Heavy Minerals Mine at Jangardup

Cable Sands (WA) Pty Ltd

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
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Foreword

The Environmental Protection Authority has received a number of submissions during the assessment of this proposal which reinforce its view that there is a high level of public interest in and concern about the mineral sands industry generally and in prospects for its establishment in the south coast region in particular.

These submissions focussed on:

- a request for a moratorium on new projects until a regional overview of the prospects for the industry in the lower south west had been carried out; and
- the need to consider an integrated approach to heavy transportation related to mineral sands mining and other industries in the region rather than ad hoc development on a project by project basis.

The Environmental Protection Authority has considered these two principal issues in detail and concluded that the underlying issue (namely concerns regarding the cumulative effects of an extension of the mineral sands industry into the south coast region) are valid and therefore demanding of an appropriate response. Such a response will need to address a wide range of environmental, social and economic factors: many, but not all, of which fall within the charter of the Environmental Protection Authority.

It is for this reason that the Environmental Protection Authority has recently commissioned a committee called "Mineral Sands - Doing it Better".

This group has representatives from the community, industry and government. Its brief is to make recommendations on ways to improve understanding of and environmental performance in the mineral sands industry generally, including the south coast region.

The Environmental Protection Authority expects the committee will make recommendations relevant to the south coast, and in turn the Authority intends to make recommendations to Government on sand mining issues in the region as a whole.

In regard to the Jangardup proposal as such, the Environmental Protection Authority is of the view that the nature and magnitude of the environmental impacts associated with it do not warrant deferral of its assessment. This view should not, however, be seen as a precedent for other cases.

The Environmental Protection Authority considers that a regional assessment is necessary before making any final recommendations about any other major mineral sand mining proposals along the south coast. In the meantime it would be appropriate for ongoing studies to continue, including the preparation of environmental documentation by the intending proponents of proposals in the region.

In addition to the above committee the Environmental Protection Authority is aware of several other initiatives which provide information which could contribute to resolution of the principal issues.

These initiatives include:

- the preparation of a review of the mineral sands industry as a result of an undertaking to the electorate by the Premier. This review, commonly known as the McKellar report, will be called the South West Mineral Sands Industry Study and is expected to be completed by early 1990;
- the Playford Report of 1985 which examined environmental issues and rehabilitation in the mineral sands industry;
- the Leeuwin Naturaliste Region Plan prepared by the State Planning Commission (now the Department of Planning and Urban Development) in 1988;
- the evaluation of the costs of 15 transportation mode and route options for current proposals at Jangardup and Beenup (north-east of Augusta). This study is being co-ordinated by the Department of Resources Development (DRD) and has produced a report called "Transportation Infrastructure for Proposed Mineral Sands and other Resource Developments in South West of Western Australia";
- a report on the perceived social impacts of the above 15 routes, prepared by a committee co-ordinated by the South West Development Authority (SWDA) and made up of Shire representatives. This is called the "Social Impacts of Proposed Mineral Sands Transport Routes" report.

In addition, the Government's new Social Impact Unit, attached to the Deputy Premier's Office, is undertaking a series of workshops and community consultations on the industry in the south west and will report its findings to Government.

It is timely for Government to institute a review of these reports with a view to assessing the extent of implementation and the integration of the recommendations into any development strategy for the south coast.

The Environmental Protection Authority reiterates that it believes that the question of a regional overview of the potential for, and effects of, mineral sands mining along the south coast is a valid one which requires addressing.

The Environmental Protection Authority believes that such a review should be carried out taking into account the wide range of studies and advice available from the initiatives listed above. Clearly, some of the issues raised require the involvement of the Department of Resources Development and the Social Impact Unit, as well as other government agencies. Input on the needs of the communities affected is also seen as vital.

In considering the submissions received during the course of the Jangardup assessment, the Environmental Protection Authority became aware that a number of issues raised applied to the mineral sands industry as a whole and events of the past or proposed in the future, rather than the Jangardup proposal specifically.

The Environmental Protection Authority now makes the following six points and recommends that the Government take note of them and initiate appropriate action:

1. New rehabilitation areas are at the forefront of rehabilitation technology - they are as good as, or better than, comparable areas elsewhere in Australia and the world. These findings are consistent with those of the Playford Report which found that current rehabilitation practice in the industry is generally of a good standard.

2. Old practices and rehabilitation standards are no longer appropriate. The Playford Report noted examples of poor rehabilitation practice in the past which have left a legacy of environmental problems. Public perceptions of the rehabilitation capabilities of the industry are still strongly coloured by views of these areas. The Environmental Protection Authority is keen to see the rate of remedial rehabilitation accelerated. Furthermore, there is a need to inform and show people what is being done to improve old areas.

3. Ways need to be found to fund the upgrading of old areas consistent with their previous, as well as their present, ownership. This should give consideration to future mining operations providing the funding for fixing past rehabilitation deficiencies by employing a sensible mix of direct expenditure and effort in kind.

4. The content of numerous submissions to the Environmental Protection Authority suggested that public perceptions of the mineral sands industry are strongly affected by external appearances or "housekeeping" issues. Initiatives by operators to address the housekeeping issue at plantsites are likely to have a major impact on future public acceptance of the industry, without incurring major costs.

5. The issue of corporate contribution to the community was raised in a number of submissions. The view was expressed that local communities sometimes endured the disbenefits of mineral sand mining without sharing in the benefits. The Authority strongly supports the concept of good corporate citizenship, whereby operators become part of the local community and visibly contribute to it socially, environmentally and economically, especially at the grass roots level. The premise has been put that the presence of mining within a community should place no net penalty on the community resources.

6. In response to public concern and submissions, there is a valid case for considering a government initiative to compile a regional strategy based on the reports and advice referred to above. A strategy which took account of and planned for the need to optimise the social, environmental and regional economic benefits to the community of any proposals to expand the mineral sands industry in the south coast region of Western Australia would be strongly supported by the Environmental Protection Authority.

Notwithstanding the above matters, the Authority is of the view that the nature and magnitude of the environmental impacts associated with the Jangardup proposal itself do not warrant the deferral of its assessment. The Environmental Protection Authority does not regard this view as a precedent for other cases. Consequently, the Environmental Protection Authority has concentrated in this assessment report on the Jangardup proposal but has also provided comments on the broad, environmental implications of the 15 transport options mentioned above. Detailed environmental assessments of transportation options would be undertaken by the Environmental Protection Authority if proposals are referred to the Authority.

The Environmental Protection Authority believes that it should make no final recommendations about any other major mineral sand mining proposals in the south coast region until a regional assessment is considered.

Summary and recommendations

The Environmental Protection Authority has assessed a proposal by Cable Sands (WA) Pty Ltd to develop a mine for heavy mineral sands at Jangardup and to transport the concentrated product to Bunbury.

Jangardup is some 47 kilometres south of Nannup and some 7 kilometres from the coast (Figures 1 and 2).

The proposal was referred to the Environmental Protection Authority in 1987 and the level of assessment was set at an Environmental Review and Management Programme (ERMP), recognising that the site bordered the D'Entrecasteaux National Park and that sand mining had not previously occurred in the south coast region. There was a high level of public interest in the proposal, particularly in the transport issue.

Wider issues

The Environmental Protection Authority is aware that there is also a high level of public interest in the mineral sands industry generally and that there are a number of other government initiatives addressing transport and other wider issues, as discussed in the Foreword.

The Environmental Protection Authority clearly recognises that this proposal is the vanguard of likely future mineral sands mining proposals in the south coast region. Thus, while considering the Jangardup proposal specifically in this assessment report, the Environmental Protection Authority has given some consideration to the wider transport issue also.

The Authority believes that the issue of a regional overview of the mineral sands industry is worthy of consideration and has established a committee to carry out a study on "Mineral Sands - Doing it Better". This committee is expected to report to the Environmental Protection Authority in early 1990.

Partly to this end the Authority intends to consider the committee's report and make public recommendations on it. In addition, the Authority believes that such recommendations should precede final assessment of any further major mineral sands mine proposals in the lower south-west.

The proposal

The Jangardup proposal would involve the extraction of about 3.7 million tonnes of ore from about 30 hectares of land each year, to produce 271,000 tonnes of heavy mineral concentrate for trucking to Bunbury annually. The proposed mine life is eight years.

Mining would be by a floating dredge feeding a wet separator. On average, some 56 truck trips (28 full, 28 return) per day would be required to transport the product to Bunbury. Cable Sands proposes that trucks operate via Nannup, 13 hours per day, usually from Monday to Friday.

Gravel required to maintain Shire and minesite roads would be obtained from existing pits or new pits in State Forest. Water would be supplied from a single, 184 metre deep, bore on site.

The Jangardup mineral sands deposit covers some 230 hectares. About 200 hectares are private grazing land, 50% of which is cleared. The remaining 30 hectares extends onto State Forest to the east. The deposit is bounded by the D'Entrecasteaux National Park to the south and west and private grazing land to the north (Figure 2).

Much of the site is inundated in winter. Apart from the pastured grazing land the mining area is vegetated with jarrah-banksia low woodland on sandy rises with low heath and dense swamp thicket on lower lying sites. There is some low jarrah forest on higher ground on the eastern part of the ore body. There are two small but permanent freshwater lakes in the mining path.

Much of the mine site and surrounding National Park and State Forest is considered to be infected with fungal root pathogens (Phytophthora species) which cause jarrah dieback disease. However some of the drier rises are not yet infected and the general level of disease impact appears to be low.

Radio-nuclide activity occurs in the ore due to the presence of thorium. The amount of thorium present is low, comprising about 0.06% of the heavy mineral concentrate. The concentrate as a whole is not active enough to require classification as a radioactive substance by the regulatory authorities.

A range of environmental issues were recognised by the Environmental Protection Authority from its own studies and as a result of submissions. They fell into the categories listed below:

- transportation impacts, especially on Nannup, and their effects on quality of life and livelihoods, especially tourism;
- potential effects on the National Park, State Forest and surrounding farms due to groundwater drawdown, gravel supply for roads and spread of dieback disease;
- rehabilitation of mined sites, especially in the forest; and
- strategic issues, related to the wider implications of the mineral sands industry in general and transport in particular, in the south coast region.

All of these issues were considered by the Environmental Protection Authority and potential impacts identified.

This report makes recommendations for the mitigation of impacts and the adequate environmental management of the project.

Conclusions

Following consideration of the Environmental Review and Management Programme, public submissions on it, and the proponent's responses to them, the Environmental Protection Authority has concluded that mining at Jangardup is environmentally acceptable and could be implemented subject to the recommendations below.

The Environmental Protection Authority considered that the proponent's preferred transport option is environmentally unacceptable. A preliminary evaluation of the 15 route options addressed in the transportation study led the Authority to conclude that environmentally acceptable options could be developed and to recommend that this be done before transport of the products commenced, proposed for mid 1991. The Environmental Protection Authority was particularly mindful of the wider transportation issue in the south coast region and has made recommendations accordingly.

The Authority's recommendations are set out below:

Recommendation 1

The Environmental Protection Authority concludes that the proposal to mine heavy minerals at Jangardup is environmentally acceptable subject to the Environmental Protection Authority's recommendations and the proponent's commitments including:

- **continuous rehabilitation following one to two months behind mining;**
- **the proponent retaining responsibility for rehabilitation until defined endpoints are reached;**
- **compliance with the Australian Codes of Practice on Radiation Protection;**
- **compliance with dust and noise standards;**
- **monitoring of groundwater levels and immediate implementation of action to avoid any harmful changes to water regimes; and**
- **incorporation of fines into surface sands to aid water retention into summer.**

Recommendation 2

The Environmental Protection Authority recommends that environmentally acceptable heavy mineral transport alternatives to those proposed in the ERMP be developed and implemented to the satisfaction of the Minister for Environment with advice from the Environmental Protection Authority before the commencement of product haulage operations.

Recommendation 3

The Environmental Protection Authority recommends that more detailed environmental and social analysis be developed for alternative haulage options, other than the proponent's preferred option which has been examined in this report, and that any option proposed in relation to this proposal, be referred to the Environmental Protection Authority for advice before implementation.

The dredge mining operation directly affects groundwater in the immediate vicinity and it is necessary to ensure that there are no unacceptable impacts on the adjacent groundwater users or to vegetation in the National Park and State Forest.

Recommendation 4

Mining should commence at a point remote from neighbouring properties and groundwater drawdown should be carefully monitored with a view to developing effective groundwater management strategies.

The Environmental Protection Authority recommends that the proponent ensure there be no unacceptable detrimental effects from the mining operation on vegetation, groundwater levels or groundwater quality within the adjacent National Park, State Forest or private land before approaching the neighbouring properties. Accordingly, prior to commencement of dredge pond construction, the proponent should prepare and implement a programme to monitor vegetation, groundwater levels and groundwater quality in the National Park, State Forest and private land, in consultation with the Department of Conservation and Land Management and the Water Authority of Western Australia as appropriate, to the satisfaction of the Environmental Protection Authority.

Should this programme identify any adverse effects, the proponent should report these immediately to the Environmental Protection Authority together with a plan of remedial action. Operations resulting in a level of drawdown in excess of half a metre at the boundary of the neighbouring properties or adjacent to State Forest not to be mined, should be confined to the winter months.

While much of the area is infected by the dieback fungus it is not severely affected and there are some uninfected areas which should be protected.

Recommendation 5

The Environmental Protection Authority recommends that dieback control prescriptions be developed in consultation with the Department of Conservation and Land Management, satisfactory to the Environmental Protection Authority, prior to any operations involving the movement of earth on the minesite and prior to any earthmoving, including gravel extraction, for activities involved with road construction.

Recommendation 6

The Environmental Protection Authority recommends that the following be carried out to its satisfaction:

- **rehabilitation plans be prepared for State Forest lands by the proponent in consultation with the Department of Conservation and Land Management (CALM) prior to any mining on state owned lands. These should be updated annually;**
- **development of a prescription in consultation with the Department of Agriculture and the land owner, within one year of the commencement of mining, for the rehabilitation of disturbed agricultural land to a use which is environmentally stable; and**
- **commencement of a rehabilitation monitoring and maintenance programme by the proponent which is continued until rehabilitation reaches a self sustaining standard. Audits should be performed annually by the proponent and results forwarded to the Department of Mines, the Department of Conservation and Land Management and the Environmental Protection Authority for review.**

1. Introduction

The Environmental Protection Authority has assessed a proposal by Cable Sands (WA) Pty Ltd to develop a mine for heavy mineral sands at Jangardup some 47 kilometres south of Nannup and 7 kilometres from the coast, and to transport the concentrated product to Bunbury (Figures 1 and 2).

The proposal was referred to the Environmental Protection Authority in 1987 and the level of assessment was set at an Environmental Review and Management Programme (ERMP), in recognition of the fact that the site bordered the D'Entrecasteaux National Park and that sand mining had not previously occurred in the south coast region. As such, it was recognised that there were sensitive environments in the area and there was likely to be a high level of public interest in mineral sands mining in this "greenfield" site.

During the preparation of the Environmental Review and Management Programme a high level of local interest became evident and a number of meetings instigated by the public were held, some of which were attended by the proponents. A key issue was the proposed transport of heavy mineral concentrate via the Vasse Highway, through Nannup, to Bunbury.

In view of the level of interest in the transport issue, the State Government initiated the studies by the Department of Resources Development and the South West Development Authority referred to in the Foreword to this report.

The Shire of Nannup also commissioned an independent evaluation of the likely social and economic impact of mineral sands developments on the Nannup region in particular. That study was known as the Macfarlane Report.

The proponent submitted the Environmental Review and Management Programme in July 1989. A 10 week public review period followed. The Environmental Protection Authority's role now is to make recommendations to the Minister for Environment specifically on the likely environmental impacts of the Jangardup proposal.

2. The proposal

The Jangardup proposal, as outlined by Cable Sands (WA) Pty Ltd, would involve the extraction of about 3.7 million tonnes of ore from about 30 hectares of land each year, to produce 271,000 tonnes annually of heavy mineral concentrate for trucking to Bunbury. The proposed mine life is eight years, with construction commencing in mid 1990 and product haulage commencing in mid 1991.

Prior to mining, vegetation would be removed and topsoil separately stripped by scrapers for reuse in rehabilitation. The watertable would be lowered in the mine pit area so that a bucket wheel excavator could break up the layer of sandstone above the mineralised zone. The water level in the pit would then be adjusted by pumping water in or out to allow a floating dredge to reach to the bottom of the mineralised zone. Additional water would come from a deep bore on site. Excess water would be disposed of into an evaporation pond, also on site.

Two dredges would be used for three of the eight years of the project life. Dredged ore would be treated in a wet separator towed behind each dredge.

About 6.8% of the original material would be removed as product. Following wet separation of the heavy mineral concentrate the remaining sand and clay would be returned to the pit and recontoured prior to rehabilitation.

Cable Sands propose to transport the concentrate to Bunbury via Black Point Road, Stewart Road and the Vasse and Bussell Highways, using trucks and trailers with a combined payload of 38 tonnes (Figures 1 and 2).

On average some 56 truck trips (28 full, 28 return) per day would be required to transport the product. Cable propose to operate over 13 hours per day, usually from Monday to Friday.

Gravel required to maintain Shire and minesite roads would be obtained from existing pits or new pits in State Forest.

Water would be supplied from a single, 184 deep metre bore on site, electricity would be generated on site and organic waste buried in the pit. Structural and hydrocarbon wastes would be removed from the site. Apart from vehicle and generator exhausts there would be no other atmospheric emissions.

Offices, workshops, meal and ablution facilities, laboratories, generating facilities, fuel oil and spare parts storage and 12 accommodation units would be erected on site.

The workforce would comprise 50 full time employees and 27 contract workers for transportation and servicing.

3. The location

The Jangardup mineral sands deposit covers some 230 hectares, of which 200 hectares are on private land. About 50% of this is currently cleared. The remaining 30 hectares extends onto State Forest, to the east. The deposit is bounded by the D'Entrecasteaux National Park to the south and west and private grazing land to the north (Figure 2).

The deposit occurs on the sandy Scott River coastal plain, much of which is inundated in winter. There is a two metre layer of cemented sandstone about two metres below the surface. Below this, five to 15 metres of sand overlie the Yaragadee formation. Apart from the pastured grazing land the mining area is vegetated with jarrah-banksia low woodland on sandy rises with low heath and dense swamp thicket on lower lying sites. There is some low jarrah forest on higher ground on the eastern part of the ore body. There are two small but permanent freshwater lakes in the mining path.

Drainage is generally south-westerly towards the National Park, either by direct infiltration and groundwater flow or via poorly defined surface channels and direct runoff. Superficial groundwater appears above the surface in winter and on average

1.5 metres lower in summer. Groundwater systems are present in the surface sands, in the sands between the cemented sandstone layer and the Yaragadee formation and within the Yaragadee formation itself. There appears to be natural downward leakage from the aquifer in the surface sand to the formations below but this is slowed by the sandstone layer, resulting in surface flooding in winter and lateral flow down gradient to the south-west. The sandstone thus probably helps to maintain water in the surface sands into summer.

Much of the mine site and surrounding Park and Forest is considered to be infected with fungal root pathogens which cause jarrah dieback disease (Phytophthora species). However some of the drier rises are not yet infected and the general level of disease impact appears to be low.

No gazetted rare or endangered flora or fauna were found on the site, although a number of new species of aquatic invertebrates were identified from the small lakes. Their representation elsewhere has not been established but it is considered likely that these species and the other flora and fauna on the site are represented in the surrounding uncleared National Park and Forest.

The private land, including the uncleared portion, is presently used for cattle grazing. The affected State Forest has been included in the multiple use category in the Department of Conservation and Land Management's regional plan for the area.

Radiation levels on the ore body are between 0.10 and 0.22 microgray per hour which is well below the allowable public exposure limit of 0.6 microgray per hour.

Radio-nuclide activity occurs in the ore due to the presence of thorium in the monazite fraction of the minerals. The amount of thorium present is low, comprising about 0.06% of the heavy mineral concentrate.

The control of radiation levels is regulated by the Departments of Health and Mines and approval separate from this assessment is required by those Departments if radioactive materials are involved in a mining or transport operation.

In this case, the activity of the thorium is shielded by the presence of the other inactive minerals both in the ground and in the concentrate, to the extent that the concentrate as a whole is not active enough to require classification as a radioactive substance by the regulatory authorities.

No sites of archeological or ethnographic significance have been identified on the site, following survey by the Western Australian Museum.

4. Environmental issues raised in submissions

There were 84 submissions made on the Environmental Review and Management Programme submitted by Cable Sands. The points raised were summarised under individual topics and the topics grouped into issues. The full range of issues raised in submissions has been summarised (Appendix A). Some summary statistics on the main issue groups and the individual topics of most concern are provided in Tables 1 and 2 below. The full text of the summarised questions and comments is provided in Appendix B, together with the proponent's responses to them.

NO	ISSUE GROUP	TOTAL TIMES TOPICS RAISED
1	Roads and Transportation	193
2	Quality of Life	142
3	Natural Environment	117

Table 1: Top Three Overall Issue Groups

NO	TOPIC	NUMBER RAISING IT	RAISED IN % OF SUBMISSIONS
1	Tourism	62	74
2	Safety	47	56
3	Road Through Nannup	46	55
4	Prefer Sues Road	43	51
5	Vasse Highway	37	44
6	Social Impacts	36	43
6	Regional Overview	36	43
8	Moratorium	35	42
9	Unclear Benefits	30	36
10	Peace and Quiet	26	31
10	Mining Trucks not justified by Log Trucks	26	31

Table 2: Top 10 Topics Within Issues

Most of these came from the south west, especially Nannup, but some were received from Busselton, Perth and even Broome.

The main issue group of concern was Roads and Transportation (Table 1). People were particularly concerned about road transport of heavy minerals via the Vasse Highway and particularly through Nannup. In fact a number of people clearly stated that they were not against the mine itself but were very concerned about the proposed transport route, especially when they perceived that there were suitable alternative routes.

There was a clear preference for a route utilising Sues Road (see Figure 1) (51% actually stated their preference for this route). People had mixed views on the suitability of a bypass around Nannup, with some stating that a bypass was acceptable and some feeling that it was not. Others simply indicated that transport via Nannup town or on other unsafe

parts of the Vasse Highway was unacceptable, without stating any preferences. Management of the road transport proposals for the project is clearly required.

The second issue group concerned Quality of Life topics. These in fact also included topics in the top 10 which were directly affected by the road transport proposals, for example safety and peace and quiet. Management of road transport is once again clearly necessary to address these topics in the Quality of Life issue group.

Aspects of the Natural Environment comprised the third issue group of concern. A wide range of natural environment topics were raised by many people. These include groundwater drawdown, dieback disease, rehabilitation and affects on the D'Entrecasteaux National Park and State Forest. These concerns too must clearly be managed to prevent unacceptable environmental impacts.

The proponent's original commitments for environmental management were listed in the Environmental Review and Management Programme and are reproduced in Appendix C.

As a consequence of public submissions, the proponent has addressed the queries raised and provided additional commitments aimed at mitigating concerns (Appendix D).

5. Environmental impacts and their management

Environmental impacts require suitable management if a proposal is to be environmentally acceptable.

5.1 General

Following consideration of the Environmental Review and Management Programme, public submissions and the proponent's response to them, the Environmental Protection Authority has determined that the proponent has addressed the relevant issues associated with the proposed mine satisfactorily and that the consequent impacts can be managed. This environmental management can be achieved by a combination of the proponent's original and supplementary commitments and the Authority's additional recommendations.

Recommendation 1

The Environmental Protection Authority concludes that the proposal to mine heavy minerals at Jangardup is environmentally acceptable subject to the Environmental Protection Authority's recommendations and the proponent's commitments including:

- **continuous rehabilitation following one to two months behind mining;**
- **the proponent retaining responsibility for rehabilitation until defined endpoints are reached;**
- **compliance with the Australian Codes of Practice on Radiation Protection;**
- **compliance with dust and noise standards;**
- **monitoring of groundwater levels and immediate implementation of action to avoid any harmful changes to water regimes; and**
- **incorporation of fines into surface sands to aid water retention into summer.**

5.2 Transport

The Environmental Protection Authority is concerned at the prospect of heavy truck traffic in Nannup increasing by two to four fold (Table 3).

Location	Heavy vehicles/day		Times increase
	without proposal*	with proposal+	
South of Nannup (Junction of Vasse and Brockman Highways)	41	97	2.4
North of Nannup (Junction of Vasse Highway and Cundinup Road)	17	73	4.3

Table 3: Projected Heavy Vehicle Counts

Source: * Data from Main Roads Department September 1987 Annual Average Daily Traffic counts with 6% heavy traffic south of Nannup and 4% heavy traffic north of Nannup.

+ Additional 56 truck movements/day, does not include service vehicles.

To these increases can be added service vehicles which may further increase heavy traffic by 10-20%.

Even though the projected totals with the proposal are lower than some other south-west towns, the low existing figure means that a two to four fold increase will be very noticeable. Given that the main street of Nannup is narrow, curved and has shops on either side, such a level of heavy traffic in close proximity is likely to impact significantly on lifestyle in the town.

The Environmental Protection Authority also finds that excessive heavy traffic at the normal speed limit in Nannup would be environmentally unacceptable.

The Environmental Protection Authority finds that the combined heavy truck traffic through Nannup as a consequence of current activity and the proposed operation as outlined in the ERMP would not be environmentally acceptable for reasons of excessive noise, and social impact comprising safety, amenity and disruption factors. As a consequence of studies done through the DRD and SWDA the Environmental Protection Authority believes that alternative routing options exist which could be environmentally acceptable.

The proponent has made a number of additional commitments with a view to ameliorating the impacts of using the proposed transport route (Appendix D).

Notwithstanding these, the Environmental Protection Authority considers that the proposal for heavy haulage via Nannup is not environmentally acceptable.

The Environmental Protection Authority is aware that product haulage would be undertaken by contractors to Cable Sands and accordingly states its clear intention that the proponent have responsibility for the environmental performance of the haulage operation and that the following recommendations be applied to the operator of the truck fleet.

Recommendation 2

The Environmental Protection Authority recommends that environmentally acceptable heavy mineral transport alternatives to those proposed in the ERMP be developed and implemented to the satisfaction of the Minister for Environment with advice from the Environmental Protection Authority before the commencement of product haulage operations.

Recommendation 3

The Environmental Protection Authority recommends that more detailed environmental and social analysis be developed for alternative haulage options, other than the proponent's preferred option which has been examined in this report and that any option proposed in relation to this proposal be referred to the Environmental Protection Authority for advice before implementation.

The Environmental Protection Authority notes the studies by the Department of Resources Development and the South West Development Authority into alternative heavy transportation options for the south west. Recognising that generalised alternatives rather than specific proposals have been presented, the Environmental Protection Authority finds that the broad environmental acceptability of the alternatives is as outlined in Table 4 below.

Each alternative was examined in a brief desktop study to assess its likely impact on the environmental issues listed in Table 4. The issues examined were:

- Severance - likely disruption of town and farming activities;
- Noise - number of residents and their proximity;
- Vibration - as above;
- Road Dust - dust raised from the road surface based on length of unsealed road or shoulder;
- Load Dust - dust blowing from the load - number of residents and their proximity;
- Gravel Source - amount of disturbance required to supply gravel based on length of new road construction/upgrad-ing required;
- Dieback - risk of dieback spread based on length of new road construction or upgrade;
- Clearing - amount of new clearing - basis as above;
- Tourists - potential disruption to tourists - based on length of existing tourist routes used.

Table 4: South-West Mineral Sands Land Transport Options

OPTION		ISSUES								
NO	DESCRIPTION	SEVERANCE	NOISE	VIBRATION	ROAD DUST	LOAD DUST	GRAVEL SOURCE	DIEBACK	CLEARING	TOURISTS
1	BUSSELL VASSE HWYS - NO BYPASSES		M	M	N	N	N	N		M
1A	BUSSELL VASSE HWYS - BYPASSES	P	N	P	N	N	S	N	P	S
1B	BUSSELL VASSE BUSSELTON RAIL	P	N	P	N	N	N	N	P	N
2	SUES VASSE WONNERUP CAPEL		P	P	N	P	M	S	N	P
2A	SUES VASSE YOGANUP CAPEL	N	P	P	N	P	M	S	S	•
3	SUES SABINA WONNERUP CAPEL		P	P	N	P	M	S	N	•
3A	SUES SABINA TUTENUP CAPEL	N	P	P	N	P	M	S	N	•
3B	SUES SABINA BUSSELTON RAIL		•	•	N	P	M	S	N	•
4	SUES ACTON PARK RAIL	M	P	•	N	P	M	S	S	•
5	VASSE YOGANUP CAPEL	P	N	P	N	N	N	N	S	N
6	BROCKMAN VASSE S-W HWY	P	N	P	N	N	N	N	P	S
7	BROCKMAN VASSE KIRUP RAIL	P	N	P	N	N	N	N	N	N
8	RAIL BEENUP BUNBURY	M	•	•	P	•	M	S	S	
9	SUES VASSE QUILGERUP RAIL	P	P	P	N	P	M	S	S	P
10	JARDEE RAIL	P	•	•	N	P	S	N	N	P

IMPACT: • = Minor
M = Major
N = Noticeable
P = Present
S = Significant

- Option numbers conform to those in the Department of Resources Development report entitled "Transport Infrastructure for Proposed Mineral Sands and other Resource Developments in South West of Western Australia".
- Option 1 is the proponent's proposed route.

5.3 Groundwater

A major potential to modify the existing environment exists through the agency of groundwater drawdown. Drawdowns of up to six metres in the dredge pond may result in consequent drawdown in adjacent groundwater, which quickly reduces with distance, extending beyond the minesite and onto the neighbouring properties. Figures 3 and 4, provided by the proponent in response to submissions, show the general decline of drawdown with distance from the mine. This drawdown takes the form of a large, inverted cone rather than a flat surface, similar to bathwater flowing down a plug hole. The proponent has undertaken to restrict drawdown operations close to the National Park to the wet season when vegetation is not likely to be dependent on groundwater. The proponent has also reached agreement with the adjacent land holder to provide alternative supplies should pasture or stockwater be affected. In addition the Environmental Protection Authority believes that experience gained from the monitoring and management of early operations can be used to better manage operations as they approach neighbouring properties.

The issue of buffer zones between the mine and the surrounding properties was raised in two submissions. The Environmental Protection Authority believes that the monitoring and management approach can deal with potential drawdown effects as successfully as any reasonable width buffers might.

Accordingly, the Environmental Protection Authority makes the following recommendation.

Recommendation 4

Mining should commence at a point remote from neighbouring properties and groundwater drawdown should be carefully monitored with a view to developing effective groundwater management strategies.

The Environmental Protection Authority recommends that the proponent ensure there be no unacceptable detrimental effects from the mining operation on vegetation, groundwater levels or groundwater quality within the adjacent National Park, State Forest or private land before approaching the neighbouring properties. Accordingly, prior to commencement of dredge pond construction, the proponent should prepare and implement a programme to monitor vegetation, groundwater levels and groundwater quality in the National Park, State Forest and private land, in consultation with the Department of Conservation and Land Management and the Water Authority of Western Australia as appropriate, to the satisfaction of the Environmental Protection Authority.

Should this programme identify any adverse effects, the proponent should report these immediately to the Environmental Protection Authority together with a plan of remedial action. Operations resulting in a level of drawdown in excess of half a metre at the boundary of the neighbouring properties or adjacent to State Forest not to be mined, should be confined to the winter months.

The Environmental Protection Authority notes that the proponent has made a commitment to an agreement with the adjacent land owners to rectify any adverse effect on pastures and dams that is attributable to the mining operation.

5.4 Dieback disease

Dieback disease was recognised as having the potential to cause significant environmental effects in a number of submissions. Following discussions with staff of the Department of Conservation and Land Management, the Environmental Protection Authority considers that it is likely that dieback disease is widespread in the low lying parts of the National Park and State Forest but notes that the impact of disease appears generally low to date because infected areas support resistant species and the disease itself is often absent from sandy rises which support the most susceptible species. Accordingly, disease impact outside the mine is only likely to significantly increase if there is direct transfer of disease onto uninfected rises or if the infective season is extended by extra runoff keeping the soil moist into the warmer part of the year. Clearly an effective dieback management plan is required to exclude direct access to the Park and manage water runoff. The Environmental Protection Authority also notes the concerns of the Department of Conservation and Land Management with respect to the potential for dieback spread during gravel extraction from forest lands remote from the minesite.

Recommendation 5

The Environmental Protection Authority recommends that dieback control prescriptions be developed in consultation with the Department of Conservation and Land Management, satisfactory to the Environmental Protection Authority, prior to any operations involving the movement of earth on the minesite and prior to any earthmoving, including gravel extraction, for activities involved with road construction.

5.5 Rehabilitation

A number of submissions questioned the ability of the proponent to re-establish native vegetation, particularly trees, when the proponent's experience has largely been with pasture re-establishment. The Environmental Protection Authority is aware that

suitable techniques have been developed for the re-establishment of diverse native understorey and trees on other sites. The Environmental Protection Authority notes the proponent's recent experience with native understorey re-establishment at Minninup. Accordingly, the Environmental Protection Authority believes that a satisfactory programme can be developed subject to adequate supervision.

Recommendation 6

The Environmental Protection Authority recommends that the following be carried out to its satisfaction:

- **rehabilitation plans be prepared for State Forest lands by the proponent in consultation with the Department of Conservation of Land Management (CALM) prior to any mining on CALM lands. These should be updated annually;**
- **development of a prescription in consultation with the Department of Agriculture and the land owner, within one year of the commencement of mining, for the rehabilitation of disturbed agricultural land to a use which is environmentally stable; and**
- **commencement of a rehabilitation monitoring and maintenance programme by the proponent which is continued until rehabilitation reaches a self sustaining standard. Audits should be performed annually by the proponent and results forwarded to the Department of Mines, the Department of Conservation and Land Management and the Environmental Protection Authority for review.**

5.6 Lakes

Some people making submissions were concerned about the disturbance of two small freshwater lakes in the mining path. The Environmental Protection Authority recognised that the lakes presently have no protection on private land and that a range of lake habitats are conserved in the adjacent D'Entrecasteaux National Park. The Authority considers that additional study of freshwater habitats which will be protected is warranted and supports the proponent's commitment in this regard. The Environmental Protection Authority notes that the proponent intends to return the lakes to a state consistent with the landowners requirements.

5.7 Change of ownership

The Environmental Protection Authority is aware that Cable Sands operations are presently being offered for sale by the owner.

Should there be a transfer of ownership of Cable Sands operations, the new owner will be required to comply with the recommendations of this assessment.

6. Conclusion

Following assessment of the Cable Sands (WA) Pty Ltd proposal the Environmental Protection Authority has concluded that the mining of heavy minerals at Jangardup is environmentally acceptable subject to the operation being carried out in accordance with the commitments in the Environmental Review and Management Programme, the proponent's additional commitments and the recommendations of the Environmental Protection Authority .

The Environmental Protection Authority further concludes that the major potential impact of the proposal is the transport of heavy mineral product to Bunbury. Accordingly, the Environmental Protection Authority concludes that transportation would only be environmentally acceptable if modifications were made to the proponent's preferred route before haulage commences, consistent with the Authority's recommendations.

Figures

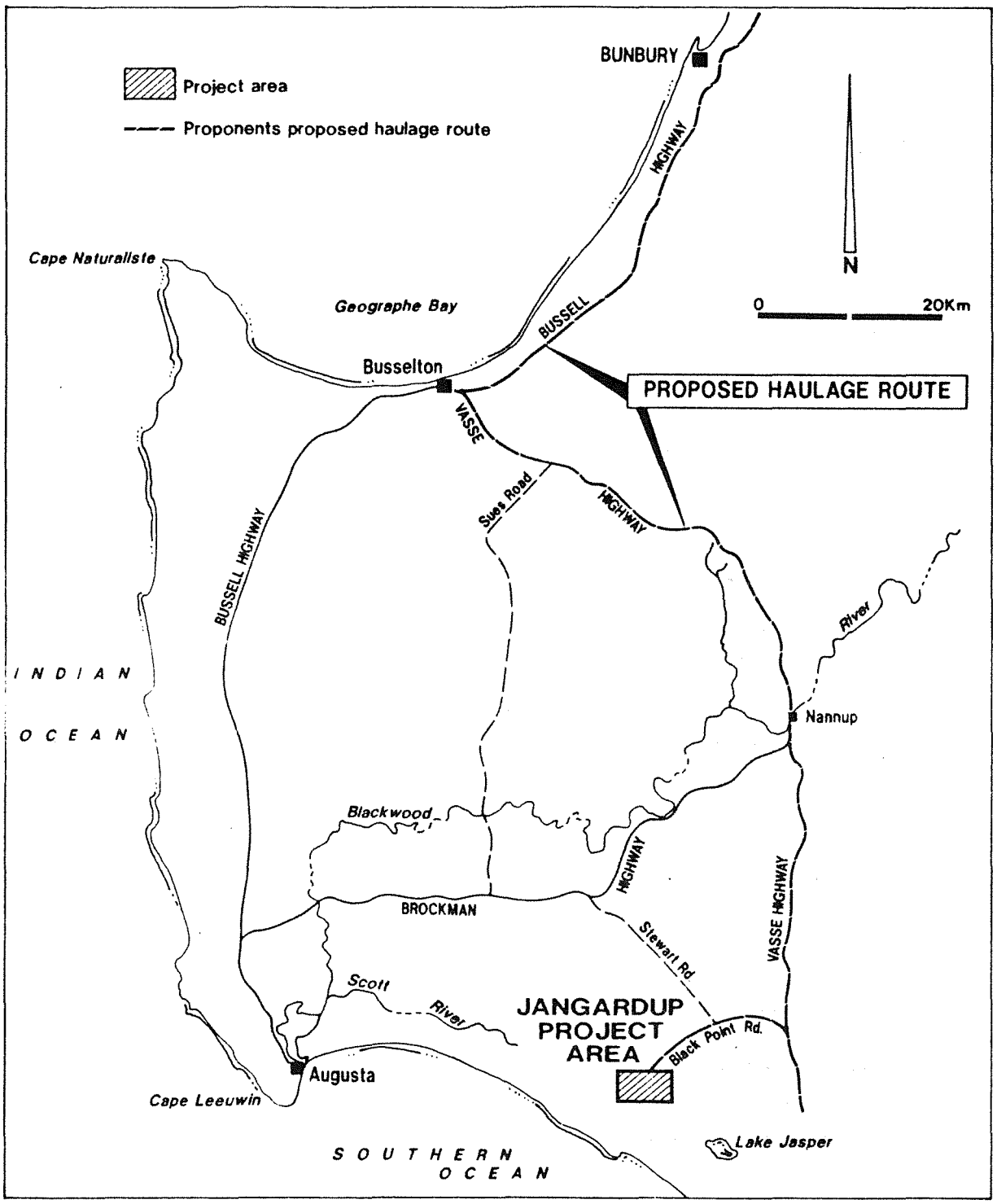


Figure 1: Jangardup project area and proponent's proposed haulage route

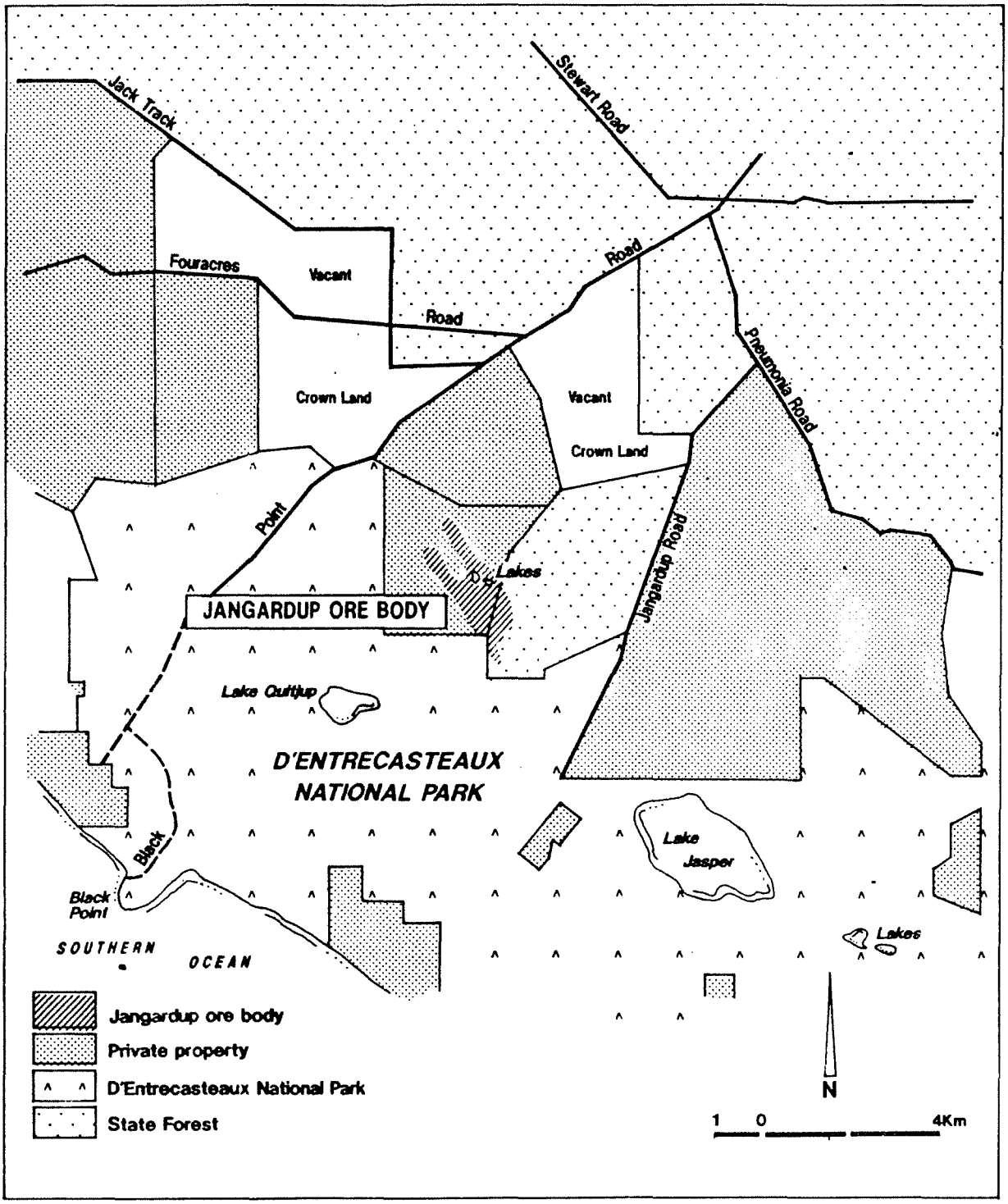


Figure 2: Jangardup project area

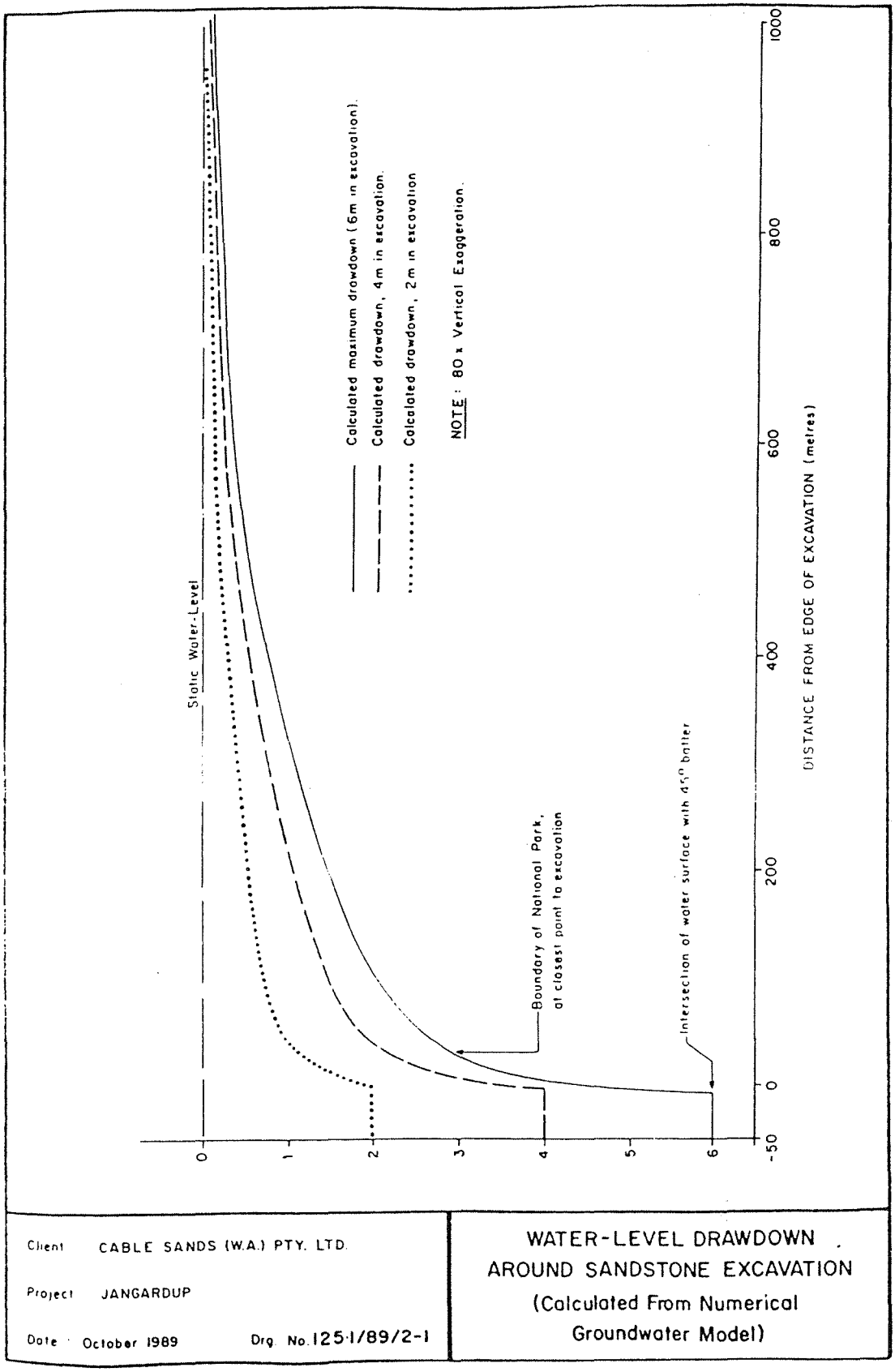


Figure 3: Water level drawdown around sandstone excavation

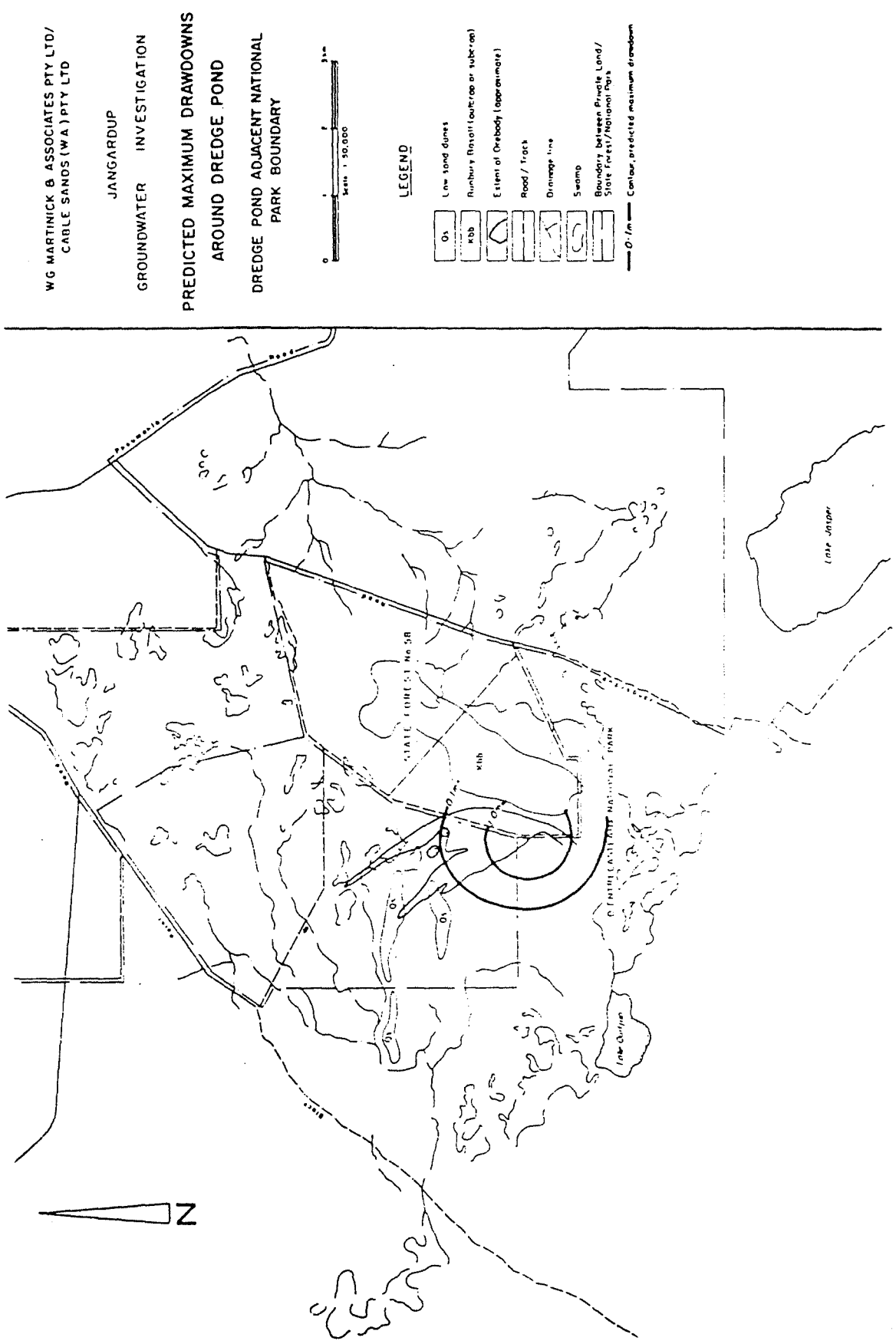


Figure 4a: Predicted maximum drawdowns around dredge pond - adjacent National Park

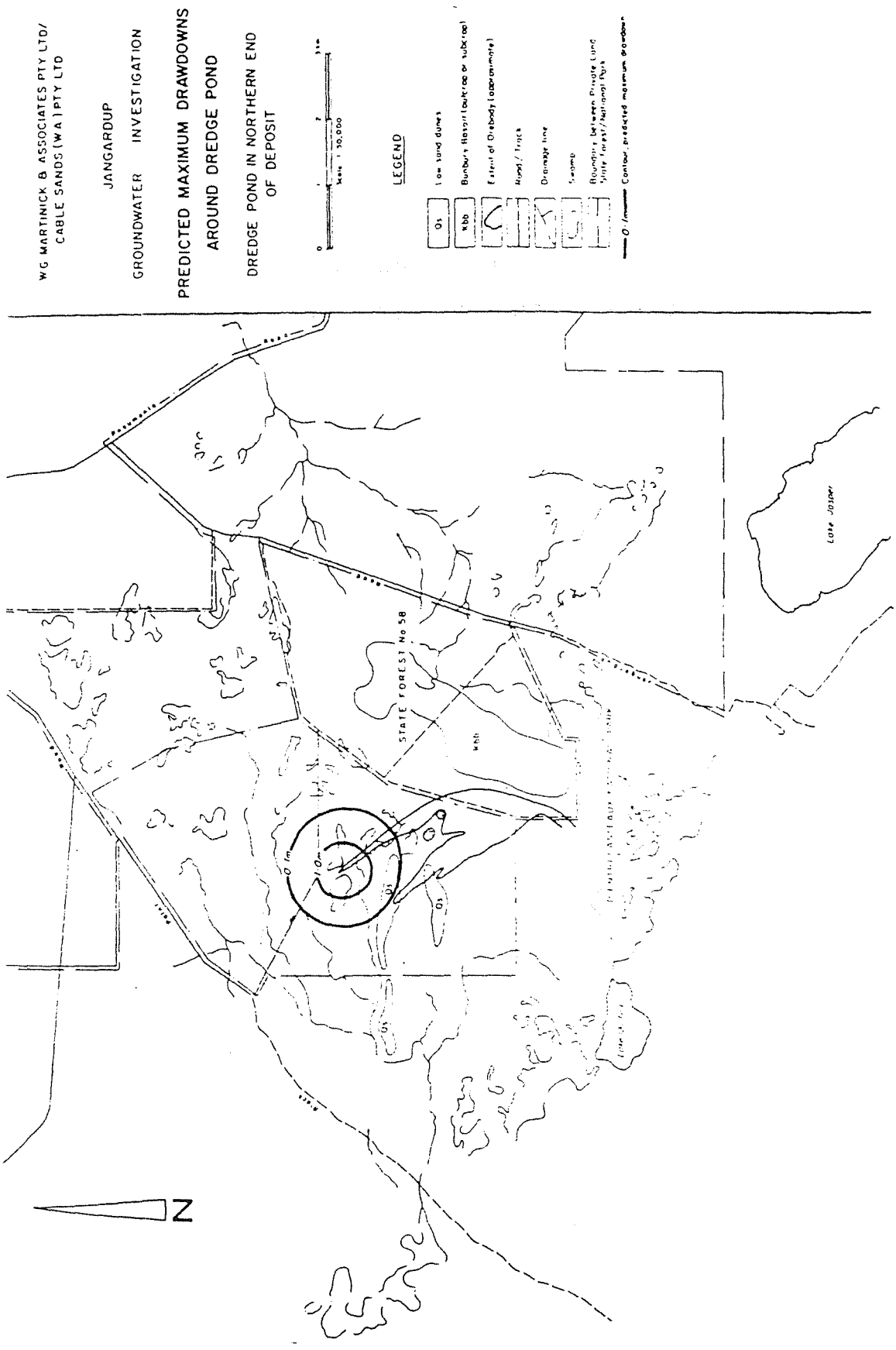


Figure 4b: Predicted maximum drawdowns around dredge pond - northern end of deposit

Appendix A

List of topics in issue groups raised in submissions

Appendix A

List of topics in issue groups raised in submissions

ISSUE GROUPS Topics	NUMBER RAISING TOPIC	RAISED IN % OF SUBMISSIONS
ROADS AND TRANSPORTATION		
Effects on road through Nannup	46	55
Prefer Sues Road	43	51
Effects on Vasse Highway	37	44
Mining trucks not justified by tolerance of log trucks	26	31
Prefer rail or sea options	21	25
Cost of road maintenance	16	19
Number of trucks	14	17
Bypass	14	17
Impact on roads	9	11
Gravel roads	8	10
Cost of roads and who pays	5	6
Passing lanes	9	5
Permits	3	4
Acton Park	3	4
QUALITY OF LIFE		
Road safety	47	56
Perceived social impacts	36	43
Peace and quiet	26	31
Effects on the operation of school buses and their safety	18	21
Radiation concerns	8	10
Heritage values	4	5
The application of buffer zones	2	2
NATURAL ENVIRONMENT		
Drawdown of groundwater levels	20	24
D'Entrecasteaux National Park	19	23
The spread of jarrah dieback disease	16	19
Mine site rehabilitation	15	18
Wetlands	13	15
State Forest	9	11
Wilderness values	8	10
Effects on fauna	6	7
Effects on drainage and flooding	4	5
Hydrologic change due to disturbance of the sandstone layer	3	4
Clearing of Tuart trees along the Bussell Highway if widened	3	4
Sources of gravel	2	2
Fire protection	1	1

ISSUE GROUPS Topics	NUMBER RAISING TOPIC	RAISED IN % OF SUBMISSIONS
STRATEGIC ISSUES		
The need to adopt a regional overview of mining and transportation	36	43
Imposition of moratorium on sand mining in the lower south-west	35	42
Unclear benefits	30	36
Interaction with the Beenup proposal	9 *	11
Questionable economics	6	7
The need to leave behind lasting benefits (eg SEC power, roads)	2	2
LIVELIHOOD		
The importance of tourism	62	74
Support for or opposition to mining	21	25
Effects on stock animals	6	7
Employment effects	5	6
Population effects	3	4
Effects on property values	1	1
POLLUTION		
Noise from trucks and the mine site	13	15
Dust from trucks and the mine site	9	11
Vibration caused by trucks	8	10
Nutrient runoff	8	10
Impact on the greenhouse effect	5	6
Air pollution from vehicle and generator exhausts	4	5
ASSESSMENT PROCESS		
Inconsistencies in the Environmental Review and Management Programme	8	10
The Government system	6	7
The Environmental Review and Management Programme process, cost, local availability of report	5	6
The need for monitoring	4	5
The need for specific environmental management plans	2	2
Consideration of public opinions by the proponent	2	2

* Proponent's responses are contained in Appendix B of this report.

Appendix B
Proponent's responses to submissions

ROADS

2 Road cost - Cost of upgrading roads

(a) Concerns

- Upgrading required - Vasse Highway
  Stewart Road
  Black Point Road

- Upgrading costs allocated are too low, more information required.

(b) Proponent's response:

The Vasse Highway is being widened to 6.2m by the Shire of Nannup with funding from the Main Roads Department. To further improve the safety of the section of the road between the township of Nannup and Stewart Road the proponent, in conjunction with the Main Roads Department and the Shire of Nannup, is willing to provide capital to the Shire of Nannup to further widen the road where the proponent considers that this is necessary.

Stewart Road and Black Point Road will be upgraded by the Shire of Nannup on contract to the proponent who, as the principal user, will bear the cost.

3 Road maintenance - Cost of road maintenance

(a) Concerns:

- Ongoing maintenance costs funded by rate payers

- More information required

- Proponent contribution too low

- Increased disruption to other users due to frequent maintenance

- Decreased efficiency elsewhere due to distance from depot

(b) Proponent's response:

The proponent will fund in proportion to its use of the roads, the annual road maintenance of Stewart Road and Black Point Road for the life of the project. A sum of $130,000 per annum has been budgeted for this purpose. The work will be performed by the Shire of Nannup on contract to the proponent.

There is not expected to be any disruption to the public who use Stewart Road and Black Point Road as the initial upgrading will include the widening of the route to 7m. These roads will be

considerably improved by the early inclusion of new drains and culverts.

4 Road permit - Need for road permits

(a) Concerns:

- Need for permits for large trucks proposed

- Ability to fix transport routes vested in Minister for Transport

(b) Proponent's response:

Permits for large trucks are required and negotiations are in progress with the Main Roads Department, the Department of Transport and the Shires of Nannup, Busselton, Capel and Bunbury.

Final permits are under the control of the Minister for Transport who ultimately decides which transport routes will be used. The Main Roads Department is the regulatory body within the State.

5 Bypass - Nannup bypass

(a) Concerns:

- What are the costs and will the proponent pay?

- Nannup bypass is unacceptable - 7 submissions

- Nannup bypass is acceptable - 5 submissions

(b) Proponent's response:

The costs for bypassing Nannup via three alternative routes to a standard acceptable to the proponent are discussed on Pp. 49-50 in the ERMP. The construction and use of a bypass was not favoured by the proponent because there is a suitable public highway passing through Nannup which the proponent believes it should use.

It is noted that 7 out of 12 submissions regard the bypass as unacceptable.

6 Nannup Road - Use of existing road through Nannup

(a) Concerns:

- Disruption to town

- Opposed to the use of this route - 46 submissions

- Supportive of this route - 0 submissions

(b) Proponent's response:

The Vasse Highway via Nannup is the proponent's preferred route relative to 11 other alternatives which were considered in the ERMP. This is because the length and immediate availability of the Vasse Highway which is sealed and capable of carrying a 38 tonne payload, is reflected in the overall operating cost of moving concentrate to Bunbury. All other alternatives were greater in cost and rail was twice the cost.

The proponent does not believe that its trucks will cause more disruption than trucks already driving through Nannup, given that the total volume of traffic will increase. The proponent is prepared to observe a 40kph speed limit through the township of Nannup and would be unique in this regard.

7 Vasse Highway - Use of Vasse Highway (outside Nannup)

(a) Concerns:

- Opposed to this route - 33 submissions
- Road is inadequate, unsafe surface, unsafe width, intersections, visibility etc.
- Road has outlived its designed life

(b) Proponent's response:

The proponent's preferred route is the Vasse Highway. Work is underway to overcome the inadequacies of the Highway between the township of Nannup and Stewart Road junction. The Main Roads Department is widening the Highway to 6.2m and this will be completed by 1991. The proponent, in conjunction with the Main Roads Department and the Shire of Nannup will fund additional improvements that it believes are necessary.

8 Passing - Difficulties with passing haul trucks

(a) Concerns:

- Dangerous, unsafe
- What provision will the proponent make to pay for the upgrading of passing lanes?

(b) Proponent's response:

The Main Roads Department is currently re-constructing the Vasse Highway south of Nannup. Should extra passing lanes be desirable to cater for increased trucking arising from the proponent's operations, the proponent in consultation with the Main Roads

Department will fund some negotiable contribution for this purpose.

11 Road impact - Deterioration of road surfaces

(a) Concerns:

- What will the proponent do to ensure the deterioration of road surfaces is not unacceptable?
- Will this be adequate to maintain roads in a safe condition?
- Will the proponents funding be adequate to seal all gravel roads?
- Impacts will be unacceptably high.

(b) Proponent's response:

Black Point Road and Stewart Road will be upgraded to, and maintained at, a high gravel standard that is equivalent to seal. When the mining project commences these improvements will be performed by the Shire of Nannup on a contract basis to the proponent. The standard has to be high so as not to cause undue wear and tear to trucks.

The gravel roads will not be sealed in the short term as this removes work available to the Shire of Nannup and also reduces the initial capital expenditure for the proponent. Sealing could be considered at a later date.

The impact of the project on the cost of road maintenance will not be great for the Shire of Nannup. The proponent will provide the funds for road damage that is attributable to heavy traffic associated with the project.

12 No. trucks - Number of trucks on roads

(a) Concerns:

- Number of trucks and frequency of movements is too high
- Will the existing frequency of heavy vehicle movements through Nannup be approximately doubled if this proposal goes ahead?

(b) Proponent's response:

The proponent will use 14 8-wheel rigid trucks, each towing a dual axle trailer. Each truck and trailer has a total gross weight of 59.5 tonnes and a payload of 38 tonnes. This is the standard configuration that the proponent currently uses for its operations that are located at Bunbury, Waroona and Capel.

It is possible to reduce the frequency of trucking movements by using a similar configuration which incorporates a tri-axle rear combination on the towed trailer. This configuration has a payload capacity of 42 tonnes, and has been discussed with the Main Roads Department.

The most recent Main Roads Department traffic counts indicate that there are up to 30 heavy vehicle movements per day through Nannup. The proposed operation would increase this 2-3-fold or by only 10% of total traffic. This frequency of truck movements is not high relative to other similarly populated areas.

37 Gravel road - Impacts on gravel roads

(a) Concerns:

- Why shouldn't all gravel roads the proponent uses be sealed?
- Who will pay for maintenance of gravel roads? What proportion of the total maintenance cost will the proponent pay? Will this be proportional to his usage?
- Keep access roads to the coast open for fishing and other recreation
- Gravel roads in the area already breakdown in winter
- Will they become impassable with the proponents increased traffic? How will the proponent ensure they stay open?
- Access from the mine should join Black Point Road as far south as possible to reduce impacts on residents to the north. Alternative access should be provided to Jangardup Road in case Black Point Road becomes impassable.

(b) Proponent's response:

The gravel roads Stewart Road and Black Point Road are not intended to be sealed in the short term as this removes work that is available to the Shire of Nannup.

Gravel roads are less costly initially but could, in the long term prove more costly than sealed roads. Nevertheless as stated in the proponent's response to Issues 3 and 11, the proponent will provide funding in proportion to use for Black Point Road and Stewart Road to be graded to the equivalent of seal, for the life of the project.

Access to the coast roads will be maintained.

Stewart Road and Black Point Road to the entrance of the mine will be upgraded to an all weather standard by adding fill, drains and culverts before the project starts production. As

stated in the proponent's response to Issue 3, an initial upgrading will include widening the route to 7m. The Shire of Nannup will then maintain these two roads at a high standard to allow the movement of traffic throughout the year.

Access to the mine from Black Point Road is at the current farm entrances, which is 8km from Stewart Road. No alternative access to Jangardup Road is desirable because of possible impacts on the State Forest and because Black Point Road will not become impassable.

39 Sue's Road - Use of Sue's Road option

(a) Concerns:

- Support or accept the use of Sue's Road as a transport route - 43 submissions

- Sue's Road was originally built for heavy haulage of iron ore from the Scott River - this investment should be utilised

- Upgrade of Sue's Road would favour other heavy haulage uses and allow separation from tourist traffic

(b) Proponent's response:

The Sue's Road options were considered in detail, and both sealed or unsealed alternatives were not favoured by the proponent because of the unaffordably high initial capital costs. The existing road cannot be used throughout the year and the best alternative to save annual operating costs is to seal the whole road. This would cost in excess of $13 million. Even to upgrade Sue's Road to a good gravel standard would be very costly and there would be additional road maintenance costs required to prevent undue wear and tear to the trucks using the route.

These unaffordably high initial capital and maintenance costs, together with the discussion raised in the ERMP Pp. 48-49, are the reasons why the Sue's Road option was not favoured by the proponent.

Should the reconstruction of a transport route via Sue's Road be undertaken by the Main Roads Department/Shires, the proponent would reconsider its earlier decisions.

49 Acton Park - Use of roads through Acton Park area

(a) Concerns:

- Disruption, safety and inconvenience

- Inadequacy of existing roads in the area to cope with frequent heavy haulage vehicles

- Safety of school buses, play groups etc

- Disruption to stock movements on rural roads. See the proponent's response to Issue 25.

(b) Proponent's response:

The route that was preferred by the proponent does not include Acton Park Road. The route was costed but eliminated because it included Sue's Road. See the ERMP Pp. 48-49.

LIVELIHOOD ISSUES

10 Mining - Opinions on mining industry

(a) Concerns:

- No objection to mining provided outstanding issues resolved - 16 submissions

- Opposed to mining - 5 submissions

- Delay start up until transport issue is resolved

(b) Proponent's response:

As the discovery of mineral reserves within a region and the feasibility of developing these tends to be progressive rather than simultaneous, it is often not possible to adopt a single strategy for matters such as transport. Proponent time schedules to meet market commitments require decisions be made promptly with regard to a mining proposal.

Any delay in resolving the transport issue in relation to the Jangardup project would be unsatisfactory for the proponent's share-holders, the 220 existing employees, the 78 proposed new employees the project will employ, the export-dependent Australian economy, the State Government and the international end users of ilmenite that the proponent has contracted to supply from August 1991. For this deadline to be met it is important that approval is granted by December 1989 so that 1990 and early 1991 are available for the purchase and manufacture of equipment and for site preparations.

15 Tourism - Opinions on the tourism industry

(a) Concerns:

- Can the proponent guarantee that the tourism industry won't be affected by the heavy haulage proposed as a consequence of this proposal?

- Tourism will be decreased by the proposal - 51 submissions

- Tourism is important, should be protected - 11 submissions

- Tourism is an important part of many peoples livelihoods and offers opportunities for employment for many in the long term whereas mining offers fewer jobs for only eight years.

- Why is the importance of tourism dismissed in the ERMP, contrary to the data available from the visitor centre and in the MacFarlane report?

- The proponent is wrong to dismiss the impact on tourism

(b) Proponent's response:

Development of the area has been in harmony with the trucking that is associated with the existing primary industries of forestry and agriculture. Similarly, the impact of the proponent's trucks on tourism is expected to be minimal. The proponent has co-existed with tourism in other areas such as Capel, Waroona and within the City of Bunbury where trucking is a major component.

The proponent has not dismissed tourism but expects visitors and tourists to increase in parallel with the project.

23 Population - Effects on population numbers

(a) Concerns:

- Population and hence the viability of Nannup will drop, not increase, due to disruption of the tourist industry

- What guarantee have the proponents got that Homeswest will build further houses in Nannup?

- Homeswest will not build in Nannup

- Any new houses should be built below the level of existing water services

(b) Proponent's response:

The project is expected to increase, not decrease the population and the viability of Nannup. There will be an increased cashflow from employees and improved business opportunities in major sectors of industry such as transportation, retail and personal services within the Shires of Nannup and Manjimup. See the ERMP Pp. 66-67.

Nannup's 1989 population is 700. Twelve houses will bring 40 new people to Nannup town, a 6% increase from one project. The population would have to decline by 40 people to show a negative impact from the proponent's operations. This is unlikely.

There is no guarantee that Homeswest would build houses in Nannup. The proponent has asked Homeswest to build 12 houses in Nannup on the basis that the proponent would guarantee rent for 10 years. The proponent guarantees that houses will be built at Nannup and will contribute towards the capital, even if Homeswest is not a participant.

25 Stock - Impacts on farming stock

(a) Concerns:

- Stock crossing roads will be disrupted, especially in milk producing areas, by haul trucks

- Milking cows will be disturbed by trucks and therefore become less productive - who will compensate farmers for loss of income?

(b) Proponent's response:

Livestock along the proponent's preferred road route already experience heavy traffic with no apparent detriments. The preferred route is mainly lined with trees and this may reduce the impact of heavy traffic.

The proponent has been operating in a rural setting for many years without creating problems to agriculture.

52 Property value - Impact on property values

(a) Concerns:

- Property values will be reduced by having mining in a rural area - will owners be compensated?

(b) Proponent's response:

The Jangardup area is remote and adjoining private properties are few in number. The operation is bordered on the east by the

State Forest Central Block and on the south by the National Park. Mining on Lot 12895 will have an impact on only 133ha over eight years and on a 10-20ha working area at any one time. The property will, after mining, be systematically redeveloped to at least the pre-mining standard.

The proponent has conducted operations near to Capel for more than 20 years without disrupting the community. There, the post-mining valuation of the mined properties increased.

The proponent does not believe there will be any impact on nearby property values except perhaps to increase them because of better roading.

54 Employment - Impact on employment opportunities

(a) Concerns:

- Total employment will drop due to disruption of the tourist industry

- Rail transport should be used to provide further employment for train crews

(b) Proponent's response:

See the proponent's response to Issues 15, 23 and 18. The proponent expects that total employment and tourism will increase after the Jangardup project commences.

Mineral sand operations such as the one at Jangardup are discontinuous and usually have no railhead nearby. The costs of establishing rail transport to service the Jangardup project and the associated excessive handling of the product would be prohibitive relative to the value of the product. Consequently the use of rail transport would make the project financially unviable and there would be no regional employment potential.

STRATEGIC ISSUES

13 Region - Consideration of regional issues

(a) Concerns:

- Regional solutions to issues, especially transportation, should be considered rather than just this proposal in isolation

- What other developments will the proponent undertake in the lower South West? When? Why haven't transportation considerations taken these longer term developments into account?

- What options exist for transportation to be co-ordinated with BHP's proposals?

(b) Proponent's response:

The discovery of mineral reserves within a region and the feasibility of developing these tends to be progressive rather than simultaneous, so it is often not possible to adopt a single strategy for matters such as transport. Proponent time schedules to meet market commitments require decisions be made promptly with regard to a mining proposal.

Regional issues are best decided by the Government which has access to the most information. The proponent is aware that the South West Development Authority, the Department of Resources Development and the Department of Transport are considering this situation. Final permits are under the control of the Minister of Transport who makes the ultimate decision on the routing of transport. The Main Roads Department is the regulatory body within this State.

Other developments in the South-West are likely to occur in the vicinity of Jangardup and are most likely to be to the east of Jangardup. A deposit at Scott River is only marginally viable. The proponent at this stage holds only exploration leases and the future potential of these are yet to be proven. The proponent's longer term needs are more likely to be met using the Vasse Highway.

Transportation cannot be co-ordinated with the BHP Beenup proposal. It is understood that BHP are still doing their feasibility studies and will not be operational in the area for some two years after 1991 when the operations at Jangardup commence.

14 Beenup - Cumulative impact/opportunities for both projects

(a) Concerns:

- Why can't both projects use a common transport route along Sue's Road or via ocean transport?

- Why can't this proposal be delayed until the Beenup proposal commences? The proponent could continue operations at Capel until then.

(b) Proponent's response:

The proponent's firm plans are to commence the Jangardup operation in 1991. The proponent has applied for a Notice of Intent to Mine and completed its ERMP study which discusses the availability and cost of various transport options and why the Vasse and Bussell Highways were selected to transport the heavy

minerals concentrate. The alternative of using Sue's Road under the current circumstances, could impair the viability of the project because of the year round requirement of having Sue's Road operational. See the proponent's response Issue 39. The Beenup proposal is still at a feasibility stage and will not be ready in time to be compatible with the proponent's commitments. See the proponent's response to Issue 13.

Transport of the heavy minerals concentrate by ocean to the proponent's Processing Plant at North Shore would raise similar problems as for the railing of the product. There is extra handling, a new weatherproof storage depot and wharf would need to be built, there would be additional haulage to the wharf, and facilities would need to be built at Bunbury to unload the wet concentrate. All these factors are costly to a commercial operator.

The Jangardup project cannot be delayed until Beenup is ready. This is not reasonable for the proponent's shareholders, its employees, new employees, the Australian Economy, the Shire of Nannup and the buyers of the ilmenite who are expecting the product on time.

18 Moratorium - Moratorium on new mineral sands projects in the lower South-West

(a) Concerns:

- A moratorium should be placed on all mineral sands proposals south of Busselton - Bridgetown - Albany until all aspects have been reviewed at a regional level

- Why is piecemeal mine development being allowed to occur?

- Regional overview should have public input

- Mining is not wanted by residents of the lower South-West

- The cost-benefit of mining to the community as a whole in the South-West should be evaluated especially with regard to its potentially negative effect on tourism

(b) Proponent's response:

A moratorium is not necessary and would delay a development which creates no serious environmental issues. The areas to be mined on farmland and in State Forest will be rehabilitated to at least the pre-mining standard. The project will provide work for many firms in the Nannup/Manjimup area and provide additional employment for 78 new staff at the Company and 20 truck drivers.

Development by the proponent is not piecemeal. The Jangardup project is based on a single large orebody which will be mined

for 8 years. It is the next stage in a continuous progression of operations with which the proponent is involved in order to meet export demands.

The Government agencies, with current assistance provided by the public are best equipped to produce an overview of the regional situation.

Mining and tourism can develop compatibly as is the situation in the Pilbara. The cost benefit of mining to the economy is positive. Economic studies which have examined the impact of the mineral sands industry in the South-West show that mining has a multiplier effect of 39% to 85%. In the South-West the mining industry employs at least 1270 people and an estimated 200 contractors and transporters of heavy minerals. The additional 78 people employed with the Jangardup project may be expected to promote a similar multiplier effect.

19 Economic - Economic cost/benefit

(a) Concerns:

- Why should this project proceed if it can't afford to offset all transportation, environmental and social costs?

- If the project is going to generate $196 million why can't it afford to pay all of the road upgrade and maintenance costs?

- The State should receive higher royalties

- Major benefits go to the proponent, State and Federal Governments - there are no benefits to Nannup in the long term

- Economic analyses in the ERMP are one sided and suspect

- Tourism should have been included in the economic analysis

- The use should pay for decreasing social and environmental amenities

(b) Proponent's response:

The project does pay for its total transport costs using the public road system. This is achieved by the cost of permits and taxes, fuel and the upgrading and ongoing maintenance of public roads from the start of the project. This is discussed in the ERMP where the proponent has addressed all the environmental costs and the impact of mining on the environment.

Project revenue is $196 million. This is not profit. Out of this has to be paid eight years mining and transportation costs,

eight years heavy minerals separation costs in Bunbury, eight years wages and salaries for 78 employees, eight years staffing costs and overheads, payroll tax, royalties, shipping costs and depreciation.

Royalties to the State Government are fixed by Parliament and have nothing to do with this project. Royalties underwent a 67% increase from 3% to 5% on 21 August 1987.

Nannup will benefit from the employment of 50 employees at Jangardup and 20 truck drivers. Nannup will also gain from having new houses built, an annual income for the maintenance of roads and the ability to purchase extra equipment. There will also be increasing work for local businesses and contractors. It is likely that there will be other enterprises which will sustain this boost to Nannup's economy.

The proponent considers that the economic analyses in the ERMP are objective and, as stated in the proponent's response to Issues 5, 15, 23 and 18, the proponent believes that tourism is compatible with mining and will grow with it.

46 Benefit - Opinion on benefits from the proposal

(a) Concerns:

- Benefits are nil/few especially to the Nannup area - 29 submissions

- Benefits are transient, when the project finishes the benefits disappear

- The local community bears all of the dis-benefits but reaps few benefits, especially in the longer term

(b) Proponent's response:

The employment of 50 people in a new industry in the Shire of Nannup will be a major benefit. Currently agriculture and forestry are the main occupations and mining will give a choice of employment that is currently not available in Nannup. The mining option is likely to remain with the discovery of new ore bodies.

Extra permanent housing will be built in Nannup with a concommitant influx of families which will have a considerable impact on the local economy in Nannup.

The proponent's commitment to road maintenance will be for the life of the project and this will allow the Shire of Nannup to purchase additional equipment as it becomes necessary.

Nannup needs this injection of capital which, through the multiplier effect, will flow through the local economy. See the proponent's response to Issue 18. The Jangardup project can provide the basis for continued mining, forestry or tourism as it is likely that new ventures will sustain developments in Nannup by the time the project is nearing completion.

POWER

44 SEC - SEC power

(a) Concerns:

- The proponent should pay for SEC power to be extended into the area so that there is some lasting benefit to the local community

(b) Proponent's response:

The proponent has approached the SEC to obtain power to the area and will contribute to the funding. It will take some three years for the SEC to provide power into the area by a route which will in part be determined by the requirements of other proposed users and environmental evaluations of the route.

OTHER TRANSPORT

17 Rail - Rail options

(a) Concerns:

- Why haven't rail options been considered in more detail?

- Rail transport would be preferred/accepted - 15 submissions

(b) Proponent's response:

The proponent has discussed two rail alternatives with Westrail and costed another one internally. Transport by rail is costly for several reasons. Railway lines cannot be readily adapted to suit changing mine area locations, capital is required to create storage areas at each end of the line that are protected from the weather, handling facilities, rail lines and rolling stock. Further, the heavy minerals concentrate requires extra handling relative to trucking direct from the mine to North Shore.

53 Log trucks - Opinions on existing log truck traffic

(a) Concerns:

- It is not valid to say that mineral sands trucks should be accepted because log trucks already use the roads

- Log trucks are not accepted, they are tolerated

- Because log trucks have to access the mill in town, there is no choice of transport route - there is a choice for mineral sands trucks

- The proponents should not expect a doubling of truck traffic to be simply accepted

(b) Proponent's response:

Logging trucks are accepted because the timber industry is an integral part of the economy of Nannup. Similarly, the proponent believes that mining will contribute to the local economy and transportation of the products is part of this operation.

58 Sea - Transportation by sea

(a) Concerns:

- Why have the proponents not considered sea transport - from Beenup

- from Black Point?

(b) Proponent's response:

See the proponent's response to Issue 14. Beenup is the BHP name for their deposit. Sea options would be costly for the proponent because the concentrate would need to be moved from Jangardup by truck to the port of Albany or similar via Beenup, before going by sea to Bunbury. Capital costs would be required for the kind of facilities described for the rail option in the proponent's response to Issue 17. For the proponent to contemplate transport by sea there would need to be an ore reserve that could last for 25 years and be operational in 1991.

Sea transport from Black Point would require additional road structures to the coast and additional facilities. The associated additional costs cannot be supported by the eight year project that the proponent plans at Jangardup.

QUALITY OF LIFE

16 Safety - Safety of haul trucks on roads

(a) Concerns:

- Haul trucks will make driving unsafe for tourists and other road users

- Haul trucks pose a major safety threat to children using the school buses - how will the proponent ensure the safety of school children?

- A cross-walk should be provided opposite the school in Nannup

- Trucks pose a threat to children riding or being dropped off at school

(b) Proponent's response:

The time taken for proponent's trucks to travel over the 161kms of the preferred route has been estimated in the ERMP as being 2hrs 40mins at an average running time of 60km/hour. This is considered to be a safe speed.

The proponent can appreciate the concerns of parents of school children and would agree to a 40km/h speed limit being imposed through the residential areas of Nannup. The proponent is also prepared to alter the timing of trucking movements through Nannup to avoid pre- and post-school movement of school buses.

Trucks currently drive through Nannup and care will need to be maintained by all road users. The proponent would pay for the cost of sealing off Bishop Street from the main road should this be a desirable approach (Figure 1). Other suggestions could be considered such as the introduction of a pedestrian crossing which is controlled by an attendant with flags before and after school.

22 Peaceful - Impact on peaceful lifestyle

(a) Concerns:

- Peaceful lifestyle will be reduced/lost - 23 submissions

- Peaceful lifestyle should be retained - 3 submissions

(b) Proponent's response:

The proposed route passes through several Shires, with Nannup being most affected. The proponent, in its ERMP, quoted 1987 Main Roads Department figures of 472 vehicle movements north of

Nannup and 680 vehicle movements south of Nannup. Averaging this to 576 vehicle movements, the proponent's trucks will increase the number of vehicle movements to 632, only a 10% increase. Truck movements are currently 15-20 north of Nannup and 20-30 south of Nannup. The proponent's operation which involves 56 movements per day will cause a 2-3-fold increase within this zone, assuming that trucking has not increased and will not increase from other sources. While the peace may be reduced, the proponent has endeavoured to alleviate the effects of this by confining trucking to weekdays during daylight hours only, by imposing a 40kph speed limit through the township of Nannup, and by observing all regulations regarding the transport of heavy minerals concentrate. The proponent has co-existed for four years in the Waroona area and 20 years in the Busselton/Capel/ Bunbury areas in close co-operation with Councils and residents.

24 School bus - Impact on school bus service

(a) Concerns:

- Safety on the school bus routes will be compromised - 18 submissions

- Fog on the roads will increase the chance of accidents

(b) Proponent's response:

The two sections of the Vasse Highway into and out of Nannup currently have 20-30 trucks per day north of Nannup and 15-20 trucks per day south of Nannup. School buses currently cope with these trucks and also with the unsafe section of the Vasse Highway between Nannup and Stewart Road which will be upgraded before the proponent's operation commences.

For reasons given in the proponent's response to Issue 16, the proponent does not believe that the increase in the heavy vehicle movements will compromise existing safety on the school bus routes. The timing of trucking movements will be altered to avoid pre- and post-school movements of school buses and the proponent's trucks will be restricted to a speed limit of 40km/h through the township of Nannup, a limit not currently recognised by the public or other truck drivers who can use the legal limit of 60km/h.

Fog may occur on any road and in the interests of safety, the proponent instructs drivers to slow down or stop during fog conditions, and is resigned to lesser tonnages being delivered during these periods.

34 Radiation - Radiation

(a) Concerns:

- Will a report be produced on the effect of radiation from haul trucks?

- The proponent representative stated at a public meeting that not one molecule of radiation would escape in Nannup but mineral sands regularly blows off existing trucks in the Capel area

- No level of radiation is safe

- Children are more vulnerable to radiation than adults

- What impact will there be on the school

- Why are radiation levels stated at "above background rates" (p64, ERMP) on the one hand and the "indistinguishable from background rates" (p64, ERMP) on the other?

- How after a spill, will "cleaning by hand be undertaken until monitoring confirms the absence of any heavy mineral sands" if the levels are indistinguishable from background?

(b) Proponent's response:

The proponent will produce a report on the effect of radiation from haul trucks on this route. Monitoring is regularly being conducted for existing operations and has shown that the levels of radiation are negligible. Feasibility drilling conducted by the proponent has shown that the concentration of monazite is low throughout the orebody and averages 0.07% in the ground. Once mined and concentrated it will represent 1% of the material to be trucked from Jangardup. Monazite is effectively shielded by non-radiative ilmenite. The radiation levels in the trucks vary from 0.5-0.9 uGy/hr compared with 0.4 uGy/hr one metre away.

With a doubling of distance from a point source of gamma rays, radiation declines to a quarter of the original exposure. The rate of decline from a linear source such as from a load of heavy minerals concentrate on a truck is a little less than this, namely 0.4 uGy/hr at 2m and 0.25 uGy/hr at 3m.

Background radiation is the radiation that is normally emitted from all surfaces as a natural event and is normally expected to be 0.1-0.5 uGy/hr. The maximum permissible level to which the public may be exposed is 0.6 uGy/hr.

The risk to the public from radiation from trucks is in fact even less than the above figures suggest as the trucks are in transit.

The risk factor is so minute that conditions of transport under the Australian Code of Practice for the Safe Transport of Radioactive Substances are not required. Nevertheless, as stated in the ERMP P.64, the proponent will manage the transportation with respect to radiation issues as directed by the Department of Mines.

The proponent's trucks have tarpaulins and sealed tailgates with gaskets. Trucks are monitored to check radiation levels of concentrate travelling to Bunbury, and this practice will be continued for the Jangardup project.

The proponent's representative at the meeting at Nannup did not intend to imply that no molecule of radiation would escape. What was said was that no dusting would occur and radiation on the trucks would be minimised by shielding from the non-radioactive ilmenite.

A cornerstone of radiation protection philosophy is the As Low As Reasonably Achievable (ALARA) principle. This principle implies that it is not enough just to comply with dose limits but that it is necessary to do all that is reasonably practicable to reduce radiation exposures. The application of this principle generally results in mean exposures substantially below the dose limits. The ALARA principle is an integral part of the regulatory process.

The impact of radiation from trucks on schools will be nil. Radiation at three metres from the source on trucks is 0.25 uGy/hr. The Nannup school boundary is 106 metres away.

Once trucking operations start the proponent would be prepared to visit the school in Nannup with a radiation counter and show how radiation is measured and how rapidly it diminishes with distance.

Spillage, if it should occur, is not dangerous. It is non-toxic and has similar radioactivity to rocks that are often crushed for road metal. Spillages will be cleared up for aesthetic reasons and because it is a valuable commodity.

Radiation levels of heavy minerals concentrate on trucks are 0.5-0.9 uGy/hr and therefore "above background rates". The level three metres away is 0.25 uGy/hr and is therefore "indistinguishable from background rates". The truck drivers will be subject to 0.25-0.35 uGy/hr, which is similar to background radiation.

38 Buffer - Need for buffers around the mine

(a) Concerns:

- Use unmade road reserve as a buffer between mine and residents to the north

- Mining should not approach closer than 100m from the National Park

(b) Proponent's response:

Stand off distances will be as specified under Department of Mines regulations.

42 Social - Social impacts

(a) Concerns:

- Social impacts will be unacceptable - 36 submissions

- Rates will be increased to subsidise the proponent road maintenance needs

(b) Proponent's response:

Excepting possibly the increased transport, the social impacts of the project are only positive. See the proponent's response to Issues 2, 3, 23, 54, 19 and 46.

Refer to the proponent's response to Issue 3. Subsidies of $130,000 annually will be provided by the proponent for maintaining roads.

55 Heritage - Heritage values

(a) Concerns:

- Heritage values should be preserved

- Farms are our heritage - they will lose their viability due to this project

(b) Proponent's response:

The proponent acknowledges that heritage values should be preserved and also acknowledges the importance of farming in the South-West. The viability of the farming property on which the mining will take place will be enhanced after mining, due to the clearing of stumps, the sowing of new pasture and planting belts of trees for shelter. The proponent does not expect the viability of the other farms to be affected.

POLLUTION

20 **Vibration - Vibration**

(a) Concerns:

- The truck transport will result in unacceptable vibration of buildings.

(b) Proponent's response:

To reduce noise and vibration and for safety, the proponent will strictly limit the speed of its trucks to 40km/h when they are passing through the residential areas of Nannup.

21 **Noise - Noise**

(a) Concerns:

- Concern that noise from trucks through Nannup would range from "disruptive to schoolwork" to "unbearable"

- Concern that noise from generators, trucks, backing beepers etc at the mine site would be disruptive to residents

- How will the proponent ensure that residents are not disturbed by noise from the mine site and haul trucks?

(b) Proponent's response:

Sound propagation in air can be compared to waves in water. When there is a clear path, the waves spread uniformly in all directions, decreasing in amplitude as they move from the source. In air, when the distance doubles, the amplitude declines by half - which is a decline of 6dB. Thus, a movement from one metre from the source to two metres from the source will result in the sound pressure level declining by 6dB. A movement to four metres will result in a 12dB decline, and so on (Figure 2). These levels can vary with atmospheric conditions, reflective and absorptive surfaces and road surfaces.

Noise of 70dB at one metre from a passing truck would decrease to 52dB at eight metres and to less than 34dB beyond 64 metres. This latter noise level is similar to background noise and should not be disruptive to school work. Noise levels in Nannup from trucks carrying concentrate will be similar to those currently being experienced by the residents. Under the Noise Regulation Act, all trucks must be fitted with exhaust mufflers. Trucking will only take place during daylight hours when background noises reduce the impact of the noise of trucks.

A dwelling which is approximately 2.3km NNW of the northern-most part of the orebody is situated on Location 12894. The owners

are part-time occupants only. Here, sound from the mining project is expected to be approximately 30dB which is similar to background noise levels. The nearest permanent residents own and occupy a dwelling which is 8.5km west of the Jangardup orebody, so will not be affected.

An indication of plant noise from dredging operations and machine noise for scrapers can be derived from data relating to the Minninup operation. In the Minninup survey noise levels were recorded at 800m from the excavation operation and found to range from 36-39 dB(A) for mid to late morning surveys. Background noise levels between shutdowns, were consistently between 30-33 dB(A). In the Minninup survey the greater percentage of noise generated from this operation was from the scrapers which operate only from 7am-6pm.

40 Dust - Dust

(a) Concerns:

- How will the proponent prevent dust generation on gravel roads?

- Will radioactive dust affect the Nannup School?

- Will dust from roads settling on pastures cause cows' teeth to be worn away more quickly?

- Dust from roads close to dairies will compromise dairy hygiene - will the proponent compensate farmers for this?

- Will dust from roads reduce pasture productivity?

(b) Proponent's response:

Road dust can only occur on the mine site roads and on Black Point Road and Stewart Road. The proponent will have a water cart based on site for suppression of dust. The two public roads will have ongoing maintenance grading and watering by the proponent and the Shire.

Radioactive dust will not affect the Nannup school. Dust will not generate from the concentrate because the clay slimes have been washed from it. The concentrate is wet and heavy and will be carted in trucks which will be approximately 60% filled and covered by a tarpaulin. The road dust is not radioactive. Routine high volume dust sampling has been conducted along the route used by trucks for transporting heavy minerals concentrate from existing mine sites to Bunbury. Here, monitoring for dust and radiation from trucks was performed just inside the boundaries of three residential properties for a number of hours over many days during the last 12 months. This programme took into account changes in environmental conditions and changes in transport

practices. The airborne dust concentration was from 37-156 uGm/m^3 for seven samples and 476 uGm/m^3 for an eighth sample. The maximum allowable level defined by the EPA is 1000 uGm/m^3. These results show that the level of environmental contamination caused by transporting heavy minerals concentrate through built-up up areas is well within that limit. In general the levels of airborne dust and associated radiation are very low and the chances of exceeding the standards are remote.

Dust will not be generated from roads on the Vasse Highway. Dust along Stewart Road is already present and will be greatly reduced by the road maintenance programme which will incorporate wetting and grading. Dust along Black Point Road will also be contained by wet grading. The proponent has often used emulsion sprays to control dust on its mine roads and this, in consultation with CALM, will be used on the edges of roads, if necessary.

The proponent has previously worked in agricultural areas where cattle and sheep are present, without adverse effects.

47 Greenhouse - Greenhouse effect

(a) Concerns:

- What contribution will the additional fuel used for road haulage make to the Greenhouse Effect - how does this compare with the amount of fuel required for rail transport of the products?

(b) Proponent's response:

The truck fleet is increased by 14 vehicles from the Jangardup project. In global terms this additional burden from exhaust emission is minute.

Emissions for rail and road transport are considered to be of a similar order of magnitude.

51 Air Pollution - Air pollution by gases

(a) Concerns:

- How will air pollution from truck exhausts be controlled to avoid effects on residents?

(b) Proponent's response:

Air pollution from truck exhausts is strictly controlled by the Transport Regulations.

32 Nutrient - Nutrient run off

(a) Concerns:

- Domestic waste and sewage should be disposed of well above the watertable

- Nutrient run off from fertilizer applications should be controlled and not enter the National Park

- How will nutrient output during mining and after rehabilitation compare with output from current farming activity?

(b) Proponent's response:

The Bacteriolytic Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations of the Health Act will be observed with regard to the construction and size of the facilities necessary to accommodate the workforce. The volume of sewage and organic rubbish from the approximately 30 people at any one time, will be small. The rubbish will be buried weekly.

Domestic rubbish from site will be contained, collected, burnt and buried in designated areas in consultation with the Shire of Nannup and Department of Mines.

Fertiliser applications will be as scheduled in the ERMP, with the current rate of application to pasture as follows:

(1) New ground - first year

1 bag straight Super per acre = 2.5 b/ha
1 bag Super-copper-zinc per acre = 2.5 b/ha
1 bag 3:2 Super potash per acre = 2.5 b/ha
TOTAL FIRST YEAR 3 b/acre or 7.5 b/ha

(2) From second year onwards

Rotation of the following:
1st year 1.5 b/acre Super-copper-zinc = 3.75 b/ha
2nd year 1.5 b/acre straight Super = 3.75 b/ha
3rd year 1.5 b/acre 3:2 super potash = 3.75 b/ha
4th year is the same as 1st and rotated as before.

The project will take some pasture out of production for a few years which will help to reduce any risk of nutrient run off. Further the proponent is prepared to use slow release Super suitable for wet sandy soils. Mining will therefore reduce nutrient run off relative to the current situation.

NATURAL ENVIRONMENT

27 **Dieback - Dieback disease**

(a) Concerns:

- A detailed dieback control prescription is required, consistent with CALM requirements - will the proponents prepare such a prescription in consultation with CALM?

- Opinions - the spread of dieback ranged from "likely" to "inevitable"

- How will the spread of disease along unsealed roads be prevented?

- Gravel extraction presents a major dieback risk - will the proponent prepare a control prescription for this?

- Will the proponents implement an ongoing employee education programme to discourage them from spreading dieback in their work and recreational time.

(b) Proponent's response:

A dieback control prescription prepared to CALM's all weather standard which is considered suitable for the prevention of dieback, will be adhered to, to the satisfaction of the EPA.

The unsealed roads will be culverted and raised above the watertable. The risks of spreading dieback will be less than the current situation.

Gravel will be extracted from State Forest under the prescription and control of CALM.

An education programme is already in practice. New employees about to move on site will be educated accordingly.

28 **Wetland - Impacts on wetlands**

(a) Concerns:

- Wetlands in the National Park and on the private property should be preserved

- The wetlands on private property should not be used as settling ponds and should be excluded from mining considering the small area involved - what alternatives exist to accommodate these options?

(b) Proponent's response:

Wetlands in the National Park will be preserved. Wetlands on private property are preserved at the discretion of the owner. The two ponds on the private property are in the mine path. The water level in these ponds becomes very low during summer and, in recognition of a request from the landowner, it is proposed to replace them with a single deeper pond to provide summer water for livestock.

Because the orebody beneath the two ponds will be mined there is no benefit from not using them as settling ponds in the intervening term.

29 Drawdown - Watertable drawdown

(a) Concerns:

- What will the drawdown be when the dredge pond is adjacent to the National Park? Model this and show on a diagram

- Why will drawdown be 6m in the pond and only 0.15m at 1km distant?

- Will drawdown affect pastures and dams on neighbouring properties? (Cross-sectional diagrams are suggested to illustrate these points)

- There is no discussion of drawdown to the north of the project area - what effect will it have?

- Any effects of drawdown should be rectified or consequent loss compensated

(b) Proponent's response:

For a worst case situation during the breaking of the sandstone, the water at the focus of drawdown will be lowered between 2-6m. From the focus of drawdown, drawdown decreases logarithmically with distance from the excavation (Figure 3). There is effectively a "cone" of drawdown. As a crude analogy, this effect may be likened to the water levels at and away from the plug-hole of an emptying wash basin.

Dredging may not take place nearer to the Park boundary than two times the depth of the dredge pond. For a worst case situation, dredging will be to 16m. Thus, during a drawdown of 6m situated 32m from the Park boundary, there will be only a 3m drawdown at the closest point to the Park boundary (Figure 3). Contours predicting the drawdown to 1.0m and <0.1m are shown in Figure 4.

The nearest neighbouring property is to the north of the orebody. The orebody is approximately 400m from the nearest boundary. As

can be seen from Figure 5, the drawdown will be in the order of 1.0m at that point based on a worst case situation with a 6m drawdown.

The proponent has agreed with the land owners to rectify any adverse effect to pastures and dams that is attributable to the mining operation. This will include pumping water to fill dams. The Department of Agriculture will advise on soil and pasture conditions.

35 Drainage - Drainage

(a) Concerns:

- How will the proponents ensure that bunding and dredge pond dewatering will not result in flooding of neighbouring farms and roads?

- How will excess dewatering output be managed under worst case conditions in winter when evaporation is low?

- Are loss rates from proposed infiltration ponds sufficient to deal with the winter excess of water? How can this be demonstrated?

- What contingency plans exist to cope with water in excess of that which can be evaporated and infiltrated, without allowing excess sediment to leave the mine site?

- How will drainage be controlled to prevent excess run off extending the duration of "wet soil" conditions in the National Park and hence increasing the dieback risk there?

(b) Proponent's response:

Neighbouring farms and roads cannot be flooded as they are upstream to, and too far removed from, the mining operation. Any excess dewatering output will be managed by appropriate bunding.

Seepage will take place through the walls of bunded areas which will be built large enough to cope with the water volumes anticipated. As stated in the ERMP P.58, the addition of 2,000m^3/day of seepage is a small contribution relative to an estimated 174,000m^3/day run off in July, attributable to rainfall less pan evaporation. The seepage will contribute in the order of 1% which is minute relative to natural variations in run off.

Excess sediment will be filtered out by the bunds which will be developed continuously in parallel with the moving dredge pond. Should water flows through the wall of the bund become reduced due to sedimentation, a suction dredge will be used to remove the sediments.

Soils in winter are usually saturated and dieback is already present in the National Park. Dewatering will make a minute contribution to the volumes of water which flow naturally into the National Park and therefore is not expected to increase the risk of dieback. The proponent will comply with the dieback prescription of CALM to the satisfaction of the EPA.

30 Park - D'Entrecasteaux National Park

(a) Concerns:

- The Park should be completely protected from spillover effects from the proposal

- Under no circumstances should mining be permitted to extend into the Park

- The Park should be closely monitored for any signs of impact and these rectified by the proponent

(b) Proponent's response:

The Park will be closely monitored for any signs of impact. Groundwater levels and the quality of groundwater entering the Park are being, and will continue to be, monitored by the proponent. Should there be any evidence of unacceptable changes, action will be implemented immediately to avoid any harmful effects to the water regimes of the area or to the vegetation and the authorities will be notified immediately.

The only possible spillover from the project into the Park will be from a very small proportion of extra water from the settling pond as stated in the ERMP P.58. The relatively small contribution will have no adverse impact. As stated in the proponent's response to Issue 35, dieback is already present in the Park.

The mining will not extend into the Park and the nearest point of dredging to the Park will be a minimum of 32m from the Park boundary.

33 Forest State Forest

(a) Concerns:

- State Forest should not be ruined

- Indigenous species should be used for forest rehabilitation - will the proponent do this?

- How will the spread of dieback be controlled in State Forest

- A more detailed rehabilitation plant for State Forest is required - will the proponent prepare this in consultation with CALM?

(b) Proponent's response:

The proponent will conscientiously rehabilitate the State Forest to the satisfaction of the EPA, using a programme that has been prepared in consultation with CALM .

The proponent will be using indigenous species to rehabilitate the State Forest.

Dieback is present in the majority of the State Forest to be mined. There are 4-5ha of State Forest that do not appear to have dieback at present and during mining topsoil from this area will be kept separate from where dieback is present.

31 Rehabilitation - Mine site rehabilitation

(a) Concerns:

- Rehabilitation should be monitored and repaired until it is satisfactory - not just for two years

- Rehabilitation plans should be more specific

- The proponent have experience with pasture rehabilitation - what evidence is there that forest rehabilitation will be successful?

- Rehabilitation of the forest will not be possible

- What arrangement will there be to ensure that the mined farm will not suffer loss of production or to compensate for any such loss?

(b) Proponent's response:

The aim of rehabilitation is to re-establish the vegetation at pre-mining densities and to re-establish a species diversity similar to pre-mining conditions.

The proponent will rehabilitate the State Forest using a plan that has been prepared in consultation with CALM to the satisfaction of the EPA. As stated in the ERMP P.43, the endpoint of rehabilitation of perennial plants will be when there are no reasons to believe that they will not continue to grow. In the climatic conditions operating at Jangardup, plants should be well established within two years. However if they are not, monitoring and replacement of plants will most certainly continue. By the time that mining ceases there will have been a history of rehabilitation for at least seven years.

While it is true that the proponent has not had experience with rehabilitation of forest the proponent has successfully rehabilitated dune environments with native species at Minninup. In recognition of their success the proponent received the John Tonkin Greening of Australia Award in 1988. There is no evidence that rehabilitation of forest will not be possible. To the contrary, the proponent has developed the kind of experience necessary so that the rehabilitation can be successfully achieved.

As stated in the ERMP Pp.15-16 an agreement which details conditions for mining on the private property has been negotiated between the landowner and the proponent.

43 Tuarts - Ludlow Tuart Forest

(a) Concerns:

- Increased traffic from mineral sands transport should not be used to justify widening the Bussell Highway through Ludlow Tuart Forest

(b) Proponent's response:

This is a Main Roads Department decision over which the proponent has no control.

48 Wilderness - Wilderness values

(a) Concerns:

- The area of National Park adjacent to the proposed mine should not be regarded as unimportant because there are few visitors there

- The wilderness experience of Park users will be spoiled by the aesthetic intrusion of the adjacent mine site

- The wilderness values of the Park should be preserved

- Mining staff should be trained so that they don't degrade the Park during their recreational time

(b) Proponent's response:

The area of the National Park adjacent to the proposed mine is not regarded as unimportant because there are few visitors there. What is important is that because this particular portion of the Park has few visitors the sight and sound impacts of the mining operation is not expected to be a problem.

Wilderness values will be preserved for the vast majority of the Park except for a relatively small area adjacent to the mining operation during an eight year period.

Senior and most other mining staff are thoroughly aware of their responsibilities with regard to the Park. To confirm this, an education programme will be conducted for all staff about to move on site.

56 Fauna - Flora and fauna studies

(a) Concerns:

- The adequacy of flora and fauna studies was questioned
- One submission questioned the credibility of a fauna study which failed to find tiger snakes on the South Coast
- Pets and firearms should be banned from the mine site to protect fauna
- Opportunities to remove foxes should be exploited to protect native fauna
- The conservation status of new aquatic invertebrates recorded from the wetlands on the farmland is uncertain - Will the proponent check that these species are adequately conserved within secure reserves in the National Park?

(b) Proponent's response:

The flora and fauna was studied adequately over a number of years. The fauna study did find that tiger snakes were present on the South Coast. Refer the ERMP Table 7, Notechis scutatus.

Firearms are controlled by the Mining Act.

As stated in the ERMP P.29 it is most likely that the fauna described for the wetlands on the farmland occurs throughout the waterbodies of the extreme South-Western coastal plain, but no studies of other waterbodies in this area appear to exist. Prior to mining the pond area, the proponent will check for the existence of the species outside the area to be mined.

60 Protection - Protection of natural environment

(a) Concerns:

- Prescriptions should be developed in consultation with CALM for the control of weeds, feral animals, dieback and fire

(b) Proponent's response:

The proponent will maintain close communication with CALM with regard to dieback and control of weeds. When necessary, matters relating to fire and feral animals will be brought to CALM's attention.

36 Coffee rock - Coffee rock

(a) Concerns:

- What is the importance of the coffee rock in maintaining water in the superficial formations available to vegetation and pastures into summer?

- If the water heads in the Yarragadee formation are 6m below those in the superficial formation why won't the superficial formations water drain away following rehabilitation since the coffee rock/sandstone is broken up by mining?

- What management actions will be taken to replace this impeding layer?

(b) Proponent's response:

The sandstone layer is semi-permeable and discontinuous as occurs in localised areas at up to about 6m in depth. Where it occurs it results in a slightly perched watertable. Because of its depth and localised position the sandstone does not appear to have had any great influence on extending the pasture growth.

The sandstone is not continuous and is semi-permeable and therefore the breaking of the sandstone will have no detrimental effect on the hydrological regime.

No remedial action is considered necessary.

ASSESSMENT PROCESS

9 Consistency - Consistency of the ERMP

(a) Concerns:

- Internal consistency of the ERMP was poor due to conflicting statements. eg. Capital expenditure on a bypass around Nannup cannot be justified because of "the less than eight year life of the mine" versus "The proponent will be operating in the area for many years". Radiation levels "above background rates" versus "indistinguishable from background rates"

(b) Proponent's response:

While the life of the Jangardup mine is expected to be less than eight years, the proponent will continue to restore and rehabilitate the area afterwards. The proponent will be involved with the South-West region for many years and will continue to expand its business wherever possible in the region.

While radiation levels of heavy minerals concentrate on trucks are 0.5-0.9 uGy/hr and therefore "above background rates". The levels three metres away are 0.25 uGy/hr and are "indistinguishable from background rates". The truck drivers will receive 0.25-0.35 uGy/hr, which is similar to background radiation.

See also the proponent's response to Issue 34.

44 Government system - Government systems of assessment

(a) Concerns:

- Assessment of projects is piecemeal - a regional review of all projects should occur

- There is insufficient time to prepare submissions

(b) Proponent's response:

Minerals are discovered and come into production at variable times. Whenever possible the Authorities co-ordinate projects to the mutual advantage of the companies and the public.

The time available for preparation of public submissions is determined by the EPA.

45 Opinion - Public opinion

(a) Concerns:

- The proponents should seek out and listen to public opinion

(b) Proponent's response:

The proponent has always been prepared to communicate with the public and has attended public meetings and has published letters through newspapers. The proponent has also maintained close communication with the public's representatives, i.e. local bodies, the Main Roads Department, the Department of Transport, the Water Authority, the Department of Conservation and Land Management, the Department of Resources Development, the Environmental Protection Authority, Members of Parliament and others. The proponent considers all public concerns on their individual merit.

50 **ERMP - ERMP document**

(a) Concerns:

- The ERMP should be available for sale in the local area
- The proponent should bear all costs of the ERMP and postage
- The page entitled "How to make a submission" deters people from making a simple statement of their views
- The ERMP was unsatisfactory - 1 submission
- The ERMP was generally adequate - 1 submission
- The ERMP was arrogant - 3 submissions

(b) Proponent's response:

These matters are under the control of the EPA.

57 **Monitoring - Monitoring**

(a) Concerns:

- Monitoring should be by independent authorities
- Water table levels should be monitored on neighbouring properties prior to mining and the drawdown monitored subsequently - will the proponent do this?

(b) Proponent's response:

All monitoring by the proponent and its consultants will be reported through the WA Mines Department.

Measurements are being recorded monthly and reported biannually.

61 **EMP - Environmental management programme**

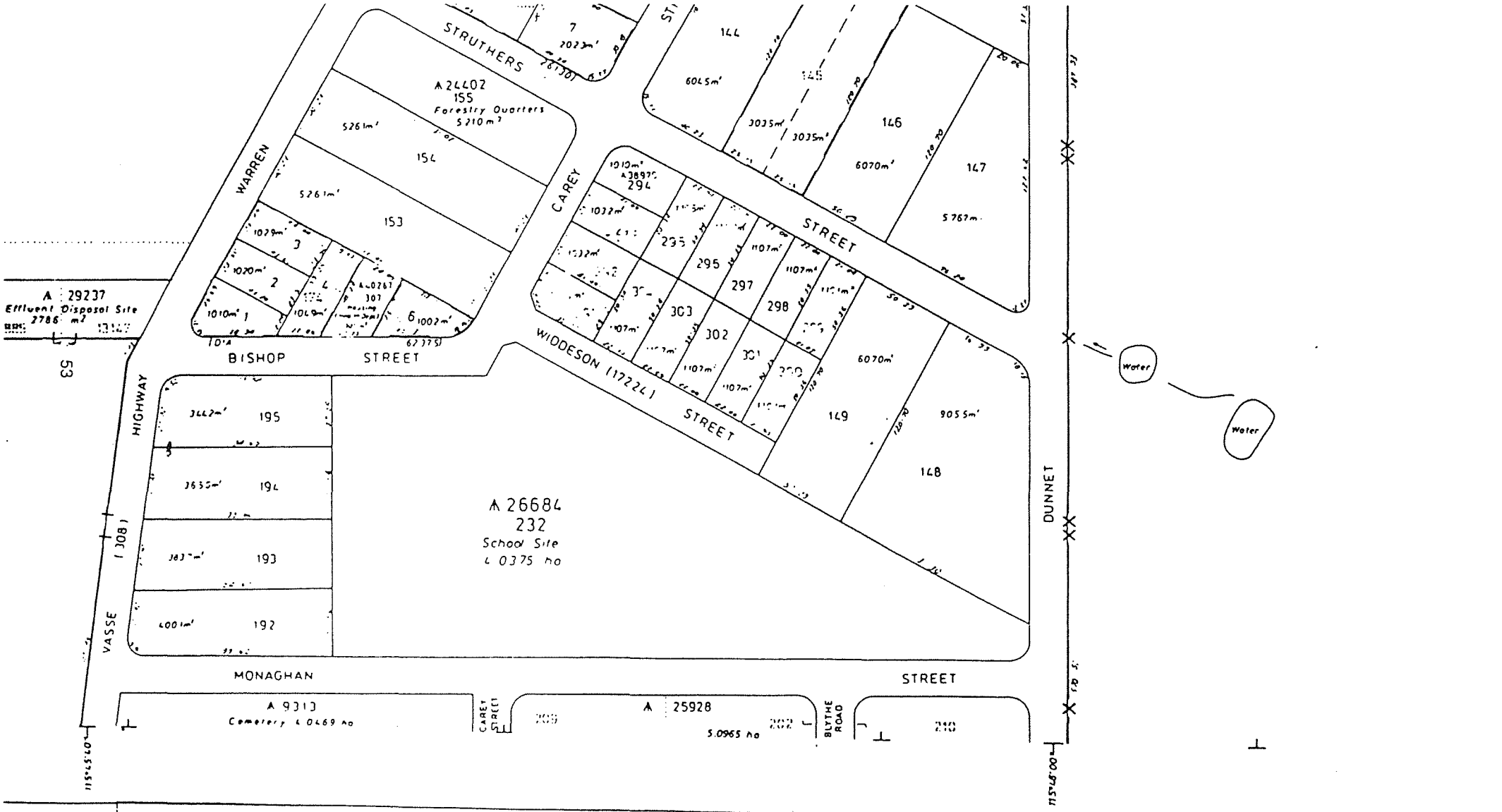
(a) Concerns:

- Detailed environmental management plans for dieback control and rehabilitation should be prepared

(b) Proponent's response:

As stated in the proponent's response to Issues 60, 31, 33 and 35, management policy for dieback control and rehabilitation will be prepared in consultation with CALM to the satisfaction of the EPA.

FIGURE 1



VALUER GENERAL'S OFFICE PERTH

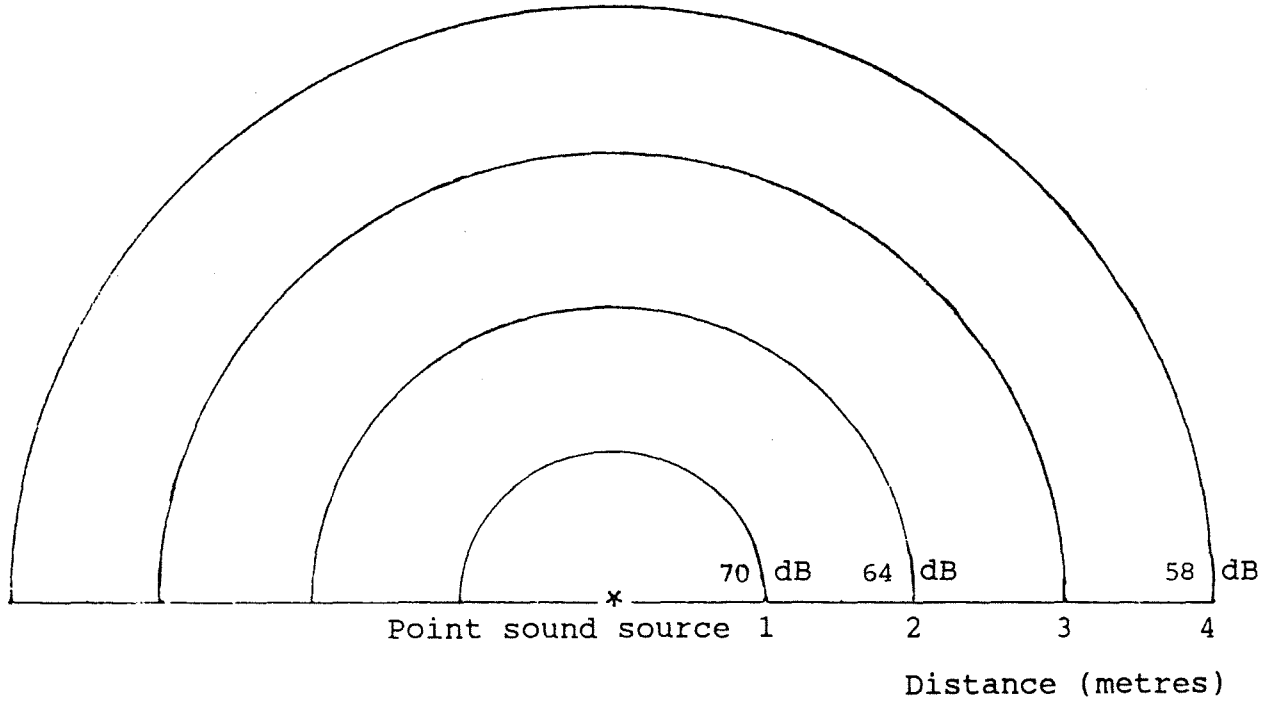
NANNUP TOWNSITE

WESTERN AUSTRALIA

LAND DISTRICT NELSON

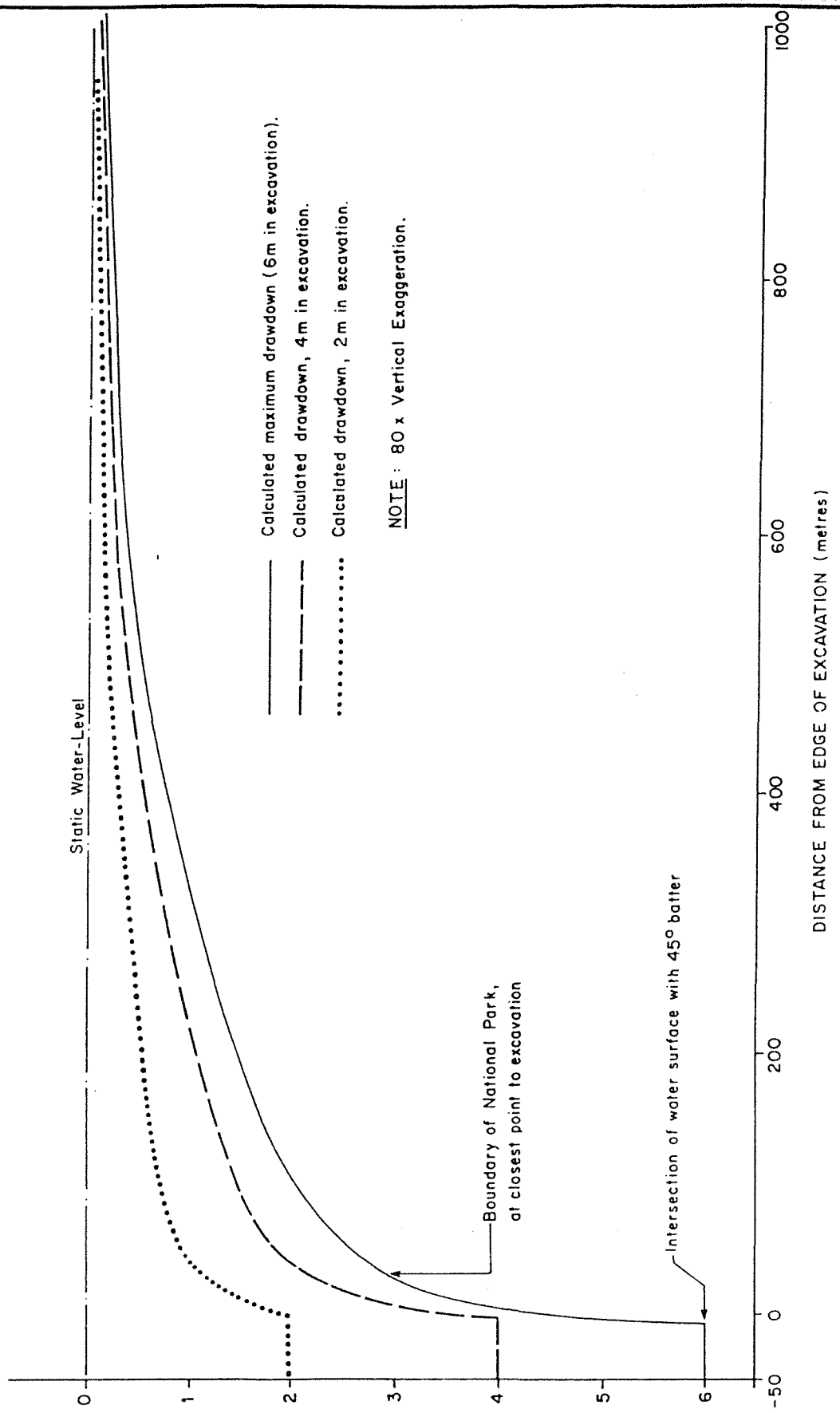
Scale 1 : 2000

FIGURE 2



If a point sound source which radiates freely into free space produces 70 dB at one metre, the sound level at two metres will be 64 dB, at four metres it will be 58 dB and so on.

FIGURE 3



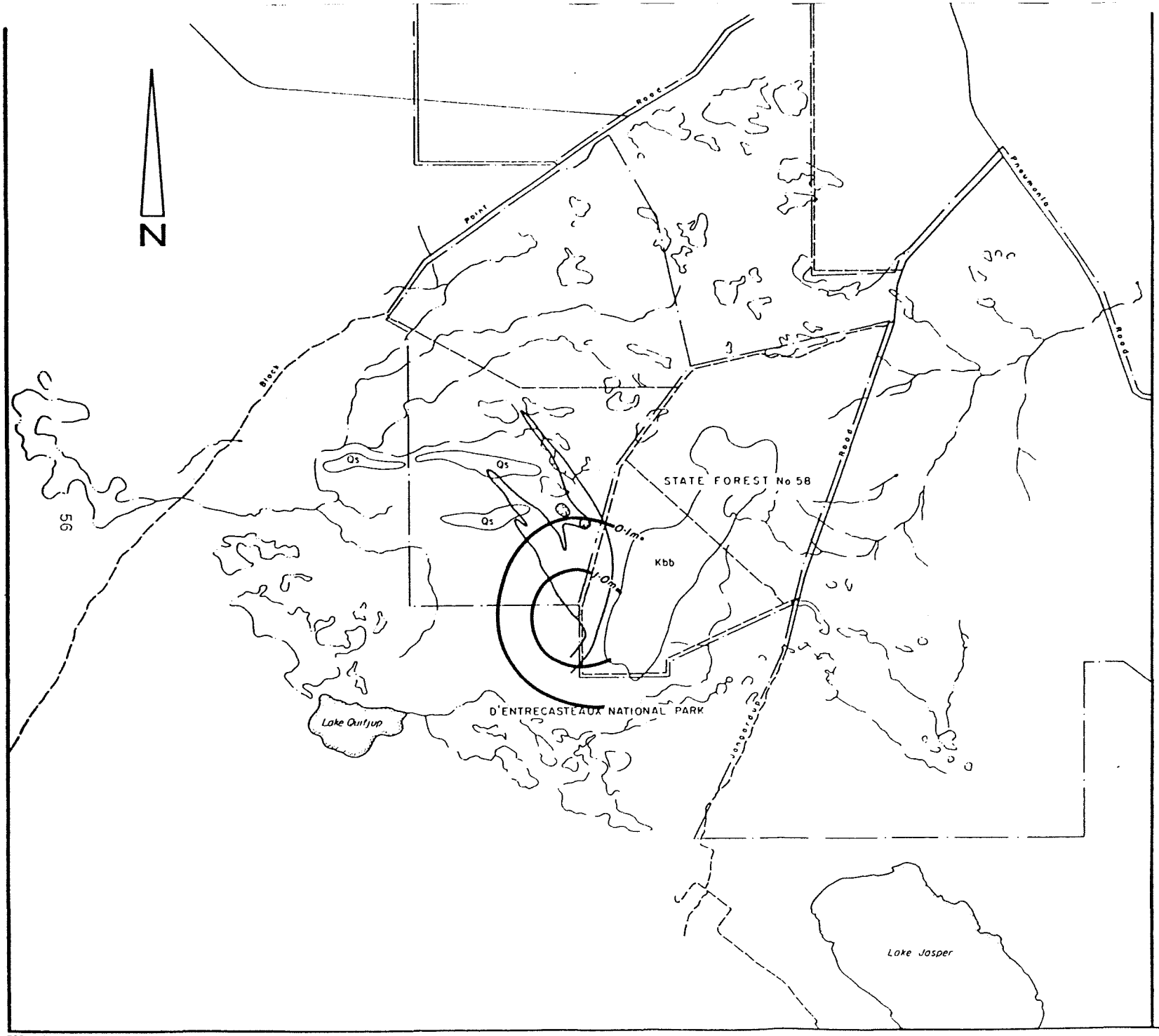
ient : CABLE SANDS (W.A.) PTY. LTD.

oject : JANGARDUP

ate : October 1989 Drg. No. 125-1/89/2-1

WATER-LEVEL DRAWDOWN AROUND SANDSTONE EXCAVATION (Calculated From Numerical Groundwater Model)

FIGURE 4



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CABLE SANDS (W.A.) PTY LTD

JANGARDUP

GROUNDWATER INVESTIGATION

PREDICTED MAXIMUM DRAWDOWNS AROUND DREDGE POND

DREDGE POND ADJACENT NATIONAL PARK BOUNDARY

0 1 2 3 km

Scale 1 50,000

LEGEND

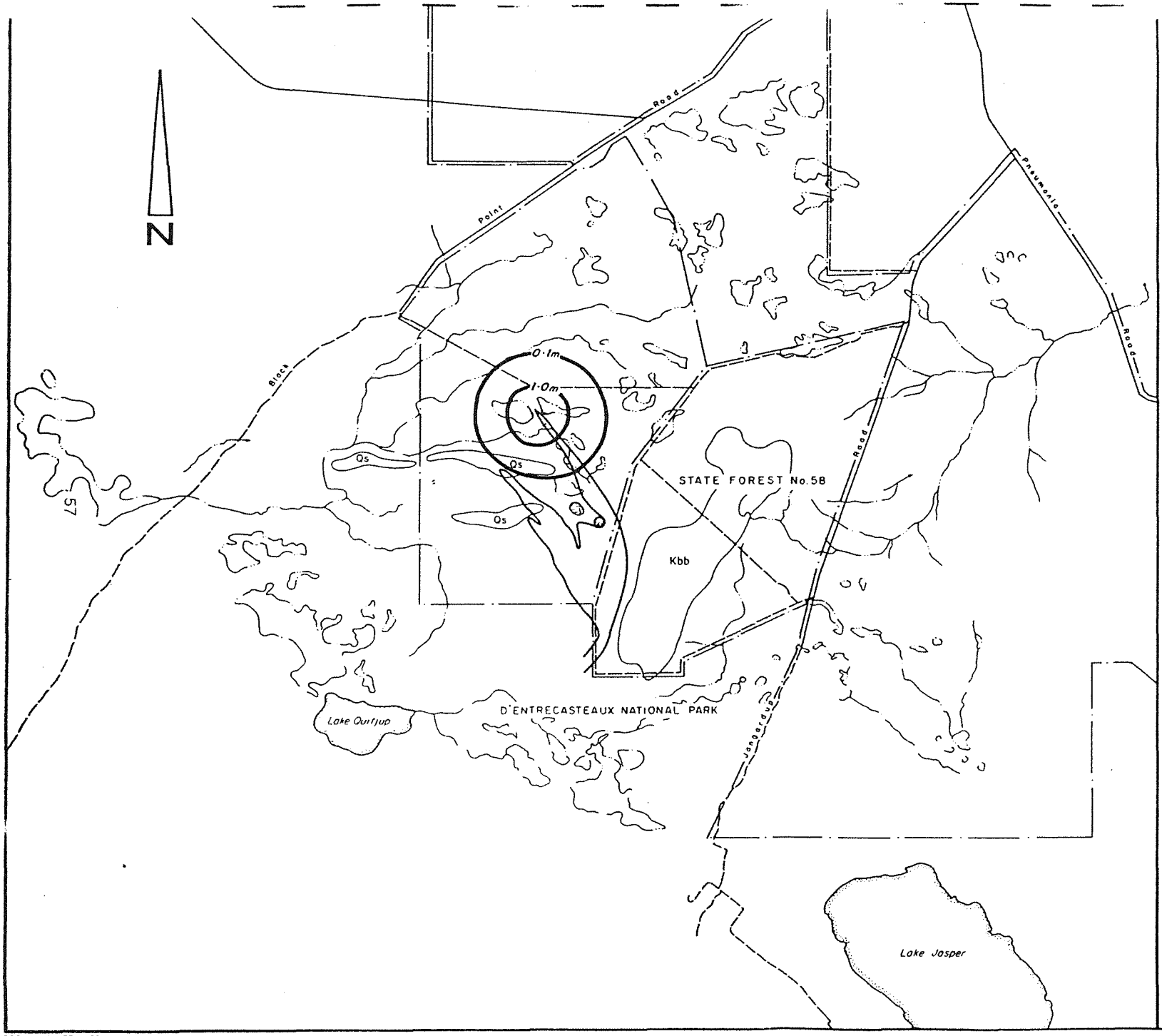
- Qs — Low sand dunes
- Kbb — Bunbury Basalt (outcrop or subcrop)
- Extent of Orebody (approximate)
- Road / Track
- Drainage line
- Swamp
- Boundary between Private Land/ State Forest/National Park
- 0·1m — Contour, predicted maximum drawdown

November 1989

125-1/89/1-

ROCKWATER PTY LTD

FIGURE 5



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JANGARDUP

GROUNDWATER INVESTIGATION

PREDICTED MAXIMUM DRAWDOWNS AROUND DREDGE POND

DREDGE POND IN NORTHERN END OF DEPOSIT

0 1 2 3km
Scale 1:50,000

LEGEND

- Qs — Low sand dunes
- Kbb — Bunbury Basalt (outcrop or subcrop)
- Extent of Orebody (approximate)
- Road / Track
- Drainage line
- Swamp
- Boundary between Private Land/ State Forest/National Park
- 0·1m — Contour, predicted maximum drawdown

November 1989

125-1/89/1-2

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Appendix C
Summary of proponent's commitments

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Summary of proponent's commitments

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 this ERMP.

3 The mining operations, the heavy minerals separation process and the transportation 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

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Summary of proponent's additional commitments

These additional commitments are related to the issues raised in public submissions (Appendix B) as noted in brackets.

A1 The provision of capital to the Shire of Nannup to further widen beyond 6.2 metres, parts of the Vasse Highway between the township of Nannup and the Stewart Road junction, where the proponent considers this is necessary (Issue 2).

A2 The contribution of funds for extra passing lanes on the Vasse Highway between Nannup and the Stewart Road junction (Issue 8).

A3 In the interests of reducing the frequency of trucking movements, a willingness to use trucks with a payload capacity of 42 tonnes (Issue 12).

A4 The contribution of funds to encourage the establishment of extra houses in Nannup (Issue 23).

A5 The observance by the proponent's heavy truck drivers of a 40km/h speed limit through the township of Nannup (Issue 6).

A6 Alteration of timing of trucking movements through Nannup to avoid pre- and post- school buses (Issue 16).

A7 Funding of sealing off Bishop Street from the main road should this be desirable (Issue 16).

A8 Prior to mining the ponds area, checking for the existence of aquatic fauna outside the area to be mined (Issue 56).