Cooljarloo Mineral Sands Mine, Mining of Titanium Minerals, Orebodies 27 200 and 28 000

Tiwest Pty Ltd

Report and Recommendations
of the Environmental Protection Authority

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Summary and recommendations

Tiwest Pty Ltd ('the proponent') proposes to mine titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine. This mine is located 10 kilometres north west of Cataby. This report provides the Environmental Protection Authority's (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

In the EPA's opinion, the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

- Vegetation - clearing up to 220 hectares (ha) of native vegetation;
- Declared Rare and Priority flora species - potential 'taking' of individuals of a Declared Rare Flora species, and disturbance to Priority flora species;
- Rehabilitation and landform - returning a suitable landform and soil profile to disturbed areas for the establishment of self sustaining native plant communities; and
- Surface water and groundwater - potential effect of contaminated surface water run-off and groundwater drawdown on native vegetation and wetlands.

Conclusion

The EPA has considered the proposal by Tiwest Pty Ltd to mine titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine.

The EPA notes that the proposal involves clearing of native vegetation to a maximum of 220 ha, and that there is more than 30% of the affected vegetation types in existence but these are poorly represented in conservation reserves, particularly the low Banksia woodland type. All areas disturbed under the proposal are to be rehabilitated to best practice standard by the proponent.

The EPA has concluded that the proposal is capable of being managed to meet the EPA's objectives provided there is satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Appendix 4 and summarised in Section 4.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

- That the Minister notes that the proposal being assessed is for mining of titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine.
- That the Minister considers the report on the relevant environmental factors as set out in Section 3.
- That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments.
- That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

- That the Minister notes under 'Other Advice' the EPA's comments regarding the desirability for new conservation areas to be created in areas surrounding M268SA.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Tiwest Pty Ltd to mine titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) that the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4; and

(b) that the proponent be required to prepare and implement an Environmental Management System, Rare Flora Management Plan, Surface Water and Groundwater Management Plan, and Integrated Mining and Rehabilitation Plan for the proposal prior to ground-disturbing activities.

Contents

1. Introduction

Tiwest Pty Ltd ('the proponent') is seeking environmental approval to mine titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine. This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to this proposal.

The proponent operates the Cooljarloo Mine, located 10 km north west of Cataby, within Mining Lease M268SA (Figure 1). The original Cooljarloo Mine proposal, which sought mining of the then known areas of mineralisation within M268SA, was assessed by the EPA in 1987/88 as an 'Environmental Review and Management Programme'. The proposal was approved, and mining commenced at the site in 1989 pursuant to the *Mineral Sands (Cooljarloo) Mining and Processing Agreement Act 1988.*

The proponent recently identified a further area of mineralisation, termed orebody '27 200'. In addition, the proponent considers that a second orebody, termed '28 000', may exist in the south east corner of the mining lease. While the northern and southern limits of the potential mineralisation have been defined, it is only surmised that the central portion occurs within Mining Lease Application (MLA) 70/1010 (see Figure 2).

In April 1999, the EPA determined the proposal to mine orebodies 27 200 and 28 000 would be formally assessed under s38 the *Environmental Protection Act 1986* at the Public Environmental Review (PER) level of assessment.

The EPA notes the proposal is likely to require referral to the Commonwealth Environment Minister under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses environmental factors relevant to the proposal. The Conditions and commitments to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 provides Other Advice by the EPA, Section 6 presents the EPA's conclusions and Section 7, the EPA's Recommendations.

The PER document (Tiwest Pty Ltd, 1999) was available for public comment from 8 November 1999 to 3 January 2000, and the list of people and organisations submitting comment is provided in Appendix 1. Appendix 2 contains the references cited in the EPA's Bulletin. Appendix 3 sets out the table of environmental factors considered and those identified as being relevant environmental factors for the EPA's evaluation. Appendix 4 provides the complete list of proposed Environmental Conditions and the proponent's commitments.

Appendix 5 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process, and which have been taken into account by the EPA, appear in the report itself.

2. The proposal

The proponent is proposing to incorporate orebodies 27 200 and 28 000 into the mine plan for the Cooljarloo southern mining operations, thereby extending the life of the mine by 22 months.

Orebody 27 200 will be dredge mined and accessed at its southern extremity through a channel constructed leading west from the existing 27 000 South orebody (Figure 2). At the completion of mining in 27 200, the dredges will return to Mullering Farm through the original access channel to the 27 000 South orebody (Tiwest Pty Ltd, 1999).

Subject to granting of MLA 70/1010 and further investigation, orebody 28 000 may be either dry or dredge mined. If dredge mined, a dredge would be transported in several sections by heavy vehicle to the orebody and re-assembled (Tiwest Pty Ltd, 1999).

The suggested process flows associated with mining the 27 200 and 28 000 orebodies are represented graphically in Figures 3 & 4. The mining methods and rates indicated are dependent on many factors eg. orebody and aquifer characteristics, equipment performance.

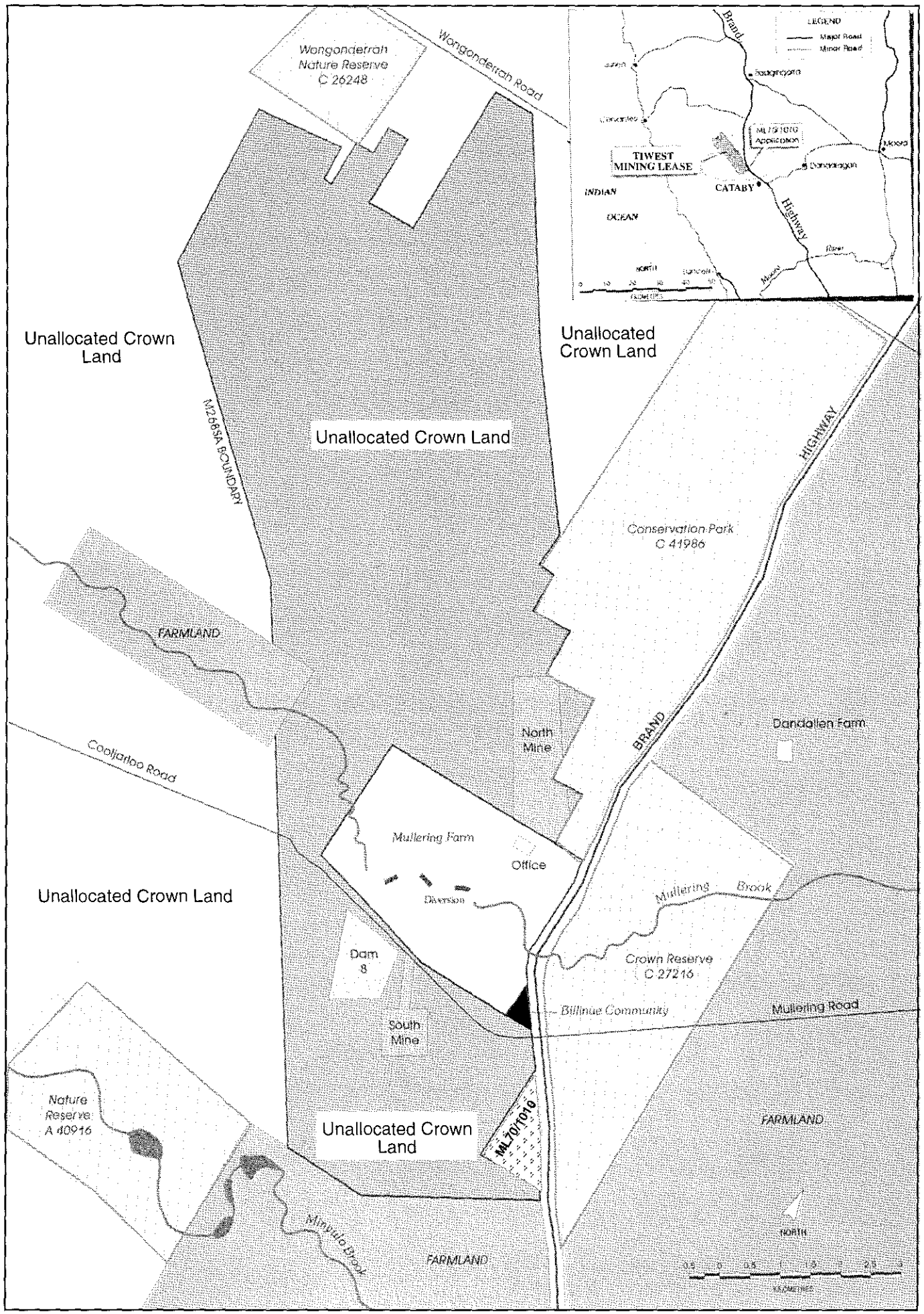

Figure 1. Location Plan, Cooljarloo Mineral Sands Mine.

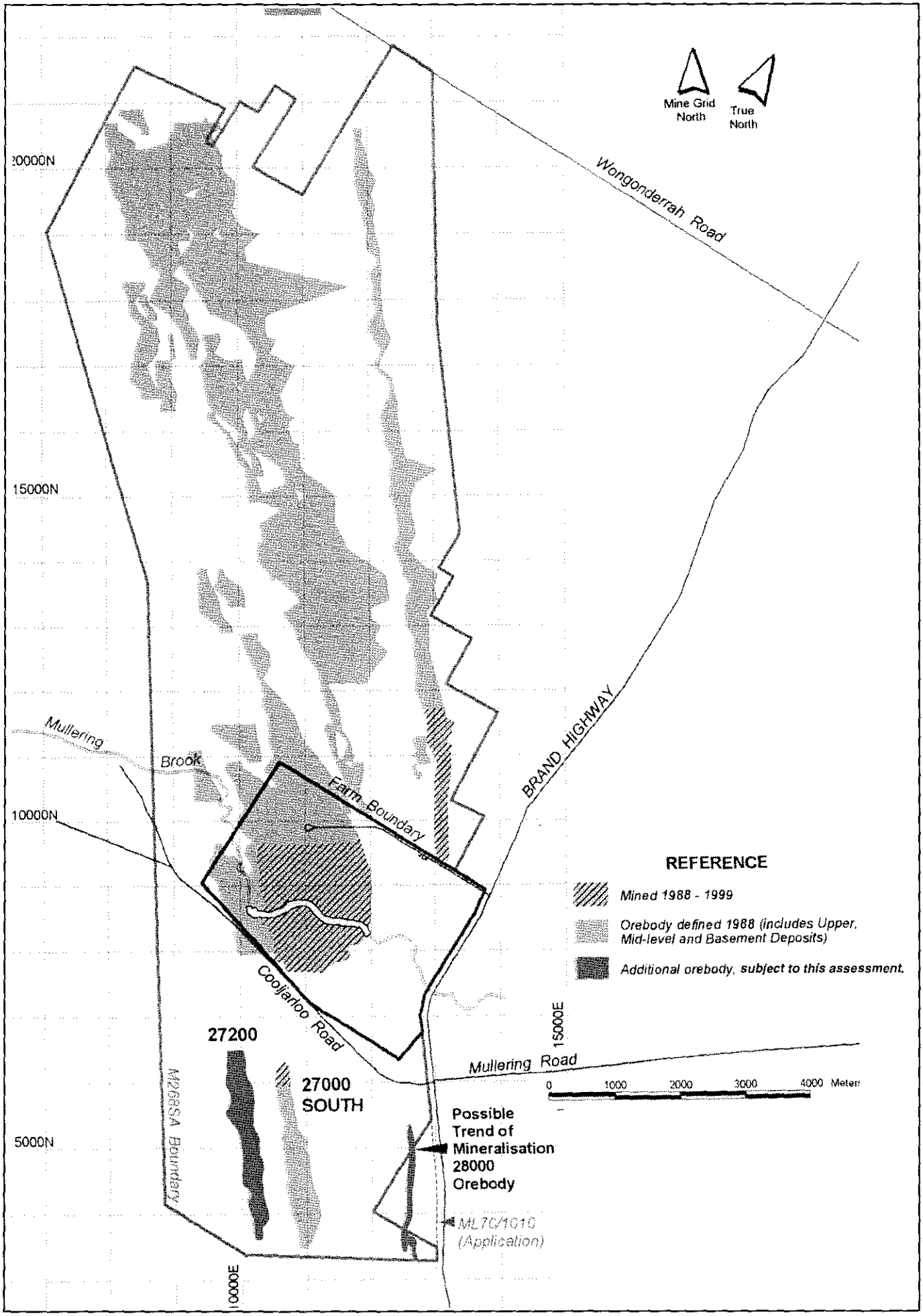

Figure 2. Location of Orebodies 27 200 and 28 000.

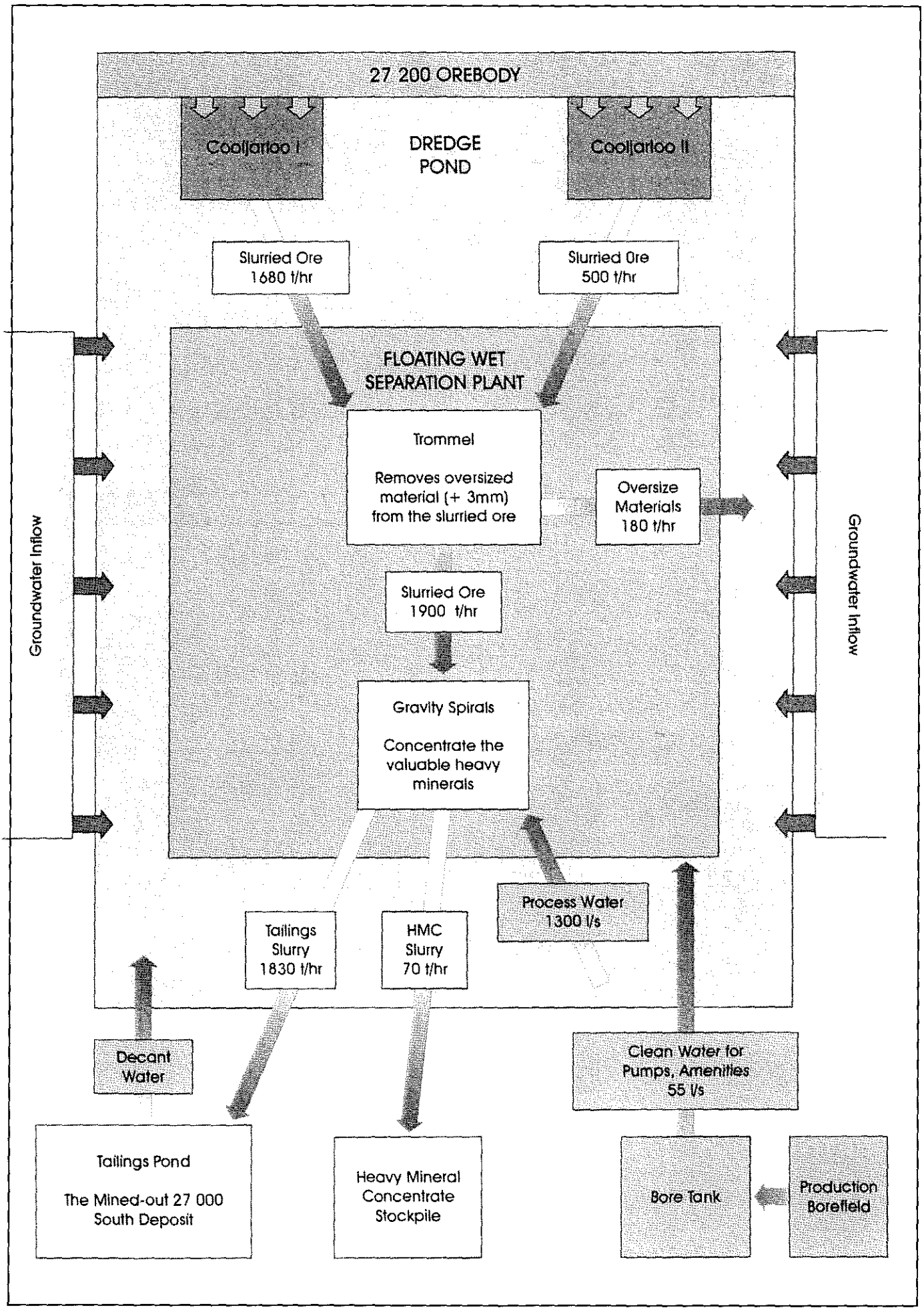

Figure 3. Nominal process diagram for mining Orebody 27 200.

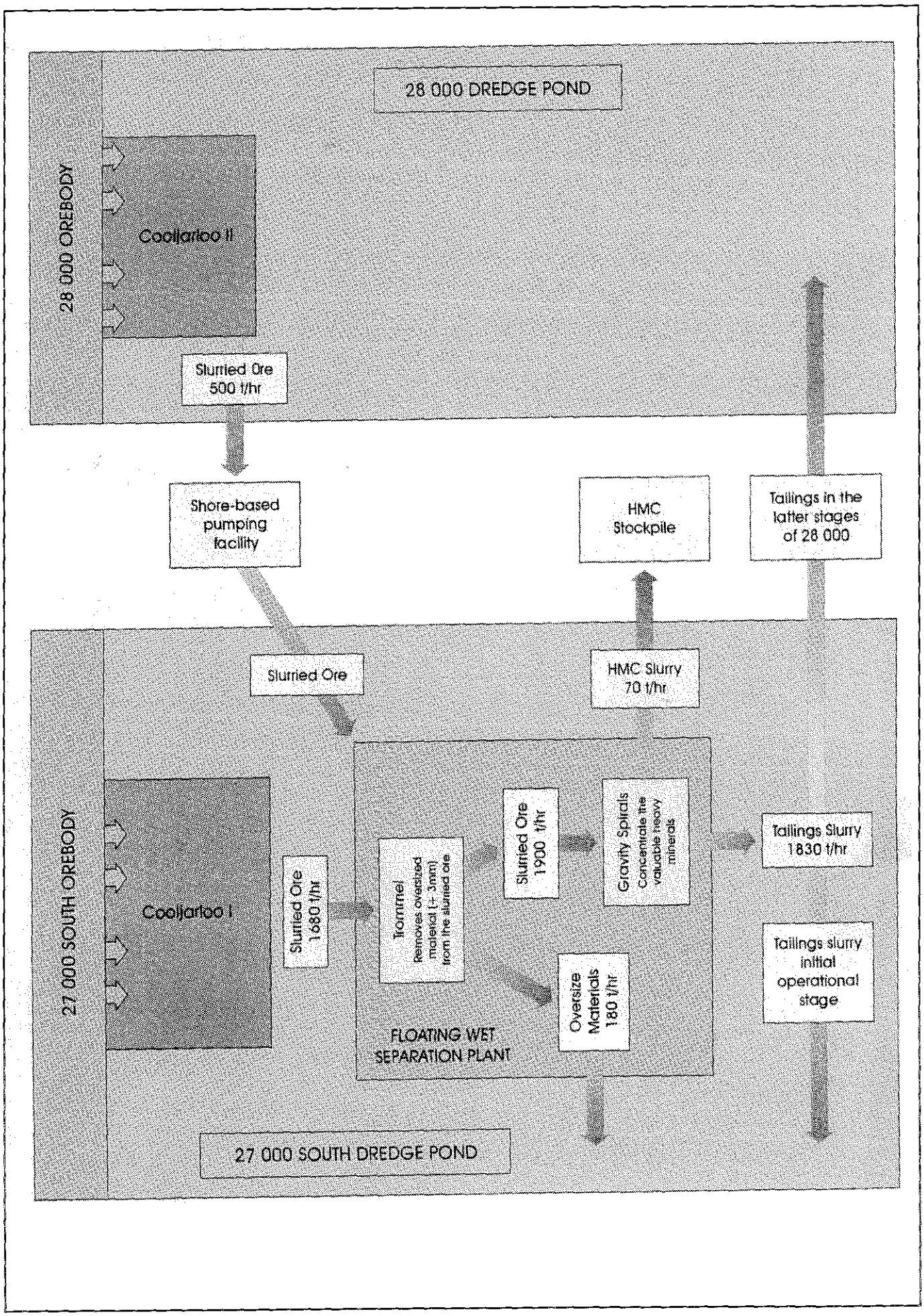

Figure 4. Nominal process diagram for mining Orebody 28 000.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Sections 2 & 3 of the PER document (Tiwest Pty Ltd, 1999).

Table 1. Summary of key proposal characteristics

Element	Description	
	Orebody 27 200	**Orebody 28 000 (theoretical)**
Extension to mine-life	Approximately 20 months	Approximately 2 months
Period of ore extraction	April 2002 – 1st Quarter 2004	June 2001 – Jun 2002
Method of ore extraction	Dredge	Dredge or dry
Size of ore-body (tonnes of Heavy Mineral Concentrate)	852,000	150,000
Area of native vegetation to be disturbed (hectares)	105	115
Depth of pit (metres) Maximum Typical	 50 46	 35 30
Infrastructure	Dredge pit, access and exit channels.	Dredge pit, access roads, overburden dump, shore-based pumping facility.
Ore Mining Rate (tonnes/hour)	Cooljarloo I Dredge – 1680 Cooljarloo II Dredge – 500	Cooljarloo II Dredge – 500
Nominal hours of operation	24 hrs per day, 7 days per week	24 hrs per day, 7 days per week
Overburden (m^3)	19 million	9 million
Water Supply • Licensed Annual Abstraction Limit (kilolitres), Superficial and Yarragadee aquifers • Abstraction per year (kilolitres)	8,780,000 1,750,000	8,780,000 1,750,000
Fuel Storage Capacity (litres)	Tiwest Pty Ltd – 138,800 Contract – 100,000	Tiwest Pty Ltd – 138,800 Contract – 100,000
Heavy Mineral Concentrate transport to Chandala processing plant - truck movements Maximum Mean	 40 return trips a day @ mean load 70 tonne 27 return trips a day @ mean load 70 tonne	 40 return trips a day @ mean load 70 tonne 27 return trips a day @ mean load 70 tonne
Rehabilitation	Stable self-sustaining ecosystems compatible with adjacent undisturbed areas.	Stable self-sustaining ecosystems compatible with adjacent undisturbed areas.

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the relevant factors is summarised in Appendix 3.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal which require detailed evaluation in this report:

- Vegetation - clearing up to 220 ha of native vegetation;
- Declared Rare and Priority flora species – potential 'taking' of individuals of a Declared Rare Flora species, and disturbance to Priority flora species;
- Rehabilitation and landform - returning a suitable landform and soil profile to disturbed areas for the establishment of self sustaining native plant communities; and
- Surface water and groundwater - potential effect of contaminated surface water run-off and groundwater drawdown on native vegetation and wetlands.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the relevant environmental factors and their assessment are contained in Sections 3.1 to 3.4. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

3.1 Vegetation

Description

The proposal requires clearing a maximum of 220 ha of native vegetation, mainly to access mineral sands ore at orebodies 27 200 and 28 000. The final area cleared may be reduced depending on the size and nature of orebody 28 000. Prior to the development of the dredge pond(s), the proponent may need to clear areas of vegetation to stockpile overburden material (ie. the soil above the mineral sand ore). The proponent has indicated that the total area of disturbance will not exceed 220 ha.

The Cooljarloo Mine occurs on the Bassendean Dune system in the northern sandplains. The mine is within a botanical area broadly referred to as the Northern Kwongan. Kwongan communities are noted for high species diversity, the common occurrence of heath and a high degree of endemism. The flora is adapted to the nutritionally impoverished soils and the growth form of plants is principally determined by the availability of soil moisture (Tiwest Pty Ltd, 1999).

In studies of the Northern Kwongan between the Moore and Irwin Rivers and west of the Midlands Highway, Griffin, Hopper and Hopkins (1990) identified 259 taxa regionally endemic or Declared Rare Flora. The majority (78%) of the regionally endemic species occurred within the Arrowsmith physiographic region[1], while the Coastal Belt and the Bassendean Dunes physiographic regions, which occupy similar spatial areas, supported 12% and 14% respectively of the regionally endemic species. The Dandaragan Plateau (39%) and the Yarra Yarra Region (25%) supported moderate proportions of the regionally endemic species.

Two vegetation types, as classified by Beard (1984), will be affected by the proposal: (i) low woodland; *Banksia attenuata* and *B. menziesii*; and (ii) Mosaic: Shrublands; Dryandra heath/Shrublands; Hakea scrub-heath (Figure 5). There is, respectively, 64% and 34% of the original spatial extent of these vegetation types remaining. According to the report, 'Conservation status of vegetation types throughout Western Australia' (Hopkins *et. al.*, 1996), there are 4.5% and 11% respectively of these two vegetation types within IUCN Category IV Reserves, these being National Parks, Nature Reserves and Conservation Parks managed by the Department of Conservation and Land Management (CALM). There is thus the need to

[1] Figure 6.1 in Tiwest Pty Ltd (1999) shows the location of the physiographic regions of the Northern Kwongan.

increase the area of particularly the low Banksia woodland vegetation type which is secured in Reserves (see Section 5, 'Other Advice').

With regard to dieback, the proponent has conducted baseline surveys of the proposal area for the presence of *Phytophthora* species. The surveys did not detect *Phytophthora cinnamomi* or any other *Phytophthora* species on mining lease M268SA south of Cooljarloo Road or on MLA 70/1010 (Tiwest Pty Ltd, 1999).

The proponent has in place a dieback management plan to minimise the risk of introducing *P. cinnamomi* to the mining lease. *P. cinnamomi* is generally regarded as the primary threat in terms of dieback in native vegetation. Access to the site is controlled and a chlorinated washdown facility is utilised to clean all equipment, machinery and vehicles entering or leaving the site.

Submissions

Public submissions expressed concern at the proposed clearing of 220 ha of heathland and Banksia woodland for only 22 months of mining operations.

A submission asserted that there was not yet enough information available to determine the local and regional significance of disturbance to the floristically rich plant communities which occur in the area. It also considered that many of the plant communities present are not yet adequately represented in conservation reserves.

The Department of Environmental Protection (DEP) asked the proponent how the proposal was consistent with the EPA's Preliminary Position Statement on protection of native vegetation in WA (EPA, 1999), and requested more information on the area covered by the theoretical 28 000 orebody/overburden dump.

Assessment

The area considered for assessment of this factor is MLA 70/1010, and the southern part of Mining Lease M268SA.

The EPA's environmental objective for this factor is to maintain the species abundance, diversity, geographic distribution and productivity of floristic communities.

The EPA's Preliminary Position Statement No. 2 'Environmental Protection of Native Vegetation in WA' (EPA, 1999) defines an area, termed the 'Agricultural Region', in which the EPA considers further clearing to be generally environmentally unacceptable. The vegetation to be cleared under the proposal occurs within this 'Agricultural Region'. However, given that: (i) there is greater than 30% of the vegetation types[2] remaining in the State; and (ii) the vegetation loss will be non-permanent (so long as there is successful rehabilitation to native vegetation[3]), the EPA considers that the proposal is consistent with Section 4.2 ('High-value land use') of the Position Statement. This clearly implies the need to achieve a rehabilitation standard equivalent to best practice for the mining industry.

The EPA notes the concern expressed in a submission regarding the extent of vegetation clearing required for a relatively short duration of mining. While the EPA does not comment on the commercial impacts of a proposal, it determines whether or not the environmental impacts of a proposal are capable of being managed. In this assessment, the EPA notes that the proponent, in carrying out a 'High-value land use', has the resources to rehabilitate areas disturbed to vegetation compatible with surrounding undisturbed areas.

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[2] ie. the two Beard (1984) vegetation types to be affected by the proposal: (i) Low woodland; *Banksia attenuata* and *B. menziesii*; and (ii) Mosaic: Shrublands; Dryandra heath/Shrublands; Hakea scrub-heath.

[3] Note: Section 3.3 considers rehabilitation in more detail.

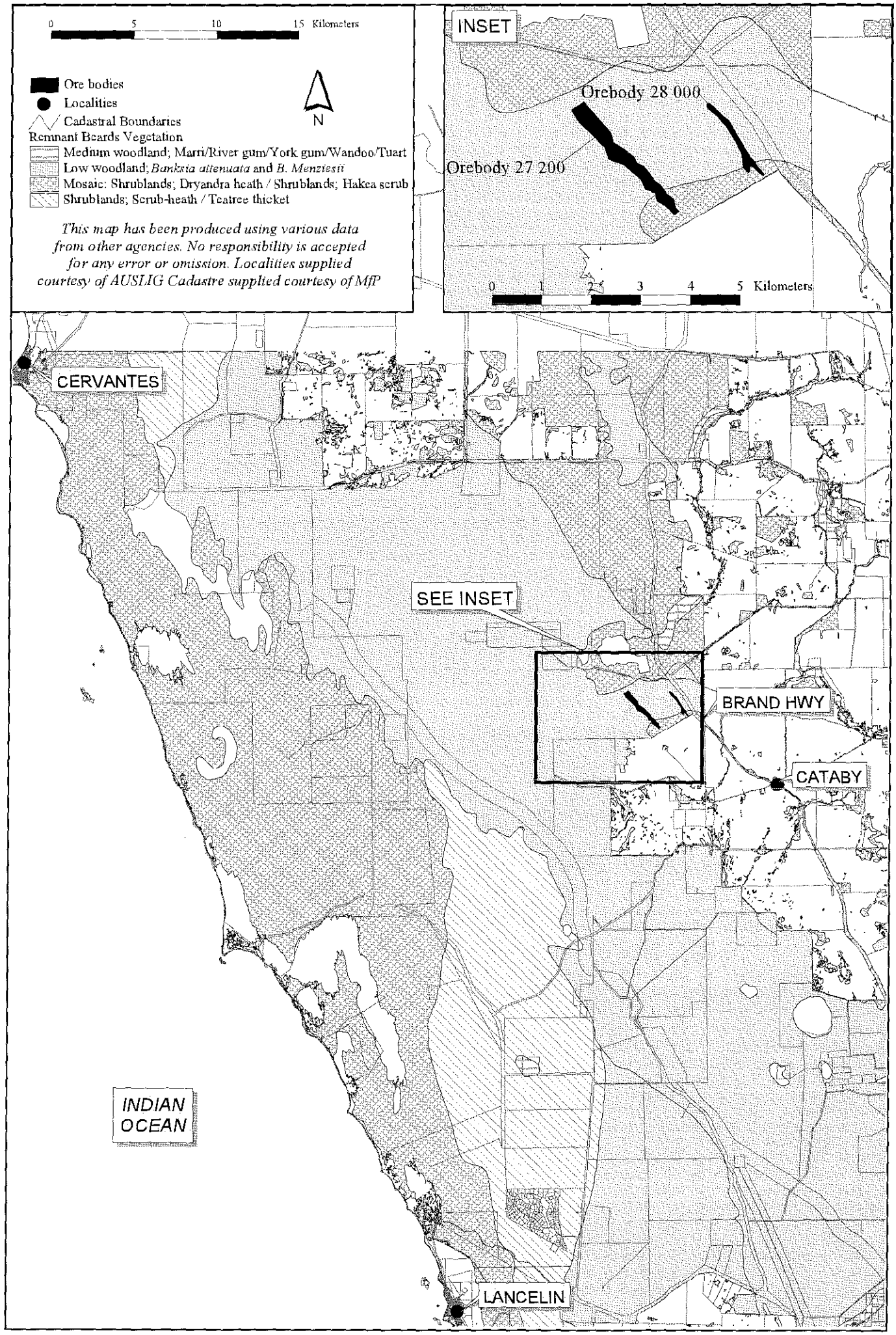

Figure 5. Regional vegetation distribution.

The EPA recognises that the two main vegetation types to be affected by the proposal are mainly contained in Unallocated Crown Land and private landholdings, and that less than 12% of this vegetation is contained in conservation estate. Of particular concern is the fact that only 4.5% of the remaining 'low Banksia woodland' vegetation type is contained in secure reserves. While noting the existence of Conservation Park C41986 and Nature Reserve A40916 (Figure 2), the EPA considers that an opportunity exists to improve the representation of the affected vegetation types in secure reserves. This may be achieved by inclusion of Reserve C27216 and surrounding areas of Unallocated Crown Land into the conservation estate. The EPA has also noted this issue in Section 5 as 'Other Advice'.

Although the proponent has committed to apply best practice rehabilitation, the EPA is of the view the proponent is unlikely to achieve the biodiversity in rehabilitation areas that existed prior to disturbance. To be consistent with recent assessments and current practice at other similar operations, the EPA has encouraged the proponent to commit to additional 'sustainability initiatives' as part of the proposal. In this regard, the EPA notes that the proponent is supporting CALM's Western Shield feral fox control program.

The EPA recognises that the Cooljarloo area is a significant habitat for amphibian, reptile, mammal and bird species, and acknowledges and encourages the long term fauna monitoring program being undertaken by the proponent. The proponent's support for fox control in the area complements the fauna monitoring program.

With regard to the stockpiling of overburden, the EPA considers there may be opportunities through mine planning to use the overburden directly in rehabilitation areas and/or to store it on areas already cleared of vegetation. The EPA has recommended that the proponent be required to prepare a detailed Integrated Mining and Rehabilitation Plan for the proposal to address this issue and ensure, among other things, that no areas of native vegetation are unnecessarily disturbed under the proposal. The Plan would be required prior to ground-disturbing activities, and be made publicly available.

The EPA notes that, while the mining area is potentially susceptible to dieback disease, no *P. cinnamomi* has been identified within the proposal area. The EPA further notes that the proponent has strict dieback control procedures at the Cooljarloo Mine, and has made a commitment to adopt these procedures for the current proposal. It is therefore considered that any potential impacts from dieback can be satisfactorily prevented by the dieback management systems currently in place at the Cooljarloo Mine.

Clearing of any vegetation within MLA 70/1010 is also subject to the grant of a mining lease to the proponent, and to the approval of the proposal by the Department of Minerals and Energy (DME).

Summary

Having particular regard to the:

- fact that there is more than 30% of the affected vegetation types in existence but these are poorly represented in conservation reserves, particularly the low Banksia woodland type;
- EPA's 'Other Advice' to address further reservation of the affected vegetation types into secure reserves; and
- proposal being consistent with the EPA's Preliminary Position Statement No. 2,

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for this factor provided that the proponent is required to prepare an Integrated Mining and Rehabilitation Plan, the rehabilitation is to best practice standard and the proponent's commitments are made legally enforceable.

3.2 Declared Rare and Priority flora

Description

The clearing of up to 220 ha of native vegetation under the proposal will affect a number of Declared Rare Flora (DRF) and Priority flora.

Flora surveys conducted by the proponent have identified two DRF species, *Andersonia gracilis* and *Anigozanthus viridis* ssp. *terraspectans*, and 14 Priority species (Priority level 2, 3 & 4) within the proposal area.

While mining of 27 200 will not affect any DRF, mining of 28 000 may require 'taking' nine individuals of *Andersonia gracilis*. This represents 0.03% of the total known population of 24,490 individuals for this species. No individuals of *Anigozanthus viridis* ssp. *terraspectans* will be affected by the proposal.

One undescribed flora species, *Darwinia* sp. Cooljarloo (G Cockerton 2852), was identified in the area of MLA 70/1010. The proponent has found that this plant is very common in the Cooljarloo area but, at this stage, will treat it as a Priority flora species.

The proposal will result in the loss of up to 760 individuals of the 14 Priority species identified; this is 32% of the total known number of the 14 Priority species individuals on M268SA and MLA 70/1010. However, all the Priority species recorded have confirmed distributions that extend well beyond the Cooljarloo Mine, with most of the species being recorded on conservation reserves.

Submissions

Public submissions expressed concern that individuals of DRF will be destroyed under the proposal, and that the proponent has provided no indication of the occurrence of Priority species over orebodies 27 200 and 28 000, nor of any specific management proposals for Priority species. Also, any disturbance to the site should treat Priority flora species with the same level of concern as DRF, even though current legislation does not require this.

CALM stated that further flora surveys are needed to confirm the impact of the proposal on the overall conservation status of *Leucopogon oliganthus, Calytrix drummondii, Lasiopetalum lineare* and *Dryandra tortifolia* so that an assessment of relative impact can be made.

Assessment

The area considered for assessment of this factor is MLA 70/1010 and the southern part of Mining Lease M268SA.

The EPA's environmental objective for this factor is to protect DRF, Priority flora and other species of conservation significance, consistent with the provisions of the *Wildlife Conservation Act 1950.*

The EPA notes the proponent's commitment to: (i) conduct additional surveys for Priority flora in nearby conservation reserves prior to mining (including for *Leucopogon oliganthus, Calytrix drummondii, Lasiopetalum lineare* and *Dryandra tortifolia*); and (ii) develop specific management measures for Priority species on the mining lease in consultation with CALM.

In making this commitment, the proponent satisfies the request raised in CALM's submission, and adequately considers the conservation significance of Priority flora species under the *Wildlife Conservation Act 1950.*

The EPA notes the concern expressed in public submissions regarding the taking of DRF and the conservation of Priority flora. In this respect, the EPA considers that:

(i) the potential 'taking' of nine individuals of the DRF species *Andersonia gracilis* during mining of 28 000 is environmentally acceptable given CALM's consideration and response to this issue (Appendix 5), and the minimal effect on the overall population of this species; and

(ii) the locating and management of Priority species will be addressed under the proponent's commitments and the EPA's recommendation that the proponent should prepare a Rare Flora Management Plan to minimise impacts to DRF, Priority flora and other flora of particular conservation significance (eg undescribed species), and to manage the existing populations of these flora in the proposal area.

If seeking to 'take' any individuals of DRF, under the provisions of the *Wildlife Conservation Act 1950* the proponent would need to seek the approval of the Minister for the Environment. The Minister would consider the proponent's application in consultation with CALM.

The EPA recommends that the proponent be required under a Ministerial condition to prepare a publicly available Rare Flora Management Plan to the satisfaction of DEP and CALM (see Appendix 4). This condition would give CALM and the DEP an opportunity, prior to ground-disturbing activities, to review, and modify if necessary, the proponent's proposed management of rare flora.

The Plan will be expected to include the principles of DRF management contained in the proponent's Environmental Management Program eg. reporting of survey results to CALM, avoiding disturbance of rare flora where possible, immediate fencing, offsite surveys, and investigating means of propagating the rare flora species.

Summary

Having particular regard to the:

- advice from CALM that impacts to DRF and Priority flora under the proposal are capable of being managed; and
- proponent's commitment to carry out further Priority flora surveys and to develop specific management measures for Priority species in the proposal area in consultation with CALM,

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for this factor, provided that the proponent is required to prepare a Rare Flora Management Plan, and the proponent's commitments are made legally enforceable.

3.3 Rehabilitation and landform

Description

The proponent will progressively rehabilitate all areas disturbed under the proposal[4] to native vegetation, with the objective to produce stable, self-sustainable ecosystems compatible with surrounding undisturbed areas. The rehabilitation will include developing suitable soil profiles and landforms, replacement of topsoil, application of mulch and the spreading of seed mixes.

The mine voids will be backfilled, once the dredge pond(s) reach an adequate operating size (around 50 ha). The proponent will return tailings from the wet separation plant to the rear of the dredge ponds in order to re-establish the landform in preparation for rehabilitation (Tiwest Pty Ltd, 1999).

The proponent has confirmed that it will continue its practice of making full financial provision for the rehabilitation of areas as disturbance occurs. The financial provision is based on the current realised cost of rehabilitation.

To date, the proponent has re-established at least 160 ha of native vegetation at Cooljarloo Mine (P Goodman, Tiwest, pers. comm.). The proponent has also been conducting rehabilitation trials at Cooljarloo Mine for the past six years, with the trial plots showing minimal erosion and yielding second generation plants, thereby giving an early indication that the regrowth is becoming self-sustaining (from proponent's response to submissions, Appendix 5).

[4] ie. up to 220 ha, this being the maximum area of vegetation cleared under the proposal.

Submissions

Public submissions raised the following issues.

- The proponent had not demonstrated that its aim to return a stable self sustaining ecosystem can be achieved through rehabilitation.
- The PER document (Tiwest Pty Ltd, 1999) did not appear to provide a plan for decommissioning of the mine.
- Completion criteria should be established to determine the final performance of rehabilitation. This process must involve public consultation.

CALM noted that the current areas of disturbance and dredge pond excavation at Cooljarloo Mine constitute a very significant rehabilitation liability, and queried whether the proponent has a contingency fund for the eventuality of early decommissioning.

Assessment

The area considered for assessment of this factor is the southern part of Mining Lease M268SA, and MLA 70/1010.

The EPA's environmental objectives for this factor are to: (i) ensure the proposal area, and any other area affected by the proposal, is rehabilitated to a standard consistent with the intended post-mining long term land use; and, (ii) establish stable, sustainable landform consistent with the surroundings.

The mining void, tailings and overburden dumps all require effective rehabilitation. The relevant issues include final landform design and returned soil profile. For orebodies located away from the central mining area, as is the case with orebody 28 000, tailings management must be carefully planned to ensure successful and timely rehabilitation.

The EPA notes that the Cooljarloo Mine has been operating for 10 years, and that environmental issues are currently being managed under an Environmental Management System (EMS) and Environmental Management Program (EMP). The EPA understands that the proponent intends to revise its existing EMS and EMP to incorporate the current proposal to mine orebodies 27 200 and 28 000.

For the current proposal, the EPA is recommending that the proponent be required to prepare a publicly available Integrated Mining and Rehabilitation Plan prior to ground-disturbing activities (see Appendix 4). This Plan will address rehabilitation and decommissioning of all areas disturbed under this proposal, and will be to the requirements of the EPA on advice from the DEP, CALM and DME. A key objective of the Plan is to require the proponent to demonstrate that mine planning and rehabilitation are integrated such that no areas of native vegetation are unnecessarily disturbed, and the post mining soil substrate and profile is capable of supporting self-sustaining and diverse vegetation communities.

The EPA notes CALM's concern regarding the current rehabilitation liability at Cooljarloo Mine. Accordingly, the EPA requests the proponent to ensure that future planning clearly addresses and commits the proponent to systematically reducing the area of land awaiting rehabilitation at Cooljarloo Mine. The EPA is seeking regular reports on the clearing which has occurred and the area under rehabilitation.

In regard to the proponent maintaining a contingency fund, the EPA notes that the proponent has made a commitment to make financial provision for the rehabilitation of disturbed areas.

The EPA notes the issues of mine decommissioning and completion criteria were raised in the public submissions. Mine decommissioning for this proposal will be addressed in the Integrated Mining and Rehabilitation Plan. In regard to final decommissioning of the Cooljarloo Mine and preparation of completion criteria, the EPA has provided advice on these issues in Section 5.

With regard to other statutory and non-statutory monitoring by Government of rehabilitation for the proposal, the Minister for Mines has placed environmental conditions on M268SA which are reviewed annually. These conditions will also be applied to the current proposal. The EPA also notes that regular site visits and ongoing liaison occurs with the Mineral Sands Agreement Rehabilitation Coordinating Committee[5] (MSARCC). The proponent is also required to prepare annual environmental reports under the *Mineral Sands (Cooljarloo) Mining and Processing Agreement Act 1988*. The reports are submitted to relevant Government agencies (eg. DME, DEP, CALM) for assessment and comment.

Summary

Having particular regard to the:

(a) proponent's commitment to rehabilitate all disturbed areas to native vegetation;

(b) rehabilitation being required to be to best practice, and the rehabilitation rate meeting and subsequently exceeding the clearance rate;

(c) proponent's commitment to maintaining financial provisions commensurate with the area disturbed and the cost of undertaking the required rehabilitation works; and

(d) current statutory and non-statutory monitoring by Government of rehabilitation at Cooljarloo Mine,

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for this factor provided that the proponent is required to prepare an Integrated Mining and Rehabilitation Plan prior to ground-disturbing activities, which includes provisions to meet point (b) above, and the proponent's commitments are made legally enforceable.

3.4 Surface water and groundwater

Description

The EPA considers surface water and groundwater to be a relevant factor in relation to the proposal's potential to affect native vegetation and wetlands, primarily as a result of groundwater drawdown.

The hydrology at Cooljarloo Mine basically comprises a superficial aquifer at up to 60 m depth, overlying the Yarragadee aquifer, at about 1500 m in depth (Rockwater, 1999). Dredge mining will result in drawdown of groundwater in the unconfined superficial aquifer as the dredge ponds are filled by groundwater inflow.

The proponent considers that the groundwater drawdown will reduce water levels in the superficial aquifer up to 4 km from the dredge ponds. However, to date, drawdown from the dredge mining at Cooljarloo has not affected vegetation. It is thought that this is due to the native vegetation being supported by seasonally perched groundwater in the unsaturated zone, and not by groundwater at depth (Tiwest Pty Ltd, 1999).

Several permanent wetlands (named 'Emu Lakes') exist on private property approximately 1.2 km south west of M268SA (see Figure 2). These wetlands, which receive surface drainage from surrounding areas and flow from Minyulo Brook, may be affected by the proposal, both from groundwater drawdown, and from any surface drainage leaving the mining areas with suspended silt, dieback (*Phytophthora* species) and pollutants.

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[5] The MSARCC was formed in 1977 under the *Mineral Sands (Eneabba) Agreement Act 1975*. As such, the MSARCC does not have any statutory link to the Cooljarloo Mine, but Tiwest Pty Ltd has invited the Committee to visit the Mine and discuss mine and rehabilitation planning. Current membership of the Committee is: the Department of Resources Development, DME, CALM, Agriculture WA, Water and Rivers Commission and DEP.

Submissions

The DEP asked what management measures the proponent will implement to protect wetlands and drainage systems eg. Minyulo Brook south west of M268SA, from silt, dieback and pollutants, particularly given the extreme rainfall events that occurred in 1999.

Assessment

The area considered for assessment of this factor is MLA 70/1010 and the southern part of Mining Lease M268SA.

The EPA's environmental objective for this factor is to maintain the integrity, functions and environmental values of wetlands, and ensure that drawdown of groundwater does not significantly impact on native vegetation and wetland values.

The EPA notes that after the public review period of the proponent's PER had closed, an area of vegetation died near to the Cooljarloo north mine borefield, and that the proponent is now conducting a detailed investigation of this incident. The vegetation death apparently occurred as a result of groundwater drawdown due to abstraction of groundwater through bores. It is evident that there is still some uncertainty about the relationship between the seasonally perched groundwater and the real groundwater table. This issue will require ongoing monitoring and management attention.

The drawdown from dredge mining under the proposal may have an effect on native vegetation near to dredge ponds, and on wetlands south west of M268SA. Wetlands in the proposal area may also be affected by the drawdown and surface water drainage offsite. In this regard, the EPA notes the following technical advice from the Water and Rivers Commission:

- more groundwater monitoring bores need to be installed to determine the effect of the proposal on seasonal and permanent wetlands;
- the depth to groundwater for vegetation in the proposal area needs to be assessed;
- the understanding that wetlands in the proposal area are perched needs to be further investigated by drilling shallow bores; and
- more groundwater monitoring bores are required to assess the relationship between the perched, superficial and Yarragadee aquifers.

The proponent will be required to address these issues in a publicly available 'Surface Water and Groundwater Management Plan' prior to ground-disturbing activities (see Appendix 4). This Plan will incorporate results from the study into the north mine incident, and proponent commitments for groundwater drawdown and control of surface water. The Plan will be prepared to the requirements of the EPA on advice of the Water and Rivers Commission and the DEP.

The EPA notes the proponent's commitment to undertake flora, fauna and hydrological monitoring of the Emu Lakes wetlands.

Summary

Having particular regard to the:

- uncertainty of the impacts of drawdown associated with the existing dredge pond operations at Cooljarloo Mine; and
- proponent's commitment to assess and monitor the 'Emu Lakes' wetlands,

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for this factor provided that the proponent is required to prepare a Surface Water and Groundwater Management Plan prior to ground-disturbing activities, which includes provisions for ongoing monitoring and management of wetlands and groundwater, and the proponent's commitments are made legally enforceable.

4. Conditions and commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the affect of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject, if it is to be implemented.

4.1 Proponent's commitments

The proponent's commitments as set in the PER, and subsequently modified as shown in Appendix 4, should be made enforceable.

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Tiwest Pty Ltd to mine titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) that the proponent be required to fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4; and

(b) that the proponent be required to prepare and implement an Environmental Management System, Rare Flora Management Plan, Surface Water and Groundwater Management Plan, and Integrated Mining and Rehabilitation Plan for the proposal prior to ground-disturbing activities.

It should be noted that other regulatory mechanisms relevant to the proposal are:

- any environmental approvals required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*;
- clearance required for 'taking' of DRF under the *Wildlife Conservation Act 1950*;
- licensing of the operations under Part V of the *Environmental Protection Act 1986*;
- approvals required under the *Mining Act 1978*; and
- licensing of the operations under the *Rights in Water and Irrigation Act 1914*.

5. Other Advice

The EPA notes that only 4.5% of the remaining 'Low woodland; *Banksia attenuata* and *B. menziesii*' vegetation type is contained in conservation estate. Therefore, in order to increase the representation of this vegetation type, and of 'Mosaic: Shrublands; Dryandra heath/Shrublands; Hakea scrub-heath', in secure nature reserves, it is recommended that Government: (i) incorporate the area of Unallocated Crown Land immediately east of M268SA

into Conservation Park C41986; and (ii) give Crown Reserve C27216 conservation estate status, with the same tenure as C41986 to the north west (see Figure 2).

Recognising the role of the MSARCC, the EPA encourages the Western Australian titanium mineral sands industry to continue its work to continually improve rehabilitation standards and completion criteria. It is essential that best practice rehabilitation for the sand mining industry continues to advance. In this regard, the EPA recommends that an appropriate group, such as the Titanium Minerals Committee (at the Chamber of Minerals and Energy of WA Inc), progress this issue further in consultation with all relevant stakeholders. A benchmarking study of rehabilitation practice for the mineral sands industry would be beneficial in developing continuous improvements in the standard of rehabilitation.

The EPA is of the view that orderly decommissioning should be directly incorporated into mine planning, and, therefore, rehabilitation planning. The EPA understands that the proponent will adopt this principle, which is central to the Integrated Mining and Rehabilitation Plan recommended for this proposal, in preparing a strategy for the final decommissioning of the Cooljarloo Mine. This issue may also be pursued through the MSARCC, and if necessary under the provisions for environmental management in the *Mineral Sands (Cooljarloo) Mining and Processing Agreement Act 1988*.

It would be beneficial for the proponent to co-ordinate its land management activities with the work being carried out by the Dandaragan Land Conservation District Committee. This would be particularly important in order to achieve informed and complementary management of the Minyulo Brook catchment and the Emu Lakes wetlands.

6. Conclusions

The EPA has considered the proposal by Tiwest Pty Ltd to mine titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine.

The EPA notes that the proposal involves clearing of native vegetation to a maximum of 220 ha, and that there is more than 30% of the affected vegetation types in existence but these are poorly represented in conservation reserves, particularly the low Banksia woodland type. All areas disturbed under the proposal are to be rehabilitated to best practice standard by the proponent.

The EPA has concluded that the proposal is capable of being managed to meet the EPA's objectives provided there is satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Appendix 4 and summarised in Section 4.

7. Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the project being assessed is for mining of titanium minerals from orebodies 27 200 and 28 000 at the existing Cooljarloo Mineral Sands Mine.
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3.
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4 and summarised in Section 4, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.
5. That the Minister notes under 'Other Advice' the EPA's comments regarding the desirability for new conservation areas to be created in areas surrounding M268SA.

Appendix 1

List of submitters

Government Departments

Aboriginal Affairs Department
Department of Conservation and Land Management
Department of Environmental Protection
Department of Minerals and Energy
Water and Rivers Commission

Public Organisations

Conservation Council of Western Australia
Wildflower Society of Western Australia

Appendix 2

References

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Tiwest Pty Ltd (1999). Public Environmental Review: Mining of Titanium Minerals Orebodies 27 200 and 28 000. Prepared by Tiwest Pty Ltd, October 1999.

Appendix 3

Summary of identification of relevant environmental factors

Appendix 3: Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
BIOPHYSICAL			
Vegetation	Up to 220 ha of native vegetation will be cleared under the proposal. The vegetation types in the proposal area, as identified by Beard (1984) are: (i) low woodland; *Banksia attenuata* and *B. menziesii*; and (ii) Mosaic: Shrublands; *Dryandra* heath/Shrublands; *Hakea* scrub-heath.	**DEP** Queried how the proponent considered the proposal to be consistent with the EPA's Preliminary Position Statement on 'Environmental Protection of Native Vegetation in WA', December 1999. The DEP requested more information on the area covered by the 28 000 orebody/overburden dump. **Public Submissions** • The clearing of 220 ha of remnant vegetation for mining is not environmentally acceptable. • It is not considered acceptable that the proponent clear 220 ha of heathland and Banksia woodland to extend the life of the mine by only 22 months. • There is not yet enough information available to determine the local and regional significance of disturbance to the floristically rich plant communities that occur in the area. Many of the plant communities present are not yet adequately represented in conservation reserves.	**Considered to be a relevant environmental factor.**
Declared Rare Flora (DRF) and Priority flora	A population of the DRF *Andersonia gracilis* (9 plants) may be located within the proposed 28 000 mining area. Fourteen Priority species are known to occur within the M268SA and MLA 70/1010. One undescribed flora species, *Darwinia* sp. Cooljarloo (G Cockerton 2852), was identified in the area of MLA 70/1010.	**CALM** The proponent should make an early application to 'take' any DRF under the *Wildlife Conservation Act 1950*. Further flora surveys are needed to confirm the proposal's impact on the conservation status of the Priority species *Leucopogon oliganthus, Calytrix drummondii, Lasiopetalum lineare* and *Dryandra tortifolia*. **Public Submissions** • There is concern that individuals of DRF will be destroyed under the proposal, and that the proponent has provided no indication of the occurrence of Priority species over the orebodies in question, nor of any specific management proposals for Priority species. • Any disturbance to the site should treat Priority flora species with the same level of concern as DRF, although current legislation does not require this.	**Considered to be a relevant environmental factor.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Terrestrial Fauna	Up to 220 ha of native vegetation will be cleared. The fauna at Cooljarloo is typical of that found in the northern sandplains.	No comments received.	The impact to fauna habitats will be short to medium term, as habitats are widely represented and the proponent intends to rehabilitate cleared areas to native vegetation. **Factor does not require further EPA evaluation.**
Specially Protected (Threatened) and Priority Fauna	The proposal area has been surveyed for rare fauna. Five species of listed fauna occur in the Cooljarloo area. None of these are Schedule 1 listed fauna. Impact primarily through clearing of up to 220 ha of native vegetation.	No comments received.	The impact to fauna habitats will be short to medium term, as habitats are widely represented and the proponent intends to rehabilitate cleared areas to native vegetation. **Factor does not require further EPA evaluation.**
Landform	Mining will be by dredge mining, or a combination of dredge and dry mining. Topsoil and overburden to be stockpiled prior to mining.	**DEP** The DEP requested more information on the disposal of overburden under the proposal.	**Considered to be a relevant environmental factor and discussed under the factor 'Rehabilitation and landform'.**
Rehabilitation	Up to 220 ha of native vegetation will be cleared, and then rehabilitated after mining. Mine voids are to be backfilled and rehabilitated.	**DEP** Queried when rehabilitation of the 28 000 orebody/overburden dump is to occur, and the final landform/landuse of the mining area. **CALM** The current areas of disturbance and dredge pond excavation constitute a very significant rehabilitation liability. Does the proponent have a contingency fund for the eventuality of early decommissioning? **Public Submissions** • The proponent has not demonstrated it can achieve its aim to return a stable self-sustaining ecosystem through rehabilitation. • The PER document does not appear to provide a plan for decommissioning of the mine. • Completion criteria should be established to determine the final performance of rehabilitation. This process must involve public consultation.	**Considered to be a relevant environmental factor.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
POLLUTION			
Particulates/ dust	Dust will be generated in the clearing of vegetation and stripping of topsoil. Further dust generation will be predominantly due to the movements of mobile equipment.	No comments received.	Dredge mining operations will generate a minimal amount of dust. The proponent will manage nuisance dust on site according to its existing environmental management program. On-site dust will also be managed under DME mining lease conditions, and a DEP licence issued under the provisions of Part V of the *Environmental Protection Act 1986*. **Factor does not require further EPA evaluation.**
Greenhouse gases	Total greenhouse gas emissions from the existing mining operations (99% as CO_2) is 113,400 tpa. The proposal will not increase emissions, but will extend current emissions by 22 months.	No comments received.	Greenhouse gas emissions will be minimised through minimisation of energy consumption. No vegetation will be burnt. There will be no net increase in the annual rate of CO_2 emissions as result of the proposal. **Factor does not require further EPA evaluation.**
Groundwater quantity	Groundwater occurs in the project area in a superficial aquifer and the Yarragadee aquifer. The proponent uses the groundwater predominantly for maintaining the dredge pond water level. No changes are required to the existing Water and Rivers Commission groundwater abstraction licence.	No comments received.	Following public review of the proposal's PER, an area of vegetation died near to the Cooljarloo north mine borefield. The proponent is conducting a detailed investigation to determine the cause of this incident. **Considered to be a relevant environmental factor, and discussed under the factor 'Surface water and groundwater'.**
Surface water quality	Potential for contamination of Minyulo Brook and the Emu Lakes wetlands south west of the proposal area.	**DEP** What management measures will the proponent implement to protect wetlands and drainage systems eg. Minyulo Brook, from any dieback, silt and pollutants coming from the mine?	**Considered to be a relevant environmental factor, and discussed under the factor 'Surface water and groundwater'.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Noise	The nearest residences are at the Billinue Community, which is located 750 m from the proposed mining operations.	No comments received.	There is minimal risk that the proponent will exceed assigned levels under the *Environmental Protection (Noise) Regulations 1997*. The proponent will periodically monitor noise levels, and is in regular communication with members of the Billinue Community. **Factor does not require further EPA evaluation.**
SOCIAL SURROUNDINGS			
Visual amenity	Orebodies 27 200 and 28 000 are 2.5 km and 375 m from Brand Hwy respectively. An overburden dump to 8 m high, and 850 m from the Brand Hwy, may be constructed for orebody 28 000.	No comments received.	The proponent will maintain a 300 m buffer of natural vegetation between the Brand Hwy and the mining operations. In the longer term, the area will be rehabilitated to similar vegetation. The proposal will not significantly lower the visual amenity of the area. **Factor does not require further EPA evaluation.**
Aboriginal culture and heritage	Surveys of the orebody 27 200 area found no ethnographic or archaeological sites of Aboriginal significance. The area covered by MLA 70/1010 is still to be surveyed.	**Aboriginal Affairs Department (AAD)** The proponent is clearly fully aware of its obligations under the *Aboriginal Heritage Act 1972*.	MLA 70/1010 is currently subject to the *Native Title Act 1993*. The proponent will survey MLA 70/1010 for the presence of Aboriginal heritage sites prior to any disturbance of the mining lease. The EPA notes the advice of the AAD. **Factor does not require further EPA evaluation.**

Appendix 4

Recommended Environmental Conditions and Proponent's Consolidated Commitments

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

COOLJARLOO MINERAL SANDS PROJECT, SHIRE OF DANDARAGAN: MINING OF TITANIUM MINERALS, OREBODIES 27 200 AND 28 000

Proposal: Mining of titanium minerals from orebodies 27 200 and 28 000, adjacent to the southern mining operations of the existing Cooljarloo Mineral Sands Mine, located 10 kilometres north west of Cataby.

Proponent: Tiwest Pty Ltd

Proponent Address: 1 Brodie Hall Drive, Bentley WA 6152

Assessment Number: 1272

Report of the Environmental Protection Authority: Bulletin 990

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

Procedures

1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

3 Proponent

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

3-2 Any request for the exercise of that power of the Minister referred to in condition 3-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

3-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

4 Commencement

4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

4-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

4-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 4-1 and 4-2.

4-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

5 Compliance Auditing

5-1 The proponent shall submit periodic Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

5-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal, written advice that the requirements have been met.

5-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

Conditions

6 Environmental Management System

6-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to ground-disturbing activity, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1. An environmental policy and corporate commitment to it.

2. Mechanisms and processes to ensure:
   - planning to meet environmental requirements;
   - implementation and operation of actions to meet environmental requirements; and
   - measurement and evaluation of environmental performance.

3. Review and improvement of environmental outcomes.

6-2 The proponent shall implement the environmental management system referred to in condition 6-1.

7 Surface Water and Groundwater Management Plan

7-1 Prior to commencement of ground-disturbing activities, the proponent shall develop a Surface Water and Groundwater Management Plan to the requirements of the Environmental Protection Authority on advice of the Water and Rivers Commission and the Department of Environmental Protection.

The objectives of this Plan are to:
- protect wetland systems linked to Minyulo Brook, including Emu Lakes wetlands; and
- ensure that drawdown from dredge mining does not significantly impact on native vegetation and wetland ecosystems.

This Plan shall address:

1. offsite movement of dieback, sediment and pollutants in surface waters;
2. recovery if spillage or leakage of an environmentally hazardous substance occurs;
3. the potential impacts of dredge mining and groundwater abstraction to vegetation, and the management of these impacts, and to assess the relationship between the perched, superficial and Yarragadee aquifers;
4. the installation of groundwater monitoring bores to determine the effect of the proposal on seasonal and permanent wetlands;
5. an assessment of the depth to groundwater for vegetation in the proposal area;
6. gaining an understanding of the extent to which wetlands in the proposal area are sustained by perched aquifers by the drilling of shallow bores; and
7. the provision for contingency plans if monitoring indicates vegetation or wetland impacts.

7-2 The proponent shall implement the Surface Water and Groundwater Management Plan required by condition 7-1.

7-3 The proponent shall make the Surface Water and Groundwater Management Plan required by condition 7-1 publicly available, to the requirements of the Environmental Protection Authority.

8 Rare Flora Management Plan

8-1 Prior to ground-disturbing activities and in consultation with the Department of Conservation and Land Management, the proponent shall prepare a Rare Flora Management Plan to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Conservation and Land Management.

This Plan shall address:

1. the impacts to Declared Rare and Priority flora within the project area;
2. reporting of flora survey results to CALM;
3. offsite surveys to prove up numbers and extent of rare flora species;
4. planning to avoid any disturbance to rare flora where possible;
5. immediate fencing of rare flora populations to be protected;
6. consideration of relocating rare flora species;
7. the propagation and return of rare flora into rehabilitation areas; and
8. process for applying to 'take' DRF under the provisions of the *Wildlife Protection Act 1950.*

8-2 The proponent shall implement the Rare Flora Management Plan required by condition 8-1.

8-3 The proponent shall make the Rare Flora Management Plan required by condition 8-1 publicly available, to the requirements of the Environmental Protection Authority.

9 Rehabilitation and Decommissioning Plan

9-1 To ensure that rehabilitation is optimised, prior to ground-disturbing activities, the proponent shall develop a Rehabilitation and Decommissioning Plan. This Plan shall be to the requirements of the Environmental Protection Authority (including any requirement of the Environmental Protection Authority for independent expert advice) on advice of the Department of Environmental Protection, the Department of Minerals and Energy, and the Department of Conservation and Land Management.

The Plan shall address:

1. baseline vegetation survey;
2. optimal clearing techniques;
3. mining strategy that integrates the mining and rehabilitation schedules, including a reconciliation of voids, tailings and overburden, promptly re-establishing the soil profile, and systematically reducing the area of land awaiting rehabilitation;
4. achievement of best practice rehabilitation;
5. comparison to industry benchmarking study;
6. reporting of clearing and rehabilitation rates;
7. funding set aside for rehabilitation;
8. weed management;
9. dieback management;
10. propagation strategy, including seed collection, maximising the direct return of topsoil, direct seeding, planting of seedlings, smoke treatment and translocation;
11. development of specific rehabilitation performance criteria;
12. a monitoring programme to determine rehabilitation success;

13. contingency plans in the event that rehabilitation is not likely to meet, or does not meet performance criteria;
14. decommissioning of the mining areas and final voids, and removal of any mine infrastructure; and
15. allocation of resources (equipment, appropriately trained and experienced personnel and independent expert advice).

Components 1 to 10 of this Plan shall be prepared prior to ground-disturbing activities. The remaining components shall be prepared within 12 months following commencement of ground-disturbing activities.

9-2 The proponent shall implement the Rehabilitation and Decommissioning Plan required by condition 9-1 to achieve the rehabilitation performance criteria referred to in condition 9-1 (7) to the requirements of the Environmental Protection Authority.

9-3 The proponent shall make the Rehabilitation and Decommissioning Plan, required by condition 9-1, publicly available to the requirements of the Environmental Protection Authority.

Schedule 1

The Proposal

Tiwest Pty Ltd ('the proponent') operate the Cooljarloo Mineral Sands Project, located 10 km north west of Cataby, within Mining Lease M268SA. The original proposal for the Cooljarloo Mine, which proposed the mining of the then known areas of mineralisation within the project area, was given environmental approval by the Minister for the Environment in October 1988.

The proponent is proposing to mine orebodies '27 200' and '28 000', which are located adjacent to the southern mining operations of the Cooljarloo Mine, at a rate of between 4.4 - 14.7 million tonnes per annum, depending on the dredge used. Orebody 27 200 would be dredge mined, and orebody 28 000 would be either dredge or dry mined. The mining would largely utilise equipment and infrastructure in use at the existing Cooljarloo Mine.

Key Characteristics Table

Element	Description	
	Orebody 27 200	**Orebody 28 000 (theoretical)**
Extension to mine-life	Approximately 20 months	Approximately 2 months
Period of ore extraction	April 2002 – 1st Quarter 2004	June 2001 – Jun 2002
Method of ore extraction	Dredge	Dredge or dry
Size of ore-body (tonnes of Heavy Mineral Concentrate (HMC))	852,000	150,000
Area of Disturbance (hectares)	105	115
Depth of pit (metres) Maximum Typical	 50 46	 35 30
Infrastructure	Dredge pit, access and exit channels.	Dredge pit, access roads, overburden dump, shore-based pumping facility.
Ore Mining Rate (tonnes/hour)	Cooljarloo I Dredge – 1680 Cooljarloo II Dredge – 500	Cooljarloo II Dredge – 500
Nominal hours of operation	24 hrs per day, 7 days per week	24 hrs per day, 7 days per week
Overburden (m^3)	19 million	9 million
Water Supply • Licensed Annual Abstraction Limit (kilolitres), Superficial and Yarragadee aquifers • Rate of abstraction (kilolitres)	 8,780,000 1,750,000	 8,780,000 1,750,000
Fuel Storage Capacity (litres)	Tiwest Pty Ltd – 138,800 Contract – 100,000	Tiwest Pty Ltd – 138,800 Contract – 100,000
HMC transport to Chandala processing plant - truck movements Maximum Mean	 40 return trips a day @ mean load 70 tonne 27 return trips a day @ mean load 70 tonne	 40 return trips a day @ mean load 70 tonne 27 return trips a day @ mean load 70 tonne
Rehabilitation	Stable self-sustaining ecosystems compatible with adjacent undisturbed areas.	Stable self-sustaining ecosystems compatible with adjacent undisturbed areas.

Figures

Figure 1. Location Plan, Cooljarloo Mineral Sands Mine.

Figure 2. Location of Orebodies 27 200 and 28 000.

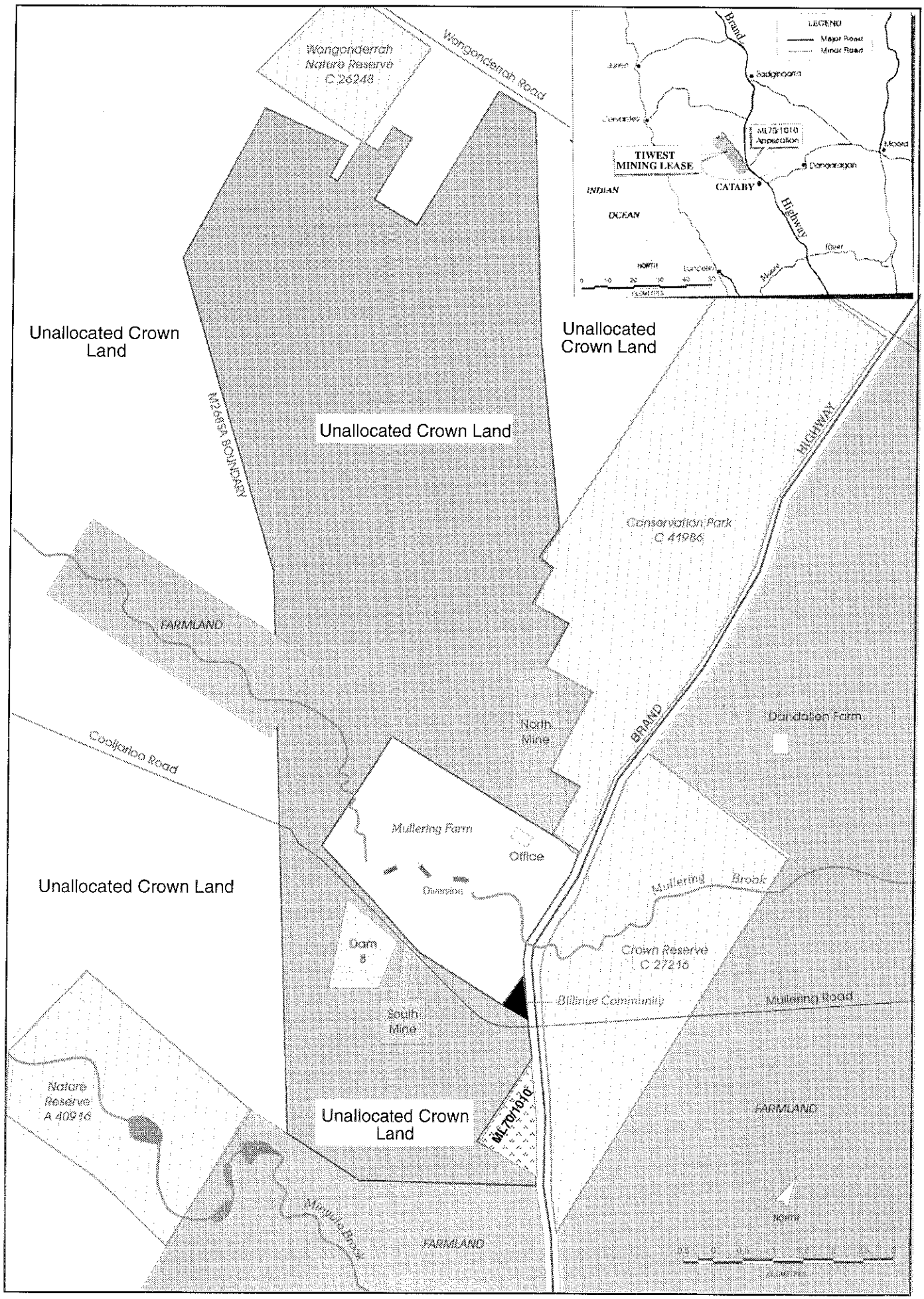

Figure 1. Location Plan, Cooljarloo Mineral Sands Mine.

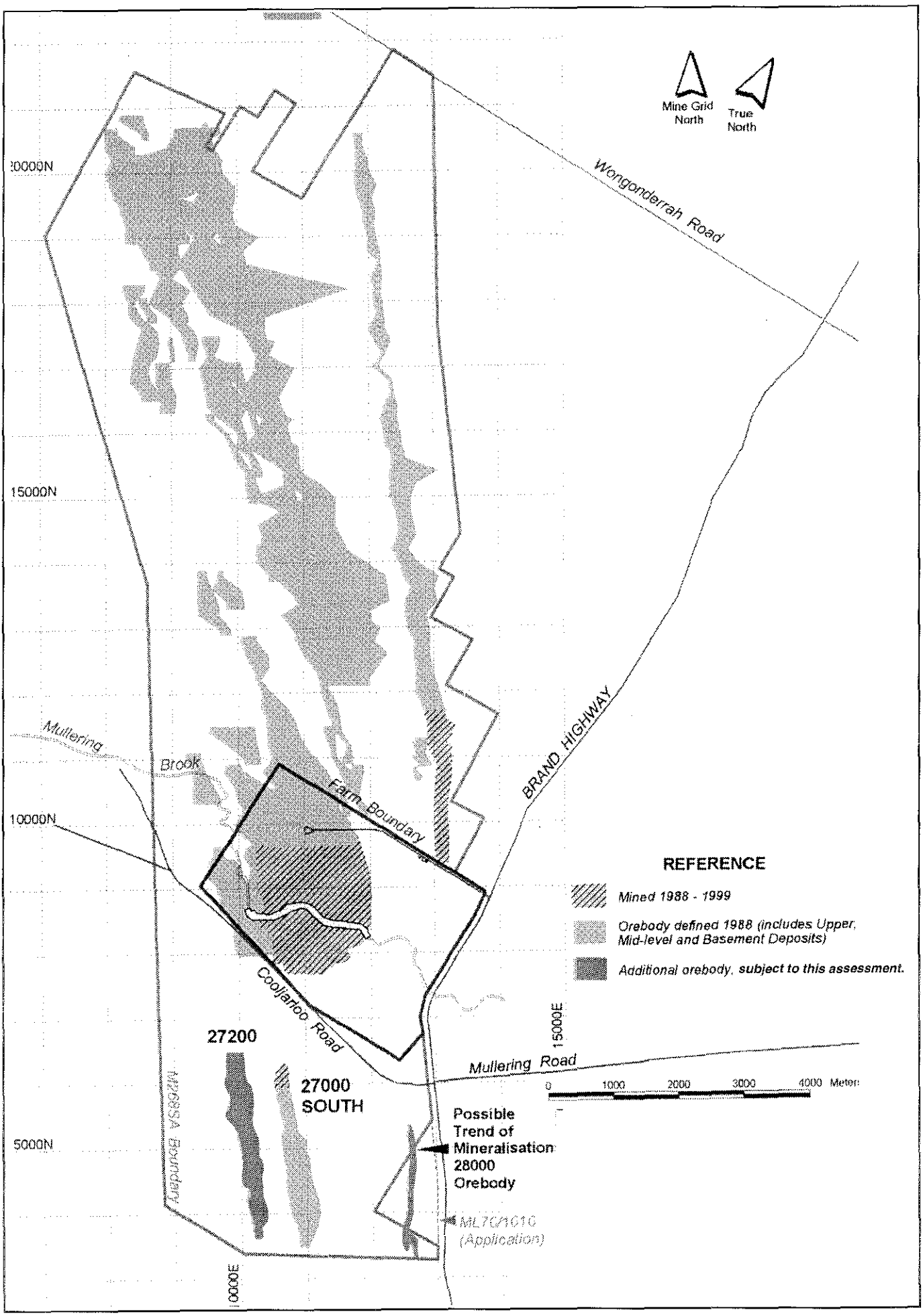

Figure 2. Location of Orebodies 27 200 and 28 000.

Schedule 2

Proponent's Consolidated Environmental Management Commitments

September 2000

COOLJARLOO MINERAL SANDS PROJECT, SHIRE OF DANDARAGAN: MINING OF TITANIUM MINERALS, OREBODIES 27 200 AND 28 000 (ASSESSMENT NO. 1272)

TIWEST PTY LTD

Environmental Management Commitments
Cooljarloo Mine, Mining of Titanium Minerals,Orebodies 27 200 and 28 000

No.	Topic	Objective(s)	Action	Timing	Advice
1.	Environmental Management Programme	Manage environmental impacts arising from the proposal.	Apply the existing Cooljarloo Environmental Management Programme (EMP) to the mining of the 27 200 and 28 000 orebodies as defined in the EMP and Cooljarloo Environmental Procedures Manual.	On an ongoing basis	DEP DME CALMW RC
2.	Environmental Management Programme	Improvement in environmental performance.	Review the Cooljarloo Environmental Management Programme and update as required.	Annually	DEP DRD CALM WRC DME
3.	Native vegetation	Minimise disturbance to native vegetation.	Limit clearing of native vegetation associated with mining the 27 200 and 28 000 orebodies to 220 hectares.	Overall	DME DEP
4.	Priority species	Improve knowledge of the abundance of Priority species present on M268SA and MLA 70/1010 in nearby conservation reserves.	Undertake specific surveys for Priority species (listed in Appendix C of the Public Environmental Review for the proposal to mine the 27 200 and 28 000 at Cooljarloo) in conservation reserves adjacent to tenements M268SA and ML 70/1010.	Spring	DEP CALM
5.	Priority species	Limit impact on the abundance of Priority species.	Develop specific management measures for particular Priority species in consultation with CALM as the results of flora surveys warrant.	Overall	CALM
6.	"Emu Lakes" wetlands	Improve knowledge of the ecological function and conservation status of the "Emu Lakes" wetlands.	Undertake flora, fauna and hydrological monitoring of the "Emu Lakes" wetlands located on private land immediately south-west of tenement M268SA. (subject to the agreement of the landholder).	Commencing in 2000	DEP
7.	Surface Water Quality	Minimise any impact on wetlands and drainage systems.	Direct turbid runoff from areas disturbed by mining activity through retention/settling basins and/or to the dredge pond.	Overall	WRC DEP
8.	Native vegetation	Minimise impacts on native vegetation caused by groundwater abstraction.	Adjust the depth and distribution of abstraction in the event of identifying adverse trends in vegetation health.	Operations phase	WRC DEP
9.	Rehabilitation	Ensure high standard of rehabilitation.	Maintain current practice of making full financial provision for the rehabilitation of disturbed areas.	Overall	DEP DME

CALM – Department of Conservation and Land Management; DEP – Department of Environmental Protection; DME – Department of Minerals and Energy; DRD – Department of Resources Development; WRC – Water and Rivers Commission

Appendix 5

Summary of Submissions and Proponent's Response to Submissions

Cooljarloo Mine, Mining of Titanium Minerals Orebodies 27 200 and 28 000 PER (Assessment No. 1272)

Tiwest Response to Submissions

Vegetation

1. *Given the overwhelming problems of salinity, land degradation and biodiversity loss currently faced by the community, the proposal to clear 220 ha of remnant vegetation for mining is an unacceptable environmental impact. It is appreciated that the rehabilitation of the mining area with locally occurring native species will tend to establish similar carbon sinks and water use. However, we do not believe it has ever been demonstrated that Tiwest's stated aim of returning a stable, self sustaining ecosystem can be achieved, especially in the highly diverse ecosystems of the northern Kwongan.*

   Tiwest would maintain that the re-establishment of native vegetation with carbon cycling and water balance characteristics similar to the pre-disturbance ecosystem (which is acknowledged as achievable), could not be achieved without also re-establishing a stable, self sustaining ecosystem.

   Tiwest have recorded 199 species in trials of native rehabilitation on one site type initiated six years ago. Second generation plants have been recorded within the trial areas (PER, p54), which is an early indication of the potential of the rehabilitated area to 'self-sustain'. All indications from the trials suggest that a self sustaining ecosystem can be re-established.

   Other than the trial areas, Tiwest's earliest native rehabilitation is three years old. This is too soon to be able to categorically demonstrate the achievement of a self-sustaining ecosystem. However, the stability of the rehabilitated landscape can be demonstrated, with no significant resource export through water or wind erosion. Given this, and the good initial vegetation coverage, Tiwest considers it is now a matter of time for successional changes to occur and vegetation communities to mature. The progress of all rehabilitated areas is monitored periodically and the results reported annually to relevant government agencies.

2. *It was noted that the operations previously approved for orebody 27 000, and those currently proposed for orebodies 27 200 and 28 000 relate to heathland and Banksia woodland. In principle opposition to clearing in these vegetation communities was expressed. It is not considered acceptable that 220 ha of these unique floral communities will be destroyed to extend the life of the mine by a mere 22 months.*

Tiwest's proposal to mine the 27 200 and 28 000 orebodies involves the clearing of a **maximum** 220 ha of native vegetation and approval to mine these orebodies was sought on this basis. It is quite possible the clearing associated with the potential 28 000 orebody (115ha, based on a maximum type scenario using current limited information) could be significantly reduced by, for example, the deposition of overburden in the mine void of the 27 000 South orebody). Native rehabilitation costs are a significant element of total mining costs and there are consequently strong financial as well as environmental reasons to avoid the disturbance associated with out of pit overburden deposition. Unfortunately, information on the potential 28 000 orebody is insufficient to allow detailed mine planning. Tiwest elected to include the proposal to mine the 28 000 orebody with the proposal to mine the 27 200 orebody when the latter was determined to require formal environmental assessment by the EPA. This was necessitated by the limited time available to integrate any mining with nearby operations, the time required to receive formal environmental approval and the need to improve certainty before the commitment of substantial resources to investigate the orebody, which is predominantly on land the subject of a mining lease application by Tiwest (PER, p1, p9).

Notwithstanding the above, all the data Tiwest has suggests that the vegetation communities within the 220 ha of disturbance are not unique, but conversely, well represented in local conservation reserves. In addition, areas disturbed will not be permanently cleared, but rehabilitated using the best procedures known to, and developed by Tiwest to re-establish similar vegetation communities.

3. *How does Tiwest consider the proposal to be consistent with the Environmental Protection Authority's Preliminary Position Statement on "Environmental Protection of Native Vegetation in WA" (December 1999)?*

The Environmental Protection Authority's Preliminary Position Statement on "Environmental Protection of Native Vegetation in WA" (December 1999) proposes that, in most instances, further clearing in the agricultural region (as defined in the statement) for agricultural purposes is environmentally unacceptable, due to the effect on biodiversity. The impact on biodiversity results from land salinisation and the permanent loss of native vegetation (habitat).

The impact of Tiwest's proposal to mine the 27 200 and 28 000 orebodies on biodiversity was identified as a primary environmental factor by the EPA (PER, Appendix A) and was addressed in Sections 6.1 and 6.4 of the PER. It has been concluded, following review of underlying site specific environmental factors, that implementation of Tiwest's proposal would not significantly affect biodiversity, on the basis that:

1. The maximum area of disturbance of native vegetation is not significant on a local scale. Vegetation types that would be impacted are well represented outside of the mining tenement.

2. There will be no permanent loss of native vegetation. Rehabilitation procedures will be implemented to establish biodiversity typical of surrounding undisturbed areas.

Tiwest's proposal is consistent with the Environmental Protection Authority's Preliminary Position Statement on "Environmental Protection of Native Vegetation in WA" because:

1. The clearing of native vegetation is not for agriculture and is not permanent.
2. There will be no impact on groundwater salinity.
3. There will be no discernible impact on biodiversity in the longer term.

4. *Please provide a breakdown of the area covered by each of the 28 000 orebody and 28 000 overburden dump. Can the 28 000 overburden material be built into the 27 000 overburden dump, or used directly for rehabilitation of the 27 000 deposit?*

As currently proposed, the maximum area disturbed in mining the 28 000 orebody comprises approximately:

35 ha overburden dump
70 ha orebody

10 ha infrastructure (roads, pipeline easements, land based pumping sites) and possible topsoil stockpiles.

As stated in response to Item 2 above, it is possible all or part of the overburden can be used in rehabilitation of the 27 000 South mine void. The detailed mine planning for the 28 000 deposit requires considerable exploration, and is dependent on the existence of a viable orebody and the grant of a mining tenement.

5. *For mining the 28 000 orebody, where would the 132 kV powerline be relocated to?*

Should mining the 28 000 deposit proceed, the 132 kV powerline would be realigned along the eastern boundary of mining tenement ML70/1010. Any realigment would proceed with the agreement of Western Power, as has previously occurred with the relocation of a section of the powerline on mining lease M268SA north of Mullering Farm. Tiwest has had recent discussions with Western Power at that agency's initiation concerning the realignment of the powerline for reasons other than mining. It is possible that the powerline may already have been moved prior to any mining of the 28 000 orebody by Tiwest.

6. *Where will overburden material from the 27 200 deposit be placed?*

Overburden from the 27 200 deposit will be placed in the 27 000 South mine void initially, and later deposited in the mined section of the 27 200 orebody itself.

Declared Rare and Priority Flora/Weeds

7. *The West Midlands area, which includes Tiwest's mining operations, is currently the subject of a detailed botanical assessment by the Department of Conservation and Land Management (CALM) to establish the flora and vegetation of the region. This is required as there is not yet enough information available to determine the local and regional significance of disturbance to the floristically rich plant communities which occur in the area. Many of the plant communities present are not yet adequately represented in conservation reserves. Therefore we do not agree with the*

assessments made and conclusions drawn in Sections 6.1.1 and 6.1.2 of the PER as the flora and vegetation of the region is not characterised well enough to make conclusions such as:

- *'There will be no reduction in species diversity or the geographic distribution of flora species.'*

- *'There will be no significant impact on total populations of Declared Rare Flora (DRF) as a consequence of mining'.*

Detailed botanical surveys undertaken by Tiwest on mining lease M268SA in the areas of the 27 200 and 28 000 orebodies indicate that the vegetation communities likely to be disturbed by mining are well represented elsewhere on the mining lease (ie away from orebodies) and in nearby conservation reserves. The results of Tiwest's surveys, which are undertaken by independent botanists, are forwarded to the Department of Conservation and Land Management and contribute to regional floristic information.

There will be no disturbance to DRF species associated with mining the 27 200 orebody. Mining any viable 28 000 deposit may possibly require disturbance of 9 plants of the DRF species *Andersonia gracilis,* which constitutes 0.03% of the total known population. There is every prospect this species can be established in rehabilitated areas with no net reduction in the total population in the longer term.

No other Declared Rare Flora species have been identified by survey as being unavoidably impacted by mining operations.

8. *Any disturbance to the site should treat Priority flora species with the same level of concern as DRF, even though current legislation does not require this. Many Priority species are upgraded to DRF status once more is known. We congratulate Tiwest on their ongoing research to establish the conservation status of the flora and vegetation communities on the area, however, this must be placed in the context of CALM's overall work on rare plant taxa if it is to be valid.*

When DRF are identified on the mining lease, surveys in local conservation reserves are undertaken to improve knowledge of the abundance and distribution of the particular species. Tiwest applies the same environmental management provisions to Priority flora (PER, p 45). Tiwest's experience is that targeted surveys tend to significantly increase known populations of Priority species. The results of DRF and Priority species surveys are routinely forwarded to the Department of Conservation and Land Management, for inclusion on CALM's databases.

As committed to in the Public Environmental Review (p 46), further surveys for Priority species will be undertaken in conservation reserves near mining lease M268SA in 2000.

9. *A hundred and thirty plants of the DRF Andersonia gracilis will be destroyed by mining. The loss represents 62.6% of the total population on the mining lease and less than 0.3% of the total known population in the wild. Tiwest should make an early application to "take" the DRF pursuant to the Wildlife Conservation Act 1950. (CALM)*

Approval to 'take' 4 *Andersonia gracilis* plants located over the 27 000 South orebody was granted by the Minister for the Environment in January 1999, in response to Tiwest's application dated 4 December 1998 (PER, p46).

Approval to 'take' 126 *Andersonia gracilis* plants located adjacent to the 27 000 South orebody was granted by the Minister for the Environment on 16 November 1999, in response to Tiwest's application dated 21 September 1999.

There will be no requirement to disturb DRF species in the mining of the 27 200 orebody and disturbance of a population of 9 *Andersonia gracilis* plants overlying the potential 28 000 orebody will be dependent on confirmation of a mineable resource. Any application to disturb the population will be made well in advance of disturbance, in line with current practice.

10. *Concern was expressed that populations of DRF will be destroyed under the proposal. Destruction of even small populations of DRF leads to their eventual demise - the "death of a thousand cuts". With respect to Priority species of flora, Tiwest has provided no indication of their occurrence over the orebodies in question, nor of any specific management proposals for Priority species.*

Tiwest has procedures to protect DRF species wherever possible, as summarized on page 45 of the Public Environmental Review. These procedures include, where warranted, investigations into the relocation and propogation of DRF species. Mining the 27 000 South deposit will result in disturbance to 0.4% of the total known population of the DRF species *Andersonia gracilis*. Mining the orebodies the subject of the current proposal (27 200 and 28 000) may result in disturbance to 9 *Andersonia gracilis* plants, or 0.03% of the currently known population. There is every prospect this species can be established in rehabilitated areas with no reduction in the total population in the longer term.

Similar to the approach with DRF, Tiwest undertakes specific surveys for Priority species found on the mining lease in nearby conservation reserves. The list of Priority species that occurs on mining lease M268SA and MLA 70/1010 was presented in Appendix C of the Public Environmental Review. Further surveys for Priority species will be undertaken in conservation reserves in 2000. The results of the surveys will be forwarded to CALM. Specific management measures for any particular priority species will be developed in consultation with CALM, as survey results warrant.

11. *Further flora surveys are needed to confirm impact of the proposal on the overall conservation status of* ***Leucopogon oliganthus***, ***Calytrix drummondii***, ***Lasiopetalum lineare*** *and* ***Dryandra tortifolia*** *so that an assessment of relative impact can be made. It is strongly recommended that Tiwest extend surveys to other Priority taxa that occur within the minesite but are not under immediate threat to assist decisions in relation to such flora as the project proceeds. (CALM)*

Tiwest will undertake specific surveys for the Priority species ***Leucopogon oliganthus***, ***Calytrix drummondii***, ***Lasiopetalum lineare*** and ***Dryandra tortifolia,*** as well as other priority species located on the mining tenements, during 2000.

See also response to Item 10, above.

Rehabilitation and Closure

12. *If site works are to proceed we strongly believe completion criteria should be established to determine the final performance of rehabilitation. This is a process currently being put in place for Alcoa's operations in the Jarrah forest. It is essential that the establishment of these criteria involve public consultation, especially because the final land use of the vacant crown land where the orebodies occur is not yet determined.*

    Tiwest's rehabilitation objective is to achieve over time a stable, self sustaining ecosystem compatible with surrounding undisturbed areas, and with no diminution in land use capability. Notwithstanding seasonal influences, the performance of rehabilitation is largely determined by the rigour and quality of the preparatory steps of rehabilitation, up to the point of seeding. Tiwest has criteria in place that govern the inputs to rehabilitation. The progress of rehabilitated areas is monitored and the results used to improve the inputs for subsequent rehabilitation. Tiwest also monitors undisturbed vegetation to characterise the natural variation that occurs in native ecosystems. This data will become useful in assessing the progress of rehabilitated areas towards compatibility with surrounding undisturbed areas.

    Tiwest would welcome feedback on its rehabilitation criteria defined in the Cooljarloo Environmental Management Programme, the revisions of which are periodically submitted to the Water and Rivers Commission and the Departments of Environmental Protection, Conservation and Land Management and Minerals and Energy.

    Tiwest's rehabilitation criteria aim to reinstate ecosystems with similar form and function to undisturbed areas, thereby preserving the options for land use that existed prior to mining. Tiwest is willing to participate in processes as necessary to define a final land use for areas of unallocated Crown Land within its mining tenements.

13. *The timing for rehabilitation of the 28 000 orebody and overburden dump is not shown in Figure 6.3 of the PER. When will this be progressed?*

    As stated in response to Item 2, Tiwest needs to complete considerable exploratory work to confirm the existence of a viable orebody before detailed mine planning can proceed. The exploratory work is contingent on receipt of a mining tenement to be granted by the Department of Minerals and Energy, subject to the provisions of the *Native Title Act 1993*. There is currently no reliable indication as to when the tenement may be granted.

14. *Unless considered elsewhere, the PER document does not appear to set out a plan of the decommissioning of the mine.*

    The Public Environmental Review describes the detail of rehabilitation measures to be applied to areas disturbed in Tiwest's proposal to mine the 27 200 and possible 28 000 deposits. The current mine life based on existing reserves, will extend around fifteen years beyond the mining of the 27 200 and 28 000 deposits, and consequently mine decommissioning has not been considered as part of this proposal.

Tiwest has committed within its Environmental Management Programme to develop decommissioning plans in consultation with government in the years prior to mine closure.

15. *The current areas of disturbance and dredge pond excavation constitute a very significant rehabilitation liability. Does Tiwest have a contingency fund for the eventuality of early decommissioning? (CALM)*

Tiwest makes financial provision for the rehabilitation of areas as disturbance occurs, based on the current realised cost of rehabilitation, in accordance with standard accounting procedures. This provision account is utilised for rehabilitation expenditure, and would be used in the event of early decommissioning. Tiwest does not maintain a specific contingency fund to provide for premature mine closure.

16. *What will be the final landform and landuse of the project area on closure?*

The final landform will include depressions and elevated areas with maximum slopes of 1:12, that will exceed pre-disturbance slopes but which ensure stability of the rehabilitated landscape. Once revegetated, the rehabilitated areas will blend with surrounding, undisturbed areas.

The area of the 27 200 and 28 000 orebodies is unallocated Crown Land, with no defined pre or post mining land use.

Weeds

17. *Section 6.1.5 (pg 53) discusses management of "Declared Plants" under the Agriculture and Related Resources Protection Act 1976. All environmental weeds, as well as declared weeds, should be managed to achieve weed density levels in the rehabilitation below that occurring prior to mining. Regular weed audits are essential. (CALM)*

Tiwest manages topsoil from areas of native vegetation and pasture separately, to prevent the introduction of weeds to native vegetation. Inspections for weeds are routinely undertaken during flora surveys of native vegetation and rehabilitation areas. Active control of all environmental weed species will be undertaken as necessary to eradicate weed species in areas undergoing rehabilitation.

A programme to control weed outbreaks on Mullering Farm, primarily through spraying or deep burial, is ongoing.

Surface Water Quality

18. *The Water and Rivers Commission recommends that a buffer zone be established on both sides of Mullering Brook to further protect the water quality and ecological function of the watercourse. Fringing vegetation plays an important role in the function of watercourses both as a filter for surface water entering the system and providing shade over the actual watercourse.*

Mining the 27 200 and potential 28 000 deposits will not impact on Mullering Brook, which is 1.5 km north of the orebodies.

The establishment of appropriate fringing, riverine vegetation will form an integral part of Tiwest's re-instatement of the diverted Mullering Brook, and will commence in advance of the redirection of streamflow, to allow for the vegetation to become established.

19. *Given the extreme rainfall events that occurred in 1999, what management measures will be implemented to protect wetlands and drainage systems e.g. Minyulo Brook, south west of the project area, from dieback, silt and pollutants?*

Hygiene measures currently in place to preserve the dieback free status of mining lease M268SA south of Cooljarloo Road will minimise the risk that mining activity will introduce *phytopthora* species to Minyulo Brook, which currently flows through cleared agricultural land south of Tiwest's mining lease.

Tiwest will contain turbid runoff from areas disturbed by mining activity on the mining lease through retention/settling basins and/or the direction of runoff into the dredge pond.

Hydrocarbon storage will remain at the existing workshop facilities on Mullering Farm. Field servicing tanks will be appropriately bunded. Other than biodegradable flocculants used to settle slime tailings, no chemicals will be used in the mining of the 27 200 and possible 28 000 orebodies.

Other Approvals

20. *The Department of Minerals and Energy notes that Tiwest will need to submit a 'Notice of Intent' for State Mining Engineer approval in accordance with the tenement conditions before development commences. It is recommended that Tiwest follow the certified route to expedite the approval process.*

The 27 200 orebody is located on mining lease M268SA, which was issued pursuant to the provisions of the *Mineral Sands (Cooljarloo) Mining and Processing Agreement Act 1988* and does not include a condition requiring the submission of a 'Notice of Intent'.

The potential 28 000 orebody is located predominantly under an area subject to a mining lease application by Tiwest (MLA 70/1010). Tiwest will meet the requirements of conditions expected to be attached to the mining tenement, including the submission of a 'Notice of Intent' to the State Mining Engineer in the event Tiwest elects to mine the orebody.