Coal mining and power generation, near Mt Lesueur

Report and recommendations of the
Environmental Protection Authority

Environmental Protection Authority
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Contents

Summary

Over the last two years, consideration of options for power supply in Western Australia has led to public debate over the type and extent of new generating plant required. The Environmental Protection Authority has commented on the general energy supply question and attendant issues in a report on the proposed Collie Power Station (Environmental Protection Authority Bulletin 472).

A private power generation option was proposed near Mount Lesueur, in an area previously proposed for nature conservation,as one option to provide this supply. This option was not selected by SECWA on economic grounds, and the proponent has sought suspension of environmental assessment.

Due to the level of public interest in the conservation issue at Mount Lesueur, the Environmental Protection Authority has decided to provide a report to the Minister for the Environment on the implications of coal mining and power generation in the Lesueur area.

Conservation of the Mount Lesueur area

The Environmental Protection Authority makes the following recommendations about conservation in the Mount Lesueur area and the impact of coal mining and power generation there.

Recommendation 1

The Environmental Protection Authority recommends that a national park of Class A status be gazetted in the Mount Lesueur area, to include the vacant crown land to the north and north-east of Mount Lesueur, to boundaries recommended by the Environmental Protection Authority, as indicated on Figure 2 in this report. The Environmental Protection Authority further recommends that the national park be implemented as quickly as possible and that a management plan is prepared and implemented.

In making this recommendation the Authority is aware of the enclave of privately owned land (Crown Grants 1730 and 1433) within the area and recognises that earlier negotiations for a land swap would need to be successfully concluded. The Environmental Protection Authority also notes that Reserve 35593, vested in the Shire of Dandaragan for the purpose of 'Gravel', significantly intrudes into the area. Mitigation of this intrusion by either reducing the area of the gravel reserve or replacing it with another site with proven gravel resources is seen as highly desirable by the Environmental Protection Authority. The Authority recognises that issues of detail will need to be resolved regarding the land swaps above, the western and north-western boundaries, Gravel Reserve 35593 and an assessment of the natural values of an area south-east of the Coorow-Greenhead and Cockleshell Gully Road junction.

Recommendation 2

The Environmental Protection Authority recommends that no open cut mining be allowed within the area recommended as a national park in Recommendation 1 above. Furthermore, the Environmental Protection Authority recommends that no power generation be allowed within, or in a position to impact upon, the area recommended as a national park in Recommendation 1 above.

The Environmental Protection Authority has also considered the general implications of extracting coal and generating power around the Mount Lesueur area. The Authority considers that any future proposals would need to be consistent with the views in this report and in Bulletin 472. Such proposals are only likely to be environmentally acceptable if, after environmental assessment, they are found:

- not to disturb areas of the highest conservation value including that proposed as a national park in this report. Mining on largely cleared, alienated land or underground may be environmentally manageable, as may construction of a power station on such land, however further assessment would be required at the time;

- to be located, operated or controlled in such a way that the effects of air emissions, with a high degree of certainty, will not have unacceptable impacts on the natural or human environment. A power station located on largely cleared, alienated land, with an adequate buffer, a station with suitable design and control parameters or a station with a gas fuel supply may be manageable. The Authority would not recommend in favour of any power station proposal that would result in a measurable impact on the composition of the biota. Consequently the Authority would take a conservative approach to any proposal near a national park until definitive studies showed otherwise. The Environmental Protection Authority may find that the issue of air emission impacts on people may be manageable to acceptable levels, depending on the designated beneficial use of the area. None has specifically been determined for the Jurien region and the presence of farming and conservation areas would require special consideration; and
- to utilise a form of cooling which, with a high degree of certainty, will not have unacceptable impacts on the environment. Groundwater which does not have a significant role in supplying natural areas or other users, seawater or other forms of cooling may be suitable.

Introduction

In 1989 the State Energy Commission of Western Australia called for proposals for the private development of the next power station in Western Australia.

Canning Resources Pty Limited (Canning Resources) and Hill River Power Development Company Pty Ltd (HRPD) jointly proposed the development of a 2.5 million tonne per annum coal mine and a 600 megawatt (MW) power station near Mount Lesueur (the Hill River proposal) about 210 km north of Perth and 25 km north-east of Jurien Bay. Much of the proposal was co-incident with the area shown in Red Book Recommendation 5.17 (the Lesueur area) which the Environmental Protection Authority recommended for A Class reservation as a nature reserve in 1976 (EPA, 1976)(Figure 1).

Upon receiving the proposal the Environmental Protection Authority called for evaluation of the conservation value of the area, the coal resource and the power demand justifying a new power station. Information on power demand has been produced by the State Energy Commission of Western Australia (SECWA, 1989) and the Harman Committee (Harman, 1990). The Authority's views on this aspect are set out in Bulletin 472.

The Department of Conservation and Land Management reported on the conservation, recreation and landscape values of the Lesueur area (CALM, 1990a). The Department of Mines declined to evaluate the coal resource as the coal mining leases had already been granted and hence the State Government procedure in place at that time (known as "Balancing the Scales"), requiring decisions on mining in proposed "A" class reserves, was held, by the Department of Mines, to be inoperative.

The Environmental Protection Authority determined that an assessment of the proposal at Environmental Review and Management Programme (ERMP) level was required. The Federal Department of the Arts, Sport, the Environment, Tourism and Territories (DASETT) called for a Draft Environmental Impact Statement, on the Power Station only, under its provisions dealing with Federal approval of funding by the Foreign Investment Review Board.

A joint document was prepared by the proponents and subjected to a 10 week public review period. As a result, over 540 individually prepared submissions and more than 400 copies of form letters were received. Table 1 groups the issues raised and shows the percentage of submissions which related to each group.

A list of questions summarising the issues raised in public submissions was finalised on 7 September 1990 and responses were received on 30 November 1990. The Environmental Protection Authority has taken these responses into account in preparing this report. The questions and responses comprise over 230 pages of text. They are publicly available at the Environmental Protection Authority and can be provided on request.

During the period when the proponent was responding to issues raised in the submissions, SECWA announced that the Hill River proposal had been dropped from consideration as the next power development in Western Australia. In view of the significant public interest in the protection of conservation values in the Mount Lesueur region, the possibility of future power supply proposals there and the Minister for the Environment's publicly stated expectation of a report, the Authority has prepared this report. The Authority has considered the general question of coal mining and power generation near Mount Lesueur by reviewing the project described in the Environmental Review and Management Programme by Hill River Power Development Company and Canning Resources. Should the Hill River project be re-activated then the Environmental Protection Authority would determine if the new proposal was sufficiently different to require reassessment.

The Environmental Protection Authority has considered the public submissions specifically about the proposal in the ERMP and the proponent's responses to them. The issues raised have then been considered by the Environmental Protection Authority in a general, rather than specific, way commensurate with balancing the environmental importance of the issues with the current status of the proposal. Some letters from Government agencies have been reproduced as Appendices to this report because they raise technical issues which are relevant in a general way to coal mining or power generation using the techniques described in the ERMP. Comments in these Appendices which are specific to the Hill River project as described in the ERMP may not be relevant if the form of the proposal were to change.

The Environmental Protection Authority's report primarily deals with the issue of the potential environmental impact of mining and power generation on conservation values in the area. At the same time the Authority has examined the other major aspects of coal mine and power station development in the area, with a view to indicating what aspects of such development may or may not be of concern and any alternative approaches required to address such concerns.

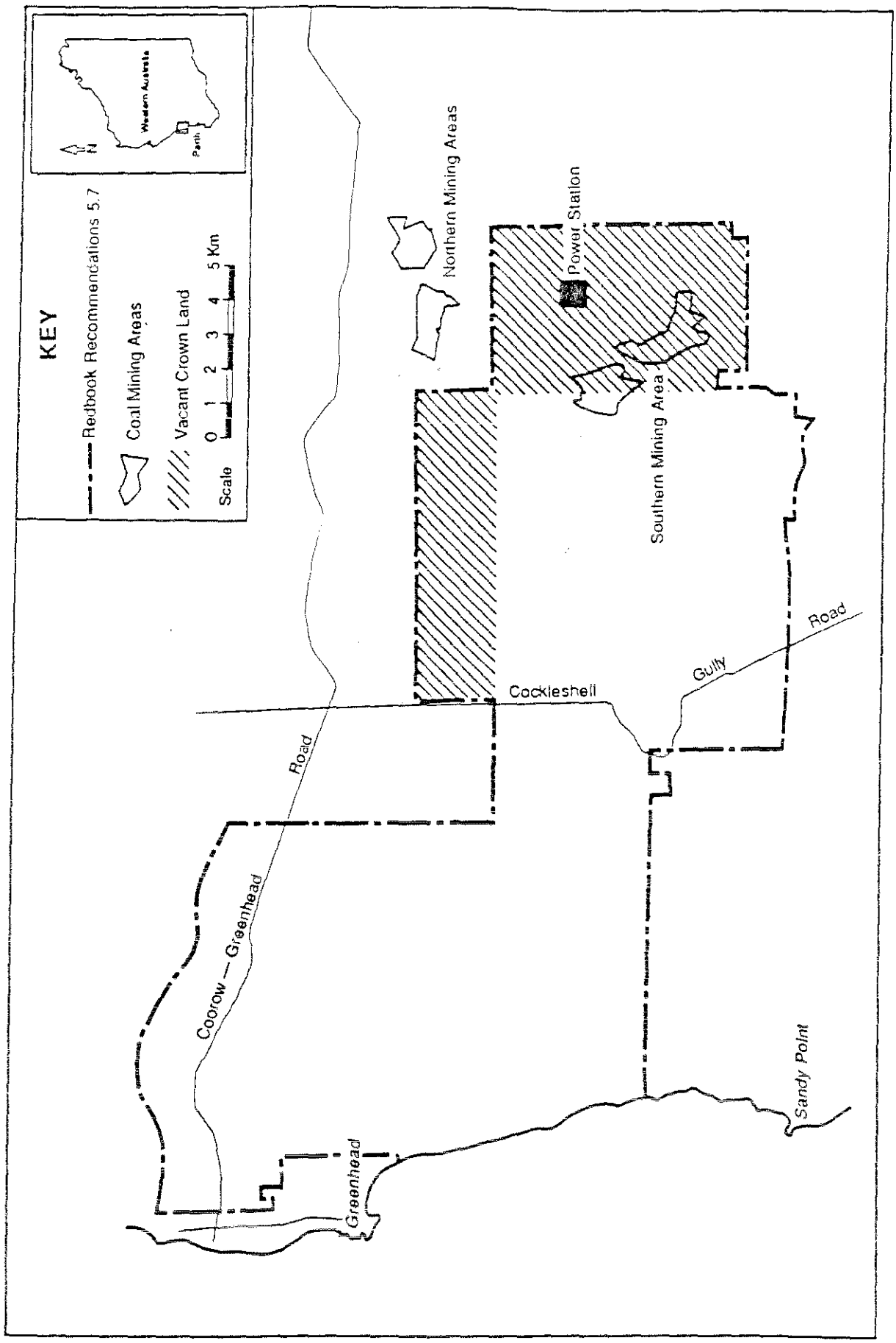

Figure 1 Mt Lesueur area map

Table 1: Groups of issues raised in public submissions on the ERMP

COAL MINE ISSUES	%	POWER STATION ISSUES	%	SOCIAL & ECONOMIC ISSUES	%
Natural value/unique flora and fauna	64	Indirect effects/pollution on surface and groundwater	11	General social and economic issues	7
Destruction of species/natural features/Mt Lesueur	48	Dust/trace elements/flyash	9	Economic value of the mine/power station	1
National park/conservation reserve	51	Atmospheric and chemical emissions	30	Costs associated with the project	2
Dieback	33	Energy conservation/ increased efficiency/consumer education	25	Benefits of the project/other industries	3
Rehabilitation/ revegetation/soil structure/erosion/seed collection	43	Alternative energy sources - renewable and gas	45	Social and economic commitments	1
Breeding refuge for birds/Carnaby's cockatoo/impact on birdlife	12	Groundwater supply/borefield/drawdown/alternative water supply	29	Traffic	1
Impact on gazetted rare species/distinct flora	11	Greenhouse effect/CO_2 emissions	29		
Low grade Lesueur coal/high sulphur content	13	Stage II - doubling the station's capacity	3		
Tourism/recreation	11	Ocean discharge/water treatment	24		
Weeds	5	Siting of the facilities	2		
Inadequate baseline vegetation data	3	Compensation for any adverse effects/ commitments/ monitoring/ decommissioning	4		
Fire	2	Effect of groundwater drawdown on vegetation	5		
Total area of impact/access to project area	4	Effect of SO_2/NO_x on vegetation	6		
Leaving the four open pits/ overburden disposal	4	Clearing associated with the pipeline/ borefield	1		
Toxic overburden/toxic leachates in the overburden dumps/ash disposal	4	Flue gas scrubbing	2		
Visual intrusiveness	6	Ground level concentrations	2		
Aboriginal sites	<1	Moistening of ash with blowdown water	1		

Table 1 continued

COAL MINE ISSUES	%	POWER STATION ISSUES	%	SOCIAL & ECONOMIC ISSUES	%
Dewatering	2	Government's policy to reduce CO_2 by 20%	3		
Dust	4	Visual intrusiveness	6		
Noise/blasting	4	Collie option	17		
Drainage/runoff/ponds	5	Need for power in Western Australia	6		
Commitments/monitoring/ management plan/ decommissioning	3	Privately owned power station	4		
Impact on fauna/ introduction of ferai animals/invertebrates/ aquatic fauna	7	Finance for the power station	<1		
Impact of clearing on bees	<1	Transport of chemicals/auxiliary fuel	<1		
Mining/mine plan	2	Transmission lines	<1		
Siting of the mine facilities/mine construction camp	1	Evaporation ponds/ waste water disposal	<1		

*% = percentage of submissions raising the issue

Conservation of the Mount Lesueur area

Proposals for reservation of land in the Mount Lesueur area originated with Government Botanist Charles Gardner in the 1950s.

In 1962 an Australian Academy of Science sub-committee recommended that the area be declared an A Class reserve for a national park.

In 1974 the Environmental Protection Authority's Conservation Through Reserves Committee took up the concept and recommended the consolidation of existing reserves and vacant Crown land to form a Class A nature reserve. These recommendations and accompanying maps were published in the 'Red Book' (EPA, 1976).The Red Book recommendations were endorsed by State Cabinet on 20 October 1976.

Subsequent action to have the area reserved was resisted due to a desire by some interests to prevent coal resources there from being sterilised. In 1982-83 another attempt to have the area reserved was made by proposing that most of the area be given C Class status and the eastern block of Vacant Crown Land (VCL) excluded to permit access to the coal. This proposal also took account of the need to provide a link to Drover's Cave National Park to the west, by arranging a swap of private for Crown land, and excision of the high recreation value coastal strip west of the planned coastal highway as shown on the Main Roads Department Drawing No 8322-33. Although falling short of the status recommended by the Environmental Protection Authority this proposal was developed as a means of obtaining some form of protection for the area, but was not implemented.

The Environmental Protection Authority has maintained its position on the need for reservation of the area and again endorsed the boundaries proposed in Red Book recommendation 5.17 and Figures 5.0 and 5.7 in a letter to Canning Resources and HRPD in 1990. Submissions received from the National Parks and Nature Conservation Authority and detailed reviews by the Department of

Conservation and Land Management have reconfirmed that the Lesueur area in excess of 27,400 ha, including all of the vacant Crown land, is of the highest conservation value and should be reserved as a national park.

That the area has not been reserved for conservation, despite State Government endorsement, is a reflection of continuing concerns by the Department of Mines and others to maintain access to the coal resources of the area.

The Environmental Protection Authority reiterates its earlier views on conservation of the Mount Lesueur area viz:

- **the whole area of conservation value should be reserved , and**
- **no significant surface or other disturbance which compromises this status would be environmentally acceptable.**

Coal mining

The coal resource is based on four separate deposits (Figure 1). The two northern-most, known as Brazier East and West, lie on private farmland. The western-most deposit is known as the Gairdner block and the southern-most is called Mintaja - Cadda. These last two are located within the area recommended in the Red Book for reservation as shown in Figure 1.

The ERMP describes the development of four open cut mines simultaneously to supply up to 2.5 million tonnes of coal annually for 30 years. Using the stripmining method, these resources would be mined in successive strips with the overburden from the first strip forming a permanent waste dump outside the pit. Successive strips follow the dipping seams of coal downwards, with the waste overburden dumped into the pit created by the previous strip.

Progressively re-shaping and revegetation of waste dumps would follow the return of topsoil from stockpiles or new stripping areas.

Mining of the four deposits and provision for associated facilities would disturb a total of about 1600 ha. Some 700 ha of this could be on the private farmland to the north. If stripmining were used, pits approximately 1.5 to 3 m long by 150 to 500 m wide and up to 125 m deep could remain at the site of each of the last strips. Four, angular waste dumps could cover the balance of the mined area. These flat topped dumps could be as high as the surrounding hills. At the end of the project or at some other time in the future the pits could continue to operate as stripmines or be converted to underground operations, based on the balance of the 460 million tonnes of known resource.

Power generation

The type of power station and associated facilities described in the ERMP would occupy 250 ha within the area proposed for reservation as a conservation reserve (Figure 1).

The ERMP describes the construction and operation of a 600 MW power station comprising two 300 MW turbine generator units.

Facilities required for a power station include:

- a turbine building, control gear switchyard and transmission lines,
- coal supply, crushing, storage and transfer facilities;
- ash handling, storage, transport and disposal facilities;
- water supply, process, treatment and disposal facilities; and
- ancillary facilities such as offices, workshop, stores etc.

Burning coal in a 600 MW power station would produce waste flyash and bottom ash, at an average rate of 1000 tonnes per day.

The flyash disposal technique described in the ERMP is not currently used in Western Australia. It involves dry silo storage followed by the addition of 20% moisture and transport to the mine waste

dumps for disposal. The main technical concern with this form of disposal would be the potential for leachates to escape from uncontained storage. In principle however the concept of returning residues to the point of origin is worthy of close examination, to avoid the need to disturb more ground for a separate storage structure.

Fresh cooling water for the type of power station described in the ERMP could be extracted from deep bores tapping the confined Yarragadee formation. For this type of station about 10,000 megalitres/year of cooling water could be required Lowering of the watertable surface (on which some native vegetation and farm bores depend) by somewhere between zero and 20 m could occur in some areas.

A coal fired power station is expected to emit sulphur dioxide, nitrogen oxides, carbon dioxide and particulates into the atmosphere via a 200m chimney stack. The ERMP describes measures to remove most of the particulates or flyash. No measures for the scrubbing of other gases are described.

The Authority has outlined its position on carbon dioxide emissions and their contribution to the Greenhouse Effect in Bulletin 472.

Due to the conservation value of the area, it would not be acceptable for any emissions from the operation of a coal fired power plant to cause any measurable change to the biota in the proposed conservation reserve.

The ERMP describes the disposal of waste cooling water and treated sewerage effluent by discharge to the ocean via a pipeline at something less than 5 megalitres/day. Such disposal would need to meet the Environmental Protection Authority's requirements to protect the water quality such that the assimilative capacity of the water to accept the discharges is not exceeded. These requirements are based on the Environmental Protection Authority's Bulletin 103, "Water Quality Criteria for Marine and Estuarine Waters of Western Australia" (EPA, 1981).

Existing environment

The attributes of the existing environment have been described in detail by CALM (1990a, 1990b) and in the ERMP.

In summary, the region of the western and southern deposits, which is part of the area proposed for reservation,comprises the sharply dissected uplands and flat topped mesas of the Gairdner Range. The northern deposits are elevated but on more subdued, rolling hills.

Two pits and two dumps, necessitating the disturbance of some 900 ha, would be located within the boundaries of the proposed conservation reserve. In the southern mining area the Mintaja-Cadda pit would be within the headwaters of Coomallo Creek and the more westerly Gairdner pit overlaps the headwaters of Cockleshell Gully and Coomallo Creek.

The Brazier East and West pits, and associated dumps, in the northern mining area lie on alienated farmland which is largely cleared.

The area coincident with that proposed for reservation supports a range of habitats with a diverse flora ranking, with the Stirling Range and the Fitzgerald River National Parks,amongst the highest species richness in the world. The presence of seven species of Declared Rare Flora, species restricted to the proposed conservation reserve and complex mosaics of flora communities which are not conserved elsewhere make the area an important refuge and one of the three most important for flora conservation in southern Western Australia (CALM, 1990a).

A rich fauna also makes the area worthy of conservation. Important ecological relationships, such as that whereby Carnaby's Black Cockatoo feeds on grubs which attack the flowers of the rare Hakea megalosperma (which might otherwise suffer from reduced seed production), are possible due to the range of habitats present. Such relationships, coupled with the unique floral assemblages, mean that the area also has considerable scientific merit.

The limited presence of dieback disease in the region means that the opportunity remains to protect the susceptible flora. At the same time, major earthworks pose a particular control problem since the fungal disease agent persists in moist soil and may be spread during earthmoving operations.

In terms of landscape values, the area encompasses some of the most attractive countryside to be found between Perth and Geraldton. The area attracts a wide range of recreational use and indications are that visitation has increased markedly with recent publicity. Opportunities for interpretation and education are also numerous (CALM, 1990a).

There is presently no industrial development in the vicinity of Mount Lesueur. Consequently, ambient air quality can be regarded as very good.

Environmental issues

The key environmental issues associated with the major components of a coal mine and power station are listed in Table 2.

The Environmental Protection Authority has considered the key issues in Table 2 and determined whether they can be managed, or alternatively result in unacceptable residual impacts. This Table forms the basis of the Authority's conclusions about the likely environmental impacts of coal mining and power generation, in the manner described in the ERMP, near Mount Lesueur.

Table 2: Impacts and conclusions on key issues for a coal mine and power station near Mount Lesueur

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
Coal Mines - Northern Mining Area	• Operating effects on farmland: dust,noise,farm water supply, dieback, runoff	• Could be managed	Could be environmentally acceptable
- Southern Mining Area • Surface disturbance	• Direct disturbance of native ecosystems with high conservation value in proposed conservation reserve	• Direct loss of about 900 ha of habitat and 10 to 50% of populations of rare species	Predicted level of impact not acceptable nor adequately manageable in this environment
• Residual pit	• Size: 1.5 to 3 km by 200 to 500 m by 125 m deep	• Open pit	Pits inconsistent with surroundings in long term
• Residual waste dumps	• Rehabilitation	• Duplication of composition, diversity unlikely	Unproven to standard appropriate to conservation reserve
	• Landscape impacts	• Operating pits and waste dumps inconsistent with conservation reserve landscape • Sense of wilderness lost	Inappropriate scale of landuse in or adjacent to proposed conservation reserve
	• Operating effects (dust,noise etc as above)	• No spillovers to conservation reserve appropriate	Potentially manageable

Table 2 continued

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
Power Station			
- Power Demand	• Need for the power station	• Full consideration of alternatives not available	Demand may be able to be met by alternative means (See Bulletin 472)
- Physical Plant	• Location in proposed conservation reserve. Bitter Pool Rises land unit is not well conserved elsewhere	• Direct loss of about 250 ha of habitat	Not acceptable in poorly conserved habitat
- Cooling water supply	• Allocation by Water Authority of large resource of drinking quality water conditional on sustainability of supply and full examination of alternatives	• Aquifer could be partially mined during operation • Alternatives of seawater, brackish groundwater and water conservation not sufficiently well known	Insufficient detail available to determine if Water Authority conditions met (See Appendix 1)
	• Effect on natural environment	• Drawdown of water table, on which some vegetation depends, by 0 to 20 m possible along Hill and Coomallo Rivers	Any such impacts on conservation reserves located there would be unacceptable
		• Significant increases in silt levels and reductions in flows in surface drainages possible • Impacts on native vegetation not predictable accurately • Impacts on native vegetation around Hill River may be irreversible once detected • No details of alternative supply available if unacceptable impacts occur as a result of groundwater abstraction • Many wells and soaks could be affected	Uncertain effects on conservation reserves and downstream users not acceptable (See Appendix 1)
	• Effects on farm water supplies	• Alternatives could be available	An acceptable guarantee should be possible.

Table 2 continued

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
- Ash Disposal dry return to mine waste dumps	• Location in proposed conservation reserve	• Impacts not determined, untried technology in Western Australia, limited test data available	Sensible concept but waste dumps not acceptable in proposed conservation reserve
	• Security of leachates etc	• Not determined, insufficient data available to determine impact of leachates on quality of groundwater currently of drinking water standard	Unable to assess as acceptable (See Appendix 1) More information required
- Air Emissions	• Effect on people	• SO_2 levels in air predicted for this type of station within accepted standards for Australia but none set for this area	Environmental acceptability depends on beneficial use for the region; none set as yet
	• Effect on crops/livestock	• SO_2 levels in air predicted for this type of station within accepted standards for Australia but effect on soil acidity not rigorously defined	As above Uncertain impact on soil acidity not acceptable (See Appendix 2)
	• Effect on native vegetation	• Sensitivity unknown for many species. Impacts on species composition not known	Uncertain impacts on most species, and on species composition.This uncertainty level not acceptable for proposed reserve with highest conservation value
	• Contribution to Greenhouse Effect	• Could significantly increase Western Australian output.	See Bulletin 472
- Water Discharge to Ocean	• Effect of solutes, principally salts etc on fishing industry	• No harmful effects on marine environment or fisheries likely	Discharge acceptable with appropriate management if criteria met (See Appendix 3)
Social Issues - Population Increase	• Effect on community infrastructure, services and facilities	• Insufficient detail available	Could be made acceptable
- Operational effects	• Impact on groundwater resources	• Effective guarantee appropriate	Could be made acceptable

Table 2 continued

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
	• Nuisance effects due to noise, dust, light, vibration etc	• Commitments to careful monitoring and management required	Could be made acceptable
Wider Issues - Creation of National Park	• Combined conservation, recreation, landscape, and scientific values warrant designation as a national park	• Such status would severely restrict disturbances such as open cut mining	Elevation to national park status now warranted by high level of values and increased public interest in the area

Conclusions

The Environmental Protection Authority considers that the general conclusions which follow are applicable to the type of proposal which is described in the ERMP, or any others like it.

The Environmental Protection Authority has considered the question of the need for the gazettal of a previously proposed conservation reserve near Mount Lesueur. In addition, the question of coal mining and power generation in and near the proposed conservation reserve has also been considered.

Conservation

The Environmental Protection Authority concludes that the whole of the Mount Lesueur area, including the northern and eastern blocks of vacant Crown land (VCL), is of the highest conservation value.The Authority has reached this view based on earlier work conducted as part of the 'Red Book' process, the data presented in the ERMP, the appendices to it and the reviews presented by CALM.

The eastern VCL contains the Bitter Pool Rises land unit, which is not well conserved elsewhere and forms an important supporting landscape to Mount Lesueur and the rest of the Gairdner Range uplands, thus contributing to its high conservation value.

Notwithstanding the intrinsic value of the eastern VCL itself, the Authority concludes that locating large open cut coal mines and a power station complex within or in a position to significantly impact upon the area recommended by the Environmental Protection Authority for conservation would drastically compromise the conservation values of an area of similar importance to the Fitzgerald River and Stirling Range national parks. These values would be compromised by the intrusiveness of operating mines and the permanent pits and waste dumps. No alternative mining method which avoids the areas of conservation value has been identified in the responses to public submissions. Benching of waste dumps as described in the responses would not be visually compatible with the existing smooth sloped hills. Statements in the responses repeatedly emphasise the lack of knowledge about impacts, their management or certainty about rehabilitation success. Such uncertainty is not considered environmentally acceptable in an area of the highest conservation value. As well, the limited data presented in the ERMP or the responses to submissions about the risk of damage to the biota from atmospheric emissions nearby makes such risks environmentally unacceptable in an area of the highest conservation value.

Further to the Authority's earlier conclusions in the 'Red Book' that the area should be set aside as an A class conservation reserve, the Authority now concludes that the recreation, landscape, and scientific values, coupled with the greatly increased level of public interest in the area, warrant its protection by national park status.The Environmental Protection Authority concludes that a national

park of Class A status should be gazetted in the Mount Lesueur area, including the areas of vacant crown land, on boundaries recommended by the Environmental Protection Authority.

The Authority is supported in this conclusion by the National Parks and Nature Conservation Authority (NPNCA) and CALM, which have responsibility for the protection and management of the resources reserved for conservation throughout Western Australia (Appendix 4, 1990b).

Further to the above, the Environmental Protection Authority concludes that a coal mine or power station as described in the ERMP would not be environmentally acceptable within or in a position to significantly impact upon the area recommended by the Environmental Protection Authority for conservation.

Coal mining

The Environmental Protection Authority concludes that the predicted level of impact from coal mining within the proposed national park in terms of loss of habitat, loss of gazetted rare and other plant species, undemonstrated rehabilitation success, inappropriate landforms created by waste dumps and residual pits and the potential to spread and intensify dieback disease is unacceptably great in an area of the highest conservation value. Additional data or commitments presented in the responses to submissions do not mitigate the level of uncertainty significantly.

Groundwater abstraction

The Water Authority of Western Australia have expressed concern about the allocation of a significant resource of drinking quality water to industrial use when insufficient information is available, in their view, on alternatives such as seawater, brackish water from the Cockleshell Gully formation or water conserving cooling technologies (Appendix 1). The Environmental Protection Authority shares this concern.

The Environmental Protection Authority concludes that the uncertainty associated with the effect of abstracting up to 10,000 megalitres/day of groundwater from the Yarragadee formation is sufficiently great that it cannot consider such abstraction to be environmentally acceptable. Specifically the Authority concludes that the effects of abstraction have not been able to be sufficiently well modelled to allow the confident prediction of impacts on native ecosystems. The Authority concludes further that should monitoring detect impacts on ecosystems such as those dependent on ground water in the Hill River then such impacts may be irreversible by the time they are detected. Although a similar level of uncertainty exists about the effects of abstraction on farm water supplies the Authority believes that it should be possible to provide assured supplies from alternative sources while a project is operating. The future recovery of existing farm supplies or the continued assurance of alternatives is less certain once a project finishes.

Power station location

The location of a power station within an area of the highest conservation value which is proposed as a national park is considered unacceptable from the point of view of direct habitat loss, landscape impact and the uncertain effects of air emissions on the composition of unique plant species assemblages in such an area. No alternative locations are proposed in the response to public submissions and no additional data are presented to reduce the level of uncertainty about impacts on native flora within the area proposed for reservation.

While the concept of returning fly ash to the mine waste dump may have merit, the Environmental Protection Authority concludes that the dumping of ash within a proposed national park is unacceptable and that there is insufficient data available on the security of leachates from the ash.

The discharge of around 5 megalitres/day of blowdown water to the ocean could be environmentally acceptable if water quality is maintained and no measurable impact on fisheries occurs.

Social aspects

Major social changes could occur as a result of a significant number of extra people attracted both temporarily and permanently to the area by a project such as that described in the ERMP. The Environmental Protection Authority concludes, on the advice of the Social Impact Unit, that such changes could be managed acceptably provided sufficient commitments to infrastructure, resources, management and monitoring were made. The responses to public submissions indicate that commitments for the provision of infrastructure would be negotiated as part of a State Agreement Act, if environmental approval was forthcoming.

Recommendations

The Environmental Protection Authority subscribes to the view that the Mount Lesueur area is of the highest conservation value. In addition, the Authority concludes that the recreation, landscape, and scientific values, coupled with the greatly increased level of public interest in the area, now warrant its protection by national park status.

Recommendation 1

The Environmental Protection Authority recommends that a national park of Class A status be gazetted in the Mount Lesueur area, to include the vacant crown land to the north and north-east of Mount Lesueur, to boundaries recommended by the Environmental Protection Authority , as indicated on Figure 2 in this report. The Environmental Protection Authority further recommends that the national park be implemented as quickly as possible and that a management plan is prepared and implemented.

In making this recommendation the Authority is aware of the enclave of privately owned land (Crown Grants 1730 and 1433) within the area and recognises that earlier negotiations for a land swap would need to be successfully concluded. The western boundary of the proposed national park has been amended from that originally proposed in the "Red Book". This change recognises that the near coastal eco-types are relatively widespread and well represented in conservation reserves. It also reflects the predominantly recreational, rather than conservation, focus of the natural values of this area and is intended to provide room for future expansion of Greenhead.

In proposing the boundary change the likely requirement for a coastal road between Jurien and Greenhead, as shown on the Main Roads Department Drawing No 8322-33, was recognised. The boundary was determined in liaison with CALM and the Main Roads Department to conform with a conceptual alignment of this road designed to protect the wetlands and dunes of the Quindalup system as well as limit potential problems of reserve management. Closer assessment of the final road alignment would be required before it was constructed.

The Environmental Protection Authority is aware that vacant crown land south-east of the junction of the Coorow - Greenhead and Cockleshell Gully Roads, which is not within the recommended national park boundary in Figure 2, requires an assessment of its natural values and consideration of appropriate vesting. The Authority believes that such consideration could be given to this area at the time that land swaps and other details are resolved to facilitate implementation of the proposed national park.

The Environmental Protection Authority also notes that Reserve 35593, vested in the Shire of Dandaragan for the purpose of 'Gravel', has significant natural values and markedly intrudes into the area proposed as national park. Mitigation of this intrusion by either reducing the area of the gravel reserve or replacing it with another site with proven gravel resources is seen as highly desirable by the Environmental Protection Authority. The Environmental Protection Authority recognises that there are likely to be significant requirements for road base materials in the region as the towns of Jurien and Greenhead grow. Given the sensitive location of current gravel reserves and the limited provision for

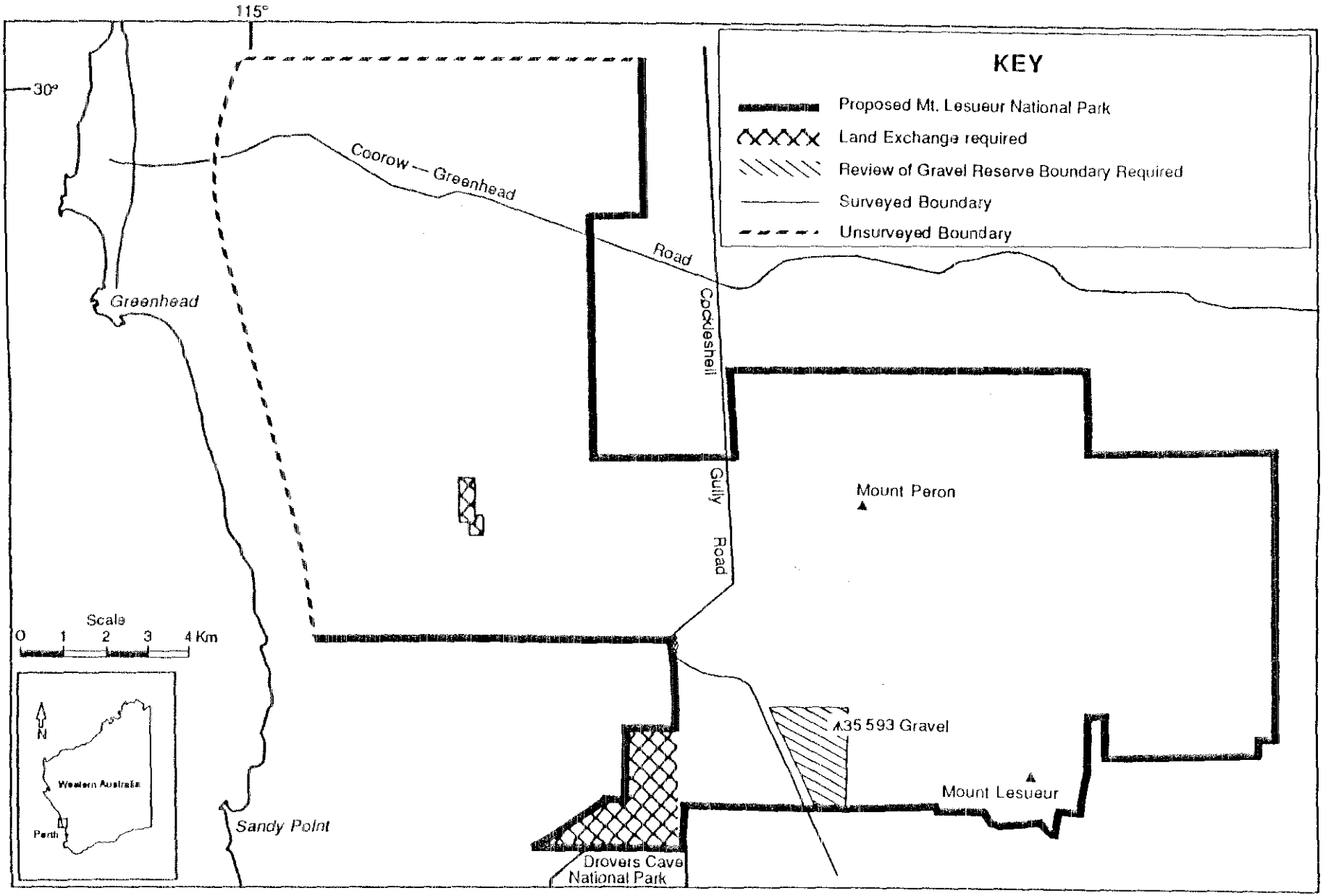

Figure 2 Map of proposed Mt. Lesueur National Park

road base materials elsewhere, the Environmental Protection Authority sees benefit in a comprehensive review of road base resources for the region, to ensure that sufficient supplies can be made available from environmentally acceptable locations. As part of this review the Authority would be prepared to consider the net conservation benefits of a possible exchange of part of the vacant crown land in the Shire of Coorow adjacent to the Coorow - Greenhead and Cockleshell Gully Road intersection, from which the Main Roads Department has previously extracted gravel, for part of Gravel Reserve 35593.

The Environmental Protection Authority believes that no significant surface or other disturbance, which would compromise the natural values of the proposed national park, would be environmentally acceptable.

Recommendation 2

The Environmental Protection Authority recommends that no open cut mining be allowed within the area recommended as a national park in Recommendation 1 above. Furthermore, the Environmental Protection Authority recommends that no power generation be allowed within, or in a position to impact upon, the area recommended as a national park in Recommendation 1 above.

Future alternatives

The Environmental Protection Authority is aware that there may be future proposals for energy developments and power generation north of Perth. Indeed future developments could be envisaged which are consistent with the Authority's views in this report and Bulletin 472.

Accordingly, the Environmental Protection Authority has considered the general implications of extracting coal and generating power in the Jurien region. Future proposals are only likely to be environmentally acceptable if, after appropriate assessment, they are found:

- not to disturb areas of the highest conservation value including that proposed as a national park in this report. Mining on largely cleared, alienated land or underground may be environmentally manageable, as may construction of a power station on such land however further assessment would be required at the time;
- to be located, operated or controlled in such a way that the effects of air emissions, with a high degree of certainty, will not have unacceptable impacts on the natural or human environment. A power station located on largely cleared, alienated land, with an adequate buffer, a station with suitable design and control parameters or a station with a different fuel supply may be manageable. The Authority would not recommend in favour of any power station proposal that would result in a measurable impact on the composition of the biota. Consequently the Authority would take a conservative approach to any proposal near a national park until definitive studies showed otherwise. The Environmental Protection Authority may find that the issue of air emission impacts on people may be manageable to acceptable levels, depending on the designated beneficial use of the area. None has specifically been determined for the Jurien region and the presence of farming and conservation areas would require special consideration; and
- to utilise a form of cooling which will, with a high degree of certainty, not have unacceptable impacts on the environment. Groundwater which does not have a significant role in supplying natural areas or other users, seawater or other forms of cooling may be suitable.

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Appendix 1

Letter from the Water Authority of Western Australia

Your Ref
Our Ref R0355
Enquiries Jeff Waddington
Tele Direct (096) 224 833

629 NEWCASTLE STREET
LEEDERVILLE W.A.
Postal Address: P.O. Box 100 Leederville
Western Australia 6007
Telephone: (09) 420 2420 Telex: AA 95140
Facsimile: (09) 328 2619

The Chairman
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Attention: Mr Warren Tacey

THE HILL RIVER PROJECT

COMMENTS ON THE ENVIRONMENTAL REVIEW & MANAGEMENT PROGRAMME/DRAFT ENVIRONMENTAL IMPACT STATEMENT

The Hill River Project, comprised of a proposed open cut coal mine and 600 MW coal-fired power station located 210 km north of Perth and 28 km northeast of Jurien Bay, has the potential for significant impacts in areas for which the Water Authority of Western Australia has the responsibility for management. These areas consist of Water Resources Management which the Water Authority carries out under the Rights in Water and Irrigation Act 1914, and Pollution Control activities delegated to the Water Authority from the Environmental Protection Authority, and carried out under the Environmental Protection Act 1986.

WATER RESOURCES MANAGEMENT - GROUNDWATER

The Board of Management of the Water Authority conditionally approved in principle, the abstraction of up to 10 mill.cu.m of water annually for a period of 30 years for the proposed power station.
This approval was subject to:

(a) environmental acceptability of the project and its groundwater abstractions;

(b) clarification of the State's support for the project;

(c) satisfactory demonstration that:

  (i) water is available on a sustainable use basis;

  (ii) alternative sources are not feasible; and

  (iii) advanced technology for water conservation is to be employed by the project;

(d) an investigation into the application of appropriate licence and user fees.

Depending on the capacity and height of these dams, they may be classified as "Referable Dams" and therefore be subject to Dam Licensing.

(c) Recovery Planning. The section 5.8 of the ERMP dealing with Water Management does not address any recovery options in the event of failure of sedimentation dams, sumps, earth bunds etc. No indication of the nature of the "remedial action" to be taken "if, and when, required" in section 6.5.1 is provided.

POLLUTION CONTROL - WATER

A number of concerns exist relating to the lining of ponds, fly ash disposal, sewage disposal and the discharge water pipeline. These are addressed in detail in the report attached (Appendix C) from the Pollution Control Section of the Headworks & Treatment Branch of the Water Authority.

CONCLUSION

The Water Authority of Western Australia is of the opinion that as a number of issues as detailed in this document and its appendices have not been adequately addressed by the proponents in the Environmental Review and Management Programme/Draft Environmental Impact Statement, the project cannot be supported at this time. Further consideration of the matters raised is required in order to permit an adequate assessment of the potential impacts of the Hill River Project.

While the allocation of water can be dealt with by the Water Authority under it's own legislative powers, the Authority strongly believes that environmental approval should not be given unless all of the issues related to water allocation are satisfied. In view of the potential environmental impact of proposed abstraction, it is appropriate that water allocation approval be subject to environmental approval, rather than the reverse.

B.S. SADLER
DIRECTOR WATER RESOURCES

July 30, 1990

HILL RIVER POWER STATION

GROUNDWATER BRANCH COMMENTS 17TH JULY 1990

1. BACKGROUND

The Hill River Power Development Company is proposing to construct and operate a 600 MW power station 28 km northeast of Jurien Bay, near Mt. Lesueur, which will be fuelled by sub-bituminous coal from nearby open cut pits. The proponent proposes to abstract large volumes of groundwater during the 30 year project life. The total anticipated groundwater consumption is estimated to be 300 mill.cu.m, of which approximately 70% will be consumed by evaporation in the cooling circuit.

The project is located within the Arrowsmith and Jurien Groundwater Areas and any groundwater abstractions are therefore subject to licensing by the Water Authority.

The proponent plans to draw water from the nearby Yarragadee Formation aquifer at an average rate of 27,000 cu.m/day, with a maximum daily abstraction of around 44,000 cu.m/day. The preferred wellfield development area is located a few kilometres east of the proposed plant site and will extend approximately 30 km north-south, with the southern limit lying approximately 5 km south of Hill River. The conceptual wellfield comprises 19 wells which will draw water from depths of 170-400m.

Prior to the completion of the ERMP the Board of the Water Authority, at a meeting on 9 November 1990, considered the proposal of using the Yarragadee Formation as water supply. The Board approved in principle, the allocation of the Yarragadee groundwater resource to the project for a 30 year period subject to:

- Environmental acceptability of the project, its groundwater abstractions and disposal of effluent.
- Clarification of the State's support for the project.
- Satisfactory demonstration that:
  - Water is available on a sustainable use basis.
  - Alternative water sources are not feasible.
  - Advanced technology for water conservation is to be employed by the project.
- Application of appropriate licence and user fees is investigated.

2. WATER SUPPLY SOURCE

2.1 Sea Water

The proponents have examined the possibility of using a seawater cooling system for both an inland and coastal station site. For the inland site, it is claimed that evaporative cooling would present environmental problems in the form of salt deposition on the surrounding countryside as a result of drift processes. Furthermore, it is claimed that failure of the saline supply and hypersaline discharge pipelines would have severe environmental consequences. Once-through seawater cooling at the inland site, on the other hand would require too much power to maintain the circuit, in the order of 10% of power station output, and is therefore not viable on economic grounds.

It appears likely that the large volumes of seawater required for cooling would be expensive in terms of pipe construction and/or power costs depending on the recycling scenarios.

The alternative of locating the power station on the coast has been dismissed by the proponent on the basis of both environmental and economic grounds. Although once-through cooling at a coastal site would be more economic than the proposed groundwater evaporative cooling system, it is claimed that the costs of coal transport to the coast, disposal of ash and associated environmental protection strategies would greatly increase the cost of the project. It is also concluded that a coastal site would present environmental problems.

The Water Authority considers that the proponent has not examined the possibilities and implications of a coastal site, using once-through cooling, in sufficient detail to justify rejection of this option. The Water Authority considers that the coastal site, with seawater cooling would provide an environmental credit as follows:

- Preservation of the potable groundwater resources.
- There would be no impact on private groundwater supplies.
- There would be no impact on springs or phreatophytic vegetation.
- There would be less construction and infrastructure at the coal mine, and therefore environmental impacts at the minesite would be minimised. In addition, the environmental impacts of proposed wellfield construction would be obviated. These impacts would need to be compared to the environmental impacts of locating the power station at the coast.

The Water Authority is of the opinion that the relevant matters required to be addressed by the proponents, in particular conditions (c) (ii) and (c) (iii), have not been adequately presented in the Environmental Review and Management Programme. This is discussed more fully in the report fro the Groundwater Branch of the Water Authority attached as Appendix A.

Possible impact on existing users of the groundwater resource is of concern to the Water Authority, however this matter can be adequately addressed through the application of appropriate licence conditions on an groundwater abstraction licence issued to the proponents. These conditions will relate to both water quality and quantity.

In the event of an Agreement Act being proclaimed, the Water Authority would seek to ensure the agreement was subject to the provisions of the Rights in Water and Irrigation Act 1914.

The proponents have indicated in a letter to landholders dated March 23, 1990, (see Appendix B) and in the ERMP (page 8-22), a commitment to compensate those other users of the resource where their water supplies have been adversely affected by the proposed power station wellfield abstraction.

WATER RESOURCES MANAGEMENT - SURFACE WATER

The project is seen as having the potential to significantly impact upon surface drainage through both the Coomallo Creek and Cockleshell Gully drainage systems.

The management strategies detailed in sections 6.5.1 and 6.5.2 of the ERMP (pages 6-9 and 6-10) are inadequate to satisfactorily address the impact the project may have on these catchments. The following matters need to be addressed:

(a) Sediment transport. Due to the extent of the disturbance of the natural land surface, the potential for erosion and sediment runoff is significant. The proponent should provide details of the methodology and proposed programme for monitoring the sediment runoff from the area of the minesite and power station. Baseline data should be collected prior to the commencement of the mining operation in order that the effect of mining may be adequately quantified.

It should be emphasised that water sampling alone is of little value for the monitoring of sediment outflow from the minesite.

(b) Interruption of Coomallo Creek flows. The Project Detail plan (Figure 7.4 in the ERMP) indicates that a number of dams will be constructed on the headwaters of Coomallo Creek.

Coomallo Creek is a tributary of the Hill River system which has been proclaimed under the provisions of the Rights in Water and Irrigation Act 1914 and has other users of these surface waters at points downstream. It is considered necessary for some assessment of the proportion of the flow of Coomallo Creek that is derived from that portion of the catchment above these dams, and of the impact that these dams will have on the total flow in Coomallo Creek. Again, any Agreement Act proclaimed for this project should be subject to the Rights in Water and Irrigation Act 1914.

2.2 Groundwater

The proponent has briefly examined the potential of drawing cooling water from aquifers other than the mid-level Yarragadee but only in the form of a desk study. The ERMP does not contain sufficient detail to enable an assessment of the adequacy of this desk study. Considerable drilling and testing of the preferred wellfield site has been undertaken to the exclusion of other possibilities.

The proponent has failed to evaluate the neighbouring Cockleshell Gully Formation resource, which has a large storage of brackish water. Use of this resource would conserve the more valuable Yarragadee resource which is largely potable. While it is expected that use of brackish water would be more expensive than fresh water, the Water Authority believes the proponent should clearly demonstrate the feasibility or otherwise of all water source options.

The proponent has not carried out detailed evaluation of the deep Yarragadee Formation. The thickness of the Yarragadee resource has not been defined but GSWA drilling has confirmed the aquifer extends to at least 800m in the area. Abstraction from levels deeper than those proposed could reduce impacts on the surface water environment, but this option has only been considered by the proponent as a contingency measure.

3.0 GROUNDWATER INVESTIGATIONS AND MODELLING

The proponent has engaged A.G.Consulting (AGC) to investigate and evaluate the groundwater supply aspects of the project. AGC has conducted a programme of drilling, testing and hydraulic analysis of the resource which includes the completion of 5 test production wells, five shallow level observation wells and 18 multi-piezometers.

Data derived from the investigative work was then used to develop an uncalibrated 3D groundwater model to simulate extended pumping of the aquifer and determine likely potentiometric drawdowns in the deeper level Yarragadee aquifers and likely impacts on the water table. Modelling predicts that drawdown of the potentiometric level may be up to 50m to 90m in places and in general drawdowns of >10m may be experienced over an area of approximately 450 sq. km. It is stated in the ERMP that the water table will remain essentially unaffected yet it is also stated that water table drawdowns may range from zero to as much as 20m.

Uncertainties arise because of the likely impact of regional hydraulic continuity effects which usually occur over long time scales. The nature of the Yarragadee Formation, which is variable lithologically in both the lateral and vertical sense, and is likely to be partially compartmentalised internally by faulting, makes reliable computer simulations of water table drawdown difficult if not impossible. The situation is complicated further by the fact the the strata are likely to be dipping. The modelling has attempted to simulate vertical anisotropy but has not attempted to simulate lateral anisotropy, faulting or strata dip. Accordingly estimates of water table drawdown using this approach must be viewed with caution.

In addition, model predictions have been based on limited pump test data and the extrapolation of this data to make long term predictions of head changes requires considerable caution. Uncertainties in the model are further compounded by the fact that at no stage have the shallow level sediments (<50m) in the Hill River and Coomallo Creek areas been confirmed as either Yarragadee Formation or more recent alluvial deposits. This is significant because all testing of vertical hydraulic conductivity was conducted in the Hill River area and the results were subsequently extrapolated over the entire model. This extrapolation would clearly be invalid if the shallow sediments are in fact alluvial.

4. EFFICIENCY OF WATER USE

The proponents have examined three water cooling options:

- Evaporative cooling using groundwater or seawater.
- Once-through cooling using seawater.
- Dry (air) cooling and partial dry cooling.

Evaporative cooling using groundwater was chosen as the only economic option.

The dry cooling option is claimed to use approximately 20% of the water required by full evaporative cooling, although no detailed costs have been presented in the ERMP. The dry or partial cooling options are preferred by the Water Authority, rather than full evaporative cooling, because of the reduced demand on the groundwater resource. These options may prove to be economic if the full economic and social costs of aquifer drawdown are included in the calculations. At this stage the full environmental, economic and social costs of aquifer drawdown have not been adequately assessed.

The Water Authority considers that the proponent has not explored advanced technology for water conservation in sufficient detail. The Water Authority recommends that the all cooling options be examined by experts in process technology to ensure an informed opinion on water conservation technology is obtained.

5. SUSTAINABILITY OF SUPPLY

The preferred option of a Yarragadee water supply source, in combination with evaporative cooling, will consume 300 mill.cu.m of groundwater during the project life. The proponent presents the case that this volume constitutes only 0.3% of the total available resources within 30 km radius of the plant site. This statement is misleading when considering the issue of sustainability of supply. A groundwater supply is regarded as sustainable when the aquifer achieves an equilibrium such that the abstraction can continue indefinitely without causing unacceptable degradation of the aquifer or environments reliant on the aquifer.

The Water Authority considers that the aquifer will be partially mined during the early stages of wellfield abstraction but will reach equilibrium during the life of the project. The drawdown cone produced by the wellfield will expand until the area of influence is large enough to command sufficient recharge to satisfy abstraction. While aquifer depletion as predicted is acceptable with respect to groundwater resource management, the impacts on the environment relying on the aquifer may be unacceptable.

6. BENEFICIAL USE OF RESOURCE

The Yarragadee Formation aquifers constitute a large resource of essentially potable water. If the resource is used by the proponent it will be committed for 30 years and will take a considerable period (up to 20 years) to recover to original conditions. While substantial recovery will be rapid and probably occur within 2 to 3 years after pumping ceases, recovery of aquifer pressure sufficient to feed springs will occur gradually over a longer period.

Existing use of the resource includes farm, stock and domestic supplies and limited market garden supplies. Potential future uses could include market gardening, wildflower farming and citrus cultivation. These industries are moving northwards from the established growing areas near Perth and with recent concern about the impact of horticulture in the Gingin Groundwater Area expansion into the Arrowsmith and Jurien Groundwater Areas could accelerate.

The Water Authority accepts that economically, in terms of product value per unit volume of water consumed, power generation is of much greater value than for horticultural or most other conceivable uses in the area. However, this should not preclude the assessment of lower quality resources such as the Cockleshell Gully resource or seawater, as other lower value uses (ie horticulture or public water supply) often do not have the option of using poorer quality water.

7. ENVIRONMENTAL AND SOCIAL IMPACTS

Drawdowns in the deeper level Yarragadee aquifers and the shallow water table aquifers, resulting from extended pumping of the proposed wellfield, will have social, economic and environmental impacts. It is likely that many farm wells will be effected as well as some springs and soaks, including Hill River Spring. Most vegetation in the region is xerophytic and will be unaffected by lowering of the water table, however it is probable that vegetation in the Coomallo Creek and Hill River valleys will be affected.

The proponent makes the commitment to compensate or replace any farm wells which fail as result of pumping but does not make any commitment with respect to maintenance of the Hill River and Coomallo Creek environments.

There is a broad commitment to monitor the anticipated area of depressurization and rectify any detrimental trends before any damage occurs in the surface environment, which would involve redistributing abstraction within the wellfield and if necessary testing and developing alternative sources.

It is conceivable that the water table could decline too rapidly in the Coomallo Creek and Hill River areas to allow sufficient time for evaluation of alternative resources. The Water Authority considers that alternative sources and contingency plans need to be more thoroughly evaluated before the project is approved.

8. CONCLUSIONS

While the Board of the Water Authority has conditionally approved in principle, the allocation of groundwater from the Yarragadee Formation to the project, it is considered that the proponent has not met the conditions of that approval. Therefore, at this stage, the Water Authority does not support the proposal as detailed in the ERMP.

After reviewing the ERMP and associated documents the Water Authority has a number of concerns which are summarised below:

- The proponent has not satisfactorily examined the possibility of siting the power station at the coast, in conjunction with once-through seawater cooling.

- The proponent has failed to sufficiently evaluate the neighbouring brackish water supply resource of the Cockleshell Gully Formation or other alternatives.

- The proponent has not explored water conservation technology options in sufficient detail.

- The proponent has not carried out detailed evaluation of the deep Yarragadee resource (500-800m). It is expected that pumping from these depths would result in much lower impacts at the water table than those expected for the proposed wellfield.

- The proponent's predictions of water table drawdowns must be viewed with caution and if significant drawdowns were to occur in the early stages of the project, contingency plans as outlined in the ERMP could be inadequate.

While the allocation of water can be dealt with by the Water Authority under it's own legislative powers, the Authority strongly believes that environmental approval should not be given unless all of the issues related to water allocation are satisfied. In view of the potential environmental impact of proposed abstraction, it is appropriate that water allocation approval be subject to environmental approval, rather than the reverse.

Hill River Power Development Company Pty. Ltd.
(Incorporated in Western Australia)
A CRA/Barrack House Group Venture

23 March 1990

Dear Landholder,

The Hill River Power Development Company Pty. Ltd. and Canning Resources Pty. Ltd. have recently submitted an Environmental Review and Management Programme (ERMP) to the Environmental Protection Authority (EPA) of Western Australia, for the Hill River Project.

The Project incorporates a proposed coal mine and coal-fired power station to be located some 28 km north east of Jurien, south of the Coorow-Greenhead Road. Following a period of review by the EPA, the Project ERMP will be available for public scrutiny and review.

The Hill River Power Development Company Pty. Ltd. (HRPDC) is a joint venture company owned by CRA Limited and Barrack Power Development Pty. Ltd. Canning Resources is a Business Unit of CRA and will be responsible for the development of the coal resource. The HRPDC will be responsible for the construction of the power station.

The purpose of this letter is to notify you of the proposed development of a borefield to supply the planned Hill River power station and to let you know that the HRPDC will unconditionally guarantee your existing water supplies in the event that they are adversely affected by the borefield's operation.

The power station is designed to employ an evaporative cooling system to reject heat from the turbine generators and condensers. The power station will use an average daily water volume of 24.5 Megalitres (out of an average total Project daily requirement of 27 Ml.), the majority of the water being consumed by the cooling system. It is proposed that the water be abstracted from a borefield adjacent to the Project site. The borefield would comprise 19 bores, each bore spaced a minimum of 2 kms apart and having an average depth of approximately 300m. The borefield's operation and impacts will be detailed in the ERMP.

A conceptual borefield layout map is attached. At this stage, we can only show possible production bore locations. The final sites of production bores depends on gaining approval for the Project, obtaining a groundwater abstraction licence from the Water Authority of W A and reaching agreement with private landholders on access to land required for the borefield. At each production bore site, it may be necessary to provide a cleared area of up to 50 metres by 50 metres during bore construction and to retain a permanently cleared 10m x 10m fenced compound to house the bore. Each of the sites will be connected by an access easement, approximately 10 metres wide, containing a vehicle track, pipeline and powerline.

It is expected that legal tenure of the bore sites will be a condition of any abstraction licence. It is also expected that the easements will need to be secured by purchase or lease.

A survey of bores and soaks within the possible influence of the proposed borefield has been undertaken and it indicates that they generally tap shallower aquifers than the deep aquifers within the Yarragadee Formation, which would be the source of water supply for the power station. It is considered that abstraction from the power station borefield would have little or no adverse affect upon the majority, if not all, the bores and soaks in the area, including those bores that go deeper than most and into the aquifers of the Yarragadee Formation. This is particularly the case for farm water supplies located west of the Warradarge fault, which generally acts as a hydraulic barrier. (The approximate position of the fault is traced on the conceptual borefield layout map).

You have been identified as the owner of a property upon which a bore(s) and/or soak(s) are already known to be or are presumed to be located. Please refer to the attached regional bore census map and the accompanying list which identifies the Location on which each of the 98 bores revealed by the bore census carried out in 1989 are situated. We acknowledge that there may well be existing bores which are not shown on the map. If so, please let us know.

Notwithstanding our comments above, should you be of the opinion that at any time during the proposed 30 year life of the power station, that the power station borefield is having an adverse impact upon your own water supply abstraction, HRPDC will appreciate your early advice.

In order to put yourselves in a position to determine whether your bore/soak has been adversely affected by the power station borefield, we strongly suggest that.

a) You contact your local regional office of the Water Authority of W.A. to have bores licensed;

b) You notify us as soon as possible of the capabilities, dimensions and volume of water abstracted from your present bores or other water supply points.

Provided that the reduction in water supply from your own bore(s) and/or soaks(s) is the result of abstraction from the power station borefield then HRPDC unconditionally undertakes to:

i) Extend your existing bore(s) to provide no less than the volume of water previously extracted.

OR

ii) Develop an alternative bore, on your property, to provide no less than the volume of water previously abstracted from your own bore.

OR

iii) Provide a similar volume of water from the power station reticulation system to your point of usage;

OR

iv) Negotiate a compensation agreement to the joint satisfaction of you and HRPDC.

You should be aware that if the power station borefield is given approval, a major condition of the abstraction licence will be to operate an extensive monitoring network to determine the impacts, if any, of the borefield's operation. Already, there are 45 regional bores being monitored to ensure that an adequate monitoring data base is in place well in advance.

Should you wish to discuss this letter further and our undertaking please contact:

Chris Schrape
CRA Business Development WA
(09) 481 2522

Yours Sincerely

N W Ford
General Manager
Hill River Power Development Company Pty Ltd

CC: Shire Clerk
Dandaragan

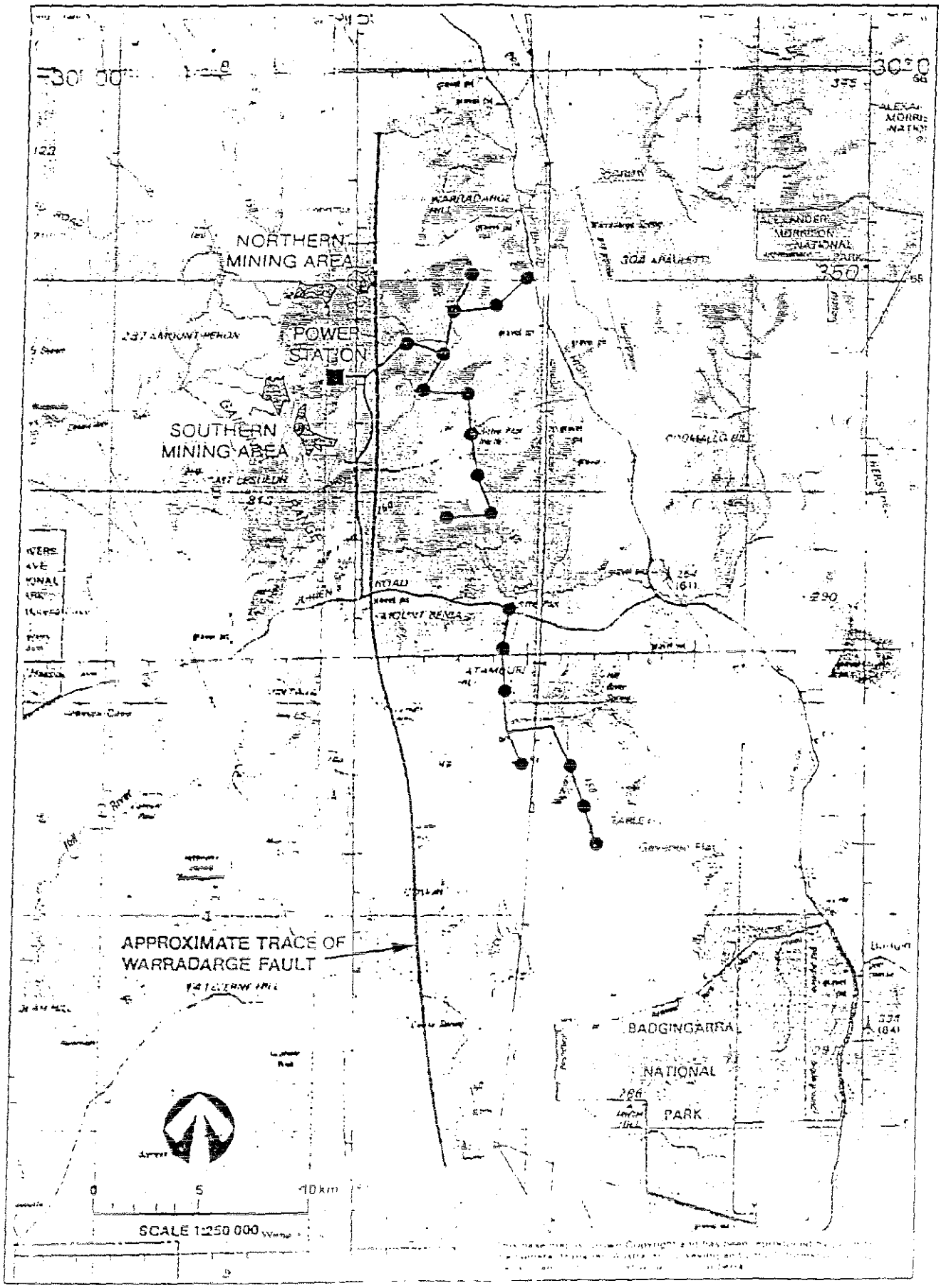
Shire Clerk
Coorow

089/cjs

REGIONAL BORE CENSUS LOCATION LIST

Bore No.	Location
1,2,3	3744
4,5	3743
6,7	3742
8	3737
9,10,11	3738
12	3737
13	2833
14,15,16,17,18	3002, 3779
19	3797
20	10173
21	10176
22,25	10175
23,24	10174
26,28	10173
27	3740
29	3438, 9743
30	2833
31,32	946, 947
33	7499, 10157
34,35,36	3704
37	3704
38,39,40,41	10303
42	10177
43	6937
44	10379
45,46,47,48	10150, 10303
49,50	3741
51	6993
52,53,54	10168
55,56	10828
57,58	10827
59	10823
60,61	10829
62	11090
63,64	10170
65	3737
66	10176
67	3710
68	3878
69,70	3747
71	3757
72	3753
73	1220, 3879
74, 75, 77	3850
76	10825, 10826
78	3728
79	10805

Bore No.	Location
80	10810
81	10808
82	10806
83,84	10808, 10809
85	10368
86	10256
87	10257
88	10825
89	10804
90	10812
91	10812, 10813
92	10840
93	10839, 10840
94	10811
95	10804
96,97	10838
98	10815



CONCEPTUAL BOREFIELD LAYOUT

HEADWORKS & TREATMENT BRANCH
POLLUTION CONTROL SECTION COMMENTS 18TH JULY 1990

ERMP AND EIS FOR PROPOSED HILL RIVER OPEN CUT COAL MINE AND POWER STATION

The Pollution Control Section has reviewed the documentation for the above development in regard to the water pollution control aspects and forwards the following comments for inclusion in the Authority's consolidated reply to the Environmental Protection Authority:

1. Evaporation Pond

The report visualises that this pond will contain numerous waste effluent streams and it is proposed that the pond will be suitably lined, possibly with clay. Before the Water Authority could comment on the suitability of such a clay liner, the proponent should be required to provide additional information as to the quality of the effluent that is to be contained within this pond.

The continued evaporative operation of this pond during the life of the power station will cause substantial concentration of contained solids which will make it essential that its design ensures its practical impermeability. In the event that the proponent cannot assure the Water Authority of the ponds lining impermeability, the Authority would require a liner similar to the plant water storage pond, vis. a synthetic liner. If the proponent has found it necessary to line the plant water storage pond with HDPE presumably on the basis of a clay lining not being sufficiently secure, then it would be incongruous to assume that clay would provide sufficient sealing of an effluent storage pond.

The proponent has made no commitment to carry out any monitoring of this pond. A monitoring programme to assess the impact of the operation of this pond should certainly be a condition of any approval to proceed with this development.

The rehabilitation program for this pond proposes its drying out, capping, and revegetation. To prevent long term leaching from this pond upon abandonment, the evaporated solids from the pond should be removed off-site to a suitably approved site which poses minimal threat to groundwater quality.

2. Emergency Ash Pond

It is proposed that this pond be clay lined. We raise grave concerns about the practicality of maintaining a (non-cracking) clay seal for what would be only a contingency facility. Before any approval could be given for this type of liner being used in this facility, the proponent would be required to develop a satisfactory maintenance programme that would ensure the integrity of the clay seal ready for immediate use, after extended periods of stand-by duty.

Similarly to the evaporation pond, the proponent has made no commitment to any form of monitoring of the impact of the operation of this pond, which should be a requirement of any approval given to this project, if ash is to remain in the facility for any extended period.

3. Fly Ash Disposal

A system of flyash disposal is proposed based on distribution of the waste in isolated consolidated pockets within the overburden dumps. This proposal is based on the premise that by distributing the flyash over a large area, the threat to groundwater quality is less than that normally posed by concentrating the flyash in a single dedicated disposal containment.

The regional groundwater is of potable quality and Water Authority policy calls for protection and maintenance of this quality. The proponent has, by in part assuming that drinking water criteria have an inbuilt safety factor of x 100, claimed that this disposal methodology will not render the receiving aquifer non-potable. Although such criteria have safety factors built into them, the level of that factor varies considerably with

each contaminant. Of special local concern are the drinking water criteria for both total dissolved solids and sulphate concentrations. Before any further consideration or approval could be given for the proponents flyash disposal methodology, we will require additional information regarding the actual impact of leachates on the receiving groundwater body. This should include modelling data which demonstrates that both vertical and horizontal diffusion of leachates maintains current drinking water criteria within the receiving water body for not only metal contaminants, but also for total dissolved solids and sulphates.

Further the proponent has made no undertaking to carry out monitoring of the effects on groundwater of their proposed flyash disposal system, which would be a condition of any approval for the proposal.

4. Effluent Pipeline

Although the report's comment on the operation and management of the ocean disposal pipeline between the power station and the ocean is considered satisfactory, the effect of a burst discharging up to 1 ML into the environment is unacceptable. The proposal should be re-addressed to reduce the threat of a large scale discharge resulting from a burst pipeline.

5. Domestic Sewage Disposal

The proponents should be requested to detail the type of treatment, vis. biological package plant or a treatment pond system. The degree of treatment should be stated as the quality of the resultant effluent will have a direct impact on the final method of disposal, i.e. either irrigation or evaporation. Dependent on the final disposal option selected the proponent may be required to provide a management program that addresses nutrient assimilation.

Appendix 2

Letter from the Department of Agriculture

THE DIRECTORATE

WESTERN AUSTRALIAN DEPARTMENT OF AGRICULTURE

Our ref: 1446/88
Your ref:
Enquiries: C. Malcolm
Date: July 27, 1990

3 Baron-Hay Court
South Perth
Western Australia 6151

Tel: (09) 368 3494
Telex: AA93304
Fax: (09) 368 1205

The Chairman
(Attention: Mr W. Tacey)
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

ATTENTION: MR W. TACEY

PROPOSED HILL RIVER COAL MINE AND POWER STATION

Please find enclosed the submission of this Department concerning the above. Comments in this Department's submission may be used fully or partially in the EPA assessment report.

The submission may be referred in its entirety to the proponent but the Department would appreciate the opportunity to comment on the proponent's response.

The EPA may refer to this Department's submission in discussion and/or by direct quotation of extracts.

The Department views with concern the likely impacts of the project in the region and recommends that the project should not proceed unless and until the matters raised in this Department's submission are fully addressed.

Yours sincerely

(R.A. Nulsen)
A/DIRECTOR OF RESOURCE MANAGEMENT

Enc.

The draft EIS concentrates on demonstrating how small an effect the Hill River power station will have relative to global CO_2 output. This argument can be advanced for all similar developments but leads to an integrated effect of great significance.

An adequate analysis of alternatives such as energy conservation could hardly be expected from a coal-fired power station proponent. It is to be hoped the EPA will ensure that all options are thoroughly evaluated.

Effects on Farm Water Supplies

Existing bores on farms in and around the proposed borefield only penetrate a few metres into the watertable. The draft EIS states that expected lowering of the watertable is from zero to 20 m. It is likely supplies of water from a high proportion of the 98 farm bores in the zone of influence will be adversely affected.

The prime agricultural land affected carries high stocking rates of sheep and cattle with an estimated peak water requirement of 20 kL per day on an average sized property (1,700 ha). On these properties about 80 per cent of farm income is from grazing.

The draft EIS indicates that the proponents would compensate landholders by providing alternative water supplies. It may be fairer to oblige the proponents to restore the water supplies. It is not clear how the company would deal with the farmers, who may require a body to negotiate on their behalf.

Economics

The economics of the Hill River Project is poorly covered in these documents. What is called economics is descriptive and contains no analysis. There is little to comment on.

It seems inappropriate that such a major project has not been subjected to a cost benefit analysis. Even if the analysis did not attempt to deal simultaneously with financial and environmental implications, it would have been valuable.

Possible implications of the project to farmers in the region are:

- increased community services including education;
- higher land prices; and
- reduced groundwater supply.

Compensation for farmers whose groundwater supplies are affected by the project is proposed. The terms of compensation require mutual agreement of farmers and developers. In effect, it would be a de facto market transfer of water, requiring that sufficient compensation is paid for farmers to willingly accept reduced water supplies.

Authorship

The Department of Agriculture submission has been prepared by C.V. Malcolm, I.A.F. Laing, G. Luke, P. Dolling, D. Morrison, R. Kingwell and R.A. Nulsen.

The Department of Agriculture is concerned to conserve the State's land resources in a condition in which their productive potential is not diminished but rather enhanced. The Department has an interest in air, soil, water and biological resources as they relate to current or potential future productive potential.

Land and Water for Horticultural Use

Only 3,000 ha of land are known to exist in the State which could be developed for horticulture (a reallocation of water resources could lift this to 5,500 ha). It is estimated that 5,000 to 10,000 ha are needed for horticultural development in the next 10 years. The 10,000 ML p.a. of water to be extracted for the Hill River Project is sufficient to irrigate 650-700 ha of intensive horticulture. The income from such an area would be $10,000 to $50,000 per ha p.a. or around $35 million p.a.

Effects on Soil Acidity

The ERMP draft EIS states that 2.5 million tonnes of coal of 1.1% S will be used each year. There is inferred to be some retention of sulphur in the ash and in coal preparation but the quantity of SO_2 emitted is not specified. It can be calculated that total potential emissions of S from the stack would be 27,500 tonnes. Discussion on the distribution of the plume (p 8.2) indicates that most of the pollutants will reach ground at about 2-10 km from the stack, an area of about 31,500 ha.

The soils near the coast have a relatively high pH but inland the soils range from about pH 5.7-6.0. Any significant lowering of the pH of these soils would seriously disadvantage agriculture and necessitate adjustments such as lime application.

It is estimated that the sulphur coming to ground from the stack could cause a lowering of 1 to 1.5 pH units in a year. The magnitude of this change is influenced by the low buffering capacity of the soils. The S application is of the order of 0.8 t/ha which is equivalent to about 2.4 t/ha of lime. One tonne of lime per ha is expected to raise soil pH by about 0.5 unit pH. The pH changes due to S and lime are approximately linear between pH 4 and 8.

The implications of these predictions for agriculture are extremely serious. It is therefore of great concern that the matter of soil pH change has not been addressed in the draft EIS.

Effects of Air Pollution on Vegetation

The natural vegetation is specifically adapted to growth on soils of particular type and pH. The relationships between vegetation types and soils are discussed in the draft EIS.

The soil pH changes discussed above would have serious consequences for the natural vegetation but have not been addressed in the draft EIS.

Effects of particulates and gaseous emissions on the natural vegetation have been discussed in the draft EIS. It has been concluded that effects would be minimal. However, that conclusions are based on studies on the effects on vegetative growth of higher plants. It is widely recognised that lichens are

Appendix 3

Letter from the Department of Fisheries

FISHERIES DEPARTMENT

Your Ref:
Our Ref:
Enquiries:

108 Adelaide Terrace, East Perth,
Western Australia 6004
Telephone (09) 325 5988

Telegraphic Address:
Fishwa, Perth

Telex: 93832
Fax (09) 325 3134

The Chairman
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Attention Mr W Tacey

THE HILL RIVER POWER STATION PROJECT - ENVIRONMENTAL REVIEW AND MANAGEMENT PROGRAMME

The nearshore waters at Jurien are an important part of the local rock lobster fishery and are also popular for recreational fishing by the resident population and tourists.

The Fisheries Department's main concern with the above project is the proposed discharge of saline wastewater into the ocean at Jurien Bay. This aspect has been examined in detail in Appendix B of the ERMP.

From the analysis of the wastewater components, the projected dilution in the receiving nearshore waters and the impact assessment given in the ERMP the discharge should not exert any harmful effects upon the marine environment in Jurien Bay. However it is important that, when the discharge site is finally chosen, the predictions on dilution levels and dimensions of the mixing zone are further examined. It would be mutually advantageous if the proponent's choice of the discharge site is made in consultation with the local commercial fishermen via the Western Australian Fishing Industry Council (WAFIC).

The scope of the environmental management and monitoring programme for the wastewater discharge described in Appendix B is broad and sufficient to cover fisheries concerns, both before and after construction of the pipeline. But it is necessary that the proponent gives prior agreement to carry out any modifications to the wastewater system which may be required in the event that the rock lobster fishery is shown to be adversely affected by the discharge.

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The Fisheries Department and WAFIC should be regularly informed on the progress of the monitoring programme and on any significant changes in the nature and quantity of the wastewater components.

B.K. Bowen
EXECUTIVE DIRECTOR

25 July, 1990

Appendix 4

Letter from the National Parks and Nature Conservation Authority regarding national park status for the Lesueur area

NATIONAL PARKS AND NATURE CONSERVATION AUTHORITY

January 18, 1989

Hon B.J. Hodge, MLA
Minister for Conservation and
Land Management
May Holman Centre
32 St George's Terrace
PERTH WA 6000

Dear Mr Hodge

RE: MT LESEUR RESERVES

Arising from difficulties encountered during the implementation of the Red Book recommendations the National Parks and Nature Conservation Authority has become aware of the proposals for coal mining in the Mt Leseur area. Following a request for information, a briefing by officers of the Departments of Mines and Resources Development and the exploration company was arranged.

The NPNCA believes that this location is of the highest conservation value. The area has been recommended for conservation reservation since the first systematic study of conservation through reserves was made in Western Australia.

We believe therefore that any proposal for mining in this area should be dealt with according to the Government's policy for mining in national parks and A class nature reserves.

The view of this Authority is that if any area in Western Australia is to be protected from mining then this area should be so protected. From our current knowledge of the mining proposal the area which would be affected by mining is vital to the integrity of the Mt Leseur nature conservation reservation.

HACKETT DRIVE CRAWLEY. WESTERN AUSTRALIA TELEPHONE (09) 386 8811

All correspondence to be addressed to Department of Conservation and Land Management P.O. BOX 104. COMO 6152.

It is important to note that this area has very high landscape values as well as nature conservation importance. This means that the area could be classified as a national park to recognize both values.

The National Parks and Nature Conservation Authority believes it is important that immediate protection should be given to the area by classifying it as either national park or A class nature reserve.

Yours sincerely

(Norman Halse)
CHAIRMAN

Mr D. Hampton
Acting Secretary
Policy Councils and Committees
Department of Conservation and
- Land Management
Hackett Drive
CRAWLEY WA 6009

Coal mining and power generation, near Mt Lesueur

Report and recommendations of the
Environmental Protection Authority

Environmental Protection Authority
Bulletin 460
December 1990

Coal mining and power generation, near Mt Lesueur

Report and recommendations of the Environmental Protection Authority

Contents

Summary

Over the last two years, consideration of options for power supply in Western Australia has led to public debate over the type and extent of new generating plant required. The Environmental Protection Authority has commented on the general energy supply question and attendant issues in a report on the proposed Collie Power Station (Environmental Protection Authority Bulletin 472).

A private power generation option was proposed near Mount Lesueur, in an area previously proposed for nature conservation,as one option to provide this supply. This option was not selected by SECWA on economic grounds, and the proponent has sought suspension of environmental assessment.

Due to the level of public interest in the conservation issue at Mount Lesueur, the Environmental Protection Authority has decided to provide a report to the Minister for the Environment on the implications of coal mining and power generation in the Lesueur area.

Conservation of the Mount Lesueur area

The Environmental Protection Authority makes the following recommendations about conservation in the Mount Lesueur area and the impact of coal mining and power generation there.

Recommendation 1

The Environmental Protection Authority recommends that a national park of Class A status be gazetted in the Mount Lesueur area, to include the vacant crown land to the north and north-east of Mount Lesueur, to boundaries recommended by the Environmental Protection Authority, as indicated on Figure 2 in this report. The Environmental Protection Authority further recommends that the national park be implemented as quickly as possible and that a management plan is prepared and implemented.

In making this recommendation the Authority is aware of the enclave of privately owned land (Crown Grants 1730 and 1433) within the area and recognises that earlier negotiations for a land swap would need to be successfully concluded. The Environmental Protection Authority also notes that Reserve 35593, vested in the Shire of Dandaragan for the purpose of 'Gravel', significantly intrudes into the area. Mitigation of this intrusion by either reducing the area of the gravel reserve or replacing it with another site with proven gravel resources is seen as highly desirable by the Environmental Protection Authority. The Authority recognises that issues of detail will need to be resolved regarding the land swaps above, the western and north-western boundaries, Gravel Reserve 35593 and an assessment of the natural values of an area south-east of the Coorow-Greenhead and Cockleshell Gully Road junction.

Recommendation 2

The Environmental Protection Authority recommends that no open cut mining be allowed within the area recommended as a national park in Recommendation 1 above. Furthermore, the Environmental Protection Authority recommends that no power generation be allowed within, or in a position to impact upon, the area recommended as a national park in Recommendation 1 above.

The Environmental Protection Authority has also considered the general implications of extracting coal and generating power around the Mount Lesueur area. The Authority considers that any future proposals would need to be consistent with the views in this report and in Bulletin 472. Such proposals are only likely to be environmentally acceptable if, after environmental assessment, they are found:

- not to disturb areas of the highest conservation value including that proposed as a national park in this report. Mining on largely cleared, alienated land or underground may be environmentally manageable, as may construction of a power station on such land, however further assessment would be required at the time;

- to be located, operated or controlled in such a way that the effects of air emissions, with a high degree of certainty, will not have unacceptable impacts on the natural or human environment. A power station located on largely cleared, alienated land, with an adequate buffer, a station with suitable design and control parameters or a station with a gas fuel supply may be manageable. The Authority would not recommend in favour of any power station proposal that would result in a measurable impact on the composition of the biota. Consequently the Authority would take a conservative approach to any proposal near a national park until definitive studies showed otherwise. The Environmental Protection Authority may find that the issue of air emission impacts on people may be manageable to acceptable levels, depending on the designated beneficial use of the area. None has specifically been determined for the Jurien region and the presence of farming and conservation areas would require special consideration; and
- to utilise a form of cooling which, with a high degree of certainty, will not have unacceptable impacts on the environment. Groundwater which does not have a significant role in supplying natural areas or other users, seawater or other forms of cooling may be suitable.

Introduction

In 1989 the State Energy Commission of Western Australia called for proposals for the private development of the next power station in Western Australia.

Canning Resources Pty Limited (Canning Resources) and Hill River Power Development Company Pty Ltd (HRPD) jointly proposed the development of a 2.5 million tonne per annum coal mine and a 600 megawatt (MW) power station near Mount Lesueur (the Hill River proposal) about 210 km north of Perth and 25 km north-east of Jurien Bay. Much of the proposal was co-incident with the area shown in Red Book Recommendation 5.17 (the Lesueur area) which the Environmental Protection Authority recommended for A Class reservation as a nature reserve in 1976 (EPA, 1976)(Figure 1).

Upon receiving the proposal the Environmental Protection Authority called for evaluation of the conservation value of the area, the coal resource and the power demand justifying a new power station. Information on power demand has been produced by the State Energy Commission of Western Australia (SECWA, 1989) and the Harman Committee (Harman, 1990). The Authority's views on this aspect are set out in Bulletin 472.

The Department of Conservation and Land Management reported on the conservation, recreation and landscape values of the Lesueur area (CALM, 1990a). The Department of Mines declined to evaluate the coal resource as the coal mining leases had already been granted and hence the State Government procedure in place at that time (known as "Balancing the Scales"), requiring decisions on mining in proposed "A" class reserves, was held, by the Department of Mines, to be inoperative.

The Environmental Protection Authority determined that an assessment of the proposal at Environmental Review and Management Programme (ERMP) level was required. The Federal Department of the Arts, Sport, the Environment, Tourism and Territories (DASETT) called for a Draft Environmental Impact Statement, on the Power Station only, under its provisions dealing with Federal approval of funding by the Foreign Investment Review Board.

A joint document was prepared by the proponents and subjected to a 10 week public review period. As a result, over 540 individually prepared submissions and more than 400 copies of form letters were received. Table 1 groups the issues raised and shows the percentage of submissions which related to each group.

A list of questions summarising the issues raised in public submissions was finalised on 7 September 1990 and responses were received on 30 November 1990. The Environmental Protection Authority has taken these responses into account in preparing this report. The questions and responses comprise over 230 pages of text. They are publicly available at the Environmental Protection Authority and can be provided on request.

During the period when the proponent was responding to issues raised in the submissions, SECWA announced that the Hill River proposal had been dropped from consideration as the next power development in Western Australia. In view of the significant public interest in the protection of conservation values in the Mount Lesueur region, the possibility of future power supply proposals there and the Minister for the Environment's publicly stated expectation of a report, the Authority has prepared this report. The Authority has considered the general question of coal mining and power generation near Mount Lesueur by reviewing the project described in the Environmental Review and Management Programme by Hill River Power Development Company and Canning Resources. Should the Hill River project be re-activated then the Environmental Protection Authority would determine if the new proposal was sufficiently different to require reassessment.

The Environmental Protection Authority has considered the public submissions specifically about the proposal in the ERMP and the proponent's responses to them. The issues raised have then been considered by the Environmental Protection Authority in a general, rather than specific, way commensurate with balancing the environmental importance of the issues with the current status of the proposal. Some letters from Government agencies have been reproduced as Appendices to this report because they raise technical issues which are relevant in a general way to coal mining or power generation using the techniques described in the ERMP. Comments in these Appendices which are specific to the Hill River project as described in the ERMP may not be relevant if the form of the proposal were to change.

The Environmental Protection Authority's report primarily deals with the issue of the potential environmental impact of mining and power generation on conservation values in the area. At the same time the Authority has examined the other major aspects of coal mine and power station development in the area, with a view to indicating what aspects of such development may or may not be of concern and any alternative approaches required to address such concerns.

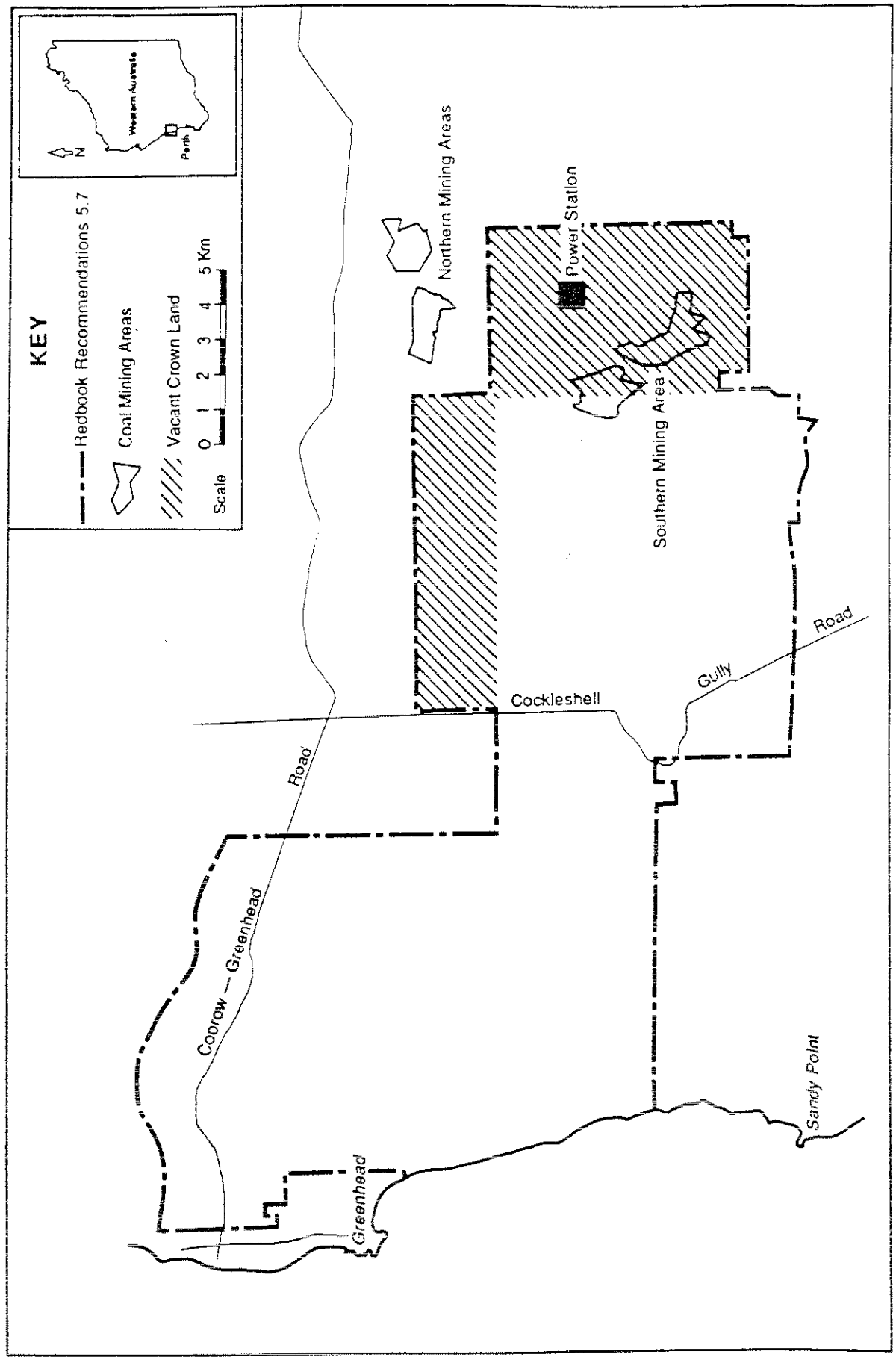

Figure 1 Mt Lesueur area map

Table 1: Groups of issues raised in public submissions on the ERMP

COAL MINE ISSUES	%	POWER STATION ISSUES	%	SOCIAL & ECONOMIC ISSUES	%
Natural value/unique flora and fauna	64	Indirect effects/pollution on surface and groundwater	11	General social and economic issues	7
Destruction of species/natural features/Mt Lesueur	48	Dust/trace elements/flyash	9	Economic value of the mine/power station	1
National park/conservation reserve	51	Atmospheric and chemical emissions	30	Costs associated with the project	2
Dieback	33	Energy conservation/ increased efficiency/consumer education	25	Benefits of the project/other industries	3
Rehabilitation/ revegetation/soil structure/erosion/seed collection	43	Alternative energy sources - renewable and gas	45	Social and economic commitments	1
Breeding refuge for birds/Carnaby's cockatoo/impact on birdlife	12	Groundwater supply/borefield/drawdown/alternative water supply	29	Traffic	1
Impact on gazetted rare species/distinct flora	11	Greenhouse effect/CO_2 emissions	29		
Low grade Lesueur coal/high sulphur content	13	Stage ii - doubling the station's capacity	3		
Tourism/recreation	11	Ocean discharge/water treatment	24		
Weeds	5	Siting of the facilities	2		
Inadequate baseline vegetation data	3	Compensation for any adverse effects/ commitments/ monitoring/ decommissioning	4		
Fire	2	Effect of groundwater drawdown on vegetation	5		
Total area of impact/access to project area	4	Effect of SO_2/NO_x on vegetation	6		
Leaving the four open pits/ overburden disposal	4	Clearing associated with the pipeline/ borefield	1		
Toxic overburden/toxic leachates in the overburden dumps/ash disposal	4	Flue gas scrubbing	2		
Visual intrusiveness	6	Ground level concentrations	2		
Aboriginal sites	<1	Moistening of ash with blowdown water	1		

Table 1 continued

COAL MINE ISSUES	%	POWER STATION ISSUES	%	SOCIAL & ECONOMIC ISSUES	%
Dewatering	2	Government's policy to reduce CO_2 by 20%	3		
Dust	4	Visual intrusiveness	6		
Noise/blasting	4	Collie option	17		
Drainage/runoff/ponds	5	Need for power in Western Australia	6		
Commitments/monitoring/ management plan/ decommissioning	3	Privately owned power station	4		
Impact on fauna/ introduction of feral animals/invertebrates/ aquatic fauna	7	Finance for the power station	<1		
Impact of clearing on bees	<1	Transport of chemicals/auxiliary fuel	<1		
Mining/mine plan	2	Transmission lines	<1		
Siting of the mine facilities/mine construction camp	1	Evaporation ponds/ waste water disposal	<1		

*% = percentage of submissions raising the issue

Conservation of the Mount Lesueur area

Proposals for reservation of land in the Mount Lesueur area originated with Government Botanist Charles Gardner in the 1950s.

In 1962 an Australian Academy of Science sub-committee recommended that the area be declared an A Class reserve for a national park.

In 1974 the Environmental Protection Authority's Conservation Through Reserves Committee took up the concept and recommended the consolidation of existing reserves and vacant Crown land to form a Class A nature reserve. These recommendations and accompanying maps were published in the 'Red Book' (EPA, 1976).The Red Book recommendations were endorsed by State Cabinet on 20 October 1976.

Subsequent action to have the area reserved was resisted due to a desire by some interests to prevent coal resources there from being sterilised. In 1982-83 another attempt to have the area reserved was made by proposing that most of the area be given C Class status and the eastern block of Vacant Crown Land (VCL) excluded to permit access to the coal. This proposal also took account of the need to provide a link to Drover's Cave National Park to the west, by arranging a swap of private for Crown land, and excision of the high recreation value coastal strip west of the planned coastal highway as shown on the Main Roads Department Drawing No 8322-33. Although falling short of the status recommended by the Environmental Protection Authority this proposal was developed as a means of obtaining some form of protection for the area, but was not implemented.

The Environmental Protection Authority has maintained its position on the need for reservation of the area and again endorsed the boundaries proposed in Red Book recommendation 5.17 and Figures 5.0 and 5.7 in a letter to Canning Resources and HRPD in 1990. Submissions received from the National Parks and Nature Conservation Authority and detailed reviews by the Department of

Conservation and Land Management have reconfirmed that the Lesueur area in excess of 27,400 ha, including all of the vacant Crown land, is of the highest conservation value and should be reserved as a national park.

That the area has not been reserved for conservation, despite State Government endorsement, is a reflection of continuing concerns by the Department of Mines and others to maintain access to the coal resources of the area.

The Environmental Protection Authority reiterates its earlier views on conservation of the Mount Lesueur area viz:

- **the whole area of conservation value should be reserved , and**
- **no significant surface or other disturbance which compromises this status would be environmentally acceptable.**

Coal mining

The coal resource is based on four separate deposits (Figure 1). The two northern-most, known as Brazier East and West, lie on private farmland. The western-most deposit is known as the Gairdner block and the southern-most is called Mintaja - Cadda. These last two are located within the area recommended in the Red Book for reservation as shown in Figure 1.

The ERMP describes the development of four open cut mines simultaneously to supply up to 2.5 million tonnes of coal annually for 30 years. Using the stripmining method, these resources would be mined in successive strips with the overburden from the first strip forming a permanent waste dump outside the pit. Successive strips follow the dipping seams of coal downwards, with the waste overburden dumped into the pit created by the previous strip.

Progressively re-shaping and revegetation of waste dumps would follow the return of topsoil from stockpiles or new stripping areas.

Mining of the four deposits and provision for associated facilities would disturb a total of about 1600 ha. Some 700 ha of this could be on the private farmland to the north. If stripmining were used, pits approximately 1.5 to 3 km long by 150 to 500 m wide and up to 125 m deep could remain at the site of each of the last strips. Four, angular waste dumps could cover the balance of the mined area. These flat topped dumps could be as high as the surrounding hills. At the end of the project or at some other time in the future the pits could continue to operate as stripmines or be converted to underground operations, based on the balance of the 460 million tonnes of known resource.

Power generation

The type of power station and associated facilities described in the ERMP would occupy 250 ha within the area proposed for reservation as a conservation reserve (Figure 1).

The ERMP describes the construction and operation of a 600 MW power station comprising two 300 MW turbine generator units.

Facilities required for a power station include:

- a turbine building, control gear switchyard and transmission lines,
- coal supply, crushing, storage and transfer facilities;
- ash handling, storage, transport and disposal facilities;
- water supply, process, treatment and disposal facilities; and
- ancillary facilities such as offices, workshop, stores etc.

Burning coal in a 600 MW power station would produce waste flyash and bottom ash, at an average rate of 1000 tonnes per day.

The flyash disposal technique described in the ERMP is not currently used in Western Australia. It involves dry silo storage followed by the addition of 20% moisture and transport to the mine waste

dumps for disposal. The main technical concern with this form of disposal would be the potential for leachates to escape from uncontained storage. In principle however the concept of returning residues to the point of origin is worthy of close examination, to avoid the need to disturb more ground for a separate storage structure.

Fresh cooling water for the type of power station described in the ERMP could be extracted from deep bores tapping the confined Yarragadee formation. For this type of station about 10,000 megalitres/year of cooling water could be required Lowering of the watertable surface (on which some native vegetation and farm bores depend) by somewhere between zero and 20 m could occur in some areas.

A coal fired power station is expected to emit sulphur dioxide, nitrogen oxides, carbon dioxide and particulates into the atmosphere via a 200m chimney stack. The ERMP describes measures to remove most of the particulates or flyash. No measures for the scrubbing of other gases are described.

The Authority has outlined its position on carbon dioxide emissions and their contribution to the Greenhouse Effect in Bulletin 472.

Due to the conservation value of the area, it would not be acceptable for any emissions from the operation of a coal fired power plant to cause any measurable change to the biota in the proposed conservation reserve.

The ERMP describes the disposal of waste cooling water and treated sewerage effluent by discharge to the ocean via a pipeline at something less than 5 megalitres/day. Such disposal would need to meet the Environmental Protection Authority's requirements to protect the water quality such that the assimilative capacity of the water to accept the discharges is not exceeded. These requirements are based on the Environmental Protection Authority's Bulletin 103, "Water Quality Criteria for Marine and Estuarine Waters of Western Australia" (EPA, 1981).

Existing environment

The attributes of the existing environment have been described in detail by CALM (1990a, 1990b) and in the ERMP.

In summary, the region of the western and southern deposits, which is part of the area proposed for reservation,comprises the sharply dissected uplands and flat topped mesas of the Gairdner Range. The northern deposits are elevated but on more subdued, rolling hills.

Two pits and two dumps, necessitating the disturbance of some 900 ha, would be located within the boundaries of the proposed conservation reserve. In the southern mining area the Mintaja-Cadda pit would be within the headwaters of Coomallo Creek and the more westerly Gairdner pit overlaps the headwaters of Cockleshell Gully and Coomallo Creek.

The Brazier East and West pits, and associated dumps, in the northern mining area lie on alienated farmland which is largely cleared.

The area coincident with that proposed for reservation supports a range of habitats with a diverse flora ranking, with the Stirling Range and the Fitzgerald River National Parks,amongst the highest species richness in the world. The presence of seven species of Declared Rare Flora, species restricted to the proposed conservation reserve and complex mosaics of flora communities which are not conserved elsewhere make the area an important refuge and one of the three most important for flora conservation in southern Western Australia (CALM, 1990a).

A rich fauna also makes the area worthy of conservation. Important ecological relationships, such as that whereby Carnaby's Black Cockatoo feeds on grubs which attack the flowers of the rare Banksia tricuspis (which might otherwise suffer from reduced seed production), are possible due to the range of habitats present. Such relationships, coupled with the unique floral assemblages, mean that the area also has considerable scientific merit.

The limited presence of dieback disease in the region means that the opportunity remains to protect the susceptible flora. At the same time, major earthworks pose a particular control problem since the fungal disease agent persists in moist soil and may be spread during earthmoving operations.

In terms of landscape values, the area encompasses some of the most attractive countryside to be found between Perth and Geraldton. The area attracts a wide range of recreational use and indications are that visitation has increased markedly with recent publicity. Opportunities for interpretation and education are also numerous (CALM, 1990a).

There is presently no industrial development in the vicinity of Mount Lesueur. Consequently, ambient air quality can be regarded as very good.

Environmental issues

The key environmental issues associated with the major components of a coal mine and power station are listed in Table 2.

The Environmental Protection Authority has considered the key issues in Table 2 and determined whether they can be managed, or alternatively result in unacceptable residual impacts. This Table forms the basis of the Authority's conclusions about the likely environmental impacts of coal mining and power generation, in the manner described in the ERMP, near Mount Lesueur.

Table 2: Impacts and conclusions on key issues for a coal mine and power station near Mount Lesueur

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
Coal Mines - Northern Mining Area	• Operating effects on farmland: dust,noise,farm water supply, dieback, runoff	• Could be managed	Could be environmentally acceptable
- Southern Mining Area • Surface disturbance	• Direct disturbance of native ecosystems with high conservation value in proposed conservation reserve	• Direct loss of about 900 ha of habitat and 10 to 50% of populations of rare species	Predicted level of impact not acceptable nor adequately manageable in this environment
• Residual pit	• Size: 1.5 to 3 km by 200 to 500 m by 125 m deep	• Open pit	Pits inconsistent with surroundings in long term
• Residual waste dumps	• Rehabilitation	• Duplication of composition, diversity unlikely	Unproven to standard appropriate to conservation reserve
	• Landscape impacts	• Operating pits and waste dumps inconsistent with conservation reserve landscape • Sense of wilderness lost	Inappropriate scale of landuse in or adjacent to proposed conservation reserve
	• Operating effects (dust,noise etc as above)	• No spillovers to conservation reserve appropriate	Potentially manageable

Table 2 continued

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
Power Station - Power Demand	• Need for the power station	• Full consideration of alternatives not available	Demand may be able to be met by alternative means (See Bulletin 472)
- Physical Plant	• Location in proposed conservation reserve. Bitter Pool Rises land unit is not well conserved elsewhere	• Direct loss of about 250 ha of habitat	Not acceptable in poorly conserved habitat
- Cooling water supply	• Allocation by Water Authority of large resource of drinking quality water conditional on sustainability of supply and full examination of alternatives	• Aquifer could be partially mined during operation • Alternatives of seawater, brackish groundwater and water conservation not sufficiently well known	Insufficient detail available to determine if Water Authority conditions met (See Appendix 1)
	• Effect on natural environment	• Drawdown of water table, on which some vegetation depends, by 0 to 20 m possible along Hill and Coomallo Rivers	Any such impacts on conservation reserves located there would be unacceptable
		• Significant increases in silt levels and reductions in flows in surface drainages possible • Impacts on native vegetation not predictable accurately • Impacts on native vegetation around Hill River may be irreversible once detected • No details of alternative supply available if unacceptable impacts occur as a result of groundwater abstraction • Many wells and soaks could be affected	Uncertain effects on conservation reserves and downstream users not acceptable (See Appendix 1)
	• Effects on farm water supplies	• Alternatives could be available	An acceptable guarantee should be possible.

Table 2 continued

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
- Ash Disposal dry return to mine waste dumps	• Location in proposed conservation reserve	• Impacts not determined, untried technology in Western Australia, limited test data available	Sensible concept but waste dumps not acceptable in proposed conservation reserve
	• Security of leachates etc	• Not determined, insufficient data available to determine impact of leachates on quality of groundwater currently of drinking water standard	Unable to assess as acceptable (See Appendix 1) More information required
- Air Emissions	• Effect on people	• SO_2 levels in air predicted for this type of station within accepted standards for Australia but none set for this area	Environmental acceptability depends on beneficial use for the region; none set as yet
	• Effect on crops/livestock	• SO_2 levels in air predicted for this type of station within accepted standards for Australia but effect on soil acidity not rigorously defined	As above Uncertain impact on soil acidity not acceptable (See Appendix 2)
	• Effect on native vegetation	• Sensitivity unknown for many species. Impacts on species composition not known	Uncertain impacts on most species, and on species composition.This uncertainty level not acceptable for proposed reserve with highest conservation value
	• Contribution to Greenhouse Effect	• Could significantly increase Western Australian output.	See Bulletin 472
- Water Discharge to Ocean	• Effect of solutes, principally salts etc on fishing industry	• No harmful effects on marine environment or fisheries likely	Discharge acceptable with appropriate management if criteria met (See Appendix 3)
Social Issues - Population Increase	• Effect on community infrastructure, services and facilities	• Insufficient detail available	Could be made acceptable
- Operational effects	• Impact on groundwater resources	• Effective guarantee appropriate	Could be made acceptable

Table 2 continued

COMPONENTS	KEY ISSUES	IMPACT/COMMENT	CONCLUSION
	• Nuisance effects due to noise, dust, light, vibration etc	• Commitments to careful monitoring and management required	Could be made acceptable
Wider Issues - Creation of National Park	• Combined conservation, recreation, landscape, and scientific values warrant designation as a national park	• Such status would severely restrict disturbances such as open cut mining	Elevation to national park status now warranted by high level of values and increased public interest in the area

Conclusions

The Environmental Protection Authority considers that the general conclusions which follow are applicable to the type of proposal which is described in the ERMP, or any others like it.

The Environmental Protection Authority has considered the question of the need for the gazettal of a previously proposed conservation reserve near Mount Lesueur. In addition, the question of coal mining and power generation in and near the proposed conservation reserve has also been considered.

Conservation

The Environmental Protection Authority concludes that the whole of the Mount Lesueur area, including the northern and eastern blocks of vacant Crown land (VCL), is of the highest conservation value.The Authority has reached this view based on earlier work conducted as part of the 'Red Book' process, the data presented in the ERMP, the appendices to it and the reviews presented by CALM.

The eastern VCL contains the Bitter Pool Rises land unit, which is not well conserved elsewhere and forms an important supporting landscape to Mount Lesueur and the rest of the Gairdner Range uplands, thus contributing to its high conservation value.

Notwithstanding the intrinsic value of the eastern VCL itself, the Authority concludes that locating large open cut coal mines and a power station complex within or in a position to significantly impact upon the area recommended by the Environmental Protection Authority for conservation would drastically compromise the conservation values of an area of similar importance to the Fitzgerald River and Stirling Range national parks. These values would be compromised by the intrusiveness of operating mines and the permanent pits and waste dumps. No alternative mining method which avoids the areas of conservation value has been identified in the responses to public submissions. Benching of waste dumps as described in the responses would not be visually compatible with the existing smooth sloped hills. Statements in the responses repeatedly emphasise the lack of knowledge about impacts, their management or certainty about rehabilitation success. Such uncertainty is not considered environmentally acceptable in an area of the highest conservation value. As well, the limited data presented in the ERMP or the responses to submissions about the risk of damage to the biota from atmospheric emissions nearby makes such risks environmentally unacceptable in an area of the highest conservation value.

Further to the Authority's earlier conclusions in the 'Red Book' that the area should be set aside as an A class conservation reserve, the Authority now concludes that the recreation, landscape, and scientific values, coupled with the greatly increased level of public interest in the area, warrant its protection by national park status.The Environmental Protection Authority concludes that a national

park of Class A status should be gazetted in the Mount Lesueur area, including the areas of vacant crown land, on boundaries recommended by the Environmental Protection Authority.

The Authority is supported in this conclusion by the National Parks and Nature Conservation Authority (NPNCA) and CALM, which have responsibility for the protection and management of the resources reserved for conservation throughout Western Australia (Appendix 4, 1990b).

Further to the above, the Environmental Protection Authority concludes that a coal mine or power station as described in the ERMP would not be environmentally acceptable within or in a position to significantly impact upon the area recommended by the Environmental Protection Authority for conservation.

Coal mining

The Environmental Protection Authority concludes that the predicted level of impact from coal mining within the proposed national park in terms of loss of habitat, loss of gazetted rare and other plant species, undemonstrated rehabilitation success, inappropriate landforms created by waste dumps and residual pits and the potential to spread and intensify dieback disease is unacceptably great in an area of the highest conservation value. Additional data or commitments presented in the responses to submissions do not mitigate the level of uncertainty significantly.

Groundwater abstraction

The Water Authority of Western Australia have expressed concern about the allocation of a significant resource of drinking quality water to industrial use when insufficient information is available, in their view, on alternatives such as seawater, brackish water from the Cockleshell Gully formation or water conserving cooling technologies (Appendix 1). The Environmental Protection Authority shares this concern.

The Environmental Protection Authority concludes that the uncertainty associated with the effect of abstracting up to 10,000 megalitres/day of groundwater from the Yarragadee formation is sufficiently great that it cannot consider such abstraction to be environmentally acceptable. Specifically the Authority concludes that the effects of abstraction have not been able to be sufficiently well modelled to allow the confident prediction of impacts on native ecosystems. The Authority concludes further that should monitoring detect impacts on ecosystems such as those dependent on ground water in the Hill River then such impacts may be irreversible by the time they are detected. Although a similar level of uncertainty exists about the effects of abstraction on farm water supplies the Authority believes that it should be possible to provide assured supplies from alternative sources while a project is operating. The future recovery of existing farm supplies or the continued assurance of alternatives is less certain once a project finishes.

Power station location

The location of a power station within an area of the highest conservation value which is proposed as a national park is considered unacceptable from the point of view of direct habitat loss, landscape impact and the uncertain effects of air emissions on the composition of unique plant species assemblages in such an area. No alternative locations are proposed in the response to public submissions and no additional data are presented to reduce the level of uncertainty about impacts on native flora within the area proposed for reservation.

While the concept of returning fly ash to the mine waste dump may have merit, the Environmental Protection Authority concludes that the dumping of ash within a proposed national park is unacceptable and that there is insufficient data available on the security of leachates from the ash.

The discharge of around 5 megalitres/day of blowdown water to the ocean could be environmentally acceptable if water quality is maintained and no measurable impact on fisheries occurs.

Social aspects

Major social changes could occur as a result of a significant number of extra people attracted both temporarily and permanently to the area by a project such as that described in the ERMP. The Environmental Protection Authority concludes, on the advice of the Social Impact Unit, that such changes could be managed acceptably provided sufficient commitments to infrastructure, resources, management and monitoring were made. The responses to public submissions indicate that commitments for the provision of infrastructure would be negotiated as part of a State Agreement Act, if environmental approval was forthcoming.

Recommendations

The Environmental Protection Authority subscribes to the view that the Mount Lesueur area is of the highest conservation value. In addition, the Authority concludes that the recreation, landscape, and scientific values, coupled with the greatly increased level of public interest in the area, now warrant its protection by national park status.

Recommendation 1

The Environmental Protection Authority recommends that a national park of Class A status be gazetted in the Mount Lesueur area, to include the vacant crown land to the north and north-east of Mount Lesueur, to boundaries recommended by the Environmental Protection Authority , as indicated on Figure 2 in this report. The Environmental Protection Authority further recommends that the national park be implemented as quickly as possible and that a management plan is prepared and implemented.

In making this recommendation the Authority is aware of the enclave of privately owned land (Crown Grants 1730 and 1433) within the area and recognises that earlier negotiations for a land swap would need to be successfully concluded. The western boundary of the proposed national park has been amended from that originally proposed in the "Red Book". This change recognises that the near coastal eco-types are relatively widespread and well represented in conservation reserves. It also reflects the predominantly recreational, rather than conservation, focus of the natural values of this area and is intended to provide room for future expansion of Greenhead.

In proposing the boundary change the likely requirement for a coastal road between Jurien and Greenhead, as shown on the Main Roads Department Drawing No 8322-33, was recognised. The boundary was determined in liaison with CALM and the Main Roads Department to conform with a conceptual alignment of this road designed to protect the wetlands and dunes of the Quindalup system as well as limit potential problems of reserve management. Closer assessment of the final road alignment would be required before it was constructed.

The Environmental Protection Authority is aware that vacant crown land south-east of the junction of the Coorow - Greenhead and Cockleshell Gully Roads, which is not within the recommended national park boundary in Figure 2, requires an assessment of its natural values and consideration of appropriate vesting. The Authority believes that such consideration could be given to this area at the time that land swaps and other details are resolved to facilitate implementation of the proposed national park.

The Environmental Protection Authority also notes that Reserve 35593, vested in the Shire of Dandaragan for the purpose of 'Gravel', has significant natural values and markedly intrudes into the area proposed as national park. Mitigation of this intrusion by either reducing the area of the gravel reserve or replacing it with another site with proven gravel resources is seen as highly desirable by the Environmental Protection Authority. The Environmental Protection Authority recognises that there are likely to be significant requirements for road base materials in the region as the towns of Jurien and Greenhead grow. Given the sensitive location of current gravel reserves and the limited provision for

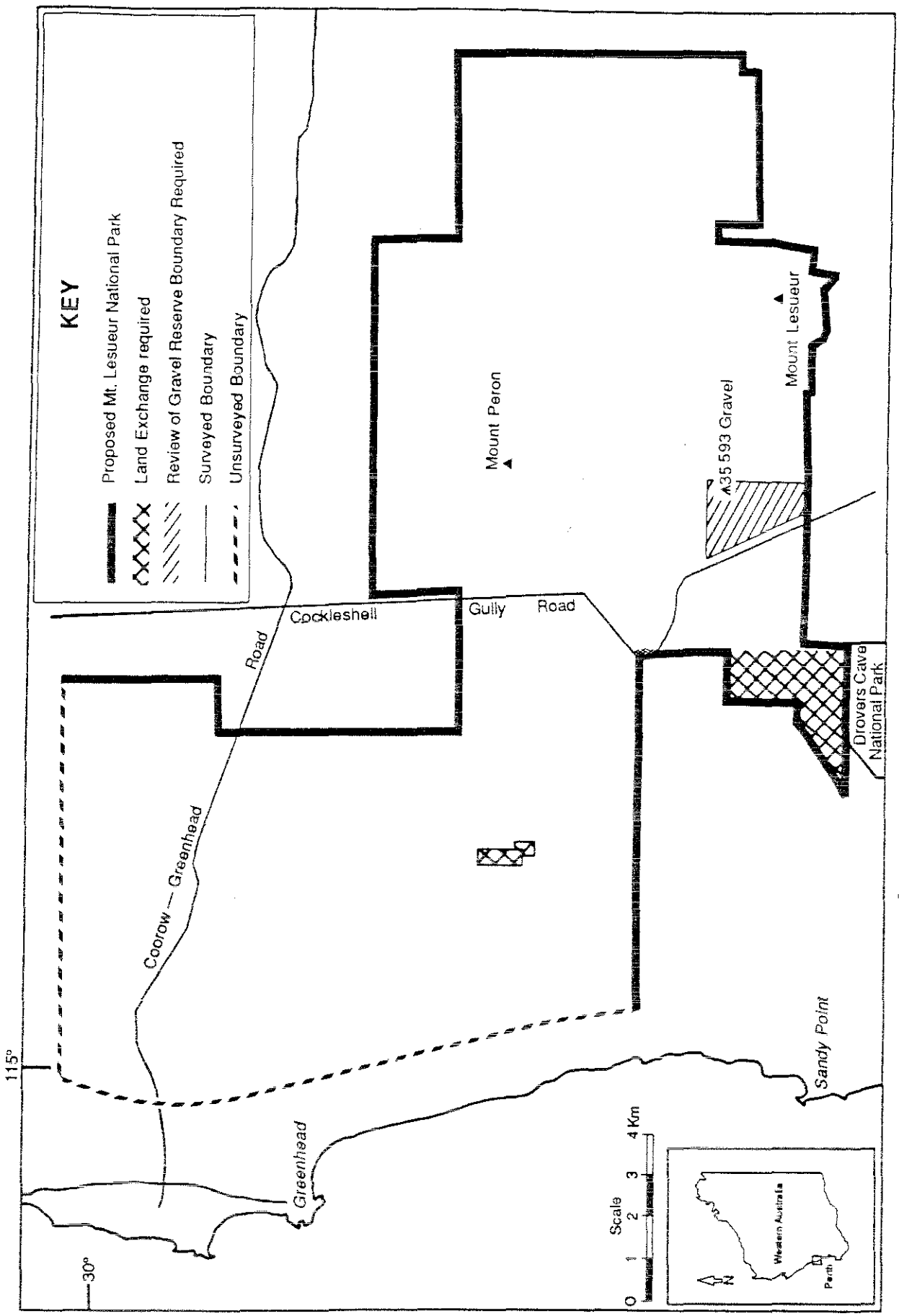

Figure 2 Map of proposed Mt. Lesueur National Park

road base materials elsewhere, the Environmental Protection Authority sees benefit in a comprehensive review of road base resources for the region, to ensure that sufficient supplies can be made available from environmentally acceptable locations. As part of this review the Authority would be prepared to consider the net conservation benefits of a possible exchange of part of the vacant crown land in the Shire of Coorow adjacent to the Coorow - Greenhead and Cockleshell Gully Road intersection, from which the Main Roads Department has previously extracted gravel, for part of Gravel Reserve 35593.

The Environmental Protection Authority believes that no significant surface or other disturbance, which would compromise the natural values of the proposed national park, would be environmentally acceptable.

Recommendation 2

The Environmental Protection Authority recommends that no open cut mining be allowed within the area recommended as a national park in Recommendation 1 above. Furthermore, the Environmental Protection Authority recommends that no power generation be allowed within, or in a position to impact upon, the area recommended as a national park in Recommendation 1 above.

Future alternatives

The Environmental Protection Authority is aware that there may be future proposals for energy developments and power generation north of Perth. Indeed future developments could be envisaged which are consistent with the Authority's views in this report and Bulletin 472.

Accordingly, the Environmental Protection Authority has considered the general implications of extracting coal and generating power in the Jurien region. Future proposals are only likely to be environmentally acceptable if, after appropriate assessment, they are found:

- not to disturb areas of the highest conservation value including that proposed as a national park in this report. Mining on largely cleared, alienated land or underground may be environmentally manageable, as may construction of a power station on such land however further assessment would be required at the time;
- to be located, operated or controlled in such a way that the effects of air emissions, with a high degree of certainty, will not have unacceptable impacts on the natural or human environment. A power station located on largely cleared, alienated land, with an adequate buffer, a station with suitable design and control parameters or a station with a different fuel supply may be manageable. The Authority would not recommend in favour of any power station proposal that would result in a measurable impact on the composition of the biota. Consequently the Authority would take a conservative approach to any proposal near a national park until definitive studies showed otherwise. The Environmental Protection Authority may find that the issue of air emission impacts on people may be manageable to acceptable levels, depending on the designated beneficial use of the area. None has specifically been determined for the Jurien region and the presence of farming and conservation areas would require special consideration; and
- to utilise a form of cooling which will, with a high degree of certainty, not have unacceptable impacts on the environment. Groundwater which does not have a significant role in supplying natural areas or other users, seawater or other forms of cooling may be suitable.

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Appendix 1

Letter from the Water Authority of Western Australia

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The Chairman
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Attention: Mr Warren Tacey

THE HILL RIVER PROJECT

COMMENTS ON THE ENVIRONMENTAL REVIEW & MANAGEMENT PROGRAMME/DRAFT ENVIRONMENTAL IMPACT STATEMENT

The Hill River Project, comprised of a proposed open cut coal mine and 600 MW coal-fired power station located 210 km north of Perth and 28 km northeast of Jurien Bay, has the potential for significant impacts in areas for which the Water Authority of Western Australia has the responsibility for management. These areas consist of Water Resources Management which the Water Authority carries out under the Rights in Water and Irrigation Act 1914, and Pollution Control activities delegated to the Water Authority from the Environmental Protection Authority, and carried out under the Environmental Protection Act 1986.

WATER RESOURCES MANAGEMENT - GROUNDWATER

The Board of Management of the Water Authority conditionally approved in principle, the abstraction of up to 10 mill.cu.m of water annually for a period of 30 years for the proposed power station.
This approval was subject to:

(a) environmental acceptability of the project and its groundwater abstractions;

(b) clarification of the State's support for the project;

(c) satisfactory demonstration that:

  (i) water is available on a sustainable use basis;

  (ii) alternative sources are not feasible; and

  (iii) advanced technology for water conservation is to be employed by the project;

(d) an investigation into the application of appropriate licence and user fees.

Depending on the capacity and height of these dams, they may be classified as "Referable Dams" and therefore be subject to Dam Licensing.

(c) Recovery Planning. The section 5.8 of the ERMP dealing with Water Management does not address any recovery options in the event of failure of sedimentation dams, sumps, earth bunds etc. No indication of the nature of the "remedial action" to be taken "if, and when, required" in section 6.5.1 is provided.

POLLUTION CONTROL - WATER

A number of concerns exist relating to the lining of ponds, fly ash disposal, sewage disposal and the discharge water pipeline. These are addressed in detail in the report attached (Appendix C) from the Pollution Control Section of the Headworks & Treatment Branch of the Water Authority.

CONCLUSION

The Water Authority of Western Australia is of the opinion that as a number of issues as detailed in this document and its appendices have not been adequately addressed by the proponents in the Environmental Review and Management Programme/Draft Environmental Impact Statement, the project cannot be supported at this time. Further consideration of the matters raised is required in order to permit an adequate assessment of the potential impacts of the Hill River Project.

While the allocation of water can be dealt with by the Water Authority under it's own legislative powers, the Authority strongly believes that environmental approval should not be given unless all of the issues related to water allocation are satisfied. In view of the potential environmental impact of proposed abstraction, it is appropriate that water allocation approval be subject to environmental approval, rather than the reverse.

B.S. SADLER
DIRECTOR WATER RESOURCES

July 30, 1990

HILL RIVER POWER STATION

GROUNDWATER BRANCH COMMENTS 17TH JULY 1990

1. BACKGROUND

The Hill River Power Development Company is proposing to construct and operate a 600 MW power station 28 km northeast of Jurien Bay, near Mt. Lesueur, which will be fuelled by sub-bituminous coal from nearby open cut pits. The proponent proposes to abstract large volumes of groundwater during the 30 year project life. The total anticipated groundwater consumption is estimated to be 300 mill.cu.m, of which approximately 70% will be consumed by evaporation in the cooling circuit.

The project is located within the Arrowsmith and Jurien Groundwater Areas and any groundwater abstractions are therefore subject to licensing by the Water Authority.

The proponent plans to draw water from the nearby Yarragadee Formation aquifer at an average rate of 27,000 cu.m/day, with a maximum daily abstraction of around 44,000 cu.m/day. The preferred wellfield development area is located a few kilometres east of the proposed plant site and will extend approximately 30 km north-south, with the southern limit lying approximately 5 km south of Hill River. The conceptual wellfield comprises 19 wells which will draw water from depths of 170-400m.

Prior to the completion of the ERMP the Board of the Water Authority, at a meeting on 9 November 1990, considered the proposal of using the Yarragadee Formation as water supply. The Board approved in principle, the allocation of the Yarragadee groundwater resource to the project for a 30 year period subject to:

- Environmental acceptability of the project, its groundwater abstractions and disposal of effluent.
- Clarification of the State's support for the project.
- Satisfactory demonstration that:
  - Water is available on a sustainable use basis.
  - Alternative water sources are not feasible.
  - Advanced technology for water conservation is to be employed by the project.
- Application of appropriate licence and user fees is investigated.

2. WATER SUPPLY SOURCE

2.1 Sea Water

The proponents have examined the possibility of using a seawater cooling system for both an inland and coastal station site. For the inland site, it is claimed that evaporative cooling would present environmental problems in the form of salt deposition on the surrounding countryside as a result of drift processes. Furthermore, it is claimed that failure of the saline supply and hypersaline discharge pipelines would have severe environmental consequences. Once-through seawater cooling at the inland site, on the other hand would require too much power to maintain the circuit, in the order of 10% of power station output, and is therefore not viable on economic grounds.

It appears likely that the large volumes of seawater required for cooling would be expensive in terms of pipe construction and/or power costs depending on the recycling scenarios.

The alternative of locating the power station on the coast has been dismissed by the proponent on the basis of both environmental and economic grounds. Although once-through cooling at a coastal site would be more economic than the proposed groundwater evaporative cooling system, it is claimed that the costs of coal transport to the coast, disposal of ash and associated environmental protection strategies would greatly increase the cost of the project. It is also concluded that a coastal site would present environmental problems.

The Water Authority considers that the proponent has not examined the possibilities and implications of a coastal site, using once-through cooling, in sufficient detail to justify rejection of this option. The Water Authority considers that the coastal site, with seawater cooling would provide an environmental credit as follows:

- Preservation of the potable groundwater resources.
- There would be no impact on private groundwater supplies.
- There would be no impact on springs or phreatophytic vegetation.
- There would be less construction and infrastructure at the coal mine, and therefore environmental impacts at the minesite would be minimised. In addition, the environmental impacts of proposed wellfield construction would be obviated. These impacts would need to be compared to the environmental impacts of locating the power station at the coast.

The Water Authority is of the opinion that the relevant matters required to be addressed by the proponents, in particular conditions (c) (ii) and (c) (iii), have not been adequately presented in the Environmental Review and Management Programme. This is discussed more fully in the report fro the Groundwater Branch of the Water Authority attached as Appendix A.

Possible impact on existing users of the groundwater resource is of concern to the Water Authority, however this matter can be adequately addressed through the application of appropriate licence conditions on an groundwater abstraction licence issued to the proponents. These conditions will relate to both water quality and quantity.

In the event of an Agreement Act being proclaimed, the Water Authority would seek to ensure the agreement was subject to the provisions of the Rights in Water and Irrigation Act 1914.

The proponents have indicated in a letter to landholders dated March 23, 1990, (see Appendix B) and in the ERMP (page 8-22), a commitment to compensate those other users of the resource where their water supplies have been adversely affected by the proposed power station wellfield abstraction.

WATER RESOURCES MANAGEMENT - SURFACE WATER

The project is seen as having the potential to significantly impact upon surface drainage through both the Coomallo Creek and Cockleshell Gully drainage systems.

The management strategies detailed in sections 6.5.1 and 6.5.2 of the ERMP (pages 6-9 and 6-10) are inadequate to satisfactorily address the impact the project may have on these catchments. The following matters need to be addressed:

(a) Sediment transport. Due to the extent of the disturbance of the natural land surface, the potential for erosion and sediment runoff is significant. The proponent should provide details of the methodology and proposed programme for monitoring the sediment runoff from the area of the minesite and power station. Baseline data should be collected prior to the commencement of the mining operation in order that the effect of mining may be adequately quantified.

It should be emphasised that water sampling alone is of little value for the monitoring of sediment outflow from the minesite.

(b) Interruption of Coomallo Creek flows. The Project Detail plan (Figure 7.4 in the ERMP) indicates that a number of dams will be constructed on the headwaters of Coomallo Creek.

Coomallo Creek is a tributary of the Hill River system which has been proclaimed under the provisions of the Rights in Water and Irrigation Act 1914 and has other users of these surface waters at points downstream. It is considered necessary for some assessment of the proportion of the flow of Coomallo Creek that is derived from that portion of the catchment above these dams, and of the impact that these dams will have on the total flow in Coomallo Creek. Again, any Agreement Act proclaimed for this project should be subject to the Rights in Water and Irrigation Act 1914.

2.2 Groundwater

The proponent has briefly examined the potential of drawing cooling water from aquifers other than the mid-level Yarragadee but only in the form of a desk study. The ERMP does not contain sufficient detail to enable an assessment of the adequacy of this desk study. Considerable drilling and testing of the preferred wellfield site has been undertaken to the exclusion of other possibilities.

The proponent has failed to evaluate the neighbouring Cockleshell Gully Formation resource, which has a large storage of brackish water. Use of this resource would conserve the more valuable Yarragadee resource which is largely potable. While it is expected that use of brackish water would be more expensive than fresh water, the Water Authority believes the proponent should clearly demonstrate the feasibility or otherwise of all water source options.

The proponent has not carried out detailed evaluation of the deep Yarragadee Formation. The thickness of the Yarragadee resource has not been defined but GSWA drilling has confirmed the aquifer extends to at least 800m in the area. Abstraction from levels deeper than those proposed could reduce impacts on the surface water environment, but this option has only been considered by the proponent as a contingency measure.

3.0 GROUNDWATER INVESTIGATIONS AND MODELLING

The proponent has engaged A.G.Consulting (AGC) to investigate and evaluate the groundwater supply aspects of the project. AGC has conducted a programme of drilling, testing and hydraulic analysis of the resource which includes the completion of 5 test production wells, five shallow level observation wells and 18 multi-piezometers.

Data derived from the investigative work was then used to develop an uncalibrated 3D groundwater model to simulate extended pumping of the aquifer and determine likely potentiometric drawdowns in the deeper level Yarragadee aquifers and likely impacts on the water table. Modelling predicts that drawdown of the potentiometric level may be up to 50m to 90m in places and in general drawdowns of >10m may be experienced over an area of approximately 450 sq. km. It is stated in the ERMP that the water table will remain essentially unaffected yet it is also stated that water table drawdowns may range from zero to as much as 20m.

Uncertainties arise because of the likely impact of regional hydraulic continuity effects which usually occur over long time scales. The nature of the Yarragadee Formation, which is variable lithologically in both the lateral and vertical sense, and is likely to be partially compartmentalised internally by faulting, makes reliable computer simulations of water table drawdown difficult if not impossible. The situation is complicated further by the fact the the strata are likely to be dipping. The modelling has attempted to simulate vertical anisotropy but has not attempted to simulate lateral anisotropy, faulting or strata dip. Accordingly estimates of water table drawdown using this approach must be viewed with caution.

In addition, model predictions have been based on limited pump test data and the extrapolation of this data to make long term predictions of head changes requires considerable caution. Uncertainties in the model are further compounded by the fact that at no stage have the shallow level sediments (<50m) in the Hill River and Coomallo Creek areas been confirmed as either Yarragadee Formation or more recent alluvial deposits. This is significant because all testing of vertical hydraulic conductivity was conducted in the Hill River area and the results were subsequently extrapolated over the entire model. This extrapolation would clearly be invalid if the shallow sediments are in fact alluvial.

4. EFFICIENCY OF WATER USE

The proponents have examined three water cooling options:

- Evaporative cooling using groundwater or seawater.
- Once-through cooling using seawater.
- Dry (air) cooling and partial dry cooling.

Evaporative cooling using groundwater was chosen as the only economic option.

The dry cooling option is claimed to use approximately 20% of the water required by full evaporative cooling, although no detailed costs have been presented in the ERMP. The dry or partial cooling options are preferred by the Water Authority, rather than full evaporative cooling, because of the reduced demand on the groundwater resource. These options may prove to be economic if the full economic and social costs of aquifer drawdown are included in the calculations. At this stage the full environmental, economic and social costs of aquifer drawdown have not been adequately assessed.

The Water Authority considers that the proponent has not explored advanced technology for water conservation in sufficient detail. The Water Authority recommends that the all cooling options be examined by experts in process technology to ensure an informed opinion on water conservation technology is obtained.

5. SUSTAINABILITY OF SUPPLY

The preferred option of a Yarragadee water supply source, in combination with evaporative cooling, will consume 300 mill.cu.m of groundwater during the project life. The proponent presents the case that this volume constitutes only 0.3% of the total available resources within 30 km radius of the plant site. This statement is misleading when considering the issue of sustainability of supply. A groundwater supply is regarded as sustainable when the aquifer achieves an equilibrium such that the abstraction can continue indefinitely without causing unacceptable degradation of the aquifer or environments reliant on the aquifer.

The Water Authority considers that the aquifer will be partially mined during the early stages of wellfield abstraction but will reach equilibrium during the life of the project. The drawdown cone produced by the wellfield will expand until the area of influence is large enough to command sufficient recharge to satisfy abstraction. While aquifer depletion as predicted is acceptable with respect to groundwater resource management, the impacts on the environment relying on the aquifer may be unacceptable.

6. BENEFICIAL USE OF RESOURCE

The Yarragadee Formation aquifers constitute a large resource of essentially potable water. If the resource is used by the proponent it will be committed for 30 years and will take a considerable period (up to 20 years) to recover to original conditions. While substantial recovery will be rapid and probably occur within 2 to 3 years after pumping ceases, recovery of aquifer pressure sufficient to feed springs will occur gradually over a longer period.

Existing use of the resource includes farm, stock and domestic supplies and limited market garden supplies. Potential future uses could include market gardening, wildflower farming and citrus cultivation. These industries are moving northwards from the established growing areas near Perth and with recent concern about the impact of horticulture in the Gingin Groundwater Area expansion into the Arrowsmith and Jurien Groundwater Areas could accelerate.

The Water Authority accepts that economically, in terms of product value per unit volume of water consumed, power generation is of much greater value than for horticultural or most other conceivable uses in the area. However, this should not preclude the assessment of lower quality resources such as the Cockleshell Gully resource or seawater, as other lower value uses (ie horticulture or public water supply) often do not have the option of using poorer quality water.

7. ENVIRONMENTAL AND SOCIAL IMPACTS

Drawdowns in the deeper level Yarragadee aquifers and the shallow water table aquifers, resulting from extended pumping of the proposed wellfield, will have social, economic and environmental impacts. It is likely that many farm wells will be effected as well as some springs and soaks, including Hill River Spring. Most vegetation in the region is xerophytic and will be unaffected by lowering of the water table, however it is probable that vegetation in the Coomallo Creek and Hill River valleys will be affected.

The proponent makes the commitment to compensate or replace any farm wells which fail as result of pumping but does not make any commitment with respect to maintenance of the Hill River and Coomallo Creek environments.

There is a broad commitment to monitor the anticipated area of depressurization and rectify any detrimental trends before any damage occurs in the surface environment, which would involve redistributing abstraction within the wellfield and if necessary testing and developing alternative sources.

It is conceivable that the water table could decline too rapidly in the Coomallo Creek and Hill River areas to allow sufficient time for evaluation of alternative resources. The Water Authority considers that alternative sources and contingency plans need to be more thoroughly evaluated before the project is approved.

8. CONCLUSIONS

While the Board of the Water Authority has conditionally approved in principle, the allocation of groundwater from the Yarragadee Formation to the project, it is considered that the proponent has not met the conditions of that approval. Therefore, at this stage, the Water Authority does not support the proposal as detailed in the ERMP.

After reviewing the ERMP and associated documents the Water Authority has a number of concerns which are summarised below:

- The proponent has not satisfactorily examined the possibility of siting the power station at the coast, in conjunction with once-through seawater cooling.

- The proponent has failed to sufficiently evaluate the neighbouring brackish water supply resource of the Cockleshell Gully Formation or other alternatives.

- The proponent has not explored water conservation technology options in sufficient detail.

- The proponent has not carried out detailed evaluation of the deep Yarragadee resource (500-800m). It is expected that pumping from these depths would result in much lower impacts at the water table than those expected for the proposed wellfield.

- The proponent's predictions of water table drawdowns must be viewed with caution and if significant drawdowns were to occur in the early stages of the project, contingency plans as outlined in the ERMP could be inadequate.

While the allocation of water can be dealt with by the Water Authority under it's own legislative powers, the Authority strongly believes that environmental approval should not be given unless all of the issues related to water allocation are satisfied. In view of the potential environmental impact of proposed abstraction, it is appropriate that water allocation approval be subject to environmental approval, rather than the reverse.

Hill River Power Development Company Pty. Ltd.
(Incorporated in Western Australia)
A CRA/Barrack House Group Venture

23 March 1990

Dear Landholder,

The Hill River Power Development Company Pty. Ltd. and Canning Resources Pty. Ltd. have recently submitted an Environmental Review and Management Programme (ERMP) to the Environmental Protection Authority (EPA) of Western Australia, for the Hill River Project.

The Project incorporates a proposed coal mine and coal-fired power station to be located some 28 km north east of Jurien, south of the Coorow-Greenhead Road. Following a period of review by the EPA, the Project ERMP will be available for public scrutiny and review.

The Hill River Power Development Company Pty. Ltd. (HRPDC) is a joint venture company owned by CRA Limited and Barrack Power Development Pty. Ltd. Canning Resources is a Business Unit of CRA and will be responsible for the development of the coal resource. The HRPDC will be responsible for the construction of the power station.

The purpose of this letter is to notify you of the proposed development of a borefield to supply the planned Hill River power station and to let you know that the HRPDC will unconditionally guarantee your existing water supplies in the event that they are adversely affected by the borefield's operation.

The power station is designed to employ an evaporative cooling system to reject heat from the turbine generators and condensers. The power station will use an average daily water volume of 24.5 Megalitres (out of an average total Project daily requirement of 27 Ml.), the majority of the water being consumed by the cooling system. It is proposed that the water be abstracted from a borefield adjacent to the Project site. The borefield would comprise 19 bores, each bore spaced a minimum of 2 kms apart and having an average depth of approximately 300m. The borefield's operation and impacts will be detailed in the ERMP.

A conceptual borefield layout map is attached. At this stage, we can only show possible production bore locations. The final sites of production bores depends on gaining approval for the Project, obtaining a groundwater abstraction licence from the Water Authority of W A and reaching agreement with private landholders on access to land required for the borefield. At each production bore site, it may be necessary to provide a cleared area of up to 50 metres by 50 metres during bore construction and to retain a permanently cleared 10m x 10m fenced compound to house the bore. Each of the sites will be connected by an access easement, approximately 12 metres wide, containing a vehicle track, pipeline and powerline.

It is expected that legal tenure of the bore sites will be a condition of any abstraction licence. It is also expected that the easements will need to be secured by purchase or lease.

A survey of bores and soaks within the possible influence of the proposed borefield has been undertaken and it indicates that they generally tap shallower aquifers than the deep aquifers within the Yarragadee Formation, which would be the source of water supply for the power station. It is considered that abstraction from the power station borefield would have little or no adverse affect upon the majority, if not all, the bores and soaks in the area, including those bores that go deeper than most and into the aquifers of the Yarragadee Formation. This is particularly the case for farm water supplies located west of the Warradarge fault, which generally acts as a hydraulic barrier. (The approximate position of the fault is traced on the conceptual borefield layout map).

You have been identified as the owner of a property upon which a bore(s) and/or soak(s) are already known to be or are presumed to be located. Please refer to the attached regional bore census map and the accompanying list which identifies the Location on which each of the 98 bores revealed by the bore census carried out in 1989 are situated. We acknowledge that there may well be existing bores which are not shown on the map. If so, please let us know.

Notwithstanding our comments above, should you be of the opinion that at any time during the proposed 30 year life of the power station, that the power station borefield is having an adverse impact upon your own water supply abstraction, HRPDC will appreciate your early advice.

In order to put yourselves in a position to determine whether your bore/soak has been adversely affected by the power station borefield, we strongly suggest that.

a) You contact your local regional office of the Water Authority of W.A. to have bores licensed;

b) You notify us as soon as possible of the capabilities, dimensions and volume of water abstracted from your present bores or other water supply points.

Provided that the reduction in water supply from your own bore(s) and/or soaks(s) is the result of abstraction from the power station borefield then HRPDC unconditionally undertakes to:

i) Extend your existing bore(s) to provide no less than the volume of water previously extracted.

OR

ii) Develop an alternative bore, on your property, to provide no less than the volume of water previously abstracted from your own bore.

OR

iii) Provide a similar volume of water from the power station reticulation system to your point of usage;

OR

iv) Negotiate a compensation agreement to the joint satisfaction of you and HRPDC.

You should be aware that if the power station borefield is given approval, a major condition of the abstraction licence will be to operate an extensive monitoring network to determine the impacts, if any, of the borefield's operation. Already, there are 45 regional bores being monitored to ensure that an adequate monitoring data base is in place well in advance.

Should you wish to discuss this letter further and our undertaking please contact:

Chris Schrape
CRA Business Development WA
(09) 481 2522

Yours Sincerely

N W Ford
General Manager
Hill River Power Development Company Pty Ltd

CC: Shire Clerk
Dandaragan

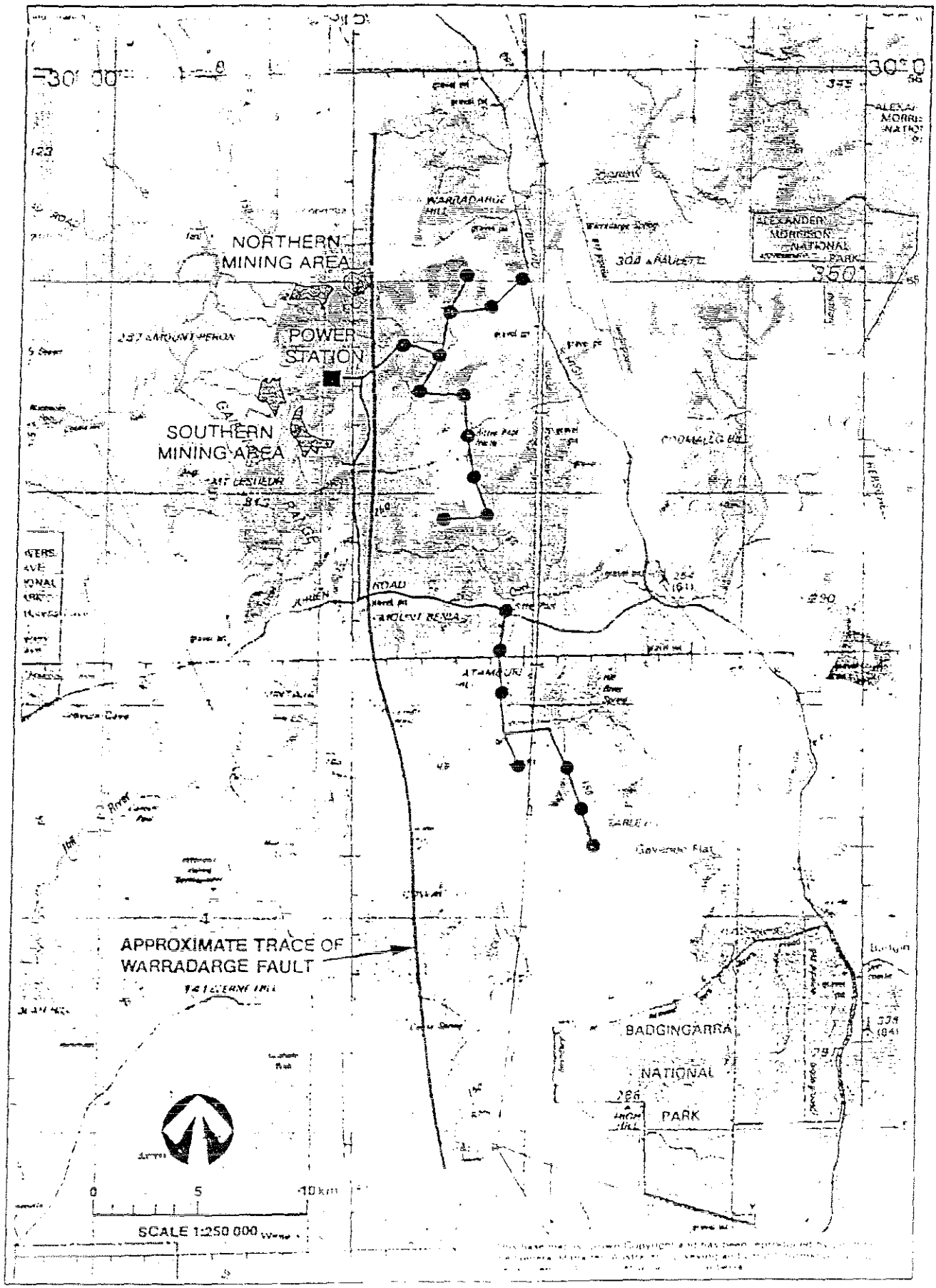
Shire Clerk
Coorow

089/cjs

REGIONAL BORE CENSUS LOCATION LIST

Bore No.	Location
1,2,3	3744
4,5	3743
6,7	3742
8	3737
9,10,11	3738
12	3737
13	2833
14,15,16,17,18	3002, 3779
19	3797
20	10173
21	10176
22,25	10175
23,24	10174
26,28	10173
27	3740
29	3438, 9743
30	2833
31,32	946, 947
33	7499, 10157
34,35,36	3704
37	3704
38,39,40,41	10303
42	10177
43	6937
44	10379
45,46,47,48	10150, 10303
49,50	3741
51	6993
52,53,54	10168
55,56	10828
57,58	10827
59	10823
60,61	10829
62	11090
63,64	10170
65	3737
66	10176
67	3710
68	3878
69,70	3747
71	3757
72	3753
73	1220, 3879
74,75,77	3850
76	10825, 10826
78	3728
79	10805

Bore No.	Location
80	10810
81	10808
82	10806
83,84	10808, 10809
85	10368
86	10256
87	10257
88	10825
89	10804
90	10812
91	10812, 10813
92	10840
93	10839, 10840
94	10811
95	10804
96,97	10838
98	10815



CONCEPTUAL DOPPLER LAYOUT

HEADWORKS & TREATMENT BRANCH
POLLUTION CONTROL SECTION COMMENTS 18TH JULY 1990

ERMP AND EIS FOR PROPOSED HILL RIVER OPEN CUT COAL MINE AND POWER STATION

The Pollution Control Section has reviewed the documentation for the above development in regard to the water pollution control aspects and forwards the following comments for inclusion in the Authority's consolidated reply to the Environmental Protection Authority:

1. Evaporation Pond

The report visualises that this pond will contain numerous waste effluent streams and it is proposed that the pond will be suitably lined, possibly with clay. Before the Water Authority could comment on the suitability of such a clay liner, the proponent should be required to provide additional information as to the quality of the effluent that is to be contained within this pond.

The continued evaporative operation of this pond during the life of the power station will cause substantial concentration of contained solids which will make it essential that its design ensures its practical impermeability. In the event that the proponent cannot assure the Water Authority of the ponds lining impermeability, the Authority would require a liner similar to the plant water storage pond, vis. a synthetic liner. If the proponent has found it necessary to line the plant water storage pond with HDPE presumably on the basis of a clay lining not being sufficiently secure, then it would be incongruous to assume that clay would provide sufficient sealing of an effluent storage pond.

The proponent has made no commitment to carry out any monitoring of this pond. A monitoring programme to assess the impact of the operation of this pond should certainly be a condition of any approval to proceed with this development.

The rehabilitation program for this pond proposes its drying out, capping, and revegetation. To prevent long term leaching from this pond upon abandonment, the evaporated solids from the pond should be removed off-site to a suitably approved site which poses minimal threat to groundwater quality.

2. Emergency Ash Pond

It is proposed that this pond be clay lined. We raise grave concerns about the practicality of maintaining a (non-cracking) clay seal for what would be only a contingency facility. Before any approval could be given for this type of liner being used in this facility, the proponent would be required to develop a satisfactory maintenance programme that would ensure the integrity of the clay seal ready for immediate use, after extended periods of stand-by duty.

Similarly to the evaporation pond, the proponent has made no commitment to any form of monitoring of the impact of the operation of this pond, which should be a requirement of any approval given to this project, if ash is to remain in the facility for any extended period.

3. Fly Ash Disposal

A system of flyash disposal is proposed based on distribution of the waste in isolated consolidated pockets within the overburden dumps. This proposal is based on the premise that by distributing the flyash over a large area, the threat to groundwater quality is less than that normally posed by concentrating the flyash in a single dedicated disposal containment.

The regional groundwater is of potable quality and Water Authority policy calls for protection and maintenance of this quality. The proponent has, by in part assuming that drinking water criteria have an inbuilt safety factor of x 100, claimed that this disposal methodology will not render the receiving aquifer non-potable. Although such criteria have safety factors built into them, the level of that factor varies considerably with

each contaminant. Of special local concern are the drinking water criteria for both total dissolved solids and sulphate concentrations. Before any further consideration or approval could be given for the proponents flyash disposal methodology, we will require additional information regarding the actual impact of leachates on the receiving groundwater body. This should include modelling data which demonstrates that both vertical and horizontal diffusion of leachates maintains current drinking water criteria within the receiving water body for not only metal contaminants, but also for total dissolved solids and sulphates.

Further the proponent has made no undertaking to carry out monitoring of the effects on groundwater of their proposed flyash disposal system, which would be a condition of any approval for the proposal.

4. Effluent Pipeline

Although the report's comment on the operation and management of the ocean disposal pipeline between the power station and the ocean is considered satisfactory, the effect of a burst discharging up to 1 ML into the environment is unacceptable. The proposal should be re-addressed to reduce the threat of a large scale discharge resulting from a burst pipeline.

5. Domestic Sewage Disposal

The proponents should be requested to detail the type of treatment, vis. biological package plant or a treatment pond system. The degree of treatment should be stated as the quality of the resultant effluent will have a direct impact on the final method of disposal, i.e. either irrigation or evaporation. Dependent on the final disposal option selected the proponent may be required to provide a management program that addresses nutrient assimilation.

Appendix 2

Letter from the Department of Agriculture

THE DIRECTORATE

WESTERN AUSTRALIAN DEPARTMENT OF AGRICULTURE

Our ref: 1440/88
Your ref:
Enquiries: C. Malcolm
Date: July 27, 1990

3 Baron-Hay Court
South Perth
Western Australia 6151

Tel: (09) 368 3494
Telex: AA93304
Fax: (09) 368 1205

The Chairman
(Attention: Mr W. Tacey)
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

ATTENTION: MR W. TACEY

PROPOSED HILL RIVER COAL MINE AND POWER STATION

Please find enclosed the submission of this Department concerning the above. Comments in this Department's submission may be used fully or partially in the EPA assessment report.

The submission may be referred in its entirety to the proponent but the Department would appreciate the opportunity to comment on the proponent's response.

The EPA may refer to this Department's submission in discussion and/or by direct quotation of extracts.

The Department views with concern the likely impacts of the project in the region and recommends that the project should not proceed unless and until the matters raised in this Department's submission are fully addressed.

Yours sincerely

(R.A. Nulsen)
A/DIRECTOR OF RESOURCE MANAGEMENT

Enc.

The draft EIS concentrates on demonstrating how small an effect the Hill River power station will have relative to global CO_2 output. This argument can be advanced for all similar developments but leads to an integrated effect of great significance.

An adequate analysis of alternatives such as energy conservation could hardly be expected from a coal-fired power station proponent. It is to be hoped the EPA will ensure that all options are thoroughly evaluated.

Effects on Farm Water Supplies

Existing bores on farms in and around the proposed borefield only penetrate a few metres into the watertable. The draft EIS states that expected lowering of the watertable is from zero to 20 m. It is likely supplies of water from a high proportion of the 98 farm bores in the zone of influence will be adversely affected.

The prime agricultural land affected carries high stocking rates of sheep and cattle with an estimated peak water requirement of 20 kL per day on an average sized property (1,700 ha). On these properties about 80 per cent of farm income is from grazing.

The draft EIS indicates that the proponents would compensate landholders by providing alternative water supplies. It may be fairer to oblige the proponents to restore the water supplies. It is not clear how the company would deal with the farmers, who may require a body to negotiate on their behalf.

Economics

The economics of the Hill River Project is poorly covered in these documents. What is called economics is descriptive and contains no analysis. There is little to comment on.

It seems inappropriate that such a major project has not been subjected to a cost benefit analysis. Even if the analysis did not attempt to deal simultaneously with financial and environmental implications, it would have been valuable.

Possible implications of the project to farmers in the region are:

- increased community services including education;
- higher land prices; and
- reduced groundwater supply.

Compensation for farmers whose groundwater supplies are affected by the project is proposed. The terms of compensation require mutual agreement of farmers and developers. In effect, it would be a de facto market transfer of water, requiring that sufficient compensation is paid for farmers to willingly accept reduced water supplies.

Authorship

The Department of Agriculture submission has been prepared by C.V. Malcolm, I.A.F. Laing, G. Luke, P. Dolling, D. Morrison, R. Kingwell and R.A. Nulsen.

The Department of Agriculture is concerned to conserve the State's land resources in a condition in which their productive potential is not diminished but rather enhanced. The Department has an interest in air, soil, water and biological resources as they relate to current or potential future productive potential.

Land and Water for Horticultural Use

Only 3,000 ha of land are known to exist in the State which could be developed for horticulture (a reallocation of water resources could lift this to 5,500 ha). It is estimated that 5,000 to 10,000 ha are needed for horticultural development in the next 10 years. The 10,000 ML p.a. of water to be extracted for the Hill River Project is sufficient to irrigate 650-700 ha of intensive horticulture. The income from such an area would be $10,000 to $50,000 per ha p.a. or around $35 million p.a.

Effects on Soil Acidity

The ERMP draft EIS states that 2.5 million tonnes of coal of 1.1% S will be used each year. There is inferred to be some retention of sulphur in the ash and in coal preparation but the quantity of SO_2 emitted is not specified. It can be calculated that total potential emissions of S from the stack would be 27,500 tonnes. Discussion on the distribution of the plume (p 8.2) indicates that most of the pollutants will reach ground at about 2-10 km from the stack, an area of about 31,500 ha.

The soils near the coast have a relatively high pH but inland the soils range from about pH 5.7-6.0. Any significant lowering of the pH of these soils would seriously disadvantage agriculture and necessitate adjustments such as lime application.

It is estimated that the sulphur coming to ground from the stack could cause a lowering of 1 to 1.5 pH units in a year. The magnitude of this change is influenced by the low buffering capacity of the soils. The S application is of the order of 0.8 t/ha which is equivalent to about 2.4 t/ha of lime. One tonne of lime per ha is expected to raise soil pH by about 0.5 unit pH. The pH changes due to S and lime are approximately linear between pH 4 and 8.

The implications of these predictions for agriculture are extremely serious. It is therefore of great concern that the matter of soil pH change has not been addressed in the draft EIS.

Effects of Air Pollution on Vegetation

The natural vegetation is specifically adapted to growth on soils of particular type and pH. The relationships between vegetation types and soils are discussed in the draft EIS.

The soil pH changes discussed above would have serious consequences for the natural vegetation but have not been addressed in the draft EIS.

Effects of particulates and gaseous emissions on the natural vegetation have been discussed in the draft EIS. It has been concluded that effects would be minimal. However, that conclusions are based on studies on the effects on vegetative growth of higher plants. It is widely recognised that lichens are

Appendix 3

Letter from the Department of Fisheries

FISHERIES DEPARTMENT

Your Ref:
Our Ref:
Enquiries:

108 Adelaide Terrace, East Perth,
Western Australia 6004
Telephone (09) 325 5988

Telegraphic Address:
Fishwa, Perth

Telex: 93832
Fax (09) 325 3134

The Chairman
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Attention Mr W Tacey

THE HILL RIVER POWER STATION PROJECT - ENVIRONMENTAL REVIEW AND MANAGEMENT PROGRAMME

The nearshore waters at Jurien are an important part of the local rock lobster fishery and are also popular for recreational fishing by the resident population and tourists.

The Fisheries Department's main concern with the above project is the proposed discharge of saline wastewater into the ocean at Jurien Bay. This aspect has been examined in detail in Appendix B of the ERMP.

From the analysis of the wastewater components, the projected dilution in the receiving nearshore waters and the impact assessment given in the ERMP the discharge should not exert any harmful effects upon the marine environment in Jurien Bay. However it is important that, when the discharge site is finally chosen, the predictions on dilution levels and dimensions of the mixing zone are further examined. It would be mutually advantageous if the proponent's choice of the discharge site is made in consultation with the local commercial fishermen via the Western Australian Fishing Industry Council (WAFIC).

The scope of the environmental management and monitoring programme for the wastewater discharge described in Appendix B is broad and sufficient to cover fisheries concerns, both before and after construction of the pipeline. But it is necessary that the proponent gives prior agreement to carry out any modifications to the wastewater system which may be required in the event that the rock lobster fishery is shown to be adversely affected by the discharge.

39282

The Fisheries Department and WAFIC should be regularly informed on the progress of the monitoring programme and on any significant changes in the nature and quantity of the wastewater components.

B.K. Bowen
EXECUTIVE DIRECTOR

25 July, 1990

Appendix 4

Letter from the National Parks and Nature Conservation Authority regarding national park status for the Lesueur area

NATIONAL PARKS AND NATURE CONSERVATION AUTHORITY

January 18, 1989

Hon B.J. Hodge, MLA
Minister for Conservation and
Land Management
May Holman Centre
32 St George's Terrace
PERTH WA 6000

Dear Mr Hodge

RE: MT LESEUR RESERVES

Arising from difficulties encountered during the implementation of the Red Book recommendations the National Parks and Nature Conservation Authority has become aware of the proposals for coal mining in the Mt Leseur area. Following a request for information, a briefing by officers of the Departments of Mines and Resources Development and the exploration company was arranged.

The NPNCA believes that this location is of the highest conservation value. The area has been recommended for conservation reservation since the first systematic study of conservation through reserves was made in Western Australia.

We believe therefore that any proposal for mining in this area should be dealt with according to the Government's policy for mining in national parks and A class nature reserves.

The view of this Authority is that if any area in Western Australia is to be protected from mining then this area should be so protected. From our current knowledge of the mining proposal the area which would be affected by mining is vital to the integrity of the Mt Leseur nature conservation reservation.

HACKETT DRIVE CRAWLEY, WESTERN AUSTRALIA TELEPHONE (09) 386 8811
All correspondence to be addressed to Department of Conservation and Land Management
P.O. BOX 104, COMO 6152.

It is important to note that this area has very high landscape values as well as nature conservation importance. This means that the area could be classified as a national park to recognize both values.

The National Parks and Nature Conservation Authority believes it is important that immediate protection should be given to the area by classifying it as either national park or A class nature reserve.

Yours sincerely

(Norman Halse)
CHAIRMAN

Mr D. Hampton
Acting Secretary
Policy Councils and Committees
Department of Conservation and
Land Management
Hackett Drive
CRAWLEY WA 6009