Environmental Impact Assessment in the Planning Process for Mining Projects

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This paper explains the matters which would normally be dealt with in an Environmental Impact Statement and presents an overview of the legal regime under which Environmental Impact Statements are prepared in Australia.

Introduction

The legal circumstances under which assessment of aspects of environmental effects of mining projects in Australia can take place are myriad. Annexure 1 contains a list of relevant legislation in the State of Queensland grouped under the headings Administrative Co-ordination, Resources Management and Development/Planning; Pollution Control; Conservation of Natural Resources; Conservation of Cultural and Historical Property; and Resource Development, Harvesting and Extraction. 1.

When one seeks to identify the position across the various States and Territories of Australia, and then to superimpose the extent of the Federal Government's environmental powers, the task becomes of textbook, if not encyclopaedic, proportions. In the case of the coal industry in Australia, this apparent complexity would give an incorrectly pessimistic picture. 3. This paper is therefore confined to formal environmental assessments where the proponent of a proposed mining project is required to prepare, and have assessed, a formal document. The document goes under various names, the most common of which are environmental impact studies or environmental impact statements. The paper will use the term "EIS", which is now in common usage throughout Australia.

Furthermore, although many features are common to other projects, this paper will restrict its emphasis, and the examples it uses, to the coal industry.

In an international forum most can be gained by seeking to present a clear picture of what is actually done in Australia, unobscured as far as is reasonable by commentary on aspects which may be of particular importance or interest to the local practitioner but which may distort the picture of what is actually done.

This paper then, and its verbal presentation, will be directed towards an explanation of what, in Australia, normally appears in an EIS. To put this into context, I will begin by an overview of the legal regime under which EIS are prepared, and follow the descriptive part with a comment on how environmental protection measures are subsequently enforced.

Finally I will conclude with some brief observations on the current environmental debate in Australia and some possible new developments.

I should say at the outset that the EIS procedures around Australia by no means constitute an exclusive code for environmental approvals. Apart from the plethora of legislation which regulates by statutory injunction matters environmental, there are other means by which environmental challenges can and are being mounted - the process of acquiring a production title, and, in some States, town and country planning scheme approvals, at local and State Government levels, provide the major avenues for this. Those issues are whole subjects of their own, and I don't propose to attempt to deal with them this morning. What I do want to emphasise is that, in commenting on the relative lack of trouble the EIS procedure has to date apparently generated, I don't want to give the false impression that environmental issues in Australia are not high on the agenda - quite the contrary is the case.

The Legal Regime

Both Federal and State Governments exercise, and are expected by their electorates to exercise, environmental responsibilities. The Federal Government's powers are constitutionally limited. The Federal Government's export power, however, gives it a clear opportunity to exercise environmental authority in relation to minerals from which exports are proposed. 4. Therefore export oriented mines will be governed by Federal requirements as well as those of the relevant local jurisdiction.

The source of the federal requirement to prepare, and have assessed, an E.I.S. is the Environment Protection (Impact of Proposals) Act 1974.5.

The operation of this Act is best understood by considering the terms of S.5(1) of the Act:

"The object of this Act is to ensure to the greatest extent that is practicable that matters affecting the environment to a significant extent are fully examined and taken into account in and in relation to:

(a) the formulation of proposals;
(b) the carrying out of works and other projects;
(c) the negotiation and operation and enforcement of agreements and arrangements (including agreements and arrangements with and with authorities of the States);
(d) the making of, or the participation in the making of decisions and recommendations; and
(e) the incurring of expenditure by or on behalf of the Australian Government and authorities of Australia either alone or in association with any other government authority, body or person."
Under the Act a full environmental impact statement can be required, or where a proposal is of public concern but with less complex environmental implications, a public environmental report. The difference between the full E.I.S. and the lesser public environment report is, largely, one of degree. A full E.I.S. must however contain an analysis of the need for the proposed action, indicate the consequences of not taking it, include detailed information and technical data adequate to permit a careful assessment of the environmental impact, and undertake a detailed analysis of the primary, secondary, short-term, long-term, adverse and beneficial environmental effects, none of which are required for a public environment report.

Administrative procedures promulgated under the legislation 6. make detailed provision for the contents of these reports and the arrangements for public review of an E.I.S. The initial EIS is formally referred to as a draft. The draft, amended as necessary and incorporating a summary of any public submissions that may be received and the proponent’s response, becomes the final EIS. The Act does contain procedures for public hearings but those procedures are not commonly implemented.

The High Court has held that members of the public at large, having no direct material interest in a development, have no standing to challenge in the courts the validity of purported compliance with the Act and the orders made under it, and that environmental groups can claim no such special interest. 7.

The various States also have requirements for the preparation of EIS. I will use New South Wales and Queensland as examples as they are the principal coal-exporting States.

In New South Wales the source of the legislative authority is the Environmental Planning and Assessment Act of 1979, an Act covering planning in general in the State. The Act requires that an E.I.S. be prepared when prescribed by regulation or when the activity concerned is likely to affect the environment significantly. It is left however to the relevant decision making authority to conclude whether an EIS is so required. Again there is an opportunity for public scrutiny of an EIS and for a review of any submissions that may be forthcoming.

In Queensland the legislative centrepiece is s.29 of the State Development and Public Works Organisation Act 1971. S.29(2) provides:

"In considering an application made to it for the granting of approval for a development or in considering the undertaking of works, it is the responsibility of -

(i) any department of the Government of the State;  
(ii) any Crown corporation or instrumentality or other person or body representing the Crown;  
(iii) any local body;  
(iv) any board, board, authority or corporation constituted or incorporated by or under any statute and authorised by statute to perform public functions or carry on a public undertaking, when it appears that the undertaking of such development or works is likely to have major environmental effects to take such environmental effects into account, and in doing so to have due regard to such policies or administrative arrangements as may be approved from time to time by the Minister to the extent that the same are compatible with legislation for the time being in force in the State."

The Administrative Procedures published for this purpose 8. distinguish between “Responsible Authorities”, normally government agencies which are empowered to consider the grant of a requisitive approval, and “Advisory Bodies”, government or private organisations possessing a relevant expertise or competence.

The Procedures are commenced by the submission to any relevant Responsible Authority by the developer of a proposed project of an initial advice statement, which would normally be relatively brief. If the Responsible Authority believes an impact assessment warranted, it will refer the initial advice statement to any relevant Advisory Bodies. Taking into account comments received, the Responsible Authority will propose terms of reference for the E.I.S. The Procedures state:

"Where applicable, the impact assessment study should be required to provide -

(a) Description of relevant aspects of the existing environment;  
(b) Description of the development proposed and any optional means of achieving the development objectives;  
(c) Definition and analysis of the likely impact of the development on the environment;  
(d) Definition of all significant impacts and measures proposed to mitigate against those effects; and  
(e) Presentation of an environmental management programme to monitor actual impacts of a development and mitigate adverse impacts."

The report once prepared is circulated to the Advisory Bodies for comment. Based on all this, the Responsible Authority determines whether approval for the development be given, and if so, on what conditions.

There is no requirement in Queensland for an EIS to be made public as a matter of course, although private organisations may be designated Advisory Bodies.

While of course there is potential for enormous confusion in having to comply with separate procedures and requirements at State and Federal level, in practice liaison between the project proponent and officers at the State and Federal Departmental levels have ensured in recent times that only one statement is required.

Attached as Annexure 2 is an actual set of guidelines for the preparation of an E.I.S. for a proposed Queensland coal project.
The Contents of an EIS

Typically an EIS, which will be prepared by engineering consultants, will commence with a summary of the relevant proposal, assessed environmental impacts and control measures. It will then deal, in more or less detail, with a description of the proposed project, the present natural and human environment, the consequences on both of implementation of the proposal and the measures proposed to deal with these consequences. It will normally contain a number of technical and statistical appendices which will typically overwhelm in volume the substantive part of the report.

The description of the project will deal with the nature and extent of all proposed activities, equipment and plant. It will make particular reference to proposed techniques of clearing of surface, overburden removal, land rehabilitation, drainage control, treatment facilities and waste disposal. Two subjects that will generally receive minimal or no treatment are any attempt at analysing the social consequences of the proposal or any serious economic cost-benefit analysis.

The report will normally identify and describe characteristics of the terrain, the climate, the surface water and ground water, flora, fauna, the existence of any matters of aboriginal or historical significance, noise and air quality, the existing land usage and the final (post-mining) land usage. In addition it will, where relevant, examine the present situation of the environs, in respect of towns, traffic, transportation and visual impact.

The report will explain the effect of the project, if implemented, upon the environment in each of these aspects and where that effect may be seen to have the potential to be in any way substantial, describe any measures proposed which are designed to limit the effect.

On occasion, an EIS must address circumstances which are regarded as commercially sensitive. At both Federal and State levels provision is made for separating out such information, usually in a separate document, which will not become available for public scrutiny.

Noise

“A comparison of the existing and predicted noise levels outlined in Tables 4.5 and 4.7, reveals that it is possible that mine associated noise could be audible at the [ ] and [ ] homesteads. It should be noted however that the circumstances outlined in Table 4.7 are a “worst case” situation and do not take account of the significant attenuation effects of the mining activities gradually descending into the mine pit. Therefore, it is assumed that while some mine associated noise may be audible at the two homesteads, it will mainly be during the initial stages of mining, after which time it is expected that the majority of the mining noise will be contained within the mine pit.

Blasting will occur each week only in daylight hours and will result in quite high noise levels. This noise will be heard at much greater distances than the general mining noises but will be of short duration. Infrequent large blasts, if well designed, generally have less impact than a greater number of small blasts fired at irregular intervals. Provided that residents within the audible distance of the mine sources are given adequate warning of the blasting programme, no cause for complaint should arise. To reduce annoyance the company will attempt to programme the blasting for the same hours of the day on nominated days of the week.

It is not expected that noise from the site will be in conflict with existing land uses in the area, and effects on any stock or wildlife should be minimal.”

Water Discharge

“Most of the run-off from catchments around the mine site will be diverted around the mining area to minimise the quantity of water entering the mine. Water which enters the mine workings from groundwater seepage or from rainfall on the working and service areas will be pumped to settling dams before being discharged to the [ ] ash dam or [ ] Creek downstream of the mine. Water used for dust suppression around the mine will be drawn from the settling basins.

Tests of groundwater quality show that the water from the mine can be expected to be neutral with minor corrections for iron and manganese.

The quality of the water in [ ] Creek downstream of the mine will be monitored throughout the life of the mine and if a deterioration of the water quality due to the mining activity is observed, appropriate action will be taken to correct the situation.

Run-off from the contaminated areas around the coal crushing and preparation plant will be treated to ensure quality is within statutory requirements before discharge into streams.”

Flora

“Ranges: As far as can be established, predominant native flora and vegetation types of the ranges do not depend upon the subsurface aquifer which is it is proposed to dewater. Scientific literature suggests that the heathy mallee, stringybark and related scrubby vegetation of the ranges relies on a soil moisture storage less than the field capacity; i.e. the water held against the action of gravity just above the water-table. Similar vegetation types are known to thrive in situations elevated 40m above local water-tables.

Mitigation measures: It is proposed to initiate a programme to monitor the response of native trees and shrubs to water stress. The actual measurement programme will be dependent upon the range of plants affected. A reasonable assumption is that water stress might
first be apparent in *Eucalyptus camaldulensis* (River red gum) whose requirements include high soil moisture and seasonal flooding. A programme of measurement of xylem pressure potential of distressed trees will be instituted to determine those affected adversely by lower soil moisture. If old mature trees show stress, it seems unlikely that a watering programme could be effective and replacement with seedlings from local seedstocks would seem the best solution in the long term. Mitigation measures involving restoration and extension of native vegetation blocks are discussed in detail in Section 6.8.

In summary, it is expected that some adverse effects might develop progressively near the pits, as a consequence of aquifer dewatering. They should register first on large ‘wet-foot’ trees, such as old river and swamp gums, initially as summer water stress. Expected effects are not likely to be immediate or severe. Similar effects might also slowly develop in other flora as a consequence of aquifer dewatering. Bulk effects on general flora of interdunal flats in the immediate proximity of the mine may also occur, not so much as a direct effect of dewatering, but as a result of interference with natural surface winter ponding.”

**Fauna**

*“Significance of Fauna”*

Gordon (1984) indicates that within the brigalow belt several native mammals have declined in numbers and distribution or may even be extinct, as a result of the clearing of native vegetation and settlement. Two endangered species listed include the Queensland Hairy Hosed Wombat (*Lasiorhinus barnardi*) and the Bridled Nailtail Wallaby (*Onchogalea fraenata*) however it is unlikely that these two species would occur in the mining area due to the lack of preferred habitat.

**Effects on the Fauna**

Most of the species which inhabit the site eg. grey kangaroo, wallabies, dingo and most bird species will be able to migrate to other suitable areas once mining commences.

The fauna and flora associated with Duckponds Lagoon and the creek system to the north of the site will remain largely unaffected by the development.”

**Land Rehabilitation**

“The surface will be cleaned of extraneous material and stones with a dimension in excess of 0.2m will be buried at least 1m below surface. It is not considered likely that acidic material will be encountered, however, if encountered it will be buried to a minimum depth of 1m before topsoil is spread. The profile of the surface will be stable, safe and will blend with the surrounding countryside.

Topsoil will be removed to a depth of at least 10cm and will generally be replaced as it is stripped. Stockpiles of topsoil will only be established at commencement of mining operations and when the depth of topsoil is sufficient to permit stockpiling for later distribution to areas without natural cover. Stockpiles will be of low profile and grassed to limit deterioration and prevent erosion.

Field trials will be carried out with the assistance of consulting bodies to confirm the types of trees and groundcover most suitable for the area. The trials will provide the background necessary to prepare a detailed programme for ploughing, fertilizing, seeding of the topsoil and tree planting.

The preliminary vegetation plan is to:

- fertilise the topsoil and chisel plough - e.g., Grower 1 (400 kg/ha).
- sow suitable grass species such as the following
  - Sirato
  - Rhodes Grass
  - Green Panic
  - Jemalong Medic
  - Sirocco Phalasis

Grass will be sown from late summer to early autumn.

- Fertilise the sown grasses
  - superphosphate in early autumn.
  - ammonium nitrate, early spring or mid-summer.

- Plant trees such as (in irregular woodlots)
  - Dwarf Sugar Gum
  - Cooba Wattle
  - Forest Red Gum

The new land surface contour will be similar to the old surface but will have less relief and a more gently undulating surface, Figure 14a and 14b. The gentle topography will be more amenable to total utilisation, will have a natural form, will blend with the surrounding countryside and will maintain the natural surface drainage pattern.”

One can make three important observations on the EIS process. The first is that the arena has not to date been dominated by legalism. The Commonwealth legislation was modelled on the U.S. National Environmental Policy Act 1969, which of course has been the source of considerable litigation in that country. This has not been the Australian experience, a phenomenon I explain in 3 ways:

(a) the Australian law on “standing to sue” has been a significant limitation: a plaintiff is required to show a special interest, beyond that of other members of the public; more emotional or intellectual concern is not enough;

(b) in energy (with the exception of uranium and the Kakadu area of the Northern Territory) mining has taken place in areas neither close to urban centres, nor in wilderness or national heritage areas;

(c) as a result of the first two factors, the process has not become especially sophisticated. The sort of scrutiny has been lacking which would
Enforcement of Environmental Protection Measures

The logical weakness of the system for environmental impact assessment in Australia is that, at neither Federal or State level, is there any overall regime which requires compliance with the environmental procedures that have been set out in an approved EIS as such. The fact that one has identified environmental problem and proposed a particular solution to it in an EIS which has been approved will not of itself carry any continuing legal compulsion to carry out the nominated procedure. There are of course a number of ways in which this result can be indirectly achieved in many cases. Where export licenses are concerned, for example, since they are only granted on an annual basis it is conceivable that a serious departure from environmental protection measures that have been the basis of a prior approval would in all likelihood be regarded as a proper ground for withholding further expert permits for coal shipments.

There are other sources of enforcement at State level. For example, some of the environmental protection measures may find themselves being introduced as special conditions in the terms of the mining lease which is granted by the State Government. The terms and conditions of various environmental licenses (for example licenses for air or water discharge) may provide a further source. Where a mining development proceeds under the authority of a special State Agreement, that agreement will contain at various levels of detail environmental obligations which could lead to serious consequences, including termination of the mining lease concerned, for breach. In some cases, the measures contained in an approved E.I.S. become binding obligations on the project developer under State Agreements.

Nevertheless there is in general a piecemeal approach involved here and it is certainly conceivable that in the future instances will occur where substantial departures take place from the procedures dealt with in the original EIS which will create sources of friction for which no obvious legal solution can be found. Furthermore, this is not only a question of potential concern for future public authorities seeking to enforce environmental standards and therefore a non-issue for the mining industry itself. A proper regime for dealing with these matters would of necessity have to contain a mechanism to cover variation in techniques in the future. The absence of any formal mechanism has the potential of leaving the mining industry in a quandary as to how to deal with proposed changes in a way that will satisfy public expectations and therefore enjoy a measure of public protection.

Possible New Developments

There can be no doubt that there has already emerged a much greater environmental consciousness, at a national and international level in Australia, and we can expect some particular developments to follow from this.

The thinking behind the EIS procedure is that of crossing bridges only when one comes to them. A particular mining development is assessed as and when its advancement is proposed. There is a growing concern that this is too fragmented an approach and can lead, over time, to long term distortions in the resolution of competing land uses. Some momentum is developing in support of the view that a broader analysis must be taken of what should and should not be permitted across the country. This view has its supporters from quite different vantage points. It is certainly held by elements of the environmental lobby who are in favour of carving up the country into “go” and “no-go” areas. Support is found sometimes from other quarters, where concern is expressed about the increasing time and cost of getting to the stage of confidence about a project where an EIS might be required, only to find that the project is ultimately regarded as fundamentally undesirable from an environmental point of view.

The recently formed Federal Resources Assessment Commission has a charter that encompasses the broader approach. The extent to which it seeks to flex its muscles in this direction remains to be seen. Another opportunity may emerge in Queensland where a public enquiry has recently been established whose primary objective is to resolve some competing land use issues in the region of Fraser Island, the largest sand island in the world, and the source of frequent environmental controversy. However there is a wider term of reference which requires the Commission to report with respect to:

“the establishment of principles, systems and procedures for the orderly development and implementation of policies and the resolution of issues or disputes concerning areas of Queensland in relation to which particular regulation or control may be needed for environmental, cultural or other special reasons”.

Both Commissions can expect to come under pressure to legislate in advance, at least by declaring certain areas off limits to exploration and mining.

Personally I find this trend curious. At a time when there appears to be growing international agreement that the apparent logic behind central planning of economies does not hold up in practice, that some may think a similar attempt at land use control would suffer a different ultimate fate is to me a little surprising. Furthermore, one cannot conduct any reasonable cost-benefit analysis without knowing the lost benefits of potential developments which, under this approach, will never be known. Perhaps the thinking is that what you don’t know won’t hurt you.

The system of preparing, assessing and approving environmental impact statements in Australia has, for the coal mining industry, been for the most part free from controversy. It will be interesting to see if that position...
remains true through the 1990's. In keeping with the rest of the world, environmental concerns loom large on the political agenda in Australia. At Federal and State levels the existence of the "greenhouse effect" is officially accepted, and it is an expressed policy that Australia must contribute to world measures to combat that perceived threat. Whether that sentiment is translated from words into actions, and whether the environment that a coal EIS must address will extend beyond the locality in which a mine is planned to encompass the whole planet and its atmosphere, remain questions for which affirmative answers are yet possible.

Two further legal developments can be anticipated. Firstly, much greater enforcement measures, with heightened attention at both legislative and administrative levels, will be implemented. Secondly, the current test on standing to sue will move to permit much easier third-party enforcement actions. Without abandoning the "special interest" test, the High Court has already conceded standing to enforce the preservation of aboriginal relics - the nexus by family descent and custodial obligations according to tribal laws and customs, and the fact that the relics were of cultural and spiritual importance to the plaintiff, were found sufficient to give standing - only a further small step need be taken to open up a new field of litigation. If these legal developments occur, the whole terrain of environmental assessment will change too.

End Notes

1. The list was issued by P. L. Ellis, then Deputy Director (Technical) in the Queensland Coordinator General's Department, in a paper presented in 1980 to the Queensland Branch of the Australian Mining and Petroleum Law Association.


6. The current ones are dated 29 May 1987.


8. The current "Policies and Administrative Arrangements for Impact Assessment in Queensland" were published in January 1987 and supplemented in January 1988 by placing primary responsibility for them under the Department of Environment, Conversation and Tourism.

 Annexure 1

The principal Acts that are concerned with environmental matters in Queensland may be grouped under the following headings -

1. Administrative Co-ordination, Resource Management, and Development/Planning
   - State Development and Public Works Organisation Act 1971-78, Premier, Co-ordinator-General’s Department;
   - City of Brisbane Act 1924-77, Minister for Local Government and Main Roads, Local Government Department;
   - City of Brisbane (Town Planning) Act 1964-78, Minister for Local Government and Main Roads, Local Government Department;
   - Local Government Act 1936-78, Minister for Local Government and Main Roads, Local Government Department;
   - Soil Conservation Act 1965, Minister for Primary Industries, Department of Primary Industries;
   - Beach Protection Act 1968-78, Minister for Maritime Services and Tourism, Department of Harbours and Marine;

2. Pollution Control
   - Clean Air Act 1967-78, Minister for Local Government and Main Roads, Air Pollution Council;
   - Clean Waters Act 1971-76, Minister for Local Government and Main Roads, Water Quality Council;
   - Noise Abatement Act 1978, Minister for Local Government and Main Roads, Noise Abatement Authority;
   - Litter Act 1973, Minister for Local Government and Main Roads, Department of Local Government.

3. Conservation of Natural Resources
   - Fauna Conservation Act 1974-77, Minister for Culture, National Parks and Recreation, National Parks and Wildlife Service;
   - National Parks Act 1977, Minister for Culture, National Parks and Recreation, National Parks and Wildlife Service;
   - Fisheries Act 1976, Minister for Maritime Services and Tourism, Queensland Fisheries Service;
   - Forestry Act 1959-76, Minister for Lands, Forestry and Water Resources, Forestry Department;

4. Conservation of Cultural and Historical Property
   - Aboriginal Relics Preservation Act 1967-76, Minister for Aboriginal and Islander Affairs, Department of Aboriginal and Islanders Advancement;
   - Queensland Museum Act 1970-74, Minister for Culture, National Parks and Recreation, Queensland Museum Trust;
   - National Trust of Queensland Act 1963-76, Minister for Local Government and Main Roads, Local Government Department.

5. Resource Development, Harvesting and Extraction
   - Fisheries Act, Forestry Act, “Water Acts” (as before);
   - Mining Act 1968-74, Minister for Mines and Energy, Department of Mines;
   - Franchise agreement acts, various Ministers, various agencies.
Annexure 2

Guidelines for the Preparation of an Impact Assessment Study Report

Introduction

An assessment study report is used for two purposes. The first is to enable a decision to be made whether or not to allow the proposal to proceed. To this end the report must clearly set out all positive and negative aspects of the proposal.

The second purpose of the report is to enable practical conditions to be formulated to ensure that the impact of the proposal will be limited to acceptable levels. The report therefore needs to address all potential difficulties which could be thought to be associated with the project, and either demonstrate how the potential problem will not arise, or demonstrate how the problem will be effectively controlled and adverse effects ameliorated.

While the report must specifically address all matters raised in the guidelines it should be written in a readable and logical form, fully describing all aspects of the proposal. Maps and diagrams should be used where appropriate, material already published and available should only be referred to and not reproduced, and the report should be as brief as is compatible with the presentation of the necessary information.

A. Guidelines Applicable to the Area for which Application has been Made

The report should address the following matters:

1. Description of the Proposed Project.

1.1 The Mine.

Its location, extent and nature. The method of working. The times at which the various stages will be complete. The equipment to be used. Quantity and quality of coal to be mined. The times of operation, number of employees. The extent of excavations to be left following mining, and the area disturbed at each stage of development.

1.2 Coal Treatment Plant.

1.2.1 Plant located off the site.

The location of the plant to be used and evidence that any existing plant can cope with the added input capacity and the extra product and wastes generated.

1.2.2 Plant located on the site.

1.2.2.1 The coal treatment plant.

The location and nature of equipment to be used in the crushing, washing, blending, storage and loading of coal won from the mine.

1.2.2.2 Washery waste disposal.

The location, extent and method of disposing of reject, slurry, tailings or any solid waste material from the coal washery. The physical and chemical nature of the waste material and the quantity expected to be generated. Information on the suitability of the preferred method of waste disposal and any treatment required.

1.3 Overburden disposal.

The location, contour and tonnage of waste dumps. The method of construction. The physical and chemical nature of the waste material.

1.4 Water supply, consumption and disposal.

This discussion should be quantitative, and cover all waters brought onto, obtained from, and discharged off the area for which application has been made. Included should be all mine pit water, runoff water from overburden dumps, roadways and industrial areas, seepage water from disposal dams, washery waste water, and waste water from any industrial usage.

Special attention will need to be paid to both structural and hydrological design of dam walls, bunds, storm water diversion drains and similar structures to ensure that:

i) storm water run-off emanating from relatively undisturbed land areas is kept segregated from other waste-waters and, in particular, is prevented from entering any slimes storage areas, settling ponds, or similar storage; and

ii) rain-water falling within the catchments of slimes dams etc. does not cause overflowing or other discharge (e.g. due to structural failure).

The proposed design criteria will need to be discussed and reasons given for selection.

1.5 Location and nature of improvements to be constructed.

These are developments not previously described and may include the following:

- freshwater dams, industrial areas, railway lines, offices, roads (both haul roads and access roads), fuel storage, explosive manufacture and storage, electricity supply, and any township or residential developments to be constructed on the area for which application has been made.

Where improvements such as dams are to be constructed then the proposals for management of these structures after the termination of the project should be given.

1.6 Visual Impact.

A description of the visual impact of the project as it relates to the surrounding landscape.

2. Description of the Existing Environment and Identification of Sensitive or High Impact Areas.

2.1 Existing tenures, land uses, and zonings.

The location and owner/custodian of all tenures, reserves, roads, and the like, over and around the area for which application has been made along with a description
of the actual use to which the areas are allocated or have been used historically. Particular attention should be paid to any existing dwellings, their associated developments and the zoning of all adjacent lands according to any existing town plan.

2.2 Topography.
   The area for which application has been made in perspective to the catchment system in which it lies. A contour map at suitable interval.

2.3 Flora.
   Identification of any species of economic importance. Identification of rare and endangered species. A vegetation map at suitable scale. Descriptions of the units mapped, and where appropriate, quantitative estimates of the populations of significant species within the map units. The description should contain an assessment of the significance of the vegetation for National Park, public park, scientific or historical interests.

2.4 Fauna.
   Identification of permanent and migratory species; native and exotic species; and of rare or endangered species. A description of the populations in the lease area and their significance to National Park, public, scientific or historical purposes. A discussion on the sensitivity of the ecosystem.

2.5 Soils.
   A soils map at suitable scale. A study of both the physical and chemical properties of the soil types that may render a soil either useful or hazardous to a rehabilitation programme including assessment of potential for erosion.

2.6 Geology.
   A description and map of the geology of the area for which application has been made, along with particular reference to those physical and chemical properties of the materials which may influence a rehabilitation programme, or influence the quality of water leaving the lease. Quality and quantity of any construction materials to be gained from the area for which application has been made should be recorded.

2.7 Groundwater.
   A review of the quantity, quality and significance of groundwater that will be disturbed during the development, operation and abandonment of the proposed mine. Maps, test, cross sections should be used where appropriate to describe the physical and chemical parameters of the groundwater resource. Local groundwater use characteristics including projected demand and the identification of recharge areas especially where these lie within or within one kilometre of the area for which application has been made.
   The review should include a determination of the design of a network of observation points which would monitor satisfactorily the ground water resources before, during and after the commencement of operations. Data pursuant to these surveys and monitoring program should include depth, water bed, intervals, standing water level below natural surface, pump inlet level, normal pumping rate, drawdown at normal pumping rate, elapsed time to achieve drawdown quoted, pump type, strata log, registered number of facility or description of location (real property, co-ordinates, etc.).
   The data should be such as enables specification of the major ionic species present in the ground waters. Determination of Sodium, Potassium, Calcium, Magnesium, Iron (total), Manganese (total), Chloride, Bicarbonate, Carbonate, Sulphate, Nitrate (total) and Fluoride are required, together with Total Dissolved Solids (sum of all ions), Hardness, Alkalinity, pH, Silica, Residual Alkalinity, Sodium Absorption Ratio, Electrical Conductivity @ 25 degrees Celsius and Radionuclides. If Total Dissolved Solids is quoted the method of calculation or determination should be stated. Analytical methods should be briefly outlined.

2.8 Surface water.
   A review of the quality, quantity and nature of all surface waters within the area for which application has been made and the receiving waters into which they flow. A description of the surface water hydrology should include drainage basin areas, flow rates, and full details of the chemical quality of waters throughout the year. Aquatic biota should be identified upstream and downstream of any proposed discharge points.

2.9 Climate.
   Local climatology and air quality should be described thoroughly. The relationships between atmospheric dispersion patterns and local topography should be discussed with the aid of models, if appropriate, and maps and text. A description of the climate from the nearest registered weather station featuring data on temperature, rainfall, and patterns of wind speed and direction. Data and tests describing atmospheric air quality should be supplied.

2.10 Cultural Resources.
   A description of any historical sites. Archaeological sites or features of cultural significance should be given. Local landmarks or recreational areas should be identified.

2.11 Improvements.
   The location and ownership of all improvements should be identified within the area for which application has been made, along with an appropriate description of the improvements.
   This should include dams, buildings, structures, pipelines, powerlines, telephone lines, bridges, etc.

3. Impact of the Proposed Project and Measures to Avoid, Reduce and Control such Impact.

3.1 Air.
   Information should be submitted on the projected
generation of any fumes, odours or particulates including where appropriate, their projected concentrations in adjacent areas as well as on the area for which application has been made and all measures and techniques proposed to avoid, eliminate or control such emissions. Matters of particular concern include generation of dust from clearing operations, overburden handling, blasting, vehicular movement, stockpiled topsoil or overburden and the generation of coal dust from coal handling, transfer, transport, crushing, screening, cleaning or other treatments whether conducted on or off the areas for which application has been made.

Consideration should be given to the construction and operational stages of the development.

3.2 Noise.

Information should be submitted on the projected generation of noise from all operations conducted including the magnitude, duration and frequencies involved and the projected increase on the background and peak levels of the existing acoustic environment. Particular attention should be given to places of work or residence and the proposals to minimize or eliminate these effects including details of any screening, lining, enclosing or bunding necessary.

Specific areas of detail should include the noise levels expected to be generated from earthmoving plant, employee movements, washing operations, transfer and loading operations, haulage vehicle movements (both empty and full), other transport requirements, and any blasting operations. Hours of operations should be defined.

Consideration should be given to the construction and operational stages of development.

3.3 Ground Vibration.

Information should be supplied on any operation which is likely to cause ground vibration on or adjacent to the site with particular attention given to places of work or residence: the magnitude, duration and frequency of any vibrations.

3.4 Visual Impact.

Information should be supplied on the techniques proposed to reduce any visual impact, especially relevant to public roads or thoroughfares or places of residence or work. This should include details of the design and colour of any buildings or fixed plant and all proposed screenings either vegetative or material.

3.5 Fire Control.

Measures to control combustion of in situ coal, waste materials and stockpiled coal should be supplied where appropriate.

3.6 Surface Water.

An analysis of the quality of all waters leaving the area for which application has been made. Reference should be made to the potential problems of acid generation, saline drainage from waste dumps, highly soluble metal ions, and high turbidity.

Where water treatment incorporates the construction or use of dams or ponds, the influence of predictable climatic events (floods, drought) on the performance of these structures should be investigated. Construction of any water pollution control structures including grit traps, oil and grease traps, clarifiers, and their maintenance should be detailed.

All dams should be described and the provisions of the Water Act must be considered.

If the proposed project involves any discharges (or escapes) of water whose quality is adversely affected by the operations, into any watercourse, it is very probable that such discharges will need to be covered by licenses under the Clean Waters Act (which licenses will need to be in the hands of the company before operations commence): the report will therefore need to discuss this aspect. It should be noted that such licenses usually apply to discharges at points of entry to watercourses, not at points where watercourses leave the area for which application has been made.

3.7 Groundwater.

An assessment of the impact of the mining operation upon the quality and quantity of groundwater existing within and within one kilometre of the area for which application has been made and any repercussions this might have on future usage. Details of the monitoring programme, plans to protect the groundwater resource from contamination, and plans to provide alternate water supplies to former users should be detailed where appropriate.

3.8 Rehabilitation.

All potential erosion areas during construction and operation phases should be defined, mapped, and proposals for their control promulgated. Slopes and batter angles should be calculated and clearly shown.

A description and projected contour map is required illustrating the proposed reinstated drainage system for the areas which have been disturbed and rehabilitated after completion of the proposed mining operations.

A discussion of all potential post-mining land use options. A discussion of the factors most limiting to the establishment of the potential post-mining land use options. The selection of a preferred option.

Details of the rehabilitation techniques proposed to achieve and maintain the preferred option.

3.9 Public Safety.

A discussion on the requirements necessary to ensure that the safety of the public is not impinged by the mine, its operation, or any activity associated with its construction and operation. This should include restricted access areas, adherence to all relevant safety regulations, and consideration of trucking movements.

3.10 Transport.

A study of all road haulage operations anticipated with
the total mining operation including delivery to the final user. This should include the times of trucking, the number of vehicles, the routes proposed, the effect on existing roadways and traffic, and a study of the noise and dust levels generated.

3.11 Administrative arrangements.
Staffing arrangements to ensure the measures described and proposed can be competently and effectively carried out and maintained. Budgetary allocations to ensure the same.

4. Economic Assessment of the Proposed Project.
Attention should be directed to the long and short-term effects of the proposal on the land-use of the surrounding area and existing industries, regional income and employment, and the State economy.

B. Guidelines Applicable to Areas not Included in the Area for which Application has been made.

The report should address the following matters:
1. That the location of infrastructure does not alienate reserves of minerals or extractive industry materials which are, or may become economically viable.
2. That the provision of services to an area may alter the economic viability of other mineral reserves in the area.

This paper was presented at Energy Law '90, an advanced seminar on energy and resources law organised by the International Bar Association's Section on Energy & Natural Resources Law in the Netherlands in April 1990. The paper forms part of the seminar proceedings, published by, and available from, Graham & Trotman Ltd, London.