WAGERUP ALUMINA REFINERY PROPOSAL
BY ALCOA OF AUSTRALIA LIMITED

REPORT AND RECOMMENDATIONS BY THE ENVIRONMENTAL PROTECTION AUTHORITY

SEPTEMBER 1978

DEPARTMENT OF
CONSERVATION & ENVIRONMENT
WESTERN AUSTRALIA

BULLETIN No. 50

ENVIRONMENTAL PROTECTION AUTHORITY

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HON. MINISTER FOR INDUSTRIAL
DEVELOPMENT

Your Ref.
Our Ref.

6 September, 1978

The Environmental Review and Management Programme prepared by Alcoa of Australia in respect of the proposed Alumina Refinery at Wagerup has been considered by the Environmental Protection Authority after an extensive period of review which has included an eight week period of public exposure.

Please find attached the Authority's report and recommendations as requested in your letter of 19 May, 1978.

C.F. Porter
CHAIRMAN

P.R. Adams, Q.C.

A.R. Main

Att.

CONTENTS

1 INTRODUCTION

The proposal to expand bauxite mining in the Darling Range by the construction of a new refinery at Wagerup represents one of the most challenging and difficult environmental decisions that any government could be called upon to make.

On one hand there is the considerable value to the State of the bauxite resource and the substantial revenue which should result from its exploitation. With the present state of rising unemployment there is an added, if hopefully temporary, incentive in the creation of new job opportunities. On the other hand are other major land uses which may be in direct conflict with bauxite mining.

In Western Australia mining has traditionally taken precedence over all other land uses. In most cases this has not led to serious conflict. Mining operations are usually short term with a life span of only a few decades. Many mines are often located in remote and largely uninhabited areas and their impact on the landscape is often relatively small.

However this is not the case with bauxite mining in the Darling Range. Here the conflicts are great. Alcoa's bauxite leases cover the principal water supply catchments, the most important State Forests, including much of the only jarrah forest, and a prime recreational and conservation resource close to the metropolitan area. The issues are confused by the existence and capacity for spread of the jarrah dieback disease *(Phytophthora cinnamomi)*.

Widespread concern has been expressed that bauxite mining should be allowed to take precedence over these other important land uses. The Authority shares this concern.

There are two important but quite separate aspects to the problems associated with bauxite mining. Firstly, there are the comparatively routine environmental impacts of mining and refining operations, such as air, water and noise pollution, effect on landscape, social impact, etc. Secondly, and perhaps more importantly, there are the effects associated with the mining operation: namely the spread of jarrah dieback disease, the possible increase in surface water salinity if mining extends to the lower rainfall areas, interference with forest management, and the possible loss of the only jarrah forest and associated ecosystems.

While the first set of impacts is reasonably well understood, the same cannot be said for the second. Much research is in hand, but conclusions cannot yet be drawn. For example, results of tree replanting programmes require as long as 20 years for adequate evaluation. Moreover, there are considerable gaps in the research programmes, which often suffer from shortage of staff and money.

Because of the unusual and complex issues involved, the Environmental Protection Authority took the step of setting up a Technical Advisory Group (TAG) to examine Alcoa's ERMP and to consider the vital issues associated with the long term, substantial mining operation which would flow from a decision to proceed with the new refinery. The TAG Report provides a more detailed basis for our recommendations, and the terms of reference are to be found in Appendix I of that Report.

The membership of the TAG is as follows:

Dr. M.J. Mulcahy	Chairman
Mr. I.C. Loh	Water Resources
Dr. A.R. Glenn	Jarrah Dieback Research
Mr. F.E. Batini	Forest Management
Dr. D.J. Kitchener	Ecology
Dr. D.R. Hudson	Geology
Mr. J.F. Thomas	Resource Economics.

In view of the importance of the issue, the heads of their employing agencies agreed to release these scientists to work together for several weeks on the environmental implications of bauxite mining in the Darling Range. It was recognised that it would be inappropriate to confine the TAG to the mining proposals associated with Wagerup alone, since the environmental problems associated with mining are common to all three mining areas. Moreover, it is illogical to consider one section of the lease area in isolation.

We believe the TAG Report to be an objective and accurate assessment of the problems and of the ERMP submitted by the Company. We have, however, prepared our own report and recommendations to the State.

The Authority, with the assistance of the scientific staff of the Department, has examined the matter exhaustively. It has studied the Company's Environmental Review and Management Programme, it has had the advantage of a five weeks' full time study by the TAG, and it has carried out a field inspection covering existing and proposed mine sites.

The proposals attracted considerable public interest and concern. From members of the public 186 submissions were received, ranging in length from 1 to 94 pages; 63 of these were carefully reasoned documents, based on concern for various environmental aspects of the Darling Range likely to be affected by bauxite mining, and some authors had considerable relevant expertise. Of the 63 approximately half were opposed to the Wagerup proposal, another quarter recommended deferment pending further research, and the remainder were non-committal. Of the remaining 123, 122 were simple, short statements of opposition to bauxite mining, and one was a statement of support. A summary of public submissions is given in Appendix III.

Fifteen State government agencies who have responsibilities affected by the proposals have made submissions; several are long and detailed. Of these, only two were unequivocally in support of the Wagerup proposal as described in the ERMP on the general grounds of the project's contribution to economic growth and industrial development.

The majority of Government agency submissions expressed concern about the project as described in the ERMP, because of its general lack of an appreciation of the need to adjust mining plans to accommodate other land uses in the Darling Range.

The Authority has also had the opportunity to discuss the proposals with senior representatives of Alcoa and the Forests Department. The Conservation and Environment Council deliberated on the proposals, and its recommendations, which were in general agreement with those of the TAG, were available to the Authority. In short, the Authority believes it has had the advantage of comprehensive studies and recommendations in arriving at its conclusions.

2 ENVIRONMENTAL BACKGROUND

The report of the Technical Advisory Group has established the conservation value of the natural ecosystems of the Darling Range, and their delicate balance in the face of disturbance.

This is a consequence of a geological and evolutionary history leading not only to the formation of bauxite, but also to a unique forest system, still largely intact, and adapted to survival despite infertile soils, extremes of climate, and large amounts of soluble salts in the deeper subsoils.

The forest has survived to date because of wise and conservative forest management by the State government. The future of the forest will be dependent on the State retaining this management initiative.

3 EFFECTS OF MINING ON CONSERVATION AND OTHER LAND USES

As well as conservation there are more material and immediate concerns. The Darling Range catchments constitute the principal surface water resource for the major centres of population and industrial development in the State. Its forests provide timber, and are a valuable and accessible recreational resource. It is important that planning for bauxite mining be integrated with planning for these alternative, and at times competing, land uses.

Some control of mining is all the more necessary since it is totally destructive of the natural ecosystems in the areas directly affected, removes a great depth of soil, and thereby exposes clays which are difficult to revegetate. It also affects the hydrological balance of the landscape with potentially adverse effects. Mining is therefore in direct conflict with other uses such as conservation, water supplies, timber production and recreation, which often have a considerable degree of compatibility between themselves. The main areas of conflict between these uses and bauxite mining are:

Conservation: The Forests Department, in its Working Plan 86 of 1977 has identified areas to be set aside for conservation management priority areas, (MPAs), consisting of a core — the conservation area proper — and a buffer area to be managed for the protection of the core (see TAG Report, Fig. 6). Several of them contain appreciable quantities of economic bauxite. However the TAG Report advises that the MPAs, including the buffer as well as the core, constitute a barely adequate system to represent the natural ecosystems of the State Forest.

Forest Management has as its objective the conservation of forest and water resources, as well as timber production and recreation. There are appreciable, and valuable, areas of healthy forest in the west as well as extensive areas of forest in the east, presently defined by the quarantined zone, which are relatively uninfected by jarrah dieback. Even when rehabilitation has been carried out, the aftermath of mining poses considerable management problems, and mining also accelerates the spread of the disease (see TAG Report, Chapters 5 and 7, and Figure 3).

Water Supplies: Adverse effects of mining on water quality through increased salinity are predicted east of the 1150 mm isohyet, though this is a broad generalisation, and anomalies are to be expected due to the variability in the amounts of salts stored in the deep subsoils. Increased salinity results in a reduction in water quality. Some preliminary research findings, so far insubstantial, suggest that the sodium associated with salinity, even at low concentrations, may predispose to such illnesses as hypertension (See Appendix I). However, the general point remains that any significant increase in salinity, and hence of sodium concentration in water has an adverse effect, and should be minimised in the interests of many sectors of the community. It decreases the value of the water for mixing with more saline supplies, whether for domestic, industrial or agricultural use. The last is of considerable importance in the Wagerup project, since existing dams in the area are primarily for irrigation purposes.

There is an additional effect due to the removal of the porous bauxitic layer, with its ability to hold water, and the exposure of impermeable clays in the floors of the mined pits. This is expected to increase runoff; it may result in an increase in water available for storage, but also it is likely to necessitate engineering works downstream to control the increased flow and consequent erosion and hydrologic problems, and the modification of water storage structures.

4 LAND USE PLANNING AND RESEARCH

The costs of some of the effects outlined above are readily quantifiable. Others, particularly on conservation and recreation values, are not, though it is here that the potential loss to State and community may be greatest. Economic arguments have been used to justify the view that bauxite mining is too profitable, and the ore too valuable, to consider significantly modifying mining plans in the long or short term to accommodate the State's interest in these matters. This is a relatively short term view which ignores the fact that bauxite is a finite resource, whereas the native forest, properly managed is there in perpetuity.

The Authority believes that compromises could be reached between the Company and those government departments responsible for forest management, water resources, and conservation which would allow the Company to mine economically while still maintaining essential land uses. We believe that the main problem in previous bauxite mining operations has been the lack of appropriate arrangements for developing optimal mining paths in terms of all potential uses. Mining costs and ore values are such that they form

only a small part of the cost of producing alumina, and there is consequently considerable scope, without intolerable economic penalties, for adjusting the Company's mining plans to the State's needs (see TAG Report, Chapter 11). This, of course, demands considerable planning activity by the State to determine what those needs are, and then to determine objectives, so that conflicts might be resolved on a rational basis. Machinery for this purpose is an urgent necessity.

The planning and management of land use in the Darling Range, involving the interaction of many uses with a complex and fragile natural environment, demands a sound technical basis on which to make predictions and develop optimum strategies. Our knowledge of the natural systems of the Darling range has grown considerably in recent years, but there are gaps needing to be filled by research. In the narrow context of bauxite mining two important research objectives are readily identifiable. These are:

1. the development of a means of control of the spread of jarrah dieback disease,
2. the development of satisfactory methods of rehabilitation of mined regions which would preserve or restore the quality of the water resource.

The achievement of both these objectives is necessary before mining can be permitted to take place in the eastern, lower rainfall, areas of the Darling Range, since to do so would be to place at risk both a unique and valuable ecosystem and our major water resource. The zone of higher risk is presently defined by the 1150 mm isohyet, and the boundaries of the dieback quarantine areas. However, the spread of the disease and the salinity problem are but two aspects of a complex natural system, and neither objective will be achieved if pursued in a piecemeal way.

Jarrah dieback affects salinity of streams in the same way as any partial forest clearing, and the incidence and control of the disease will depend on forest condition as affected by management. Consequently there is an urgent need to expand research programmes in forest ecosystem function as a whole, on the hydrology of forested catchments, and on rehabilitation techniques, but with the achievement of the above two important objectives being given high priority. This will probably require trial mining in lower rainfall areas.

Further details of a possible research programme are given in Appendix II. We believe that substantial funding may be available from forest users, including bauxite miners. Some suggestions for the administration of the funds and co-ordinating and directing the research are also in Appendix II.

It is important to realise that research findings which provide solutions to applied problems cannot be guaranteed in advance. It may, for example, turn out that research will conclude that mining and other activities in the eastern zone could lead to the effective destruction of the last remaining extensive areas of healthy forest, even though it could perhaps be replaced by some form of perennial vegetation which would control salinity problems. Fortunately, the question of whether mining should be permitted in the eastern zone of the Darling Range does not need to be decided now. The decision point will be approached somewhere between 25 and 50 or more years in the future, depending on the rates of mining permitted and other factors.

It is important for the State not to enter into commitments now which close off options which should be available to future generations.

Our proposals for research, and for planning to integrate mining with other land uses are intended to maximise benefits to the State; this, together with practical experience of the operations themselves, should provide a rational basis for sound decision making by governments in the future.

The Authority has been impressed by the integrated programmes for industrial development, of which alumina refining is an important part. It is regrettable that similar integration is not apparent with regard to the secondary effects on other land uses. Some of these effects, including those resulting from the need to provide energy and raw materials, will have important environmental implications, locally or elsewhere.

5 THE WAGERUP ENVIRONMENTAL REVIEW AND MANAGEMENT PROGRAMME

Planning for the integration of mining with other land uses is, however, completely at variance with the philosophy expressed in the Wagerup ERMP. As we have already said, the overall impression is that bauxite mining is too profitable an activity to be hindered by taking account of other interests. The argument is that the most economic mining plan dominates, and in practice there has been little modification of the Company's plans in its existing operations at Jarrahdale and Dwellingup. Such an attitude is perhaps understandable in the absence of clear land use policies (or at least their clear expression) on the part of the State, but that does not make the philosophy any more acceptable to the Environmental Protection Authority; thus we do not consider the ERMP to be an objective review of the environmental impacts.

The ERMP takes a hard line on the priority of mining. Although the Act stipulates an operation of 2 million tonnes per annum maximum, the ERMP is based on double this amount, and an operating life of 70 years is stated. Moreover, Alcoa declares its intention to mine all the commercially viable bauxite within the lease area other than in areas described as "so environmentally sensitive" as to make that undesirable. No scope is given to vary the path of the mining operation to encompass badly infected dieback areas or to by-pass prime stands of uninfected jarrah. The Company states clearly its intention to mine through the quarantine areas and in those areas which are known to have a high salinity risk, as well as those areas set aside for conservation.

In the long run the security of water resources in the south west of the State must rate higher priority than bauxite mining. Yet the ERMP states that management could involve "Exemption of particularly saline areas from mining if it is demonstrated that such mining would cause unacceptable deterioration of water quality regardless of the utilisation of the best management procedures available at the time". The departments charged with the management of water resources understandably find such an approach unacceptable. The effects of mining on water quality are still imperfectly understood, moreover the capacity to re-establish mature forests with hydrologic properties akin to jarrah in the drier risk prone areas is at this stage completely unknown. Field trials will need to extend over perhaps twenty years or more.

The Authority believes that the onus of proof that no significant deterioration of water resources will result from mining should rest with the Company, not the State.

6 SUMMARY AND RECOMMENDATIONS

On balance the EPA believes that there is a justification for a new refinery to be established at Wagerup; that the refinery should be allowed to expand to a maximum capacity of 2 million tonnes alumina production per annum, and that, with proper planning by the Company and the State acting together, there are adequate bauxite reserves available to allow the refinery to operate economically for a minimum of 30 years without risk to forestry, water resources or conservation and recreation. In reaching this conclusion, our objective is to minimise any long term deleterious effects on the environment.

It is a requirement of the Wagerup Agreement Act that the Government must first accept the Company's ERMP. The EPA has three options open to it, to recommend:

1. Acceptance of the ERMP with or without conditions.
2. Acceptance of the ERMP only after modifications.
3. Rejection of the ERMP.

Our most serious criticism relates to the main thrust of the ERMP, which is to the effect that mining must take priority over the other land uses. The analysis undertaken by the Technical Advisory Group indicates that there is a strong argument for planning to integrate bauxite mining with other land uses, and that this could be accomplished at little additional cost to Alcoa.

The Authority does not believe that the Company's commercial interests should so completely take precedence over other important land uses in the Darling Range.

We believe that to approve the ERMP as presently submitted, would not be in the best interests of the State. It would appear that approval by the State is the approval of a contracting party to the Agreement and thereafter the ERMP would become an extension of the Agreement and would need to be read as one with it.

Already it is clear that the ERMP, in dealing with an expanded refinery of 4 million tonnes per annum, goes beyond the scope of the present Wagerup Agreement, and there could be other extensions not contemplated by the State.

In any event, we believe that what the State should require is that it should have some say in the Company's mining plans. Unless this is done there can be no security for other land uses. What is required is that the Company's mining plans should be as agreed from time to time between the Company and the State, recognising the Company's need for a commercially viable mining operation, and the State's need to manage and conserve the forest, to maintain water quality in the catchments, to cater for the proper needs of the community for recreation, and to protect the flora and fauna of the forest. The joint planning between State and Company which we propose will require the prior development of land use policies and options on the part of the State, and the co-ordination of land use planning by the several government agencies concerned. In the event of the Company and the State at any time failing to agree on the mining plans, the matter should be decided by arbitration.

We further believe that without the approval of the State, there should be no further expansion of the Kwinana and Pinjarra refineries beyond 1.5 and 2.5 million tonnes per year respectively, nor expansion of the Wagerup refinery beyond 2 million tonnes per year.

We believe that many of the existing problems must be solved before the Company can safely extend its operation into the low rainfall and dieback free areas. But this can only happen if an adequate research programme is undertaken, and this would clearly be in the interests of both State and Company. The authority believes that research priorities should be set by a committee on which those contributing funds should be strongly represented.

We recommend:

1. ***that, subject to the conditions contained in our further recommendations below, the construction of the alumina refinery should be allowed to proceed***

2. ***that the State should not approve the ERMP as submitted by the Company***

3. ***that the State should require:***

   (a) that all mining plans of the Company should be as agreed from time to time between the Company and the State, giving recognition both to the Company's need for a commercially viable mining operation and the State's need to manage and conserve the forest, to maintain water quality in the catchments, to cater for the proper needs of the community for recreation, and to protect the flora and fauna of the forest. In the event of the Company and the State at any time failing to agree on the mining plans the matter should be decided by arbitration

   (b) that without the approval of the State there should be no further expansion of the Kwinana and Pinjarra refineries beyond 1.5 and 2.5 million tonnes per year respectively, nor expansion of the Wagerup refinery beyond 2 million tonnes per year

4. ***that the State establish a means for developing land use policies and options for the Darling Range, and for co-ordinating land use planning by the several government agencies concerned***

5. ***(a) that a single research co-ordinating committee be established; it should include adequate representation of the industries contributing funds, together with an equal number of representatives from the State; its function will be to draw up a budget and negotiate contributions from industry and from the State; it will also be responsible for assessing research priorities***

   (b) that in addition, there should be specialist committees of scientists responsible for directing and co-ordinating research in particular areas of concern, and for publishing the results.

APPENDIX I

SALINITY AND HEALTH

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A number of public submissions expressed concern over the medical aspects of a rise in salinity. These were not so much comments on the ERMP, or even opposition to the expansion of bauxite mining, as much as a discussion of the impact of saline drinking water on health. The EPA recognises the concern that has been aroused in the community, and following discussions with the health and water supply authorities, and after consideration of the public submissions by the Cardiac Society of Australia, other medically qualified persons, and the Campaign to Save Native Forests, feels it appropriate to make the following summary.

The current desirable drinking water standard as set by the National Health and Medical Research Council is 500 mg/l total dissolved solids (TDS). Confusion sometimes occurs between TDS, salinity and sodium, since it is the latter which gives most cause for concern, while it is the former which is more commonly measured. For the catchments of south western Australia a rule of thumb guide is that the sodium level is one quarter of the TDS concentration.

Some sufferers from such illnesses as hypertension (high blood pressure), oedema, cardiac failure, renal disease and cirrhosis of the liver, require to limit their sodium intake, and three levels are suggested: strict sodium restriction of 500 mg per day; moderately restricted diets of 1,000 mg/day; and mildly restricted diets of 2,400-4,500 mg/day.

The main source of sodium is in foodstuffs, and water provides normally only 5% to 10% of the total sodium intake for people in Western Australia. It is difficult to avoid exceeding the strict sodium diet limit when normal water supplies with TDS levels of 250-500 mg/l are consumed, and people on such a diet, who form only a very small proportion of the population, should use rain water, distilled water, or deionised water for drinking and cooking.

A recent paper by E.J. Calabrese and R.W. Tuthill of the University of Massachusetts, has suggested that communities on relatively high levels of saline drinking water (107 mg/l sodium, equivalent to 428 mg/l TDS for south western Australia) had a higher incidence of hypertension than communities on very low levels of salinity (8 mg/l sodium, equivalent to 32 mg/l TDS for south western Australia). This research was based on examination of two groups of high school students subjected to different levels of salinity in their drinking water.

An examination of the paper suggests that not much weight should be given to these findings. The authors admit that the results "should be considered as preliminary", and that "the possibility of confounding variables has not yet been eliminated". The validity of the research is in our view suspect since the two groups chosen would most likely have been subject to a wide range of other variables, including diet, lifestyle and scholastic pressures. To gain validity such a test would have to be conducted on a wider range of groups for whom the only common factor would have to be a domestic water supply of high or low salinity. The fact that water supplies such a small proportion of total sodium intake makes it difficult to accept these conclusions. The "Lancet" makes this point when it states "Clinicians who have failed to detect any effect of dietary sodium upon blood pressure will tend to regard the effect of such miniscule differences with incredulity".

A clear distinction should therefore be drawn between the medically proven need for a very small section of the community to make arrangements for salt free drinking water, and the somewhat dubious suggestion that the normal person is likely to be adversely affected by the desirable salinity standard of 500 mg/l TDS recommended by the National Health and Medical Research Council, and adopted by the health and water supply authorities in Western Australia. Nevertheless the Commissioner for Public Health in Western Australia has asked the National Health and Medical Research Council to consider the relationship between sodium intake and blood pressure.

To place Western Australian water supplies in an international context it should be pointed out that the salinity levels current, while higher than average for Australia, are substantially lower than those in many parts of the world.

Some statistics of water supplies in the 100 largest cities in the United States in 1962 showed levels of total dissolved solids in raw water supplies as follows:

TDS-mg/l	Population (millions)
less than 100	21
101-250	23
251-500	11
more than 500	1.5

This table indicates that while Perth's water supplies are more saline than average, they are not excessively so.

APPENDIX II

RESEARCH PROGRAMME

APPENDIX II

RESEARCH PROGRAMME

Research Requirements

The Technical Advisory Group Report has made a number of recommendations for research arising from their consideration of the effects of bauxite mining. These are tabulated below:

Recommendations for Research

Topic	TAG Recommendation Numbers
Forest Management	5.15, 5.16
Recreation	6.2, 6.4, 6.16, 6.17, 6.19
Jarrah Dieback	7.1, 7.12, 7.13, 7.14, and TAG App. VI
Water Resources	8.5, 8.6, 8.9, 8.10
Flora and Fauna	9.4, 9.9
Rehabilitation	10.1, 10.2
Land Use Planning Techniques	12.4

The TAG Report does not contain a discussion of the overall research programme, and the necessity for its proper direction and co-ordination, since the group felt that they could hardly do justice to the subject in the time available.

It is, however, extremely important, particularly in view of the possibility of substantial research funds becoming available from Alcoa, that the programme be soundly conceived and planned. It should have sound management of the natural resources of the Darling Range as a major objective, and these resources constitute a complex natural system. Management must be based on an understanding of how that system works, and will be concerned with such matters as the characteristics of the landforms and drainage systems, the hydraulic properties of soils and superficial deposits, nutritional status of forest soils in relation to ecosystem function, water use by vegetation, and its interaction with catchment hydrology.

It would not be advisable to constrain any organisation set up to promote the research by narrowly confining it to the topic of jarrah dieback disease or to the salinity problem. Each is only a part of the whole system whose function must be understood. Management and exploitation may have predisposed the forest to disease through lowered nutritional status, consequently affecting vigour and resistance. This will in turn interact with water use and hydrology, and aesthetic and other values.

A suggested outline for a research programme which should provide a basis of understanding which may lead to solutions of the salinity and dieback problems, is as follows:

Forest Ecosystem Function

- Inventory — flora and fauna
- Nutrient cycling and conservation in relation to forest health, vigour, and resistance to disease
- Water use — (evapotranspiration) of selected species and communities
- Development of management techniques based on increased knowledge of ecosystem functions

Hydrology of Forested Catchments

- Mapping of superficial deposits (surface soils, sub-soil clays), distribution, thickness, salt loads

- Hydraulic properties of materials (surface soils, sub-soil clays)
- Hydrologic monitoring of natural, mined and rehabilitated areas
- Modelling biophysical aspects of hydrologic systems as a basis for prediction and subsequent planning and management

Rehabilitation

- Field trials with adequate monitoring of growth and development (above and below ground)
- Ecosystem development, floral, faunal and microbiological aspects
- Management — sylvicultural techniques, fire control
- Trial mining in the eastern zone
- Development of options and identification of attainable objectives

Research Organisation

Users of the forest, particularly bauxite miners, but also including the timber industry, are willing to contribute research funds, and the amount to become available may be substantial, perhaps of the order of between $500,000 and $750,000 per year. Naturally contributors will wish to have some say in how the money is spent, and they could play a useful and valuable role in determining the main objectives of the programme. On the other hand, they should not be involved in the direction of the programmes at the scientific and technical level. This should be the business of the scientists themselves.

Arrangements are thus needed for:

- the collection and administration of research funds
- the determination of main research objectives
- the direction of programmes at the scientific level

It is likely that the most efficient way of deploying the research capacity available to the State will be by channelling funds towards existing institutions and agencies able and willing to undertake the work (Government departments, CSIRO, Universities and Institutes of Technology). Government and contributors should be represented on some co-ordinating and policy making committee or council, but should delegate scientific direction to technical committees on which relevant scientific and technical disciplines are represented.

APPENDIX III

A REVIEW OF PUBLIC SUBMISSIONS RECEIVED ON THE WAGERUP ERMP

AUGUST 1978

DEPARTMENT OF CONSERVATION & ENVIRONMENT
WESTERN AUSTRALIA
BULLETIN No. 47

CONTENTS

1. Summary

A total of 186 submissions or statements of opposition was received by the Department of Conservation and Environment in response to the advertisements calling for public comments on Alcoa's proposed alumina project at Wagerup.

Of these, the 63 detailed submissions raised a large number of points and expressed concern over a wide range of issues. Criticisms of the proposal which have been tabulated and discussed in the following pages, generally refer either to technical inadequacies of the ERMP (such as criticism of the ERMP itself and/or the State's environmental control and assessment procedures); or to specific areas of environmental concern (notably salinity, rehabilitation, conservation of the jarrah forest, dieback, recreation and conservation of fauna and flora aspects).

Many submissions were based on the Company's description of the existing environment and its assessment of the proposed environmental impacts. Public comments on the relationship of the Wagerup proposal to the broader aspects of land use planning in the Darling Range are also discussed. Each author's attitude towards the Wagerup proposal has also been tabulated. Where relevant, individual submissions have been referred to throughout this report.

Public participation and interest in this proposal has been of a high level as indicated by the quantity and quality of the submissions.

2. Introduction

The Department of Conservation and Environment has received 186 responses from the public in regard to Alcoa's ERMP for the Wagerup proposal. Of these, 122 were statements of opposition to either the proposal specifically, or bauxite mining in general, in which no referral to the ERMP was made. This number includes names and signatures of people who filled in petition slips, prepared by the Campaign to Save Native Forests, stating an objection to any expansion of bauxite mining in the Darling Range. Only one general statement of support for the proposal was received.

A total of 62 detailed submissions was received by the State Department of Conservation and Environment in response to the nation-wide advertisements inviting public comment. One further submission was received by the Commonwealth Department of Environment, Housing and Community Development (EHCD). Of these, 46 submissions were based on some aspect of the ERMP and have been accepted by EHCD as formal submissions under their Administrative Procedures to the Environment Protection (Impact of Proposals) Act, 1974-75. Under paragraph 8.2.c of these Procedures, these authors will receive from Alcoa a copy of their final environmental impact statement. The authors of one detailed submission requested that it be treated confidentially by the Authority and that it not be forwarded to either Alcoa or EHCD.

Of the 63 detailed submissions, 48% of the authors had either professional qualifications or work experience relevant to their submission while 30% of the submissions were from organisations including most of the recognised conservation groups. Sixty-eight percent of these detailed submissions were based on the ERMP, 8% showed no obvious relationship to the ERMP while the remaining 24% had obviously not read the document (see Table III).

The attitudes of the authors towards the proposal are given in Table IV. It can be seen that 49% were opposed to the proposal, 24% were non-committal, and 27% of the submissions recommended a deferment of the project pending further research. Of the 63 submissions, 16% requested that a public inquiry be held into bauxite mining and 29% made constructive recommendations concerning the mining and/or refining operations. Furthermore, 5% of the submissions recommended that the Environmental Protection Authority's report to Government should be made public.

The Environmental Protection Authority believes that all 63 submissions are relevant to the State's consideration of the environmental aspects of Wagerup, and all the points raised have been taken into their consideration. This includes for example, the concern expressed by the Cardiac Society of Australia and New Zealand (W.A. Division) on the possible medical effects of increased salinity of drinking water, irrespective of the cause of the increase.

A total of 359 specific comments on different aspects of either the environment or the State's environmental assessment process were in the 482 pages which comprised the 63 detailed public submissions. These submissions ranged in length from one to 94 pages. A detailed breakdown of all the Environmental Aspects of Wagerup ERMP is given in Table I while a similarly detailed breakdown of public comments on the Technical Aspects of the Wagerup ERMP and the State's Environmental Assessment and Control Procedures is given in Table II.

In the following discussion, key issues are expressed as a percentage of the number of detailed submissions. Where appropriate individual submissions are identified by the author(s) name(s) and a departmental number. A full list of submissions is given in Table VIII.

3. Public Review of the Environmental Content of the Wagerup ERMP

A review of the 63 public submissions has identified 17 areas of environmental concern, each of which is noted in a number of submissions. In considering these environmental aspects most of the criticism concerned the lack of adequate data and the fact that Alcoa's future management programmes had been based on unjustified conclusions drawn from this data. In many instances, particularly relating to the biological environment, it was considered that the ERMP showed a lack of understanding of many of the basic principles involved.

Most of the 49% of submissions opposed to the Wagerup proposal, and the 27% which recommend that the project should be deferred pending further research (see Table IV), do so out of concern for the major, unresolved environmental effects of the bauxite mining in the Darling Range. The areas of environmental concern are shown in Table V and the major ones are briefly discussed in this section of the report.

3.1 Salinity and Water Supplies

Undoubtedly the aspect of the Wagerup proposal which has caused most concern among the public (57% of the submissions received) is the potential increase in water salinity either directly as a result of bauxite mining or indirectly due to accelerated spread of dieback.

The submissions concentrated on two major issues; the potential effects of increasing salinity on public health as best expressed by the Cardiac Society (61), Campaign to Save Native Forests (CSNF — 52) and W.N. Bartholomaeus (54); and the limiting effects which increasing salinity of the Darling Range catchments would have on the provision of blended fresh water to metropolitan Perth.

Two specific aspects of the impact of increased water salinity on public health were discussed. These are the problems of controlling the intake of sodium by people on therapeutic sodium restricted diets, and the possible predisposition to, and precipitation of, hypertension in susceptible individuals as reported by Calabrese and Tuthill (1977) in America. The submissions which deal most fully with the health aspects are those by W.N. Bartholomaeus (54) and the CSNF (52).

The second issue, that of the effect of increasing the salinity of hills catchment areas on metropolitan water supplies was comprehensively covered in the submission by Holt and Rankin (59). This submission draws freely on information published by the Metropolitan Water Board and the Public Works Department to support their contention that any salinity increase in hills water could result in enormous

cost increases in supplying drinking water to metropolitan Perth. The unproven status of rehabilitation in maintaining a suitable hydrological regime and the discontinuous distribution of soil salinity within the 25 year mining area were the most frequently given reasons for the concern expressed. The use of an unverified theoretical model to draw conclusions with respect to future salinity trends, particularly in the lower rainfall eastern zone, was questioned in several submissions (see Hollick — 7).

3.2 Water Quality and Supply

Twenty-four percent of the submissions looked at other aspects of water quality including turbidity, bacteriological pollution and contamination as a result of increased activity within the catchment areas. The submissions of Bowyer (47) and Holt and Rankin (59) are the most detailed on these aspects.

The State Parliamentary Labor Party (53) and the CSNF (52) also considered the aspect of the supply of water to the refinery and mine sites. Failure of the ERMP to clearly detail the sources from which Alcoa would obtain the volume of water required for the mining and refining processes, and the possible conflict with present users, were seen as the two major omissions from this section of the report. The resulting effects on biologically diverse valley ecosystems of damming small streams for water supply was questioned by the Institute of Foresters (37).

3.3 Dieback

Many submissions opposed the proposed increase in bauxite mining because it would accelerate the spread of dieback within the forest. However in the 37% of submissions which discussed dieback, the concern was generally related to one or more of the specific effects that increased dieback would have on the various forest user groups. The Forests Products Association (37) for example, recommended that mining should be restricted to dieback affected areas in order that protectable forests could be conserved for commercial forestry and conservation purposes.

Other submissions associated dieback with the potential increase in salinity of Darling Range catchments, particularly with regard to the expansion of mining into the lower rainfall areas (Holt and Rankin — 59).

In relation to conservation it was feared that the area affected by dieback spread by bauxite mining would be so great in the western areas of the Scarp that no viable portion of the forest ecosystem could survive in the long term. The CSNF (52) claim that as little as 10% of the western part of the forest from Armadale to halfway between Harvey and Collie may escape the combined effects of mining, dieback spread by mining and dieback already present.

Some submissions suggested that future research may allow presently threatened areas to be protected from dieback. These submissions suggested that mining should be restricted to the dieback infected areas and that the rate of mining should be reduced to the minimum viable level.

3.4 Jarrah Forest

Forty-four percent of submissions expressed a desire to generally protect the remaining jarrah forest. More specific comments concentrated on the jarrah forest as a unique ecosystem and as a refuge for many species of fauna and flora which have suffered significant range reductions as a result of agricultural clearing (Trudgen — 43). Specific concern for the preservation of jarrah as part of Western Australia's natural heritage was expressed by 6.3% of submissions, one of the most telling being that by Hare and Hutchison (45).

3.5 Flora

The major public criticism of the ERMP on flora is the inadequacy of the data used to support the conclusions drawn as to the impact of bauxite mining on the vegetation. The lack of a floristic survey was seen as a major omission from the document by Weston (11). Twenty-three submissions (37%) criticised some aspect of the ERMP with respect to flora. Of these 12 have authors with professional qualifications in this field (or relevant work experience). The number of rare, poorly collected or endangered species known to exist in the jarrah forest is cited as a major reason why this information should have been obtained. Muir (12) has criticised Alcoa's use of Havel's (1975) vegetation survey. He believes that this technique only has a valid use in the vegetation mapping over very large areas and that it is not applicable to the Company's proposed 25 year mining area.

Trudgen (43) and others have noted that no consideration was given to lower plant groups while Muir (12) points out that aquatic and peripheral wetland vegetation, which is important in influencing water quality, is poorly covered in the ERMP. A number of submissions supported the protection of the Samson Management Priority Area in view of the fact that its stand of Bullich *(E. megacarpa)* could not be replaced by an alternative area in the event of Alcoa mining within the MPA. Weston (11) in particular makes a number of recommendations with respect to the protection and provision of additional buffer areas for this conservation area.

Use of the jarrah forest by beekeepers was not considered in the ERMP. The loss of major honey producing plant species is expected to adversely affect local honey production and failure to consider the value of replacement species for future production could result in a long term decline in the industry (Beekeepers' Section of the Farmers Union —42).

3.6 Fauna

Thirty-three percent of submissions criticised those sections of the ERMP on fauna. Most stated that the surveys and data on which conclusions were based were inadequate. The submission by the CSNF (52) considered that only the section dealing with birds had been covered in any detail but then went on to point out that the Red-eared Firetail *(Emblema occulata),* which appears on the "List of Rare and Likely to Become Extinct Species", is known to be present in this area but has not been mentioned in the ERMP. This point was substantiated by the comments of the Department of Fisheries and Wildlife.

Alcoa's field surveys and data on mammals, reptiles and invertebrates was considered to be inadequate by several people while Muir (12) points out that little consideration was given to aquatic fauna. It is on this basis that the CSNF (52) believe that Alcoa's statement that no rare species are known to exist in the proposed mining area can be shown to be based on inadequate data.

Failure to consider the viable population requirements of faunal species was also criticised. The ability of the rehabilitated vegetation to support populations was questioned in view of the present lack of establishment of understorey vegetation. The long period during which replanted trees will be of little use to fauna, especially birds, was emphasised.

Lack of information on the immediate effects of mining was criticised. A high mortality rate among displaced fauna was forecast. Continued mortality of waterfowl in the red mud ponds was noted and the lack of a solution to this problem criticised.

3.7 Reserves

The protection of existing reserves from mining, and the establishment of additional reserves for flora and fauna protection and all forms of recreation was a commonly expressed requirement (41%). The Samson Management Priority Area in particular was singled out as an area which potentially could be mined, but which could not be replaced as no comparable area exists elsewhere (Weston — 11).

The discontinuous areas of forest remaining after mining were not considered to be individually large enough for the maintenance of viable plant and animal communities. The preservation of migratory corridors, linked with appropriately sized areas representative of each ecosystem, was a major recommendation of the Australian Conservation Foundation (ACF — 63) and a number of other submissions.

The need for additional reserves, in the form of National Parks, for present and future recreational demands was also considered essential. It was stated that the rehabilitated areas would not fulfil the same function as the original forest for a variety of active and passive activities. This point was best expressed by Elliot (58) and, in a specific instance, the Western Australian Trout and Freshwater Angling Association (55).

3.8 Recreation

Thirty-seven percent of submissions discussed aspects of the jarrah forest as a recreational resource. The location of the northern jarrah forest within the return day's journey of Perth was stated as a major factor in determining the popularity of this area for recreational purposes.

The "natural" forest scenery is an essential element of many forms of recreation including picnicking, bushwalking, fishing and rock climbing. One submission (Elliot — 58) stated that in 1971, the Committee of Inquiry into the Mining Act pointed out that the whole of the south-west forest will be required for recreational purposes within the next 70 years. Mr Elliot then noted that the ERMP proposes that mining, in association with Wagerup alone, would be over a period greater than 70 years. The suitability of the rehabilitated landscape for active forms of recreation, such as bushwalking and orienteering, was also questioned (Climbing Association — 15).

3.9 Rehabilitation

Forty-four percent of submissions, including many from persons with relevant professional qualifications, stated that the present level of progress in rehabilitation did not justify Alcoa's conclusions that all rehabilitation would be completely successful (particularly in the drier eastern zone). The failure of the Company to define what was meant by successful rehabilitation, and what this would mean both to the natural environment and to other forest users, was also criticised. Specific comments highlighted the failure to find a tree species which would satisfactorily replace jarrah in terms of its hydrological performance. The lack of knowledge as to whether presently used species will survive to maturity and serve a similar function was considered sufficient reason by the Environmental Management Group, from the Geography Department University of Western Australia (62) to restrict mining until this information is available.

The establishment of a well developed understorey was considered a vital part of the replacement of both faunal habitat and of a structured forest. The lack of detail in future rehabilitation planning was criticised as was the lack of comparative data from other mine sites. The failure of the Company to make a formal commitment to rehabilitation, including the responsibility for it after decommissioning, was another point of concern.

3.10 Refinery Effluent and Emissions

Relatively few of the public submissions dealt with environmental considerations of the refining process and it has been stated by the CSNF (52) that the public's lack of knowledge on this aspect was demonstrated by Alcoa's social surveys.

Ten percent of submissions considered the problem of caustic effluent disposal (red mud lakes) and four areas that the ERMP was said to have inadequately covered were identified. These were the problems of waterfowl landing on the lakes, the control and monitoring of seepage of caustic effluent from the lakes into the groundwater, the rehabilitation of red mud areas after filling is completed and the effect on the environment of 2,500 ha of residue by 2055 (this area has been estimated by the Institute of Foresters (37) from figures quoted by Alcoa).

A similar percentage of submissions considered the problems of noise, both at the mine sites and at the refinery, odours, and particulate and gaseous emissions from the refinery. The submissions of Allen (8), the Institute of Foresters (37) and the CSNF (52) are the most detailed on these aspects.

3.11 Energy

Thirty-three percent of submissions discussed the high energy requirement of the alumina industry. The high energy use of refining, in relation to the employment created and the gross return to the State, has been covered in detail by W.N. Bartholomaeus (54 — Appendix 3), and raised in a number of other submissions. They conclude that the refining process employs disproportionately few workers in relation to the energy used, and similarly the gross return to the State is comparatively low.

The high rate of utilisation of fossil fuel resources was criticised in view of the low level of reserves in Western Australia. The claim that a natural gas pipe is dependant on bauxite refining at Wagerup and therefore that the other needs of the south-west cannot be met unless the refinery is constructed is said to be invalid and that the environmental review of the pipeline construction may be downgraded once a demand for the gas exists. The CSNF (52) has estimated that if both the Wagerup and Alwest proposals proceed, then the State's known reserves of fossil fuels will be consumed by the year 2014. For this reason Hodge (19) sees the proposals to increase the level of alumina production as precipitating the early construction of a nuclear power plant in Western Australia.

3.12 Environmental Research

The number of submissions which criticised the inadequacy of data presented in the ERMP is reflected in the fact that 25% stated that some aspect of further research was required. Research into the control of dieback and the salinity problem, particularly in the drier areas, were the two points most emphasised.

A number also recommended that a research institute should be established to carry out further intensive research, particularly in respect to dieback and management of the forest ecosystem. It has been recommended that such an institute should be funded by all commercial users of the forest, including Alcoa, Metropolitan Water Board, timber producers, etc. The recommendations of the Forest Products Association (31) are noted in this respect.

4. Technical Inadequacies of the ERMP

This section discusses the public criticisms of the technical aspects of the ERMP itself and attitudes to either the State's general environmental assessment and control procedures, or the Agreement Acts relating to control of Alcoa's operations.

4.1 Criticism of the ERMP Itself

As shown on Table VI, the major public criticism was that Alcoa's ERMP was generally inadequate and 27% of submissions discussed these inadequacies or omissions. Comments of an environmental nature have already been discussed.

However, many people (17.5%) felt that Alcoa had given insufficient consideration to other alternatives. This was in fact a requirement of the Guidelines agreed upon by the State and the Commonwealth environmental authorities. This public criticism included not only alternatives to the proposal itself and alternative refinery sites which Alcoa have been said to cover superficially, but also alternative mining strategies which take different land uses and different rates of mining and refining into consideration. It has generally been said that the Company has only considered their most economic option. The manner in which they present alternatives to mining the Samson MPA is cited by the Australian Conservation Foundation (ACF — 63) as an example of this biased approach.

The most noteworthy of submissions covering these aspects are from Hollick (7), A. and L.M. Hopkins (34), J.F. Loneragan (35), the Institute of Foresters (37) and the South West Forests Defence Foundation (41). The submissions by Hollick and the Environmental Management Group, Geography Department, University of Western Australia (62) suggested that other alternatives may be preferable from the State's point of view. Dr. Hollick's submission is especially interesting as he proposes a number of constructive alternatives, particularly in relation to mining strategies.

Included in the above 17.5% of people who believe that alternative options have not been adequately considered, are those who believe that Alcoa has generally not followed the agreed guidelines. The Tree Society (25) has been most comprehensive in this regard.

Many critics believe that the statements, assertions and proposed environmental management procedures in the ERMP are not supported by detailed evidence and technical data. Many comments also criticised the sampling and survey methods used by the Company. Muir (12) and Majer (24) provide good examples of the criticism on this aspect in relation to flora and fauna respectively. Both authors have professional qualifictions in botany and zoology respectively.

4.2 Environmental Assessment and Control Procedures

Nineteen percent of people expressed concern over the State Government's 'premature' passing of related legislation (i.e. the Wagerup and Alwest Amendment Agreement Acts) prior to:

(i) release of the ERMPs (Elliott — 58), and

(ii) before the public had had the opportunity to participate in the environmental assessment process (Hare and Hutchison — 45).

Most people saw this action as precluding additional and necessary environmental safeguards or amendments which would have resulted from the public review of the ERMP. Other people, such as the Environmental Management Group, Geography Department, University of W.A. (62) saw this as a departure from the Commonwealth Government's established assessment procedures under the Environment Protection (Impact of Proposals) Act, 1974-75.

Furthermore, 11% felt that the State Government should have delayed this legislation until the findings of the System 6 Study and the Stanford Research Institute had been made available (ACF — 63, Western Australian Association of Recreation Personnel — 30 and Environmental Management Group, University of W.A. — 62).

As well as being critical of the relevant Agreement Acts, some authors were critical of the Environmental Protection Authority or the State Government in general. Such criticism was aimed either at an inferred lack of public involvement in the past, or a concern that Western Australia did not have any formal environmental assessment requirements and procedures. Specific points raised included the

need for the Environmental Protection Authority to have access to an independent legal opinion to advise on the implications of Agreement Acts. The submission by Mr. R.A. Cotton (33) raised many valuable comments on the legislative aspects of the Wagerup proposal.

4.3 Broader Issues of the Wagerup Proposal

Many submissions were concerned with a range of broader issues associated with the Wagerup proposal. The major points raised are given in Table VII.

Twenty-nine percent felt that the ERMP was of little value as it had not viewed the impact of Wagerup on a regional scale (i.e. within the framework of all bauxite mining in the Darling Range). The Institute of Foresters (37) for example, discuss the inter-relationship between Pinjarra and Wagerup and the impacts (particularly at projected refining rates of 4 million tonnes per year) of mining in the drier eastern zones.

The lack of, and need for, overall co-ordinated land-use planning in the Darling Range was a major comment (19%) while 16% of submissions expressed concern at the possible conflict with existing land-uses which could result if Wagerup went ahead as proposed in the ERMP. Both these points were extensively covered by the South West Forests Defence Foundation (41), the Beekeepers Section of the Farmers Union (42), Loneragan (35), O'Brien (57) and the Environmental Management Group, University of W.A. (62).

Eleven percent of submissions expressed concern with the lack of information in the ERMP on the long-term commitment and responsibility of Alcoa after decommissioning. This concern was particularly related to maintenance of the red mud disposal ponds and the rehabilitation of the mined areas (Tree Society — 25 and Loneragan — 35). A further 10% recommended that both the Kwinana and Pinjarra operations warranted a review of their environmental impacts.

5. Conclusion

Irrespective of the considerable press coverage given to the Wagerup proposal and the ERMP, and the numerous 'letters to the editor' over the past three months, the number of public responses to the nation-wide advertisements on this project indicates a high level of public interest. The comments expressed in the 63 detailed submissions indicate a genuine concern for the natural and human environment of Perth and the Darling Range.

Of the 63 detailed submissions received, it is worthy of note that 48% of the authors had professional qualifications relevant to the subject matter of their submissions. Many of these people are currently involved in aspects of research associated with the northern jarrah forest.

This report, the summaries of the public comments and the analyses of these submissions have all been presented to the Environmental Protection Authority, which has in turn taken this information into consideration in the preparation of its final report to the Government of Western Australia, on the Wagerup proposal and Alcoa's ERMP.

6. References

Calabrese, E. and Tuthill, R. (1977), Arch. Environ. Health, **32,** 200.

Havel, J.J. (1975), Bull. 86, and Bull. 87, Forests Dept. of W.A.

W.A. Government Committee of Inquiry (1971). Appointed to inquire into and report on the operation of the Mining Act of the State and to report whether any and what amendments should be made to the Mining Act, 1904.

Table I — Detailed Breakdowns of Environmental Aspects of the Wagerup ERMP

ıbmission No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	Overall Totals
ıter Quality - Other than Salinity		X				X				X				X	X							X																								X	X					X		X	X				X	X		X	X	15
ılinity	X	X								X				X				X	X	X	X		X		X	X	X	X			X	X	X	X		X	X	X		X	X			X		X		X	X			X	X	X	X	X	X		X		X	X	X	36
ıter Quantity - Inc. Supply to Ref.																																				X	X	X														X		X					X					6
npact not viewed on Regional Scale							X														X						X			X	X			X	X		X						X	X		X						X	X	X			X			X		X	X	18
ecreation				X	X	X	X								X		X			X	X					X				X				X		X	X				X							X			X	X			X	X		X		X		X	X	23
ıtural Heritage for Children																										X		X																	X											X								4
ll Aspects of Flora		X		X					X	X	X	X		X						X	X	X			X		X				X			X			X				X		X	X				X				X				X						X	X	23
ll Aspects of Fauna		X		X			X		X			X		X						X	X	X		X	X											X	X				X			X		X		X				X				X						X	X	21
ıergy Consumption		X			X					X					X	X			X	X	X				X				X							X								X	X		X	X				X	X	X		X						X	X	21
nployment							X														X								X																							X								X				5
ed Mud Disposal	X																		X																		X								X			X														X		6
ıck of Coordinated Land-Use Planning													X												X		X							X	X		X				X						X	X			X						X					X		12
ır Pollution - Inc. All Emissions								X							X																						X				X							X												X		X		7
onservation of Jarrah Forest	X	X	X	X	X				X							X	X		X	X	X	X			X	X		X											X		X			X	X			X			X	X	X	X		X				X		X	X	28
ieback	X	X							X		X			X	X								X								X	X				X	X	X	X	X			X			X	X					X	X	X			X		X				X	23
ehabilitation not Proven	X						X		X	X									X	X	X		X	X	X		X					X		X	X	X			X		X			X	X	X		X			X	X	X	X						X		X	X	28
onflict with Existing Land-Use			X																												X						X	X			X	X					X					X											X	10
oncern for Existing/Additional Reserves				X			X			X	X			X		X			X		X				X		X				X			X	X		X	X			X		X	X			X	X				X	X	X				X				X	X	26
ong Term Committment - Inc. After Decommiss.							X																		X										X	X																X	X									X		7
urther Research (Inc. Research Instit.)							X									X								X	X		X				X		X	X	X	X			X					X			X										X					X	X	16
.t. Mining Strategies not Considered - new ones suggested							X																				X				X			X	X		X										X						X				X					X		10
ıadequate Time - Area Mining Details																									X												X																X									X		4
RMP not considered with System 6/SRI.																														X																	X			X							X			X		X	X	7
ıck of Cost - Benefit Analysis Study																																									X				X															X				3
TALS	5	7	2	5	3	2	9	1	5	6	3	2	1	6	5	4	2	1	6	7	10	4	3	3	11	4	8	3	2	3	8	3	2	9	7	9	14	5	4	2	11	1	4	9	6	6	9	11	1	1	4	15	10	9	3	7	7	2	4	9	1	19	14	359

TABLE I

Table II — Detailed Breakdown of the Technical Aspects of the ERMP and the State's Environmental Assessment and Control Procedures.

Submission No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	Overall Totals
Qualifications Relevant to Sub.					X			X	X		X	X	X	X	X										X			X				X			X	X		X		X		X	X	X	X		X			X	X	X	X		X			X	X	X		X	X		30
Group Affiliation - Inc. Conservation GPS.																X	X									X					X	X						X	X			X	X						X		X	X	X	X	X	X						X	X	X	19
Based on ERMP	SUBMISSION				X			X	X		X	X	X	X	X		X				X	X			X	X		X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X			X	X	X	X			X	X	X	X		X	X	43
Not Based on ERMP	SUBMISSION	X														X																									X									X	X														5
Not Read ERMP	SUBMISSION		X	X		X	X			X								X	X	X			X	X			X		X																											X	X					X			15
For	ATTITUDE																																																																0
Against	ATTITUDE	X	X	X	X	X	X			X	X				X	X	X	X	X	X	X	X	X	X			X		X	X							X				X	X	X	X									X		X	X	X			X					31
Non-Committal	ATTITUDE							X	X					X											X	X		X				X				X		X	X										X	X								X	X			X			15
Request Inquiry	ATTITUDE																X																												X	X					X		X	X	X							X	X	X	10
Defer Pending Research	ATTITUDE											X	X																		X		X	X	X					X					X	X	X	X			X	X		X							X		X	X	17
Proposes Constructive Recommendations	ATTITUDE							X				X					X					X			X	X		X			X	X		X	X	X		X										X				X		X				X					X		18
Availability	CRITICISM OF THE ERMP ITSELF							X																																	X			X		X													X						5
Document Inadequate	CRITICISM OF THE ERMP ITSELF										X	X	X				X					X			X	X				X				X	X			X				X			X	X							X										X	X	17
Inadequate Review Period	CRITICISM OF THE ERMP ITSELF																																		X			X									X												X				X		5
Agreement Acts Premature or Inadequate	CRITICISM OF THE ERMP ITSELF	X																												X				X				X			X	X				X					X								X	X			X	X	12
Alternatives not Considered - Inc. Guidelines not followed	CRITICISM OF THE ERMP ITSELF							X																		X									X	X	X	X				X				X					X												X	X	11
ERMP too Long	CRITICISM OF THE ERMP ITSELF							X																																																									1
Cost	CRITICISM OF THE ERMP ITSELF	X						X																														X			X					X													X					X	7
Time Frame Inadequate	CRITICISM OF THE ERMP ITSELF																																		X			X			X	X					X						X								X		X	X	9
Critical of EPA or Government Environ. Control		X	X																															X	X			X				X											X	X				X		X	X		X		12
EPA Report should be made Public			X																															X				X																											3
Need for Review of Pinjarra, Kwinana Operations																																X			X	X		X															X	X											6
Length of Submission - No. of Pages		1	2	1	2	1	1	40	7	2	6	4	2	1	10	1	11	1.	1	3	3	3	1	1	9	14	1	4	1	1	4	6	4	6	23	5	4	12	2	3	1	31	2	8	7	4	5	3	4	2	1	5	94	4	38	2	1	11	17	17	3	1	10	7	
TOTALS		5	4	2	3	2	2	8	3	2	4	5	4	3	3	3	6	2	2	2	2	4	2	2	5	6	2	4	2	4	4	6	2	7	10	6	3	14	3	3	6	9	4	4	5	8	5	3	3	3	7	5	9	7	5	3	2	5	7	5	4	5	12	9	291

TABLE II

TABLE III

BACKGROUND OF SUBMISSIONS

Authors' Background	Percentage of Submissions Received
Professional qualifications relevant to submission	48
Group affiliation	30
Lay persons	22
Relationship of Submission to ERMP	
Submission based on ERMP	28
Submission not obviously based on ERMP	8
Obviously NOT read ERMP	24

TABLE IV

ATTITUDE TOWARDS THE WAGERUP PROPOSAL

	Percentage of Submissions Received
For	0
Against	49
Non-Committal	24
Request a Public Inquiry	16
Defer pending research	27
Proposed constructive recommendations	29

TABLE V

AREAS OF ENVIRONMENTAL CONCERN TO THE PUBLIC

Major Issues Identified	Percentage of Submissions Received
Salinity	57
Conservation of the jarrah forest	44
Rehabilitation not proven	44
Concern for reserves	41
Recreation	37
Dieback	37
Flora	37
Fauna	33
Energy consumption	33
Other Areas of Concern	
Further research required (including Research Institute)	25
Water quality other than salinity	24
Alternative mining strategies not con sidered	16
Air pollution (including all emissions)	11
Red mud disposal	10
Water quantity (including supply to refinery)	10
Employment	8
Inadequate detail on timing and location of mining	6

TABLE VI

TECHNICAL INADEQUACIES OF THE ERMP ITSELF AND/OR THE STATE'S ENVIRONMENTAL PROCESS

	Percentage of Submissions Received
Document generally inadequate	27
Agreement Acts premature or inadequate	19
Critical of EPA or government environmental control	19
Alternatives not considered (including Guidelines not followed)	17.5
Time frame of the ERMP inadequate	14
Cost of ERMP too high	11
Availability of ERMP restricted	8
Inadequate period for Review of ERMP	8
Lack of Cost-Benefit Analysis in ERMP	5
ERMP too long	2

TABLE VII

BROADER ISSUES OF THE WAGERUP PROPOSAL

	Percentage of Submissions Received
Impact not viewed on regional scale	29
Lack of co-ordinated land use planning	19
Conflict with existing land use	16
Long-term commitment (including after decommissioning)	11
ERMP not considered with System 6 and SRI Reports	11
Need for review of Pinjarra and Kwinana operations	10

TABLE VIII

LIST OF SUBMISSIONS

Submission Number	Name	Address
1	Galvans, A.	P.O. Box 36, Karrinyup 6018
2	Flynn, J.C.	9 Ellen Street, Fremantle 6160
3	Fullarton, E.	Unit 30/20 Plantation Street, Mount Lawley 6050
4	Firth, D.	EHCD "Sheraton Court", 207 Adelaide Terrace, Perth 6000
5	Collins, S.R.	7 Jason Street, Melville 6156
6	Frayne, R.J.	Wesley Way, Market Street, Fremantle 6160
7	Hollick, M.	Department Civil Engineering, University of W.A., Nedlands 6009
8	Allen, G.H.	Physics Department, WAIT, Hayman Road, Bentley 6102
9	Beck, P.	Red Gum Hollow, Gill Street, Mundaring 6073
10	Robinson, C.J.	33 Loftus Street, Nedlands 6009
11	Weston, A.S.	16 Bellevue Terrace, West Perth 6005
12	Muir, B.G.	Coulston Road, Boya
13	Beard, J.S.	6 Fraser Road, Applecross 6153
14	Mahon, B.C.	Lot 5, Osborne Street, Stoneville 6554

TABLE VIII (cont.)

Submission Number	Name	Address
15	Climbing Association of W.A.	Flat 23, 7 Clifton Crescent, Mount Lawley 6050
16	Conservation Council	Environment Centre, 537 Wellington Street, Perth 6000
17	Wheeler, J. & T.	198 Riseley Street, Booragoon 6154
18	Green, V.	29 Charsley Street, Willagee 6156
19	Hodge, G.	4 Carroll Street, Ardross 6153
20	Readhead, E.	14 Elabana Crescent, Dianella 6062
21	Emberson, E.J.	1 La Grange Street, Innaloo 6018
22	Payne, J.	16 Lachlan Road, Thornlie 6108
23	Young, H.	202 Riseley Street, Booragoon 6154
24	Majer, J.D.	Department Biology, WAIT, Hayman Road, Bentley 6102
25	The Tree Society	Station House, Claremont, 6010
26	Day, G.R.	11 The Bullwark, Willetton 6155
27	Dell, B.	School of Environmental and Life Sciences, Murdoch University, Murdoch 6153
28	Irwin, E.	10 Gledden Street, Morley 6062
29	Fenner, J.E.	5 Mosaic Street, Shelley 6155
30	W.A. Association of Recreation Personnel	P.O. Box 179, Wembley 6014
31	Forest Products Association	103 Colin Street, West Perth 6005
32	Norman, M.J.	1 Strathcona Street, West Perth 6005
33	Cotton, R.A.	23 Pearse Street, North Fremantle 6159
34	Hopkins, A. & L.M.	130 Gloster Street, Subiaco 6008
35	Loneragan, J.F.	School of Environmental and Life Sciences, Murdoch University, Murdoch 6153
36	Leah, A.	25 Swan Street, Mosman Park 6012
37	Institute of Foresters	Science Centre, 20 Stirling Highway, Nedlands 6009
38	National Country Party (W.A.)	11 Havelock Street, West Perth 6005
39	Nesbitt, H.J.	School of Environmental and Life Sciences, Murdoch University, Murdoch 6153
40	Sundstrom, J.	40 Tangmere Way, Balga 6061
41	South West Forests Defence Foundation	P.O. Box 203, Nedlands 6009
42	Beekeepers Section, Farmers Union	239-243 Adelaide Terrace, Perth 6000
43	Trudgen, M.E.	266 York Street, Subiaco 6008
44		The authors of this submission requested that their comments **NOT** be forwarded to either Alcoa or EHCD.
45	Hare, W.L. and Hutchison, J.R.	68 Rupert Street, Subiaco 6008
46	Lowe, G.P.W.	84 Parklands Square, Riverton 6155
47	Bowyer, R.	17 Clarke Road, Morley 6062
48	Earth, C.S.	23 Carlton Street, Leederville 6007
49	Taylor, R.	Department Cardiology, Royal Perth Hospital, G.P.O. Box X 2213 Perth 6001
50	Ackerman, Oldham and others	P.O. Box 11, Wanneroo 6065
51	Australian Institute of Landscape Architects	46 Kings Park Road, West Perth 6005

TABLE VIII (contd.)

Submission Number	Name	Address
52	Campaign to Save Native Forests	Environment Centre, 537 Wellington Street, Perth 6000
53	State Parliamentary Labor Party	Parliament House, Perth 6000
54	Bartholomaeus, W.N.	105 Rosedale Street, Floreat Park 6014
55	W.A. Trout and Freshwater Fishing Association	No address given
56	Bartholomaeus, E.	105 Rosedale Street, Floreat Park 6014
57	O'Brien, B.J.	12 Caithness Road, Floreat Park 6014
58	Elliot, R.	39 Bricknall Road, Attadale 6156
59	Holt, P.G. and Rankin, B.J.	C/- Department of Microbiology, University of W.A. Nedlands 6009
60	de la Hunty, S.	22 Fraser Road, Applecross 6153
61	Cardiac Society of Australia and New Zealand (W.A. Div.)	C/- Royal Perth Hospital, G.P.O. Box X 2213, Perth 6001
62	Environmental Management Group (Uni. of W.A.)	C/- Mr. A. Conacher, Department of Geography, University of Western Australia, Nedlands 6009
63	Australian Conservation Foundation	672 B Glenferrie Road, Hawthorn, Victoria 3122

APPENDIX IV
ROUTINE ENVIRONMENTAL CONSTRAINTS

APPENDIX IV

ROUTINE ENVIRONMENTAL CONSTRAINTS

Some organisations and government departments have authority over specific aspects of the environment as a consequence of responsibilities vested under certain statutes. Recognising this, the Environmental Protection Authority circulated the Wagerup ERMP to each of these authorities (14) and their comments have been considered in the preparation of this report.

This section of the Authority's report deals with the more 'routine' aspects of the environment for which either licences or approvals are required under specific legislation, or for which there are powers of control through the general responsibilities of that authority or government department.

Emission Control

Air Pollution

Alcoa's proposed operations will be subject to control through the Mines Regulations Act, 1946-69 and the Clean Air Act, 1964. Air emissions are not expected to pose any problems at the mine-sites although normal dust suppression on haul roads requires a significant amount of water.

Alcoa will comply with State requirements for emission control from the refinery through licences issued under the Clean Air Act. While no risk to humans is anticipated, the Department of Agriculture has indicated that there would be adverse effects on nearby vegetation from SO_2, NO_x and O_3 emissions.

> ***RECOMMENDATION 1***
>
> ***The Air Pollution Control Council must take the above factors into consideration in the approval of a licence for any refinery at Wagerup.***

Noise

Industrial and community noise levels are subject to various regulations under the Noise Abatement Act, 1972. Alcoa will meet all such requirements at both the refinery and the mine-site. (See also Recommendation 11.)

Odours

There are no specific statutes controlling odours. The Bayer refinery process has an inherent organic odour which is offensive to many people. Complaints from nearby residents can be minimised if Recommendation 11 is followed.

Hydrologic and Engineering Aspects of the Refinery Area

Potable Water Supply

Available aquifer information suggests that the supply of potable water for the refinery will not be able to be met by the on-site bore proposed by Alcoa.

> ***RECOMMENDATION 2***
>
> ***A suitable alternative supply must be defined.***

Hydrogeology of the Refinery Area

Additional hydrogeological information suggests that the Harvey River Main Drain has a significant effect on the groundwater flow regime. It is incised through the water table normal to the flow direction and consequently acts as a line sink conducting groundwater north towards the Harvey Estuary. Thus contaminants from the refinery or red mud disposal areas could be transported to the estuary unless effectively contained onsite.

Red Mud Disposal

The authority controlling such disposal is the Public Works Department under both the Regulations to the Rights in Water and Irrigation Act and the Wagerup Agreement itself. While Alcoa recognises and accepts its responsibilities in meeting stringent design criteria for the mudlakes, details are not given in the ERMP.

Current knowledge suggests that clay seals are never wholly impermeable and some groundwater contamination will occur.

RECOMMENDATIONS

3. ***Before approvals for residue disposal dams are given, Alcoa should provide evidence showing that the proposed clay seals will render them impermeable.***
4. ***The hydrological monitoring programme for the refinery and residue disposal sites must be approved by Government before construction commences.***
5. ***Before the final mud lakes design is approved, Alcoa must submit for approval:***
   - ***(i) details of how leakage will be contained,***
   - ***(ii) estimates for the quantity of leachates from the red mud and the termination time for the leaching out of caustic soda,***
   - ***(iii) details of how the Company will deal with leachates after decommissioning and until leaching is complete, and***
   - ***(iv) details of contingency plans for remedial action in the event of surface and groundwater contamination. Such plans must consider the effects of the Harvey River Main Drain.***

Alcoa has initially allowed approximately five square kilometres for residue disposal. Independent authorities have calculated that between 15 and 30 square kilometres will be needed for this purpose at the time of decommissioning.

RECOMMENDATION 6

In submitting mud lake design plans to Government for approval, Alcoa must propose means for surface drainage of the total area and for ensuring permanent maintenance free protection against erosion after decommissioning.

Caustic Soda

The use of caustic soda from mercury cells is not acceptable to the Public Works Department or the EPA.

RECOMMENDATION 7

Caustic soda from mercury cells should not be permitted at Wagerup and must be quickly phased out at Kwinana and Pinjarra.

Flocculants and Other Chemicals

Details are not given in the ERMP.

RECOMMENDATION 8

The prior approval of the State should be required on the use of flocculants or chemicals which could find their way into residue ponds.

Occupational Health and Community Safety

Mine Safety

The safety of operators within the mining area is adequately covered by the provisions of the Mines Regulations Act.

General Operational Safety

All aspects of fire protection and general operational safety are covered by a range of government regulations. Alcoa will meet all such requirements at both the refinery and mine-sites. Procedures would be the same as those practised at their current operations.

Control of Blasting and Mining Near Public/Private Property

Alcoa's blasting operations are controlled by inspectors operating under the Mines Regulations Act. To minimise noise levels, structural damage and danger from fly-rock, blasting is restricted to within 500 metres of private property or areas open to public access unless special arrangements are made with either the freeholder, or the relevant authority (e.g. Main Roads Department with respect to the closure of public roads).

Little conflict is expected in the proposed Wagerup 25 year mining area as:

(i) there are no towns present (c.f. Dwellingup within the Pinjarra mining envelope), and

(ii) the number of freehold locations is small and one third of these have been purchased by Alcoa.

Insufficient attention has been paid to approved public recreation within the forest. The Bibbulman track passes through the proposed 25 year mining area and safety precautions for people using this public facility have not been covered.

RECOMMENDATION 9

Future operations by Alcoa must cater for the public use of the Bibbulman Track.

Impact on Existing Communities

Community Services Monitoring

Some communities (e.g. Harvey and Waroona) will show marked population increases. Alcoa will undertake to monitor the development and adequacy of community services. This must be done in association with the appropriate government authorities and the local shire councils.

RECOMMENDATION 10

Should Wagerup proceed, a co-ordinated community services monitoring programme must be instigated. It must include input from Alcoa, the appropriate government departments and each of the shires involved.

Urban Development of Waroona

Waroona is only seven kilometres north of the preferred refinery site. Normal summer south-east to south-west breezes will direct emissions towards this town (including refinery noise and odours). Restrictions to the urban development of Waroona, including the creation of small rural holdings (i.e. hobby farms) are possible through the provisions of the Town Planning and Development Act, 1928.

RECOMMENDATION 11

The southern extension of Waroona, including subdivision for small rural holdings, should be restricted to provide the maximum possible buffer zone. Under no circumstances should this be less than five kilometres from the northern boundary of the refinery site.

Developmental Inter-relationships

Raw Materials

The refining process requires large quantities of raw materials (lime, acid, oil-fuel, caustic soda, etc.). Some of these are produced locally such as the lime which is supplied by Cockburn Cement from sands dredged from Cockburn Sound (39,000 tonnes/million tonnes of alumina produced/annum).

RECOMMENDATION 12

The availability and environmental impacts on the State in supplying these raw materials must be taken into consideration in any future decision to expand bauxite mining.

Energy Requirements and Associated Integrated Development

The guaranteed demand by Alcoa for north-west gas is an essential factor in determining the economic viability of the proposed Dampier-Perth pipeline. Several further integrated industrial developments, dependent on north-west gas, have been proposed for the South-West. These include:

(i) combined cycle electricity generation

(ii) aluminium smelting

(iii) caustic soda production, and

(iv) ethylene chloride production as a basis for the manufacture of plastics.

RECOMMENDATION 13

A commitment to these energy intensive developments intimately associated with the expansion of Alcoa's operations should only be undertaken after careful integrated planning. This planning must take into consideration the environmental impacts including those of future natural resource and energy commitment.