Ravensthorpe Nickel Project

Comet Resources NL

Report and recommendations of the Environmental Protection Authority

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Summary and recommendations

Comet Resources NL proposes to develop a nickel mining and processing operation 35 km east of Ravensthorpe. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors, conditions and procedures relevant to the proposal.

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

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

(a) Significant flora species and vegetation communities — vegetation clearance;

(b) Terrestrial fauna — loss of fauna habitat;

(c) Gases (SO_2 and NO_x) and odour — health impacts of process plant emissions;

(d) Greenhouse gases — contribution to global warming; and

(e) Solid waste (Tailings Storage Facility) — impacts on surface and groundwater systems.

Conclusion

The EPA has considered the proposal by Comet Resources NL to develop a nickel mining and processing operation 35 km east of Ravensthorpe.

The EPA notes that the project is located within a corridor of remnant native vegetation in a region well known for its floristic diversity. Proper management of impacts on flora and fauna will be necessary and the EPA has recommended the development of management plans for this purpose.

The EPA has concluded that the proposal can be managed in an environmentally acceptable manner such that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

Recommendations

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

1. That the Minister notes that the project being assessed is for the development of a nickel mining and processing operation 35 km east of Ravensthorpe

2. That the Minister considers the report on the relevant environmental factors of significant flora species and vegetation communities, terrestrial fauna, gases and odours, greenhouse gases, and solid waste as set out in Section 3.

3. That the Minister notes that the EPA has concluded that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

4. That the Minister imposes the conditions and procedures recommended in Appendix 3 of this report.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Comet Resources NL to develop a nickel mining and processing operation 35 km east of Ravensthorpe is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include the following:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3;

(b) that the project should be managed in accordance with a comprehensive environmental management system to be developed by the proponent to the requirements of the EPA;

(c) that management plans for priority flora and significant vegetation communities should be developed in consultation with the Department of Conservation and Land Management prior to ground-disturbing activities;

(d) that a fauna management plan should be developed in consultation with the Department of Conservation and Land Management prior to ground-disturbing activities;

(e) that the proponent should continue to investigate ways in which greenhouse gas emissions may be minimised;

(f) that decommissioning strategies for the mine be considered and adopted early in the life of the project; and

(g) that the environmental performance of the project be subject to an intensive review every six years.

Contents

1. Introduction and background

Comet Resources NL proposes to develop a nickel mining and processing operation 35 km east of Ravensthorpe (Figure 1).

The proposal was referred to Environmental Protection Authority (EPA) in March 1998 and the level of assessment was set at "Consultative Environmental Review" (CER). This level of assessment was set by the EPA in recognition of the scale and scope of the project as well as the significance of the environment in which it is situated. This proposal is the latest in a number of nickel laterite mining and processing projects which have been assessed by the EPA over the past three years (EPA 1996a, EPA 1996b, EPA 1996c, and EPA 1996d).

The proponent's CER document was made available for public comment for a period of four weeks from 3 August 1998 to 31 August 1998.

Further details of the proposal are presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposal. Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in Section 4. The EPA provides other advice in Section 5, Section 6 presents the EPA's conclusion and Section 7, the EPA's recommendations.

A list of people and organisations that made submissions is included in Appendix 1. References are listed in Appendix 2, and recommended conditions and procedures and proponent's commitments are provided in Appendix 3. The proponent's summary of environmental impacts and their proposed management is included in Appendix 4.

The DEP's summary of submissions and the proponent's response to those submissions has been published separately and is available in conjunction with this report.

2. The proposal

The Ravensthorpe Nickel Project is a proposal to mine and process up to 4 million tonnes of laterite nickel ore per year at a site 35 km east of the town of Ravensthorpe. Ore will be extracted from an open pit and processed using the Pressure Acid Leach process and solvent extraction / electrowinning. Annual production of nickel metal would be 30 000 tonnes per year.

The mine and associated infrastructure would consist of:

- open pits, waste rock dumps, and haul roads;
- a process plant;
- a tailings disposal facility;
- a new project site access road from the South Coast Highway, about 4 km north of the project site
- a water supply scheme using seawater pumped from the coast, about 40 km south of the project site;
- an accommodation village; and
- a power station.

The location of these components of the project are shown in Figure 2. Most components are situated on, or in the vicinity of, Bandalup Hill which lies within a larger area of uncleared Vacant Crown Land. Surrounding the uncleared land is farmland. Bandalup Hill lies approximately 30 km northeast of the Fitzgerald River National Park.

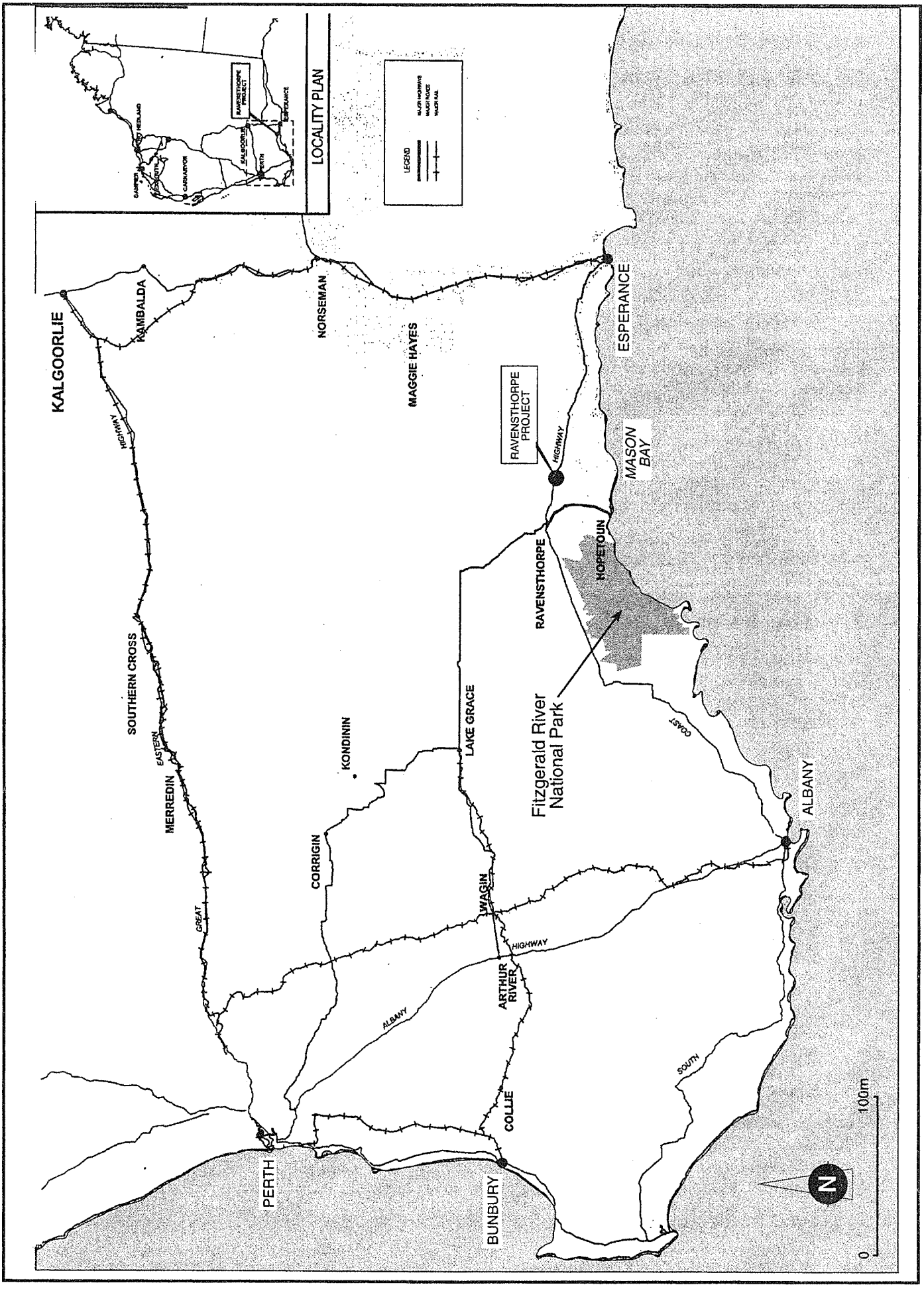

Figure 1. Location plan (Source: Kaiser Simons Joint Venture, 1998).

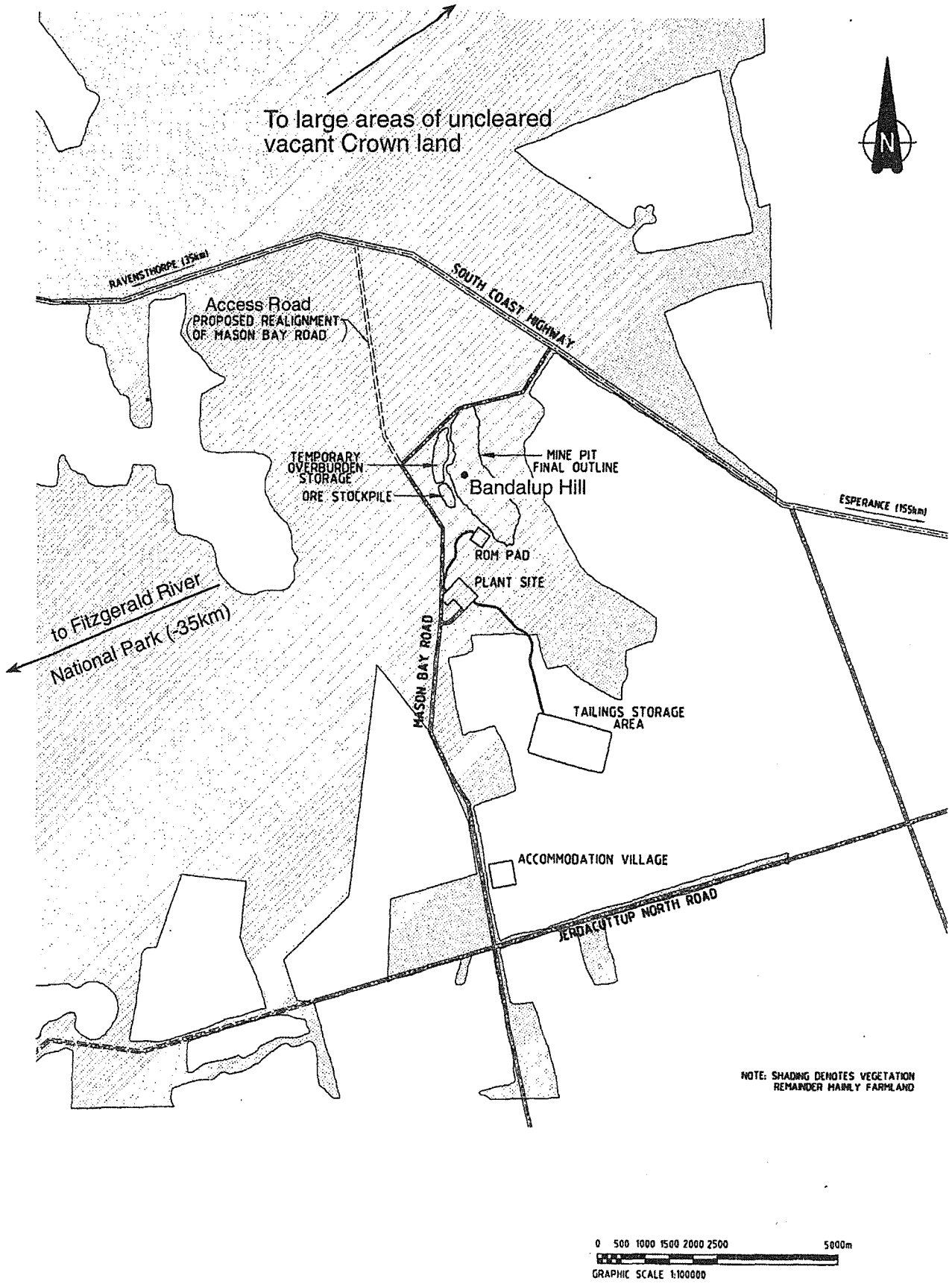

Figure 2. Project layout (Source: Comet Resources NL).

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 2 of the CER (Kaiser Simons Joint Venture, 1998).

Table 1. Summary of key proposal characteristics

Project life		approx. 20 years
Size of deposit	(at cut-off grade of 0.5% Ni)	60 million tonnes
Mining rate	- maximum	4.0 million tonnes per annum
Beneficiated concentrate production (average)		1.8 million tonnes per annum
Acid leach throughput		1.8 million tonnes per annum
Maximum depth of mining		50 m
Tailings storage area	- ground level footprint	144 ha
	- final surface area	115 ha
Evaporation pond	- maximum likely area	144 ha
Water Supply	- source	sea water
	- raw water (average) (35,000 mg/L Total Dissolved Solids)	13,000 kL/d
	- process/potable water (210 mg/L Total Dissolved Solids)	6,000 kL/d
(The process/potable water stream is a component of the total requirement of 13,000 kL/d)		
Energy generation	- installed capacity	60 MW
	- normal (power station)	40 MW
	- recovered (acid plant)	12 MW
Major resource use	- limestone	300,000 tonnes per annum
	- sulphur	220,000 tonnes per annum
	- diesel	59,000 tonnes per annum
Workforce	- construction	900
	- operation	250
Pit area		199 ha
Plant area		25.4 ha
Stockpile area (ore)		18 ha
Overburden storage area		65 ha
Accommodation village		~25 ha
Nickel production		30,000 tonnes per annum
Cobalt sulphide production		2,200 tonnes per annum
Transport rate	- to site	675,000 tonnes per annum
	- from site (product)	32,200 tonnes per annum
		(approximately 70 truck movements per day, mainly between the site and Esperance)

Since release of the CER, a number of modifications to the proposal have been made by the proponent. These include:

- relocation of the accommodation village site to the west side of Mason Bay Road; and
- moving the Run-Of-Mine (ROM) pad southwest to avoid some priority flora species.

The potential impacts of the proposal initially predicted by the proponent in the CER document (Kaiser Simons Joint Venture, 1998) and their proposed management are summarised in the table of Appendix 4.

3. Environmental factors

3.1 Relevant environmental factors

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

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

(a) Significant flora species and vegetation communities — vegetation clearance;

(b) Terrestrial fauna — loss of fauna habitat;

(c) Gases (SO_2 and NO_x) and odour — health impacts of process plant emissions;

(d) Greenhouse gases — contribution to global warming; and

(e) Solid waste (Tailings Storage Facility) — impacts on surface and groundwater systems.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the CER document and the submissions received, in conjunction with the proposal characteristics (including significance of the potential impacts), the adequacy of the proponent's response and commitments, and alternative approval processes which ensure that the factors will be appropriately managed. On this basis, the EPA considers that the preliminary factors: marine flora; marine fauna; watercourses; landform; groundwater quality; particulates/dust; groundwater and surface water quality; noise; public health and safety; heritage; and other issues raised in the submissions do not require further evaluation by the EPA. The identification process is summarised in Table 2.

The relevant environmental factors are discussed in Sections 3.2 to 3.6 of this report and are summarised in Table 3.

Table 2. Identification of Relevant Environmental Factors

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
BIOPHYSICAL			
Vegetation communities	Ground disturbance and vehicle movement associated with the mine and the processing plant have the potential to spread the dieback (*Phytophthora*) disease. In particular the mine pit, processing plant, and access road. *Eucalyptus flocktoniae - Melaleuca coronicarpa 'gorse'* community is widespread on the slopes of Bandalup Hill, but is not known to occur elsewhere in any significant quantity. A small part of the pit and the majority of the waste dump overly this community (~30% of the community area on Bandalup Hill).	**Government:** CALM provided the following comments. • The CER document does not acknowledge or map the potential downslope spread of dieback. • Consideration should be given to relocating infrastructure plant sites to the east of Bandalup Hill in order to reduce the potential for spread of the disease into the "Bandalup Corridor". • Detailed consideration will need to be given to hygiene management (with respect to *Phytophthora*) in the EMP and CALM should be consulted. **Public:** • Effects of land clearing especially on topographically specific endemic vegetation communities such as *Eucalyptus flockoniae - Melaleuca coronicarpa 'gorse'* has not been addressed sufficiently. • CER does not enable a thorough review of the value of vegetation and the role it plays in maintaining biodiversity in the region. • Although most vegetation communities are well represented elsewhere, are they represented within the conservation estate?	Preliminary dieback survey has been carried out which will be used to develop a dieback management plan. The proponent has advised that land tenure problems prohibit the relocation of the processing plant to the east which is CALM's preferred location. Proponent commits to develop and operate a dieback management plan in consultation with CALM. Dieback issues are adequately addressed by proponent commitments. Impact on vegetation community *Eucalyptus flockoniae - Melaleuca coronicarpa 'gorse'* requires further evaluation. **Considered to be a relevant factor. (refer to "Significant flora species and vegetation communities")**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Declared rare and priority flora	The project area contains a number of priority species flora. A significant population of *Spyridium glaucum* (Priority 1) occurs within the ROM ore pad as located in the CER document. A Priority 3 species, *Donodaea trifida*, is also found in association with *Spyridium glaucum* at this site. A major population of *Dampiera deltoidea* (Priority 2, 6000 plants) lies within the mine pit and would be destroyed. Three populations of *Kunzea similis* (recently added to Priority 1) occur within the project area. Two populations lie within the mine pit and would be destroyed. A number of other Priority 3 species: • *Boronia oxyantha*; • *Adenanthos glabrescens*; • *Jacksonia elongata*; and • *Melaleuca pomphostoma*; also occur within the project area, but in locations where direct disturbance is expected to be minimal.	**Government:** CALM provided the following comments. • The CER and biological survey report contained insufficient information for CALM to make a reasoned judgement on overall impacts on flora and diversity. • The impact on *Spyridium glaucum* may be significant. • *Dampiera deltoidea* appears dependent on Bandalup Hill for its conservation. • Conservation of at least a proportion of the population of *Kunzea similis* at Bandalup Hill is essential to the conservation of this species. **Public:** • The loss of priority species flora as a result of this proposal is unacceptable.	**Considered to be a relevant factor. (refer to "Significant flora species and vegetation communities")**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Terrestrial fauna	The project area will, during the life of the project, reduce the width of a vegetation corridor link extending between the Fitzgerald River National Park and vacant Crown Land to the north-east. Mining and processing activities and clearing of habitat are likely to displace any rare species from the project area during the life of the mine. Three rare mammals and two rare bird species are known to occur within the project area. For one of the mammal species, the Heath Rat (*Pseudomys shortridgei*), the project area includes one of only six know sites for this species.	**Government:** CALM provided the following comments. • More information is required in order to fully determine the future impact on the "Bandalup Corridor" and implications on the movement of native fauna. • Relocation of the plant infrastructure to private property to the east of Bandalup Hill would reduce the impact on native fauna within the corridor due to clearing and/or possible *Phytophora* introduction. • Disturbance to Heath Rat habitat should be minimised and prior to any disturbance, trapping for this species should be carried out. • Impact of the mine on fauna, in particular the Heath Rat, should be monitored. • Alternative access routes to the mine site need to be given further consideration as the proposed route has the potential to fragment habitat and provide paths for predators to hunt from. **Public:** • The proposed mining activities will effectively eliminate the Bandalup Hill corridor linking the Fitzgerald River National Park (UNESCO Biosphere Reserve) with larger undisturbed areas of vegetation that extend through to the Goldfields region.	**Considered to be a relevant factor.**
Marine flora	Construction and operation of the inlet and outlet pipes for the seawater abstraction scheme.	**Public:** • Detailed modelling should be undertaken to ensure brine discharge will not adversely affect flora and fauna. • The location of intake and outlet pipes should be selected to minimise direct impacts on seagrass. • The use of seawater and the discharge of brine may impact the existing marine ecosystem, specifically the seagrass beds.	Proponent commits to conduct a marine flora study of pipeline areas and to construct and operate the pipelines to avoid unnecessary disturbance to marine flora and fauna. Factor does not require further EPA evaluation as proponent's commitments are adequate.

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Marine fauna	Construction and operation of the inlet and outlet pipes for the seawater abstraction scheme.	**Public:** • there should be no blasting on the reef; • detailed modelling should be undertaken to ensure brine discharge will not adversely affect flora and fauna;	Proponent commits to construct and operate the pipelines to avoid unnecessary disturbance to marine flora and fauna, and to establish a water quality and marine fauna monitoring programme. Factor does not require further EPA evaluation as proponent's commitments are adequate.
Watercourses	The mine pit and processing plant are located in the upper reaches of the Bandalup Creek catchment. However, the affected areas comprise less than 1 % of the Bandalup Creek catchment.	No comments received.	Proponent commits to minimising disturbance to natural surface drainage wherever practicable and to implement a drainage monitoring programme. Factor does not require further evaluation as proponent's commitments are adequate.
Landform	Mining at Bandalup Hill will reduce the overall height of the hill by approximately 40 m. A 144 ha tailings storage area and a 65 ha overburden dump will be permanent additions to the landscape.	No comments received.	A mining plan which reduces the visual impact during mining is proposed. Proponent commits to develop a rehabilitation programme designed to restore disturbed area to conditions consistent with the defined post-mining land-use objectives. In addition, the proposal would be subject to a decommissioning condition routinely applied to substantial mining operations. (Refer to draft condition 7.) Factor does not require further evaluation as proponent's commitments and standard condition are adequate.

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Groundwater quantity	It is currently proposed to establish bores to provide a temporary water supply for construction phase.	**Public:** • The proponent states that proposed seawater-based project water supply may be replaced with a groundwater-based supply, but no assessment of this option is provided. • Proponent should investigate and ensure that the water supply to Jerdacuttup River and plant life is not affected by the abstraction of water for the proposal.	Temporary water supply will require a groundwater abstraction licence from the WRC. Proponent commits to seeking the approval of the EPA for any permanent groundwater-based scheme. Proposal would be referred to the EPA. Factor does not require further evaluation as subject to separate assessment.
POLLUTION			
Greenhouse gases	The most significant greenhouse gas for this proposal is CO_2. CO_2 will be produced by the power station (~80 000 tpa) and through limestone neutralisation of acid in the processing plant (~97 000 tpa).	**Public:** • The greenhouse gas inventory presented by the proponent appears to be somewhat incomplete.	**Considered to be a relevant factor.**
Particulates/Dust	Open cut mining and the crushing and grinding of ore will generate dust.	No comments received.	Proponent commits to prepare and implement a dust management plan to ensure compliance with relevant standards and guidelines. Factor does not require further evaluation as dust will be addressed in works approval and licensing under Part V of the EP Act.

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Gases (SO_2 and NO_x) and Odours	SO_2 will be emitted from the sulphuric acid plant and the power station during normal operations, and by the hydrogen sulphide plant when starting up. Initial modelling indicates that the NEPM 1-hourly standard will be met for all downwind distances greater than approximately 1 km. NO_x will be generated by the diesel power station. Initial modelling suggests NEPM concentration standards may be exceeded, however this modelling is overly conservative and the NEPM standard will be used as minimum standard when finalising the design. Hydrogen sulphide is generated on site as one of the reagents for nickel processing.	**Public:** • Limited attention has been paid to the possible impacts of gaseous emissions on vegetation, in particular the Fitzgerald River National Park / Biosphere Reserve. • The sulphuric acid plant is guaranteed to emit less than 1.8 kg of SO_2 /tonne of acid, this is still a considerable way from current best practice. • The worst case modelling uses stack heights greater than those described in the CER (i.e. the modeling is not truly "worst case"). • There seem to be inconsistencies in the sulphur dioxide dispersion modelling. • Hydrogen sulphide vented to flare from the precipitation circuits does not appear to have been quantified or included in gaseous emissions modelling. • Hydrogen sulphide has an extremely low odour threshold and a separation distance of 5 km may not be sufficient to ensure no odours are detectable off-site.	**Considered to be a relevant factor (refer to "Gases [SO_2 and NO_x] and odours").**

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
Groundwater and surface water quality.	The processing plant and infrastructure will involve considerable use of reagents and hydrocarbons. Spillage and migration of these materials off-site could affect groundwater and surface water quality. Rupture and/or leakage of the pipelines taking in seawater and returning brine could affect the quality of local surface waters and groundwaters surrounding the pipeline. Water quality impacts associated with Tailings Storage Facilities and Evaporation Ponds are discussed below.	No comments received.	Proponent commits to preparing a project construction Environmental Management Plan before the start of construction. This plan would include management procedures for the protection of surface water and groundwater quality. The water supply pipeline will be equipped with pressure sensing and remote control of pumps so that spills resulting from any rupture of the pipeline can be controlled. Construction of the processing plant and infrastructure will require Works Approval and Licensing under Part V of the *Environmental protection Act 1986*. Drainage containment and treatment structures necessary to prevent contaminated waters leaving the site will be required as part of the Works Approval application. Factor does not require further evaluation as proponent commitments and Part V approvals address this issue.

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

Solid Waste (Tailings Storage Facility)	Up to 1.8 Mtpa of tailings will be deposited into a 144 ha Tailings Storage Facility. The tailings slurry will contain 27% solids (by mass) and be neutralised to have a pH > 6. Assay work conducted on the tailings categorise the tailings as low hazard waste, however, the supernatant water in the tailings storage facility will be saline process water.
	
	Although decant water is expected to be of a quality that can be returned to the processing plant, an evaporation pond would be required if future work proves that this is not the case.
		Government:
		CALM provided the following comments.
		• The proposed rehabilitation strategy for the tailings dam may not be appropriate to the saline tailings material.
		• An external batter of 4:1 (or less) would result in better long term stability.
		DME provided the following comments.
		• DME will require a NOI detailing mining, rehabilitation, environmental management systems to be used, and how the impact will be managed. In particular the NOI shall relate to:
		  ◦ tailings storage (and evaporation facility);
		  ◦ waste dumps;
		  ◦ water management; and
		  ◦ safety.
		Public:
		• Seepage or spills from the tailings facility have the potential to contaminate groundwater aquifers in the region.
		• No modelling of the seepage from the tailings dams or evaporation ponds seems to have been undertaken.
		• The highly saline tailings material may leach into surrounding land.
			Considered to be a relevant factor.

Noise	Mining and processing activities at Bandalup Hill will generate noise.	**Public:** • noise impacts have not been quantified in terms of emission levels; • noise levels below DEP regulations may still be unacceptable in a quiet rural area; • noise impacts due to increased road usage have not been addressed;	Nearest residences to the proposed mine site are >5 km away and hence noise levels not expected to exceed levels set in State's noise regulations. Proponent commits to respond to complaints from local community. Project will be subject to State noise regulations, which are at this time the *Environmental Protection (Noise) Regulations 1997.* Factor does not require further evaluation as issue adequately covered by noise regulations.

FACTOR	PROPOSAL COMPONENT WITH POSSIBLE IMPACT	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS
SOCIAL SURROUNDINGS			
Public health and safety	Nickel processing requires the use and transport of a number of reagents harmful to either humans in particular or the environment in general. Transport of materials will be by road.	**Public:** • The importation of sulphur through Esperance has not been addressed.	Proponent commits to developing and implementing a Hazardous Substances Management Programme and to undertake a Hazards and Operability Study for the operation of the project and its infrastructure. Esperance Port already handles sulphur and is subject to a licence under Part V of the *Environmental Protection Act 1986*. The proposed increased sulphur handling would be subject to review under a licence amendment. Transport of hazardous materials by road is covered by relevant legislation. Factor does not require further evaluation as issue addressed by proponent commitments, existing licences, and other legislation.
Heritage (Aboriginal culture and heritage, non-indigenous heritage)	Surveys indicate project area is unlikely to have any heritage sites.	**Government:** AAD provided the following comments. • It is noted that areas immediately affected have been surveyed and no sites identified. • It is understood that all remaining areas will be surveyed prior to development of these areas.	Proponent commits to conduct awareness training for its workforce in the significance of Aboriginal and non-indigenous heritage. Factor does not require further evaluation.

3.2 Significant flora species and vegetation communities

Description

Mining operations on Bandalup Hill will affect a number of priority flora species and one significant vegetation community type (refer to Figure 3 for locations of Priority flora species discussed in this section). The mine pit, waste rock dump, ROM pad, and processing plant will require clearing of native vegetation from these parts of Bandalup Hill.

A significant population of *Spyridium glaucum* (Priority 1) occurs within the ROM ore pad as located in the CER document. A Priority 3 species, *Donodaea trifida*, is also found in association with *Spyridium glaucum* at this site. However, after consulting with the Department of Conservation and Land Management (CALM) the proponent has relocated the planned position of the ROM pad (refer to Figure 3) to avoid any direct disturbance to this flora population.

A major population of *Dampiera deltoidea* (Priority 2, a population of 6000 plants) lies within the mine pit and would be destroyed over the life of the mine. A preliminary search for this species beyond Bandalup Hill has located another population of 5 000+ plants within the Fitzgerald River National Park and it is inferred that other populations are likely to occur at other locations within the park.

All three known populations of *Kunzea similis* (recently added to Priority 1) occur within the project area. Two populations lie within the mine pit and would be destroyed over the life of the mine thus affecting 190 000 plants out of a known total at this time of 430 000 plants.

The vegetation community *Eucalyptus flocktoniae - Melaleuca coronicarpa 'gorse'* is widespread on the slopes of Bandalup Hill, but is not known to occur elsewhere in any significant quantity. A small part of the pit and the majority of the waste dump overly this community.

Submissions

It was considered that the effects of land clearing, especially on topographically specific endemic vegetation communities such as *Eucalyptus flockoniae - Melaleuca coronicarpa 'gorse'*, was not sufficiently well addressed in the CER document.

Another submitter believed that the loss of priority species as a result of this proposal was unacceptable.

CALM made a number of comments which are summarised below:

- The CER and biological survey report contained insufficient information for CALM to make a reasoned judgement on overall impacts on flora and diversity.
- The impact on *Spyridium glaucum* may be significant.
- *Dampiera deltoidea* appears dependent on Bandalup Hill for its conservation.
- Conservation of a least a proportion of the population of *Kunzea similis* at Bandalup Hill is essential to the conservation of this species.

Assessment

The area considered for assessment of this factor is Bandalup Hill.

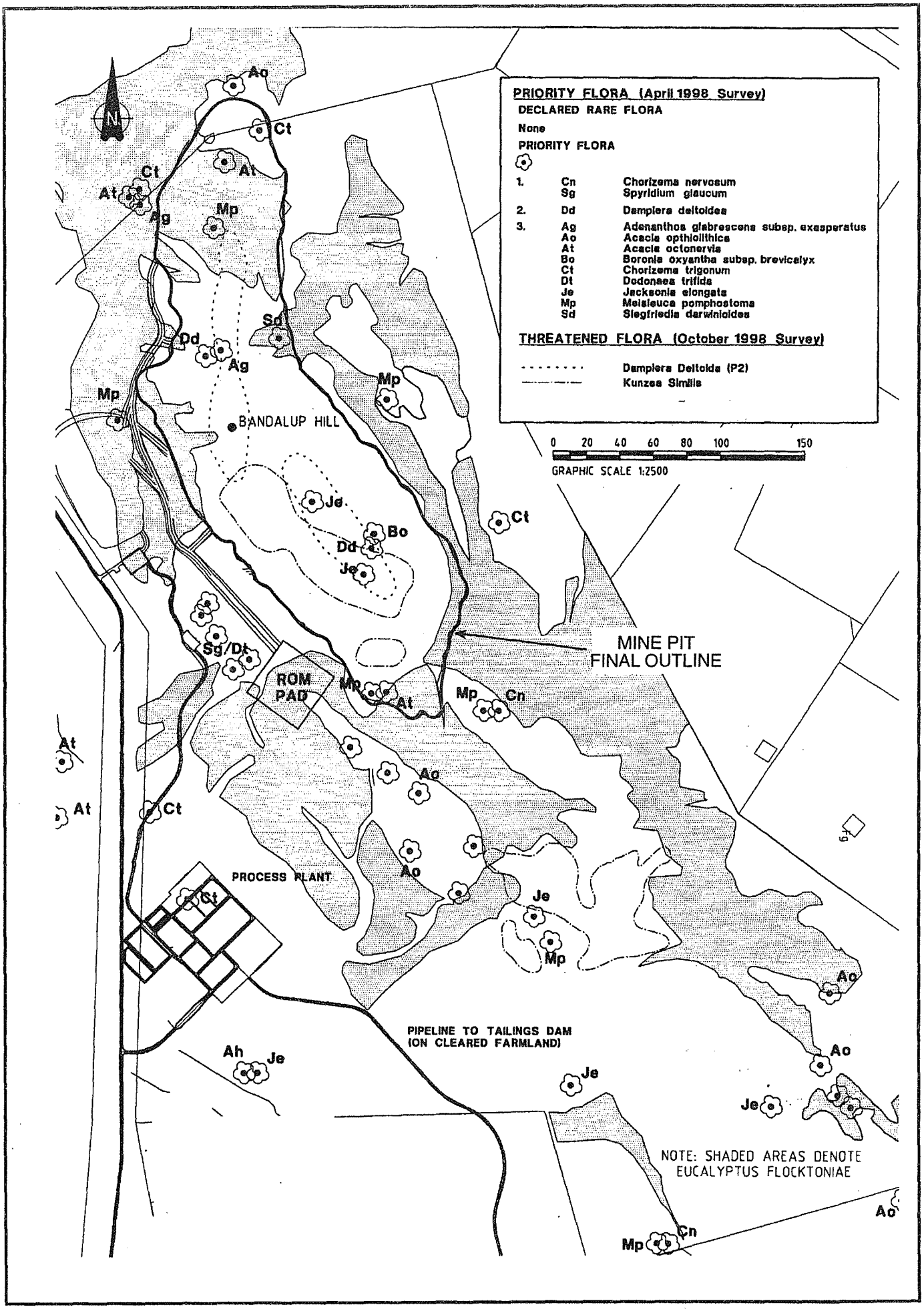

Figure 3. Threatened and Priority Flora map (Source: Comet Resources NL).

The EPA's objective in regard to this environmental factor is to protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950; and to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.

While the CER document provided insufficient information on the conservation significance of flora and vegetation that may be impacted the proponent, in response to CALM's requests for more information, the proponent has now provided further information sufficient for relevant impacts to be assessed.

After being provided with the additional information, CALM provided the following advice (summarised):

> *Spyridium glaucum*
>
> The relocation of the ROM pad and proper management during operations should provide adequate protection for this species.
>
> *Dampiera deltoidea*
>
> This species appears dependent on Bandalup Hill for its conservation, but appears to be a species which responds to disturbance and hence rehabilitation may be a suitable strategy for conservation of the species.
>
> The proponent should continue regional surveys to confirm the conservation status of this species.
>
> The proponent should prepare a revegetation strategy linked to completion criteria before population is significantly impacted. Such completion criteria are intended to be used as targets to guide the revegetation strategy and to determine the requirement for additional research, rather than as requirements to be met before mining progresses to the next stage.
>
> The proponent should undertake research to determine the appropriate regeneration methodology for this species, should completion criteria not be met.
>
> *Kunzea similis*
>
> Conservation of at least a proportion of the population of *Kunzea similis* at Bandalup Hill is essential to the conservation of this species.
>
> Conservation strategy for this species should be developed.

The proponent has provided further details of the proposed mine plan describing how Bandalup Hill will be mined in a number of stages so the whole area of the pit is not open at any one time. The deposit will be mined in a number of strips across Bandalup Hill, with mining progressing north to south over time and previously mined strips being backfilled and revegetated as new strips are opened up. This will allow progressive rehabilitation of the pit area to begin 2-3 years after mining commences and means that it should be possible to maintain substantial populations of Priority species within the final mine pit boundary at all times during mining.

The EPA also notes that, as much as possible, disturbance to the vegetation community *Eucalyptus flocktoniae - Melaleuca coronicarpa 'gorse'* has been minimised and that most (approximately 70%) of this community type is unaffected by the project.

Given that the proposal will affect significant flora and vegetation communities, the EPA's first consideration is that conservation of species is not jeopardised, with resultant loss of biodiversity. Staged mining with progressive rehabilitation should ensure that species are conserved by maintaining viable populations throughout the life of the mine provided they can be regenerated. However, success of this strategy will need to be monitored closely and fed back into the rehabilitation programme. A secondary consideration for the EPA is that given there will be significant impacts on Priority flora, if only temporarily during life of mine, there is an expectation that the proponent should provide some reciprocal benefit to the environment. In this case this could be provided through improved understanding of the distribution and management of these flora and vegetation, which will be required in order to ensure a successful rehabilitation programme. Therefore the EPA recommends the development of a

formal programme of survey, study, and management for significant flora species and vegetation communities be a condition of approval. Another way in which reciprocal benefit may also be achieved, is by identifying land of similar conservation value and arranging for this to included in the conservation estate. This is an option which would be clarified by the recommended survey programme and which could be adopted as part of the management plans for flora and vegetation.

Summary

Having particular regard to the:

(a) CALM's advice regarding the Priority Species;

(b) the potential for rehabilitation to maintain the population levels of these species as mining progresses;

(c) that some species appear to respond well to disturbance,

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's objective for significant flora species and vegetation communities, provided that the proponent develops and implements specific plans for the management of Priority flora species and significant vegetation communities (refer to draft condition 4).

3.3 Terrestrial fauna

Description

The mine pit waste rock dumps and processing plant are located within a corridor of remnant vegetation (Refer to Figure 2) which forms part of a larger vegetation corridor link between the Fitzgerald River National Park and vacant Crown Land to the northeast of the project area. These components of the project will reduce the width of the corridor at this location throughout the life of the mine. The corridor link is considered important in that it provides a path for fauna movement in the area. The mine facilities on Bandalup Hill will reduce the width of the corridor at this point by approximately 17%.

Another impact upon the corridor will occur through the construction and use of a mine access route which runs north to south through the corridor. While this will not affect on much of the corridor habitat, it has the potential to fragment the corridor in that it may provide a barrier to fauna movement and provide a path into the corridor for predators to hunt from.

Within the overall project area three rare mammal species and two rare bird species are known to occur. These are the Heath Rat, Western Mouse, Western Brush Wallaby, Mallee Fowl, and Western Whipbird. The fauna survey of the area (Craig and Chapman, 1998) concluded that none of these species are critically dependent on habitats which will be impacted by mining the orebody although there may be some minor displacement into adjoining similar habitats.

CALM has advised that for one of these rare species, the Heath Rat (*Pseudomys shortridgei*), the project area includes one of only six know sites for this species.

Submissions

In summary CALM made the following comments on this environmental factor:

- More information is required in order to fully determine the future impact on the "Bandalup Corridor" and implications on the movement of native fauna.

- Relocation of the plant infrastructure to private property to the east of Bandalup Hill would reduce the impact on native fauna within the corridor due to clearing and/or possible *Phytophora* introduction.

- Disturbance to Heath Rat habitat should be minimised and prior to any disturbance, trapping for this species should be carried out to remove any Health Rats in the area to be disturbed.

- Impact of the mine on fauna, in particular the Heath Rat, should be monitored.

- Alternative access routes to the mine site need to be given further consideration as the proposed route has the potential to fragment habitat and provide paths for predators to hunt from.

A member of the public considered that the proposed mining activities will effectively eliminate the Bandalup Hill corridor linking the Fitzgerald River National Park (UNESCO Biosphere Reserve) with larger undisturbed areas of vegetation that extend through to the Goldfields region.

Assessment

The area considered for assessment of this factor is the uncleared land surrounding the project area referred to as the "Bandalup corridor".

The EPA's objective in regard to this environmental factor is to maintain the abundance, species diversity and geographical distribution of terrestrial fauna, and to protect Specially Protected (Threatened) Fauna, consistent with the provisions of the Wildlife Conservation Act 1950.

"Threatened fauna" are protected under the *Wildlife Protection Act 1950* which is administered by CALM. The EPA therefore acknowledges that CALM has a direct interest and role in regulating any activities which may affect, either directly or indirectly, such fauna.

The EPA notes that proposal will reduce the width of the Bandalup corridor by ~17% at this location but understands that proper consideration has been given to options which could reduce this impact. CALM has recommended that relocation of facilities to the east of Bandalup Hill would reduce the impact on the corridor. In response, the proponent has advised that it has been unsuccessful in attempts to acquire the land to the east or obtain land tenure suitable for mining activities on this land. It therefore had to eliminate this option when formulating this proposal. One of the recommendations of the fauna survey was that the initial plant site be relocated from the east side of Mason Bay Road to the west, in order that no Heath Rat habitat was directly impacted and also to increase the remaining width of the Bandalup corridor at this point. This recommendation was adopted in the proposal described in the CER.

In regard to the proposed access road, although the EPA would prefer a mine access road route similar to the existing Mason Bay Road alignment, it is advised that such a route would be unsafe and therefore considers the proposed route an acceptable alternative. The existing road would be preferred on the basis that it is already disturbed and, in addition, does not further fragment the corridor. However, Main Roads Western Australia has advised that the current junction of Mason Bay Road with South Coast Highway would be unsafe for the frequency and type of heavy vehicle movement associated with this proposal. The current junction is in the centre of a fairly flat crest, which then drops off steeply at either side and would not provide a safe sight distance for trucks entering or leaving the highway. In addition, it would take a major re-alignment of more than 1.5 km to provide a safe junction. The direct impact of the access road on the corridor function by restricting fauna movement is not expected to be major, as the corridor is already traversed by a major highway. In its response to submissions the proponent has indicated that culverts will be installed if required to facilitate fauna movement. The potential for the access road to act as a path for predators can be managed through implementation the proponent's commitment to be part of CALM's Western Shield Programme, aimed at reducing the population of feral predators.

The EPA believes that the reduction in the width of the corridor and the introduction of an access road through the corridor should not critically affect the function of the corridor if the indirect impacts are managed effectively. The reduction in width will still leave a corridor over 2.5 km wide at this point, which is larger than the width of the corridor in other areas along its length. However, potential indirect impacts spreading out from the mine area and the access

road need to be effectively managed to prevent further reduction in the effective width of the corridor. It is therefore recommended that a fauna management and monitoring plan be prepared to reduce, monitor, and rectify impacts on the fauna within the corridor.

The EPA expects that eventual decommissioning of the project should return the affected areas to their previous function as part of the Bandalup corridor. It is therefore recommended that this is addressed in the decommissioning plan for the project (refer to draft condition 7).

Summary

Having particular regard to the:

(a) protection provided to fauna under the *Wildlife Conservation Act 1950*;

(b) that 83% of the corridor width will be retained;

(c) that some facilities have been relocated to reduce impacts,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for terrestrial fauna, provided that provided that a fauna management plan is prepared prior to any ground disturbing activities (refer to draft condition 5).

3.4 Gases (SO_2 and NO_x) and odour

Description

Sulphur dioxide (SO_2) is a colourless gas which has a pungent odour and can irritate and be absorbed in the respiratory tract. The sensitivity of humans to SO_2 varies considerably and asthmatics may suffer adverse reactions at quite low levels.

SO_2 gas also dissolves in moisture forming dilute sulphurous acid, which then forms sulphuric acid and sulphates, which can be readily absorbed onto small airborne particles. This increases the potential for adverse effects on humans and for environmental impacts such as leaf damage to sensitive plants and reduced water quality in wetlands.

SO_2 will be generated by the proposal through the operation of the sulphuric acid plant and the diesel-fuelled power station. It may also be generated for short periods of time (typically 2-3 minutes) during start-up of the hydrogen sulphide plant. The estimated total SO_2 emission is ~ 2 000 tonnes per annum.

The sum of nitric oxide (NO) and nitrogen dioxide (NO_2) is generally referred to as NO_x for reason that under normal conditions NO is rapidly oxidised to NO_2 which has environmental and health effects. NO_2 is a reddish brown gas which is soluble in water and is a strong oxidant. The major sources of man-made emission to the atmosphere derive from the combustion of fossil fuels. At low concentrations, NO_2 can cause irritation of the mucous membranes and may cause or exacerbate respiratory problems such as asthma and bronchitis.

The only significant source of NO_x will be the project power station. The estimated total NO_x emission is ~ 3 500 tonnes per annum.

Hydrogen sulphide (H_2S) is a flammable colourless gas with the characteristic odour of rotten eggs. While at high concentrations it is an irritant (~20 mg/m^3) and an asphyxiant (~1500 mg/m^3), its more usual impact is that of producing an offensive odour. This occurs between 0.0008 and 0.20 mg/m^3 (0.0005—0.13 ppm) depending on individual sensitivity.

H_2S is manufactured within the processing plant for use as a reagent. As such there is no intended emission of this gas under normal plant operation. Unused gas is only expected to be generated during plant start-up, shut down, and other upset conditions. In these circumstances the H_2S is directed to a flare where is fully combusted, producing among other by-products SO_2.

Submissions

It was commented that limited attention had been paid to the possible impacts of gaseous emissions on vegetation, in particular the Fitzgerald River National Park/ Biosphere Reserve.

A number of points relating to various aspects of the preliminary modelling of emissions were made by various submitters. These included:

- Worst case modelling uses stack height greater than those described elsewhere in the CER. In addition, worst case modelling has not assumed absolute worst case for cumulative impacts from multiple sources under specific wind conditions.
- There seem to be some inconsistencies in the presentation of SO_2 modelling results in the CER in Table 15 and Appendix G.
- H_2S vented to flare from the precipitation circuits does not appear to have been quantified or included in gaseous emissions modelling.

One submitter expressed the view that although the sulphuric acid plant is guaranteed to emit less than 1.8 kg of SO_2 /tonne of acid, this is still a considerable way from current best practice.

It was observed that H_2S has an extremely low odour threshold and a separation distance of 5 km may not be sufficient to ensure no odours are detectable off-site.

Assessment

The area considered for assessment of this factor is surrounding Ravensthorpe region, outside of the project area.

The EPA's objective in regard to this environmental factor is that SO_2/NO_x emissions meet relevant air quality standards/guidelines and requirements of Section 51 of the Environmental Protection Act 1986 (all reasonable and practicable measures are taken to minimise pollutant discharge). For odours, it is the EPA's objective that odours emanating from the proposed development should not adversely affect the welfare and amenity of other land users.

The National Environment Protection Council has developed a draft National Environment Protection Measure (NEPM) for ambient air quality which addresses SO_2 and NO_2. Table 3 presents a summary of the NEPM air quality standards for SO_2 and NO_2.

Table 3. Ambient Air Quality Guidelines

Pollutant	National Environment Protection Standards in Populated Areas		
	Averaging Time	Maximum Concentration	Goal: (10 years) Maximum Number of Allowable Exceedences per year
Nitrogen Dioxide	1 hour	0.125 ppm	1
	1 year	0.03 ppm	0
Sulphur Dioxide	1 hour	0.20 ppm	1
	1 day	0.08 ppm	1
	1 year	0.02 ppm	0

Although compliance with these standards applies specifically to performance monitoring stations to be specified in jurisdictional monitoring plans, the standards do provide a basis from which the EPA can assess the significance of proposed emissions, and from which proponents can demonstrate whether project emissions will be managed to regionally acceptable levels.

The DEP recommends that an appropriate standard to be met in regard to the odorous properties of H_2S is that a ground level concentration of 0.0007 ppm (volume/volume) not be exceeded at the nearest residence.

The proponent has carried out some preliminary modelling of gaseous emissions and has given a commitment that the final design of the processing plant will only be determined after more detailed modelling has confirmed that the design will comply with the relevant air quality standards/guidelines. The standards/guidelines to be used in determining compliance include the Kwinana Environmental Protection (Atmospheric) Policy, the draft National Environment Protection Measure and Impact Statement for Ambient Air quality, and the National guidelines for control of emission of air pollutants from new stationary sources. The most appropriate standard/guideline for each emission will be determined by the DEP when issuing Works Approvals and Licences under Part V of the *Environmental Protection Act 1986.*

Preliminary modelling indicates that the NEPM 1-hour standard for SO_2 will be met for all downwind distances greater than approximately 1 km. The total emission level of 2 000 tonnes per annum and the large distance to the Fitzgerald River National Park (greater than 30 km) imply that impacts of SO_2 emissions on the vegetation of the National Park are unlikely.

The *National guidelines for control of emission of air pollutants from new stationary sources* (AEC/NH&MRC, 1986) gives a standard of 2.0 kg of SO_2 for each tonne of sulphuric acid produced. The processed to be used in the acid plant gives a conversion efficiency of SO_2 to acid of 99.7% and the proponent has stated that the emission rate will not be more than 1.8 kg of SO_2 for each tonne of sulphuric acid.

Preliminary worst case modelling of NO_x indicates that the NEPM standard may be exceeded at the nearest residence. However, this modelling is considered by the proponent to be overly conservative. Further modeling will be carried out during the design of the power station and the necessary NO_x reduction technologies will be employed to ensure that the NEPM standard will be met in populated areas.

In response to submissions, the proponent acknowledged that modelling was at this stage preliminary and that further work would be carried out as final plant and power station designs are decided upon.

The construction and operation of the processing plant and the power station will require Works Approvals and Licences under Part V of the *Environmental Protection Act 1986.* Detailed specification for the discharge of emissions, monitoring, and reporting will be established under the licence and works approvals conditions. The proponent's application for works approvals and licences will require more detailed emissions modelling as supporting documentation and will also need to demonstrate that all reasonable and practicable measures have been taken to minimise emissions.

Although the air emissions modelling carried out to date is not definitive, the proponent's commitment to meet relevant standards through the detailed design of the processing plant and power station, together with the overall magnitude of the modelled emission limits, reassures the EPA that its objective for this factor can be met. The emissions identified and modelled so far are not so high that they cannot be managed through appropriate design using current emissions reduction technology. The proponent's commitment ensures that appropriate emission reduction measures will be included in the detailed design of the project to ensure that acceptable emissions levels are achieved. This detailed design and modelling will be subject to regulation through the proponent's commitments and the requirements of Works Approvals and licences under Part V of the *Environmental Protection Act 1986.*

Summary

Having particular regard to the:

(a) preliminary modelling which indicates appropriate standards are achievable at a reasonable distance from the project area;

(b) the proponent's commitments to confirm that appropriate standards can be met during the design phase of the project; and

(c) the fact that emissions will be subject to Part V of the Environmental Protection Act 1986;

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for gases and odour, provided that the proponent's commitments are made legally enforceable.

3.5 Greenhouse gases

Description

The most significant greenhouse gas for this proposal is carbon dioxide (CO_2) which will be produced in substantial quantities by the ore processing component of this proposal. CO_2 will be produced by the power station through the burning of diesel fuel as a source of energy at a rate of approximately 80 000 tonnes per annum. CO_2 will also be produced as a by-product of limestone neutralisation of acidic process streams in the processing plant at a rate of approximately 97 000 tonnes per annum. After being leached by sulphuric acid the acidic ore slurry is neutralised as part of the chemical process to produce nickel and also to ensure that tailings sent to the Tailings Storage Facility are roughly pH neutral.

In addition to CO_2 produce by the processing plant, a lesser amount will also be generated by mining activities, principally the use of large haul trucks. This will generate approximately 10 000 tonnes per annum of CO_2.

The total estimated emission of 187 000 tonnes per annum of CO_2 represents approximately 0.3% of Western Australia's greenhouse gas emissions in 1990.

Submissions

One submitter believed that the proponent's inventory of greenhouse gases was incomplete, in that emissions of CO_2 from the hydrogen plant were omitted and that the proponent had incorrectly implied that the use of natural gas as a fuel source, rather than diesel, would eliminate greenhouse gas emissions from the power station.

Assessment

The area considered for assessment of this factor is Western Australia.

The EPA's objectives in regard to this environmental factor are:

(a) to ensure that greenhouse gas emissions emitted from proposed projects are adequately addressed and best available efficient technologies are used in Western Australia to minimise Western Australia's greenhouse gas emissions (EPA 1998); and

(b) to mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, and in accordance with the National Greenhouse Strategy.

The greenhouse effect is a natural phenomenon that warms the earth and enables it to support life. Greenhouse gases are those gases which contribute to the greenhouse effect. Over the past 200 years, human activity has dramatically increased the amount of greenhouse gases in the atmosphere and this increase continues today leading to an enhanced greenhouse effect. While there is wide dissension within the scientific community over the climatic and environmental effects of increasing levels of greenhouse gases, the majority view is that global warming is occurring.

In response to the predicted impact of increasing levels of greenhouse gases National and International targets limiting the emissions of these gases have been set. At the Kyoto Climate Change Conference in December 1997 the developed countries agreed to a collective target of a 5% decrease in greenhouse gas emissions from 1990 levels by 2010. Within this agreement Australia's target allows for an 8% increase in emissions over 1990 levels by 2010. The target represents a 25% reduction from "business as usual" predictions of greenhouse gas emission for the year 2010.

In its response to submissions, the proponent clarified that emissions from the hydrogen plant were insignificant in comparison to the other sources identified. The use of natural gas would reduce greenhouse gas emissions to 75% of that which would be generated from a diesel-fuelled power station.

The EPA notes that his proposal will involve an estimated increase in Western Australia's greenhouse gas emissions based on 1990 emission rates. In a nation-wide context this equates to an approximate increase of 0.03% increase of Australia's emissions based on 1990 emission rates. This makes the Ravensthorpe Nickel Project a significant contributor to greenhouse gas emission, but not a major contributor.

It is considered by the EPA that the proposed design of the processing plant includes greenhouse gas efficiencies and that further detailed design is likely to identify further improvements. Energy requirements are reduced by capturing much of the heat evolved from the burning of sulphur in the acid plant and using it to generate electrical power and steam for the process plant. In addition the proponent has identified a number of measures which could be used to further reduce emissions and has given a commitment that these will be pursued (Commitment 11). One measure with substantial potential to reduce emissions is the use of natural gas rather than diesel. The EPA understands that this may emerge as the preferred power supply option, but that it is dependent on the development of regional infrastructure (extension of the Goldfields gas pipeline to Esperance). In addition, the EPA notes that the project lies in an region which is suitable for the establishment of plantations and encourages the proponent to investigate this option as a means to offset some of its greenhouse gas emissions.

Summary

Having particular regard to:

(a) the proponent's commitment to use energy efficient equipment and processes, and to pursue a number of measures to reduce greenhouse gas emissions; and

(b) the fact that there is scope for further energy efficient measures to be adopted in the detailed design of the processing plant,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for greenhouse gases, provided that the proponent continues to investigate and implement energy efficiencies in the design of the project, as part of a Greenhouse Gas Emissions Management Plan.

3.6 Solid waste (Tailings Storage Facility)

Description

Up to 1.8 million tonnes per annum of tailings will be deposited in a Tailings Storage Facility (TSF) over the 20 year life of the project. The TSF will be located on cleared farm land to the south of Bandalup Hill and will cover an area of 144 hectares (ha). The tailings will have a pH greater than 6 and are categorised as low hazard waste according to DEP definitions (DEP, 1996). Supernatant water in the TSF will be saline process water but will not contain any toxicants as is common in other types of tailings storages (for example, gold tailings storages often contain cyanide).

In addition to the TSF, an evaporation pond may be required if the decant water from the TSF is not suitable for reuse in the processing plant. As a result, the dissolved salts in the decant water will precipitate and accumulate as solid waste within the evaporation pond.

The TSF embankments will be progressively rehabilitated during the project's operational life. Final rehabilitation will be in accordance with government agency recommendations and will include control of drainage form the surface and slopes of the structure, revegetation and landscaping to form a stable drained landform over the long term.

Submissions

It was suggested that seepage or spills from the TSF have the potential to contaminate groundwater in the region, affecting agricultural operations. There was also concern that no modelling of seepage from the TSF or evaporation pond seems to have been undertaken and that highly saline tailings material may leach into the surrounding land.

The Department of Minerals and Energy stated that it would require the proponent to submit a Notice of Intent (NOI) for the project detailing mining, rehabilitation, environmental management systems to be used, and how the impact will be managed. In particular, the NOI would need to address the TSF (and evaporation pond).

CALM noted that an external batter of the facility embankments of 4:1 (or less) would result in better long term stability and the proposed rehabilitation strategy for the tailings dam may not be appropriate to the saline tailings material.

Assessment

The area considered for assessment of this factor is the storage facility and the surrounding groundwater and surface waters.

The EPA's objective in regard to this environmental factor is that wastes should be contained and isolated from groundwater and surface surrounds.

Most groundwater in the region is saline, ranging from 12 000 - 20 000 mg/L total dissolved solids. Some use of fresher groundwater from localised perched aquifers made for stock watering purposes.

In Appendix D of the CER the proponent provides a general description of the TSF including the seepage control measures. The site has been subject to a geotechnical investigation which indicates it is a suitable site and has identified areas which will need special attention. Embankments will be constructed of low permeability fill and will include a cut-off key trench to restrict lateral seepage under the embankment. Areas within the facility identified as potential seepage pathways will be covered with compacted low permeability clay liners. An underdrainage system will be install to recover water and promote consolidation.

Any liquor collected would be recycled into the processing plant or sent to an evaporation pond. Should an evaporation pond be required, it would be constructed in a similar fashion to the TSF with the addition of a synthetic liner.

Commitments have been made by the proponent to monitor all liquid waste streams and leachates from solid waste storage's which have the potential to affect groundwater or surface water quality and ensure containment of any contaminated waste, and to undertake remediation work in the event of any leakage.

In response to the submissions the proponent has stated that detailed seepage modelling will be undertaken as a fundamental part of the TSF design.

The proponent has discussed with CALM its comments on the batter angle and rehabilitation strategies. CALM's suggested improvements will be considered by the proponent when finalising the design of the TSF and rehabilitation strategies which will be refined over the life of the project in consultation with CALM. Although the tailings are not expected to be as saline as those from in the Goldfields region which prompted CALM's comments, some specific rehabilitation strategies to address the saline nature of the tailings may need to be investigated when developing final rehabilitation plans.

The design and operation of Tailings Storage Facilities within Western Australia are regulated under both the *Mining Act 1978* and Part V of the *Environmental Protection Act 1986*. The DME requires a Notice of Intent to be prepared for a TSF including a signed certificate of compliance for tailings storage facility design. Aspects of design to be assessed for compliance are detailed in the DME's *Guidelines on the Safe Design and Operating Standards for Tailings Storages*. In addition, due to the potential for such facilities to cause pollution, they also require Works Approvals and Licences to be issued by the DEP. Conditions of DEP licences require

monitoring of water quality surrounding the facility and contingency plans in the case of any deterioration in water quality.

Summary

Having particular regard to the:

(a) the general design features described in Appendix D of the CER;

(b) the fact that detailed designs will be subject to further review and approval through works approval, licence, and NOI requirements; and

(c) the proponent's commitments to monitoring and remediation (should leakage occur),

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for solid waste, provided that the proponent's commitments are made legally enforceable.

4. Conditions

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

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

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

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

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Comet Resources NL to develop a nickel mining and processing operation 35 km east of Ravensthorpe, is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3;

(b) that the project should be managed in accordance with a comprehensive environmental management system to be developed by the proponent;

(c) that management plans for priority flora and significant vegetation communities should be developed in consultation with the Department of Conservation and Land Management prior to ground-disturbing activities;

(d) that a fauna management plan should be developed in consultation with the Department of Conservation and Land Management prior to ground-disturbing activities;

(e) that the proponent should continue to investigate ways in which greenhouse gas emissions may be minimised;

(f) that decommissioning strategies for the mine be considered and adopted early in the life of the project; and

(g) that the environmental performance of the project be subject to an intensive review every six years.

Table 4. Summary of Assessment of Relevant Environmental Factors

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE

Significant flora species and vegetation communities.	Bandalup Hill	Protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950.
		Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.
			The EPA considers that while the CER provided insufficient information on the conservation significance of flora and vegetation that may be affected, that the proponent has now provided further information sufficient for relevant impacts to be assessed.
			After being provided with the additional information CALM provided the following advice:
			• *Spyridium glaucum*
			  • Relocation of the ROM pad and proper management during operations should provide adequate protection for this species.
			• *Dampiera deltoidea*
			  • Appears dependent on Bandalup Hill for its conservation, but appears to be a species which responds to disturbance and hence rehabilitation may be a suitable strategy for conservation of the species.
			  • The proponent should continue regional surveys to confirm the conservation status of the species.
			  • The proponent should prepare a revegetation strategy linked to completion criteria before population is significantly impacted.
			  • The proponent should undertake research to determine the appropriate regeneration methodology for this species, should completion criteria not be met.
			• *Kunzea similis*
			  • Conservation of at least a proportion of the population of *Kunzea similis* at Bandalup Hill is essential to the conservation of this species.
			  • Conservation strategy for this species should be developed.
			The EPA notes:
			• CALM's advice regarding the Priority Species;
			• that the project has been designed to minimise, as far as practicable, disturbance to *Eucalyptus flocktoniae - Melaleuca coronicarpa 'gorse'* communities and that most (approximately 70%) of this community type is unaffected by the project;
				Having particular regard to:
				• CALM's advice regarding the Priority Species;
				• the potential for rehabilitation to maintain the population levels of these species as mining progresses;
				• that some species appear to respond well to disturbance; and
				• that some species are securely conserved in the Fitzgerald River National Park,
				it is the EPA's opinion that the proposal can be managed to meet the EPA's objective, provided that the proponent develops and implements specific plans for the management of Priority flora species and significant vegetation communities.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
			• that another population of *Dampiera deltoidea* of similar size to that affected by the proposal has been found in the Fitzgerald River National Park and that it likely to occur at other locations within the park; • indications that *Dampiera deltoidea* seems to respond well to disturbance and may therefore be present on the site as a result of recent exploration activities; • that 190 000 *Kunzea similis* plants out of known total of 430 000 plants would be affected by this proposal; and • the mine plan follows a staged approach where the mine pit is progressively rehabilitated and the whole area is not open at any one time. The EPA agrees with CALM that the proponent should develop a conservation strategy for the two priority species which ensures that a viable population of each species is maintained on Bandalup Hill throughout the project. Formulation of this strategy will require research into the regeneration of these species and the continuation of regional surveys for these species.	
Terrestrial fauna	The uncleared land surrounding the project area referred to as the "Bandalup corridor".	Maintain the abundance, species diversity and geographical distribution of terrestrial fauna. Protect Specially Protected (Threatened) Fauna, consistent with the provisions of the Wildlife Conservation Act 1950.	**Proponent Commitments:** • The EMP procedures will include sponsorship of CALM's Western Shield programme, aimed at reducing the population of introduced feral predators. The EPA notes that 'threatened' fauna are protected under the *Wildlife Conservation Act 1950* and therefore CALM has an interest/role in regulating any activities which may affect, either directly or indirectly, such fauna The EPA understands that Heath Rat (*Pseudomys shortridgei*) will not be directly disturbed as a result of this proposal but that suitable habitats do occur within the overall project area. The EPA believes the potential exists for the mine access road to fragment the Bandalup corridor and therefore affect its function as a pathway for fauna movement. However, it notes the advice of Main Roads WA that an alternative route is unacceptable with regard to road safety. The EPA considers that the impact of the project (in particular the access road) on the corridor can be managed provided that a specific management and monitoring plan is put in place prior to commencing the project. The EPA expects that eventual decommissioning of the project should return the affected areas to their previous function as part of the Bandalup corridor.	Having particular regard to: • protection provided to fauna under the *Wildlife Conservation Act 1950*; • that 83% of the corridor width will be retained; • that some facilities have been relocated to reduce impacts, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective, provided that a fauna management plan is prepared prior to any ground disturbing activities.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Gases (SO_2 and NO_x) and odour.	The surrounding Ravensthorpe region outside of the project area.	Ensure that SO_2/NO_x emissions meet relevant air quality standards/guidelines and requirements of Section 51 of the Environmental Protection Act 1986 (all reasonable and practicable measures are taken to minimise SO_2/NO_x discharge). Odours emanating from the proposed development should not adversely affect the welfare and amenity of other land users.	**Proponent Commitments:** • Carry out detailed dispersion modelling following detailed design of hydrogen sulphide plant to confirm that odour impacts meet draft Queensland criteria [currently being used by the EPA as an interim approach for odour assessment] and implement an emergency response plan for malfunctions which could release hydrogen sulphide. • Carrying out detailed dispersion modelling of SO_2, NO_x and any other significant emissions using the latest meteorological data and final plant design, in order to demonstrate compliance with the relevant standards and guidelines. Construction and operation of the processing plant will require works approvals and licences under Part V of the *Environmental Protection Act 1986*. The EPA notes that the DEP presently recommends a design ground level concentration for H_2S of 0.0007 ppm (volume/volume).	Having particular regard to: • preliminary modelling which indicates appropriate standards are achievable at a reasonable distance form the project area; • the proponent's commitments to confirm that appropriate standards can be met during the design phase of the project; and • the fact that emissions will be subject to Part V of the *Environmental Protection Act 1986*; it is the EPA's opinion that the proposal can be managed to meet the EPA's objective, provided that the proponent's commitments are made legally enforceable.
Greenhouse gases	Western Australia	Ensure that greenhouse gas emissions emitted from proposed projects are adequately addressed and best available efficient technologies are used in Western Australia to minimise Western Australia's greenhouse gas emissions. (EPA 1998)	The EPA notes that the proposal would contribute an additional 0.3% (190 000 tonnes per annum) to Western Australia's greenhouse gas emissions. **Proponent Commitments:** • Ensure that equipment and processes used are as energy efficient as possible and develop a Greenhouse Gas Emissions Management Plan. • The proponent will join, the Commonwealth's Greenhouse Challenge Programme prior to commissioning.	Having particular regard to: • the fact there is scope for energy efficiency measures to further reduce CO_2 emissions, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective, provided that the proponent continue to investigate energy efficiencies which can be achieved in the design of the project, as part of a Greenhouse Gas Emissions Management Plan.

RELEVANT FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA ASSESSMENT	EPA ADVICE
Solid Waste (Tailings Storage Facility)	The proposed Tailings Storage Facility and surrounding surface and groundwaters.	Wastes should be contained and isolated from groundwater and surface surrounds.	**Proponent Commitments:** • design, construct, and operate the TSF in accordance with government regulations and in the event of any leakage, undertake remedial work to the satisfaction of the appropriate regulatory authorities. • monitor all liquid waste streams and leachates from solid waste storages which have the potential to impact groundwater or surface water quality and ensure containment of any contaminated waste. A suitable site has been chosen for the TSF and seepage control measure have been outlined in the CER. Control measures will include: construction using low permeability fill; a cut-off key trench to restrict lateral seepage; and an underdrainage system. The EPA notes that the tailings dam (and evaporation pond) will require a Works Approval and Licence under Part V of the *Environmental protection Act 1986*. In addition its construction and operation would also need to be in accordance with an NOI submitted to the DME.	Having particular regard to: • the general design features described in Appendix D of the CER; • the fact that detailed designs will be subject to further review and approval through works approval, licence, and NOI requirements; and • the proponent's commitments to monitoring and remediation (should leakage occur); it is the EPA's opinion that the proposal can be managed to meet the EPA's objective, provided that the proponent's commitments are made legally enforceable.

5. Conclusions

The EPA has considered the proposal by Comet Resources NL to develop a nickel mining and processing operation 35 km east of Ravensthorpe.

The EPA notes that the project is located within a corridor of remnant native vegetation in a region well known for its floristic diversity. Proper management of impacts on flora and fauna will be necessary and the EPA has recommended the development of management plans for this purpose.

The EPA has concluded that the proposal can be managed in an environmentally acceptable manner such that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

6. Recommendations

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

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

1. That the Minister notes that the project being assessed is for the development of a nickel mining and processing operation 35 km east of Ravensthorpe
2. That the Minister considers the report on the relevant environmental factors of significant flora species and vegetation communities, terrestrial fauna, gases and odours, greenhouse gases, and solid waste as set out in Section 3.
3. That the Minister notes that the EPA has concluded that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.
4. The Minister imposes the conditions and procedures recommended in Appendix 3 of this report.

Appendix 1

List of submitters

Organisations:

Aboriginal Affairs Department
Conservation Council of Western Australia
Department of Conservation and Land Management
Department of Minerals and Energy

Individual:

David R. Bungey
Kevin Crane
Mr & Mrs Goldfinch

Appendix 2

References

AEC/NH&MRC (1986), *National guidelines for control of emission of air pollutants from new stationary sources: Recommended methods of monitoring air pollutants in the environment*, Australian Environment Council, National Health and Medical Research Council, 1986. Canberra.

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Appendix 3

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

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

RAVENSTHORPE NICKEL PROJECT

Proposal: The mining and processing of up to 4 Mtpa of nickel ore from Bandalup Hill, approximately 35 km east of Ravensthorpe, producing 30 000 tpa of nickel metal and 2 200 tpa of cobalt sulphide over a period of 20 years, as documented in Schedule 1 of this Statement.

Proponent: Comet Resources NL

Proponent Address: Level 1, 619 Murray Street, WEST PERTH WA 6005

Assessment Number: 1199

Report of the Environmental Protection Authority: Bulletin 930

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

1 Implementation

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

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

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

2 Proponent Commitments

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

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

3 Environmental Management System

3-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to commissioning, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1 An environmental policy and corporate commitment to it;

2 Mechanisms and processes to ensure:

(1) planning to meet environmental requirements;

(2) implementation and operation of actions to meet environmental requirements;

(3) measurement and evaluation of environmental performance; and

3 Review and improvement of environmental outcomes.

3-2 The proponent shall implement the environmental management system referred to in condition 3-1.

4 Priority Flora / Significant Vegetation Communities Management Plan

4-1 Prior to ground-disturbing activities and in consultation with the Department of Conservation and Land Management, the proponent shall prepare a Priority Flora / Significant Vegetation Communities Management Plan to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Conservation and Land Management.

The objective of this Plan is to:

- ensure the conservation of flora species and vegetation communities which occur within the project area.

This Plan shall address:

1 the management and monitoring of impacts on Priority flora species within the project area, in particular, *Spyridium glaucum*, *Dampiera deltoidea*, and *Kunzea similis*;

2 further regional surveys to confirm the conservation status of each of the above species;

3 revegetation strategies including industry best practice completion criteria to be met as the mining area progresses;

4 preliminary research into the propagation of these species during the first few years of mining, in order to select initial rehabilitation techniques to be used during this time;

5 further investigations into the regeneration and seed ecology of these species (particularly *Dampiera deltoidea*) in order to determine appropriate regeneration methodologies, if completion criteria are not being achieved; and

6 the management and monitoring of impacts on significant vegetation communities within the project area, in particular, *Eucalyptus flocktoniae - Melaleuca coronicarpa 'gorse'*.

4-2 The proponent shall implement the Priority Flora / Significant Vegetation Communities Management Plan required by condition 4-1.

4-3 The proponent shall make the Priority Flora / Significant Vegetation Communities Management Plan required by condition 4-1 publicly available, to the requirements of the Environmental Protection Authority.

5 Fauna Management Plan

5-1 Prior to ground-disturbing activities and in consultation with the Department of Conservation and Land Management, the proponent shall prepare a Fauna Management Plan to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Conservation and Land Management.

This Plan shall address:

1 management and monitoring to minimise impacts on fauna within the project area and the adjacent Bandalup corridor; and

2 in particular, management and monitoring of the Heath Rat (*Pseudomys shortridgei*) and the Western Mouse (*Pseudomys occidentalis*);

5-2 The proponent shall implement the Fauna Management Plan required by condition 5-1.

5-3 The proponent shall make the Fauna Management Plan required by condition 5-1 publicly available, to the requirements of the Environmental Protection Authority.

6 Greenhouse Gas Emissions Management Plan

6-1 Prior to commissioning, the proponent shall prepare a Greenhouse Gas Emissions Management Plan:

- to ensure that greenhouse gas emissions emitted from the project are adequately addressed and best available efficient technologies are used in Western Australia to minimise Western Australia's greenhouse gas emissions; and
- to mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, and in accordance with the National Greenhouse Strategy,

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

This Plan shall include:

1 calculation of the "greenhouse gas" emissions associated with the proposal, as indicated in "Minimising Greenhouse Gas Emissions, Guidance for the Assessment of Environmental Factors, No. 12" published by the Environmental Protection Authority;

2 specific measures to minimise the "greenhouse gas" emissions associated with the proposal;

3 monitoring of "greenhouse gas" emissions;

4 estimation of the "greenhouse gas" efficiency of the project (per unit of product and/or other agreed performance indicators) and comparison with the efficiencies of other comparable projects producing a similar product;

5 an analysis of the extent to which the proposal meets the requirements of the National Strategy using a combination of:

- "no regrets" measures;
- "beyond no regrets" measures;
- land use change or forestry offsets; and
- international flexibility mechanisms.

6-2 The proponent shall implement the Greenhouse Gas Emissions Management Plan required by condition 6-1.

7 Decommissioning Plan

7-1 Within five years following commissioning, or at such later time considered appropriate by the Minister for the Environment on advice of the Department of Environmental Protection, the proponent shall prepare a Decommissioning Plan to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Department of Minerals and Energy, and the Department of Conservation and Land Management.

This Plan shall:

1 describe the processes for decommissioning and rehabilitation of the project area;

2 provide for the long term management of ground and surface waters systems affected by the tailings storage facility (and evaporation pond if one is required);

3 provide for the development of a 'walk away' solution for the decommissioned mine pit, process plant, tailings dam (evaporation pond), and all associated infrastructure;

4 identify all contaminated areas, including provision of evidence of notification to relevant statutory authorities; and

5 recognise the importance of restoring the Bandalup corridor to its former size at the conclusion of operations.

Note: A 'walk away' solution means that the site shall either no longer require management at the time the proponent ceases operations, or if further management is deemed necessary, the proponent shall make adequate provision so that the required management is undertaken with no liability to the State.

7-2 The proponent shall implement the Decommissioning Plan required by condition 7-1 until such time as the Minister for the Environment determines that decommissioning is complete.

7-3 The proponent shall make the Decommissioning Plan required by condition 7-1 publicly available, to the requirements of the Environmental Protection Authority.

8 Performance Review

8-1 Each six years following the commencement of construction, the proponent shall submit a Performance Review to the Department of Environmental Protection:

- to document the outcomes, beneficial or otherwise;
- to review the success of goals, objectives and targets; and
- to evaluate the environmental performance over the six years;

relevant to the following:

1 environmental objectives reported on in Environmental Protection Authority Bulletin 930;

2 proponent's consolidated environmental management commitments documented in schedule 2 of this statement and those arising from the fulfilment of conditions and procedures in this statement;

3 environmental management system environmental performance targets;

4 environmental management programs and plans; and/or

5 environmental performance indicators;

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

Note: The Environmental Protection Authority may recommend changes and actions to the Minister for the Environment following consideration of the Performance Review.

9 Proponent

9-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act 1986 is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

9-2 Any request for the exercise of that power of the Minister referred to in condition 9-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

9-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

10 Commencement

10-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

10-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

10-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 10-1 and 10-2.

10-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

11 Compliance Auditing

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

11-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal written advice that the requirements have been met.

11-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

Note

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

Schedule 1

The Proposal

The mining and processing of nickel ore from Bandalup Hill, approximately 35 km east of Ravensthorpe nickel and cobalt ores, employing open-cut mining of up to 4,000,000 tpa (tonnes per annum) of ore to produce up to 30,000 tpa of nickel metal and 2,200 tpa of cobalt sulphide over a period of 20 years.

The major features of the project are:

- mining at Bandalup Hill, approximately 35 km east of Ravensthorpe and 155 km west of Esperance
- a processing plant comprising facilities for ore beneficiation, pressure acid leaching, neutralisation precipitation, solvent extraction and electrowinning
- a sulphuric acid manufacturing plant
- a power station and steam generation facility
- a water supply scheme using seawater pumped from the coast, about 40 km south of the project site, to a water treatment facility producing potable and demineralised water
- a pipeline returning brine to the ocean
- a new, all-weather, project site access road from the South Coast Highway, about 4 km north of the project site
- a village to accommodate a construction workforce of around 900 and, thereafter, an operational workforce of up to 250
- tailings storage facility
- waste rock stockpile
- offices, workshops, laboratory and other ancillary buildings
- haul roads and access roads within the project site

Key Characteristics Table

Project life		approx. 20 years
Size of deposit	(at cut-off grade of 0.5% Ni)	60 million tonnes
Mining rate	- maximum	4.0 million tonnes per annum
Beneficiated concentrate production (average)		1.8 million tonnes per annum
Acid leach throughput		1.8 million tonnes per annum
Maximum depth of mining		50 m
Tailings storage area	- ground level footprint	144 ha
	- final surface area	115 ha
Evaporation pond	- maximum likely area	144 ha
Water Supply	- source	sea water
	- raw water (average) (35,000 mg/L Total Dissolved Solids)	13,000 kL/d
	- process/potable water (210 mg/L Total Dissolved Solids)	6,000 kL/d
(The process/potable water stream is a component of the total requirement of 13,000 kL/d)		
Energy generation	- installed capacity	60 MW
	- normal (power station)	40 MW
	- recovered (acid plant)	12 MW
Major resource use	- limestone	300,000 tonnes per annum
	- sulphur	220,000 tonnes per annum
	- diesel	59,000 tonnes per annum
Workforce	- construction	900
	- operation	250
Pit area		199 ha
Plant area		25.4 ha
Stockpile area (ore)		18 ha
Overburden storage area		65 ha
Accommodation village		~25 ha
Nickel production		30,000 tonnes per annum
Cobalt sulphide production		2,200 tonnes per annum
Transport rate	- to site	675,000 tonnes per annum
	- from site (product)	32,200 tonnes per annum
		(approximately 70 truck movements per day, mainly between the site and Esperance)

Schedule 2

Proponent's Consolidated Environmental Management Commitments

March 1998

RAVENSTHORPE NICKEL PROJECT (1199)

Comet Resources NL

TABLE ES-2 (Rev B)

SUMMARY OF PROPONENT'S COMMITMENTS

Environmental Factor	Proponent's Commitments (The No. refers to the Commitment No. stated in the main text of the report)		Objectives(s)	Timing (phase)	Regulatory Agencies	Compliance Criteria Environmental Protection Act, 1986, plus the following:
	No.	Description				
Management Plan	1	The proponent will develop and implement an Environmental Management Plan (EMP) as part of an Environmental Management System complying with the principles of the ISO 14000 series. The EMP will be developed in consultation with the DEP and DME and other regulatory authorities, in the following two stages: 1. Project Construction EMP; to be submitted for DEP endorsement before the start of construction 2. Project Operation EMP; to be submitted for DEP endorsement before project commissioning	Implement and maintain an approved EMP in order to: - comply with Comet environmental policies - achieve the goals of protection of the environment, public and workforce.	Develop Construction EMP during design, implement before site works commence (early to mid 1999). Develop Operation EMP during construction, implement before project commissioning (mid 2001). Continuous review, improvement will be key principle of Operation EMP throughout project life.	Develop both EMPs in consultation with DEP, DME, CALM, WRC. Receive approval by DEP and DME.	ISO 14000 series
	2	The EMP will be reviewed and continuously improved.				
	3	**The EMP will incorporate procedures that will ensure fulfillment of the following Commitments, Nos. 2 to 38.**				
Terrestrial Flora refer also Commitment 38 re flora protection on proposed Access Road alignment	4	Prohibit unauthorised clearance of terrestrial flora and vegetation, particularly old growth vegetation and rare or priority classified flora.	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	Exploration, development, construction, operation and decommissioning of all project facilities and infrastructure	CALM DEP	Wildlife Conservation Act 1950
	5	Develop and operate a dieback management plan in consultation with CALM	Protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950. Avoid introduction or spread of disease.			
	6	Encourage the establishment of priority species in rehabilitation areas				
	7	Develop and implement procedures, within the Environmental Management Plan for the construction and operation of the project, to avoid unnecessary disturbance to terrestrial flora and vegetation, particularly old growth vegetation and rare or Priority-classified flora.				
	8	During the course of mining and backfilling the Halleys deposit over 15 years, The proponent will monitor the success of the regeneration of priority species in the mine topsoil relocation and backfilling program.				
	9	During the period prior to mining other areas not the subject of the current CER, The proponent would be required to complete further site flora surveys; The proponent would also undertake further regional work to ascertain regional populations where necessary.				
	10	Should it become evident that regeneration was not successful within the backfilling program and that regional populations did not exist to reduce the impact of site disturbance, then The proponent would undertake to fund seed collection and specific research aimed at maintaining the species.				
Terrestrial Fauna	11	Prohibit unauthorised activities that may impact upon terrestrial fauna and their habitats.	Maintain the abundance, species diversity and geographic distribution of terrestrial fauna. Protect Specially Protected (Threatened) Fauna consistent with the provisions of the Wildlife Conservation Act 1950			
	12	EMP procedures will address early revegetation of cleared land, prohibition of pets and firearms, restricted vehicle access to bush areas, sponsorship of Western Shield program, prompt and correct disposal of putrescible waste to discourage vermin.				
Marine Flora and Fauna	13	Develop and implement procedures within the EMP to avoid unnecessary disturbance to marine flora and fauna, and to design facilities accordingly.	Maintain the ecological function, abundance, species diversity and geographic distribution of marine flora. Maintain the abundance, species diversity and geographic distribution of marine fauna	Construction and operation of seawater intake and return brine pipeline	DEP	
	14	Undertake thorough investigation, to the satisfaction of the DEP, into the possible impacts of seawater abstraction and brine discharge before proceeding with development of either of these schemes.				
Watercourses, including Surface Water Quality	15	Prohibit unauthorised activities that could impact on the hydraulic function of the drainage system or the downstream water quality.	Maintain the integrity, functions and environmental values of watercourses Maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance, are protected.	Exploration, development, construction, operation and decommissioning of all project facilities and infrastructure	Water and Rivers Commission DEP	Draft WA Water Quality Guidelines for Fresh and Marine Waters (EPA, 1993) NHMRC/ARMCANZ Australian Drinking Water Quality Guidelines – National Water Quality Management Strategy
	16	Implement a drainage monitoring programme to assess any impacts on vegetation arising from unavoidable changes to the drainage regime; development and operation of the monitoring programme will be undertaken in consultation with the DEP and WRC.				
	17	Incorporate holding basins within the site drainage system to arrest and assess possibly contaminated run-off before release to the environment.				
Landform, including Visual Amenity and Rehabilitation	18	Prohibit unauthorised disturbance to landforms and introduction of visual impact to areas not required for mining, processing or infrastructure development.	Establish stable and sustainable landform consistent with surroundings.	Development, construction, operation and decommissioning of all project facilities and infrastructure	DME CALM Shire of Ravensthorpe DEP	Guidelines for Mining in Arid Areas, DME Environmental Management of Quarries: Development, Operation and Rehabilitation Guidelines, DME
	19	Develop a rehabilitation programme designed to restore disturbed areas to stable, self-sustaining conditions that are consistent with the defined post-mining land-use objectives.	Rehabilitate impacted areas to an acceptable standard which will integrate the post-mining landform with the surrounding environment	Programme will be developed during design stage; implemented before site works commence; maintained/reviewed/improved through all phases of project, up to and including decommissioning.		

Environmental Factor	Proponent's Commitments (The No. refers to the Commitment No. stated in the main text of the report)		Objectives(s)	Timing (phase)	Regulatory Agencies	Compliance Criteria Environmental Protection Act, 1986, plus the following:
	No.	Description				
Groundwater Quantity, including Groundwater Quality	20 21 22 23	Comply with all regulations pertaining to groundwater exploration, development and abstraction, including seeking the approval of the EPA and the WRC. Involve the DME during the design, construction and operation of the tailings storage facility (TSF) to ensure its compliance with all relevant regulations. Install and routinely sample and groundwater monitoring bores down-hydraulic-gradient of the TSF. Install and routinely sample and record water levels in groundwater monitoring bores down-hydraulic-gradient of any groundwater abstraction bores; prepare annual monitoring report for WRC review and approval.	Maintain the quantity of groundwater so that existing and potential uses, including ecosystem maintenance, are protected Ensure that the beneficial uses of groundwater can be maintained, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993).	Exploration, development, construction, operation and decommissioning of all project facilities and infrastructure	Water and Rivers Commission DEP	Draft WA Water Quality Guidelines for Fresh and Marine Waters (EPA, 1993) Guidelines on the Safe Design and Operating Standards for Tailings Storages, DME Water and Rivers Commission Act, 1995
Odour	24 25	Arrange for air-dispersion modelling to be undertaken following detailed design of the hydrogen sulphide plant, to confirm that odour impacts are below the draft Queensland criteria at odour-sensitive premises. Seek world's best practice in the detection and control of hydrogen sulphide and prepare and implement an emergency response plan to address any possibility of malfunction that could result in the release of hydrogen sulphide to the atmosphere.	Odours emanating from the proposed development should not adversely affect the welfare and amenity of other land users.	Operation of process facilities	DEP	Queensland Department of Environment and Heritage, 1994, "Policy for Odours from New Developments", in the absence of equivalent WA Criteria. (DGLC OU = 2.5) Qld. Criteria are referenced in Table 4 of draft DEP (WA) paper "Determination of Acceptable Air Discharges from Stationary Sources, 1997".
Dust and Particulates	26	Prepare and implement a dust management plan based on advice from the DME and DEP. The plan will include ambient monitoring proposals to verify that dust levels comply with the relevant standards or guidelines.	To ensure that the dust levels generated by the project do not adversely impact upon welfare and amenity or cause health problems, by meeting statutory requirements and acceptable standards. Ambient dust concentrations will be compared to those stated in the Draft National Environment Protection Measure and Impact Statement for Ambient Air Quality (National Environment Protection Council, 1997).	Construction and operation, especially during blasting and mining	DEP	Draft National Environment Protection Measure and Impact Statement for Ambient Air Quality (or alternative agreed with EPA), with compliance levels established in conjunction with DEP/EPA
Gases	27 28 29	Establish an on-site meteorological station for the purpose of collecting data suitable for detailed air dispersion modelling at the plant site, for emission concentration predictions. To conduct detailed dispersion modelling of SO_2, NOx and any other significant emissions using collected meteorological data and final plant design data. The results from the modelling, demonstrating compliance with the relevant standards or guidelines, will be submitted to the DEP when applying for a works approval under the Environmental Protection Act.	To ensure that all reasonable and practicable measures are taken, in Accordance with the Environmental Protection Act 1986, to minimise the discharge of SO_2 (sulphur dioxide) and NO_x (nitric oxide, nitrogen dioxide etc.) gases	Operation of process facilities and infrastructure	DEP	Air quality standards and limits stated in the Kwinana Environmental Protection (Atmospheric) Policy Draft National Environment Protection Measure and Impact Statement for Ambient Air Quality National guidelines for control of emission of air pollutants from new stationary sources, Aust.Env.Council/NHMRC
Greenhouse Gases	30 31	Ensure that equipment and processes used for the project are energy efficient. Measures that will be pursued include: - investigating natural gas as the principle energy source for the project; - a purchasing policy which prefers energy-efficient equipment; - minimising clearing of vegetation; - progressive revegetation; - investigating the use of alternative and renewable energy sources; - energy monitoring and information systems; - energy awareness and waste minimisation training. The proponent will join, the Commonwealth's Greenhouse Challenge Programme prior to commissioning.	To ensure that greenhouse gas emissions meet acceptable standards and requirements of the Environmental Protection Act 1986, using all reasonable and practicable measures to minimise greenhouse gas discharge	Operation of process facilities and infrastructure	DEP	Guidance for the Assessment of Environmental Factors: Minimising Greenhouse Gas Emissions. No.12, Preliminary guidance, EPA 1998
Solid Waste	32 33	Monitor all liquid waste streams and leachates from solid waste storages which have the potential to impact groundwater or surface water quality. Install systems and procedures to ensure containment of any unacceptably contaminated waste stream before its release into the environment.	To ensure that wastes are contained and isolated from groundwater and surface surrounds.	Construction, operation and decommissioning of all project facilities and infrastructure	DME DEP	DEP Code of Practice for Country Landfill Management Guidelines on the Safe Design and Operating Standards for Tailings Storages, DME
Noise	34 35	Manage project-related noise levels within the acceptable limits stated by the Environmental Protection (Noise) Regulations, 1997, and oblige all contractors to comply with this undertaking. Respond to any complaints from the local community regarding project-related noise levels, and rectify them if investigations show them to be unacceptable.	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal, by ensuring that noise levels meet statutory requirements and acceptable standards. The relevant statutory requirements and standards are understood to be those stated in the Environmental Protection (Noise) Regulations, 1997, published by the DEP, and the workforce safety requirements.	Construction and operation, especially during blasting and mining	DME DEP	Environmental Protection (Noise) Regulations, 1997 Part 7 of the Mines Safety and Inspection Act 1995
Public Health and Safety	36	Develop and implement a Hazardous Substances Management Programme (HSMP) and a Hazard and Operability Study (HAZOPS).	Ensure that risk is managed to meet the EPA's criteria for individual fatality risk off-site and the DME's requirements in respect of public safety Ensure that roads are maintained or improved and road traffic managed to meet an adequate standard of level of	Construction and operation of all project facilities and infrastructure	DME MRWA< Shires of	Explosives and Dangerous Goods Act, 1961 Dangerous Goods Regulations, 1992

Environmental Factor	Proponent's Commitments (The No. refers to the Commitment No. stated in the main text of the report)		Objectives(s)	Timing (phase)	Regulatory Agencies	Compliance Criteria Environmental Protection Act, 1986, plus the following:
	No.	Description				
			service and safety and MRWA requirements.		Ravensthorpe and Esperance	
Heritage	37	Undertake awareness training of all the workforce in regard to the significance of Aboriginal and non-indigenous heritage and the identification and requirement to report any such indications.	Ensure that the proposal complies with the requirements of the Aboriginal Heritage Act 1972 Ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area. Comply with statutory requirements in relation to areas of cultural or historical significance.	Construction and operation of all project facilities and infrastructure	Aboriginal Affairs Department Australian Heritage Commission	Aboriginal Heritage Act 1972
Access Road	38	The detailed access road alignment, within the broad outline provided in the CER report (July 1998) and the Response to Public Review report (November 1998), will be prepared in consultation with CALM and the DEP prior to construction of the access road. A detailed flora survey of the route will be carried out as one of the considerations when selecting the alignment.	Protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950.	During selection of road alignment, prior to detailed road design.	CALM DEP	Wildlife Conservation Act 1950

Abbreviations:

CALM	Department of Conservation and Land Management	MRWA	Main Roads, Western Australia
DEP	Department of Environmental Protection	NEPC	National Environment Protection Council
DGLC	design ground level concentration	OU	odour unit
DME	Department of Minerals and Energy	SC	South Coast (Highway)
EMP	Environmental Management Plan	TSF	tailings storage facility
EPA	Environmental Protection Authority	WRC	Water and Rivers Commission
FRNP	Fitzgerald River National Park		

Appendix 4

Proponent's Summary of Predicted Environmental Impacts and their Proposed Management (from Table ES-1 of CER)

TABLE ES-1

SUMMARY OF ENVIRONMENTAL FACTORS AND PROPOSED MANAGEMENT FOR THE RAVENSTHORPE NICKEL PROJECT

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Proposed Environmental Management	Predicted Outcome
Terrestrial Flora	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	All project site is in new growth vegetation or farmland. Mallee shrub and proteaceous thicket dominates slopes of Bandalup Hill, with acacia, grevillea, melaleuca, generally less than 2.5 m tall. Area contains some species that are susceptible to dieback.	Introduction or spread of disease, e.g. dieback.	Develop and implement disease management programme in consultation with CALM, Inc. vehicle inspection and washing procedures, explanation of disease origin and propagation mechanism to all staff as part of induction procedure	Exclusion of disease from, or containment of disease on, project area; no disease has yet been identified
	Protect Declared Rare and Priority Flora, consistent with the provisions of the Wildlife Conservation Act 1950.	Survey found one possible rare species (to be confirmed), two Priority One, one Priority Two, nine Priority Three species of flora. Old growth vegetation occurs west of project.	Possible rare species will remain undisturbed. Priority Flora exist in area to be mined so disturbance will be unavoidable.	Interested parties will be invited to collect seedstock before any vegetation is cleared; identity of possible rare species will be established and, if confirmed, location will be excluded from construction work; on-site environmental staff will be acquainted with classified species in order to identify and protect them during operational phase	Protection of any rare species that are confirmed to be present; minimal disturbance to classified species where practicable
Terrestrial Fauna	Maintain the abundance, species diversity and geographical distribution of terrestrial fauna.	Survey found various native rats, mice, possum, kangaroos, also foxes, many house mice, assorted birds and reptiles. Site is in vegetation corridor which affords migration of fauna between FRNP and Goldfields.	Area to be cleared is about 17% of width of vegetation corridor at its narrowest section Proposed access road from SC Highway will pass through corridor. (Note: corridor function is already impaired by rabbit-proof fence).	Rehabilitate cleared areas when no longer in use; restrict vegetation clearance to essential areas; seal off drill holes; prohibit keeping of firearms and pets; restrict vehicles to designated routes and speed limits; sponsor CALM's Western Shield programme to eradicate non-native feral predators Incorporate features in new access road to facilitate fauna migration (eg. culverts on identified migration routes, fences to exclude fauna from road).	Disturbance to native fauna will be temporary; fauna are expected to adjust to changes in environment, eg. noise
	Protect Specially Protected (Threatened) Fauna, consistent with the provisions of the Wildlife Conservation Act 1950.	Survey found two birds and three mammals classified *vulnerable*. Old growth vegetation serves as base for rare fauna recolonisation of new growth vegetation	None of species is dependent on habitats that will be disturbed. Old growth vegetation will remain intact.	Restrict all development, construction and operational activities to areas of new-growth (ie. post-fire) vegetation, leaving old-growth vegetation intact	No disturbance to old-growth habitat of identified *vulnerable* species; this will encourage recolonisation of existing and rehabilitated new-growth areas
Marine Flora	Maintain the ecological function, abundance, species diversity and geographical distribution of marine flora.	Westernmost, less-frequented and less-sheltered of the two bays that comprise Mason Bay. The bay is exposed to the vigorous wave action of the Southern Ocean. Preliminary inspection revealed no marine flora.	No potential impacts identified.	Seabed at proposed intake and brine outlet pipes will be inspected in detail to establish flora 'baseline' (no flora are anticipated). Water samples will be taken at diffuser of brine outlet pipe during early operation to confirm rapid mixing and confirm dilution of salinity to that of seawater, within immediate vicinity of diffuser.	No impact is foreseen.
	Maintain the abundance, species diversity and geographic distribution of marine fauna.				
Watercourses (addressed along with the factor 'Surface Water Quality' in the CER)	Maintain the integrity, functions and environmental values of watercourses.	Project site is at head of shallow, ephemeral surface drainage system, discontinuous in places, draining eventually into Bandalup, Creek, then Jerdacuttup Creek, finally to saline Jerdacuttup Lakes.	Interruption to surface drainage will be negligible. Potential impacts are lateral seepage from TSF, or rupture of seawater supply pipe or brine return pipeline.	Run-off from areas at risk of contamination will be contained before release to natural watercourses, with monitoring of suspended solids, pH, and hydrocarbon analysis, if suspected or evident. Pipelines and TSF will be built to best engineering practice, with auto shut-down of pumps if pipeline fails (v. unlikely), and seepage detection/recovery system for TSF. Refer to DME regulation of TSF, under 'Groundwater Quality', below.	Negligible change to surface water regime; no impact on existing surface water quality; compliance with WRC policies and WA Water Quality Guidelines
Wetlands	Maintain the integrity, functions and environmental values of lakes.	Saltwater lakes (salinity sometimes greater than that of seawater) have developed as closed coastal lagoons behind shoreline dunes at Southern Ocean, 35km south of project.	This topic was included because the original plan to obtain seawater via coastal borefield posed potential impact of draining wetlands, but borefield plan is now abandoned	None required	Not applicable
Landform (including visual amenity and rehabilitation).	Establish stable, sustainable landform consistent with surroundings.	Mine site is Bandalup Hill, a prominent feature rising to about 40 to 60 m above general surrounding, undulating ground level. Hill is approx. 2.5km long (n-s), 1.5km wide	Pit created by mining Bandalup Hill; TSF and waste rock/ore stockpiles will be large, above-ground features; tall vent stacks will be visible from SC Highway, water supply pipeline along Mason Bay Road.	No unnecessary landform changes or vegetation disturbance. Rehabilitation plan will be prepared at outset, to ensure final backfill and grading of pit, grading of TSF, progressive revegetation, etc. are all consistent with surrounding landform. Pipeline will be buried for entire length from Mason Bay to site, only visible features will be pump stations. DME Rehabilitation Guidelines will be observed.	Some project features will be visible from SC Highway during operations; final rehabilitation will restore natural appearance and self-sustaining ecosystem to all disturbed areas
Groundwater quantity	Maintain the quantity of groundwater so that existing and potential uses, including ecosystem maintenance, are protected.	Scant information available re groundwater quantity. Only abstraction is from isolated wells in shallow, brackish perched aquifers, in low quantities for stock watering. Nearest down-hydraulic-gradient well is some 20 km south of project site.	Groundwater abstraction for construction phase will be from deeper aquifer, so will not impact present shallow aquifer users.	Groundwater abstraction will be permitted by WRC only after comprehensive testing demonstrates no impacts. Surrounding water levels (in purpose-installed observation wells), water quality, abstraction volumes etc. will be monitored monthly and reported annually to WRC to provide ongoing reassurance of no impact.	No impact on other users or ecosystem. May be long-term drawdown of deeper aquifer over project life, followed by recovery after decommissioning.

TABLE ES-1 (continued)

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Proposed Environmental Management	Predicted Outcome
Odour	Odours emanating from the proposed development should not adversely affect the welfare and amenity of other land users.	There is no industry in the region. The only landuse is agricultural, south of project, so no odours exist.	Odours could arise from malfunction of hydrogen sulphide plant, although odour intensity would ensure immediate detection on site and immediate rectification, long before odour disturbs residents (over 5 km away) or SC Highway users. (Process plant designers have extensive experience in design and operation of similar plants elsewhere)	During normal operations, hydrogen sulphide is fully contained within the process facilities. Plant design ensures that, in cases of possible escape, eg. plant start-up and shutdown, gas is directed to permanent flare and combusted. We will seek out world's best practice in detection and control of hydrogen sulphide, and prepare and implement an emergency response plan to address any possibility of malfunction that could result in the release of hydrogen sulphide to the atmosphere. Adherence to Worksafe requirements re workforce environment will ensure minimal odour impacts.	No significant impacts foreseen. Any odour levels will comply with criteria adopted by DEP (it is assumed that Queensland criteria is temporarily applicable)
Particulates/Dust	Ensure that the dust levels generated by the proposal do not adversely impact upon welfare and amenity or cause health problems by meeting statutory requirements and acceptable standards.	Late summer burnoff after harvesting (to kill weeds) creates particulates in smoke. Post-burnoff soil is very dry and loose and prone to blowing by wind into quite dense duststorms	Some dust generation will be inevitable, from blasting, crushing, loading, unloading etc. Dust has potential to impact on workforce health, sensitive vegetation, and residents (but there are none nearby).	Most dust will be from crustal sources and from abrasion, so too coarse to represent health problem. Dust emissions will be controlled by equipping facilities with dust suppression systems where required, by water tanker to haul roads etc. , enforcement of speed restrictions, vegetation of topsoil stockpiles, appropriate design of stockpiles. A dust monitoring program will be established to confirm that off-site dust levels comply with criteria.	Some dust coating of on-site vegetation. No significant off-site impacts foreseen. Dust levels will comply with ambient air quality requirements of NEPC (below) and EPA (Kwinana) Policy.
Gases	Ensure that SO_2 emissions meet the air quality standards and limits stated in the Kwinana EPP and requirements of Section 51 of the Environmental Protection Act 1986 (all reasonable and practicable measures are taken to minimise SO_2 discharge).	None present. NOTE: Air dispersion modelling was undertaken to predict SO_2 and NO_x emissions. Relatively scant meteorological data (esp. wind) meant that (improbable) worst-case conditions had to be assumed. Comet will therefore establish a weather station and data recording system compatible with DEP systems, to facilitate future predictions by air-dispersion modelling.	SO_2 will be emitted by the acid plant, hydrogen sulphide plant, power station (if diesel). It can contribute to acid rain in very dense urban environments. Estimated project emission is 0.5% of Kalgoorlie emissions. Air dispersion modelling for *worst case* climatic conditions demonstrates acceptable concentrations at all downwind sites	Acid Plant specifications stipulate <1.8 kg SO_2 emission per tonne of manufactured acid, which ensures compliance with emission level criteria. Recording of acid manufacture rate will be ongoing and SO_2 ground-level concentrations will be monitored at least quarterly. Total mass emission will be determined at least annually.	SO_2 mass emissions and ground-level concentrations will comply with NEPC requirements, in Draft NEPM and Impact Statement for Air Quality, and with workforce health and safety regulations.
	Ensure that NO_x emissions meet acceptable standards and requirements of Section 51 of the Environmental Protection Act 1986 (all reasonable and practicable measures are taken to minimise NO_x discharge).	None present.	NO_2 will be emitted by the power station and haulage vehicles. It is an irritant if inhaled. It is mainly of concern near major cities where it is a major contributor to photochemical smog (NEPC, 1997). Estimated project emission is 7% of Kwinana emission.	Power station specifications stipulate <1.8 kg NO_x emission per kWh energy generated. NOX emissions will be monitored, and estimated for vehicles, to ensure compliance with t emission level criteria. Comet is actively investigating other energy source options, such as Goldfields Gas pipeline, which represents potential major reduction in NO_x emission.	Prelim. modelling for worst-case (improbable) climate conditions and assumed power station emission and stack height indicated possible exceedance of NEPM criteria. This will be remedied by low-emission design power station and selection of appropriate stack height
Greenhouse gases	Ensure that greenhouse gas emissions meet acceptable standards and requirements of Section 51 of the Environmental Protection Act 1986 (all reasonable and practicable measures are taken to minimise greenhouse gas discharge).	None present (vehicle emissions from light traffic on nearby South Coast Highway are negligible)	Greenhouse gas emissions world-wide are believed to cause global warming. Greenhouse gases (almost all CO_2) will be emitted by the power station, limestone to neutralise acid ($CaCO_3 = CaO + CO_2$), and from diesel used by haulage vehicles. Estimated total emission is about 0.3% of WA emission.	Emissions will be minimised by incorporating energy-use and process efficiencies in plant design, construction, operation. Energy recovered from heat generated by acid plant reduces power station demand (and CO_2 emission) by 23%. Alternative energy source is being investigated (above), purchasing policy favours energy-efficient equipment, progressive revegetation and minimising de-vegetation will help restore CO_2 sink capacity of vegetation. Comet will investigate opportunities for revegetating previously cleared areas (eg. farmland) to boost this sink capacity.	No local impact foreseen. National impact is negligible.
Groundwater quality	Ensure that the beneficial uses of groundwater can be maintained, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA 1993).	Refer to note re shallow groundwater abstraction under Groundwater Quantity, above. Deeper groundwater is saline, recent samples indicated 16,000 to 28,000 mg/L TDS. (Max recommended TDS for stock is 6,000 mg/L).	Main *potential* impact is vertical seepage through floor of TSF, into the saline groundwater. This would not impact users of perched shallow aquifers (isolated from deeper, saline aquifer).	TSF site selection dictated by geotechnical investigation to identify low-permeability ground conditions (up to 8m clay and sandy clay). TSF design incorporates many construction and operational features to minimise seepage and to detect/control any seepage, including regular groundwater sampling and analysis from potential impact zone. TSF design and operation will be regulated by DME guidelines and regular inspection throughout project life.	No impact foreseen. Compliance with WA Water Quality Guidelines is assured.
Surface water quality	Maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993) [and the NHMRC/ARMCANZ Australian Drinking Water Guidelines – National Water Quality Management Strategy].	Scant data available; WRC data indicates chloride ranging from 2,200 to 11,000 mg/L (cf. potable standard of 250 mg/L). Recent samples from Jerdacuttup River exhibited salinity of 14,000 mg/L TDS in main stream and up to 48,000 mg/L TDS in standing pools (cf. typical seawater salinity of 35,000 mg/L TDS)	Main *potential* impact is lateral seepage through embankments of TSF. Other potential impacts are: - spillage of reagents, fuels etc. causing contamination of run-off - rupture of seawater or return brine pipeline causing release of saline water into water courses (already saline, refer to 'Existing Environment')	Refer above re secure design, construction and operation of TSF. All runoff which has the potential to be contaminated will be separated from 'clean' runoff, for containment and assessment before release to natural environment. A surface water quality baseline study will be undertaken and a monitoring programme will be set up, with WRC advice, for routine sampling and analysis. All pipelines will be designed and constructed to best practice. Automatic shutdown of pumps will occur in the event of any abnormality (eg. high or low pipeline pressure, no flow etc.), with additional security provided by telemetry system to report on status of major components of water supply scheme.	No impact foreseen. Compliance with WA Water Quality Guidelines is assured.

TABLE ES-1 (continued)

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Proposed Environmental Management	Predicted Outcome
Solid waste	Wastes should be contained and isolated from groundwater and surface surrounds.	None present	Potential impacts are groundwater contamination by leachate from solid waste dumps and TSF, risk to fauna if trapped in TSF, attraction of vermin by putrescible waste	Rock waste and soil will be stockpiled separately for eventual use as pit infill and topsoil, respectively. Non-hazardous wastes will be disposed of to an on-site landfill designed and operated to DEP Code of Practice. Where practicable, recyclable packaging will be specified for material, equipment delivery. Putrescible waste will be composted or buried promptly to discourage vermin. Oily or hazardous wastes will be stored in accordance with regulations and removed for disposal by a licensed contractor. Burning of refuse will be avoided. Refer 'Groundwater quality' environmental factor re secure design, construction, and operation of TSF.	No impacts are foreseen
Noise	Protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards.	None present (road traffic and agricultural machinery noise levels are occasional and negligible)	Project-generated noise will be continuous low-level (from trucks, machinery etc) and occasional higher-level (blasting). Nearest residences are 5 and 8km away. SC Highway is not classed as noise-sensitive site	A noise monitoring programme will be established, to monitor workforce exposure and environmental noise levels. If necessary, the blasting programme will be regulated to avoid exceedance of airblast levels at noise-sensitive times (night, public holidays etc.). Comet will repond to any concerns expressed over project-related noise levels and rectify them if they are found to be unacceptable.	Compliance with the Environmental Protection (Noise) Regulations and the Mines Safety and Inspection Regulations is assured.
Public health and safety	Ensure that risk is managed to meet the EPA's criteria for individual fatality risk off-site and the DME's requirements in respect of public safety.	Not applicable	Potential impact to public by transporting hazardous goods in illegal manner; by unsafe on-site work practices, potential impact to workforce by unsafe storage and handling on site	DME has confirmed that none of the goods to be transported is unusual or especially hazardous. All potentially hazardous materials likely to be required on site are covered by DME regulations for transport and storage, which will be strictly adhered to. A very detailed and comprehensive HAZOPS (hazards and operability study) will be undertaken before operations commence, to identify all possible hazards in order to eliminate or minimise the associated risks and to ensure implementation of contingency plans.	The project will not introduce any unacceptable risk to members of the public, nor to public or private property, in the vicinity of the site or associated transport routes
	Ensure that roads are maintained or improved and road traffic managed to meet an adequate standard of level of service and safety and MRWA requirements.	Nearby South Coast Highway will be delivery route to site. Present road traffic is extremely light compared with design capacity and traffic use on many other WA highways.	MRWA has advised that proposed loads and frequency of project-related transport do not represent a significant burden on the state roads likely to be used. The Shire of Ravensthorpe is not concerned by the possible increased use of agzetted roads in the project area.	Roads likely to be affected by the project are the responsibility of MRWA regional offices in Albany or Kalgoorlie, or the Shires of Ravensthorpe or Esperance. All four organisations have been consulted and will continue to be consulted regarding proposals for significant increase or new utilisation of roads under their respective jurisdiction.	No impacts are forseeen
Heritage	Ensure that the proposal complies with the requirements of the Aboriginal Heritage Act 1972; Ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area. Comply with statutory requirements in relation to areas of cultural or historical significance.	The site has no aboriginal or non-indigenous heritage significance.	No impacts foreseen, but EMP will accommodate the possibility.	Mandatory induction procedure for all project staff and contractors working at the site will include aboriginal cultural awareness, to enable identification of any sites or artefacts of possible archaeological significance, and to instruct notification of such finding under Section 15 of the Aboriginal Heritage Act (1972).	No impact foreseen

Abbreviations:

CALM	Department of Conservation and Land Management	MRWA	Main Roads, Western Australia
DEP	Department of Environmental Protection	NEPC	National Environment Protection Council
DME	Department of Minerals and Energy	SC	South Coast (Highway)
EMP	Environmental Management Plan	TSF	tailings storage facility
FRNP	Fitzgerald River National Park	WRC	Water and Rivers Commission