Wagerup Alumina Refinery Expansion

Alcoa of Australia Ltd

Report and Recommendations
of the
Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 423 December 1989

Wagerup Alumina Refinery Expansion

Alcoa of Australia Ltd

Report and Recommendations
of the
Environmental Protection Authority

ISBN: 0 7309 3442 X
ISSN: 1030 - 0120

Contents

Appendices

Map

Summary and Recommendations

Alcoa of Australia mines bauxite from the Darling Range, and refines it into alumina at refineries at Kwinana, Pinjarra and Wagerup. In Western Australia Alcoa is covered by the Special Agreement Act ML1SA, 1961, and is thereby excluded from the environmental control of the Environmental Protection Act, 1986. In this report the EPA has recommended that Alcoa be required to be covered by the same environmental law as other companies.

Alcoa has been highly successful at mining and rehabilitation in the Darling Range. There is, however, considerable uncertainty as to the long term environmental acceptability of extensive residual areas on the Swan Coastal Plain. In this report there is a recommendation that Alcoa provide a "walk-away" solution to residue disposal for all of its operations in Western Australia.

Alcoa proposes to raise the production of alumina at its Wagerup refinery from 840,000 tonnes to 1.5 million tonnes annually.

The 1978 environmental review and Agreement Act ratified production of up to 2 million tonnes per year. Alcoa then constructed only one out of a proposed four units, with a then nominal capacity of 500,000 tonnes. The Environmental Protection Authority required the present expansion to undergo a formal assessment at the level of Consultative Environmental Review.

The capacity of the refinery will be increased by integrating a second production unit with the first one.

Bauxite for the refinery is mined from the Willowdale mine, 10 km east, and transported to the Wagerup processing facility by conveyor. While there are no new constructed facilities required at the mine about 50% more water will be needed, mainly to suppress dust on mine haul roads. Extra bauxite production will be achieved by the working of extra shifts and will require 35 more miners and an increase in earth-moving and support vehicles.

At the refinery most existing facilities will require upgrading or duplication, but there is no new clearing required.

Bauxite residue disposal will report to the existing impoundments. Alcoa will continue with "wet" disposal methods, at least for the present. As the disposal lakes continue to grow in size their ongoing management may become a more significant factor, with their attendant problems of dust, and potential to pollute groundwater.

Construction at the refinery will take place over 30 months and will require a peak workforce of about 850, most of whom are expected to commute.

The refinery will require an increase of personnel of about 90, bringing the expanded, combined mine-refinery workforce to about 609. There is the possibility for social impact to the town of Waroona nearby, which can be minimised by close liaison between Alcoa and the Shire of Waroona.

The accelerated mining regime will enable areas to be mined and rehabilitated more quickly but will require a re-scheduling of forestry management and production in order to minimise the potential for conflict.

With the evolution of the technology of alumina refining since 1978, savings in the amounts of requirements (such as energy, water and sodium hydroxide) per tonne of alumina are expected. The Wagerup plant uses natural gas as its energy source, and the increased power requirements may be sourced from a co-generating unit, which would efficiently deliver power in excess of requirements, to be fed back into the State Energy Commission of Western Australia grid system. Extra water will come partly from the Samson South Diversion Drain, but increasingly from rainwater channelled off the residue ponds as these grow in size. Requirements for the mine area will be met either via an upgraded pipeline from the refinery or by building a reservoir nearer to Willowdale. The latter option has the potential for significant environmental impact and would require a careful review of the proposal to minimise effects on stream valleys and on fish migration routes.

The Environmental Protection Authority concludes that this proposal is acceptable subject to the following.

Recommendation 1

The Environmental Protection Authority concludes that the Wagerup Refinery Expansion Proposal is environmentally acceptable and recommends that it could proceed provided that commitments given in the proponent's 1978 ERMP, 1978 ERMP Supplement and 1989 CER are followed, and subject to the following:

Recommendation 2

The Environmental Protection Authority recommends that Alcoa liaises closely with the Department of Conservation and Land Management throughout the project's life to ensure that mining schedules are integrated with that of forest management.

Recommendation 3

The Environmental Protection Authority recommends that all Alcoa's operations in Western Australia come under the jurisdiction of the Environmental Protection Act 1986.

Recommendation 4

The Environmental Protection Authority recommends that the proponent be required to set up a programme to develop a walk-away solution for the bauxite residue disposal across all three refineries, to the satisfaction of the Minister for Environment, within 12

months of the commissioning of this expansion.

Recommendation 5

The Environmental Protection Authority recommends that minimising of greenhouse gas emissions should be a major factor in the proponent's selection of energy generation options.

Recommendation 6

The Environmental Protection Authority recommends that Alcoa establishes formal liaison and monitoring processes with the Shire of Waroona to the satisfaction of the Environmental Protection Authority, upon advice from the Social Impacts Unit, to minimise social disruption to the Waroona district.

Recommendation 7

The Environmental Protection Authority recommends that the proponent should be responsible for decommissioning the plant and rehabilitating the site and environs of the expanded facility, to the satisfaction of the Environmental Protection Authority. At least six months prior to decommissioning, the proponent shall prepare, for the expanded facility and its site, a decommissioning and rehabilitation plan to the satisfaction of the Environmental Protection Authority.

1. Introduction

Alcoa of Australia Pty Ltd has been operating the Wagerup Refinery (Stage 1) near Waroona (100 km south of Perth) since 1984, under the Alumina Refinery (Wagerup) Agreement and Acts Amendment No 15 of 1978. This agreement covers a production capacity up to 2 mtpa (million tonnes per annum).

Initially the refinery produced about 670,000 tpa, but fine tuning of the plant (currently under way) is expected to lift its capacity to 840,000 tpa of alumina.

The expansion proposal referred to in this report is to increase the production of the refinery to a capacity of 1.5 mtpa by the construction and operation of a new process line.

Although the original 1978 Environmental Review and Management Programme and Environmental Protection Authority Assessment (DCE Bulletin Number 50) planned and gave approval for a capacity of up to 2 mtpa a formal review was nevertheless sought. It was considered necessary because of the considerable elapsed time (nearly 12 years) since the original assessment, during which period earlier concepts and values have changed. The level of assessment set was formal Consultative Environmental Review. (CER).

The purpose of the CER prepared by Alcoa is to outline the significant changes in the scope of the project in relation to predicted impacts and changes to environmental management programmes and to compare Alcoa's performance against the commitments made in the 1978 Environmental Management and Review Programme.

2. Project description

The capacity of the refinery will be raised from 840,000 tpa to 1.5 mtpa by building a second production unit. Stage 2 will be integrated with Stage 1.

2.1. Alternatives

Alcoa considered further expansion at its Kwinana and Pinjarra refineries as alternatives to Wagerup but concluded that the latter was most suited because:

- Wagerup has the most up to date technology;
- it is the most energy efficient of the three plants;
- has the greatest potential for achieving economies of scale; and
- the bauxite resource for Wagerup at the Willowdale mine is the least constrained by other land uses.

2.2 Willowdale mine

In order to feed the expansion additional bauxite from the Willowdale mine (10 km east) will be transported via the existing conveyor to the refinery. There will be no major works required at the mine, but 50% more water will be required, most of which will be used for dust suppression on haul roads. A decision by Alcoa needs to be made on whether to upgrade the capacity of the existing pipeline from the refinery to the mine or to construct a new reservoir closer to it.

The number of 50 tonne haul trucks will initially be increased from 11 to 14, but as these fall due for replacement, the fleet will be progressively converted to a lesser number of more fuel efficient 85 tonne trucks. As well, two bulldozers, a scraper and service vehicles will be required. Extra production will be achieved mainly by working additional shifts.

2.3. Wagerup refinery

At the refinery most existing facilities will require upgrading, or duplication, but as the existing plant site was cleared at the outset to accommodate the Stage 2 expansion, there is no new clearing required.

2.4. Residue lakes

Residue disposal will continue to be to the existing underdrained impoundments ,the first of which was filled in July 1989. The composition of the sodium hydroxide liquor will remain the same at 12g/l total alkali. Alcoa has not yet made a decision on whether to change to "dry" disposal methods, such as are already employed at Kwinana and Pinjarra refineries.

2.5. Raw materials, water and energy requirements

Compared with the 1978 proposal there are expected to be significant savings on requirements per tonne of alumina produced. These are shown in the table below, taken from Alcoa's Consultative Environmental Review (Table 1) and have arisen as a result of design improvements which have evolved in the interim.

Table 1: Raw Materials Usage (per tonne of alumina produced)

Material	Unit 1 1988-90	Units 1 and 2 1992	Original Proposal
Bauxite (t)	3.4	3.4	3.4
NaOH (kg)	53-61	50-58	62
Water (kl)	1.8	1.5	2.3
Energy (Gj)	10.0-10.7	9.7-10.2	10.0-12.5

Make-up water requirements will rise from 1,470 to 2,170 megalitres initially, and will continue to be obtained from the facilities on Yalup Brook, supplemented if necessary by winter runoff from the Samson South diversion drain. However, as the size of the residue area increases and more rainfall run-off from it can be collected and recycled, the make-up water requirement will decrease.

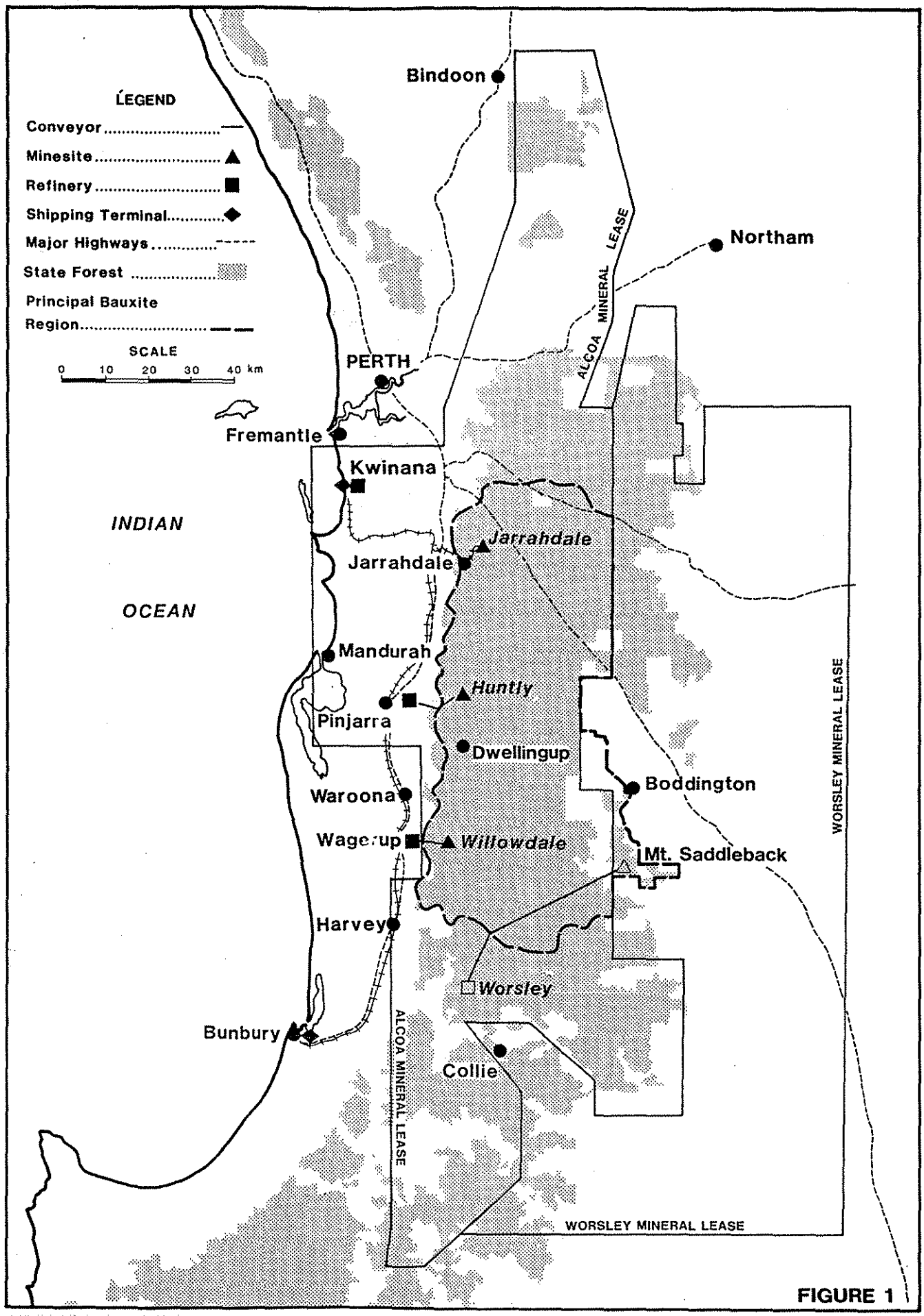

Figure 1 : Location

Power requirements will increase. Alcoa will choose between another turbo-alternator, or a co-generation power unit, which would be far more efficient and would have the capacity to feed surplus power back into the SECWA grid.

2.6. Workforce

The construction workforce will peak at 850 over the 30 month period of construction, and the permanent workforce at the refinery is expected to increase by 88. Alcoa believes that, on past experience, most of the construction workers will, aided by a travel allowance, commute to the site, and that about 45-50 of the permanent workforce may settle in Waroona.

The expanded combined Willowdale - Wagerup production workforce will total 609 personnel.

3. Existing environment

While the Willowdale minesite lies within State forest, the refinery is at the foot of the Darling Scarp in cleared agricultural land. No further clearing at the refinery site is envisaged for Stage 2 and, while the rate of mining at Willowdale will increase, the overall area to be mined and rehabilitated remains the same as described and approved in the original ERMP. Similarly the residue ponds will be more quickly filled as a result of the proposed expansion, but the total volume to be disposed of is the same as originally proposed.

4. Submissions relating to Alcoa's Consultative Environmental Review

1. Five submissions were received; two from conservation bodies and three from government agencies. More detail on the points raised, and
2. Alcoa's responses, are compiled in Appendix II of this report.

Concerns raised centred around:

- the unquestioned assumption that a refinery expansion was good for Western Australia;
- aluminium recycling - lack of consideration of this issue;
- incremental impacts on greenhouse effect;
- dieback in the jarrah forest;
- residue pond rehabilitation;
- unclear procedures with regard to construction camps;
- likely impacts of the construction workforce;
- unclear direction with regard to supplementary water supplies; and
- forest management implications arising from the increased mining rate.

The Environmental Protection Authority has taken these points into account in its assessment and recommendations which follow.

5. Environmental impacts and management

Alcoa's operations in Western Australia are covered by a special agreement act from 1961.

A difficulty peculiar to projects which are subject to early State Agreement Acts is that they do not fall directly under the control of the Environmental Protection Act 1986. In order to remove this inconsistency Alcoa should come under the direct powers of the Environmental Protection Act, in the same way as other developers in Western Australia.

Expansion of refinery throughput means that the bauxite resource will be depleted sooner, although there are still reserves at the proposed 1.5 mtpa rate to ensure that the operation has a life of at least 50 years. The impacts though are expected to be less than were anticipated in 1978's ERMP because of design and technology improvements in the interim.

The proposed increase will require an additional 6,100 terajoules of natural gas each year, the consumption of which would create approximately 286,000 tonnes of carbon dioxide, or 1.3% of the total generated annually by the combustion of fossil and wood fuels in Western Australia. However the amount of carbon dioxide will be substantially lower than was envisaged in the 1978 ERMP (see Table 1) when three units were proposed for the refinery.

With regard to greenhouse gas emissions, the Wagerup plant is cleaner than most others because it is relatively modern and uses natural gas as its energy source. If expansion to meet projected world demands for alumina is considered acceptable, then the development of Wagerup Stage 2 with the capacity to co-generate power should be encouraged as an environmentally preferable technology.

A potential problem with the accelerated mining regime proposed is the implications for long-term forest management in the Samson, Driver, Hoffman and Waterous forest blocks. The fast-changing mining plans for these areas are not integrated with long-term fire protection and logging plans, and changes to scheduling of logging, mining and fire protection (buffer) zones may be required in order to avoid conflict. Increased mining rates will require forest dieback mapping in advance of clearing for exploration of mining, as well as actual logging of areas to be mined, and the sale of these products. Some of these activities may stretch the present resources of the Department of Conservation and Land Management.

The 50% increase in water requirements at the mine will be met by either upgrading the existing pipeline from Wagerup, or by constructing a new reservoir nearer to the mine. If the latter option is chosen there is the potential for environmental impacts, such as the blocking of a fish migration route, and the drowning of portion of a forested catchment, and the

proposal should be referred to the Mining and Management Planning and Liaison Group* for review.

Bauxite residue is generated from the refining process. Two tonnes (dry weight) are created for each tonne produced of alumina. This residue contains caustic liquor (sodium hydroxide) at a concentration of about 12 g/l. This alkali cannot be fully recycled and the storage and confinement of the residue presents a growing management problem at all of Alcoa's refineries. The uses to which these dumps can be put are restricted, even after stabilisation and revegetating. At Wagerup it is proposed to rehabilitate to pasture for stock grazing. The sealed ponds may become waterlogged with alkaline solution unless liquor is regularly pumped away to a refinery.The scale of bauxite mining and refinery projects and their long-lasting effects require that high priority be given to finding permanent solutions to the alkaline residue disposal lakes so that, upon cessation of mining and refining operations, there will be no requirement for ongoing management. This is similar to the requirements placed upon other mining operations.

6. Social impacts

The possible social impacts on the Waroona community from up to 850 construction workers and an extra 130 production employees have been based on the preferences shown by the workforce for Stage 1 of the refinery. Only about 38% of Alcoa's workforce currently lives in Waroona, with the remainder split mainly between Mandurah (32%), Harvey (11%), Pinjarra and Bunbury (14%).This data is taken from Alcoa's CER, Section 5.4. Using the 38% figure an extra 46 new employees might be expected to take up residence in the Waroona area, the current population of which is around 1,960. No estimates are given in Alcoa's CER of where the large construction force will be based, although again it is expected that most will commute to the Wagerup site from areas further afield. The company has indicated that it will seek to minimise any traffic disruptions during the construction phase.

In order to pre-empt potential problems Alcoa plans to undertake a community survey in conjunction with the Social Impacts Unit**. It is seen by the Authority to be important for Alcoa to maintain its good lines of communication with the community via the Shire of Waroona, through the construction phase and into production.

* The MMPLG consists of representatives from the Environmental Protection Authority, Water Authority of Western Australia and Departments of Conservation and Land Management. Its function is to rehabilitate and integrate them with other uses to minimise conflicts.

** This unit is directly responsible to the Deputy Premier and works closely with affected communities, developers and government agencies to identify and ameliorate the social impact of developments.

7. Conclusions and recommendations

The proposal is considered to be environmentally acceptable with the following recommendations.

Recommendation 1

The Environmental Protection Authority concludes that the Wagerup Refinery Expansion Proposal is environmentally acceptable and recommends that it could proceed provided that commitments given in the proponent's 1978 ERMP, 1978 ERMP Supplement and 1989 CER are followed, and subject to the following.

Recommendation 2

The Environmental Protection Authority recommends that Alcoa liaises closely with the Department of Conservation and Land Management throughout the project's life to ensure that mining schedules are integrated with that of forest management.

Recommendation 3

The Environmental Protection Authority recommends that all Alcoa's operations in Western Australia come under the jurisdiction of the Environmental Protection Act 1986.

Recommendation 4

The Environmental Protection Authority recommends that the proponent be required to set up a programme to develop a walk-away solution for the bauxite residue disposal across all three refineries, to the satisfaction of the Minister for Environment, within 12 months of the commissioning of this expansion.

Recommendation 5

The Environmental Protection Authority recommends that minimising of greenhouse gas emissions should be a major factor in the proponent's selection of energy generation options.

Recommendation 6

The Environmental Protection Authority recommends that Alcoa establishes formal liaison and monitoring processes with the Shire of Waroona to the satisfaction of the Environmental Protection Authority, upon advice from the Social Impacts Unit, to minimise social disruption to the Waroona district.

Recommendation 7

The Environmental Protection Authority recommends that the proponent should be responsible for decommissioning the plant and rehabilitating the site and environs of the expanded facility, to the satisfaction of the Environmental Protection Authority. At least six months prior to decommissioning, the proponent shall prepare, for the expanded facility and its site, a decommissioning and rehabilitation plan to the satisfaction of the Environmental Protection Authority.

Appendix 1

List of Alcoa's Commitments

8. COMMITMENTS

All but one of the major environmental management commitments made in the supplementary ERMP of 1978 are considered still relevant. Alcoa believes its commitment to dieback research is adequately covered in Item 6.4, repeated below as 8.9. There is no continuing justification for dieback research to be considered separately. Additional or modified commitments are proposed in the areas of residue disposal, dieback management and forest conservation. A restatement of the major environmental management commitments is given below. The proposed changes (printed in heavy type) mainly reflect the importance placed on these issues in Alcoa's current environmental management programme.

8.1 In addition to the 10 year mining plans to be submitted to the State under Clause 5 of the Wagerup Agreement, Alcoa will also prepare and submit to the State mining and management programmes

which will specify such matters as the areas which it is proposed to mine, the method of mining, and the proposed methods of rehabilitation in accordance with procedures to be agreed between Alcoa and the State. Alcoa undertakes to consult closely with the State on the preparation of these programmes and not to implement these programmes until agreement to them has been reached with the State or they have been determined by arbitration.

8.2 **Bauxite** mining will not take place in the eastern, lower rainfall portion of Alcoa's lease, until research shows that mining operations can be conducted without significant increasing the salinity of water resources.

8.3 Alcoa undertakes to formulate its detailed rehabilitation proposals to best suit the land use priorities established by the State for the particular mining area concerned.

8.4 Alcoa will monitor the success of all its rehabilitated mined areas in cooperation with the Department of Conservation and Land Management and, if necessary, is prepared to carry out further treatments **up to the time when it is agreed that CALM should resume full management responsibility.**

8.5 **Alcoa will forego the bauxite resources in the Jarrah forest conservation areas agreed in consultation with the State's Reserves Review Committee and specified in the Alumina Refinery Agreement Amendment Act, No. 99 of 1986, for as long as their conservation values remain. Mining adjacent to the conservation areas will utilize site-specific environmental management procedures agreed in consultation with the Mining and Management Programme Liaison Group. These will include particular consideration of dieback management and mine rehabilitation requirements.**

8.6 **Alcoa will implement a comprehensive dieback management programme designed specifically for its mine operations in the jarrah forest.** This will include the rehabilitation of dieback-effected areas adjacent to its mine operating areas, in accordance with procedures agreed with State agencies, and irrespective of the cause of introduction of the disease.

8.7 **Alcoa will prepare detailed design reports on future residue disposal areas and submit them to the Water Authority of Western Australia for approval. The design reports will include consideration of slope stability, seepage control, groundwater monitoring and construction and operating procedures. Results from monitoring programmes will be reported to the Water Authority at intervals determined by agreement with the Authority.**

8.8 **Alcoa will develop long-term management plans for the residue deposits including consideration of surface drainage, seepage control, groundwater management, slope stability, surface rehabilitation, aesthetic impact and future land use. Such plans will be formulated in consultation with relevant State agencies and will include agreement with the State on responsibilities for any ongoing management requirements after decommissioning of the refinery. Concept plans will be formulated by 1994 and reviewed periodically thereafter.** Alcoa will recover and treat or reuse alkaline solutions in the residue disposal areas until such times as it is demonstrated that such solutions do not pose an environmental hazard.

8.9 Alcoa is committed to an ongoing research programme into all aspects of its operations that have the potential to adversely affect the environment, and into those environmental characteristics that could be adversely affected by its operations.

8.10 **Alcoa will submit a brief review of its environmental research and management programme to the Department of Resources Development on an annual basis. Copies will be made available to relevant State agencies and the Shire of Waroona. A more detailed review will be prepared on a triennial basis.**

8.11 Alcoa will co-operate in a joint community services monitoring programme in conjunction with the State and the Shire of Waroona to monitor socio-economic efforts of the project and provide input for community services planning.

8.12 Alcoa will dismantle its facilities at the termination of mining and refinery operations and carry out reasonable restoration measures at the sites of those operations providing such facilities are not required for other purposes.

Appendix 2

Submissions to CER and Proponent's Responses

Scope of Consultative Environmental Review

Question

The stated purposes of the CER "to outline any significant changes in the scope of the project in relation to the predicted impacts and changes in environmental management programmes, and to compare Alcoa's actual environmental management performance against the commitments made in the 1978 ERMP" (p2, CER) ignores many of the changes that have occurred in the last ten years. The mammoth changes in public attitudes and awareness of the environment, the emergence of information relating to the extremely serious nature of the greenhouse effect and the continuing decline of the jarrah forest from a variety of causes, put the current environmental review in a totally different context from the 1978 document.

Alcoa's response

Although there have been considerable changes in community attitudes towards the environment in recent years, the potential impacts of the mining and refining operations have not changed significantly. Indeed the magnitude of those impacts in most cases is expected to be substantially less than predicted in 1978 because of improvements in knowledge and/or management procedures since that time.

The only major issue not addressed in the original ERMP was the potential impact of Greenhouse gas emissions. This topic was discussed at some length in the CER and in earlier sections of this response to public submissions.

Alumina demand and recycling

Question 1

Aside from some subjective statements on the benefits to the community (and an absence of any mention of disbenefits) and a perceived inevitability of increased world demand and production of alumina, nothing is said of the need for the proposal. There is no mention as to where this demand arises from (ie what end uses the alumina has) nor of the possibility of reducing this demand with alternative (more environmentally benign) products and recycling. If the WA Government's statements on its commitment to sustainable development are true such questions should be addressed in the assessment of a "major development project" (p3, CER).

Question 2

Alcoa state that world demand for alumina is rising but they are not doing enough in WA to reduce this demand. Aluminium smelting is a very energy intensive process and it is also environmentally destructive because of the fluoride emissions produced by the smelter.

All forms of aluminium should be recycled to limit the destructive effects of bauxite mining and smelting. As the world's largest bauxite miners, Alcoa has a responsibility to set up an aluminium recycling plant in WA. Alcoa should take a lead in this area and this could be a requirement for the approval of the Wagerup expansion.

Alcoa's response

Demand for alumina is established by world markets over which Alcoa has little control. More than 80% of the alumina produced by Alcoa in Western Australia is smelted overseas. Most of the metal produced at Alcoa's smelters in Victoria is also exported. Although it is correct to say that the amount of energy required to produce primary aluminium is relatively high, the main uses of the metal are such that substantial net energy savings often occur over the life of the products involved. For example, the amount of aluminium in the average US passenger vehicle at the time of the 1973 oil embargo was about 37 kg. It is now 71 kg (American Metal Markets, October 6, 1989). Aluminium displaced up to 3.2 kg of ferrous metals in vehicles. The energy savings through reduced fuel consumption over the life of the vehicle is many times greater than the energy cost in producing the aluminium.

One of the major advantages of aluminium is its recycling properties. It is highly durable and can be recycled many times for applications such as beverage cans without loss of quality. The total energy requirement to recycle aluminium is less than 5% of that required to produce the primary metal. Approximately 27% of aluminium used in short life products in Australia is derived from recycling sources (Aluminium Development Council, Australia, 1989). More than half of the aluminium cans sold each year in Australia are recycled. This is a higher rate of recycling than for any other beverage container and is the highest recycling rate achieved by any voluntary system worldwide. About 1.3 million cans were returned in 1988 through Alcoa, Comalco and other voluntary recycling schemes. It is reasonable to expect that the proportion of recycled material will increase substantially as longer life products such as building materials and car parts become available as scrap.

Greenhouse impacts

Question 1

The proposed expansion will consume a considerable quantity of fossil fuel and will increase the State's output of carbon dioxide by 1.3% (286 000 tonnes of carbon dioxide per annum). In addition there will be further impacts due to the clearing of the forest, the energy inputs into the construction of the new plant and the additional mining activity. All of these should have been included in the greenhouse gas assessment of the project.

We are pleased however that Alcoa have done a Greenhouse impact assessment. Their attempt

suffers from many deficiencies such as those listed above. The EPA should require them to rework their analysis to include all sources of greenhouse emissions and commitments from Alcoa about how they plan to mitigate these effects. This should be a standard requirement in the assessment of all major industrial projects in future.

Alcoa themselves estimate that 6 million trees covering 12 000 hectares will be required to consume the additional carbon dioxide produced by this project. We believe that this is a substantial underestimate for the reasons stated above.

We request that Alcoa be required to supply at least 6 million additional trees to Greening Australia and other community tree planting groups if this project is approved. These trees should be in addition to those they already supply to compensate for carbon dioxide emissions at their other sites.

Question 2

It is recognised that some alternatives have been assessed in an attempt to limit greenhouse emissions. Commitments to energy efficiency and the use of gas rather than coal or oil are commended. However, there is no tandem assessment of the effect of carbon dioxide production and forest clearance (with the resultant decrease in CO_2 absorption) on the greenhouse effect. In fact there is no mention of forest clearance at all in this section; an omission that is unacceptable considering the significant clearing (100-110 hectares per year) that would occur.

Yet the CER states in length the many trees Alcoa have been responsible for planting. This results in a lack of the complete picture. How many of those trees are just replacing ones they previously removed?

Whilst we commend Alcoa's commitments to the Land Care project, it is disturbing to see the project used as a justification for environmentally damaging acts. Undertaking one environmentally responsible act does not constitute licence to destroy with the other hand.

Regardless of the comparative context in which greenhouse gas emission figures are presented, the fact remains that the expansion of the Wagerup refinery would be a significant contributor to greenhouse gas emissions in WA, and should be assessed as such.

Alcoa's response

The additional natural gas required for the operation of the expanded refinery dominates the energy consumption figures and hence Greenhouse gas emissions. Carbon dioxide emissions from additional mobile equipment at the Willowdale Mine are almost inconsequential by comparison (<4000 tonnes per annum, or approximately 1.4% of the total emissions).

Before clearing, merchantable timber and minor forest produce is removed from the site and utilized as building materials, fence posts, etc. Only the residual material is burnt. All mined areas are rehabilitated as soon as possible after mining, and usually within three years of initial clearing. Carbon accretion by the dense stands of regrowth in rehabilitated areas is expected to at least offset and probably exceed the amount of carbon released as CO_2 in the burning of waste material during clearing for mining. Alcoa has initiated a joint study with CALM to improve the utilization of wood material on areas scheduled for mining. A large-scale field trial is planned for January 1990. Longer-term clearing associated with conveyor alignments and other ancillary works is more than compensated by landscape, shelterbelt and commercial tree plantings on Alcoa farmlands.

Alcoa's approach to mitigating the effects of CO_2 emissions resulting from its use of fossil fuels is consistent with the recommendations of the Western Australia Greenhouse Coordination Council's discussion paper of November 1989: "Addressing the Greenhouse Effect" (refer Recommendation 10, page 19). In particular, Alcoa will:

1. continue to give close attention to energy efficiency in the design of the additional power station facilities, and to energy conservation throughout the plant;
2. jointly with SECWA, evaluate the viability of a cogeneration power facility;
3. continue to ensure that any land disturbed by the mining operations is fully revegetated, unless agreed otherwise with the relevant State agencies (eg to better suit recreational needs at a particular site);
4. minimize the amount of wood wasted in the clearing operations which precede mining;
5. increase the existing tree cover on Alcoa farmlands by establishing commercial plantations and large landscape/shelterbelt plantings where appropriate;
6. continue to support community-based tree planting and other land restoration projects through the Alcoa Landcare Project; and
7. continue to encourage the development of a conservation ethos within its workforce.

One submission suggested that Alcoa should be required to supply at least 6 million additional trees to Greening Australia. Alcoa believes this coercive approach is inappropriate, for the following reasons:

1. The Company has been the major sponsor of Greening Australia in Western Australia since 1983, and had a major involvement in community tree planting projects before then. Introducing a coercive element into what is already a successful community-based tree planting and land conservation programme is likely to discourage other potential sponsors from becoming involved, and dissuade Alcoa from further extending its own involvement in similar activities.
2. Alcoa has already committed itself to a major extension of its support for community-based tree planting and land conservation projects through the Alcoa Landcare Project announced in October this year. The project will establish at least 2.5 million trees over the next 5 years. The tree planting component of the project is

expected to continue well beyond 5 years.

One submission expressed concern that the Alcoa Landcare Project was being used as justification for the refinery expansion. The Alcoa Landcare Project is an extension of the Company's ongoing support for community-based tree planting projects. Tree planting is the primary objective of only one of the seven projects encompassed by the Alcoa Landcare Project. However, it also will be one of the desirable outcomes from five of the other six projects. None of the projects was planned with the objective of justifying the Wagerup expansion. The same submission questioned the number of trees planted as a result of Alcoa's community support and farming activities. The numbers quoted on pages 41 and 42 of the CER do not include trees established by Alcoa in the rehabilitation of land disturbed by its mining operations.

Rehabilitation of residue ponds

Question 1

The red mud ponds which Alcoa have produced at Kwinana, Pinjarra and Wagerup are ugly and hazardous. There have been extensive leaks from the Kwinana red mud ponds and these have polluted the local groundwater. The situation at Wagerup seems to be somewhat more satisfactory.

However, there is still no firm evidence available that these red mud ponds can be rehabilitated back to forest and farmland. The red mud is also radioactive and the radon and radiation levels over such areas could be too high for human habitation. The EPA should request Alcoa to undertake a major project, as a matter of urgency, to demonstrate that they can rehabilitate these red mud lakes. Radiation levels on the rehabilitated land should be carefully monitored.

Alcoa's response

Alcoa has a commitment to rehabilitate residue areas to productive land uses after decommissioning. Successful surface revegetation has been demonstrated at Kwinana on areas A,B and C (total area 90 ha) where grazing and vegetable growing have been successfully established. A 10 ha area at Pinjarra has also been successfully rehabilitated to pasture. The commitment for Wagerup is to rehabilitate residue areas back to productive farming use.

Since all residue areas are located on agricultural or industrial land, establishment of forest is not seen as an important objective of rehabilitation. Tree growing trials are in progress at Kwinana and Pinjarra and while early results are promising it is not expected that trees and shrubs growing on residue areas will serve more than an aesthetic or windbreak function.

Intensive studies were conducted in 1981 and 1989 on the background radiation levels associated with Alcoa's operations including residue disposal. These studies indicate that while small increases in radiation levels occur due to the presence of naturally occurring radioactive minerals in Darling Range bauxite, these increases are within acceptable public limits. Radiation levels are similar to those in existing urban areas along the Darling Scarp.

Ongoing monitoring of radiation levels within Alcoa's operations including rehabilitated residue areas is a part of the Company's extensive environmental monitoring program.

In line with the ALARA principle, Alcoa would not advocate re-use of residue areas for residential development while an alternative range of more appropriate land use options is available.

Impact on the jarrah forest

Question 1

To be able to operate in dieback infected areas is a privilege, not a right, and in many ways comprises the better interest of the public and the environment. It is therefore essential that this commitment be upheld.

Note: This statement refers to a commitment by Alcoa listed in their CER and reprinted below:

> 8.6 Alcoa will implement a comprehensive dieback management programme designed specifically for its mine operations in the jarrah forest. This will include the rehabilitation of dieback-affected areas adjacent to its mine operating areas, in accordance with procedures agreed with State agencies, and irrespective of the cause of introduction of the disease.

Question 2

Dieback is a major environmental problem in WA and bauxite mining is a major cause of this problem. Alcoa themselves admit this on page 15 of the CER. It is not sufficient to monitor the spread of dieback. They must make a major effort to control and reverse it. Alcoa should be required to make a substantial contribution to programmes to develop procedures for dieback control and prevention.

Alcoa's response

Alcoa does implement dieback management procedures in all forest areas in which it operates. The intensity of the measures taken varies according to the existing level of disease impact and the amount of uninfected or lightly-infected forest at risk. It is not practicable to implement stringent dieback management procedures in areas where the existing disease impact is high, especially where access to the area prior to mining has not been restricted. In these circumstances it is generally not possible to establish disease boundaries with any degree of reliability. However, basic disease management measures are still undertaken.

Alcoa has actively pursued research into dieback disease and the development of control and rehabilitation procedures for the last 11 years. During that time, more than $2.5 million has been

expended on research and development, $1.4 million in the funding of research by other organizations. As the major sponsor of the Foundation for Jarrah Dieback Research, Alcoa has made a substantial contribution to knowledge on dieback and the developments of methods for controlling the disease (refer Landscope, Spring 1989, 38-44). In addition, Alcoa funds the rehabilitation of all dieback affected areas in the vicinity of its operations, regardless of the cause of introduction of the disease. The bulk of the areas rehabilitated were infected prior to the commencement of any mining activity.

Conservation areas

Question 1

The phrase "for as long as their conservation values remain" causes considerable concern. A representative example of an ecosystem has an increasing conservation value as surrounding areas of that ecosystem are destroyed unless the conservation values are compromised by an outside influence, be it a direct disturbance or the destruction of a connecting corridor. This qualifier should be removed from the commitment.

Question 2

We would like to use this opportunity to express our dissatisfaction that the Lane-Poole Reserve is still not a national park. We do not believe that this proposal should be approved until Alcoa is prepared to allow the creation of the Lane-Poole National Park. The northern jarrah forest is an important ecosystem which should be protected in a national park and the Conservation Council has long maintained that the Lane-Poole Reserve should be given national park status.

Alcoa's response

The qualification refers to the unlikely possibility of a major deterioration of conservation values within the reserves, not outside them. The conditions under which bauxite mining might be considered (after a major deterioration in conservation values) were defined by the State's Reserves Review Committee, and ratified in the Alumina Refinery Agreement Amendment Act No.99 of 1986. Any decision to allow mining to proceed would be made jointly by the Ministers for Resource Development and Conservation and Land Management, based on the recommendations of an environmental review committee which would include representatives of the National Parks and Nature Conservation Authority, the voluntary conservation movement and Alcoa.

Alcoa has worked cooperatively with State agencies, other forest users and representatives of the conservation movement to facilitate the establishment of a comprehensive network of A Class conservation reserves within its mineral lease (refer Figure 5 of CER). After several years of areas recommended for conservation by the EPA in its System 6 duty report of 1983. Any decision to change the current status of Lane-Poole Reserve is the prerogative of the State Government. Expansion of the Wagerup refinery in no way affects that decision.

Lane-Poole is the largest of the reserves in Alcoa's mineral lease. Excluding recently agreed additions such as the Stene conservation area, Lane-Poole comprises approximately 54,400 ha of which 80% is zoned for conservation and 20% is zoned for recreation. The recreation zone contains about 80 million tonnes of bauxite on the lateritic upland flanking the Murray River Valley. As indicated in the CER, Alcoa has agreed not to extend its bauxite mining operations into the conservation areas of Lane-Poole Reserve, but has retained the right to mine in the recreation zone, subject to agreement on appropriate management plans to minimize impacts on recreational values. Alcoa has no objection to the main body of the conservation zone of Lane-Poole Reserve being declared a national park, but believes that inclusion of the whole recreation zone would be inconsistent with the Company's right to access the bauxite in that zone.

Mining in the salt risk zone

Question

In relation to the commitments and changes thereto, I would like to raise the following points:

8.2 The insertion of the word "bauxite" into this commitment considerably changes its nature. With the absence of "bauxite" from the original commitment, Alcoa's gold mining operations (Hedges Gold Mine) in the low rainfall area contravene it. I find it difficult to comprehend the difference in the impacts on salinity dependent upon whether the forest is cleared for bauxite or gold mining. Given that the original commitment was in relation to "mining", why has gold mining been permitted?

Alcoa's response

The word bauxite was added to reflect the reality of the existing situation, whereby a range of different mining operations already exist in the eastern part of the jarrah forest (eg coal mining east of Collie, gold mining near Boddington and Worsley Alumina's bauxite mining at Mt Saddleback).

Addition of the word bauxite is relevant in a legal sense, in that the Alumina Refinery Agreement (Alcoa) Amendment Act No.86 of 1987 effectively restricts Alcoa's rights in Mineral Lease 1SA to the mining of bauxite. Alcoa does not have the right to mine other minerals unless the area of interest is first excised from Mineral Lease 1SA and a separate lease is granted. Any proposal to mine in the separate lease would be subject to the environmental assessment provisions of the Environmental Protection Act 1986.

The original commitment in the Wagerup ERMP of 1978 was made in the context of a proposal involving relatively extensive bauxite mining operations. Alcoa believes that small localized operations such as the gold mining operations near Boddington, or more

extensive operations located outside existing or potential water supply catchments, should be assessed individually. They should not be considered in the same context as Alcoa's bauxite operations. This was the case with the Boddington and Hedges Gold projects, which were assessed under separate ERMPs in 1985 and 1987 respectively.

Management of rehabilitated areas

Question

Who decides when the time has come for CALM to assume full management responsibility? Do the public get a say?

Alcoa's response

The current proposal is that a set of criteria will be developed by CALM with input from Alcoa's consultants. CALM will decide which of the areas nominated by Alcoa meet the agreed criteria.

Water supply

Question

The Water Authority of Western Australia considers that Section 3.5 of the "Review of the Expansion to Wagerup Alumina Refinery, and Compliance with Approved Conditions" is inadequate.

Under the Act, the Company is "entitled to a first call on surface water from sources situated within the Wagerup Refinery Site".

The source of the extra water requirements for the proposed extensions to the refinery is Samson South Drain, which traverses the refinery site. Winter flows will be diverted to make up any shortfall from existing sources. There is no specified quantity range for this diversion, nor the percentage of annual total flow volume for the drain in question. The report also does not address the method of handling the additional wastewater which will result from the refinery extension.

Similar comment relates to the discussion of mine site water requirements where no mention is made of source or disposal of wastewater.

Alcoa's response

The Alumina Refinery (Wagerup) Agreement and Acts Amendment No.15 of 1978 gave approval for a 2 million tpa refinery. The purposes of the CER were to compare Alcoa's actual environmental management performance against the commitments made in the 1978 ERMP and to outline any significant changes in the scope of the project in relation to predicted impacts and consequent changes in the environmental programmes put forward in that document. The additional water supply requirements outlined in the CER are substantially less than projected in the 1978 ERMP.

At its current rated capacity of 0.84 million tpa the Wagerup Refinery utilises 2900 ML of fresh makeup water annually. With the expansion of the refinery to 1.5 million tpa this will increase to 4500 ML/A.

At present, makeup water is sourced from stormwater runoff from the plantsite and residue areas and surface runoff from the local catchments of North and South Yalup Brooks. All of the flow from South Yalup Brook is captured and stored in two dams across its valley within the plant boundary. Part of the flow of North Yalup Brook is also diverted into the dams by a small diversion dam and pipeline. The proportion of the winter flow from North Yalup which is utilised depends upon the amount required to top up the dams and the flow which is available, but for average weather conditions is around 60%. This withdrawal does not affect any downstream users as the stream is located on Alcoa property until it joins the Samson South Diversion Drain which itself traverses Alcoa property prior to discharging into the much larger Harvey Main Drain on its way to the Harvey Inlet.

To meet the water requirements of the expanded refinery it is planned to utilize excess winter runoff from the Samson South Diversion Drain. A detention pond already exists on the drain, adjacent to the residue disposal areas. It has a storage capacity of around 1000 ML. A pump station will be constructed on this pond to enable transfer of water to the refinery.

During average runoff years only around 250 ML of Samson South water will be required, representing about 10% of the winter flow. During multiple drought years as occurred during 1978-79, up to 60% of the winter flow could be required. The water utilized from Samson South Diversion Drain will be winter rainfall runoff which would otherwise flow into the Harvey Main Drain and is not used by others. It should be noted that a large amount of additional surplus winter runoff could be diverted into Samson South Diversion Drain from McKnoes or Drakes Brooks if required.

A projected water balance for the refinery is given in the attached table. The water balance accounts for a future conversion to dry residue disposal.

As indicated in the CER, all wastewater from the refinery will be collected and recirculated to minimize make-up water requirements. There will be no discharges of wastewater to natural streams or the drainage network associated with the local irrigation scheme.

One submission referred to the lack of a firm proposal to meet the water requirements for the expanded Willowdale Mine. These water requirements are substantially lower than projected in the 1978 ERMP. The original proposal was for a number of small water holes on streams close to the mining operations (as currently exist at the Jarrahdale Mine). This was subsequently discarded in favour of a pumping scheme from the refinery water supply reservoir. Two options are currently under consideration to meet the long-term requirements for the expanded mine:

- upgrade the existing pumping system from the refinery; or
- construct a small weir on a stream closer to the centre of the mining operations (as currently exists at the Huntly mine).

The second option requires consideration by the State's Mining and Management Program Liaison Group before it can be further evaluated.

Review of environmental research and management programs

Question

8.10 Will the documents referred to in this commitment be publicly available?

Note: The commitment referred to is re-printed below.

Alcoa will submit a brief review of its environmental research and management programme to the Department of Resources Development on an annual basis. Copies will be made available to relevant State agencies and the Shire of Waroona. A more detailed review will be prepared on a triennial basis.

Alcoa's response

One submission questioned the availability of the annual and triennial reviews of environmental research and management programs. These reviews are circulated to relevant State agencies by the Department of Resources Development. The more detailed triennial reviews are available for perusal by the public in the EPA library.

Social impacts of the construction workforce

Question

The Social Impacts Unit has reviewed the consultative Environmental Review document prepared by Alcoa of Australia and offers the following comment. The Company has generally covered the social impact requirements of the guidelines originally issued.

The benefits to the State and local area are well recorded and satisfactory analysis of demographic data and impacts relating to housing requirements and services has been undertaken.

However, the document does not give clear plans or procedures relating to the construction phase especially in relation to the operation of construction camps by sub-contractors and the impact of up to 800 workers.

For this reason, the Unit strongly believes that Alcoa's commitment to the establishment of liaison and monitoring processes with the Shire of Waroona be formalised as a condition relating to approval, if forthcoming.

It is important that the Company and Council liaise closely during the construction phase to enable the issues relating to the impact of construction camps and workers to be resolved before any problems arise. The Unit will assist in this regard.

Alcoa's response

As indicated in the CER, Alcoa's experience has been that the majority of construction workers will prefer to commute rather than live in a construction camp. Alcoa has a well established liaison process with the Shire of Waroona and will ensure that potential issues related to the impact of construction camps and workers are addressed before significant problems arise.

Dismantling of facilities

Question

Who decides on what is a "reasonable restoration measure"?

Alcoa's response

The State agency responsible for the administration of the Alumina Refinery (Wagerup) Agreement is the Department of Resources Development. It is envisaged that the Department would coordinate the planning of the dismantling and restoration measures, taking due account of land-use priorities identified in regional management plans and the views of the landowner (Alcoa) and relevant State and local authorities. Both Alcoa and the Department are cognisant of the environmental protection responsibilities outlined in Clause 17 of the Agreement.

WAGERUP REFINERY - WATER BALANCE

1) USES :

	Present Capacity (2300 tpd) (ML/A)	Unit 2 Capacity (4000 tpd) (ML/A)
Plant Evaporation	367	639
With Residues	1147	1994
Mine Use	60	90
Cooling Evaporation	400	700
Natural Evaporation from Residue Areas	904	904
Drying Area Dust Control	-	120
TOTAL :	2878	4447

2. SOURCES :

a) Internal

Bauxite Moisture	252	438
Caustic Water	55	96
Plantsite Runoff	425	425
Rainfall Runoff Residue Areas	620	1230
SUB TOTAL	1352	2189
Net External Requirement	1526	2258

b) External Sources

		Av. Year	Dry Year 1:10
Yalup Brook	1526	2000	1300
Samson South Drain	-	258	942

1) Assumes "Average" weather conditions except as otherwise noted.

2) All figures are approximations only.