Extension to Jangardup Heavy Minerals Mine, Change to Environmental Conditions

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Cable Sands (W.A) Pty Ltd

Section 46 Report and Recommendations
of the Environmental Protection Authority

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Summary and recommendations

This report provides the Environmental Protection Authority's (EPA's) advice to the Minister for the Environment on the proposal by Cable Sands (W.A) Pty Ltd (Cable Sands) to:

- extend the approved Jangardup Heavy Minerals Mine into a small part of class 'C' Reserve 44705, Nelson Location 13471 which is adjacent to D'Entrecasteaux National Park; and
- modify the approval relating to the company's mining operations at Jangardup.

Section 46(3) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on whether or not the proposed changes to conditions and procedures should be allowed. 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 this proposal:

(a) Vegetation communities - loss of significant vegetation and dieback effects;

(b) Rehabilitation - success of rehabilitation techniques and re-establishment of Declared Rare and Priority Flora; and

(c) Water Quality - potential for contamination of surface and ground water quality.

Conclusion

The EPA has considered the proposal by Cable Sands to mine about four hectares of class 'C' Reserve 44705, Nelson Location 13471 and has concluded that it can be managed to meet the EPA's objectives for the relevant environmental factors.

The EPA believes that the period since the proposed Jangardup Heavy Minerals mine was originally assessed has not given rise to any significant changes in the environment which would cause the EPA to reconsider its previous assessment of the project and, in particular, its previous recommendation as to the environmental acceptability of the project.

In addition to the request to extend mining operations into adjacent class 'C' Reserve 44705, the EPA considers that the conditions of the environmental approval should be updated, and accordingly has also reported on the changes required.

Recommendations

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

1. That the Minister notes that this report is pursuant to Section 46(3) of *the Environmental Protection Act 1986* and thus is limited to consideration of proposed changes to the original proposal.
2. The Minister notes that the proposed change is to modify the original Jangardup Heavy Minerals Mine proposal by extending its mining operation into part of class 'C' Reserve 44705, Nelson Location 13471.
3. The EPA recommends that the Minister considers the report on the relevant environmental factors as set out in Section 3.
4. That the Minister notes that the EPA has concluded that the modified proposal can be managed to meet the EPA's objectives, and thus not impose an unacceptable impact on the environmental provided there is satisfactory implementation by the proponent of the amended conditions, including the proponent's commitments, as set out in Section 4.
5. The Minister imposes the amended conditions, commitments and procedures recommended in Appendix 5 of this report.

Conditions

Having considered the proponent's commitments and the information provided in this report, the EPA recommends that the following conditions be imposed if the proposal by Cable Sands is approved for implementation:

(a) The existing Environmental Conditions applied to the project (Ministerial Statement 455 published on 23 July 1997), be subject to modifications necessary to:

- extend mining operations into part of class 'C' Reserve 44705, Nelson Location 13471;
- update the consolidated commitments statement; and
- update the statement into current format with the inclusion of new condition 11 to replace procedures 1 and 2 of Statement No. 455.

The amended conditions and amended Consolidated Commitments statement are presented in Appendix 5.

1. Introduction

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 a proposal by Cable Sands to modify the approvals relating to the company's existing mining operations at Jangardup.

The heavy minerals mine at Jangardup has been previously assessed by the Environmental Protection Authority (EPA, 1990) at the level of Environmental Review and Management Programme (ERMP). The Minister for the Environment gave environmental approval for the project, subject to conditions, on 20 July 1990.

In 1997, Cable Sands requested two changes to the Ministerial Conditions for Jangardup. These changes related to:

- increasing the nominated production rate from 271,000 tonnes annually to a maximum of 410,000 tonnes annually; and
- inclusion of a non-substantial change clause in the environmental approval.

The EPA assessed these changes (EPA, 1997), under Section 46(3) of the *Environmental Protection Act* and an amended Environmental Statement No. 455 was published on 23 July 1997.

In 1998, Cable Sands requested a change to Conditions 1 and 10 of Environmental Statement 455, under S46 of the *Environmental Protection Act 1986*, to enable the company to extend their current mining operation into the adjacent class 'C' Reserve. The S46 review document (Cable Sands, 1998) was subject to a four week public review, ending 25 January 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 procedures to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 presents the EPA's Conclusions and Section 6, the EPA's Recommendations.

A list of people and organisations that made submissions is included in Appendix 1 and References are listed in Appendix 2. Environmental Condition Statement 103, published on 20 July 1990 is presented in Appendix 3 and Environmental Condition Statement 455 published on 23 July 1997 is presented in Appendix 4. The recommended conditions and procedures and proponent's commitments are provided in Appendix 5.

Appendix 6 contains a summary of the public submissions and the proponent's response. The summary of public submissions and the proponent's response is included as a matter of information only and do not form part of the EPA's report and recommendations. The EPA has considered issues arising from this process relating to identifying and assessing relevant environmental factors.

2. The proposal

The Jangardup heavy minerals mine is located on the Scott Coastal Plain within the Shire of Nannup approximately 47 kilometres south of Nannup and 7 km from the coast (see Figure 1).

The approved project, as assessed by the EPA is to mine and process a maximum of 410, 000 tonnes of heavy mineral concentrate per year. The concentrate is then trucked from the mine to Bunbury via Black Point Road, Stewart Road and the Vasse and Bussell highways and exported through the port of Bunbury. A more detailed description of the original proposal is contained within the EPA's previous assessments of the proposal (EPA, 1990 & EPA, 1997) and in the ERMP (Martinick & Associates, 1989).

Cable Sands is now seeking to extend its current Jangardup heavy minerals mining operation into a small part of class 'C' Reserve 44705 (see Figure 2). Although class 'C' reserve 44705 occupies an area of 8 ha, the area of direct disturbance will be a maximum of 4 ha. Reserve 44705 was excised from the D'Entrecasteaux National Park and consists of four locations separated by road reserves and Central Forest Block.

The proposed area to be mined is within Nelson Location 13471 and is vested with the National Parks and Nature Conservation Agency (NPNCA) for the purpose of conservation and resource management. This section of the reserve is bounded to the north by private property (Nelson Location 12895), to the east by Central Forest Block and to the south-west by D'Entrecasteaux National Park (Cable Sands, 1998).

The life of the proposed mine extension is for one month only. The mineral resource in the extension area is geologically part of the Jangardup orebody and will be mined using the equipment and techniques currently in use at the Jangardup mine. This involves a cutter wheel dredge feeding a floating wet plant where a heavy mineral concentrate is separated from the unmineralised sands and clays. Dry mining techniques may be used to supplement feed to the wet plant.

Table 1 summarises the key project characteristics of the approved project and proposed extension. A detailed description of the proposal is provided in Section 2 of the Section 46 document entitled "Extension to Jangardup Heavy Minerals Mine" (Cable Sands, 1998).

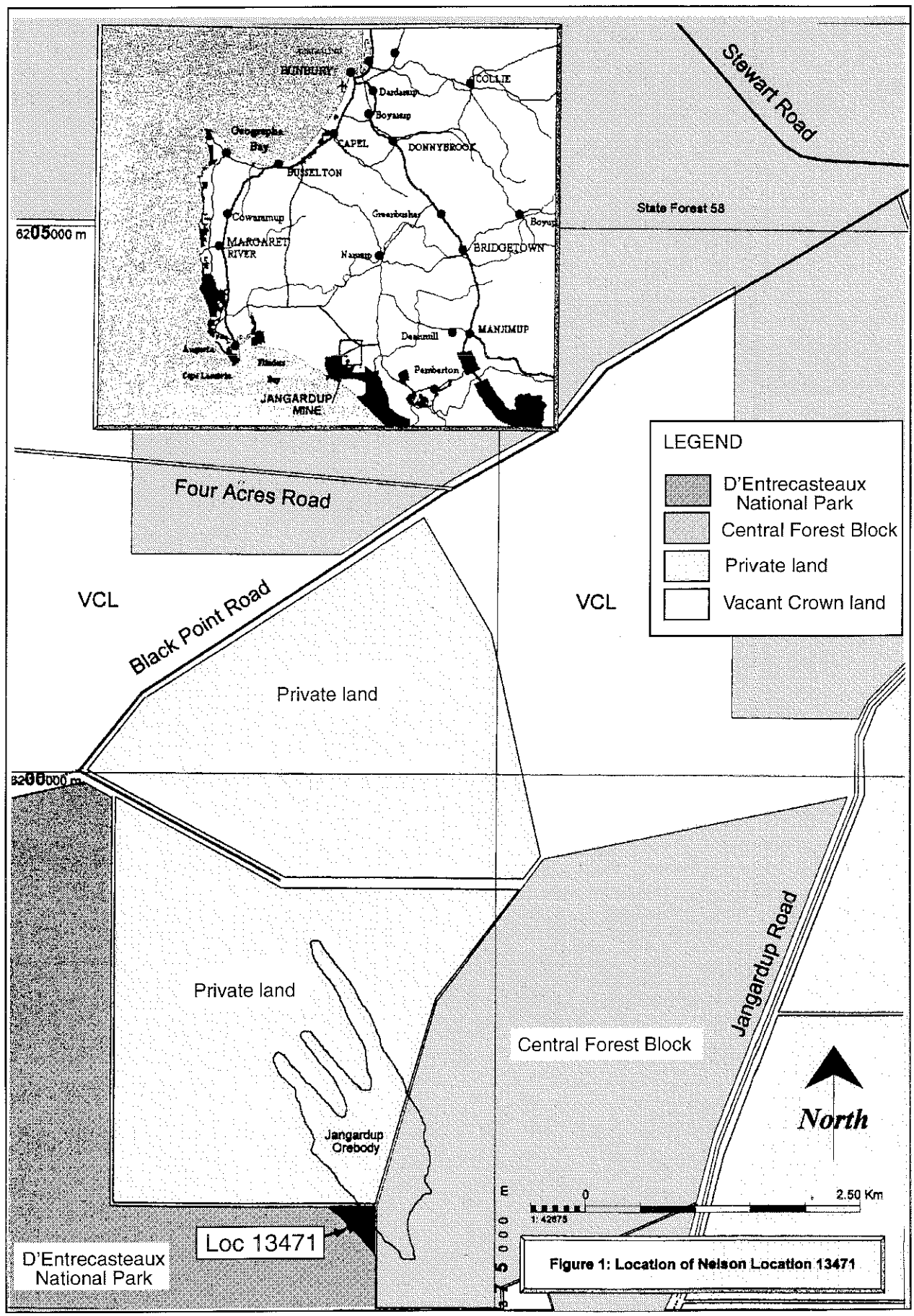

Figure 1. Location Nelson Location 13471 (Source: Cable Sands, 1998).

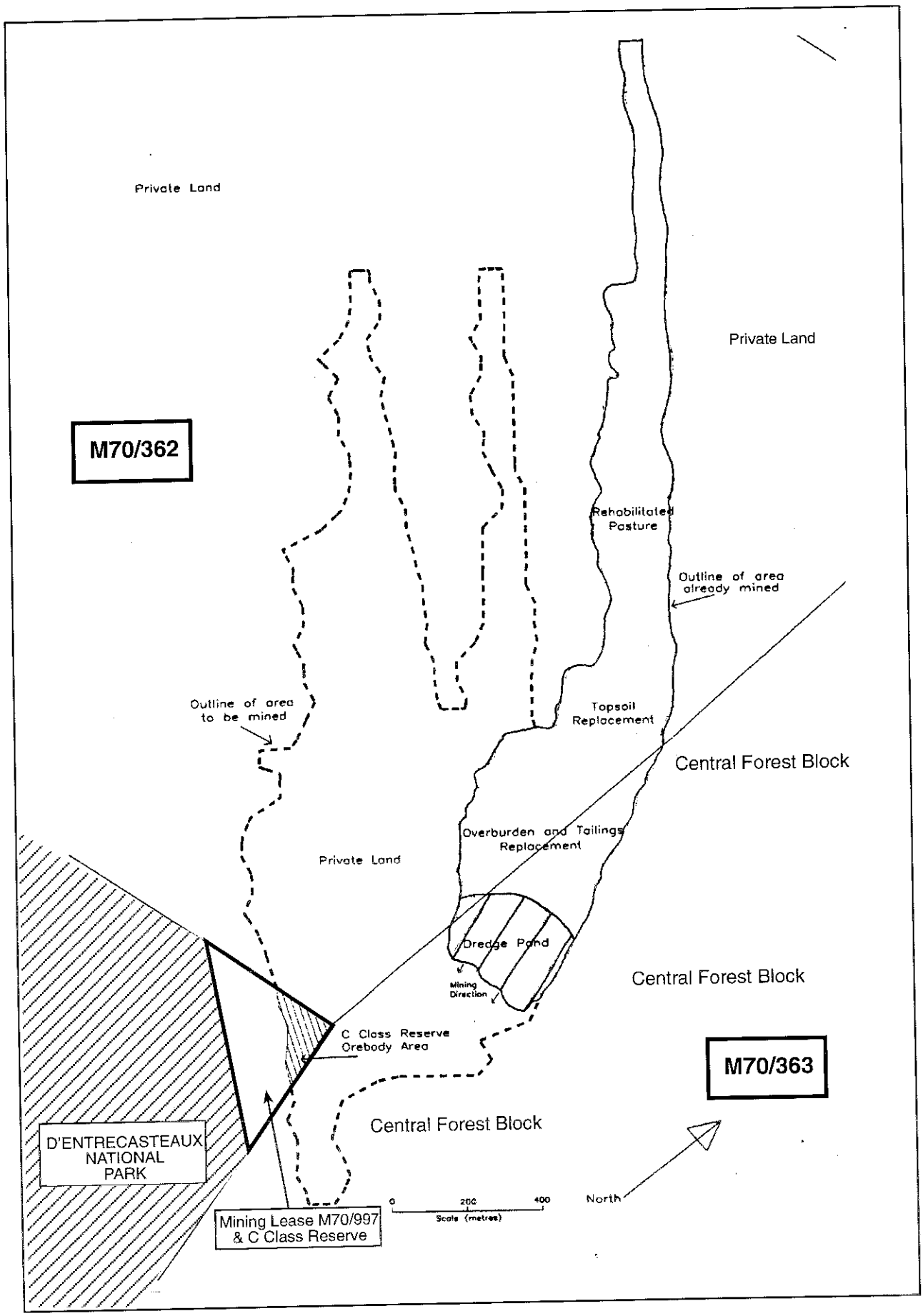

Figure 2. Jangardup mine and extension (Source: Cable Sands, 1998).

Table 1: Summary of proposed project extension.

Project characteristic	Current approved project	Proposed extension
Life of project (mine production)	99 months	1 month
Orebody (tonnes heavy mineral concentrate)	2,100,000	20,000
Depth of mining	20 metres	Approximately 15 metres
Area of disturbance (ha)	250	4
Typical mine operation	7 days per week (24hr per day)	7 days per week (24hr per day)
Major components	Dredge mining of orebody with some dry mining. Slime dams, water dam, wet treatment plant, thickener, concentrate towers, workshops, offices, access roads and substation. Rehabilitation following mining to pasture and State Forest.	Development restricted to ore body area. Rehabilitation of mined area back to acceptable native vegetation standards to allow Nelson Location 13471 to be incorporated in the D'Entrecasteaux National Park at a later date. No major infrastructure located on the reserve.
Mining rate (tpa heavy mineral concentrate)	286,000	286,000
Max mining rate (tpa heavy mineral concentrate)	410,000	410,000
Water supply: • source • annual requirement (ML)	Bore into Yarragadee 803	Bore into Yarragadee 803

3. Relevant environmental factors

Section 46(3) of the *Environmental Protection Act 1986* requires the EPA to report on whether or not the conditions or procedures should be changed. In addition, the EPA may make recommendations as it sees fit.

Having considered appropriate references, public and government submissions and the proponent's response to submissions, it is the EPA's opinion that its inquiry into the proposed modification to extend mining operations into class 'C' Reserve 44705, Nelson Location 13471 should address the following relevant factors:

(a) Vegetation communities;

(b) Rehabilitation;

(c) Declared Rare and Priority flora;

(d) Surface water quality; and

(e) Groundwater quality.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the S46 document and the submissions received, in conjunction with the proposal characteristics (including significance of the potential impacts), the adequacy of the proponent's response and commitments, and the effectiveness of current management. On this basis, the EPA considers that fauna, Specially protected (Threatened) and priority fauna, surface water quantity, landform, particulates/ dust, noise, greenhouse gases, heritage, aesthetic and recreation do not require further evaluation by the EPA.

The relevant environmental factors can be broadly grouped and assessed in relation to three significant environmental issues arising from the proposal. The relationship between the relevant environmental factors and environmental issues arising from the proposal is shown in Table 2.

Table 2: The relationship between the relevant environmental factors and environmental issues arising from the proposal.

Issue	Relevant Factor
Vegetation Communities	Vegetation Communities
Rehabilitation	Rehabilitation Declared Rare and Priority Flora
Water Quality	Surface water quality Groundwater quality

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

The environmental significance of the above issues of the proposal and their assessment are discussed in Sections 3.1 to 3.3 of this report. The description of each issue shows how it relates to the project. The assessment of each issue, combined with the consideration of the environmental factors relevant to it, is where the EPA considers if the proposal can be managed to meet its environmental objectives.

A summary of the EPA's assessment is presented in Table 4.

3.1 Vegetation communities

Description

The predominant vegetation on the gently sloping sandplains and flats of the Jangardup extension area is low scrub and heath over sedges up to 0.5m in height, with patches of taller shrubs forming tall scrub and thickets in seasonally moist depressions. There are scattered emergent trees, usually Jarrah and the Western Australian Christmas Tree (*Nutysia floribunda*) up to four metres in height, with Blackbutt (*Eucalyptus patens*), Bullich (*Eucalyptus megacarpa*), Paperbark (*Melaleuca pressiana*) and Swamp Banksia (*Banksia littoralis*) in wetter depressions (Cable Sands, 1998).

The proposed extension area was searched for rare, threatened or conservation priority listed flora in 1992-1993 and again in January 1998. The survey confirmed the presence of *Astartea sp 'Scott River'* and *Melaleuca basicephala*, which are Priority four species. *Grevillea papillosa*, a Priority Three species, is known to occur in adjacent vegetation to the west, but was not sighted within the project area (Cable Sands, 1998).

The Jangardup mine site, extension area and surrounding D'Entrecasteaux National Park and State Forest are infected with fungal root pathogens which cause jarrah dieback disease (*Phytopthora* species) (Cable Sands, 1998; EPA, 1990).

Table 3: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
BIOPHYSICAL			

Vegetation communities	The proposal will result in the loss of 4 hectares of native vegetation.	**Public**:
		• Submissions focussed on:
		  • dieback hygiene monitoring procedures;
		  • dieback management ;
		  • re-establishment of species using translocation techniques;
		  • loss of biodiversity; and
		  • cumulative impact of vegetation loss from Cable Sands' leases.
			'Vegetation communities' is considered to be a relevant factor.

Declared Rare and Priority Flora	Area of direct disturbance is 4ha. Two priority 4 species *Astartea sp 'Scott River'* and *Melaleuca basicephala* present in extension area.	**Public**: • One submission highlighted the fact that the mining process will involve the clearing of two priority 4 species, *Melaleuca basicephala* and *Astartea* sp *Scott River* and potentially a priority 3 species, *Grevillea papillosa*. Concern was raised in relation to the proponent's ability to rehabilitate these species. **DEP**: The DEP notes that: • Cable Sands carried out a survey for rare, threatened and conservation listed flora during 1992-1993 (which included the extension area), and that a follow-up survey was undertaken in January 1998; • the proponent has committed to developing and implementing a Mining and Restoration Plan (MRP) for the Jangardup Extension (new commitments 20 and 21). This plan will be developed prior to mining the extension area and is to the requirements of DEP and CALM. This plan will address translocation of priority flora and the protection of these species by reseeding or planting of seedlings during rehabilitation. Management of priority species will be included within the MRP; and • the proponent is required to comply with the Conservation and Land Management Act and the *Wildlife Conservation Act* 1950.	'Declared Rare and Priority Flora' is considered to be a relevant factor. This factor, however will be addressed under the issue of rehabilitation.

Table 3: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Fauna	Clearing (4ha) will reduce fauna habitat in the short term.	**DEP:** The DEP notes that: • the proponent has committed to create a range of habitat types as part of the rehabilitation process (existing commitment P10), and that this will be addressed in the Mining and Restoration Plan for the Jangardup Extension (new commitment 20); • clearing will be restricted to the minimum practical area and that this will be specified in the Mining and Restoration Plan; and • extensive habitat exists in adjoining National Park and Forest blocks.	Factor does not require further EPA evaluation as proponent commitments are considered adequate.
Specially Protected (Threatened) and Priority Fauna	Clearing (4ha) will reduce fauna habitat in the short term.	**Public:** • The loss of habitat would significantly impact on the Southern brown Bandicoot. **DEP:** The DEP notes that: • the area of direct disturbance is small, extensive habitat is available in the adjoining D'Entrecasteaux National Park, and that the temporary loss of 4ha is unlikely to impact on populations of this species; and • the proponent has committed to create a range of habitat types as part of the rehabilitation process (existing commitment P10) and that this will be addressed in the Mining and Restoration Plan for the Jangardup Extension (new commitment P20). The proponent has also committed to restricting clearing to the minimum practical area and this will also be addressed in the Mining and Restoration Plan.	Factor does not require further EPA evaluation as there is a small temporary loss of habitat. Long term implications will be addressed under the issue of rehabilitation.

Table 3: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Surface water quantity	Through mining operations there may be a possible reduction in the quantity of surface water available to vegetation adjacent to the mining operation.	**DEP:** The DEP notes that: • existing Condition 3 (which ensures that any effect of the mining operation on the vegetation or groundwater quality or levels will be managed effectively and that action will be taken if monitoring reveals any harmful changes to the water regimes in the area) will apply to the Jangardup Extension; and • the proponent has made new commitments (P18 and 19) to regularly monitor surface water flows from all Jangardup leases and undertake remedial action if results indicate unacceptable deterioration in surface water quality.	Factor does not require further EPA evaluation as proponent commitments are considered adequate.
Landform	Clearing of vegetation and mining to -20m below the surface.	**DEP:** The DEP notes that: • the Jangardup area is part of the Scott Coastal Plain and generally has very subdued (flat) topography typical of the plain. The extension area is part of the flat plain immediately west of the forested basalt ridge; • the mined area will be restored to landforms compatible with the adjoining unmined areas to the south and west and with the areas to be mined and restored to the north and east; and • the proponent has committed (new commitments 20 and 21) to prepare and implement a Mining and Restoration Plan which will include making reconstructed land consistent with adjoining unmined areas.	Factor does not require further EPA evaluation as proponent commitments are considered adequate.

Table 3: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Rehabilitation	Area of direct disturbance is 4ha.	**DME**: • The mining proposal should not have any deleterious effects on the 5g Reserve 44705 or on the adjacent D'Entrecasteaux National Park. Dredge mining has limited external impacts outside of the immediate mining area. **CALM**: • The proposed Mining and Restoration Plan will need to address completion criteria, weed management and monitoring of rehabilitation success. • The translocation and storage of sedge and heath plants with topsoil is considered as an appropriate methodology to restore some of the species which are more difficult to rehabilitate. This technique shows some promise. The major constraint is the availability of adequate areas for storage that are reasonably isolated from weed contamination. In the interests of enhancing rehabilitation outcomes, every effort should be made to utilise this technique, including direct transfer of material to suitable areas ready for rehabilitation in central Block and/or storage on the private property after the pasture grass topsoil has been stripped for some distance. This needs to be addressed in the Mining and Restoration Plan. **DEP**: • This 4ha area represents an opportunity to demonstrate rehabilitation of native vegetation in this environment and rehabilitation should be pursued as soon as possible, consistent with CALM's comments. **Public:** • Cable Sands has no experience, no examples and no expertise in rehabilitating native vegetation to National Park status.	Rehabilitation is considered to be a relevant environmental factor.

Table 3: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
POLLUTION			
Particulates/Dust	Mining of the extension area adjoins existing sand mining operation. Mining activities may generate dust.	**DEP** The DEP notes that: • there should be no significant change to the dust generation and management through mining of the extension area; • the current Pollution Control Licence Conditions relating specifically to dust will apply to the Jangardup Extension area. These conditions specify management and limits to dust generation; and • proponent commitment 12 will apply to the Jangardup Extension requiring the proponent to keep dust levels below the standards currently set for the mining industry.	Factor does not require further EPA evaluation as existing licence conditions can manage the issue.
Noise	Mining activities may generate noise and vibration. Jangardup Extension is no closer to noise sensitive premises.	**DEP** DEP notes that: • the current Pollution Control Licence Condition N1 will apply to the Jangardup Extension which requires the proponent to maintain plant components in a manner so as to minimise the generation of noise; and • proponent commitment 12 will apply to the Jangardup Extension requiring the proponent to keep noise levels below the standards currently set for the mining industry.	Factor does not require further EPA evaluation as existing licence conditions can manage the issue.
Greenhouse gases	Anticipated emissions of carbon dioxide is estimated to be 1.3kt based on diesel fuel consumption during a mining period of 1 month.	**DEP**: • The small amount of greenhouse gases that will be released does not require special management.	Factor does not require further EPA evaluation as the effect is minor.
Groundwater quality	Potential impact on groundwater quality through changes in physical or chemical characteristics (for example the oxidation of pyrite).	**Public**: • Points made in submissions focused on contamination of surface or groundwater by iron, aluminium, manganese, or other heavy metals which may arise from the disturbance of acid sulfate soils.	Groundwater quality is considered to be a relevant factor and is discussed under the issue of water quality.

Table 3: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Surface water quality	Potential impact on surface water quality through changes in physical or chemical characteristics (for example the oxidation of pyrite).	**Public:** • Submissions focused on the issue of acid sulfate soils within the Jangardup Extension area. Concern was expressed that the proponent had not identified the occurrence of acid sulfate soils in the area or environmental management measures to deal with the potential disturbance of acid sulfate soils. • Other comments were made in relation to the availability of referenced documents in relation to water quality, and management strategies for increased surface water flow from rehabilitated areas of the extension area to the adjacent areas of Reserve and National Park. **DEP:** • Pollution Control Licence specifies monitoring, analysis and reporting of surface water samples from the mining operation. This condition will apply to the extension.	Surface water quality is considered to be a relevant factor and is discussed under the issue of water quality.
SOCIAL SURROUNDINGS			
Aboriginal culture and heritage	Through construction there may be impact on sites of cultural significance.	**Aboriginal Affairs Department:** • The proponent has made a commitment to undertake an Aboriginal Heritage survey prior to mining in the extension area. Once this has been completed and a copy of the report has been lodged with the Aboriginal Affairs Department (AAD), the proponent will have addressed the AAD's concerns with the development. If it is found that sites will be impacted by the development, the proponent will need to submit a section 18 application under the *Aboriginal Heritage Act.* **DEP:** • The DEP notes that the proponent has made a new commitment (P22) to undertake anthropological and archaeological investigations, for the extension, prior to mining.	Factor does not require further EPA evaluation as project commitments and other legislative requirements can manage the issue.
Aesthetic values	Jangardup mine is located at the end of a sealed section of road that is used solely to service the operating mine.	**DEP:** • Site is a small area contiguous with existing mining operations.	Factor does not require further EPA evaluation because the impact is minor.

Table 3: Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Recreation values	Potential for impact on D'Entrecasteaux National Park.	**DME:** • Mining should not have any deleterious effects on the adjacent D'Entrecasteaux National Park. **DEP:** • Recreational activities in the Jangardup area are largely concentrated around Lake Jasper and Black Point. Recreational activities include off-road vehicle use, camping, horse riding, bushwalking , boating and marroning. These activities will not be impacted on by the Jangardup extension.	Factor does not require further EPA evaluation because the impact is minor.

Table 4: Summary of Assessment of Relevant Factors

RELEVANT ISSUE	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
BIOPHYSICAL				
Vegetation communities	Nelson Location 13471 which forms part of Reserve 44705.	To maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	The EPA notes: • current Ministerial Conditions and Commitments will apply to the extension area; • the predominant vegetation on the gently sloping sandplains and flats of the extension area is low scrub and heath over sedges up to 0.5m in height, with patches of taller shrubs forming tall scrub and thickets in seasonally moist depressions; • there are large areas (>20% of pre-European distribution) of the Scott vegetation complex which are formally reserved, including areas of D'Entrecasteaux National Park; and • the Jangardup area is heavily dieback infected. The proponent has made a commitment to: • develop and implement a Mining and Restoration plan for the Jangardup extension area. (new commitments 20 and 21). This plan will include clearing restrictions, landform restoration, dieback management, vegetation re-establishment, weed management, completion criteria and monitoring of rehabilitation success to the requirements of the DEP and CALM.	Having particular regard to: • the small area involved (4ha); • secure representation of the same communities in the D'Entrecasteaux National Park; • the preparation and implementation of a Mining and Restoration Plan for the Jangardup Extension area; • the proponents' new commitments; and • existing conditions and commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives for vegetation communities.
Rehabilitation	Nelson Location 13471 which forms part of Reserve 44705.	To ensure proposal area is rehabilitated to a standard consistent with the intended post mining long term land use.	The EPA notes that: • current Ministerial Conditions and Commitments will apply to the Jangardup Extension; and • the proponent has made new commitments to prepare and implement a Mining and Restoration Plan for the Jangardup Extension, to the requirements of the DEP, CALM and DME. The plan will include completion criteria, weed management, monitoring of rehabilitation success, dieback management, clearing restrictions, landform restoration and vegetation re-establishment (Commitments 20 and 21).	Having particular regard to: • the small area involved (4ha); • the preparation and implementation of a Mining and Restoration Plan for the Jangardup Extension area; • the proponents new commitments; and • existing conditions and commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives for

Table 4: Summary of Assessment of Relevant Factors

RELEVANT ISSUE	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
				rehabilitation.
POLLUTION				
Water quality	Surface and groundwater hydrology of Jangardup, including soils.	To maintain or improve the quality of surface water and groundwater to ensure that existing and potential uses, including ecosystem maintenance, are protected consistent with the draft WA Guidelines for Fresh and Marine Waters.	The EPA notes that: • current Ministerial Conditions and Commitments will apply to the Jangardup Extension; • the proponent has made a new commitment to regularly monitor surface water flows from all Jangardup leases (commitment 18); • the proponent has made a new commitment to take appropriate action, in consultation with the DEP and WRC, should any results indicate an unacceptable deterioration in surface water quality (commitment 19); and • soil testing in the extension area has indicated that total sulphur levels average 0.02%, which are below the action trigger specified in the Acid Sulfate Soil Manual produced by the NSW Acid Sulfate Soil Management Advisory Committee in August 1998.	Having particular regard to: • the extension area is geologically part of the Jangardup orebody which is being mined without problems; • low levels of pyrite being found in the Jangardup Extension area; • total sulphur levels in the Jangardup Extension average 0.02% which is below the action criteria trigger; and • existing conditions and commitments; it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives for water quality.

Agency and public comments

Submissions expressed concern in relation to the issue of dieback and highlighted the need for dieback hygiene monitoring procedures and dieback management. Submissions also focused on loss of biodiversity, regional representation, and the cumulative loss of vegetation from Cable Sands' leases.

Assessment

The area considered for assessment of this factor is Nelson Location 13471 which forms part of Reserve 44705. The area that will be directly disturbed is 4ha. The Scott vegetation complex provides regional context.

As part of the original Jangardup proposal, and in accordance with Condition 5 of the Minister's Statement No. 103, Cable Sands has developed a vegetation monitoring programme to ensure that there are no significant detrimental effects from the mining operation on the vegetation within adjacent National Park, State Forest and private lands.

This programme involved establishing monitoring plots for the five main vegetation types potentially affected. Cable Sands has indicated that the proposed extension is the closest point that mining will approach two of the plots established to determine mining impacts and that any impact from mining the extension will be detected through the vegetation monitoring programme.

In addition to this, the EPA notes that Condition 5, which will apply to the extension area, requires the proponent to report any adverse impacts on vegetation to the EPA, together with a plan of remedial action.

The EPA notes that results of monitoring to date have indicated that the passage of the dredging operation is not having a significant impact on the adjacent vegetation (Cable Sands, 1998).

With regard to regional representation of vegetation communities, the EPA notes that the Jangardup area was included in a recent review of vegetation complexes undertaken as part of the Regional Forest Agreement process. The Jangardup extension area was mapped as part of the Scott vegetation complex which extends east of the Donnelly River to just east of Augusta. The review indicated that there are large areas (>20% of pre-European distribution) of the Scott vegetation complex which are formally reserved in areas including D'Entrecasteaux National Park, which occupies a total area of 118,000ha (Cable Sands, 1998).

Accordingly, the EPA considers that the Scott vegetation complex is adequately reserved and that the clearing of the extension area will be insignificant in terms of regional representation of this vegetation complex. It is also noted that whilst 4ha of vegetation will be cleared, the area will subsequently be rehabilitated.

In relation to dieback, the EPA in its assessment of 1990 recognised that dieback disease was widespread in the low lying areas of the National Park and State Forest. The EPA also recognised that disease impact outside the mine would only significantly increase if there was direct transfer of disease into uninfected rises, or if the infective season was extended by extra runoff keeping the soil moist into the warmer part of the year. Accordingly, the EPA recommended that dieback control prescriptions be developed by the proponent in consultation with CALM.

Cable Sands, in keeping with the EPA's recommendation and subsequent Environmental Condition (Condition 4), prepared a dieback hygiene programme for the Jangardup operations. This plan is currently being implemented.

With regard to the Jangardup extension, this area is also dieback-infected and will therefore be subject to dieback hygiene procedures currently in place for the Jangardup minesite. These procedures aim to prevent the spread of infected soil from the mining area to areas off-site by making sure:

- earthmoving equipment enters and leaves the site in a clean condition;
- vehicle movements are restricted to reduce off-road use; and
- unauthorised access into the D'Entrecasteaux National Park is prevented from the minesite.

Commitments

The proponent has made a new commitment to prepare and implement a Mining and Restoration Plan for the Jangardup extension area. This plan will include clearing, landform restoration, dieback management, vegetation re-establishment, weed management, completion criteria and monitoring of rehabilitation success, to the requirements of the Department of Environmental Protection (DEP), Department of Conservation and Land Management (CALM), and Department of Minerals and Energy (DME).

Relevant environmental factor

Relevant factor	EPA objective
Vegetation communities	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities

Having particular regard to the:

(a) small area involved (4ha);

(b) secure representation of the same communities in the D'Entrecasteaux National Park;

(c) preparation and implementation of a Mining and Restoration Plan for the Jangardup Extension area (new commitments 20 and 21); and

(d) existing conditions,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for vegetation communities.

3.2 Rehabilitation

Description

The maximum area to be directly disturbed is 4ha. Cable Sands, however, has indicated that direct disturbance may be less as the orebody only covers 2ha of the extension area.

Rehabilitation will involve seed collection; storage of habitat logs and translocated vegetation, topsoil stripping and storage; subsoil stripping and storage; overburden stripping; recontouring following mining using tailings, fines and/or overburden; replacing of subsoil; replacing topsoil; seeding, seedling planting, return of translocated material and habitat logs; and ongoing maintenance of the rehabilitated area.

Most of the vegetation contained within the Jangardup extension is low scrub, heath and sedgeland. There are scattered emergent trees, usually Jarrah and *Nutysia floribunda* up to four metres in height, with Blackbutt (*Eucalyptus patens*), Bullich (*Eucalyptus megacarpa*), Paper bark (*Melaleuca pressiana*) and Swamp Banksia (*Banksia littoralis*) in wetter depressions.

Plants from the range of species currently present will be re-established following mining (Cable Sands, 1998).

Agency and Public comments

DME in its submission on the proposal indicated that:

- the mining proposal should not have any deleterious effects on the 5g Reserve 44705 or on the adjacent D'Entrecasteaux National Park. Dredge mining has limited external impacts outside of the immediate mining area.

CALM in its submission indicated:

- the proposed Mining and Restoration Plan will need to address completion criteria, weed management and monitoring of rehabilitation success; and
- the translocation and storage of sedge and heath plants with topsoil is considered as an appropriate methodology to restore some of the more difficult to rehabilitate species. This technique shows some promise. The major constraint is the availability of adequate areas for storage that are reasonably isolated from weed contamination. In the interests of enhancing rehabilitation outcomes, every effort should be made to utilise this technique, including direct transfer of material to suitable areas ready for rehabilitation in central Block and/or storage on the private property after the pasture grass topsoil has been stripped for some distance. This needs to be addressed in the Mining and Restoration Plan.

The public raised issues regarding the re-establishment of species using translocation techniques and Cable Sands ability to rehabilitate native vegetation to National Park status.

Assessment

The area considered for assessment of this factor is Nelson location 13471, which forms part of class 'C' Reserve 44705.

In accordance with Conditions 5 and 6 of the Minister's statement No. 103, and proponent's commitments 4, 6, 9, 10 and 14, the EPA notes that Cable Sands has a comprehensive rehabilitation programme for the current Jangardup minesite.

However, it is also noted that in relation to the Jangardup extension, Cable Sands has made a new commitment to prepare and implement a Mining and Restoration Plan (MRP). This plan will pertain specifically to the extension area and include clearing, landform restoration, dieback management, vegetation re-establishment, weed management, completion criteria and monitoring of rehabilitation success.

The EPA notes that in response to CALM's submission, this commitment was amended to include completion criteria, weed management and monitoring of rehabilitation success and that the plan will be developed in consultation with CALM.

The EPA also notes that Cable Sands has advised (Cable Sands, 1999) that:

1. Completion criteria will address:

    - overstorey vegetation in terms of seedling survival, pre-mining densities and re-establishing species present in the extension area, for example *Nuytsia floribunda* and *Melaleuca preissiana*; and
    - understorey vegetation in terms of re-establishing low scrub, heath or sedgeland using the translocation technique wherever practical, and re-establishing vegetation at minimum densities of 15 perennial plants per $100m^2$ with a minimum projected foliage cover of 60%.

2. Weed management techniques will include:

- no spreading or stockpiling of topsoil from the Jangardup Extension on adjacent farmland prior to re-spreading;
- no topsoil from previously pastured mined areas being used for rehabilitation of the Jangardup Extension; and
- monitoring rehabilitated areas regularly for weeds, with weed control implemented where required.

3. Rehabilitation monitoring will include:

- monitoring of vegetation on and adjacent to rehabilitated areas of the Jangardup extension as part of the ongoing vegetation monitoring in adjacent areas;
- quantitative assessment of species abundance and density using 50m transects and $20m^2$ plots;
- modifying rehabilitation monitoring, if necessary, to give a more accurate assessment of rehabilitation success in relation to developed completion criteria; and
- identifying measures of rehabilitation success, for example development of a final landform that is non-eroding and compatible with the surrounding environment.

In addition to the above, the EPA notes that the MRP will:

- address the need to maximise the success of the translocation techniques for re-establishment of sedge, heath plants and priority flora; and
- indicate appropriate methods for the transfer and storage of these plants prior to their return to the minesite;

It is also expected that through the development of the MRP, Cable Sands will address species diversity and ecosystem function criteria such as maintaining the soil profile and incorporating slimes into the soil.

With regard to Priority Flora, the EPA notes that for the two Priority 4 species Cable Sands (1999) has indicated that where these species have to be removed, they will be identified by a qualified botanist, prior to clearing, and be targeted for translocation. The EPA also notes that the management of the priority species will be included within the MRP and that the proponent will be required to comply with the *Wildlife Conservation Act 1950.*

In terms of rehabilitation undertaken to date by Cable Sands, the EPA notes that although Cable Sands has rehabilitated native vegetation at Minninup Beach (a coastal environment), the company has limited experience in rehabilitating native vegetation in an area intended to be incorporated in the D'Entrecasteaux National Park at a later date.

The EPA notes that at the time of the excision of Nelson Location 13471 from D'Entrecasteaux National Park, the Minister for Mines indicated in Parliament that it was the Government's intention that the mined portion be revegetated to acceptable native vegetation standards which will allow this location to be incorporated into the D'Entrecasteaux National Park at a later date.

The EPA expects that the proponent's commitment to rehabilitation in the MRP will have this as one of its primary objectives.

It is considered that the 4ha area that will be disturbed represents an opportunity for Cable Sands to demonstrate rehabilitation of native vegetation in this environment. This should be pursued as soon as possible, consistent with CALM's comments.

As such it is noted, that Cable Sands is undertaking:

- native seed trials (viability and germinability in response to smoking treatment) to maximise the success for seedling recruitment during rehabilitation;

- translocation trials to test the suitability of the translocation and storage method for rehabilitating difficult species; and
- vegetation surveys and monitoring.

Commitments

The EPA notes that Cable Sands has made a new commitment to prepare and implement a MRP for the Jangardup extension.

This commitment is designed to ensure appropriate management of operations by detailing clearing, landform restoration, dieback management, vegetation re-establishment, weed management, completion criteria and monitoring of rehabilitation success in a MRP.

Relevant environmental factor

Relevant factor	EPA objective
Rehabilitation	• To ensure 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.
Declared Rare and Priority flora	• To protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950.

Having particular regard to the:

(a) small area involved (4ha);

(b) preparation and implementation of a Mining and Restoration Plan for the Jangardup Extension area (new commitments 20 and 21); and

(c) existing conditions and commitments,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives.

3.3 Water quality

Description

At Jangardup, the superficial aquifer comprising Quaternary and Pleistocene sediments, between 20m and 40m thick, overlies the Yarragadee Formation. This layer can be sub-divided into upper and lower superficial layers separated by ferrugenised sand or "coffee rock", usually present at depths of 2 -5m below surface (Cable Sands, 1998).

The Yarragadee Formation is a major regional aquifer which extends over a large area in the south of the Bunbury trough. This aquifer is hydraulically separated from the superficial formation (Cable Sands, 1998).

The Jangardup mineral sands deposit occurs on the sandy Scott River coastal plain, much of which is inundated in winter (EPA, 1990). Drainage is generally south-westerly towards D'Entrecasteaux National Park, either by direct infiltration and groundwater flow or via poorly defined channels and direct runoff. Superficial groundwater appears above the surface in winter and on average 1.5 metres lower in summer. There appears to be natural downward leakage from the aquifer in the surface sand to the formations below but this is slowed by the coffee rock layer, resulting in surface flooding in winter and lateral flow down gradient to the south west (EPA, 1990).

Agency and public comments

Concern raised in submissions focused on the issue of acid sulfate soils within the Jangardup extension area. Concern was expressed that the proponent had not identified the occurrence of acid sulfate soils in the area or environmental management measures to deal with the potential disturbance of acid sulfate soils.

Other comments made related to:

- the potential for contamination of surface or groundwater by iron, aluminium, manganese, or other heavy metals which may arise from the disturbance of acid sulfate soils;
- the availability of referenced documents in relation to water quality; and
- management strategies for increased surface water flow from rehabilitated areas of the extension area to the adjacent areas of Reserve and National Park.

Assessment

The area considered for assessment of this factor is the surface and groundwater hydrology of Jangardup and the soils of the area.

With regard to current mining operations at Jangardup, the EPA notes that, during mining, water that accumulates on the surface of the mining area is directed into the process water circuit. The process water circuit circulates water between the dredge pond, the storage dam and the processing plant via the thickener. The current mining operation only discharges water as clean decant or pump water from fines dams and this occurs largely in winter when rainwater collecting in these dams contributes to the total discharge volume. The water is directed onto the farmland where it ponds in depressions. Where this water can be reused in the process, it is directed into the process water circuit. This management will also apply to the mining within the extension area (Cable Sands, 1998).

Monitoring of surface water quality in areas surrounding the mine has been undertaken since mining commenced at Jangardup. Measurement of surface waters (for pH, sulfate, iron, manganese, suspended solids and dissolved solids) at points of water flow adjacent to the minesite has been undertaken to determine changes in surface water quality. Cable Sands (1998) has indicated that no impacts on water quality adjacent to the minesite have been observed to date.

The primary issue with respect to water quality at Jangardup is the potential oxidation of pyrite. Acid sulfate soil is the common name given to sediment and soil containing iron sulfides. The exposure of pyrite in these soils to oxygen by drainage or excavation, leads to the generation of sulfuric acid, which can dissolve minerals in clay and release toxic concentrations of aluminium, iron or other metals into waterbodies. Drainage waters from areas of acid sulfate soils will affect water quality and can lead to the death or disease of aquatic organisms (NSW EPA, 1997).

The issue of acid sulfate soils was raised by the DEP and the public as part of the assessment process. As a consequence Cable Sands was asked to identify the occurrence of acid sulfate soils within the extension area in their response to submissions.

Accordingly, the EPA notes that Cable Sands undertook soil testing within the extension area. It is noted that pyrite levels in the soil profile indicated that total sulphur (pyritic and non-pyritic sulphur) levels in the Jangardup extension averaged 0.02% and that this is below the action criteria trigger specified in the 'Acid Sulfate Soil Manual' produced by the NSW Acid Sulfate Soil Management Advisory Committee in August 1988. The action criteria given in that document is 0.03% oxidisable sulphur (Cable Sands, 1999).

The EPA also notes the different geological setting of Jangardup orebody compared with the Beenup orebody. The former represents an old shoreline whereas the Beenup orebody was formed within an estuarine environment leading to a higher potential for acid forming materials to be present.

In terms of management, Cable Sands (1999) has indicated that current mining operations are appropriate to handle the low levels of sulphur found in the Jangardup extension and that monitoring of surface waters in the area will continue. In addition, Cable Sands has also indicated that given the low level of sulphur in the extension area, any decrease in pH or metal contamination of water is not expected and that continued monitoring of process water circuit will provide an early indication of changes in water quality. In any event, the small area of the extension is unlikely to make a material difference to water quality in the context of the existing operation.

The EPA notes that the existing Pollution Control Licence specifies monitoring, analyses and reporting of surface water samples from the mining operation, and that this licence will be expanded to include the Jangardup extension area. In addition, the proponent has made a new commitment to monitor surface water flows from all Jangardup leases.

With regard to groundwater, the EPA notes the findings of a recent investigation undertaken by CSIRO Land and Water (1999) to determine the hydrological impacts of mining at Jangardup. These findings indicate that:

- the local groundwater gradient from the north-east to south-west across the minesite is preserved after mining;
- measurements at 800m from the mining operation indicate that pre and post mining seasonal water level fluctuations are similar;
- drawdown in water levels measured in the lower superficial formation in response to dredge pond levels are not translated into discernibly lower levels in the upper superficial formation;
- the typical background pH of groundwater in the Jangardup region is between 4.5 and 5;
- comparison of the pre-mining and during mining pH in groundwater indicates no discernible change in pH as a result of mining activity; and
- review of iron, SO_4/Cl ratio and pH indicate that there is no widespread or significant environmental impact attributable to pyrite oxidation.

Based on the above, and given that the extension area forms part of the same orebody, the EPA expects that groundwater will not be significantly affected by the proposed mining of the extension area.

The EPA, however, notes that Cable Sands is currently implementing a groundwater management strategy and a programme to monitor groundwater levels and groundwater quality for the Jangardup minesite, under Condition 3 of the Minister's Statement No. 103. This management strategy and programme, will incorporate the Jangardup extension area, and aims to ensure that there are no environmentally significant detrimental effects from the mining operation on vegetation, groundwater quality or levels within the adjacent National Park, State Forest and private lands.

In addition, Condition 3 also requires the proponent to:

- notify the EPA of any detected adverse impacts together with a plan of remedial action; and
- restrict drawdown operations to the months of May to September (the wet season) where operations would result in a level of groundwater drawdown in excess of 0.5m at the boundary of adjacent private properties, National Park or State Forest.

Commitments

In relation to the Jangardup extension area, the EPA notes that Cable Sands has made two new commitments (commitments 18 and 19) to regularly monitor surface water flows from all Jangardup leases and to take appropriate action should results indicate an unacceptable deterioration in surface water quality. Any action, will be determined in consultation with the DEP and Water and Rivers Commission (WRC).

It is also noted that Cable Sands has a pre-existing commitment to monitor groundwater levels and quality around the dredge pond and the production bore, and to analyse all data for unacceptable changes (commitment 13). This monitoring will be continued.

Relevant environmental factor

Relevant factor	EPA objective
Surface water quality	• To maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the draft WA Guidelines for Fresh and Marine Waters.
Groundwater quality	• To maintain or improve the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the draft WA Guidelines for Fresh and Marine Waters.

Having particular regard to the:

(a) low levels of pyrite found in the Jangardup Extension area;

(b) total sulphur levels being below the action criteria trigger necessary to prepare a management plan;

(c) existing conditions and commitments; and

(d) new commitments made by Cable Sands to regularly monitor surface water flows and take remedial action as appropriate;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for surface and ground quality.

4. Conditions and commitments

Section 46(3) of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environmental Protection Act 1986 on whether or not the proposed changes to conditions or procedures should be allowed. In addition, the EPA may make recommendations as it sees fit.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

4.1 Recommended commitments

Cable Sands has made changes to commitments to reflect discussions with the DEP which have been part of the assessment process. The proponent's commitments as set out in the Section 46

document (Cable Sands, 1998) and subsequently modified, as shown below (Table 5), should be made enforceable conditions.

Table 5: Summary of proponent's commitments relating to the Jangardup Extension.

Commitment (Who/ What)	Objective (Why)	Action (How/ where)	Timing (When)	Whose Advice	Measure-ment Complian ce Criteria
The proponent will regularly monitor surface water flows from all Jangardup mining leases.	To minimise impacts of surface water quality on downstream users	Surface flows off all Jangardup mining leases monitoring locations and frequencies to be consistent with DEP Licence 6662/1	Throughout mining operation	DEP WRC	Advice with annual reports.
Any results indicating an unacceptable deterioration in surface water quality will result in the appropriate action determined in consultation with the DEP and WRC.	To minimise impacts of surface water quality on downstream users	Surface flows off all Jangardup mining leases monitoring locations and frequencies to be consistent with DEP Licence 6662/1.	Throughout mining operation	DEP WRC	Advice with annual reports.
The proponent will prepare a Mining and Restoration Plan for the Jangardup Extension area. The plan will include clearing restrictions, landform restoration (reconstructed land will be consistent with adjoining unmined landforms), dieback management, vegetation re-establishment, weed management, completion criteria and monitoring of rehabilitation success.	To ensure appropriate management of operations	In extension area.	Prior to mining the extension area.	DEP CALM DME	Clearance of Mining and Restoratio n Plan.
The proponent will implement the Mining and Restoration Plan for the Jangardup Extension area.	To ensure appropriate management of operations	In extension area	Throughout mining operation	DEP CALM DME	Advice with annual reports. Letter from DEP.
The proponent will undertake anthropological and archaeological investigations for the extension area.	To ensure Aboriginal heritage values are protected.	In extension area.	Prior to mining the extension area.	DAA	Letter from DAA.

Abbreviations:

DEP: Department of Environmental Protection
WRC: Water and Rivers Commission
CALM: Department of Conservation and Land Management
DME: Department of Minerals and Energy
DAA: Department of Aboriginal Affairs

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA recommends that the following conditions be imposed if the proposal by Cable Sands is approved for implementation:

(a) The existing Ministerial Conditions applied to the project (Ministerial Statement 455 published on 23 July 1997), be subject to modifications necessary to:

- extend mining operations into part of class 'C' Reserve 44705, Nelson Location 13471;
- update the consolidated commitments statement; and
- update the statement into current format with the inclusion of new condition 11 to replace procedures 1 and 2 of Statement No. 455.

The amended conditions and amended Consolidated Commitments statement are presented in Appendix 5.

5. Conclusions

The EPA has considered the proposal by Cable Sands to extend its mining operation into part of class 'C' Reserve 44705, Nelson Location 13471 and has concluded that it can be managed to meet the EPA's objectives for the relevant environmental factors.

The EPA believes that the period since the proposed Jangardup Heavy Minerals mine was originally assessed has not given rise to any significant changes in the environment which would cause the EPA to reconsider its previous assessment of the project and, in particular, its previous recommendation as to the environmental acceptability of the project.

In addition to the request to extend mining operations into adjacent class 'C' Reserve 44705, the EPA considers that the conditions of the environmental approval should be updated, and accordingly has also reported on the changes required.

6. Recommendations

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

1. That the Minister notes that this report is pursuant to Section 46(3) of *the Environmental Protection Act 1986* and thus is limited to consideration of proposed changes to the original proposal.
2. The Minister notes that the proposed change is to modify the original Jangardup Heavy Minerals Mine proposal by extending its mining operation into part of class 'C' Reserve 44705, Nelson Location 13471.
3. The EPA recommends that the Minister considers the report on the relevant environmental factors as set out in Section 3.
4. That the Minister notes that the EPA has concluded that the modified proposal can be managed to meet the EPA's objectives, and thus not impose an unacceptable impact on the environmental provided there is satisfactory implementation by the proponent of the amended conditions, including the proponent's commitments, as set out in Section 4.
5. The Minister imposes the amended conditions, commitments and procedures recommended in Appendix 5 of this report.

Appendix 1

List of Submitters

State/Local Government

- Aboriginal Affairs Department
- Department of Conservation and Land Management
- Department of Minerals and Energy
- Shire of Nannup

Organisations

- Denmark Environment Centre Inc and D'Entrecasteaux Coalition

Individuals

- Mr Jim Scott MLC

Appendix 2

References

Cable Sands (W.A) Pty Ltd (1999), *Response to Summary of Submissions*, Cable Sands, Western Australia.

Cable Sands (W.A) Pty Ltd (1998), *Extension to Jangardup Heavy Minerals Mine, Section 46 Change to Ministerial Conditions*, Cable Sands (W.A) Pty Ltd, Western Australia.

CSIRO Land and Water (1999), *Hydrological Impacts of Mineral Sand Mining at Jangardup*, A consultancy report to Cable Sands (W.A) Pty Ltd, CSIRO, Perth.

Environmental Protection Authority (1990), *Heavy Minerals Mine at Jangardup, Report and Recommendations of the Environmental Protection Authority*, Bulletin 422, Environmental Protection Authority (EPA), Perth, Western Australia.

Environmental Protection Authority (1993), *Draft Western Australian Water Quality Guidelines for Fresh and Marine Waters.* Environmental Protection Authority Bulletin 711, October 1993, Perth, Western Australia.

Environmental Protection Authority (1997), *Heavy Minerals Mine at Jangardup - Change to Environmental Conditions, Report and Recommendations of the Environmental Protection Authority*, Bulletin 859, Environmental Protection Authority (EPA), Perth, Western Australia.

Martinick, W.G and Associates (1989), *Jangardup Heavy Minerals Mine Environmental Review and Management Programme*, prepared for Cable Sands (W.A) Pty Ltd, Perth, Western Australia.

New South Wales Environmental Protection Authority Department of Urban Affairs and Planning, Acid Sulfate Soils Management Advisory Committee (1997), *Draft Acid Sulfate Soils, Assessment and Management Guidelines*, NSW.

Appendix 3

Statement of Environmental Conditions of Approval (20 July 1990)

Ass # 116

Bull # 422

State # 103

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

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

PROPOSED HEAVY MINERALS MINE AT JANGARDUP

This proposal may be implemented subject to the following conditions:

1. The proponent shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made in the Environmental Review and Management Programme and as subsequently modified (copy of commitments attached).

2. Prior to commencement of product haulage operations, the proponent shall develop a more detailed environmental and social analysis for alternative haulage options and propose a heavy mineral transport programme, satisfactory to the Minister for the Environment on advice from the Environmental Protection Authority, the Department of Transport, the Department of Conservation and Land Management and the Main Roads Department. In the course of developing the transport option, the proponent shall ensure an adequate level of public consultation.

3. The proponent shall ensure that there are no environmentally significant detrimental effects from the mining operation on the vegetation or groundwater quality or levels within adjacent National Park, State Forest and private lands. Accordingly, the proponent shall adhere to the following management requirements, to the satisfaction of the Minister for the Environment on advice from the Environmental Protection Authority, the Water Authority of Western Australia and the Department of Conservation and Land Management:

   - initial mining operations shall commence at a point remote from adjacent properties; and
   - prior to commencement of dredge pond construction, the proponent shall prepare and implement a groundwater management strategy and a programme to monitor vegetation, groundwater levels and groundwater quality; and
   - should this programme identify any adverse effects, the proponent shall report these immediately to the Environmental Protection Authority, together with a plan of remedial action; and
   - operations which would result in a level of groundwater drawdown in excess of half a metre at the boundary of adjacent private properties, National Park or State Forest, shall be confined to the months of May to September.

4. Prior to any operations involving the movement of earth, including gravel extraction for road construction, the proponent shall prepare and subsequently implement a dieback hygiene programme, in consultation with the Department of Conservation and Land Management and to the satisfaction of the Minister for the Environment on advice from the Environmental Protection Authority. The dieback hygiene programme shall be available for public viewing.

5. Prior to commencement of mining, the proponent shall prepare rehabilitation plans to the satisfaction of the Minister for the Environment on advice from the Environmental Protection Authority, The Department of Conservation and Land Management and the Department of Agriculture. The rehabilitation plans shall be available to the public following examination by the Environmental Protection Authority.

Published on

20 JUL 1990

During mining, the rehabilitation plans shall be reviewed annually and continuously implemented to the satisfaction of the Minister for the Environment on advice from the Environmental Protection Authority and the Departments of Conservation and Land Management and Agriculture.

Rehabilitation of State Forest shall be planned and implemented in consultation with the Department of Conservation and Land Management.

Rehabilitation of private lands shall be planned and implemented in consultation with the landowner and the Commissioner of Soil Conservation. Disturbed agricultural lands shall be rehabilitated to a use which is environmentally stable.

6. Following the commencement of rehabilitation, the proponent shall implement a rehabilitation monitoring and maintenance programme until such time as the rehabilitation is self-sustaining, to the satisfaction of the Minister for the Environment on the advice of the Environmental Protection Authority. The proponent shall perform audits annually and forward the results to the Department of Mines, the Environmental Protection Authority and other involved agencies. These reports on rehabilitation shall be available to the public following examination by the Environmental Protection Authority.

7. The proponent shall be responsible for removal of the plant, all equipment and installations and rehabilitating the site and its environs to the satisfaction of the Environmental Protection Authority.

8. The proponent shall, at least six months prior to ceasing mining operations, prepare a decommissioning and rehabilitation plan to the satisfaction of the Environmental Protection Authority.

9. No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

Bob Pearce, MLA
MINISTER FOR THE ENVIRONMENT

19 JUL 1990

APPENDIX C

SUMMARY OF PROPONENT'S COMMITMENTS MODIFIED TO ACCOMMODATE TRANSPORTATION ISSUES

1. Cable Sands agrees to comply with the relevant statutory requirements of both the State of Western Australian and the Commonwealth of Australia.

2. Site preparation prior to mining will be as described in this ERMP.

3. The mining operations and the heavy minerals separation process will comply with the descriptions presented in this ERMP.

4. All topsoil will be used for covering restored landforms, and there will be no loss of topsoil.

5. Rehabilitation will be fully integrated with mine production and it will be undertaken continuously, some one to two months behind the dredging front. Rehabilitation will comply with the guidelines presented in this ERMP.

6. Cable Sands will be operating in the area for many years and will maintain the responsibility for rehabilitation until the defined endpoints are achieved. Successful rehabilitation will be determined by the Department of Mines, using the endpoints outlined in this ERMP. The endpoints will be accepted by Cable Sands as a condition.

7. Water usage, electricity generation, access roads, and sewerage and rubbish disposal will be carried out as described in this ERMP and will not be varied greatly without prior consultation with the authorities.

8. All workers will be kept within radiation standards set by the Department of Mines for the heavy minerals mining industry in compliance with the Australian Code of Practice on radiation protection in the mining and milling of radioactive ores of 1987.

9. Every effort will be made to protect regrowth of plants on the rehabilitated areas from fire and weed encroachment.

10. Part of the rehabilitation process will be to create a range of habitat types.

11. In the event that material of Aboriginal origin is uncovered during the operations, all work will cease within that area and the Western Australian Museum will be called upon to advise.

12. Dust and noise levels will be kept below the standards which are currently set for the mining industry.

13. Groundwater levels and the quality of groundwater around the dredge pond and the production bore will be monitored by Cable Sands. All data will be analysed and should there be any evidence of unacceptable changes, action will be implemented immediately to avoid any harmful changes to the water regimes of the area. The authorities will be notified immediately.

14. Monitoring of the rehabilitation will be undertaken by Cable Sands and reported annually to the Department of Mines, the Department of Conservation and Land Management and the Environmental Protection Authority.

APPENDIX D

SUMMARY OF PROPONENT'S ADDITIONAL COMMITMENTS

These additional commitments are related to the issues raised in public submissions (Appendix B) as noted in brackets, and modified subsequently in response to transportation requirements.

A1. The contribution of funds to encourage the establishment of extra houses in Nannup (Issue 23).

A2. Prior to mining the ponds area, checking for the existence of aquatic fauna outside the area to be mined (Issue 56).

Appendix 4

Statement of Environmental Conditions of Approval (23 July 1997)

MINISTER FOR THE ENVIRONMENT;
EMPLOYMENT AND TRAINING

Statement No.
000455

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PROPOSAL:	HEAVY MINERALS MINE AT JANGARDUP (116/1041)
CURRENT PROPONENT:	CABLE SANDS (WA) PTY LTD
ORIGINAL CONDITIONS SET:	19 JULY 1990

The implementation of this proposal is now subject to the conditions contained in Ministerial Statement No. 103 (July 1990), subject to the amendment and addition of the following conditions and procedures:

Condition 1 is amended to read as follows:

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal (including the documented modifications of March 1997), the proponent shall fulfil the relevant environmental management commitments made in the Environmental Review and Management Programme (June 1989) and reported on in Environmental Protection Authority Bulletin 422, in the Section 46 document (March 1997), and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

In the event of any inconsistency, the conditions and procedures shall prevail to the extent of the inconsistency.

The consolidated environmental management commitments of July 1990, as modified on 3 June 1997, are attached.

Published on
23 JUL 1997

18th FLOOR, ALLENDALE SQUARE, 77 ST. GEORGE'S TERRACE, PERTH 6000 TELEPHONE: (08) 9421 7777 FACSIMILE: (08) 9221 4665/8

Condition 10, Procedures 1 and 2, and Notes 1 and 2 are added following condition 9:

10 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

10-1 Subject to these conditions, the manner of detailed implementation of the modified proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority initially with the proposal and subsequently in March 1997, as part of further consideration under Section 46 of the Environmental Protection Act 1986.

10-2 Where, in the course of the detailed implementation referred to in condition 10-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

Procedure

1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Note

1 The Environmental Protection Authority reported on the proposal in Environmental Protection Authority Bulletins 422 (January 1990) and 859 (June 1997).

2 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act 1986.

CHERYL EDWARDES (Mrs) MLA
MINISTER FOR THE ENVIRONMENT

22 JUL 1997

Proponent's Environmental Management Commitments

3 June 1997

Heavy Minerals Mine at Jangardup
Change to Environmental Conditions
(116/1041)

Cable Sands (WA) Pty Ltd

1 Cable Sands agrees to comply with the relevant statutory requirements of both the State of Western Australia and the Commonwealth of Australia.

2 Site preparation prior to mining will be as described in the Environmental Review and Management Programme.

3 The mining operations and the heavy minerals separation process will comply with the descriptions presented in the Environmental Review and Management Programme.

4 All topsoil will be used for covering restored landforms, and there will be no loss of topsoil.

5 Rehabilitation will be fully integrated with mine production and it will be undertaken continuously, some one to two months behind the dredging front. Rehabilitation will comply with the guidelines presented in the Environmental Review and Management Programme.

6 Cable Sands will be operating in the area for many years and will maintain the responsibility for rehabilitation until the defined endpoints are achieved. Successful rehabilitation will be determined by the Department of Minerals and Energy, using the endpoints outlined in the Environmental Review and Management Programme.

The endpoints will be accepted by Cable Sands as a condition.

7 Water usage, electricity generation, access roads, and sewerage and rubbish disposal will be carried out as described in the Environmental Review and Management Programme and will not be varied greatly without prior consultation with the authorities.

8 All workers will be kept within radiation standards set by the Department of Minerals and Energy for the heavy minerals mining industry in compliance with the Australian Code of Practice on radiation protection in the mining and milling of radioactive ores of 1987.

9 Every effort will be made to protect regrowth of plants on the rehabilitated areas from fire and weed encroachment.

10 Part of the rehabilitation process will be to create a range of habitat types.

11 In the event that material of Aboriginal origin is uncovered during the operations, all work will cease within that area and the Western Australian Museum will be called upon to advise.

12 Dust and noise levels will be kept below the standards which are currently set for the mining industry.

13 Groundwater levels and the quality of groundwater around the dredge pond and the production bore will be monitored by Cable Sands.

All data will be analysed and should there be any evidence of unacceptable changes, action will be implemented immediately to avoid any harmful changes to the water regimes of the area. The authorities will be notified immediately.

14 Monitoring of the rehabilitation will be undertaken by Cable Sands and reported annually to the Department of Minerals and Energy, the Department of Conservation and Land Management and the Environmental Protection Authority.

15 The contribution of funds to encourage the establishment of extra houses in Nannup.

16 Prior to mining the ponds area, checking for the existence of aquatic fauna outside the area to be mined.

17 Transportation of HMC between Jangardup and Bunbury will use the Sues Road route whenever this is available, subject to appropriate approvals.

Any trucking of HMC along the Vasse Highway route through Nannup will be undertaken under the regime which has applied since trucking commenced in 1994.

Appendix 5

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

HEAVY MINERALS MINE AT JANGARDUP

Proposal: The Jangardup heavy minerals mine is located on the Scott Coastal plain within the Shire of Nannup. The proposal involves mining and processing a maximum of 410,000 tonnes of heavy mineral concentrate per year. The concentrate is then trucked from the mine to Bunbury via Black Point Road, Stewart Road and the Vasse and Bussell highways and exported through the port of Bunbury.

Proponent: Cable Sands (WA) Pty Ltd

Proponent Address: Koombana drive, North Shore, BUNBURY WA 6230

Assessment Number: 1206

Previous Assessment Numbers: 116/ 1041

Previous Statement Numbers: Statement No. 103 published on 20 July 1990

Statement No. 455 published on 23 July 1997

Report of the Environmental Protection Authority: Bulletin 932

Previous Reports of the Environmental Protection Authority: Bulletins 422 (Jan 1990) & 859 (June 1997)

The implementation of this proposal is now subject to the conditions contained in Ministerial Statement No. 103 (July 1990) as amended by Statement No. 455 (July 1997), subject to the amendment and addition of the following conditions, procedures and notes:

Condition 1 of Statement No. 455 is deleted and the following conditions are inserted:

1 Proponent Commitments

1-1 The proponent shall implement the consolidated environmental management commitments as amended on 3 June 1997 and 24 March 1999 and documented in schedules 2 and 3 of this statement.

1-2 The proponent shall implement environmental management commitments which the proponent makes or has made as part of the fulfilment of conditions and procedures in this and any previous statements issued for this proposal.

Condition 10 of Statement No. 455 is deleted and the following conditions are inserted:

10 Implementation

10-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

10-2 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.

10-3 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.

Procedures 1 and 2 of Statement No. 455 are deleted and the following conditions and procedures are inserted:

11 Compliance Auditing

11-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

11-2 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.

13-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

Note 1 of Statement No. 455 is deleted and Note 2 renumbered as Note 1 as follows:

Note

1 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986.*

Schedule 1

Proposal (1206)

The Jangardup heavy minerals mine is located on the Scott Coastal Plain within the Shire of Nannup, approximately 47km south of Nannup (Figure 1). The proposal involves mining and processing a maximum of 410,000 tonnes of heavy mineral concentrate per year. The concentrate is then trucked from the mine to Bunbury via Black Point Road, Stewart Road and the Vasse and Bussell highways and exported through the port of Bunbury.

Table 1 summarises the key project characteristics of the approved project and proposed extension.

Table 1: Key project characteristics

Project characteristic	Current approved project	Proposed extension
Life of project (mine production)	99 months	1 month
Orebody (tonnes heavy mineral concentrate)	2,100,000	20,000
Depth of mining	20 metres	Approximately 15 metres
Area of disturbance (ha)	250	4
Typical mine operation	7 days per week (24hr per day)	7 days per week (24hr per day)
Major components	Dredge mining of orebody with some dry mining. Slime dams, water dam, wet treatment plant, thickener, concentrate towers, workshops, offices, access roads and substation. Rehabilitation following mining to pasture and State Forest.	Development restricted to ore body area. Rehabilitation of mined area back to acceptable native vegetation standards to allow Nelson Location 13471 to be incorporated in the D'Entrecasteaux National Park at a later date. No major infrastructure located on the reserve.
Mining rate (tpa heavy mineral concentrate)	286,000	286,000
Max mining rate (tpa heavy mineral concentrate)	410,000	410,000
Water supply: • source • annual requirement (ML)	Bore into Yarragadee 803	Bore into Yarragadee 803

Schedule 2

Proponent's Environmental Management Commitments

3 June 1997

Heavy Minerals Mine at Jangardup (116/1041/1206)

Cable Sands (WA) Pty Ltd

1 The proponent agrees to comply with the relevant statutory requirements of both the State of Western Australia and the Commonwealth of Australia.

2 Site preparation prior to mining will be as described in the Environmental Review and Management Programme.

3 The mining operations and the heavy minerals separation process will comply with the descriptions presented in the Environmental Review and Management Programme.

4 All topsoil will be used for covering restored landforms, and there will be no loss of topsoil.

5 Rehabilitation will be fully integrated with mine production and it will be undertaken continuously, some one to two months behind the dredging front. Rehabilitation will comply with the guidelines presented in the Environmental Review and Management Programme.

6 The proponent will be operating in the area for many years and will maintain the responsibility for rehabilitation until the defined endpoints are achieved. Successful rehabilitation will be determined by the Department of Minerals and Energy, using the endpoints outlined in the Environmental Review and Management Programme.

The endpoints will be accepted by the proponent as a condition.

7 Water usage, electricity generation, access roads, and sewerage and rubbish disposal will be carried out as described in the Environmental Review and Management Programme and will not be varied greatly without prior consultation with the authorities.

8 All workers will be kept within radiation standards set by the Department of Minerals and Energy for the heavy minerals mining industry in compliance with the Australian Code of Practice on radiation protection in the mining and milling of radioactive ores of 1987.

9 Every effort will be made to protect regrowth of plants on the rehabilitated areas from fire and weed encroachment.

10 Part of the rehabilitation process will be to create a range of habitat types.

11 In the event that material of Aboriginal origin is uncovered during the operations, all work will cease within that area and the Western Australian Museum will be called upon to advise.

12 Dust and noise levels will be kept below the standards which are currently set for the mining industry.

13 Groundwater levels and the quality of groundwater around the dredge pond and the production bore will be monitored by the proponent.

All data will be analysed and should there be any evidence of unacceptable changes, action will be implemented immediately to avoid any harmful changes to the water regimes of the area. The authorities will be notified immediately.

14 Monitoring of the rehabilitation will be undertaken by the proponent and reported annually to the Department of Minerals and Energy, the Department of Conservation and Land Management and the Environmental Protection Authority.

15 The contribution of funds to encourage the establishment of extra houses in Nannup.

16 Prior to mining the ponds area, checking for the existence of aquatic fauna outside the area to be mined.

17 Transportation of heavy mineral concentrate between Jangardup and Bunbury will use the Sues Road route whenever this is available, subject to appropriate approvals.

Any trucking of heavy mineral concentrate along the Vasse Highway route through Nannup will be undertaken under the regime which has applied since trucking commenced in 1994.

Schedule 3

Proponent's Additional Environmental Management Commitments

9 April 1999

Heavy Minerals Mine at Jangardup (116/1041/1206)

Cable Sands (WA) Pty Ltd

Commitment (Who/ What)	Objective (Why)	Action (How/ where)	Timing (When)	Whose Advice	Measure-ment Compliance Criteria
18. The proponent will regularly monitor surface water flows from all Jangardup mining leases.	To minimise impacts of surface water quality on downstream users	Surface flows off all Jangardup mining leases monitoring locations and frequencies to be consistent with DEP Licence 6662/1	Throughout mining operation	DEP WRC	Advice with annual reports.
19. Any results indicating an unacceptable deterioration in surface water quality will result in the appropriate action determined in consultation with the DEP and WRC.	To minimise impacts of surface water quality on downstream users	Surface flows off all Jangardup mining leases monitoring locations and frequencies to be consistent with DEP Licence 6662/1.	Throughout mining operation	DEP WRC	Advice with annual reports.
20. The proponent will prepare a Mining and Restoration Plan for the Jangardup Extension area. The plan will include clearing restrictions, landform restoration (reconstructed land will be consistent with adjoining unmined landforms), dieback management, vegetation re-establishment, weed management, completion criteria and monitoring of rehabilitation success.	To ensure appropriate management of operations	In extension area.	Prior to mining the extension area.	DEP CALM DME	Clearance of Mining and Restoration Plan.
21. The proponent will implement the Mining and Restoration Plan for the Jangardup Extension area.	To ensure appropriate management of operations	In extension area	Throughout mining operation	DEP CALM DME	Advice with annual reports. Letter from DEP.
22. The proponent will undertake anthropological and archaeological investigations for the extension area.	To ensure aboriginal heritage values are protected.	In extension area.	Prior to mining the extension area.	DAA	Letter from DAA.

Abbreviations:

DEP: Department of Environmental Protection
WRC: Water and Rivers Commission
CALM: Department of Conservation and Land Management
DME: Department of Minerals and Energy
DAA: Department of Aboriginal Affairs

Appendix 6

Summary of Public Submissions and Proponent's Response

EXTENSION TO JANGARDUP HEAVY MINERALS MINE, SECTION 46 CHANGE TO MINISTERIAL CONDITIONS (1206)

RESPONSES TO SUMMARY OF SUBMISSIONS (8th March 1999)

1. General comments

1.1 *Approval is required from the State Mining engineer as this operation will be located on a new mining lease. Any approval by the State Mining Engineer will be subject to the Minister for the Environment's approval and the granting of the mining lease by the Minister for Mines.*

Approval will be sought from the State Mining Engineer following the grant of the Mining Lease and approval from the Minister for the Environment.

1.2 *Many of the references noted by the proponent to support its mining claim in the Section 46 document are unpublished reports and as such are unavailable to the public for consideration. As some of the reports are extremely important a decision on this proposal should be delayed until interested parties have full access to the documents referred to by the proponent.*

The Environmental Protection Authority expects that referenced documents will be made publicly available. Where can the public obtain access to reports cited in the S46 document?

The reports cited in the S46 document are available for review at Cable Sands' Bunbury office. Where applicable these reports are also available through the relevant government department either DEP or CALM.

2. Biophysical

2.1 Impact on D'Entrecasteaux National Park

The mining proposal should not have any deleterious effects on the 5g Reserve 44705 or on the adjacent D'Entrecasteaux National Park. Dredge mining has limited external impacts outside of the immediate mining area (Department of Minerals and Energy, DME).

Cable Sands agrees with this comment.

2.2 Rehabilitation

2.2.1 *The rehabilitation practises are very successful and this result should continue into this area (DME).*

Cable Sands agrees with this comment.

2.2.2 *The proposed Mining and Restoration Plan will need to address completion criteria, weed management and monitoring of rehabilitation success (CALM). What completion criteria, weed management and monitoring of rehabilitation success techniques will be used?*

Completion criteria, weed management and monitoring of rehabilitation success will be outlined in the Mining and Restoration Plan (MRP) which will be developed for the Jangardup Extension area in consultation with CALM. Cable Sands has amended the

relevant commitment from the Section 46 document to reflect this. The MRP will be similar to the MRP for the Jangardup Central Forest Block (ESM 1996). The following items are likely to form part of the MRP:

COMPLETION CRITERIA

Overstorey vegetation: seedlings of overstorey plants should survive 2 years at twice the pre-mining densities of the mature vegetation. Typical tree species densities are indicated in Table 1 of the MRP for the Jangardup Central Forest Block (ESM 1996), however within the Jangardup Extension, pre-mining tree densities are reduced as a result of the naturally high water table. There are approximately 20 trees (predominantly Nuytsia floribunda and Melaleuca preissiana up to 4m) in the 2 ha orebody area of the Extension. The same species as currently present shall be re-established following mining.

Understorey vegetation: most of the vegetation contained within the Jangardup Extension is low scrub, heath or sedgeland (see Figure 3 in the S46 document). This vegetation will be re-established using the translocation technique wherever practical. Understorey density shall be a minimum of 15 perennial plants per $100m^2$ and have a minimum projected foliage cover of 60%.

WEED MANAGEMENT

- No topsoil from the Jangardup Extension will be spread or stockpiled on adjacent farmland prior to re-spreading.
- No topsoil from previously pastured mined areas shall be used for rehabilitation of the Jangardup Extension.
- Topsoil bunding will reduce the spread of windblown weed seeds
- Rehabilitated areas shall be monitored regularly for weeds, with weed control implemented where required.

REHABILITATION MONITORING

Monitoring of vegetation on and adjacent to rehabilitated areas of the Jangardup Extension will be undertaken as part of the ongoing vegetation monitoring in adjacent areas. The methodology for this monitoring is detailed by Martinick and Associates (1994) and includes quantitative assessment of species abundance and density using 50m transects and $20m^2$ plots. The rehabilitation monitoring may be modified to give a more accurate assessment of rehabilitation success in relation to developed completion criteria.

Successful rehabilitation will be by compliance of the quantitative monitoring data with the completion criteria. In addition, a measure of the rehabilitation success shall be the development of a final landform that is non-eroding and compatible with the surrounding environment.

2.2.3 *The translocation and storage of sedge and heath plants with topsoil is considered as an appropriate methodology to restore some of the more difficult to rehabilitate species. This technique shows some promise. The major constraint is the availability of adequate areas for storage that are reasonably isolated from weed contamination. In the interests of enhancing rehabilitation outcomes, every effort should be made to utilise this technique, including direct transfer of material to suitable areas ready for rehabilitation in central Block and/or storage on the private property after the pasture grass topsoil has been stripped for some distance. This needs to be addressed in the Mining and Restoration Plan (CALM).*

The MRP for the Jangardup extension area shall address the need to maximise the success of the translocation technique for re-establishment of sedge and heath plants. The MRP shall indicate appropriate methods for the transfer and storage of these plants

prior to their return to minesite areas. These methods shall aim to ensure a high survival rate for the translocated material while in storage and shall minimise the potential for weed infestation.

2.2.4 *Cable Sands has no experience, no examples and no expertise in rehabilitating native vegetation to National Park status. Examples noted by the proponent relate to farmland pastures and Minninup Beach. Minninup Beach is a good example why the Jangardup extension proposal should not go ahead. The EPA permitted mining on the condition that only 10% of the original vegetation species were replaced. It needs to be pointed out that many of the deep rooted species of this 10% have failed.*

What monitoring and work has the proponent undertaken to support the claim that they can rehabilitate native vegetation to National Park status?

Cable Sands has undertaken rehabilitation at a large number of sites in the South West. Rehabilitation objectives have varied for different sites. Rehabilitation completed to date has been consistent with rehabilitation objectives and with regulatory Conditions imposed on the company.

Cable Sands has experience and expertise in native vegetation rehabilitation. The company aims to continually improve its environmental performance, and in accordance with this objective, Cable Sands has contracted experienced environmental consultants to assist in the development of its rehabilitation techniques. Work on native vegetation rehabilitation which has been undertaken by Cable Sands to date includes:

Minninup Beach Rehabilitation - The progress of native vegetation re-establishment has been monitored annually since the mining of heavy minerals at Minninup Beach between October 1988 and July 1990. Regular monitoring of rehabilitated areas was undertaken up until 1993, when results showed that the required conditions for rehabilitation success had been achieved. This quantitative species richness and density data was considerably in excess of completion criteria. Stable landforms had been achieved and plant populations developed with the desired level of plant diversity and structures appropriate for their position in the landscape.

Since achieving the required rehabilitation endpoints, Cable Sands has implemented additional management and monitoring to ensure the longterm success of the rehabilitation. Additional management undertaken by Cable Sands has included the implementation of a rabbit and snail control programme. At certain times these pests have caused minor problems in vegetation development.

Monitoring in 1998 revealed some general changes in the development of the vegetation (ESM 1998). On the seaward slopes of the primary dunes, which are exposed to sea breezes, salt tolerant shrubs and herbaceous perennials such as *Scaevola, Trachyandra, Acacia cochlearis* and *Acanthocarpus* are favoured. On the inland slopes of the primary dunes the vegetation has matured, shrub density has decreased slightly while vegetation cover has been maintained. Also, a natural reduction in the prevalence of colonising species has occurred. These changes indicate a successional process is occurring and it does not detract from the success of the rehabilitation.

Jangardup Native Seed Trials - A range of seed from species native to the area have undergone trials, to maximise the success for seedling recruitment during rehabilitation. Seed viability and germinability has been tested in response to smoking treatment.

Jangardup Translocation Trials - Trials have been developed to test the suitability of the translocation and storage method for rehabilitating difficult species. The trials indicate this method is appropriate and the methodology has been endorsed by CALM (see 2.2.3, REF: 111/87). Due to the predominance of "low shrub and heath over sedges on sandplain", this method will be widely implemented during the rehabilitation of disturbed areas of the Jangardup Extension.

2.2.5 *The potential damage to vegetation from mining in the Reserve and adjacent National Park would be significant and long term (20-50 years). The proposal cannot meet the EPA's objective of rehabilitation to a standard consistent with the post mining long-term landuse (conservation).*

How will Cable Sands demonstrate that they can meet the EPA's objective?

Cable Sands proposal will be able to meet the EPA's objective of rehabilitating the land to a standard suitable for conservation purposes in the long term. Implementation of Cable Sands' comprehensive rehabilitation programme will ensure the regeneration of native vegetation is optimised.

Work undertaken at Jangardup to date demonstrates clear progress towards achieving this objective and includes:

- Native seed trials;
- Translocation trials;
- Vegetation surveys and monitoring.

The ability of the rehabilitated vegetation to fulfil its landuse objective of conservation will increase progressively. Translocated vegetation will provide some species and structural diversity immediately. Establishment of vegetation using the other techniques outlined in the Section 46 document will increase the species diversity in the rehabilitated area.

Rehabilitation of native vegetation within fragile ecosystems at Minninup Beach (discussed in 2.2.4) provides evidence that Cable Sands is able to comply with rehabilitation performance criteria recommended by the EPA.

2.3 Hydrology

2.3.1 *The Minister for the Environment has confirmed: "the Jangardup South and Jangardup Extension projects have been identified as having the potential to disturb acid sulfate soils....As part of the environmental assessments, the proponent will be required to identify the occurrence of acid sulfate soils within the project areas and to propose appropriate environmental management measures" (Minister for Finance representing the Minister for the Environment, Questions on Notice, Legislative Council, 12/11/98).*

Accordingly:

1. *Has the proponent identified the occurrence of acid sulfate soils in the extension area? If so what areas have been identified and what is the occurrence of acid sulfate soils in the extension area?*

   Pyrite levels in the soil profile in the Jangardup Extension have indicated that there are no environmental issues associated with acid sulfate soils. Testing in the Extension has shown that total sulphur levels in the Jangardup Extension average 0.02%. This is below the action criteria trigger specified in the Acid Sulfate Soil Manual produced by the NSW Acid Sulfate Soil Management Advisory Committee in August 1988. The action criteria given in that document is 0.03% oxidisable sulphur.

2. *Has the proponent conducted soil testing in the proposed mining area to determine the presence of acid sulfate soils?*

   Soil testing has been conducted with low levels of sulphur recorded.

   Samples have been drilled using company drill rigs at 1 metre intervals between the surface and the orebody basement (up to 18m) at six locations within the Extension. These samples were dried at low temperatures and total sulphur determined by Cable Sands using an Eltra CS800 at the Bunbury laboratory.

3. *If 1 and 2 have not been done, the proponent should undertake investigations to determine the occurrence of acid forming soils, prior to the EPA completing its assessment.*

   Not applicable.

4. *What management measures will be adopted by the proponent to deal with the potential disturbance of acid sulfate soils?*

   Current mining operations are appropriate to handle the low levels of sulphur found in the Jangardup Extension. Monitoring of surface waters in the area (for pH, sulfate, iron and manganese) will continue.

5. *If acid sulfate soils are present what will be the impact on the soils in the rehabilitated mined land and local and regional hydrology?*

   There will be no impact on rehabilitated mined land and local and regional hydrology due to the low levels of sulphur present in the Jangardup Extension area.

2.3.2 *Can the proponent identify the degree (pyritic content) and spatial extent of pyritic sediments (potential acid sulfate soils) in the proposed extension area by means of extensive soil sampling following the procedures detailed in the Acid Sulfate Soils Manual NSW (Department of Urban Affairs and Planning), and make these findings available to the public.*

Low levels of pyrite are found throughout the Extension area. Total sulphur results (0.02%) are below those that would require further investigation to determine the distribution of oxidisable sulphur. The levels are also below the trigger action levels (0.03% oxidisable sulphur) specified in the Acid Sulfate Soils Manual NSW (Department of Urban Affairs and Planning). The levels were determined using sampling frequencies specified in that document (ie 6 holes for 1-2ha of land).

2.3.3 *The CSIRO (1998) Hydrological Impacts of Mineral Sand Mining at Jangardup Report (quoted and referenced in the S46 document) has not been made available for public scrutiny. As this document is referenced in the S46 document, it is requested that the proponent make this document available, particularly the section relating to water quality monitoring.*

The Environmental Protection Authority expects that referenced documents will be made publicly available. Where can the public obtain access to reports cited in the S46 document?

See answer to 1.2

2.3.4 *What management procedures will the proponent put in place to avoid:*

1. *any decrease in pH of surface or ground water within the existing mine, the proposed extension area and the adjacent areas of State Forest, Reserve and National Park; and*
2. *any contamination of surface or groundwater by iron, aluminium, manganese or other heavy metals which may arise from the disturbance of ASS.*

Sampling and analysis of soils in the Jangardup Extension have indicated that the total sulphur level averages 0.02%. Given the low level of sulphur in the extension area, decrease in pH or metal contamination of water is not expected. Continued monitoring of the process water circuit will provide an early indication of changes in water quality.

2.3.5 *The proponent refers to sulphur levels around the extension area. Can the proponent clarify whether this refers to the generation of sulphuric acid or the content of iron sulphide (pyrite).*

Sulphur levels around the extension area are total sulphur. This includes both pyritic and non-pyritic sulphur.

2.3.6 *What strategies does the proponent intend to use to deal with increased surface water flow from rehabilitated areas of the extension area to the adjacent areas of Reserve and National Park?*

There will be no increased surface water flow from rehabilitated areas. Changes to the surface water flow from rehabilitated land will be minimal. The flat topography that will be re-created following mining discourages surface water flows.

During mining, water that would accumulate on the surface of the mining area will be incorporated in the process water circuit. Water in the adjacent areas of Reserve 44705 will be allowed to accumulate as normal and will be separated from the mining area by a bund or other appropriate barrier.

2.4 Declared Rare and Priority Flora

2.4.1 *The mining process will involve the clearing of two priority 4 species, Melaleuca basicephala and Astartea sp Scott River and potentially a priority 3 species, Grevillea papillosa. The proponent has had no demonstrated experience in the rehabilitation of these species and has not given any solid commitment that they can or will be able to do so. The EPA's objective of the protection of Declared Rare and Priority Flora cannot be met by the proponent.*

1. *How does Cable Sands intend to ensure these species are returned to the rehabilitated area?*

2. *How will Cable Sands demonstrate that they can meet the EPA's objective?*

Flora surveys undertaken in 1992-3 and in 1998 identified the presence of two priority 4 species (Melaleuca basicephala and Astartea sp Scott River) in the 8ha reserve. The orebody occupies approximately 2ha of the reserve and these species are not necessarily on the orebody or adjacent area required for mining. Where Priority flora have to be removed, Cable Sands will target these species for translocation. This will be determined by a qualified botanist prior to the clearing phase of operations. It will also be possible to protect these species by reseeding or planting of seedlings during rehabilitation. Management of the priority species will be included in the MRP.

The methods outlined above will protect the priority flora identified in the Extension area. In addition Cable Sands will comply with the Wildlife Conservation Act, 1950.

2.5 Dieback

2.5.1 *The proponent gives no details of proposed dieback hygiene procedures, nor were any procedures detailed in the original ERMP document for dieback management at Jangardup. The ERMP states that there are small areas in the minepath which are not infected....There will be an ongoing programme of monitoring dieback.*

There is no evidence in the Jangardup Extension document that any areas of the mine path remain unaffected. It appears that either these areas have been infected during the existing mining process, or that the proponent no longer intends to identify unaffected areas and take precautions to prevent the spread of the disease.

Can the proponent clarify this issue?

The original Jangardup ERMP highlighted that the Jangardup area was extensively dieback infected with only small areas remaining unaffected. These areas were considered unprotectable as natural spread of dieback (not associated with mining) would inevitably infect these areas. Nevertheless, Cable Sands has endeavoured to separate management of dieback free areas with the aim of re-establishing these areas following mining. No spread of dieback has been identified that is attributable to mining at Jangardup.

2.5.2 *What dieback hygiene and monitoring procedures will be applied to the Jangardup Extension, to ensure that there is no spread of dieback within the mine extension and to surrounding conservation areas?*

No spread of dieback is possible within the Jangardup Extension as the area is already entirely dieback infected. The conservation areas immediately adjacent to the Extension are also entirely dieback infected. Dieback hygiene procedures used at Jangardup relate to prevention of the spread of infected soil from the mining area off site. To ensure that this is achieved the following actions are undertaken by the company: -

- earthmoving equipment will enter and leave the site in a clean condition;
- vehicle movement is restricted to reduce off-road use; and
- no unauthorised access into the D'Entrecasteaux National Park is permitted from the minesite.

These are detailed in the approved Dieback Hygiene Policy.

Dieback spread is monitored as part of the vegetation monitoring programme. No spread is possible within the entirely infected Extension area and the adjacent conservation areas.

No modifications to Cable Sands dieback management and monitoring are warranted.

2.5.3 *The EPA's objective regarding vegetation is compromised by the proponent's lack of commitment to strategies which avoid the spread of dieback. What strategies and will the proponent apply to avoid the spread of dieback?*

The strategies used are given in the response to 2.5.2. Spread of dieback will continue into unprotectable areas. Mining of the Extension will not increase the spread of dieback.

2.5.4 *What results have been obtained from the proponent's dieback monitoring programme to date? Will these results be made publicly available?*

Vegetation monitoring has indicated that dieback fronts have continued to move through vegetation monitoring plots. This information is reported to relevant government agencies as part of the monitoring process.

2.5.5 *Plans to re-establish species using translocation techniques are speculative. How will Cable Sands ensure that translocation will not spread dieback? In addition where will the plants come from and will a management plan be developed?*

Translocation techniques at Jangardup will take place only in areas that have already been infected with dieback. Spread of the disease is therefore not possible. The translocated plants are sourced from the area to be mined and are, following appropriate storage, replaced on the restored area. The only exception to this would be where translocated plants are moved only once and are positioned on rehabilitated ground of the adjoining Jangardup operation. Translocation will be detailed in the MRP.

2.6 Regional Representation

2.6.1 *The proponent states throughout the document that the vegetation to be cleared (Scott vegetation complex) is adequately represented in reserves. Cumulatively, the exploration licenses and mining lease applications held by the proponent over National Parks and Conservation Reserves containing the Scott vegetation complex represents a significant reduction in the security of this vegetation complex in reserves. While leases do not necessarily mean mining will take place, exploration will be carried out and there is always the likelihood that mining will follow in significant conservation areas on the Scott Plain region. In this context, the proponent demonstrates a lack of commitment towards the conservation of the Scott vegetation complex.*

Exploration licences and mining lease applications held by Cable Sands over National Parks and Conservation Reserves do not reduce the security of vegetation complexes contained within. For each new mining proposal within these areas, Cable Sands must comply with the Environmental Protection Act (1986), and present the proposal to the EPA for environmental impact assessment. This process is intended to ensure all environmental issues, including the regional representation of vegetation complexes, is addressed and managed to the satisfaction of the EPA.

2.6.2 *Cable Sands propose to mine 4 of the 8 hectares of the 'C' Class Reserve. The complete elimination of half of this reserve will render it unsuitable from a biodiversity perspective and devalue its conservation value.*

As stated in the S46 document, the Scott vegetation complex is adequately conserved, with > 20% of its pre-European distribution formally reserved (A. Walker, CALM, pers. Comm.). The impact of the small and temporary nature of clearing which would occur within the Jangardup Extension will be insignificant in terms of its impact on regional representation of this vegetation complex.

While four hectares of vegetation will be cleared, subsequent rehabilitation will restore the conservation values of the area affected. While this area represents 50% of Reserve 44705, this reserve adjoins the D'Entrecasteaux National Park, which occupies a total area of 118,000 hectares. When these two contiguous areas are considered together, the impact of the proposal in spatial terms is minimal.

2.7 Fauna

2.7.1 *The proponent's claim that the loss of 4ha of habitat would be short-term (pg21) is false. The loss of habitat would be long term, in excess of 20 years, and therefore would significantly impact on the habitat of the Southern Brown bandicoot. Can the proponent comment on this?*

Rehabilitation will result in the return of habitat suitable for use by the Southern Brown bandicoot a few years following mining. The 4ha area is insignificant in terms of the large adjoining area of similar habitat and the observations that the Southern Brown Bandicoot only uses this vegetation type for that part of the year when the landscape is not inundated.

The MRP will include consideration of fauna habitat development.

3. Social

3.1 Aboriginal heritage

3.1 *The proponent has made a commitment to undertake an Aboriginal Heritage survey prior to mining in the extension area. Once this has been completed and a copy of the report has been lodged with the Aboriginal Affairs Department (AAD), the proponent will have addressed the AAD's concerns with the development. If it is found that sites will be impacted by the development, the proponent will need to submit a section 18 application under the Aboriginal Heritage Act.*

Cable Sands will undertake the required surveys and liaise with the Aboriginal Affairs Department about appropriate response to findings of the surveys.

3.2 Recreation

3.2.1 *Future recreation value of the area reintroduced into the National Park (if the proposal proceeds as described) would be compromised due to site radiation from mine residues. How will Cable Sands ensure radiation is controlled?*

Mining reduces radiation levels by removing the low level radioactive component of the ore. Radiation levels at Jangardup are typically very low. No elevated levels of radiation are likely after mining. Post mining gamma radiation surveys are a standard aspect of post mining management. Management of radiation issues is required to be undertaken in compliance with the Mines Safety and Inspection Regulations 1995.

4. Commitments/ Conditions

4.1 *The proponents commitments (Table 3) in conjunction with the current conditions and procedures appear adequate to address environmental management of this project (CALM).*

Cable Sands agrees with this comment.

4.2 *A recent report on possible non-compliance (February/ March 1997) by the DEP reveals that Cable Sands has, for 3 consecutive years, failed to audit its rehabilitation efforts and to meet statutory environmental requirements in relation to its current Jangardup mine. Cable Sands has thus failed to demonstrate that its environmental performance can be trusted. What action has Cable Sands taken?*

The issue of possible non-compliance has been resolved in conjunction with the DEP. No outstanding issues exist. Auditing of rehabilitation has taken place and statutory requirements have been met.

4.3 *The proponent has not fulfilled existing conditions 4, 5 and 6 which relate to:*

- *the dieback hygiene programme being available for public viewing;*
- *rehabilitation plans being available to the public; and*
- *annual audits of rehabilitation monitoring and maintenance programmes by the proponent and making these reports available to the public.*

The proponent is not committed to fulfilling Ministerial Conditions and therefore there is no reason to be confident that further Ministerial Conditions will be met by the proponent.

Cable Sands is committed to fulfilling all Ministerial Conditions relating to all operations. The programs and plans listed are available for public viewing through the relevant government departments or directly through the company.

4.4 *Where can the public obtain access to the documents referred to in 4.2?*

See answer to 4.3

Summary of commitments

Commitment (Who/What)	Objective (Why)	Action (How/where)	Timing (When)	Whose Advice	Measurement Compliance Criteria
Cable Sands will regularly monitor surface water flows from all Jangardup Mining Leases. Any results indicating an unacceptable deterioration in surface water quality will result in appropriate action determined in consultation with the DEP or WRC.	To minimise impacts of surface water quality on downstream uses	Surface flows off all Jangardup Mining Leases. Monitoring locations and frequencies are consistent with DEP Licence 6662/1	Throughout mining operation	DEP WRC	Advice with annual reports
Develop a Mining and Restoration Plan for the Jangardup extension area. The plan will include clearing, landform restoration, vegetation re-establishment, weed management, completion criteria and monitoring of rehabilitation success.	To ensure appropriate management of operations	In extension area	Prior to mining the extension area	DEP CALM	Clearance of Mining and Restoration Plan
Clearing will be restricted to the minimum practical area	To minimise habitat loss	As specified in Mining and Restoration Plan	Prior to mining the extension area	DEP CALM	Advice with annual reports
Use various rehabilitation techniques to create a range of habitats	To provide appropriate rehabilitation	As specified in Mining and Restoration Plan	Following mining	DME CALM DEP	Advice with annual reports
Merge reconstructed land with adjoining unmined landforms	To provide appropriate rehabilitation	As specified in Mining and Restoration Plan	Following mining	DME CALM DEP	Advice with annual reports
Undertake anthropological and archaeological investigations for the extension area.	To ensure aboriginal heritage values are protected	In extension area	Prior to mining the extension area	DAA	Letter from DAA