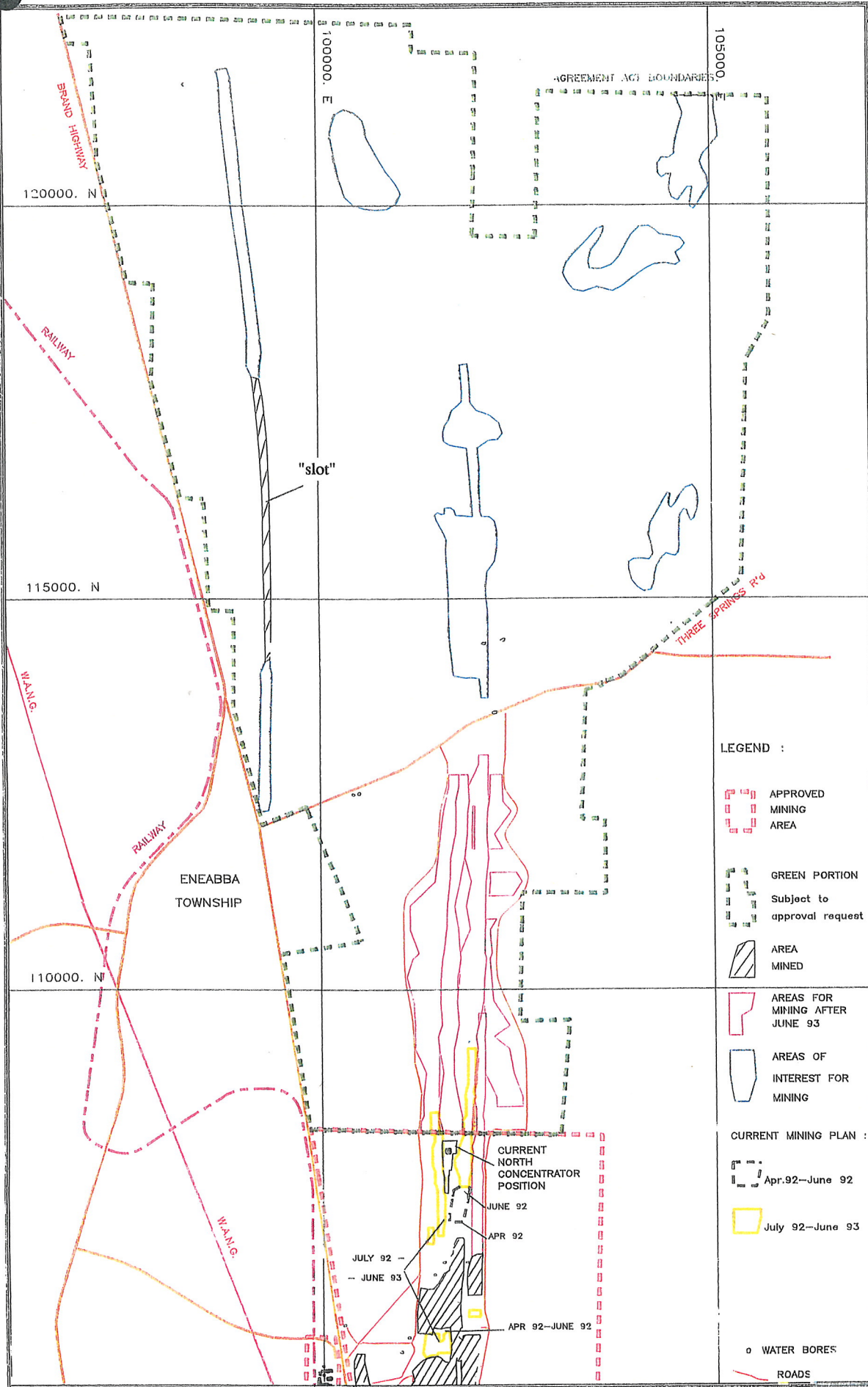
I refer to the letter dated 24 August 1989, signed by Mr W. Dawes of your organisation, with which you forwarded your detailed proposals for the expansion of your operations at Eneabba and Narngulu, pursuant to Clause 6B and 7 of the above Agreement, and which proposals were modified by your letter and attachments of 6 October 1989.

Having received an authority under Section 45(7) of the Environmental Protection Act 1986 in relation to this project and the additional information sought from AMC to modify the proposals, I hereby, pursuant to Clause 6C of the Agreement, approve the proposals as amended.

Yours sincerely

Ian Taylor, MLA  
ACTING MINISTER FOR RESOURCES DEVELOPMENT

**AGREEMENTS  
LIBRARY**



**AMC MINERAL SANDS LTD--ENEABBA OPERATION**

PORTION OF GREEN AREA PROPOSED FOR MINING  
 MINERAL SANDS (ENEABBA) AGREEMENT (1987)

148078

RECEIVED BY  
STATE DEVELOPMENT  
FILE No: 50831/91

-3 JUL 1992



OFFICER	
M. JAMES	4/7 3/8
AND TRED:	/

Director  
Resource Processing Development  
DEPARTMENT OF STATE DEVELOPMENT

Your ref: 0831/91  
Our ref: 118/74: 58173  
Enquiries: Colin Murray  
(222 7076)

ATTENTION: Mr M James

**RGC MINERAL SANDS - FORMAL PROPOSALS TO MINE "JENNINGS" AREAS, ENEABBA**

Reference is made to your letter of 1 July concerning the above proposal by RGC Mineral Sands Limited.

The Authority has discussed the proposal with the proponent and agrees that this mining project could be considered to be an extension of its existing operations, and be subject to statutory requirements relevant to those operations. The Authority will therefore not treat this proposal under the provisions of Part IV of the Environmental Protection Act.

Commitments have been made by the Company to undertake environmental management practices applied to its other Eneabba operations, and it is noted that this extension will be incorporated into the forthcoming 1992 Triennial Report.

The Authority therefore has no objection to RGC Mineral Sands Limited commencing the overburden stripping for parts of the "Jennings" land south of the Three Springs Road during September. Clearly such stripping should be confined to those areas which are in the immediate mine path or required for infrastructure.

Dr J R Ottaway  
A/DIRECTOR  
EVALUATION DIVISION

30 July 1992

**Environmental Protection Authority**  
Westralia Square  
38 Mounts Bay Road  
Perth WA 6000  
Telephone (09) 222 7000  
Facsimile (09) 322 1598.



Your Ref: 14710

Ms F.M. Nicholls  
Manager Environmental Affairs  
RGC Mineral Sands Limited  
45 Stirling Highway  
NEDLANDS WA 6009

11 AUG 1992

Dear Ms Nicholls

**MINERAL SANDS (ENEABBA) AGREEMENT - PROPOSALS FOR MINING  
"GREEN AREAS"**

I refer to your letter of 23 June 1992 and the accompanying proposals to extend mining at Eneabba into the "green areas", pursuant to Clause 6B of the Mineral Sands (Eneabba) Agreement ("the Agreement").

The proposals and associated commitments given by RGC Mineral Sands Limited are acceptable to me and I hereby approve the commencement of mining operations in the "green areas", pursuant to Clause 6C of the Agreement.

Your comments with respect to possible future rehabilitation work on the "slot", north of the Eneabba - Three Springs Road are noted. Notwithstanding the question of legal responsibility, you will appreciate, I feel sure, that the continuing lack of remedial action at this site cannot help but reflect unfavourably on the mineral sands industry, generally, in Western Australia. I encourage you to work closely in future, as you have done in the past, with the Mineral Sands Agreement Rehabilitation Co-ordinating Committee in order to identify and evaluate environmentally appropriate and economically feasible means to address this problem at an early opportunity. In this respect, I am heartened by your willingness to consider possible remedial measures, should future mining operations be undertaken in the vicinity of the "slot".

RGC is to be congratulated for its commitment to high standards of environmental performance and rehabilitation at Encabba, and I anticipate a continuation of this philosophy will be evident in future annual and triennial reports submitted pursuant to the Agreement.

Yours sincerely

(Sgd.) IAN TAYLOR

**IAN TAYLOR, MLA**

## **APPENDIX 2**







# Application for a clearing permit (area permit)

Environmental Protection Act 1986 s 51E

FORM C1

Clearing of native vegetation is prohibited in Western Australia except where a clearing permit has been granted or an exemption applies. A person who causes or allows unauthorised clearing commits an offence.

### Part 1 Applicant

An area permit is required to clear a particular area of native vegetation unless an exemption applies.

To apply for a permit you must either be:

- the owner of the land
- acting on the owner's behalf, or
- likely to become the owner of the land.

Applicant's given name(s) and surname or company name(s)

Iluka Resources Limited

### Contact details

If there is insufficient room on any part of this form, please continue on a separate sheet of paper and attach to this form.

Postal address

GPO Box U1988 PERTH WA

Postcode

Contact name (if different to applicant)

Brendan Bow

Phone number

08 9360 4730

Mobile number

0427 998 325

Fax number

08 9360 4777

Email address

brendan.bow@iluka.com

### Part 2 Land details

The land where clearing is proposed must be accurately described.

Lot or location number(s), Crown Lease Number, Pastoral Lease Number or Mining Tenement

Mining Lease M70/267

Street

Brand Highway

Locality

Eneabba

Nearest town

Eneabba

Distance from nearest town

10 km

Local government area

Shire of Carnamah

Land zoning, eg rural, residential, industrial

Mining/Rural/Conservation

A current copy of the certificate of title can be submitted to assist in the correct identification of the land. If you do not have the certificate of title, copies are available from the Department of Land Information.

Volume and folio number for certificate of title of all properties or other land description.

Vacant Crown Land and Reserve 31030

### Ownership of land

If granted, the permit will be issued in the name of the land owner.

A land owner can be:

- a person who holds the certificate of title
- a person who is the lessee of crown land, or
- a public authority that is responsible for care of the land.

Full name of land owner as appears on certificate of title

Iluka Midwest Limited

If the land owner is a company or registered body, please provide the Australian Company Number (ACN)

008 675 018

### Relationship to owner of land

Please state your relationship to the owner of the land.

If you are likely to become the owner of the land, please attach evidence of the pending transfer of ownership, such as the contract of sale.

I am (tick applicable box):

the owner of the land

acting on behalf of the owner and have attached an **agent's authority**, expressly authorising me to act on behalf of the land owner

likely to become the owner of the land

### IMPORTANT

Information submitted as part of this application may be made publicly available. If you wish to submit information that you believe to be commercially sensitive or otherwise confidential, then you should submit that information in an appendix to this application, with a written statement of reasons why you request that each item of information be kept confidential. The department will take reasonable steps to protect confidential or commercially sensitive information. Please note in particular that all submitted information may be the subject of an application for release under the *Freedom of Information Act 1992*. If you have any enquiries regarding the provision of relevant information as part of this application contact either:

Department of Environment and Conservation or Department of Industry and Resources

**Part 3 Proposal**

An aerial photograph or map must be attached, clearly marking the area proposed to clear

and if you have the facilities, a digital map on CDROM of the area to clear in one of the following formats:

1. **ESRI Shapefile** with the following properties:
  - **Geometry Type:** Polygon
  - **Coordinate System:** GCS GDA 1994 (Geographic latitude/longitude)
  - **Datum:** GDA 1994 (Geocentric Datum of Australia 1994);
2. **Autocad 2000** or earlier; or
3. **Microstation 8** or earlier.

Total area of clearing proposed (ha) or number of individual trees to be removed

442 ha of rehabilitation

Method of clearing and proposed disposal of vegetation

Harvesting of vegetation for mulch followed by dozer

Period for which clearing is required, e.g. May 2007 – June 2007

January 2008 - January 2011

Purpose of clearing

Mining (see attached document for details and maps)

**Part 4 Fees**

Make cheques or money orders, payable to:

**Department of Industry and Resources** for mineral and petroleum clearing activities under the Mining Act, various Petroleum Acts or State Agreement Acts.

**Department of Environment and Conservation** for all other clearing purposes.

Payment method (tick applicable box)

Amount

Cheque

\$50 for an area of less than 1ha; or

Money order

\$100 for an area between 1ha and 10ha; or

Credit card (complete Form C3)

\$200 for an area of more than 10ha.

**Do not send cash in the mail.**

**Part 5 Declaration and Signature**

For your application to be accepted, you must sign it either on behalf of your company (a) or as an individual (b).

By signing this form you are declaring that the statements on this form are true and correct. Providing false or misleading information is grounds for revocation or suspension of a clearing permit.

**a) For company applicants**

For applicants that are a company or registered body, complete this part of the form.

ACN

008 675 018

Signature of person duly authorised to sign for and on behalf of incorporated body or company

*Mia Sadle*

Date

13-09-07

If you are authorised to sign on behalf of your company, sign this part of the form.

OR

The common seal was affixed in accordance with the company articles of association in the presence of

Date

Company seal

OR

If your company is required to use a common seal, you must affix this seal and have this application signed by an authorised director(s) in accordance with the Corporations Law.

**b) For individual applicants**

For individual applicants, such as private land holders, ALL owners of the land must sign this part of the application form.

Signature

Date

**Part 6 Application checklist**

Additional information to assist in the assessment of your proposal may be attached to this application. If possible, information should be in electronic format and submitted on CDROM.

Please ensure you have included the following as part of your application:

- A completed application form that is signed and dated by all landowners
- An aerial photograph or map with a north point identifying the areas of vegetation to be cleared
- Optional CDROM or disk containing electronic maps, photos and reports to support this application. Existing additional information such as reports on salinity, fauna or flora studies or other environmental reports conducted for the site will assist with the assessment of your proposal

**Part 7 Post this completed application to either Department of Environment and Conservation or Department of Industry and Resources**

Applications related to Mineral and Petroleum Activities

Applications for all other purposes such as agriculture.

**Department of Industry and Resources**

Native Vegetation Assessment Branch  
Mineral House  
100 Plain St  
East Perth WA 6004  
<www.doir.wa.gov.au/nvab>

**Department of Environment and Conservation**

Native Vegetation Protection and Wetlands  
PO Box K822  
Perth WA 6842  
<http://nvp.environment.wa.gov.au>

For enquiries relating to clearing for Mineral and Petroleum Activities, telephone DoIR at Perth Head Office on 9222 3333.

For general enquiries, telephone your local DEC Office:

Perth 6250 8000, Bunbury 9726 4111, Albany 9842 5760, Mandurah 9550 4222, Geraldton 9964 5978, Karratha 9182 2000, Kununurra 9168 4200

Please retain a copy of this form for your records. Incomplete applications will not be dealt with.

## **APPENDIX 3**





**ILUKA**

---

**MIDWEST OPERATIONS**  
*ANNUAL ENVIRONMENTAL REPORT*



***INTERIM REPORT***  
**2006**

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## INTRODUCTION

This Annual Environmental Report details environmental management and rehabilitation activities across Iluka operations in the Midwest. This incorporates mining operations at Gingin and Eneabba, and processing operations at Narngulu. The report provides monitoring data collected during the 2006 reporting year, from 01 January to 31 December.

This report is submitted in accordance with the following requirements:

- Section 8 (2) of the Mineral Sands (Eneabba) State Agreement Act 1975 requiring annual Interim Reports and three-yearly Triennial Reports.
- Department of Environment and Conservation Prescribed Premises licences;
  - 5646 (Eneabba)
  - 5425 (Narngulu Minerals Plant)
  - 6129 (Narngulu Synthetic Rutile Plant)
  - 8071 (Gingin)
- Condition M5.1 of Ministerial Statement 666 for the Gingin operation, requiring submission of Compliance Reports
- Condition 81:M2 and 81:P10 of Ministerial Statement 81 for the Eneabba West Mine operation

In accordance with the Mineral Sands (Eneabba) State Agreement Act 1975, this Interim Report is submitted for activities in 2006. More detailed reviews of research and development works and forecast mining operations are provided in the three-yearly *Triennial Reports*, next to be submitted in 2008.

This report is submitted to the Mineral Sands Agreement Rehabilitation Coordination Committee (MSARCC) formed under the State Agreement Act for distribution to interested parties.

## 1 MIDWEST OPERATIONS OVERVIEW

Iluka was formed through the merger between RGC Mineral Sands and Westralian Sands in 1999. The company's Head Office is based in Perth, and operations are international with mining and processing occurring in Australia and the United States.

In the Midwest, mineral sands are mined and concentrated at the Eneabba and Gingin operations. Heavy Mineral Concentrate (HMC) is transported by road train from the Gingin operation to Eneabba. Locations of Midwest operations are shown in Figure 1. Mining commenced at Gingin in August 2005 and is expected to continue operation until 2009. The Eneabba area has been one of the world's major zircon and rutile deposits since 1975. Eneabba is also the principal source of ilmenite for Iluka's processing plant at Narngulu.



Titanium Minerals and Zircon

Following processing of HMC through the South Secondary Concentrator at Eneabba, product is transported by rail to Narngulu. Processing at Narngulu consists of a dry separation plant, a synthetic rutile plant and a zircon finishing plant. Final products are exported through the Geraldton Port.

Final products include titanium minerals (titanium, rutile and synthetic rutile) which are primarily used in pigments for paints and colourings. These have application in a diverse array of products including toothpaste, sunscreen, food colouring, paints and plastics.

The production of zircon is primarily used in the manufacture of ceramics (eg. basins, tiles) and glass screens (eg. TV and computer).



Some common products made from Titanium Minerals and Zircon

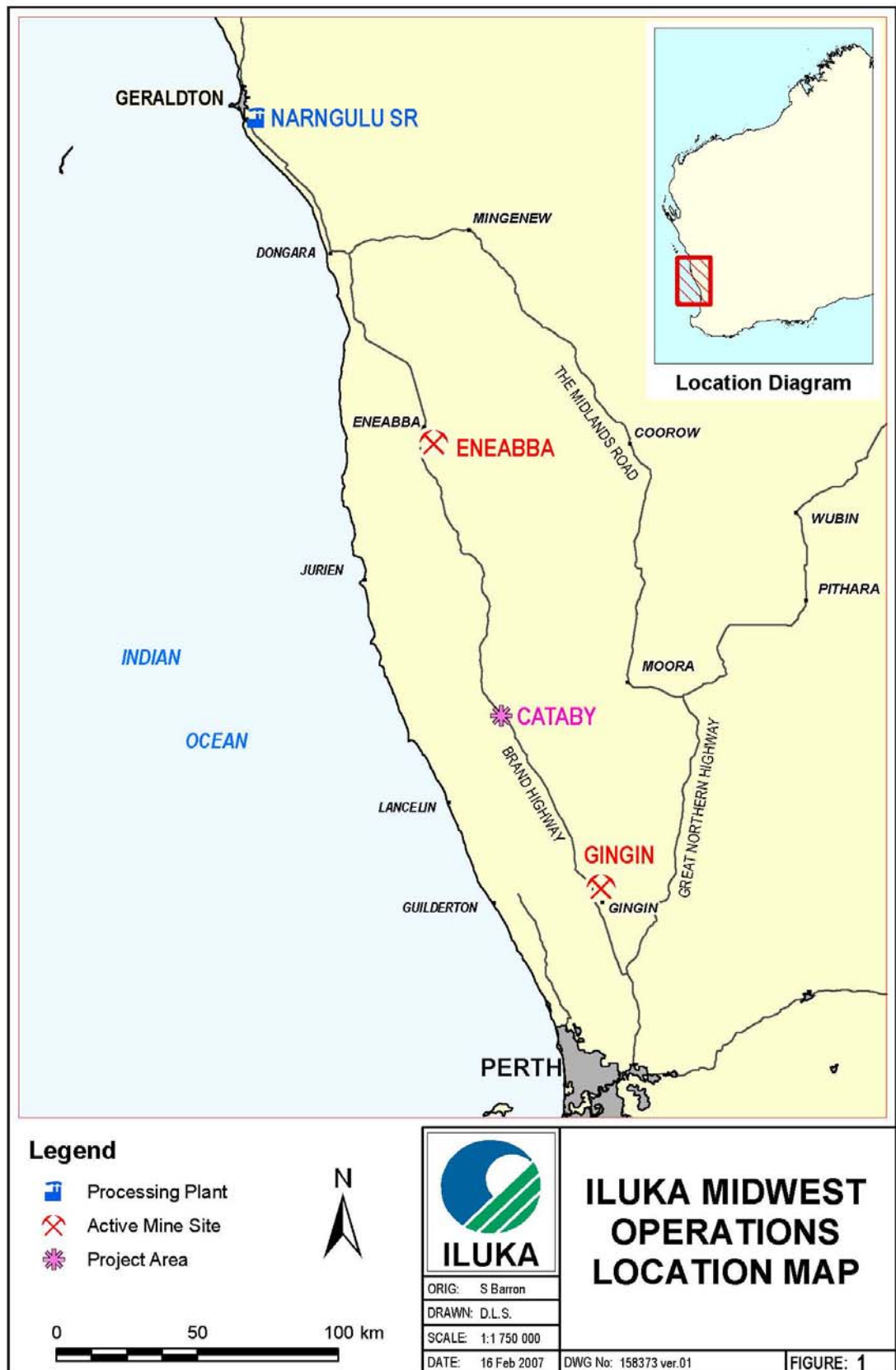


Figure 1. Iluka Midwest Operations Location Map.

## 2 ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT SYSTEM (EHSMS)

### 2.1 EHS Policy



ILUKA RESOURCES LIMITED



## ENVIRONMENT, HEALTH & SAFETY POLICY

Iluka Resources values the safety and health of our employees, customers and the communities in which we operate and is committed to operating in a responsible manner which minimises our impact on the environment. We believe that continuous improvement in the areas of EHS is fundamental to our ongoing business success.

#### We will:

- not compromise on safety;
- comply with all legislative requirements;
- work closely with our customers and maintain a product stewardship approach to our products to enable their ongoing use;
- identify, assess and manage environmental, health and safety hazards, risks and impacts of our operations;
- maintain an EHS management system to apply uniform standards to all operations and personnel;
- promote continuous improvement practices;
- minimise workplace exposure to hazards, ecosystem disturbance or degradation;
- re-establish disturbed areas as sustainable ecosystems and community assets;
- strive to use resources more efficiently by reducing, reusing and recycling waste products;
- encourage and support our employees to make positive lifestyle changes;
- understand and work to meet the expectations of the community; and
- provide appropriate training to employees and contractors to ensure environmental, health and safety issues and responsibilities are clearly understood.



**K M (Mike) Folwell**  
Managing Director and CEO

## 2.2 Systems and Standards Development

All Iluka sites operate under an integrated Environment, Health and Safety Management System (EHSMS). The system is implemented in accordance with twelve management system standards as follows:

Leadership and Policy	Emergency and Crisis Preparedness
Organisation and Responsibility	Procedures and Training
Communication	Operational Management
Contractor Management	Monitoring
Risk and Hazard Management	Change Management
Incident Investigation and Reporting	Audits and Assurance

The eight Iluka Environmental procedures developed in 2005 continued to be implemented across Iluka sites. The procedures introduced were as follows:

- Air Quality Management
- Closure Planning and Provisioning
- Efficiency Waste / Energy
- Environmental Approvals
- Environmental Noise
- Flora and Fauna Management
- Land and Soil Management
- Water Management

In addition, Major Risk procedures were introduced, which included an Iluka procedure for Tailings Management.

## 2.3 EHSMS Audits

External audits of the EHSMS were undertaken at Eneabba and Gingin in October 2006. This was completed internally at Narngulu, with an external audit planned for 2007.



## 2.4 Organisational Changes

Midwest Environment and Rehabilitation personnel are listed in Table 1. New team members who joined Iluka in 2006 are denoted with an asterix.

**Table 1. Midwest Environment and Rehabilitation Personnel, 2006.**

<b>Rehabilitation Personnel</b>		
<b>Position</b>	<b>Employee</b>	<b>Location</b>
Rehabilitation Superintendent	Don Ferguson	Midwest
Rehabilitation Supervisor	Robert Wynne	Eneabba
Nursery Supervisor	Rochelle Sharp	Eneabba
Agricultural Operator	Alan Cornish	Eneabba
Agricultural Operator	Harley Coventry	Eneabba
Agricultural Operator	Peter Fox-Grey	Eneabba
Agricultural Operator	Charles White	Eneabba
Nursery Operator	Cheree Downie	Eneabba
Nursery Operator	Malcolm Ovans	Eneabba
Nursery Operator	Rob Smith	Eneabba
<b>EH&amp;S (Environment) Personnel</b>		
<b>Position</b>	<b>Employee</b>	<b>Location</b>
Environment Health and Safety Manager	John Hemsley	Midwest
Environmental Superintendent – Mining	Sarah Barron *	Midwest
Environmental Specialist – Mining	Michael Mannion	Eneabba
Environmental Specialist – Mining	Cindy Walker *	Gingin
Environmental Specialist – Processing	Stephen Neill	Narngulu
Environmental Monitoring Technician	Kerri Conder	Eneabba
Environmental Monitoring Technician	Russell Browne *	Narngulu

## ENEABBA OPERATIONS

### 3 ENEABBA MINING

Land area open at the Eneabba operations at the end of 2006, totalled 1,284 hectares. New area opened in 2006 and rehabilitation completed is outlined in Table 2.

**Table 2. Eneabba operations areas opened and closed summary (hectares), 2006.**

	2004	2005			2006		
	<i>Total Area Open</i>	<i>New Area Open</i>	<i>Revegetation Complete</i>	<i>Total Area Open</i>	<i>New Area Open</i>	<i>Revegetation Complete</i>	<i>Total Area Open</i>
<b>North Mine</b>	241.1	0	78.3	165.8	54.2	50.9	169.3
<b>Depot Hill</b>	107.5	30.8	0	138.3	36.8	0	175.0
<b>South Mine</b>	650.5	70.7	30.8	690.5	33.7	8.5	715.7
<b>West Mine</b>	455.7	0	159.1	296.6	0	72.2	224.4
<b>Total</b>	1454.8	101.5	268.2	1291.1	124.6	131.5	1284.4

For the purposes of this report North Mine denotes areas north of the mine Administration buildings to Three Springs Road. Depot Hill denotes areas to the North of Three Springs road. South Mine denotes areas to the south of the Administration buildings and West Mine denotes areas to the West of Brand Highway.

### 3.1 North Mine Summary

#### 3.1.1 Description of mining process

North Mine operations are conducted using a combination of dry mining methods including; using scrapers feeding into a mining unit; or loaders, excavators and trucks feeding into a mining unit. Mining units screen out oversize material and slurry, and pump ore to the Newman Concentrator.

Ore is separated using wet gravity techniques at the Newman Concentrator. Final Heavy Mineral Concentrate (HMC) is sent via truck to the South Secondary Concentrator. Sand tails and the clay/slimes fractions are co-disposed back into the previously mined pits. Pits are tailed into and rehabilitated progressively as mining ceases in each pit. North Mine mining areas and major infrastructure are shown in Figure 2.

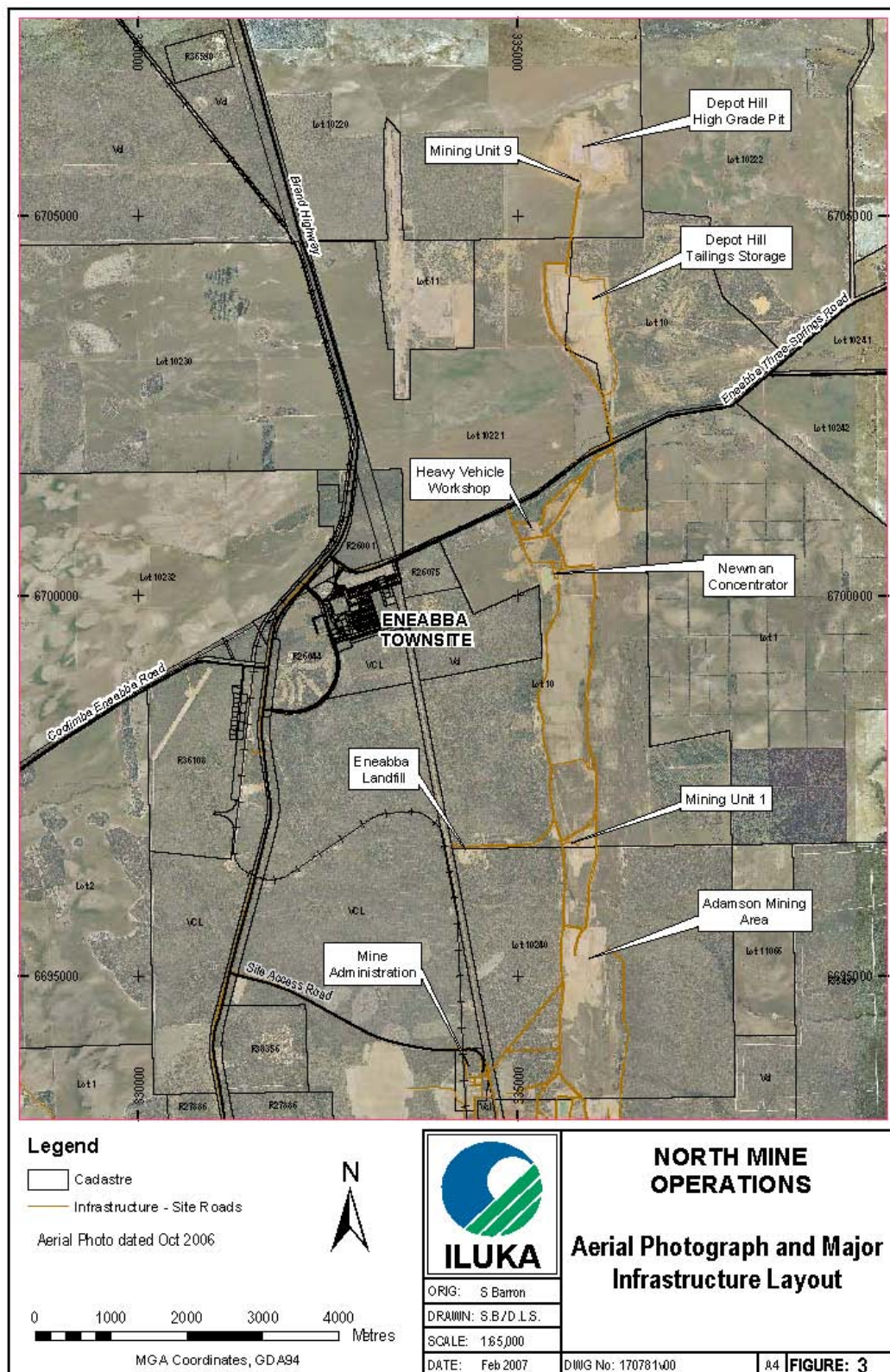


Figure 2. North Mine layout and major infrastructure, 2006.

### 3.1.2 2006 Areas Mined and 2007 Forecast

In early 2006, mining activities were focussed on the Depot Hill Central and Depot Hill High Grade deposits. Following completion of mining in Depot Hill Central, Mining Unit 1 was relocated to the Adamson area, where it remains in its current location (Figure 2). Tailings deposition continues in Depot Hill Central, and also commenced in Depot Hill High Grade (Dam 5) in early 2007. The Blue 17 tailings storage facility remains operational for emergency deposition (short leg).

In 2007, mining will continue in Depot Hill High Grade, with ongoing works in the Adamson area. Future mining in Adamson's is reliant on continued clearing approvals in 2007. The "Adamson B" area was approved for mining in early 2007; under CPS 1549/1 and CPS 1657/1, for 25 hectares of native vegetation and 9 hectares of rehabilitation respectively. Further exploration work is continuing in the Adamson's area.

### 3.1.3 Production and Tailings

A summary of North Mine production, including ore mined and tailings deposition is given in Table 3.

**Table 3. North Mine Production and Tailings Summary**

Production (1,000 t)	2005	2006	2007 Forecast
Overburden mined	2,760	3,500	2,280
Ore Mined	10,516	10,953	10,491
Newman Concentrator Throughput	8,936	8,604	8,781
Newman HMC Produced	416	408	296
Newman Tailings	9,771	9,499	9,755

## 3.2 South Mine Summary

### 3.2.1 Description of mining process

Ore mining and waste removal utilises conventional dry mining techniques incorporating the use of trucks, shovels, front end loaders and scrapers. The ore is mined and hauled to three mining units which screen and slurry the ore prior to pumping to the PC03 primary concentrator.

At the PC03 concentrator the slurried ore is separated using wet gravity techniques. The Heavy Mineral Concentrate (HMC) produced from this process is pumped to the South Secondary Concentrator for blending and further processing before it is dried and transported by rail to the Minerals Separation Plant at Narngulu. Process wastes, sand and fine clay/slimes, is co-disposed back into the previously mined pits. South Mine mining areas and major infrastructure are shown in Figure 3.

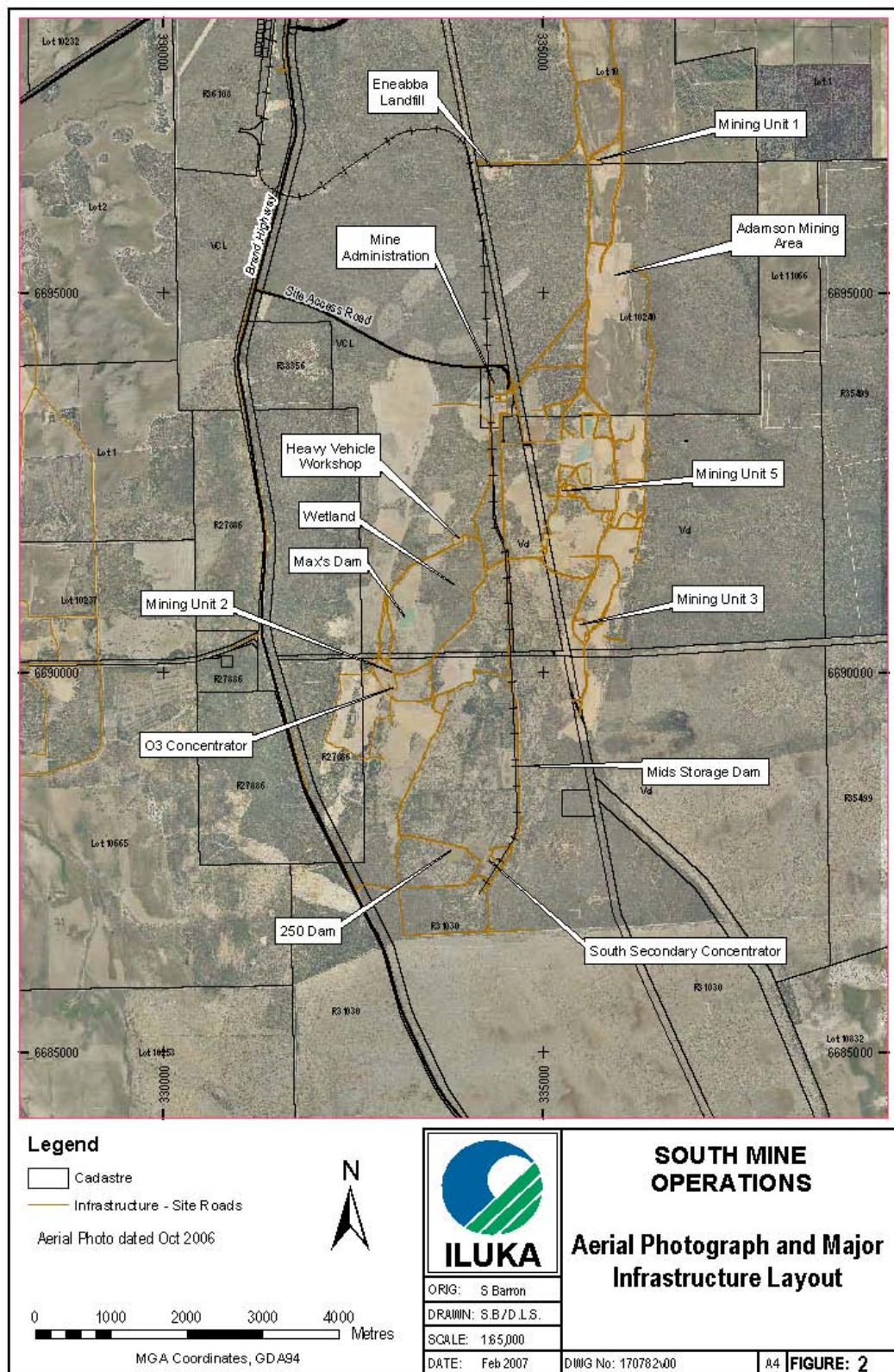


Figure 3. South Mine layout and major infrastructure, 2006.

### 3.2.2 2006 Areas Mined and 2007 Forecast

South Mine operations continued throughout 2006, predominantly with re-processing of previously mined tailings material from within the South Tails area. This included deposits both inside and outside of the Eneabba South Nature Reserve. Ore was processed through three in-pit mining units; MU02, MU03 and MU05.

In July 2006, Mining Unit 2 (MU02) was relocated to the IPL Central area, immediately north of the O3 concentrator, where it remains in 2007.

### 3.2.3 Production and Tailings

Eneabba South Mine production throughput and tailings disposal is summarised in Table 4.

**Table 4. South Mine Production and Tailings Summary**

Production (1,000 t)	2005	2006	2007 Forecast
Overburden mined	1,198	573	796
Ore Mined	6,153	7,090	7,446
O3 Throughput	4,069	4,431	5,570
O3 HMC Produced	503	379	294
O3 Tailings	3,554	5,321	6,441

### 3.3 South Secondary Concentrator

Concentrate produced at the North Mine, South Mine and Gingin operation was further processed at the Eneabba South Secondary Concentrator. Throughput and tailings disposal is summarised in Table 5. Tailings from South Secondary Concentrator continued to be deposited in the "Mids Storage Dam", shown in Figure 3.

**Table 5. South Secondary Concentrator, Production and Tailings Summary**

Production (1,000 t)	2006	2007 Forecast
Concentrate Throughput	1,401	1,363
Concentrate Produced (HMC)	1,131	1,121
SSC Tailings	270	242

## 4 ENEABBA ENVIRONMENTAL MANAGEMENT

### 4.1 Land Management

#### 4.1.1 Flora and Fauna Management

The Eneabba mining area follows mineral sands deposits which run in a north-south orientation associated with ancient coastal landforms. The vegetation in this area is described as proteaceous heath on sand (Kwongan Heath) and is classified as part of the Geraldton Sandplains Bioregion (GSB). The GSB is a transitional zone between the South-West and the interior or northern bioregions. Consequently, flora and fauna species from the North and Southern bio-regions can be found with some species existing at the extremes of their ranges.

Vegetation community mapping continued through 2006 with an emphasis on areas around the northern sections of the Eneabba South Nature Reserve (R31030). Mapping is ongoing and will extend Iluka's knowledge of the vegetation in this reserve through 2007. New DRF locations for *Paracaleana dixonii* and *Tetralthea* spp. have been recorded during the 2006 vegetation surveys as well as numerous recordings for priority flora. An extended search for the as yet un-named Leucopogon species (*Leucopogon* sp. Ciliate) was undertaken in 2006 which complimented searches done in 2003 and 2004. Likely soil type and vegetation associations have been inspected as far north as Mt Adams, Tathra National Park to the east, Alexander Morrison National Park to the south and Lake Logue Nature Reserve to the west. The known population is associated with remnant native vegetation located within a small area on Depot Hill. This area is surrounded by pastoral activities and appears to have had some disturbance probably associated with early clearing for agriculture.

Fauna surveys conducted in 2006 have focused on species with conservation significance. These have included a preliminary survey for Carnaby Cockatoo (*Calyptorhynchus latirostris*) roosting and feeding sites and habitat surveys for the Shield-backed Trapdoor Spider (*Idiosoma nigrum*). Further surveys on cockatoo feeding habitat within and around the mining lease will be conducted in 2007. The Shield-backed Trapdoor Spider has not been found on site to date. Although not targeted in 2006 fauna surveys, another species of conservation significance, the Rufus Fieldwren (*Calamanthus campestris montanellus*), was noted as being common in both remnant native vegetation and areas rehabilitated back to native vegetation.



Emus in Agricultural Rehabilitation Area at Eneabba, 2006

## 4.1.2 Clearing

Clearing of native vegetation in 2006 occurred in accordance with clearing permits CPS 716/1 (Adamson A) and CPS 389/1 (Exploration). Details on compliance with permit conditions are provided in Tables 6 and 7.

**Table 6. Compliance Status Report for Area Permit Number CPS 716/1 (Adamson A)**

Condition	Summary of Requirement	Comply	Compliance Details
1	Clearing of up to 14.7 hectares of native vegetation permitted, within the area delineated on Plan 716/1.	✓	14.7 hectares of native vegetation was cleared in 2006, within the defined area, as delineated by Plan 716/1.
2	After completing the works required under condition 1; <ul style="list-style-type: none"> <li>Selectively remove or kill all plant species that are not native within the cleared area</li> <li>Sow the cleared site with a seed mixture consisting of local native species found within a 15km radius of the site. The seed mixture shall be spread at a minimum rate of 1kg per hectare</li> </ul>	✓	Not required at this stage
3	Ensure that livestock are excluded from the area by means of a stockproof fence, and do not permit stock to enter or remain within the area.	✓	Not required at this stage

**Table 7. Compliance Status Report for Purpose Permit Number CPS 389/1 (Exploration)**

Condition	Summary of Requirement	Comply	Details
1	Clearing is for the purposes of mineral exploration	✓	Clearing is managed internally via a "Ground Disturbance Permit" system, which ensures only clearing for drill lines occurs under CPS 389/1.
1	Not more than 30 hectares of native vegetation is to be cleared, within the area delineated on Plan 389/1.	✓	1.74 hectares was cleared in 2006.
2	Permit holder may authorise persons, including employees and contractors to clear native vegetation for the purpose of this permit, subject to compliance with conditions.	✓	Only personnel authorised by Iluka have conducted clearing under this permit.
3 (a)	Prior to undertaking any clearing, the areas shall be inspected by a flora specialist who shall identify Rare Flora, Priority flora taxa and Threatened Ecological Communities.	✓	Each drill line was inspected by a qualified botanist, engaged through Woodman Environmental Consulting.
3(b)	Where Rare Flora or Priority Flora are identified, ensure that; <ul style="list-style-type: none"> <li>The rare flora is flagged with fluorescent</li> </ul>	✓	No DRF was identified through surveys completed under this permit in 2006.





Condition	Summary of Requirement	Comply	Details
	<p>flagging tape</p> <ul style="list-style-type: none"> <li>No clearing occurs within 10m of the rare flora</li> <li>All records of DRF and priority flora submitted to the DEC</li> </ul>		Reports of newly identified DRF and priority flora are submitted to DEC by Woodman's.
3(c)	<p>Where Threatened Ecological Communities are identified, ensure that;</p> <ul style="list-style-type: none"> <li>The identified community is flagged with fluorescent flagging tape</li> <li>No clearing occurs within 1000m of the community</li> <li>The community is immediately reported to the DEC</li> </ul>	✓	No Threatened Ecological Communities were identified during 2006.
4(a)	<p>When undertaking any clearing, revegetation and rehabilitation, take the following steps to minimise the introduction and spread of dieback;</p> <ul style="list-style-type: none"> <li>Clean earth-moving machinery of soil and vegetation prior to entering and leaving the area</li> <li>Avoid the movement of soils in wet conditions</li> <li>Ensure no dieback affected road building materials, mulches or fill are brought into an area not affected by dieback</li> <li>Restrict movement of machines and vehicles to the limits of areas to be cleared.</li> </ul>	✓	Dieback requirements are identified through the "Ground Disturbance Permit" system, in consultation with the Environmental Specialist. Hygiene requirements are implemented in accordance with the site Dieback Management Plan.
4(b)	<p>When undertaking any clearing, revegetation or rehabilitation, take the following steps to minimise the introduction and spread of weeds;</p> <ul style="list-style-type: none"> <li>Clean earth-moving machinery of soil and vegetation prior to entering and leaving the area</li> <li>Ensure no weed affected material is brought into the area</li> <li>Restrict the movement of machines and vehicles to the limits of the areas to be cleared.</li> </ul>	✓	Earthmoving machinery is inspected in accordance with condition 4(a).
4(c)	At least once in each 12 month period, remove or kill any weeds growing within the areas cleared, revegetation or rehabilitated under this permit.	✓	Not required at this stage.
5(a)	Where native vegetation is allowed to naturally regenerate in an area cleared under this permit, identify the composition, structure and density of the area 12 months after the clearing occurred.	✓	Not required at this stage.
5(b)	Where the composition structure and density identified under 5(a) is less than that identified under 6(a), revegetate the area cleared by deliberately planting or seeding native vegetation that will result in similar species composition, structure and density of native vegetation in that area.	✓	Not required at this stage.



Condition	Summary of Requirement	Comply	Details
6(a)	Maintain the following records, in relation to clearing of native vegetation; (i) species composition, structure and density of cleared area (ii) location where the clearing occurred (iii) date that the area was cleared (iv) size of the area cleared (ha)	✓	Records are maintained and included in Appendix 1.
6(b)	Maintain the following records, in relation to revegetation and rehabilitation of areas; (i) the location of any area revegetated and rehabilitated (ii) a description of the revegetation and rehabilitation activities undertaken (iii) the size of the area revegetated and rehabilitated (ha)	✓	Rehabilitation activities for 2006 are presented in this report.
6(c)	Maintain the following records, in relation to flora management; (i) the location of each Rare Flora, Priority Flora and Threatened Ecological Community (ii) the species of each Rare Flora or Priority Flora identified (iii) the community ID of each Threatened Ecological Community	✓	Locations and species / community identifications are presented in consultant reports provided by Woodman's. Locations are maintained and updated on Iluka's internal GIS mapping system.
7	Provide a written report of records and activities by 30 June each year, for the period 1 January and 31 December of the preceding year.	✓	Provided in this report.

### 4.1.3 Dieback Management

Phytophthora dieback (PD) is a devastating plant disease which affects both native and introduced vegetation. Of the four species of Phytophthora found throughout the southwest only *P. cinnamomi*, *P. megasperma* and *P. citricola* have the potential to cause localised disease outbreaks on the minesite. The conditions at Eneabba could favour the establishment and proliferation of these species due to the warm moist conditions present in sites under rehabilitation. Mining has the potential to spread the pathogen in soil, process water, mining slurries, with mud or vegetation on vehicles and can also enhance the disease spread though the creation of moist soil conditions when tailing back into mine voids.

The Eneabba Dieback Management Plan was reviewed in 2006 with input and comment from the Environmental Management Branch (DEC). Re-mapping infestation areas were deferred to 2007 as dieback interpretation services were unavailable during the summer of 2006. Dieback signage on secondary mine roads and access tracks from the South Eneabba Reserve and drilling procedures were reviewed this year and upgraded where required. Changes and upgrading to site signage will be ongoing throughout 2007. Site access procedures were reviewed in light of expanding drilling programmes, and Environmental and Rehabilitation staff attended dieback meetings on management and hygiene issues organized by the Northern Agricultural Catchment Council (NACC) and the Dieback Working Group (DWG). Some site roads which were historically difficult to manage in winter due to surface saturation were treated in 2006 with Rainstorm 'cement gravel binder' which performed better than the previous treatment of 'Dust Mag'.

Iluka remains committed to the Northern Sandplains Dieback Working Group and initiatives by local community groups such as the Lake Indoon Catchment Management Project to combat PD.

### 4.1.4 South Mine Wetland Management

The Eneabba South wetland is a seasonally inundated (ephemeral), perched wetland system that is not connected to the deeper water tables from which Iluka extracts water for mining. It is however vulnerable to changes in local hydrology which may occur due to localized mining operations. The wetland was recognised as a significant wetland in 1997 and is protected under the Environmental Protection (South West Agricultural Zone Wetlands) Policy 1995 as a conservation category wetland.

Iluka undertakes annual monitoring of the wetland via groundwater reporting in the Eneabba East Annual Aquifer Review and by targeted vegetation monitoring by consultant botanists.

Vegetation has been monitored in the wetland area since 1998, with current observations showing that since monitoring began the health of *Eucalyptus camaldulensis* branches has improved. Conversely, *Melaleuca raphiophylla* trees continue to show signs of distress with the number of healthy trees remaining fairly static. During the period 2005-2006 there has been no obvious change in the overall health of individual *Macrozamia fraseri*. Differences observed can be due to plant morphology and/or a requirement by some species to have their root systems inundated for short periods. Standing waters in 2005 and 2006, for instance, did not inundate the *Melaleuca* area, and annual rainfall has been below average since 1999 (refer to Figure 4).

Standing waters in the wetland are monitored for pH and conductivity in situ with periodic samples collected for major ion analysis. As for last year, no data was collected in 2006 as water pooling was minimal and too shallow to sample. Historical data show typical variations expected from a small ephemeral water body with pH ranging between 6-9, conductivity of between 0.2-14 uS/cm and TSS range between 1-148 mg/L (Table 8). Trend lines for conductivity, pH and SO<sub>4</sub> water chemistry are presented in Figure 5 of Appendix 2.

Groundwater levels in the vicinity of the wetland are slowly falling in association with lower rainfall, localized groundwater recharge and mining activities in the area. The shallow groundwater salinity is within historical values and mimics the variable and complex groundwater movements in this area which are influenced by tailings dams, process water dams and pumping from shallow production bores in the area. The wetland is under consideration for a management plan which will identify the main threatening processes and investigate possible recovery actions.

**Table 8. Eneabba South Wetland Standing Water Quality.**

YEAR	Average Annual Water Quality		
	pH	Conductivity	TSS
1998	8.3	0.3	NA
1999	6.8	1.3	30
2000	7.3	3.1	9
2001	7.9	1.3	25
2002	7.9	0.4	40
2003	7.8	0.5	35
2004	7.1	0.5	18
2005	NA	NA	NA
2006	NA	NA	NA

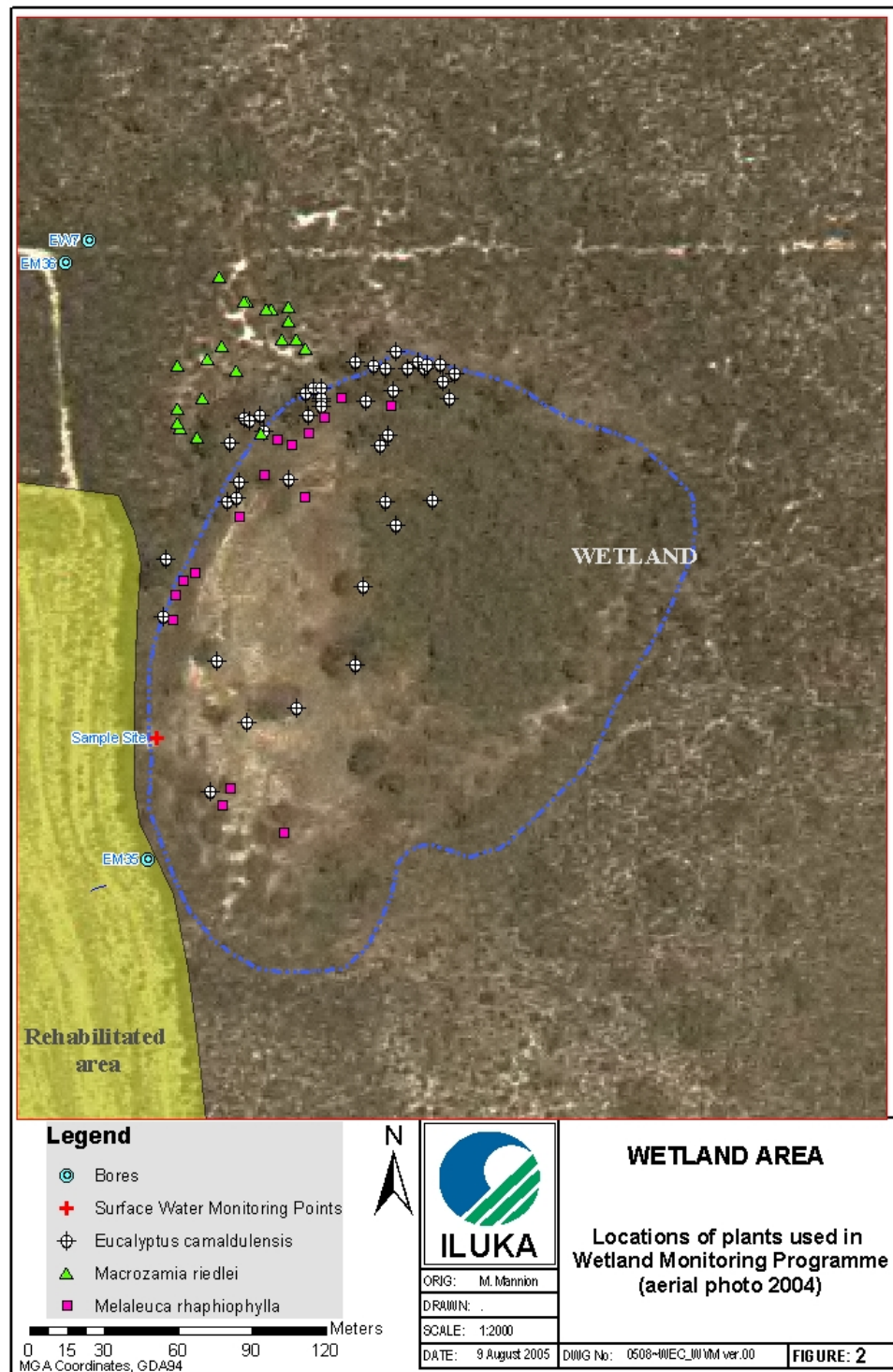


Figure 4. Eneabba South Wetland with water and vegetation monitoring locations.

#### **4.1.5 Solid Waste Disposal**

A total of 31.1 m<sup>3</sup> of inert material was disposed of into on-site landfill in 2006. The majority of this material (30.1 m<sup>3</sup>) was disposed of to pit 120D before tailing was completed. The remainder was disposed of to pit 115D as per the Eneabba operational licence conditions. Inert materials consisted of steel off-cuts (plate, tube and rod), lengths of poly pipe and fittings, disused 44 gallon drums, decommissioned spirals from the 03 concentrator and 2 car bodies used in emergency rescue training.

#### **4.1.6 Contaminated Sites**

In 2006, further investigation of known and potential sites identified at Eneabba was undertaken. This work was based on recommendations provided by the external consultant review in 2005. The contaminated site register has undergone further review, and been uploaded onto Iluka's GIS mapping system. This work will be ongoing in early 2007, to ensure compliance with reporting requirements of the Contaminated Sites Legislation that was enacted in December 2006.

The site bioremediation facility (landfarm) continued to be used to actively remediate contaminated soil in 2006. This contaminated soil was excavated from decommissioned fuel facilities in 2005, and also originates from hydrocarbon spills on-site.

### **4.2 Water Management**

Eneabba mining operations have been licensed to extract groundwater since 2001 through the granting of two Groundwater Well Licences (GWL). In 2006 annual licence allocations allow 15 Gegalitres to be extracted from the Eneabba Plains sub-area (GWL No. 104700) and 6 Gegalitres from the Twin Hills sub-area (GWL No. 104709). Both licences extract groundwater from the Yarragadee formation but are separated by non-water related boundaries defined in the Arrowsmith Groundwater Area Management Plan.

A revision of the existing Groundwater Resource Management Operating Strategy (GRMOS) was done in late 2006. This document will be superseded by a Groundwater Licence Operating Strategy (GLOS) and Staged Development Timetable which were submitted to DoW in January 2007. These documents identify Iluka's commitment to water management for the next 5 years, including requirements of DEC Prescribed Premises licence 5646/8.

#### **4.2.1 Water Use**

A total of 18 production bores, 5 allocated to the Twin Hills Sub-area and 13 to the Eneabba Plains Sub-area, were available for water extraction during 2006. Not all production bores are operational at the same time.

A total of 11.2 GL was extracting from the Yarragadee aquifer in 2006 which was 5% higher than that extracted in 2005, although there is an 8% reduction over the long term average extraction values. Of this total volume, 8.5 Gegalitres were abstracted under GWL No. 104700, and 2.7 GL were abstracted under GWL No. 104709. This equates to 18% less water extracted under GWL No. 104709 and 15% more water extracted under GWL No. 104700.

Monthly pumpages for 2006 show below average extractions for the first 3 months with an increase mid year due to a lack of rainwater recharge for process dams because of a late

winter this year. In November, the commissioning of new tailings facilities with subsequent high seepage rates resulted in less water return from tailings, consequently pumpage rates increased to make up process water requirements.

A comprehensive summary of groundwater levels and chemistry is submitted to DEC annually and the reader is directed to these documents for further information.

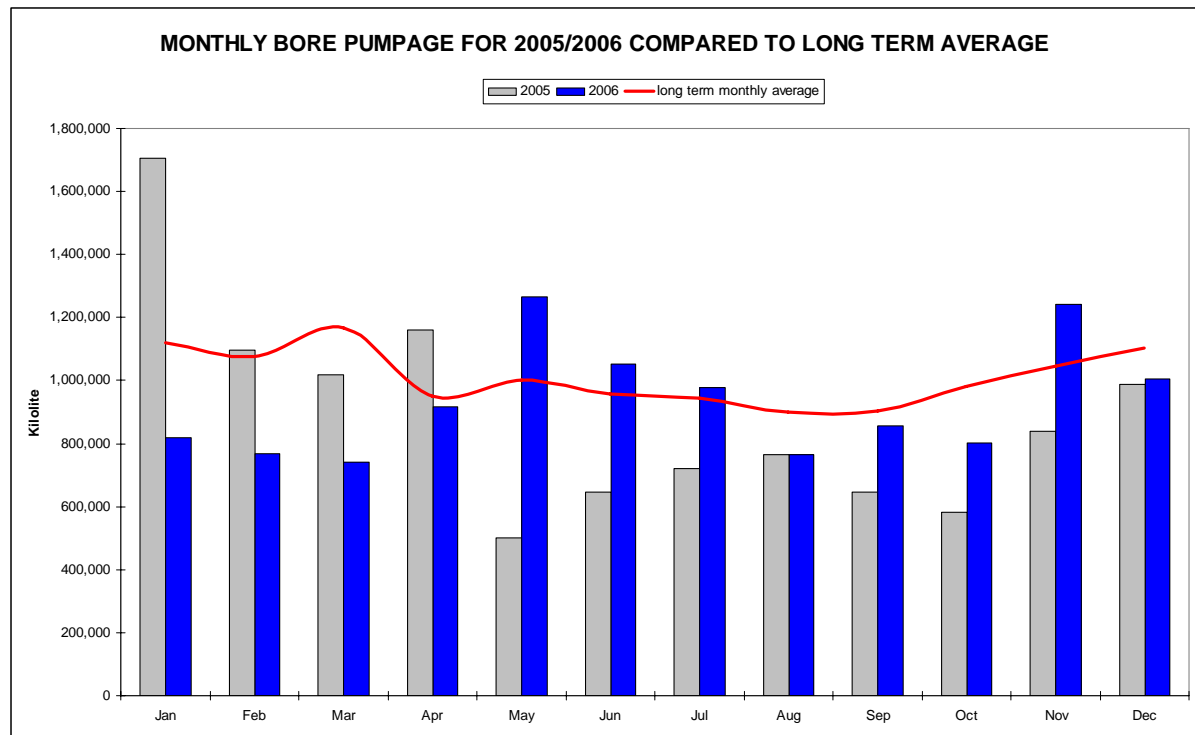


Figure 5. Iluka Eneabba groundwater extraction, 2006.

#### 4.2.2 Water Monitoring

Water monitoring, both groundwater and surface waters, are a condition of Iluka's DEC operational licence (Lic No. 5646/7) and DoW groundwater licences (GWL 104700 and GWL 104709). Water monitoring schedules have been agreed to with regulatory bodies and are articulated in the GRMOS (to be superseded by the 2007 GLOS). A comprehensive water monitoring and hydrology report is prepared for DOW annually and includes water levels, chemistry, borefield status, groundwater production, microbiology and hydrocarbon monitoring results. The reader is directed to the Eneabba East Annual Aquifer Reviews submitted to DOW for a comprehensive summary of individual piezometer hydrographs and chemistry.

Monitoring data trend lines are presented in Appendix 2. Raw data is available on request. Monitoring bore EM22 is situated to the east of the Eneabba operational area and is used in all graphs as a representational 'undisturbed background' reference source.

The Mids Storage Dam is a temporary feature for stockpiling intermediate recycle materials from the South Secondary Concentrator (SSC). Bores EM14, EM15, EM23 (replaced with EM53) and EM45 have been used to monitor this area (Figure 1 of Appendix 2). Some downstream bores reflect the impact of the recycled materials from the Zircon Upgrade Plant while it was running (1994-Nov 2002), specifically pH and SO<sub>4</sub> in bore EM23. Residual

SO<sub>4</sub> from the acid leach plant is also evident in surface water levels during this period. Remediation of the sulphate plume has seen the SO<sub>4</sub> levels steadily decrease to below target values set by DEC (ANZECC Livestock Limits). The success of the ZUP remediation process is discussed later in this report. The higher conductivity in bore EM45 appears to reflect higher sodium and chloride levels not SO<sub>4</sub> levels.

The 250 Dam is part of the SSC process water circuit and is monitored from bores EM24, EM47 and EM48. Process waters were affected by ZUP discharge as is reflected in the elevated SO<sub>4</sub> levels of surface waters and all bores (Figure 2 in Appendix 2). Only the downstream bore, EM48 has not returned to background levels when last sampled. This bore was isolated and inaccessible during 05/06 but will be picked up during 2007 sampling. Conductivity and pH for bores and surface waters follow background groundwater values.

Waters recovered from the SSC flow into the Water Recovery Pond where sediments fall out prior to the water being channelled into the 250 Dam. Bores EM25 (replaced with EM25 A) and EM46 monitor groundwater associated with the SSC plant and South Secondary Concentrator Water Recovery Pond. Conductivity values and trends follow regional background levels (Figure 4, Appendix 2). Apart from one data point, surface water pH values trend with regional background levels as does EM46. Bore EM25/25A however show a falling pH trend since 2004. Sulphate levels have recovered to pre-mining levels in surface waters of the recovery pond, however groundwater levels show a rising trend in SO<sub>4</sub>. As groundwater levels were similar to background SO<sub>4</sub> levels pre-2000, and only rise after ZUP remediation commenced, this rise in SO<sub>4</sub> may be an artefact of the SO<sub>4</sub> plume originating from the 250 Dam which is migrating outwards with bore dilution waters.

Max's Dam constitutes part of the 03 Concentrator process water circuit and has been monitored since 2001. Conductivity, pH and SO<sub>4</sub> levels and trends for this dam follow the regional trends of the background monitoring bore (Figure 3, Appendix 2). No affect due to process loss from the primary concentrator or nearby mining processes are evident.

Bores associated with monitoring the protected wetland have pH values similar to background regional trends. Apart from 2 bores, EM31 and EM34, all bores follow regional background trends for sulphate and conductivity. Elevated conductivity in bore EM34 was transient and appears to be associated with tailings and rehabilitation activities to the west of the wetland, while the elevated conductivity in EM31 may reflect infiltration of solutes due to localized drawdown from nearby production bores.

### ***ZUP Remediation and Monitoring***

The Zircon Upgrade Plant (ZUP) was a treatment circuit used at Eneabba to remove iron staining from zircon products from August 1994 to November 2002. A consequence of using sulphuric acid with the ZUP was low level groundwater contamination in the immediate vicinity of 250 Dam, South Secondary Concentrator and South Mids Return Dam.

A groundwater study for this area in 2002 showed that pH and sulphate levels exceeded the limits proposed in the ANZECC guidelines for Livestock Drinking Waters (1992). Levels of radioactivity (Alpha and Beta activity) were also higher than limits proposed for ANZECC guidelines for Potable Drinking Water (1996).

A remediation strategy put forward by Iluka Resources, which was approved by the DoE (now DEC) in August 2002, used bore water to accelerate the dispersion of the groundwater



plume. A review of groundwater data in 2005 showed that all groundwater samples had sulphate levels below the target ANZECC guidelines, 3 years earlier than predicted by groundwater modelling. Continued monitoring of the sulphate plume and radionuclides indicate sulphate levels have remained below the ANZECC guidelines, however radiation levels exceed potable guidelines. Monitoring data show that the radiation is attributable to Thorium decay (Radium 228) and not from Uranium, both of which are natural constituents of mineral sands. Work is continuing to determine the source of radiation detected in groundwater monitoring around the South Secondary Concentrator and associated process areas.

### 4.2.3 Water Use Efficiency

A review of the Eneabba bore field was conducted by a consultant hydrologist (Rockwater) in late 2006. This review is conducted on a five yearly basis, as outlined in the GLOS. The purpose of the assessment was to review bore field efficiency, sustainability of the aquifer and provide recommendations on preventative maintenance programs. These recommendations will be implemented throughout 2007.

Water consumption in the North Mine remained relatively constant throughout 2006, with an average of 0.575kL of water used per tonne of ore fed to the Newman Concentrator. Water use efficiency for the North Mine is shown in Figure 6.

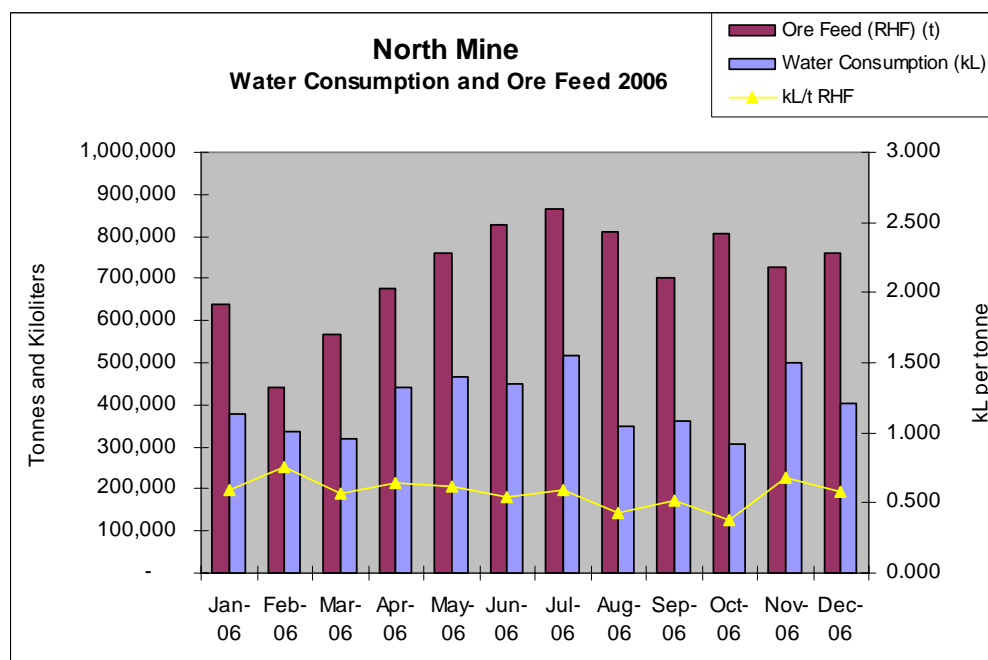


Figure 6. Newman Concentrator Water Consumption (North Mine) 2006.

Water consumption in the South Mine is shown in Figure 7. The elevated water usage in May is believed to be partially attributed to commencement of tailings deposition into the new 115B pit, with high losses through infiltration.

The calculated average for 2006 is 1.422 kL required per tonne of ore feed. Water use efficiency is comparatively lower in the South Mine, predominantly due to a larger surface area for water storage and tailings disposal. This results in increased losses through infiltration and evaporation. Higher slimes content also results in less water being returned

from tailings facilities for reuse. Additionally, the bulk of ancillary or domestic usage (Administration, Workshops etc) comes from the South Mine.

From October 2006, the design throughput at the O3 concentrator increased from 550 tph, to above 700 tph. This was following the installation of a scrubber at MU05 and improved thickener control. Iluka will be targeting 750 tph average during 2007. Some increase in water consumption is expected, however, this will be off-set by an increase in tailings density to be achieved with new pumping systems.

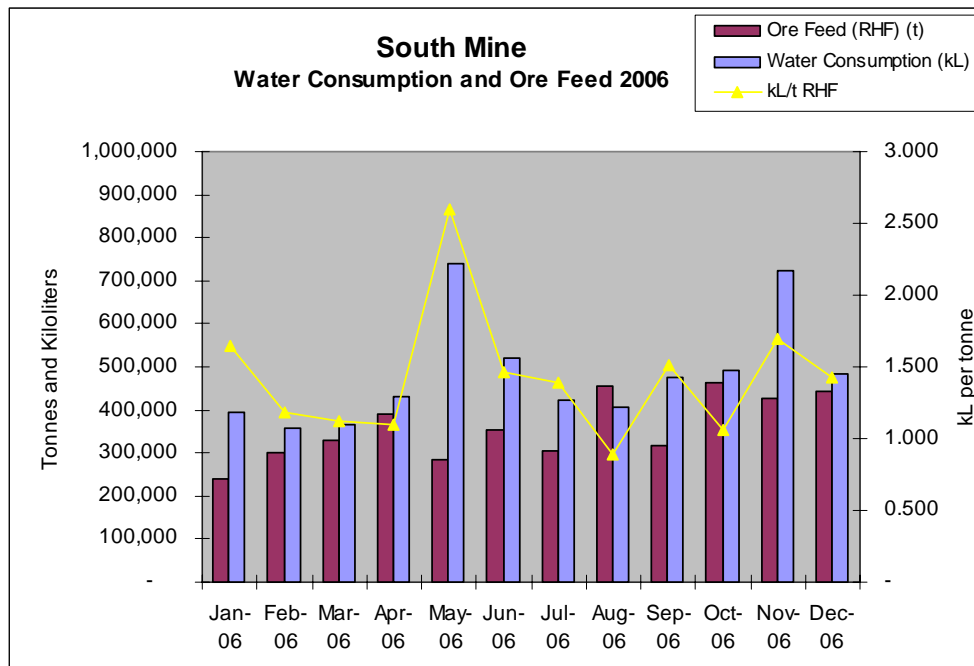


Figure 7. O3 Concentrator Water Consumption (South Mine) 2006.

Water supply for the South Secondary Concentrator is predominantly recycled water direct from the O3 concentrator. During 2006, an average of 1.2 kL per tonne of ore feed was supplied from the O3 concentrator, equivalent to 211 kL per hour. Additional water required for processing is supplied from production bores, at an average rate of 0.228 kL per tonne of HMC feed in 2006. Water consumption at South Secondary Concentrator is shown in Figure 8.

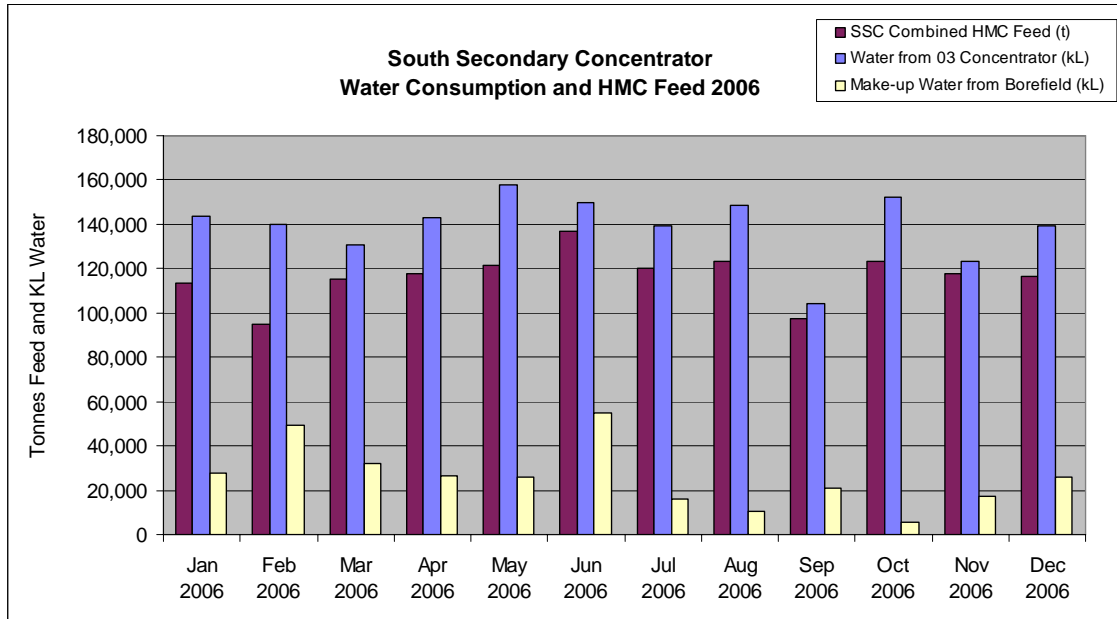


Figure 8. Water consumption per tonne of HMC Feed to South Secondary Concentrator 2006.

### 4.3 Air Quality Management

#### 4.3.1 Dust Management

Dust management controls were applied throughout the year in accordance with DEC licence 5646/7 and the Dust Management Plan (2002). This plan is currently being reviewed and will be submitted to the DEC in 2007, for comment and endorsement. Dust suppression activities include the use of water trucks and a "slimes" truck, which is used to spray clay fines over open areas and stockpiles.

Open areas are kept to a minimum, through progressive rehabilitation of completed mine areas. Further details on rehabilitation activities for 2006, can be found in section 5.

#### 4.3.2 Dust Monitoring

Dust monitors are located between the town of Eneabba and the North Mine Operations, and at Depot Hill on the eastern boundary of the North Mine Operations (Figure 9). Background dust levels are recorded at the Depot Hill unit during strong easterly winds which typically prevail in summer and can cause dust problems for the township located 2Km due west of the Newman concentrator. Dust is monitored at the 10 micron level (PM<sub>10</sub>) using two Rupprecht & Patashnick 1400a TEOM Ambient Particulate Monitors with direct telemetry to the operational control room.



Background Dust Monitor at Depot Hill, Eneabba

The ambient airborne dust concentration limit prescribed in the DEC licence requires continuous monitoring of dust levels over a 24 hour period with reporting required if levels exceed 50ug/m<sup>3</sup> within that period. A total of 5 excursions above this limit are allowable in any one calendar year.

Only one exceedence of the licence limit was recorded at the town of Eneabba for the reporting period. The dust levels recorded for this exceedence was 1 ug/m<sup>3</sup> higher than the exceedence limit and was 8 ug/m<sup>3</sup> higher than background dust (Figure 10). Background dust monitoring levels often exceed dust levels measured in the town of Eneabba and on one occasion exceeded the Eneabba town reporting level by 12 ug/m<sup>3</sup>. Monthly average dust levels for 2006 show that background dust levels were consistently higher than town dust levels (Figure 11). Monthly dust data also reflect the affect of late winter rainfall in 2006 with higher dust levels recorded in May and June when compared to 2005 data.

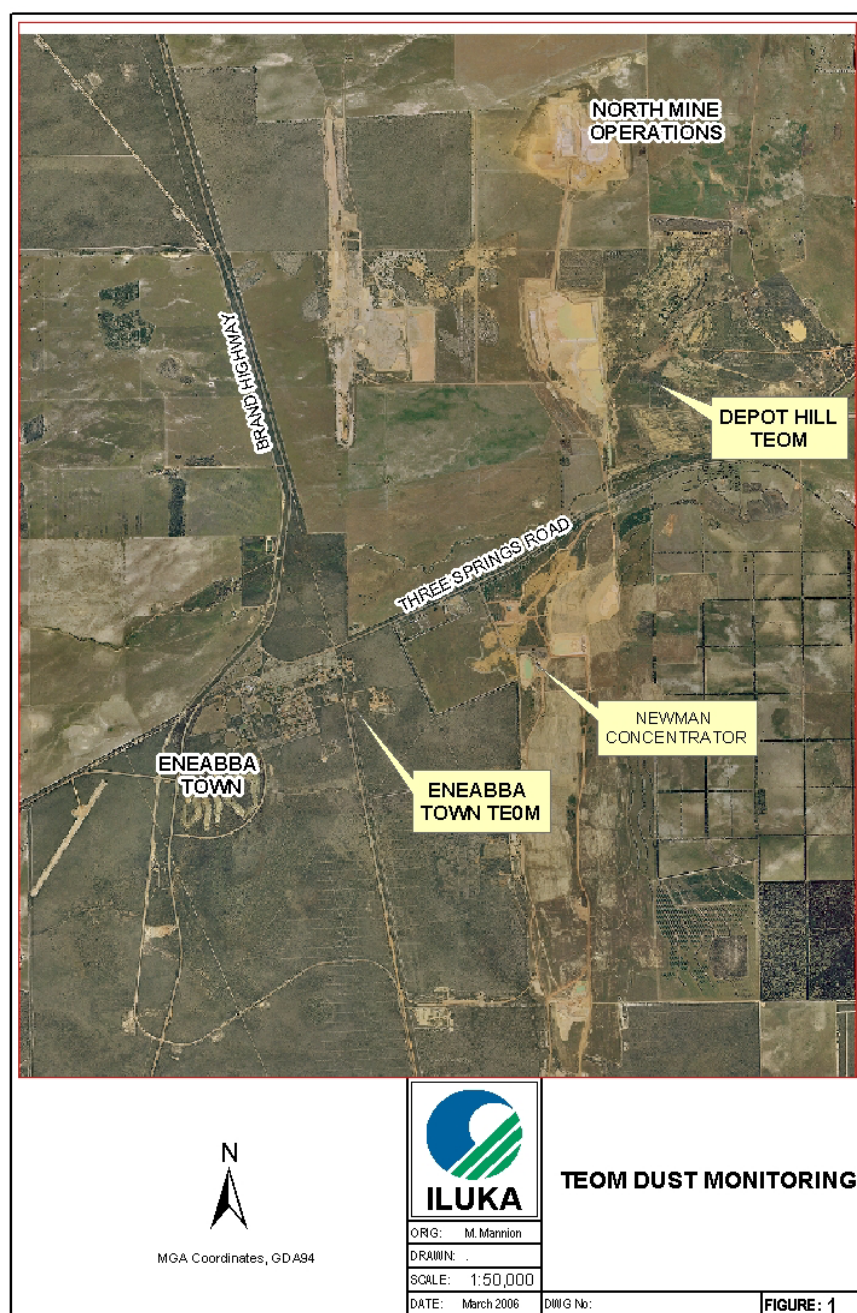


Figure 9. Iluka Eneabba TEOM dust monitoring station locations.

### DAILY AVERAGE DUST LEVEL

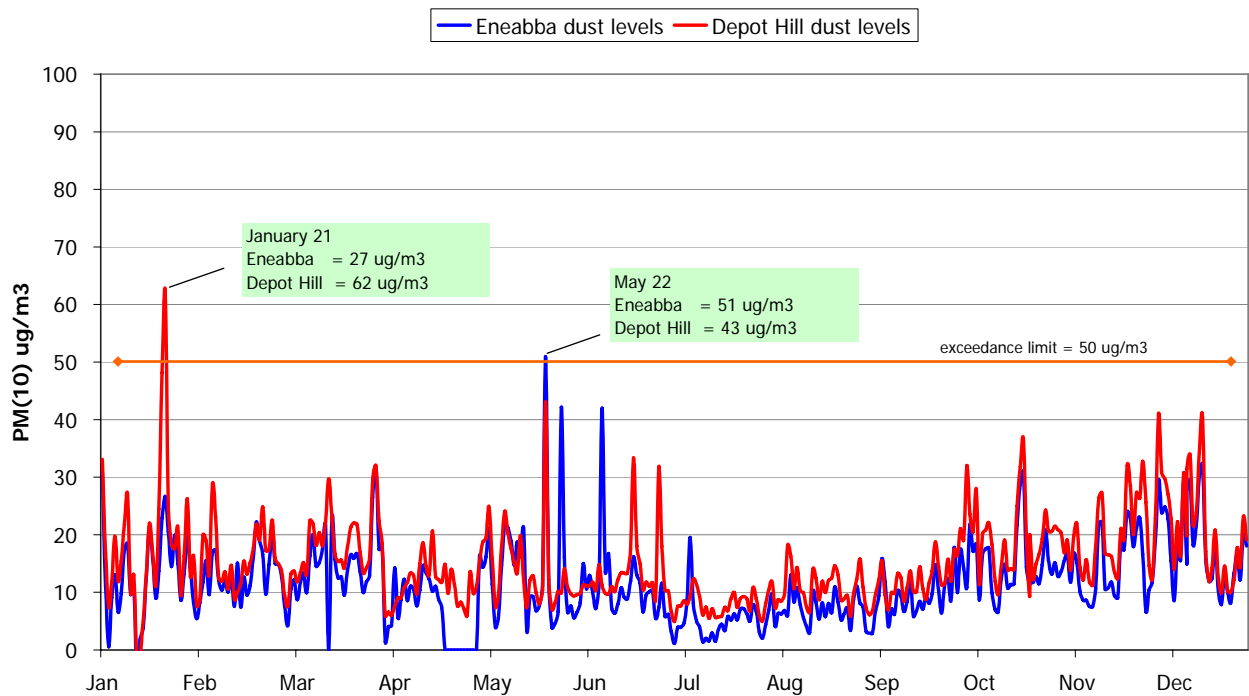


Figure 10. Average daily TEOM dust levels at Eneabba and Depot Hill, 2006.

### AVERAGE MONTHLY DUST LEVELS

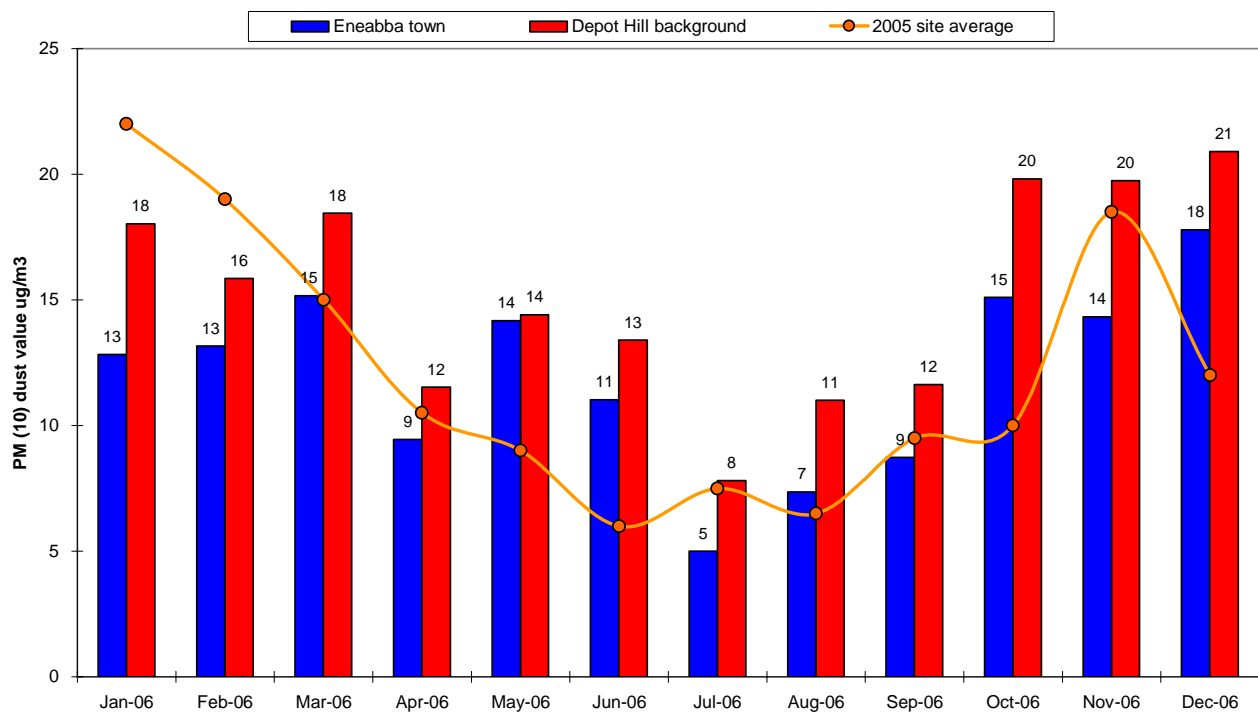


Figure 11. Average monthly TEOM dust levels at Eneabba and Depot Hill, 2005 - 2006.

### 4.3.3 Stack Emissions

Stack emissions from the dryers at the South Secondary Concentrator were sampled quarterly throughout 2006. Sampling is completed by Environmental Consultancy Services (ECS Stack Pty Ltd) in accordance with AS4323.1 and USEPA Methods 1, 2, 3A and 4. USEPA Methods 5 and 29 were used for the sampling of particulate matter and metal emissions, including uranium and thorium. Particulate and metals samples were recovered in NATA accredited laboratories, at ECS and Chemistry Centre of Western Australia.

The sampling planes of the two dryers do not meet the requirements for the provision of stack sampling determinations for flow rate and particulates as detailed in USEPA Method 1. In order to compensate, the number of sampling points (within the stack) is increased as required by the Method.

As shown in Table 9, stack emissions remained well below regulatory guidelines levels.

**Table 9. South Secondary Concentrator stack monitoring results, Eneabba, 2006.**

Stack Condition	unit	Dryer 201					Dryer 301				
		Q1	Q2	Q3	Q4	Mean	Q1	Q2	Q3	Q4	Mean
Moisture Content	%	13.4	13.1	15.3	11.8	13.4	18.55	21.4	21.25	19.35	20.1
Volume Flow Rate	m <sup>3</sup> /min	547.5	465.5	425.5	403.5	460.5	437.5	929.5	458.5	456.5	570.5
Velocity	m/sec	8.0	6.3	6.3	5.8	6.6	20.5	12.85	21.45	21.4	19.1
Temperature	°C	55.5	59.5	60	56	57.8	58	63	62	58.5	60.4
<b>Emissions</b>	<b>unit</b>										
Particulate Concentration	mg/m <sup>3</sup>	71.8	45.9	49.5	49.9	54.3	25.9	61.2	39.0	6.1	33.0
Particulate Emission Rate	g/min	39.3	21.2	21.1	20.1	25.4	11.3	56.8	17.9	2.8	22.2
Uranium Concentration	ug/m <sup>3</sup>	nd	nd	4.9	3.9	4.4	nd	3.0	1.9	nd	2.4
Uranium Emission Rate	g/min	nd	nd	0.002	0.002	0.002	nd	0.003	0.001	nd	0.002
Thorium Concentration	ug/m <sup>3</sup>	nd	nd	92.5	131.5	112	nd	113.5	55.5	17.5	62.2
Thorium Emission Rate	g/min	nd	nd	0.040	0.053	0.046	nd	0.106	0.026	0.009	0.047

Emission Guideline	unit	limit	source
Particulates	mg/m <sup>3</sup>	150	DEC
Thorium	g/day	150	DoIR

nd = not detected

### 4.3.4 Meteorological Data

Long term rainfall trends show a typical sinusoidal pattern between winter and summer seasons with the wettest periods being from May through September (Figure 12). Total rainfall in 2006 was well below the long term average (30%). Monthly rainfall patterns however were considerably more variable and show some months were as much as 70% below long term trends (April, May, August, October and November). Overall, seven months recorded below average rainfall. Seasonally, there was a reversal of long term trends with the hottest months also receiving higher than average rainfall, while very little rain fell during winter. Maximum monthly temperatures were significantly higher for the duration of 2006. Rainfall events (periodicity and magnitude) have significant affects on minesite rehabilitation and groundwater recharge.

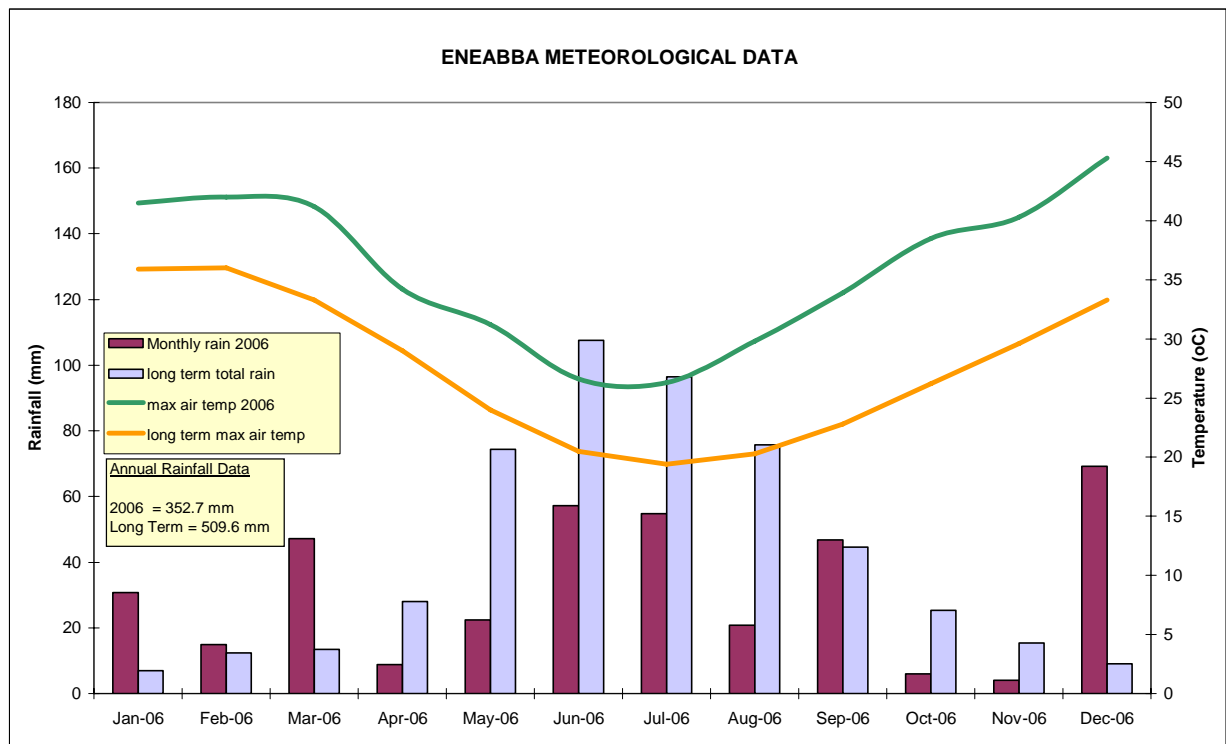


Figure 12. Eneabba Meteorological data, 2006.

## 4.4 Energy Use

The main energy sources for the mining operation at Eneabba is electricity, gas and diesel fuel. Electricity is supplied externally from the Western Power grid, and used for powering the concentrators, field generators, groundwater production bores and general use in administration buildings and workshops. As shown in Figure 13, electricity use accounted for 69% of Eneabba's total greenhouse emissions in 2006 (143,296 MWh).

Gas is used to run the drying process at the South Secondary Concentrator, with 300,974 GJ consumed in 2006. Diesel fuel is required to run the heavy vehicle mining fleet, mobile pumps, generators and light vehicle use. A total of 15,161,404L of diesel was consumed in 2006, accounting for 22% of Eneabba's greenhouse emissions.

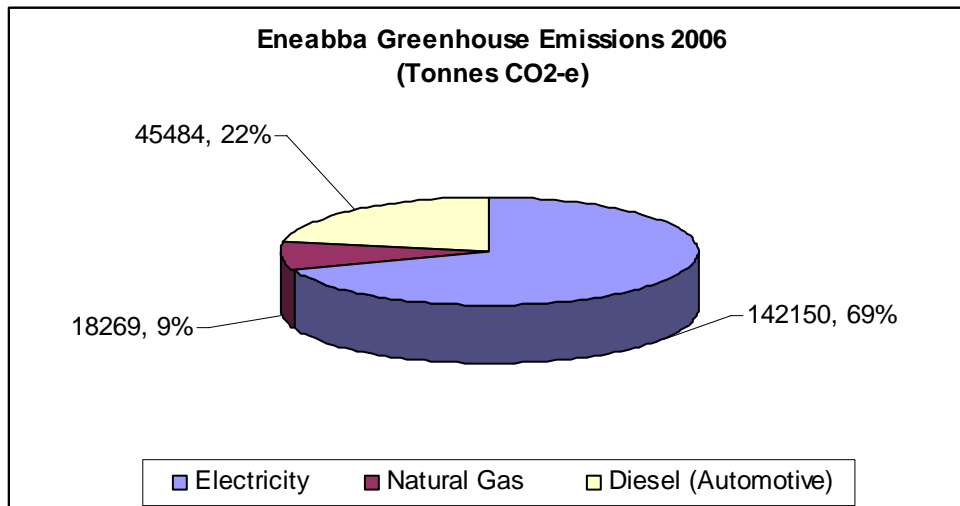


Figure 13. Eneabba Greenhouse Emissions, 2006.

#### 4.4.1 Energy Use Efficiency

In accordance with the Energy Efficiency Opportunities Act 2006 (EEO), Iluka has registered with the Department of Industry and Tourism for using an excess of 0.5 petajoules annually. Iluka also remained a signatory to the Mineral Council of Australia's Enduring Values framework, in 2006, and committed to investigating ways of reducing fuel and energy use.

Energy use (electricity and gas) per tonne of product produced at Eneabba is shown in Figure 14.

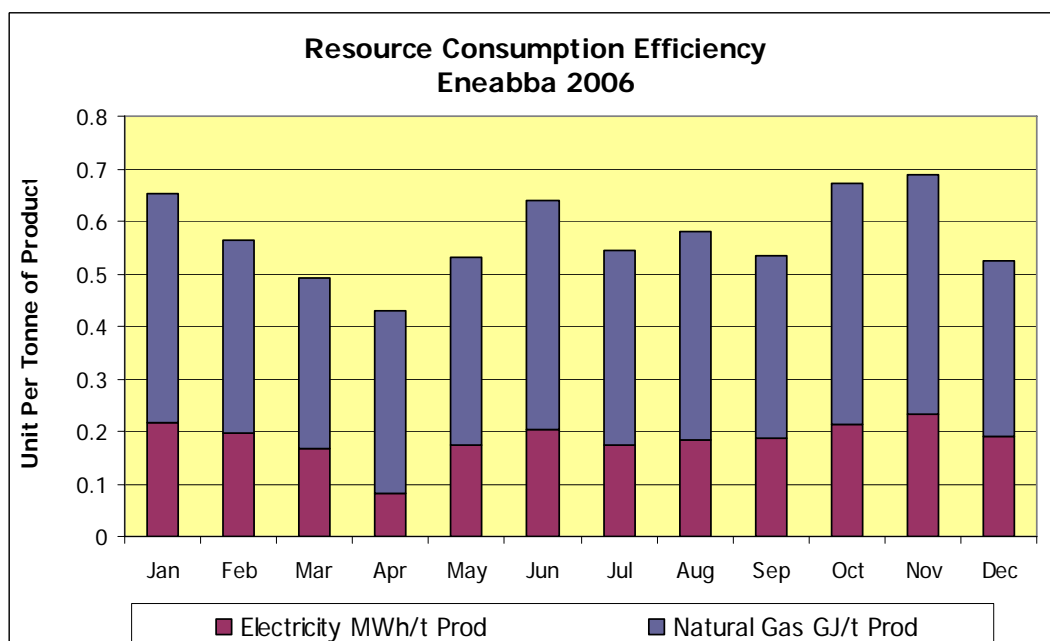


Figure 14. Energy use at Eneabba per tonne of final product, 2006.



## 4.5 Radiation

Details of Eneabba's radiation monitoring program are reported in the Annual Environmental Radiation Monitoring Report. This was submitted as required to the Department of Consumer and Employment Protection (DoCEP) in November 2006. Additional copies can be made available on request.

## 4.6 Community Relations

In 2006 Iluka Resources commissioned IPSOS, a leading global survey-based market research company, to undertake a state-wide community survey of all sites. The aim of the survey was to gain a deeper understanding of landowner and community needs and to identify ways in which the company can strengthen these relationships ultimately adding value to the communities in which it operates. The research program engaged with key stakeholders such as government agencies, local businesses, and community groups.

The key output of the research was to guide Iluka in the development of a structured community engagement program that can be rolled out by Iluka in future. Since its completion, Iluka has implemented several strategies addressing issues arising from the survey with great success.

Iluka has actively built partnerships with emergency services within the Eneabba and Leeman communities. These beneficial partnerships involve more than purely cash donations. Many Iluka employees are involved in volunteer roles with local Fire Brigade, SES and Ambulance Services which assists and strengthens Iluka's partnerships with these organisations.

Through our Community Development program in 2006 we partnered with Leeman Sea Search and Rescue, Leeman and Eneabba Silver Chain, Leeman and Eneabba St Johns, Eneabba and Leeman Schools and several other community groups. Further, Iluka has committed to assist the Royal Flying Doctor Service to purchase a new aircraft over the next four years.

Iluka is closely involved with the community in Eneabba, with mine site staff attending many community meetings and events, with the community relations team providing additional support to the township and region. Through Iluka's Community Development Partnership program we support many community events. Iluka also supports the Eneabba and Leeman playgroups, Eneabba swimming Pool, Eneabba Horseman's Associations, Golf Club, Leeman Bowling Club and Tennis Club.

## 4.7 Environmental Noise

Quarterly noise surveys were conducted in the vicinity of Eneabba, during 2006. Locations of noise surveys are shown in Figure 15. Noise levels were found to be substantially compliant against the Environmental Protection (Noise) Regulations 1997 and no complaints have been received. It is not considered warranted to continue quarterly noise surveys at Eneabba, and they will be discontinued in 2007. If noise levels are shown to create a concern for residents in future, or mining operations change significantly, monitoring will be re-initiated.

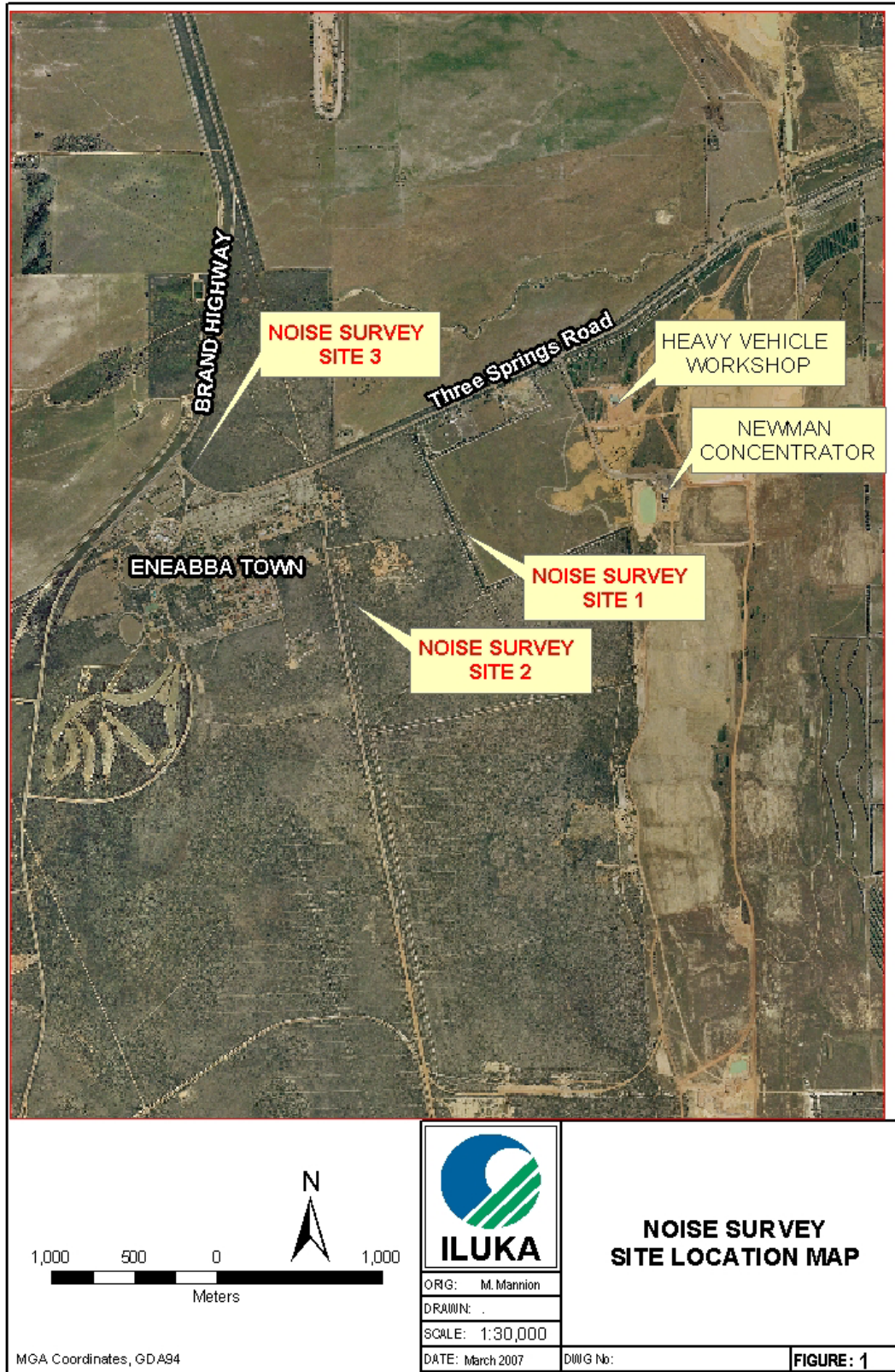


Figure 15. Environmental Noise Survey Locations, Eneabba, 2006.

## 4.8 Eneabba Environmental Incidents Summary

All environmental incidents are reported internally via the Loss Control Card system. A total of 98 environmental incidents were reported through this system in 2006. Six incidents were reported to the Department of Environment and Conservation, as non-compliances to licence conditions. The remaining 92 were considered minor with negligible impact on the environment. Reported Environmental Incidents are listed in Table 10.

**Table 10. Reported Environmental Incidents, Eneabba, 2006.**

Type of Incident	Incident description	Actions
Freeboard exceedance 19 January 2006  <i>LCC: MW61890</i>	Freeboard exceedance on internal wall of Depot Hill Tailings Storage Facility (TSF), Dam 3. No tailings material was lost from the dam or to the environment.	An ICAM investigation was undertaken, which resulted in the following actions being completed; <ul style="list-style-type: none"> <li>• Tailings Operating Manual reviewed</li> <li>• Procedures for freeboard monitoring and inspections reviewed</li> <li>• Tailings training delivered to relevant personnel</li> </ul>
Dust exceedance 22 May 2006  <i>LCC: MW59207</i>	Exceedance of 50ug/m <sup>3</sup> PM <sub>10</sub> at the Eneabba Town TEOM dust monitor. 24 hours average of dust levels were 51ug/m <sup>3</sup> and 43ug/m <sup>3</sup> respectively at the Eneabba and background monitor at Depot Hill.	All available water carts were operational during the incident. Difference between 'background' dust and 'town' dust was negligible, indicating that surrounding agricultural land contributed significantly to the dust emissions.
Off-site discharge of water 25 May 2006  <i>LCC: MW61761</i>	During repairs of a process water line, it is estimated that up to 5,000L of clean water was discharged to the Eneabba Creek, after overflowing the road containment bund. The creek bed was dry at the time of the incident and the water quickly dissipated through seepage. Some clay sediments were deposited in the creek bed, however, these were less than 1cm in depth, and the impact considered negligible.	Creek line was inspected by site environmental personnel and assessed impacts to be minor.
Tailings Dam Breach 7 August 2006  <i>LCC: MW65453a</i>	Following a period of high rainfall, pooling of water on top of the tailings wall resulting in a depression and erosion. Sand tailings escaped the dam following a seepage line. The tailings material was contained at the foot of the dam wall and did not impact on any surrounding vegetation.	Tailings discharge shut down and wall rebuilt with additional material. Improved contouring of the dam walls across site was implemented, to prevent pooling which may result in runoff and erosion.



Type of Incident	Incident description	Actions
<p>Tailings Spill 5 November 2006  <i>LCC: MW67664</i></p>	<p>A split tailings line resulted in a spill of inert sand / clay tailings extending outside of the bunded pipeline corridor. A small area of vegetation was inundated, however, the depth of this was not significant and the environmental impact was considered low. No DRF was impacted by the incident.</p>	<p>Pipeline was repaired and bund rebuilt to contain future spills. An ICAM investigation was completed, identifying the following corrective actions:</p> <ul style="list-style-type: none"> <li>• Investigate upgrade of tails line to cater for pressure required to maintain plant output.</li> <li>• Review tailings manual to include standard for pipeline corridor construction and maintenance, detailed standard for tailings disposal system.</li> <li>• Implement a pipe replacement strategy in line with planned maintenance shuts</li> </ul>
<p>Dust Exceedance 11 December 2006  <i>LCC: EMW77535</i></p>	<p>High dust emissions which extended across Brand Highway adjacent to South Mine operations, during period of above average wind speed. Impact on motorists was negligible, with dust considered a light haze. Background dust levels as high as those measured in Eneabba. Both dust monitors remained below licence limit of 50ug/m3 average.</p>	<p>All available water trucks deployed.</p>

## 4.9 Government Inspections

Site visits to Eneabba by government departments are outlined in Table 11.

**Table 11. Government Visits to Eneabba, 2006.**

Government Department	Date	Reason for Visit
<ul style="list-style-type: none"> <li>• Department of Industry and Resources</li> <li>• Department of Environment and Conservation</li> <li>• Department of Water</li> </ul>	5 October	<p>Mineral Sands Agreement Rehabilitation Coordination Committee (MSARCC).</p> <p>Annual site visit.</p>
<ul style="list-style-type: none"> <li>• Department of Water</li> </ul>	1 December	To discuss groundwater licence re-issue and general site water management.

## 4.10 Compliance with DEC Licence Conditions

**Table 12. Compliance with Eneabba Licence Conditions (5646/7), 2006.**

Condition	Summary of Requirement	Comply	Ref.
G1(a)	Person left in charge is aware of conditions	✓	N/A
G1(b)	Any person who performs tasks on premises is informed of conditions	✓	N/A
G2	Annual Environmental Report to be submitted by 15 March each year. To include details of licence exceedences, incidents, discharges and assessment of monitoring results against limits and standards.	✓	This report
A1	Comply with Dust Management Plan 2002 to suppress all visible dust from crossing the premises boundary.	✓ *	4.3.1
A2(a) (i) – (v)	Maintain dust monitoring equipment	✓	4.3.2
A2(b)	Operate equipment and activities such that dust emissions do not exceed 50ug/m <sup>3</sup> average over 24 hours period (5 allowable exceedences per year)	✓ *	4.3.2 & 4.8
A3(a)	Gates at monazite blending unit are closed at all times, except while unloading	✓	4.3.1
A3(b)	Ensure that monazite does not contact steel grates covering the blending unit	✓	4.3.1
W1(a)	Take representative water samples from the designated sites, at listed frequency and parameters	✓	4.2.2
W1(b)	Collect samples in accordance with AS/NZ 5667.1:1998	✓	4.2.2
W1(c)	Submit all water samples to laboratory with NATA accreditation for analysis specified.	✓	4.2.2
W2(a)	Ensure contaminated stormwater run-off is retained or treated prior to discharge	✓	4.2.2
W2(b) (i) – (v)	Discharge of water from premises to meet specified water quality criteria.	✓ *	4.8
W2(c)	Divert stormwater run-off away from waste management facilities.	✓	N/A
W3(a)	Vehicle wash down areas equipped with fuel/oil traps	✓	N/A
W3(b)	Install and maintain hydrocarbon bunding systems around workshop and plant areas to enable recovery of spillages.	✓	N/A
W3(c)	Collect all waste lubricants in holding tanks for disposal off-site.	✓	N/A
W4(a) – (c)	Storage of hydrocarbons and hazardous chemicals in accordance with specifications.	✓	N/A
W5(a)	Maintain minimum freeboard of 500mm in tailings facilities	✓ *	4.8
W5(b)	Ensure tailings facilities are inspected regularly and recorded	✓	N/A
W5(c)	Retain Tailings Dam Report (inspections) for minimum of 2 years, available on request	✓	N/A
S1(a)	Dispose of waste to 'blue pit' and '97A, 120D and 115D'	✓	4.1.5
S1(b)	Inert waste only disposed of on-site.	✓	4.1.5
S1(c)	Keep record of tonnes waste disposed on-site	✓	4.1.5
S2(a)	Maintain 3m distance below base of landfill and groundwater level	✓	4.1.5
S2(b)	Maintain 100m distance from waste disposal site and surface water bodies.	✓	4.1.5
S3(a) – (c)	Ensure all waste is covered with material as stipulated	✓	4.1.5
S3(d)	Contain any wind-blown waste within premises.	✓	4.1.5
S4 (i) – (v)	Compliance with tyre storage criteria.	✓	N/A
S5(a)	No burning of waste at landfill.	✓	N/A
S5(b)	Extinguish any fires with 12 hrs of becoming aware of the fire.	✓	N/A
S6 (i) – (v)	Manage soil remediation facility in accordance with requirements	✓	4.1.6

\* 2006 exceedences reported to DEC (refer to section 4.8)

## 5 ENEABBA REHABILITATION OPERATIONS

### 5.1 Rehabilitation Summary

In 2006, 9.0 hectares of native vegetation and 51.7 hectares of pasture establishment of rehabilitation was carried out at the Eneabba North and Eneabba South operations. A further 262.19 hectares of stabilisation work was completed for dust control and repair work in both native vegetation and pasture establishment.

Areas rehabilitated and areas seeded for dust control works are shown in Figures 1 to 7 of Appendix 3.

### 5.2 Topsoil Handling

Topsoil return is the key step in the rehabilitation process at the Eneabba Operation. In 2006, 74,589 m<sup>3</sup> of topsoil was spread over 60.7 hectares of rehabilitated land. All topsoil used was obtained from stockpiles created during overburden stripping prior to previous mining operations. Topsoil movement details are shown in Table 13.

**Table 13. Eneabba (East Mine) Topsoil Movement Details, 2006.**

#### Native Vegetation

Rehabilitation Block	Topsoil Stockpile ID	Area	Volume m <sup>3</sup>	Type	Soil Depth
06AS	IPL 122	South Mine – 82B4	4,320	Topcut	4.8 cm
	IPL 138		10,630	Subsoil	11.8 cm
<b>Total</b>			<b>14,950</b>		

#### Pasture Establishment

Rehabilitation Block	Topsoil Stockpile ID	Area	Volume m <sup>3</sup>	Type	Soil Depth
06AN	J36	Cell 4	22,330	Agricultural	16.0 cm
06BN	J29	Blue 17	4,826	Agricultural	13.0 cm
	J48		9,454	Agricultural	
	J45		4,060	Agricultural	
	J49		6,000	Agricultural	
06CN	J44	Red 17	10,648	Agricultural	12.4 cm
	J28		17,271	Agricultural	
<b>Total</b>			<b>74,589</b>		

### 5.3 Seed Collection

A total weight of 43.79 kilograms of seed was collected from 100 species in 2006. Seed collection for 2007 was targeted at particular species, using flora survey data, expected germination and previous rehabilitation outcomes with direct seeding as a guide. Quantities of seed collected in 2006 are listed in Table 14.

Improved seed collection quality control saw emphasis placed on seed viability rather than quantity of seed collected. This was implemented in 2005.

**Table 14. Eneabba Native Seed Collection, 2006.**

Genus	Species	Amount (grams)	Genus	Species	Amount (grams)
<i>Acacia</i>	<i>pulchella</i>	120	<i>Hakea</i>	<i>eneabba</i>	75.7
<i>Actinostrobus</i>	<i>acuminatus</i>	84	<i>Hakea</i>	<i>flabellifolia</i>	206.6
<i>Actinostrobus</i>	<i>pyramidalis</i>	747	<i>Hakea</i>	<i>gilbertii</i>	107.5
<i>Allocasuarina</i>	<i>humilis</i>	467	<i>Hakea</i>	<i>incrassata</i>	587
<i>Angiozanthus</i>	<i>humilis</i>	34	<i>Hakea</i>	<i>lissocarpa</i>	97
<i>Angiozanthus</i>	<i>manglesii</i>	484	<i>Hakea</i>	<i>polyanthema</i>	70
<i>Angiozanthus</i>	<i>pulcherrimus</i>	4	<i>Hakea</i>	<i>prosrata</i>	169.4
<i>Banksia</i>	<i>attenuata</i>	1217	<i>Hakea</i>	<i>psilorrhyncha</i>	307.5
<i>Banksia</i>	<i>candolleana</i>	266	<i>Hakea</i>	<i>ruscifolia</i>	12.5
<i>Banksia</i>	<i>menziesii</i>	260	<i>Hakea</i>	<i>smilacifolia</i>	32
<i>Beaufortia</i>	<i>elegans</i>	158.3	<i>Hakea</i>	<i>spathulata</i>	31
<i>Calothamnus</i>	<i>blepharospermus</i>	354	<i>Hakea</i>	<i>undulata</i>	46
<i>Calothamnus</i>	<i>brevifolia</i>	207	<i>Jacksonia</i>	<i>floribunda</i>	49.5
<i>Calothamnus</i>	<i>hirsutus</i>	18	<i>Jacksonia</i>	<i>lehmannii</i>	51
<i>Calothamnus</i>	<i>quadrifidus</i>	774	<i>Lachnostachys</i>	<i>eribotrya</i>	5
<i>Calothamnus</i>	<i>sanguineus</i>	8	<i>Lambertia</i>	<i>multiflora</i>	3054
<i>Calothamnus</i>	<i>torulosus</i>	114	<i>lasiopetalum</i>	<i>drummondii</i>	171.5
<i>Calothamnus</i>	<i>villosus</i>	55	<i>Leptospermum</i>	<i>erubescens</i>	56
<i>Calytrix</i>	<i>flavescens</i>	2760	<i>Leptospermum</i>	<i>spinescens</i>	239.5
<i>Calytrix</i>	<i>fraseri</i>	19	<i>Lomandra</i>	<i>preissii</i>	283
<i>Calytrix</i>	<i>stirgosa</i>	8	<i>Melaleuca</i>	<i>accuminata</i>	19
<i>Casuarina</i>	<i>obesa</i>	93.5	<i>Melaleuca</i>	<i>ciliosa</i>	84
<i>Conospermum</i>	<i>wycherleyi</i>	287	<i>Melaleuca</i>	<i>lateriflora</i>	29
<i>Conostylis</i>	<i>aurea</i>	241	<i>Melaleuca</i>	<i>leuropoma</i>	25
<i>Conostylis</i>	<i>hiemalis</i>	27	<i>Melaleuca</i>	<i>megacephala</i>	382
<i>Conostylis</i>	<i>neocymosa</i>	704	<i>Melaleuca</i>	<i>radula</i>	287
<i>Daviesia</i>	<i>divaricata</i>	5	<i>Melaleuca</i>	<i>rhaphiophylla</i>	9
<i>Dryandra</i>	<i>carlinoides</i>	1329	<i>Melaleuca</i>	<i>trihopylla</i>	20
<i>Dryandra</i>	<i>fraseri</i>	11	<i>Melaleuca</i>	<i>uncinata</i>	110
<i>Dryandra</i>	<i>glauca</i>	40	<i>Petrophile</i>	<i>drummondii</i>	1424
<i>Dryandra</i>	<i>kippistana</i>	138.3	<i>Petrophile</i>	<i>linearis</i>	544
<i>Dryandra</i>	<i>sessilis</i>	234.5	<i>Petrophile</i>	<i>macrostachya</i>	140
<i>Dryandra</i>	<i>shuttleworthiana</i>	1680.5	<i>Phymatocarpus</i>	<i>porphyrocephalus</i>	55
<i>Dryandra</i>	<i>tridentata</i>	608	<i>Scholtzia</i>	<i>involutata</i>	2371
<i>Dryandra</i>	<i>vestita</i>	74	<i>Stirlingia</i>	<i>latifolia</i>	514
<i>Eremaea</i>	<i>beaufortioides</i>	331	<i>Tersonia</i>	<i>cyathiflora</i>	2609
<i>Eremaea</i>	<i>ectadiolada</i>	29.4	<i>Verticordia</i>	<i>argentea</i>	129
<i>Eremaea</i>	<i>violacea</i>	56	<i>Verticordia</i>	<i>aurea</i>	9163
<i>Eucalyptus</i>	<i>macrocarpa</i>	62.5	<i>Verticordia</i>	<i>blepharophylla</i>	26
<i>Eucalyptus</i>	<i>pleurocarpa</i>	338	<i>Verticordia</i>	<i>densiflora</i>	1768
<i>Eucalyptus</i>	<i>todtiana</i>	266	<i>Verticordia</i>	<i>eriocephala</i>	935
<i>Gompholobium</i>	<i>shuttleworthii</i>	3	<i>Verticordia</i>	<i>grandis</i>	330
<i>Grevillea</i>	<i>eristachya</i>	23.5	<i>Verticordia</i>	<i>monoadelpha</i>	697.6
<i>Hakea</i>	<i>auriculata</i>	99	<i>Verticordia</i>	<i>nitens</i>	115
<i>Hakea</i>	<i>candolleana</i>	109.4	<i>Xanorrhoea</i>	<i>drummondii</i>	682
<i>Hakea</i>	<i>conchifolia</i>	88.5	<i>Xanorrhoea</i>	<i>preissii</i>	19
<i>Hakea</i>	<i>costata</i>	38	<i>Xylomelum</i>	<i>angustifolium</i>	550
<b>Total</b>					<b>43789.7</b>

## 5.4 Nursery Production

The nursery produced 87,199 seedlings from 32 species. The nursery increased production from 50,240 units in 2005 (39 Species) to 87,199 in 2006 an increase of 73.56%.

The stock produced was utilised in the planting programme for rehabilitation of native vegetation at the West Mine. Plants were also grown for use in agricultural tree belts, amenity screening and community groups, with the breakdown being:

- Native Vegetation – 31,012
- Tree Belts – 43,257
- Amenity planting - 570
- Community Groups – 4,110
- School Groups – 8,250

**Table 15. Eneabba Nursery Production, 2006.**

Genus	Species	No.	Genus	Species	No.
<i>Acacia</i>	<i>salinga</i>	3650	<i>Eucalyptus</i>	<i>marginata</i>	1600
<i>Allocasuarina</i>	<i>humilis</i>	4080	<i>Eucalyptus</i>	<i>pleurocarpa</i>	3228
<i>Banksia</i>	<i>attenuata</i>	6091	<i>Eucalyptus</i>	<i>totiana</i>	5276
<i>Banksia</i>	<i>candolleana</i>	567	<i>Eucalyptus</i>	<i>wandoo</i>	1820
<i>Banksia</i>	<i>hookeriana</i>	2887	<i>Hakea</i>	<i>auriculata</i>	530
<i>Banksia</i>	<i>lanata</i>	237	<i>Hakea</i>	<i>candolleana</i>	530
<i>Banksia</i>	<i>leptophylla</i>	3295	<i>Hakea</i>	<i>conchifolia</i>	479
<i>Banksia</i>	<i>grandis</i>	1100	<i>Hakea</i>	<i>incrassata</i>	639
<i>Calothamnus</i>	<i>sanguineus</i>	1180	<i>Hakea</i>	<i>smicifolia</i>	56
<i>Calothamnus</i>	<i>torulosus</i>	100	<i>Hakea</i>	<i>trifurcata</i>	571
<i>Calothamnus</i>	<i>villosus</i>	800	<i>Hakea</i>	<i>varia</i>	258
<i>Casuarina</i>	<i>obesa</i>	7968	<i>Kunzea</i>	<i>recurva</i>	1468
<i>Corymbia</i>	<i>calophylla</i>	865	<i>Melaleuca</i>	<i>hamulosa</i>	260
<i>Ereamea</i>	<i>violacea</i>	1600	<i>Verticordia</i>	<i>densiflora</i>	170
<i>Eucalyptus</i>	<i>gomphocephala</i>	33895	<i>Xanthorrea</i>	<i>drummondii</i>	200
<i>Eucalyptus</i>	<i>loxophleba</i>	498	<i>Xylomelum</i>	<i>angustifolium</i>	1155
<b>Total</b>					<b>87,199</b>

## 5.5 Native Vegetation Establishment

As in 2005, the 2006 rehabilitation year was hampered by the introduction of clearing regulations and the loss, for most part of the ability to harvest mulch off the mine path. As a result, approximately 240 hectares of native rehabilitation has not been completed from the 2005 and 2006 seasons.

A small amount of area was cleared in the Adamson area which enabled 9.0 hectares of native vegetation to be completed in the South Mine. This was completed in accordance with the clearing permit for Adamson A, CPS 716/1.

### Mulch treatment – South Mine

Rehabilitation Block	Operation Area	Loads	Type	Harvested From
06AS – 9.0 ha	82B4	114	Heath	Adamson's



A further 136 hectares of area was seeded with cereal rye and sprayed with herbicide to prevent seed set. This work was carried out in areas to be rehabilitated as native vegetation, and was carried out to prevent dust being generated.

### 5.5.1 Native Vegetation Tubestock Planting Works

No tube stock was planted on rehabilitation blocks on the North and South Mine. All tube stock was grown in the nursery for planting around the Dry Dock area at the West Mine.

### 5.5.2 Broadcast Seeding

A total of 9.0 hectares was sown with native seed, collected by the Eneabba Rehabilitation Team. The total quantity of treated seed broadcast was 6.746 kilograms, as shown in Table 16. Seed broadcast occurred on native vegetation block 06AS.

**Table 16. Eneabba Broadcast Seeding, 2006.**

Genus	Species	Grams	Genus	Species	Grams
Actinostrobus	acuminatus	93	Ereamea	violacea	5.5
Allocasuarina	humilis	10	Grevillea	eristachya	30
Banksia	attenuata	2044	Hakea	eneabba	91.5
Banksia	candolleana	225	Hakea	psilorrhyncha	298
Banksia	lanata	10	Jacksonia	floribunda	51
Banksia	menziesii	200	Lambertia	multiflora	4
Beaufortia	elegans	29	Lasiopetalum	drummondii	14
Calytrix	fraseri	52	Leptospermum	spinescens	32
Conospermum	wycherleyi	478	Melaleuca	leuropoma	8
Conostylis	aurea	244	Petrophile	macrostachya	42
Daviesia	divicarta	5	Verticordia	densiflora	30
Dryandra	shuttleworthiana	1039	Verticordia	grandis	307
Ereamea	beaufortioides	1063	Xylomelum	angustifolium	314
<b>Total</b>					<b>6,746</b>

### 5.5.3 Mulch Harvest and Application

The rehabilitation techniques used by Iluka at Eneabba have been developed since the early 1980's and have provided good quality, low risk rehabilitation results over an extended period of time. The mulching process was approved under the State Agreement Act review processes and been monitored on an annual basis by the Mineral Sands Agreement Rehabilitation Coordinating Committee. Under the new state legislation mulching has been deemed clearing and is subject to the new approval process.

A revised mulching application was submitted to the Department of Industry and Resources in December 2006.

## 5.6 Cereal and Pasture Establishment

51.7 hectares of pasture establishment using Oat/Clover mix was completed for the North Mine with a further 12.4 hectares of stabilisation carried out using Triticale. A further 71.35 hectares of maintenance pasture using an Oat/Clover mix was reseeded directly south of the Newman concentrator.

The pasture rehabilitation work used the following seed and fertiliser mix:

- 80 kilograms per hectare of Mortlock Oat
- 14 kilograms per hectare mixed clovers (Balansa, Rose and Dalkeith)
- Summit Hi-Phos fertiliser was applied at 100 kilograms per hectare

## 5.7 Rehabilitation Monitoring

Annual flora monitoring on the rehabilitation and control blocks was undertaken by Mattiske Consulting in February 2007. The delay of the survey was due to the poor climatic season in the district. A summary of the works with the final monitoring report will be forwarded as an addendum to this report.

## 5.8 Improvements

A number of maintenance activities and improvements were carried out in the 2006 season, in both nursery and agricultural sections;

- Additional filters added to the Reverse Osmosis system
- A second shade house added in the nursery growing area
- Additional benches added which has the potential to upgrade nursery production by 35,000 units
- New tillage equipment purchased for the agricultural section

## 5.9 Rehabilitation Research and Development

**Table 17. Eneabba Rehabilitation R&D Projects Summary**

Project	Progress
Potential polyculture use of Mine Void	West Australian Regional Initiatives Scheme (WARIS) project in conjunction with Curtin University. Identifying potential for a business enterprise in fish culture with possible plant culture. Submissions received. Project currently on hold.
Comparisons of control methods for <i>Acacia blakelyi</i> in revegetation sites	Ongoing project conducted by Greening Australia (WA) to find effective control of <i>Acacia blakelyi</i> . Initial findings presented in June 2005. Further trials and monitoring took place in 2006 and are ongoing in 2007.
Seed Germination of Native Seed Species	Ongoing. Botanic Gardens and Parks Authority research project. Looking at optimising storage, and germination of seed. Aim to provide mining industry data on seed. Summary Report received February 2005. Research work is ongoing.
Successful rehabilitation of species-rich heath lands after mining for heavy minerals Project M364	Ongoing ARC-Linkage project looking at the spatial pattern and fire in post-mining restored vegetation linked with another project focusing on the spatial pattern and species diversity in natural revegetation. Research work is ongoing.

## 5.10 2007 Forecast

Approximately 25.1 hectares of rehabilitation will be carried out in both native vegetation and pasture re-establishment for the 2007 season.

A further 380 hectares of stabilisation will be carried out; this figure depends largely on type of area open.

### 5.10.1 South Mine

Tube stock planting and broadcast seeding works will be undertaken in existing rehabilitation blocks to improve vegetation quality. Mulching of Adamson A block will provide approximately 12.5 hectares of mulch material. 5 hectares of native vegetation rehabilitation will be carried out in 120D North.

There will be approximately 95 hectares sown with Cereal Rye for soil stabilisation.

### 5.10.2 North Mine

Approximately 20.1 hectares of rehabilitation will be carried out in both native vegetation and pasture re-establishment for the 2007 season.

Adamson A – 7.1 hectares of native vegetation

Adamson A – 5.0 hectares pasture

North Mine Red 16 – 8 hectares

There will be approximately 135 hectares sown with Cereal Rye and Triticale for soil stabilisation.

No rehabilitation will be carried out at Depot Hill due to tailings dam's not reaching full capacity. There will be approximately 150 hectares sown with Cereal Rye and Triticale for soil stabilisation.

## 6 WEST MINE CLOSURE

### 6.1 West Mine Environmental Management

The West Mine consisted of dredging and dry mining for mineral sands and operated from 1990 to 1999. Environmental management of the operation was governed by conditions of the DEP (now DEC) pollution control license, Public Environmental Review and Ministerial Statement 81. Since the decommissioning of mining operations in 1999, environmental management is guided by the West Mine Closure Plan, approved by relevant Government Authorities in 2001. This section contains annual reporting as required by the West Mine Closure Plan and a review of environmental management conditions and commitments outlined in the Ministerial Statement.

### 6.2 2006 Summary of Rehabilitation Works

#### 6.2.1 Native Vegetation Establishment

46.7 hectares of native vegetation rehabilitation was carried out in the West Mine for the 2006 season. Rehabilitation blocks in which mulch was applied are listed in Table 18.

Tube stock for the West Mine Rehabilitation was predominately *Eucalyptus* and *Banksia* species (Table 19). The tube stock was planted to the east of the void over the rehabilitated dry dock area. With an extremely dry season a netting fence was erected with the aim to control rabbits from destroying planted tube stock, this method along with Iluka's feral animal control work to a certain degree with numbers of surviving stock up on previous years in this area.

**Table 18. Rehabilitation Mulch Treatments, West Mine, 2006.**

Rehabilitation Block	Operation Area	Loads	Type	Harvested From
06AW – 11.0 ha	T39	74	Dunal	South of central Farm House
		7	Wet Area	Wilkinson's – Big Valley S/E
06BW - 27.4 ha	T29	130	Dunal	South of central Farm House
		11	West Area	Wilkinson's – Big Valley S/E
06CW – 5.2 ha	T27	59	Dunal	Wilkinson's – Big Valley S/E
06DW – 1.7 ha	Roads	4	Dunal	Wilkinson's – Big Valley S/E
06EW – 1.0 ha	T18 Nth	10	Wet / Heath	Wilkinson's – Big Valley S/E
06FW – 0.4 ha	T25 Road Verge	4	Dunal	Wilkinson's – Big Valley S/E
<b>TOTAL</b>		<b>299</b>		

**Table 19. Tube Stock Plantings, West Mine, 2006.**

Area Planted	Species	Genus	Quantity
Drainage / Wet Areas	Kunzea	recurva	<b>1468</b>
Dry Dock Area	Allocasuarina	humilis	4080
	Banksia	hookeriana	2887
	Banksia	attenuata	6091
	Banksia	leptophylla	3295
	Banksia	menziesii	146
	Banksia	lanata	237
	Banksia	candolleana	567
	Calothamnus	villosus	800
	Calothamnus	sanguineus	1180
	Calothamnus	torulosus	100
	Ereamea	violacea	1600
	Eucalyptus	pleurocarpa	3228
	Eucalyptus	todtiana	5276
	Verticordia	densiflora	170
	Xanthorrea	drummondii	200
Xylomelum	angustifolium	1155	
			<b>31,012</b>

## 6.2.2 Cereal and Pasture Establishment

37 hectares of pasture rehabilitation was carried out in the West Mine for the 2006 season.

The work consisted of:

- Cereal and pasture / topsoiled – 37.0 hectares
- Cereal and pasture / no topsoil – 0.0 hectares
- Reworking cereal and pasture – 36.67 hectares

Cereal and pasture work carried out used the following mix:

- 80 kilograms per hectare of Mortlock Pat
- 12 kilograms per hectare of mixed clovers (Balansa, Rose and Dalkeith)

Fertiliser was applied at 100 kilograms per hectare to cereal crops using Summit Hi-Phos.

## 6.2.3 Topsoil Handling

Topsoil return is the key step in the rehabilitation process at the West Mine Operation. In 2006, 147,681 m<sup>3</sup> of topsoil was spread over 83.7 hectares of rehabilitated land. All topsoil used was obtained from stockpiles created during overburden stripping prior to previous mining operations.

**Table 20. West Mine Topsoil Movement Details, 2006.**

**Native Vegetation**

Rehabilitation Block	Topsoil Stockpile ID	Area	Volume m3	Type	Soil Depth
06AW	W122	T39	5,500	Subsoil	10.7 cm
	W107		6,350	Subsoil	5.3 cm
	W121		3,760	Topcut	
	W120		1,530	Topcut	
	W108		1,220	Topcut	
06BW	W85	T29	12,819	Subsoil	13.8 cm
	W81		12,250	Subsoil	9.7 cm
	W78		12,300	Subsoil	
	W27		4,765	Subsoil	
	W86		12,500	Topcut	
	W80		7,400	Topcut	
	W79		7,800	Topcut	
	W26		5,533	Topcut	
06CW	W85	T27	5231	Subsoil	10.0 cm
	W86		2326	Topcut	5.2 cm
06DW	W22	Road Verges Nth	1,700	Subsoil	10.0 cm
	W26		850	Topcut	5.0cm
06EW	W51	Under S/P W51	1,000	Subsoil	10.0 cm
	W83A		500	Topcut	5.0 cm
06FW	W67	Road Verges T25	525	Subsoil	15.0 cm
	W66		175	Topcut	5.0 cm
<b>Total</b>			<b>106,034</b>		

**Pasture Establishment**

Rehabilitation Block	Topsoil Stockpile ID	Area	Volume m3	Type	Soil Depth
06GW	W51	T18	12,025	Subsoil	16.9 cm
06HW	W84A	T15	7,520	Subsoil	13.6 cm
06IW	W84A	T3/4	5,000	Subsoil	13.5 cm
06JW	W89	T33 South	6,902	Agricultural	15.0 cm
06KW	W89	T33 North	6,750	Agricultural	18.2 cm
06LW	W107	T37 South	3,450	Subsoil	15.0 cm
<b>Total</b>			<b>41,647</b>		

### 6.3 2006 Earthworks Rehabilitation Summary

The Earthworks Rehabilitation Plan is given in Attachment2 of the West Mine Closure Plan (2001). The plan consists of all remaining tailings dams created along the path that require earthworks and rehabilitation.

The Plan sets out the earthworks program for each dam to be undertaken each year. The Plan is a dynamic plan within the document and is reviewed each year, when reviewed the document is included as an addendum each year for the West Mine Closure Plan.

The Plan provides detailed programs of each dam which include earthworks and revegetation native or pasture required to fully rehabilitate each area. The work described for each dam is conceptual in nature and makes assumptions based on moisture levels in clays, rainfall, volume of overburden, water on dams, establishment of drainage channels etc. The complexity of the works and the uncertainty of the conditions may and will give a variance to the final landform and schedule of the works completion.

The practice of spilling and drying tailings material continues from the 2005 and 2006 programs, the results of this practise has proved the most practical method in drying the material remaining in the dredge path. This work along with re-establishing drainage channels has resulted in establishing a stable landform similar to that of pre-mining.

Land preparation and bulk earthmoving for the spreading of top soil were carried out in the following areas;

- Northern end of T38
- Southern and northern ends of T33/34
- Dam's T28 to T30

The 2006 West Mine rehabilitation areas are shown in Figures 3 and 7, of Appendix 3.

### **Final Void Area**

No work was carried out around the void area with the exception of planting of green stock in areas where required. The 2005 planting may possibly see the vegetation levels established around the void shore line and the bypass creeks reaching pre-mined levels. To verify this monitoring of the area will be carried out in 2007. Monitoring of water quality and erosion control continues as per the closure plan.

### **Dry Dock Area**

As per the void area the planting of green stock in areas where required, this process will continue until vegetation being re-established has reached pre-mined levels.

### **Tailings Dam – T38**

Approximately 95% of the dam area has been re-contoured with excavation of sand/clay mixture being removed and dried. Contouring of the dam area and surrounds was completed by mid 2005; the area was sown with a cover crop of pasture grasses to reduce dust and erosion. Top soil is to be applied in the 2007 rehabilitation area and the area mulched for re-establishing native vegetation.

### **Tailings Dam – T37**

Approximately 55% of the dam area has been re-contoured with excavation of sand/clay mixture being removed and dried. Contouring of the dam area and surrounds was completed by mid 2005, with a cover crop of pasture grasses sown to reduce dust and erosion.

### **Tailings Dam – T36**

Area completed with creek systems in place with the area topsoiled and mulched to establish native vegetation. The creek system has been fenced. The remainder of the area was spread with topsoil and sown to a clover / oat crop to re-establish the pasture areas.

### **Tailings Dam – T35**

Area completed with topsoil applied and sown to a clover / oat crop re-establish the pasture areas.

### **Tailings Dam – T33/34**

Material from the western dump has been carted by scrapers and trucks to form the eastern side and northern sides of the dam, this material then dozed westerly into the dam. The

northern side of the dam has advanced approximately 55 metres to the south with the eastern side advancing 55 metres to the west.

A large spill area has been created on the western side to dry slimes; this area is on top of the old waste dump therefore open area is not increased. This material was dried, carted and pushed into the dam on the western side. This area will be one of the last areas to be rehabilitated in the West Mine due to size and nature of the material.

### **Tailings Dam – T32**

Area completed and contoured with topsoil spread and sown to a clover / oat crop re-establish the pasture areas.

### **North Concentrate Stacker Area**

Area completed and contoured will tree lines re-established. Only work carried out in this area was the removal of two topsoil dumps that were spread on T32 dam.

### **Tailings Dam – T31**

Area completed

### **Tailings Dam – T28/30**

Area completed

### **Tailings Dam – T27**

Area has been topsoiled and mulched, approximately 10% of the dam remains to be contoured.

### **Tailings Dam – T4**

Area completed with pasture cover re-established.

### **Tailings Dam T10/26**

Excess material from T27 has been carted to the southern side of the dam with material from the northern side pushed south. Approximately 90% of the dam has been completed. Further work is required to allow re-designing of drainage lines.

### **Tailings Dam – T3**

Area completed.

### **Tailings Dam – T11**

Area completed.

### **Tailings Dam – T12 (Evaporation and Discharge Pond)**

Area completed.

### **MDL Pond**

Area completed with topsoil spread and pasture reestablishment completed. A 1.5 hectare area will remain open as the hard stand area for the earth moving contractor's equipment.

### **Tailings Dam – T13**

Minor work has commenced with pushing of western and northern sides into dam.



### **Tailings Dam – T25**

Excess material from Tails dams 28 to 31 carted to this area as fill, the dam size has been reduced 5%. The southern end of the dam has had topsoil spread and pasture crop planted.

### **Tailings Dam – T23/24**

Tails pushing was carried out around the perimeter of the dam, approximately 5% of the original dam requires filling and contouring.

### **Tailings Dam – T14**

Area was not completed due to very wet conditions. The area will be topsoiled in 2007 thus completing the dam.

### **Tailings Dam – T18/19**

The revised system of lowering the height of the dam walls has further been successful with a further 2 metres lowered from 2005 dam height. The dam now has been lowered approximately 8.0 metres from the pushed up height. The 2007 rehabilitation season will see continued work in this area with excess material being carted to T15 as additional fill.

### **Tailings Dam – T15**

Work has continued around the perimeter of the dam due to allowing time for sufficient drying. Approximately 10% of the dam remains open. As this dam is exceptionally wet, this may result in delayed completion. The 2007 rehabilitation season will see the dam scheduled for topsoiling and pasture seeding.

### **Tailing Dam – South Satellite**

Area completed.

## **6.4 2007 West Mine Rehabilitation Forecast**

The first six months of 2007 will see the majority of the dams close up. This may result in wetter than expected tailing / overburden soils remaining around the perimeters, based on actual observations around the dams.

The largest dam open being T33/34; in June 2006, two slots were opened up on the western side to spill slime for drying. The result of this exercise was material that lowed was approximately 35% liquid. The dam has reached the stage where capacity has been reached therefore spilling needs to keep occurring to allow material to dry or the dam left for a number of years to allow drying.

For T33/34 the proposal is to push all remaining slimes from around the dam edges and push into the dam. Topsoil any areas that can be done by the end of July. The area will then be fenced off with ring-lock and barbwire to stop any access from personnel and stock. The dam will be then left to dry over the next few years continued annual monitoring.

**Table 21. West Mine Rehabilitation Forecast Summary, 2007.**

Dam	Hectares	Type	Property	2007 Rehabilitated Areas
T38	10.7	Native	Iluka	0.0
T37	15	Pasture	Iluka	0.0
T33/34	63.8	Pasture	Iluka	0.0
T28/30	11.93	Native	Sword Nominees - Wilkinson	11.93
T28/30	24.67	Pasture	Sword Nominees - Wilkinson	24.67
T13	13.49	Native	Sword Nominees - Wilkinson	3.49
T13	9.8	Pasture	Sword Nominees - Wilkinson	0.0
T25	5.6	Pasture	Sword Nominees - Wilkinson	5.6
T23/24	14.8	Native	Sword Nominees - Wilkinson	14.8
T14	9.8	Pasture	Sword Nominees - Wilkinson	9.8
T15	10.95	Pasture	Sword Nominees - Wilkinson	3.5
T18/19	30.7	Pasture	Iluka	5.5
<b>Total</b>	<b>221.24</b>			<b>79.29</b>

#### **Tailings Dam – T38**

**Area open September 2006: 10.7 hectares (Native Vegetation)**

Area to be completed and re-contoured with top soil applied in the 2007 rehabilitation year; the area will not be mulched until 2008 for re-establishing native vegetation. A cover cereal crop will be seeded

#### **Tailings Dam – T37**

**Area open September 2006: 15.0 hectares (Pasture Vegetation)**

Area to be completed and re-contoured with top soil in the 2007 rehabilitation year, pasture will be established. The area will be completed in 2007.

#### **Tailings Dam – T33/34**

**Area open September 2006: 63.8 hectares (Pasture Vegetation)**

Material from the western dump has been carted by scrapers and trucks to form the eastern side and northern sides of the dam, this material then dozed westerly into the dam. The northern side of the dam has advanced approximately 35 metres to the south with the eastern side advancing 55 metres to the west.

A large spill area has been created on the western side to dry slimes; this area is on top of the old waste dump therefore open area is not increased. This area will be one of the last areas to be rehabilitated at the west mine due to size and nature of the material.

#### **Tailings Dam T10/26**

**Area open September 2006: 11.93 hectares (Native Vegetation)  
24.67 hectares (Pasture Vegetation)**

All excess material from T27 has been carted to the western side of T13 for fill. All drainage lines have been installed. Contouring of the dam area and surrounds to be completed by March 2007 with topsoil placed and area seeded by end of July 2007. The area will be completed 2007.

### **Tailings Dam – T13**

**Area open September 2006: 13.49 hectares (Native Vegetation)  
9.8 hectares (Pasture Vegetation)**

Pushing and contouring of the dam and the area immediately to the south to continue in 2007 rehabilitation season. The western end to be topsoil and rehabilitated with native vegetation. This area is a problem area due to the amount of slime as the dam was mined three times.

### **Tailings Dam – T25**

**Area open September 2006: 5.6 hectares (Pasture Vegetation)**

Excess material from the area carted to T13 as fill, the area will be topsoiled and pasture re-established. The area will be completed in 2007.

### **Tailings Dam – T23/24**

**Area open September 2006: 14.8 hectares (Native Vegetation)**

Tails pushing was carried out around the perimeter of the dam, approximately 25% of the original dam requires filling and contouring. Due for completion in February 2006 with topsoil spread and the area rehabilitated in native vegetation. The area will be completed in 2007.

### **Tailings Dam – T14**

**Area open September 2006: 9.8 hectares (Pasture Vegetation)**

Area completed. Will be topsoiled in 2007, with pasture re-established. The area will be completed in 2007.

### **Tailings Dam – T18/19**

**Area open September 2006: 30.7 hectares (Pasture Vegetation)**

The revised system of lowering the height of the dam walls has been successful with a further 10% lowering of the original dam. The dam now has been lowered approximately 6.0 metres from the pushed up height. The remainder of the 2006 rehabilitation season will see continued work in this area with excess material being carted to T15 as additional fill. This area is a problem area due to the amount of slime as the dam was mined three times.

### **Tailings Dam – T15**

**Area open September 2006: 10.95 hectares (Pasture Vegetation)**

Work has continued around the perimeter of the dam due to allowing time for sufficient drying, approximately 10% of the dam remains open. The 2007 rehabilitation season will see a further 3.5 hectares scheduled for topsoiling and pasture seeding.

## **6.5 Surface Water Discharge**

Five areas have been identified in the Eneabba West Closure Plan as surface water discharge monitoring sites. Four of these areas are drainage discharge points immediately to the West of Erindoon Road, while site 1 is a downstream discharge point where Erindoon Creek crosses the West Mine lease boundary. When flowing, Bindoon Creek is also sampled at the Simpson Road crossing for comparison with water quality generated from surrounding pastoral activities.

Only 6 sites recorded any water during 2006. Water flow at the sample points were described as "trickle" or stagnant, consequently no data is presented for this year due to inadequate water flows for sampling purposes.

## 6.6 Lake Indoon Water Quality

Monitoring of Lake Indoon water quality is undertaken as part of an ongoing commitment to the now relinquished Department of Environmental Protection Licence (DEP Lic 5314), and the subsequent West Closure Plan approved in 2000.

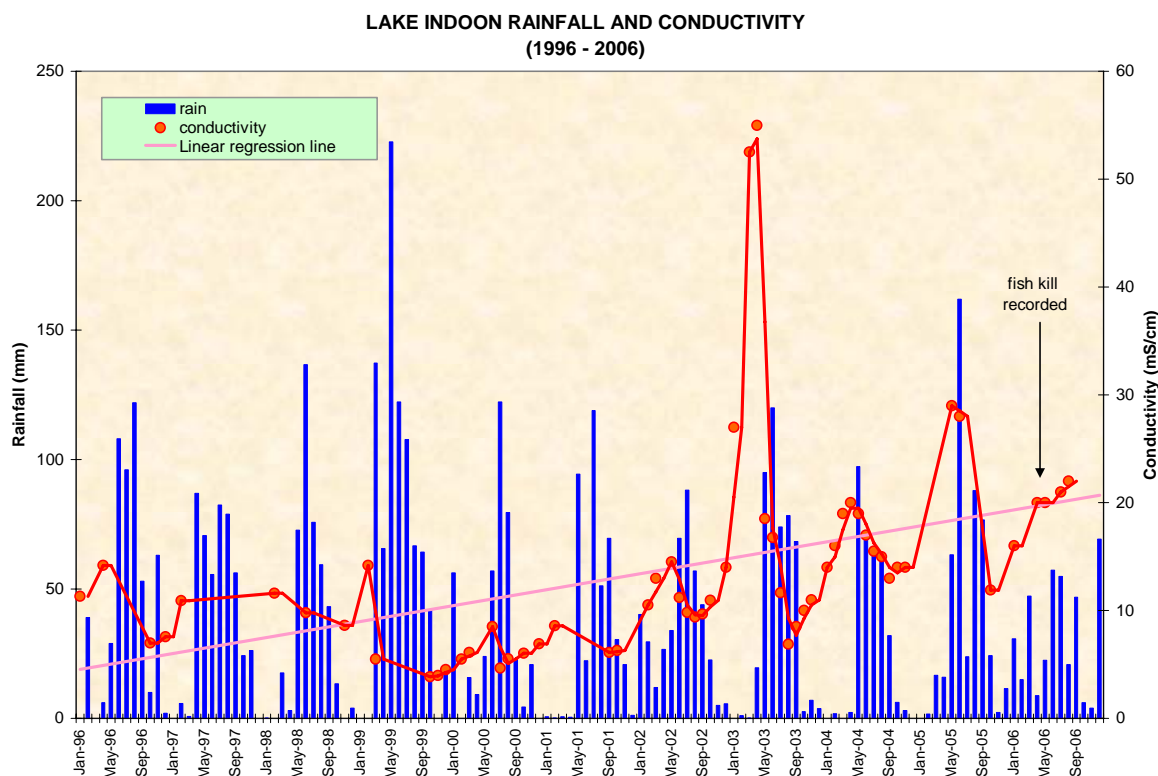
Lake Indoon is primarily used for recreation and forms part of the Lake Logue/Indoon inland lake systems which is an A Class Reserve and recognized in the 'Directory of Important Wetlands in Australia'. The Lake has been described in the past as "a seasonal freshwater basin" that dried out during summer. The hydrology of the lake has changed over the past 30 years however to that of a more permanent water body due to localized clearing for farming within the catchment area and changes to water drainage channels. Consequently the water chemistry has also changed to now reflect a more saline water body. A regression line fitted to conductivity records collected since 1996 show a 2-4 fold increase in conductivity over this period (Figure 17).

The lake has had a history of periodic algal blooms which were investigated by the Phytoplankton Ecology Unit (then the Water and Rivers Commission) in 2001 when skin rashes were reported by swimmers in the lake. Subsequently investigations found the algae in the lake to be predominantly blue-green (cyanobacteria) in nature. Lake Indoon has historically recorded some of the highest levels of blue-green algae in the state with cell counts 50-500 times higher than the guidelines for safe recreational use of waters containing blue-green algae (ARMCANZ 1995).

In April 2006, an algal bloom resulted in the death of approximately 300,000 yellowfin bream due to acute anoxia caused by the algae when they reduced dissolved oxygen levels in the lake. The presence of the fish in the lake was unknown at the time. Water samples collected by Iluka and submitted to the Phytoplankton Ecology Unit of DoE (now DEC) detected close to 1 million cells per mL of the blue-green alga *Planktolyngbya*. Historical records show that this species can be present in Lake Indoon waters at densities as high as 10 million cells per mL. Faecal bacterial have also been isolated from the lake waters at levels above the 2004 NHMRC & ARMC Australian Drinking Water Guidelines.



Birdlife at Lake Indoon



**Figure 16. Lake Indoon water conductivity and rainfall, Eneabba.**

## 6.7 West Mine Vegetation Monitoring (Groundwater Drawdown)

Monitoring the impact of groundwater drawdown on vegetation has been completed annually, since 1990, in accordance with the West Mine Closure Plan and Ministerial Statement 81 (elements 81:P8 and 81:M4).

During the 2006 assessment, 163 vascular plant species belonging to 30 families were recorded on the monitoring transects. This number is slightly higher than the number recorded in 2004, when Transect A of each pair were monitored. While the majority of transects have recorded much larger percentage foliage covers in 2006 compared to 1997, the percentage foliage covers recorded along transects in 2006 were generally lower than those recorded during in 2004, with only two exceptions (MB08A and MB03A). As discussed in previous reports, this decline in foliage cover is most likely due to low rainfall and lack of burning in the area for many years.

There was no significant positive correlation between plant density or percentage foliage cover and groundwater levels over 1997 – 2006. Significant negative correlations have been identified in transect MB02A, however this has involved decreases of density and percentage foliage cover with increases in groundwater levels. Therefore, it is unlikely that fluctuating groundwater levels are impacting upon the health of vegetation.

As there is limited use of production bores from within the West Mine and there has been no obvious impact upon native vegetation, it has been recommended by Woodman Environmental Consulting, that the monitoring programme be discontinued. The full report is included in Appendix 5.

## 6.8 Lake Logue Nature Reserve - Vegetation Monitoring

Rehabilitation of the West Mine resulted in a void which bisects an existing ephemeral creekline, running east-west into the adjacent Lake Logue Nature Reserve (R29073). In 2001, this creekline was re-aligned around the northern perimeter of the void. The creekline now flows through a constructed drain around the northern end of the void, then back into the original bed before crossing the Erindoon Road and entering the Nature Reserve.

Monitoring of vegetation in the creekline has been conducted since 2000, in accordance with DEP licence 5314/4 (now relinquished) and the West Mine Closure Plan (2001).

A total of 83 native vascular plant species were recorded in the plots and quadrats in July 2006. This shows an increase in the number of species recorded in comparison to the 2005 data. In general there were few sites that showed a statistically significant change in plant foliage cover or plant density indicating that impacts to the vegetation of the creek by the void have been minimal to date.

The health of vegetation within the creek line has been monitored for six years during which time there has been no flow of water along the creek diversion. The vegetation has remained healthy, indicating that it is dependant on the local catchment for water rather than flow through the creekline.

Based on these findings it has been recommended by Woodman Environmental Consulting, that the monitoring programme be discontinued. Re-instating the monitoring will be considered if high rainfall causes the creek to flow in the future, with the aim of monitoring potential silt deposition. The full monitoring report is in Appendix 5.

## 6.9 Sediment and Erosion Monitoring

Photographic monitoring of surface water channels at seven sites for erosion and sediment build-up is required through commitments of the West Mine Closure Plan (2001). These sites are located along the eastern boundary of the Lake Logue Nature Reserve (R29073), on the east side of the void and at an inflow site from neighbouring pastoral properties. Locations of monitoring points are shown in Figure 17, and photographic records for 2003 to 2006 in Appendix 4.

There has been little change in 2006 monitoring compared to previous years. This is largely a result of below average rainfall experienced in the region, and negligible flow occurring at monitoring sites. There continues to be no evidence of channel erosion or sediment build-up at any of the monitoring points.



Figure 17. Eneabba West Mine stream erosion photo monitoring locations.

## 6.10 West Mine Hydrology

Annual reporting of groundwater and surface waters are submitted to DEC and DoW in accordance with the Eneabba West Closure Plan (2001). This report has reviewed the recovery of West Mine hydrology since the closure of mining operations in 1999. One ex-production bore which was given to a local pastoralist for ongoing pastoral purposes is still in use.

In summary, West Mine hydrology has recovered well from groundwater extraction conducted for mining operations. Most bores show recovery to levels similar to pre-mining levels. The West Mine Void water levels show stable trends over the past 4 to 5 years, however there is an increasing trend in salinity which is matched by nearby groundwater salinity. Salinities for both groundwater and the void are within historical values.



## 6.11 West Mine Ministerial Statement Compliance

The current status of conditions and commitments made under Ministerial Statement 81, for the West Mine Operations, is outlined in the Audit Table (Table 22).

**Table 22. Audit Table for Eneabba West Mine – Ministerial Statement No. 81**

<ul style="list-style-type: none"> <li>• Audit Code</li> <li>• Subject</li> </ul>	<ul style="list-style-type: none"> <li>• What action must be taken</li> <li>• How action must be taken and/or objective of action</li> <li>• Objective</li> <li>• Evidence that action has been taken</li> </ul>	<ul style="list-style-type: none"> <li>• Project phase</li> <li>• When action to be taken</li> <li>• Where it is to be taken</li> </ul>	<ul style="list-style-type: none"> <li>• To requirements of</li> <li>• On advice from</li> </ul>	<b>Status</b>
81:A2 Additional information to M3.2: Dieback Management Strategies	<p><b>Action</b> Development hygiene practice to limit dieback introduction and spread on minesite</p> <p><b>How</b> Include a) Advising all contractors, carriers, personnel of their obligation under the dieback management programme; b) Ensuring that all vehicles and equipment entering and leaving the site are clean of soil and plant material; c) Providing appropriate wash-down and inspection facilities; d) Constructing new roads and upgrading existing roads to dieback control standards, eg developing a hard road surface and constructing roads above ground level; e) Liaising with CALM, landowners and other authorities to control unauthorised access; f) Developing procedures for movement of vehicles and equipment between sites and locations.</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• DEC</li> </ul>	Satisfactory during this period
81:A3 Additional information to M3.2: Dieback Management Strategies	<p><b>Action</b> Identify existing infections on mine sites and in adjacent areas, and quantify the rate of spread of the disease</p> <p><b>How</b> Include: a) Conducting surveys biennially of future mining areas to locate any dieback infections; b) Conducting surveys of rehabilitated block to identify any dieback infections; c) Participating in a regional survey to assess the impact of dieback in the northern sand plains; d) Quantifying the rate of spread of the disease in unmined and rehabilitated sites.</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• DEC</li> </ul>	Satisfactory during this period



<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:A4 Additional information to M3.2: Dieback Management Strategies	<p><b>Action</b> Develop rehabilitation techniques to minimise the impact of the disease in high risk or infected areas</p> <p><b>How</b> Include: a) identify species and plant communities which can be preferentially established to limit the impact of the disease in already infected or high risk areas; b) Developing appropriate databases to record and report information; c) Identifying species infected and topographical or soil conditions preferentially favoured by the disease on rehabilitation and unmined land. Determine landforms to be preferentially established post-mining to limit infection and spread of the disease.</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• DEC</li> </ul>	Satisfactory during this period
81:A5 Additional information to M3.2: Dieback Management Strategies	<p><b>Action</b> Manage the mine drainage patterns to limit the potential for dieback spread</p> <p><b>How</b> Include: a) Controlling waste water ponding, temporarily created as a result of mining activity; b) Controlling drainage into and away from known infected areas.</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• DEC</li> </ul>	Satisfactory during this period
81:A6 Additional information to M3.2: Dieback Management Strategies	<p><b>Action</b> Develop education and communication programmes for dieback management</p> <p><b>How</b> Include: a) Active involvement in the Northern Sandplains Dieback Working Party - a group established to promote effective education, management and research objectives in the northern sandplains; b) Providing information to educate the public on achievements in dieback management and control; c) Liaising with external personnel through regular contact, presentation and reporting; d) Conducting regular sessions with environmental and mining staff and contractors to maintain awareness of developments; e) Developing and implementing dieback training and information programmes for mining and environmental personnel involved in dieback management.</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• DEC</li> </ul>	Satisfactory during this period

<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:A7 Additional information to M3.2: Dieback Management Strategies	<p><b>Action</b> Initiate a research programme to develop techniques for control or elimination of the disease</p> <p><b>How</b> Include in the program: a) Conducting a literature review of existing information on dieback; b) Investigating other potential modes of dispersal and develop appropriate strategies as necessary; c) Fostering open communication with research institutions, government departments and companies involved in dieback research; d) Review monitoring data collected from field surveys and establish research priorities; e) Conducting investigations into the biology of the disease and its control on the minesite.</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• DEC</li> </ul>	Satisfactory during this period
81:M1:1 The proposal	<p><b>Action</b> Implement the proposal as approved</p> <p><b>How</b> As assessed by the EPA</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Implementing the proposal</li> <li>• Site</li> </ul>	<ul style="list-style-type: none"> <li>• Minister for Environment</li> <li>• EPA</li> </ul>	Satisfactory during this period
81:M1:2 Project Implementation	<p><b>Action</b> Fulfil the commitments</p> <p><b>How</b> As contained in Ministerial Statement 81</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• As required by the commitments</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• Minister for Environment</li> <li>• EPA</li> </ul>	Satisfactory during this period
81:M2 Environmental Protection and Management	<p><b>Action</b> Implement environmental protection and management measures.</p> <p><b>How</b> Carry out mining and processing operation in accordance with the provisions for the protection and management of the environment contained in the Mineral Sands (Eneabba) Agreement Act 1975-1988. Include: (i) submission of detailed proposals for approval by the Minister; (ii) conduct continuous programme of investigations and research including monitoring; (iii) submission of Triennial Reports (due 31 December 1989 and 31 December every third year thereafter) for approval by the Minister together with interim reports on progress (as requested by the Minister)</p> <p><b>Evidence</b> Triennial Report and Interim Report</p>	<ul style="list-style-type: none"> <li>• Operation</li> <li>• During the mining and processing operations</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• Minister for Environment</li> <li>• EPA</li> </ul>	Satisfactory during this period

<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:M3:1 Dieback Hygiene Program - Preparation	<p><b>Action</b> Prepare a Dieback Hygiene Program and have it approved</p> <p><b>How</b> In consultation with CALM</p> <p><b>Evidence</b> Dieback Hygiene Programme</p>	<ul style="list-style-type: none"> <li>• Pre-operation</li> <li>• Prior to commencement of both construction and mining activities</li> <li>• Project and environs, for locations as identified by CALM</li> </ul>	<ul style="list-style-type: none"> <li>• Minister for Environment</li> <li>• <b>EPA</b></li> </ul>	Cleared (for construction phase)
81:M3:2 Dieback Hygiene Program - Implementation	<p><b>Action</b> Implement approved Dieback Hygiene Program</p> <p><b>How</b> As approved in M 3-1</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Implement once it has been approved prior to commencing both construction and mining activities and maintain throughout the life of the project</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• Minister for Environment</li> <li>• <b>EPA</b></li> </ul>	Satisfactory during this period  <i>Dieback Management Plan was reviewed by DEC in 2006.</i>
81:M3:3 Dieback Hygiene Program - Public Availability	<p><b>Action</b> Make the approved Dieback Hygiene Program publicly available</p> <p><b>Evidence</b> Dieback Management Program</p>	<ul style="list-style-type: none"> <li>• Pre-operation</li> <li>• Once the program has been approved</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• Minister for Environment</li> <li>• <b>EPA</b></li> </ul>	Satisfactory during this period
81:M4:1 Vegetation and groundwater protection	<p><b>Action</b> Protect vegetation, groundwater levels and groundwater quality</p> <p><b>How</b> Take all reasonable measures to ensure that no detrimental or unacceptable effects occur which result from the mining operation</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Throughout the life of the project</li> <li>• Project and environs, within the adjacent Reserves</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Satisfactory during this period



<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:M4:2 Vegetation Monitoring Program - Preparation	<p><b>Action</b> Prepare a Vegetation Monitoring Program and have it approved</p> <p><b>How</b> In consultation with CALM so as to monitor vegetation, groundwater levels and groundwater quality in these Reserves</p> <p><b>Evidence</b> Vegetation Monitoring Program</p>	<ul style="list-style-type: none"> <li>• Pre-operation</li> <li>• Prior to the commencement of productive mining</li> <li>• Project and environs, within the adjacent Reserves</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Completed (1991)
81:M4:3 Vegetation Monitoring Program - Implementation	<p><b>Action</b> Implement approved Vegetation Monitoring Program in M4.2</p> <p><b>How</b> In consultation with CALM</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Prior to commencing productive mining and maintain throughout the operating life of the project</li> <li>• Project and environs, within the adjacent Reserves</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Satisfactory during this period  <i>Vegetation monitoring conducted in accordance with approved Closure Plan (2001). There has been no obvious impact to vegetation shown to date, and it is recommended that monitoring program be discontinued (refer to section 6.7 and Appendix 5)</i>
81:M4:4 Vegetation and groundwater protection Reporting -	<p><b>Action</b> Report adverse environmental impacts and implement remedial action</p> <p><b>How</b> Immediately to EPA, devising a plan for remedial action to be undertaken as soon as is possible</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Immediately adverse impacts occur or as they are identified through the monitoring programme</li> <li>• Project and environs, within the adjacent Reserves</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Satisfactory during this period  <i>There has been no obvious impact to vegetation</i>



<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:M4:5 Works Approval	<b>Action</b> Obtain a Works Approval <b>How</b> Apply to EPA, under Part V of the Environmental Protection Act 1986 <b>Evidence</b> Application for Works Approval	<ul style="list-style-type: none"> <li>• Pre-operation</li> <li>• Prior to construction of the project</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Completed  Monitored by another agency (DEC Midwest Office, Part V of EP Act)
81:M4:6 License	<b>Action</b> Obtain a Licence <b>How</b> Apply to EPA, under Part V of the Environmental Protection Act 1986 <b>Evidence</b> Application for Licence	<ul style="list-style-type: none"> <li>• Pre-operation</li> <li>• Prior to commencing mining</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Completed  Monitored by another agency (DEC Midwest Office, Part V of EP Act)
81:M5:1 Decommissioning and Rehabilitation Plan - Preparation	<b>Action</b> Prepare a Decommissioning and Rehabilitation Plan <b>How</b> Submit to Minister responsible for administering the Agreement Act and notify the EPA; so as to decommission the plant and rehabilitate the site and its environs in accordance with the proposals submitted under the provisions of Clause 7 and the requirements of Clause 8 of the Mineral Sands (Eneabba) Agreement Act <b>Evidence</b> Decommissioning and Rehabilitation Plan	<ul style="list-style-type: none"> <li>• Operation</li> <li>• At least six months prior to commencing decommissioning work</li> <li>• Project area</li> </ul>	<ul style="list-style-type: none"> <li>• Min for Env (Minister responsible for administering the Agreement Act)</li> <li>• <b>EPA</b></li> </ul>	Satisfactory during this period.  <i>Final Eneabba West Closure Plan submitted and approved by relevant government agencies in 2001.</i>
81:M5:2 Decommissioning and Rehabilitation - Implementation	<b>Action</b> Implement the Decommissioning and Rehabilitation Plan as approved in M5.1	<ul style="list-style-type: none"> <li>• Post-operation</li> <li>• Decommissioning and rehabilitating the project and environs</li> <li>• Project area and environs</li> </ul>	<ul style="list-style-type: none"> <li>• Min for Env</li> <li>• <b>EPA</b></li> </ul>	Satisfactory during this period.
81:M5:3 Agricultural Land Rehabilitation Plan - Preparation	<b>Action</b> Prepare an Agricultural Land Rehabilitation Plan and have it approved <b>How</b> In conjunction with the AgWA; so as to continuously rehabilitate the mined productive agricultural land to an environmentally stable condition; and not to decrease the proportion of land currently supporting native vegetation unless approved by the Commissioner of Soil Conservation <b>Evidence</b> Agricultural Land Rehabilitation Plan	<ul style="list-style-type: none"> <li>• Operation</li> <li>• Once the agricultural land has been mined</li> <li>• Project, agricultural land</li> </ul>	<ul style="list-style-type: none"> <li>• Min for Env</li> <li>• <b>EPA</b></li> </ul>	Satisfactory during this period.  <i>In accordance with 81:M5:1, Eneabba West Closure Plan (2001)</i>

<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:M5:4 Agricultural Land Rehabilitation Plan - Implementation	<p><b>Action</b> Rehabilitate the mined agricultural land by implementing the Agricultural Land Rehabilitation Plan referred to in M5.3</p> <p><b>How</b> Continuously, once mining is complete, as approved in M5.3</p> <p><b>Evidence</b> Proposal for changes to land use</p>	<ul style="list-style-type: none"> <li>• Post-operation</li> <li>• During the rehabilitation of the mined area, once mining is complete in an area</li> <li>• Project, agricultural lands</li> </ul>	<ul style="list-style-type: none"> <li>• Min for Env</li> <li>• <b>EPA</b></li> </ul>	In process
81:M5:5 Decommissioning and Rehabilitation - Native Vegetation	<p><b>Action</b> Maintain the proportion of land supporting native vegetation</p> <p><b>How</b> Through rehabilitation unless the Commissioner of Soil Conservation, acting under the Soil and Land Conservation Act is satisfied that land degradation will not result from any proposed change in land use</p> <p><b>Evidence</b> Proposal for changes to land use</p>	<ul style="list-style-type: none"> <li>• Post-operation</li> <li>• During the rehabilitation of the mined area</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• Commissioner of Soil Conservation</li> <li>• <b>Commissioner of Soil Conservation</b></li> </ul>	In process
81:M6 Project Alterations	<p><b>Action</b> Obtain approval for changes to the project</p> <p><b>How</b> Refer proposed changes to modify the mining and/or processing operation to EPA for assessment</p> <p><b>Evidence</b> Proposed changes or modifications</p>	<ul style="list-style-type: none"> <li>• Operation</li> <li>• Prior to implementing any changes or modifications that would be likely to have a significant effect upon the environment</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Not required at this stage
81:M7 Proponent	<p><b>Action</b> Seek approval for transfer of proponent</p> <p><b>How</b> In a letter to the Minister for the Environment - including the nomination of a replacement proponent and a copy of the Statement endorsed with an undertaking by the nominee to accept the Conditions</p> <p><b>Evidence</b> Transfer of Proponent</p>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• It is proposed to transfer ownership, control or management of the project</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• Min for Env</li> <li>• <b>EPA</b></li> </ul>	Not required at this stage
81:P1 Road Access and Safety	<p><b>Action</b> Construct Brand Highway access</p> <p><b>How</b> Construct an access point to and from the Brand Highway to MRWA and Shire standards with special regard to road safety</p>	<ul style="list-style-type: none"> <li>• Pre-operation</li> <li>• Prior to commencing operation of the facility</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>MRWA, Shire of Greenough</b></li> </ul>	Completed (1990)



<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:P2 Occupational Health and Safety	<b>Action</b> Implement Occupational Health and Safety requirements	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Maintain throughout the life of the project</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DoIR / DoCEP</b></li> </ul>	In process  Monitored by another agency (DoIR / DoCEP)
81:P3 Radiation Monitoring	<b>Action</b> Monitor radiation levels and report results <b>How</b> As required under the Code of Practice on Radiation Protection on the Mining and Milling of Radioactive Ores 1987, and reporting to the Dept Mines	<ul style="list-style-type: none"> <li>• Pre-operation</li> <li>• Prior to operating the facility</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DoIR / DoCEP</b></li> </ul>	In process  Monitored by another agency (DoIR / DoCEP)
81:P4 Occupational Health and Safety Monitoring	<b>Action</b> Extend existing Monitoring Programme <b>How</b> Extend the Programme where relevant to the new mining and processing facilities of this project so as to include; 1) personal and environmental air sampling in accordance with requirements of Regulations under the Mines Regulation Act; 2) monitoring for noise under the "yet-to-be" proclaimed amendments to the Mines Regulation Act and Regulations; 3) monitoring for radiation in compliance with the Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores 1987; 4) monitoring and reporting of lost time accidents under the Department of Mines "Axtat" system	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Maintain throughout the life of the project</li> <li>• Project, new mining and processing facilities</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DoIR / DoCEP</b></li> </ul>	In process  Monitored by another agency (DoIR / DoCEP)
81:P5 Erindoon Creek	<b>Action</b> Monitor the hydrology of Erindoon Creek <b>How</b> As detailed in the Statement; 1) groundwater levels and electrical conductivity in suitable farm bores within 5km radius of the mine site, as well as the dredge pond, production bores and two lines of piezometers; 2) Analysis of major ions in water samples from Lake Erindoon on a quarterly basis; 3) <i>monitoring of surface soil salinity along two transects through saline land on a quarterly basis (monitoring of surface soil salinity is no longer required as agreed with MMI 12/2/98 and letter confirming this sent 2/3/98)</i>	<ul style="list-style-type: none"> <li>• Overall</li> <li>• Maintain throughout the life of the project</li> <li>• Project, Erindoon Creek</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Satisfactory during this period
81:P6 Vegetation and Groundwater Level	<b>Action</b> Implement a Vegetation Investigation Program <b>How</b> Investigate the use of alternative agricultural crops and trees to improve production and reduce the rate of groundwater recharge on farm land and to lower groundwater levels by increasing evapotranspiration (deep rooted species such as native species, lupins, lucerne, tagasaste).	<ul style="list-style-type: none"> <li>• Overall</li> <li>• As appropriate</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	Satisfactory during this period



<ul style="list-style-type: none"> <li>• <b>Audit Code</b></li> <li>• <b>Subject</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What action must be taken</b></li> <li>• <b>How action must be taken and/or objective of action</b></li> <li>• <b>Objective</b></li> <li>• <b>Evidence that action has been taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Project phase</b></li> <li>• <b>When action to be taken</b></li> <li>• <b>Where it is to be taken</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>To requirements of</b></li> <li>• <b>On advice from</b></li> </ul>	<b>Status</b>
81:P7 Rehabilitation	<p><b>Action</b> Develop rehabilitation strategies  <b>How</b> In consultation with the land owners and AgWA following the appropriate investigations and submission of strategies for approval under the Agreement Act</p>	<ul style="list-style-type: none"> <li>• Operation</li> <li>• Prior to the completion of mining activities on site</li> <li>• Project, agricultural land</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>AgWA</b></li> </ul>	<p>Satisfactory during this period.</p> <p><i>In accordance with Eneabba West Closure Plan (2001)</i></p>
81:P8 Vegetation and Groundwater	<p><b>Action</b> Monitor vegetation  <b>How</b> So as to determine the effect of water table draw down on standing native vegetation along three drill lines and to determine the need to develop strategies to minimise draw down effects</p>	<ul style="list-style-type: none"> <li>• Operation</li> <li>• During the life of the project, particularly during the mining operation</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	<p>Satisfactory during this period.</p> <p><i>It is recommended that this monitoring program be discontinued (refer to section 6.7 and Appendix 5)</i></p>
81:P9 Rehabilitation	<p><b>Action</b> Monitor vegetation rehabilitation  <b>How</b> Using the existing electronic botanical data management system to monitor the establishment and development of rehabilitated native vegetation</p>	<ul style="list-style-type: none"> <li>• Post-operation</li> <li>• Following the rehabilitation of the site</li> <li>• Project and environs</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	<p>Satisfactory during this period</p>
81:P10 Reporting	<p><b>Action</b> Report on progress of the project  <b>How</b> Report on: • minimising the area open to operation; • details of areas disturbed; • details of areas rehabilitated; • details of the area open to operation; in accordance with the procedures of the Agreement Act  <b>Evidence</b> Triennial Report and Interim Reports</p>	<ul style="list-style-type: none"> <li>• Operation</li> <li>• Regularly following the commencement of operations, in accordance with the procedures of the Agreement act</li> <li>• Project</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• <b>DEC</b></li> </ul>	<p>Satisfactory during this period</p> <p><i>Evidence provided is this report</i></p>



<ul style="list-style-type: none"> <li>• Audit Code</li> <li>• Subject</li> </ul>	<ul style="list-style-type: none"> <li>• What action must be taken</li> <li>• How action must be taken and/or objective of action</li> <li>• Objective</li> <li>• Evidence that action has been taken</li> </ul>	<ul style="list-style-type: none"> <li>• Project phase</li> <li>• When action to be taken</li> <li>• Where it is to be taken</li> </ul>	<ul style="list-style-type: none"> <li>• To requirements of</li> <li>• On advice from</li> </ul>	<b>Status</b>
81:P11 Dieback	<p><b>Action</b> Review the Dieback Prevention Policy  <b>How</b> So as to upgrade the policy as necessary  <b>Evidence</b> Dieback Prevention Policy Review</p>	<ul style="list-style-type: none"> <li>• Operation</li> <li>• As necessary throughout the operating life of the project</li> <li>• Project, Eneabba Operations</li> </ul>	<ul style="list-style-type: none"> <li>• EPA</li> <li>• DEC</li> </ul>	Satisfactory during this period.  <i>Dieback Management Plan was reviewed by DEC in 2006, as for 81:M3:2</i>

# **APPENDIX 4**



# Ground Disturbance Permit Midwest Operations



**ILUKA**

## Flow Chart of Internal Approval Process

