TABLE OF CONTENTS

Page No.

LIST OF TABLES

Page No.

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

EXECUTIVE SUMMARY

Alcoa's Wagerup Alumina Refinery (the refinery) is located 120 kilometres (kms) south of Perth, 2 kms north of Yarloop and approximately 7 km south of Waroona. The Wagerup refinery currently has two production units and Alcoa is proposing the addition of a third production unit, which is the subject of this ERMP.

The Wagerup Refinery currently has environmental approval to produce 3.3 million tonnes per annum (Mtpa). However, its current capacity is approximately 2.6 Mtpa of alumina. Production is limited to 2.5 Mtpa by environmental licensing.

Alcoa considers its Wagerup refinery to be the most environmentally advanced alumina refinery in the world. Expansion at Wagerup is one of several world-wide options currently being considered by Alcoa to provide additional capacity to meet increased global demand for alumina.

The proposed Wagerup expansion (the Proposal) will increase the capacity and efficiency of existing components in the refinery through the installation of new equipment and upgrades to some existing equipment. The additional new plant and modifications will occur across the refinery. Table E1 lists the key characteristics of the Proposal:

Proponent

Alcoa of Australia Limited, trading as Alcoa World Alumina Australia, is the Proponent for the Proposal. Alcoa World Alumina Australia is one of 25 Alcoa Inc business units, and is the world's leading producer of alumina. Alcoa's alumina refineries at Kwinana, Pinjarra and Wagerup have a combined annual production capacity of 7.8 Mtpa, equivalent to some 15% of world demand.

Alcoa Inc is the world's leading producer and manager of primary aluminium, fabricated aluminium and alumina facilities, and is active in all major aspects of the industry.

Proposal Schedule

It is anticipated that the engineering design phase of the Proposal will take approximately 6 to 12 months with preliminary design and feasibility work already underway. Construction is scheduled to commence in late 2005, subject to the Proposal receiving all necessary government and Alcoa approvals. A 27 month construction period is expected, with the newly expanded Wagerup refinery reaching full production mid 2008.

Table E1: Key Characteristics of the Proposal

Characteristic	Units	Current Refinery	Expanded Refinery
Alumina Production	Mtpa	Approx 2.4	Approx 4.7
Refinery Operations		Continuous operation	Continuous operation
Bauxite Mine		Continuous operation	Continuous operation
Bauxite Mining Rate	Mtpa	9	16
Proposal Life	yrs	>60	>35
Capital Investment	A$	-	1.5 billion
Refinery Footprint	ha	183	183
Construction Period	months	-	27
Workforce (peak construction)	persons	-	>1,600
Workforce (operation) (Refinery + mine)	persons	900	1,050
Bauxite Residue	Mtpa	4.8	9.6
Noise		Regulation 17 application under the *Protection (Noise) Regulations 1997* is being considered by the Minister for Environment	No increase in noise impacts on surrounding residents
Particulates	tpa	60	65
Oxides of Nitrogen (NOx)	tpa	1005	1974
Sulphur Dioxide (SO_2)	tpa	70	113
Volatile Organic Compounds (VOCs) [1]	tpa	78	93
Greenhouse Gases	tpa	1,342,000	2,255,000 (cogeneration) 2,544,000 (boilers)
Greenhouse gas emission intensity	$kgCO_2/t$ alumina	557	480 (cogeneration) 541 (boilers)
RAW MATERIALS			
Caustic Soda (dry)	tpa	141,000	282,000
Lime	tpa	110,000	200,000
Water	MLpa	4,800	9,600

Note[1] : Total VOCs is the sum of Acetone, Acetaldehyde, 2-butanone, Benzene, Toluene, Xylenes, Acrolein, Ethylbenzene, Methylene Chloride, Styrene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene & Vinyl chloride

Proposal Area

The Wagerup refinery and associated residue drying area (RDA) is located on Alcoa owned industrial-zoned land. Surrounding the refinery is approximately 6,000 ha of Alcoa freehold property, which is predominately operated as a beef farming enterprise by "Alcoa Farmlands". The surrounding landuse is predominantly rural, with most of the region cleared for agriculture.

The Proposal boundary is defined as the existing Wagerup refinery boundary (located on the east side of the South Western Highway) and the residue operations (located on the west side of the South Western Highway). The additional refining infrastructure required for the Proposal will all be located within the existing refinery boundary and will occupy an area less than 10% of its total size.

The existing residue area will be expanded in accordance with the Wagerup refinery Long Term Residue Management Strategy (LTRMS) to accommodate increased residue production. Further modification to the residue area over the life of the Proposal will be considered and assessed through future reviews of the LTRMS.

Alcoa presently exports all alumina from the Wagerup refinery through its Bunbury Port facilities. Some modifications will be made to the existing port facilities to improve loading and unloading efficiencies however, the port facility has the capacity to accommodate increased production as a result of the Proposal.

On referral of the Proposal to the EPA, the EPA advised that bauxite mining is not considered within the scope of this ERMP. The acceptability of mining within the lease is approved by the Minister for Resource Development via the Mining and Management Program Liaison Group (MMPLG).

Proposal Benefits

There are a number of significant socio-economic benefits to be gained from the Proposal. The Proposal will entail a capital expenditure of over A$1.5 billion and is expected to earn approximately A$17 billion over 30 years in new export revenues. The proposal will deliver substantial economic benefits to the region, the State of Western Australia and the Commonwealth of Australia. Implementation of the Proposal will increase production capacity from around 2.6 Mtpa to a total of approximately 4.7 Mtpa, which equates to an 81% increase in current annual alumina capacity from the refinery. The Proposal is expected to increase the value of Western Australian alumina exports by over A$550 million per year.

Direct economic benefits to the local community, State and the Peel and South West Regions will be delivered through increased Commonwealth and State royalties, 150 permanent Alcoa positions and an estimated 3,000 direct and indirect employment opportunities within Western Australia. It is estimated that the Proposal will generate around 1,500 new jobs in the Peel and South West Regions during the operational phase. During the construction period, the workforce will peak at approximately 1,600 employees, which is the equivalent of around 500 full time jobs during the entire 3 year construction period.

Air Quality

Air quality in populated areas near the Wagerup refinery has been an issue of importance since the mid 1990s with some members of the local community reporting odour, dust and health concerns as a result of refinery emissions. These concerns reached a peak in 2001 and 2002 with high numbers of complaints lodged with Alcoa, particularly for odour. Since this time the number of environment related complaints has fallen steadily in response to further emission control works and Alcoa's land management strategy. However, community complaints remain an important issue and emissions management, air quality monitoring, air quality modelling and health risk assessment are important parts of this ERMP.

A study was undertaken in 2004 to provide detailed information on the ambient air quality in the region surrounding the Wagerup alumina refinery, including the townships of Waroona and Yarloop and the associated rural environment.

The overall air quality was found to be typical of rural environments in both the nature and the levels of chemical compounds detected, except for acetaldehyde which was at levels more typical of urban environments. All of the compounds detected were at levels well below applicable environmental and health standards.

The main chemical compounds detected are all known to be present in refinery emissions. The levels found in the ambient environment are generally many times greater than the predicted refinery influence for each compound based on dispersion modelling of refinery and RDA emissions. All compounds were detected at concentrations well below levels normally considered to be of concern from a human health perspective.

Air dispersion modelling was used to predict the ground level concentrations (GLC's) of a suite of compounds emitted from the refinery processing area and the RDA. The substances selected for dispersion modelling, and the prediction of GLCs from refinery sources, account for approximately 96% of the total mass of refinery emissions, with no individual source in the remaining 4% representing 1% or more of point source emissions.

A specific investigation program was undertaken to quantify the relevant emissions from diffuse sources (such as residue drying beds, run-off collection areas and the cooling pond). Both point (refinery) and diffuse (RDA) emissions were modelled and combined to generate contour maps of the GLCs for both the current refinery and expanded refinery scenarios. This allowed comparison of the predicted GLCs against air quality and health criteria and evaluation of the potential air quality impacts from the proposed expansion, compared to the current refinery. This work also provided the compound concentration data to enable a quantitative health risk assessment to be conducted as part of the ERMP.

Evaluation of the predicted GLCs, for a range of compounds, at adjoining residences and in nearby townships found that the Proposal is predicted to generate GLCs less than the applicable air quality standards.

Short-term emission exposures

This air dispersion modelling work also included estimation of potential short-term maximum GLCs from refinery emissions; at three-minute and ten-minute timescales. The maximum three-minute average concentrations predicted by modelling were found to be all substantially less than the ambient guidelines for longer averaging periods. This strongly suggests that short-term exposures for these compounds are unlikely to result in health effects. This conclusion holds for the base case and the two expansion scenarios. Evaluation of the potential for short-term emission impacts also included statistical analysis of an extensive data base of six-minute field data for oxides of nitrogen and

particulate matter. This work concluded there is no evidence that complaints are due to an irritant response to alkaline particles.

Alcoa recognises the issue of air quality will remain important to members of the local community, as it does for the company, and this ERMP includes an Air Quality Management Plan which will be used to help guide air quality investigations into the future.

Odour

Predicted odour emissions from both the current and expanded refinery and residue areas were estimated following field sampling exercises. This allowed the potential change in ground level odour concentrations to be evaluated.

This work found that while odour from the refinery may still be detected in surrounding areas, under certain meteorological conditions, there is expected to be a significant decrease in the predicted peak odour concentrations at ground level as a result of the Proposal. The two expansion scenarios modelled as part of this ERMP predict reductions for both the 99.5th and 99.9th percentile ground level odour concentrations. It is therefore considered that the Proposal satisfies the EPA's guidance statement requiring no deterioration of amenity values from expanded facilities and Alcoa's public undertaking that the Proposal will result in no increase in odour impacts on surrounding residents.

Health Risk Assessment

A quantitative health risk assessment (HRA) has been conducted by a specialist consultants. The HRA process examines the potential health impact of refinery and RDA emissions on the nearby population using a comparison of the predicted ground level concentrations (GLC) of selected compounds to their accepted health guideline levels. This occurs for the individual compounds and the combination of all selected compounds. For the combined suite of modelled compounds this includes evaluation of acute hazard and chronic hazard risks as well as the incremental carcinogenic risk.

The HRA concluded:

- the potential for emissions from the existing or expanded Wagerup refinery to cause acute health effects is low;
- the potential for emissions from the existing or expanded Wagerup refinery to cause chronic non-carcinogenic health effects is very low; and
- the potential for emissions from the existing or expanded Wagerup refinery to contribute to the incidence of cancer based on inhalation exposure is below USEPA *de minimis* threshold of one in a million (i.e. 1 x 10-6) at all of the residential receptors considered.

Furthermore, to ensure that potential risks are not underestimated, uniformly conservative assumptions were used to characterize exposure and toxicity in the HRA. Due to the resultant compounding of

conservatism, the quantitative risk indicators should be considered as over-estimates of potential health risks associated with emissions from the Wagerup refinery.

Community Health Status Survey

A health survey of local community members will be undertaken prior to commissioning the Proposal, if approved. The survey will aim to measure the current health status of local community members to enable a comparison to Western Australia wide health results.

The main aspects of the proposed health status survey are:

- A cross-sectional survey method used to capture "a point in time" data;
- Random sample selection of the populations of Yarloop, Hamel and nearby townships;
- Statistically valid sample sizes;
- The Computer Assisted Telephone Interview (CATI) technique will be used;
- The WA Health and Wellbeing Questionnaire developed by the Department of Health will be used for the survey ;
- Statistical analysis applied to detect associations between various aspects of the survey results, such as the likelihood of chronic health conditions and location, health risk factors and health enhancing factors. This will allow comparison with the State-wide database

Refinery Noise Emissions

Alcoa recognises that refinery noise is also an issue of considerable importance to some neighbours and noise complaints are logged by Alcoa along with other environment related complaints. In recent years Alcoa has also invested significantly in noise control measures and provided ameliorative work at relevant nearby residences. Noise complaints peaked during 2002 and have subsequently declined during 2003 and 2004. Noise modelling and a framework for noise emission management are important parts of this ERMP.

Analysis of the monitoring data suggests that there has been no increase in the refinery contribution to ambient noise levels over the past three years and that the actual refinery sound power level (noise emission) is relatively constant. Occasional variations are primarily caused by meteorological conditions.

In February 2002, Alcoa submitted an application for a variation to the assigned noise levels, under the provisions of Regulation 17 of the Environmental Protection (Noise) Regulations. This variation provision was included in the Regulations in recognition that some facilities might not be able to comply with the newly introduced and more stringent assigned noise levels. On referral of the proposal to expand the Wagerup refinery, the EPA determined that the Regulation 17 assessment

should be incorporated into the EPA's assessment of the proposed upgrade of the Wagerup refinery (this ERMP).

Alcoa has undertaken to ensure that there is no increase in noise impacts from the refinery area on surrounding residents. This ERMP outlines work conducted to characterise and understand refinery noise emissions as well as a noise modelling that has been used to assess the implications of expansion. The ERMP also outlines a management program, including a Noise Management Plan, which will be used to ensure the Proposal is implemented in a way that ensures the public undertaking is met.

Energy Requirements

The Wagerup refinery is recognised as one of the most technologically advanced and energy efficient alumina refineries, when compared with international benchmarks. The Proposal will result in the installation of current best practice energy efficient processes. There will be an overall increase in energy consumption at the refinery, however with improved energy efficiency; energy consumption per tonne of alumina produced will decrease.

Currently two options are being considered to meet the additional energy requirement for the Proposal. Either two additional boilers and two turbine alternators will be constructed in the existing powerhouse, or two additional turbine alternators will be constructed in the existing powerhouse and a new Cogeneration facility will be developed by a third party. The relevant environmental aspects of both options are considered in this ERMP.

Water Supply

The refinery's current total water requirement is 9,460 MLpa, of which 4,800MLpa is obtained from licenced surface water sources. The Proposal will take the total water requirement to approximately 14,900 MLpa in a dry year. The refinery's surface water requirements will vary each year depending on annual rainfall, requiring approximately an additional 4,800 MLpa in a dry year or 1,100MLpa in an average rainfall year, from external water sources.

Alcoa commissioned an analysis of the water supply options and water conservation opportunities, which were identified through a process of consultation with key stakeholders including Alcoa staff, local community representatives, Harvey Water, Water and Rivers Commission (DoE) and Agriculture WA. Several water supply options are considered in this ERMP, including additional surface water supply and efficiency improvement options.

Community Consultation

Alcoa developed and implemented a comprehensive community consultation process for the Proposal, which recognised existing community consultation networks and the considerable interest members of the local community have in the operations of the Wagerup refinery. Following an Open Space Forum in September 2004, five working groups were formed to enable consultation on detailed

aspects of the Proposal. The existing Wagerup Community Consultative Network (CCN), established in 1994, monitored the process to ensure openness and transparency. This process enabled community members to participate in the identification, assessment and potential management of environmental factors associated with the Proposal, whilst also monitoring the consultation process. A broader range of stakeholders have been involved through regular communications, such as newsletters, press articles, a designated website and a public open day during the preparation of this ERMP.

In addition to providing a range of communication tools to meet stakeholder needs, Alcoa aimed to achieve a high 'level' of community involvement, particularly for those stakeholders seeking active involvement.

Over 120 people attended an Open Space Forum to start the community involvement process. A report of their proceedings was collated and distributed on the final day of the forum. One outcome of the forum was the identification of key topics for further discussion. This assisted in the formation of the working groups which formed a key part of the community involvement program.

Five independently facilitated working groups were established in mid-October to examine and comment on the detailed content of Alcoa's proposal to expand the Wagerup refinery and to address the ongoing issues and opportunities identified at the Open Forum.

The groups established were: Emissions & Health; Transport & Noise; Residue & Water; Social & Economic; and Land Management. The use of multiple, topic specific working groups allowed concurrent examination of issues, rather than one group needing to cover all topics.

Each of the five working groups considered key aspects (including technical investigations) of the project relevant to their subject area and had an opportunity to provide feedback on how opportunities could be optimised and issues or concerns managed. As part of the ERMP assessment process, around 60 community working group meetings were held, totalling more than 200 cumulative hours of consultation.

Informing Stakeholders

Alcoa staff met with and briefed a range of stakeholders including employees, unions, affected shires, local development commissions, chambers of commerce and business groups, stakeholder groups, peak industry groups and relevant State government departments within the planning, environment, health and industry sectors.

An Open Day, attended by more than 1,000 people, was held at the Wagerup refinery on 10 October 2004 to provide further information on the Proposal and Alcoa attended displays with current project information at the Harvey and Waroona Shows in October and November, 2004, the Harvey Harvest Fair and Waroona Autumn Fair in mid-March and early April 2005.

Other tools to inform the community have included two advertising series (17 full-page advertisements to date), a monthly newsletter produced from August 2004 provided to 3,500 local households, 350 key stakeholders and refinery employees, the bi-monthly internal newsletter Alcoa News, and a dedicated Wagerup Unit Three website. An Information Day will be held in the local area following the ERMP being published and another Wagerup Refinery Open Day will also be held later in 2005.

Sustainability framework

Building on its values, Alcoa's sustainability objective is to "achieve simultaneously financial success, environmental excellence, and social responsibility through partnerships in order to deliver net long-term benefits to our shareholders, employees, customers, suppliers, and the communities in which we operate"

Alcoa's sustainability framework, which complements national and State sustainability principles, is based on eight principles:

- Respect for people.
- Building community experience and well-being.
- Long-term economic benefit.
- Efficient resource use and cleaner production.
- Ecological integrity and biodiversity.
- Meeting the needs of current and future generations.
- Stakeholder involvement.
- Accountability and governance.
- Identification of Environmental factors

Alcoa commenced the identification of key environmental factors very early in the Proposal planning stages. The Proposal will be developed at the site of the existing Wagerup refinery which has been operational since 1984. There is therefore a good understanding of the natural and cultural environment within which the Proposal is located.

Of particular significance in understanding issues of community interest has been the community involvement framework established for the Proposal. This framework has provided many opportunities for community input during the development of this ERMP. This has occurred through an initial stakeholder forum that identified issues and opportunities of significance and also through the five working groups established for ERMP consultation.

This community involvement framework has allowed ongoing identification and refinement of environmental issues during development of the ERMP.

The key environmental factors and issues that are considered to be significant in the assessment of the environmental impacts of the Proposal are presented in Table E2.

Table E2: Environmental Factors

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Integration					
Biodiversity	*To avoid adverse impacts on biological diversity, comprising the different plants and animals and the ecosystem they form, at the levels of genetic, species and ecosystem diversity.*	The Wagerup operations are in the majority surrounded by paddocks, used mainly for grazing of livestock.	No remnant native vegetation will be cleared and there is not expected to be any impact on biodiversity from what little clearing or disturbance takes place.	Alcoa will keep vegetation clearing for the Proposal to a minimum and will rehabilitate the residue area with native flora indigenous to the area. This will prevent any adverse impact on biodiversity.	No adverse impact to biodiversity.
Sustainability	*To ensure as far as practicable that the proposal meets or is consistent with the sustainability principles in the National Strategy for Ecologically Sustainable Development (C'wealth 1992)*	Alcoa's sustainability framework, which complements national and State sustainability principles, is based on eight principles: • Respect for people. • Building community experience and well-being. • Long-term economic benefit. • Efficient resource use and cleaner production. • Ecological integrity and biodiversity. • Meeting the needs of current and future generations. • Stakeholder involvement. • Accountability and governance.	Poor design and management of a development could result in unacceptable economic, environmental and social impacts. Conversely, protection of the environment and social values needs to take into account consideration of economic constraints.	Alcoa's sustainability principles have been and will continue to be applied to the Proposal. Alcoa has also recently developed a socio-economic booklet describing ideas that could contribute to a sustainable future for the region. Two of these initiatives include a regional sustainability fund and a regional learning centre. In the following months, during the Government's formal assessment phase, Alcoa will further examine the ideas proposed.	Project is consistent with sustainability principles in the National Strategy for Ecologically Sustainable Development and Alcoa's sustainability principles.

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Biophysical					
Flora and Vegetation	*Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.* *Avoid adverse impacts on biological diversity, comprising of different plants and animals and the ecosystems they form at the levels of genetic, species and ecosystem diversity.*	The Wagerup operations are in the majority surrounded by paddocks, used mainly for grazing of livestock. In the vicinity of the residue area the paddocks have generally been levelled to allow even water flow and are irrigated by an extensive system of drains. Vegetation in this area consists of pasture grasses and a mixture of *Eucalyptus* spp. trees and shrubs.	No significant remnant native vegetation will require clearing and none of the Threatened Ecological Communities (TECs) or locally significant vegetation communities identified in the vicinity of the refinery will be affected (either directly or indirectly) by the expansion of the refinery or RDAs.	Alcoa will keep vegetation clearing for the Proposal to a minimum and will rehabilitate the residue area with native flora indigenous to the area.	No impact to flora and vegetation.
Fauna - Specially Protected (Threatened) Fauna	*Protect Specially Protected (Threatened) Fauna species and their habitats, consistent with the provisions of the Wildlife Conservation Act 1950.* *Avoid adverse impacts on biological diversity, comprising of different plants*	No specially protected fauna are known to occur within the area impacted by the proposal.	It is not expected that changes to the refinery as a result of the Proposal will result in any additional impacts to the native fauna in the area. Fauna occurring near the residue areas may be disturbed during construction of the new RDAs during the life of the Proposal, and to a lesser extent during operation. However, this disturbance is not expected to	Alcoa will minimise clearing of vegetation to minimise the impact on native fauna habitats. Alcoa will establish a wildlife corridor on rehabilitated residue areas and land along existing and planned drainage lines to promote recolonisation of these areas by native fauna, establish native fauna habitats, and increase the biodiversity of these	No impact on fauna.

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
	and animals and the ecosystems they form at the levels of genetic, species and ecosystem diversity.		adversely impact any fauna species in the area as no areas of remnant vegetation will be cleared).	communities.	
Pollution Management					
Air quality – refinery gaseous and dust emissions	*To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses, by meeting statutory requirements and acceptable standards.*	The overall ambient air quality was found to be typical of rural environments in both the nature and the levels of chemical compounds detected, except for acetaldehyde which was at levels more typical of urban environments. All of the compounds detected were at levels well below applicable environmental and health standards.	The Proposal will result in no increase in odour or dust impacts. The combination of new infrastructure, increased production and emission control works results in emissions from some sources increasing and others decreasing. There will be an overall increase in particulates, NOx, SO_2, and VOCs through the Proposal, but these all remain well below applicable environmental and health standards.	Alcoa will implement the Air Quality Management Plan as detailed in this ERMP. Measures taken to manage emissions will include: • A Regenerative Thermal Oxidiser (RTO) on the liquor burner; • An RTO on oxalate process emissions; • Improved calciner performance; • Low NOx burners in new boilers; • Redirection of calciner low volume vent emissions for destruction; • Reduction in cooling tower VOC emissions; • Reduced emissions from causticisation; • Sealing of some additional tank vents; • Green liquor filter upgrades, and	No increase in odour or dust emissions impacts. Air dispersion modelling shows emissions from the proposal are within applicable air quality criteria. Health risk assessment found the potential for the existing or expanded refinery to: - Cause acute health effects is low; - Cause chronic non-carcinogenic health effects is very low; and - Contribute to the incidence of cancer is below the "one in a million" threshold. The maximum short-term emission

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
				• Upgraded sprinkler system for the RDA. In the event of engineering design changes, appropriate emission controls or other measures will be implemented to deliver equivalent environmental outcomes A community health status survey will be undertaken prior to commissioning the Proposal, on approval	concentrations (3 minute) were found to be all substantially less than the ambient guidelines for longer averaging periods. This indicates that short-term exposures are unlikely to result in health effects.
Air quality – RDAs and Cooling Ponds, Gaseous and Dust emissions	*To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses, by meeting statutory requirements and acceptable standards*	Sources of fugitive particulate emissions from the refinery operations are from dust lift off from residue areas, uncontrolled sources such as vehicles on paved and unpaved roads, dust from the material handling operations such as stacking and reclaiming at the bauxite stockpiles and wind generated dust.	Without emission control measures the Proposal offers potential to impact detrimentally on surrounding air quality through increased emissions of various types and compounds.	The RDA sprinkler system will be upgraded to significantly improve dust control.	No increase in dust emission impacts from RDA. Gaseous emissions from the RDA were combined with refinery point sources and input into the health risk assessment (see above).
Air Quality – Bunbury Port	*To ensure that emissions do not adversely affect*	The main potential sources of dust at Alcoa's port operations are ship	Potential deterioration in air quality due to emissions.	Existing procedures are in place at Alcoa's Bunbury Port operations for	After inclusion of alumina from the Proposal, Alcoa's Bunbury Port

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
	environmental values or the health, welfare and amenity of people and land uses, by meeting statutory requirements and acceptable standards	loading activities, conveyor operations and filling of the alumina bins.		controlling dust emissions (Document No. 44146 Minimising Dust During Shiploading). .	facility will be operating within its current capacity. No increase in dust impacts are expected at the Alcoa port operations.
Air quality – Construction Dust	*To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses, by meeting statutory requirements and acceptable standards*	Refinery area is highly modified including extensive paved areas.	Dust emissions arising from construction activities could reduce air quality	Dust suppression measures during construction	No unmanageable dust impacts are predicted from construction.
Greenhouse Gas Emissions	*To minimise emissions to levels as low as practicable on an on-going basis.* *To ensure that potential greenhouse gas emissions from the proposed project are adequately addressed and best practicable measures and technologies are used.*	The refinery currently emits 1,342,000 tonne of greenhouse gas carbon dioxide equivalents. During the 2004 calendar year the Wagerup refinery operated at an average energy efficiency of 9,195 MJ/t of alumina produced, which is a significant improvement on the World-wide weighted average.	The Proposal would result in GHG emissions rising from 1,342,000 to 2,544,000 tonnes Gg CO_2 equivalents if boilers are installed. The cogeneration option would cause emissions to increase to 2,255,000 Gg CO_2 equivalents, which is significantly higher than the base case, but a reduction over the boiler option. The most significant GHG contribution from the refinery	Implementation of the Proposal is projected to further improve energy efficiency to 8,758 MJ/t with the boiler option and to 7,770 MJ/t with the cogeneration option.	Depending on the power supply option selected, the Proposal is estimated to improve the greenhouse gas emissions intensity by approximately 5% to 541 kg CO_2-e with the boiler option, or by approximately 15% to 480 kg CO_2-e per tonne of alumina produced with cogeneration.

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
			arises from the combustion of natural gas.		
Groundwater Quality	*Maintain the quality of groundwater so that existing and potential uses, including ecosystem maintenance, are protected.*	Groundwater quality investigations have identified groundwater contamination in certain locations beneath the refinery and the residue area.	Additional contamination of groundwater.	Alcoa is in the process of implementing a Groundwater Remediation 5 Year Plan (2005-2009) for all of its WA Operations.	No deterioration in groundwater quality as a result of the Proposal.
Surface Water Quality	*Retain the integrity, functions and environmental values of protected wetlands, and to ensure that the EPP lakes are protected and their key ecological functions are maintained.* *Maintain the integrity, functions and environmental values of rivers and ephemeral streams, and to ensure that alterations to surface drainage do not adversely impact native vegetation.*	For the existing refinery, management systems are in place to capture all stormwater runoff and process spill water that is not contained within bunds. The storm sewer and surge pond for the refinery have been designed for a 1:100 year storm. Therefore the risk of contaminated water leaving the property is considered low and manageable.	Monitoring results indicate that the Wagerup refinery operations have had no impact on surface water quality in the vicinity of the Proposal area.	Any new capital project proposed by Alcoa is required to be internally assessed via a comprehensive set of management tools and designed in accordance with appropriate design principles. The design and capacity of the existing stormwater management system at the Wagerup refinery will be reviewed as part of detailed engineering design to ensure the Proposal can be accommodated.	No impact is predicted from the Proposal

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Liquid and Solid Wastes (other than bauxite residue)	*Ensure that liquid and solid wastes do not affect groundwater or surface water quality, nor lead to soil contamination.* *Ensure that the generation of all wastes follows consideration of waste reduction in accordance with the waste hierarchy of reduction, reuse, recycle, treatment and disposal.*	The Wagerup refinery has an existing waste management programme within the EMS. The waste streams are grouped into categories which adhere to Government regulations and internal Alcoa guidelines. The Wagerup waste minimisation program was initiated in 1993 with the objective of characterising and quantifying waste streams and identifying waste minimisation and recycling opportunities. Significant advances have since been made in the area of waste recycling and minimisation. Alcoa has a target of zero non-process waste to landfill by 2008.	Inadequate waste management practices can lead to contamination of soil or water.	Waste management at Wagerup is undertaken in accordance with the Waste Management Procedure (Doc. Number 5102) and specific procedures written for disposal of hazardous wastes.	Waste management will be adequately controlled by existing practices extended to cover the Proposal
Noise – Refinery	*To comply with statutory requirements on a stand-alone basis*	In 2002, Alcoa applied to the Minister for Environment for a variation to the assigned noise levels, as allowed under regulation 17, such that the refinery would be fully compliant with the	If the expansion were implemented with no acoustic controls, offsite noise levels could increase by over 4 dB(A) (i.e., the noise levels will revert to levels similar to those present before the implementation of	An acoustic assessment of the proposed expansion has been undertaken to verify that the noise objective is technically feasible and detail the noise control and management methods required from	If the proposed sound power allocation is implemented there would be no significant change to noise levels experienced by neighbours when compared with the noise levels from the existing

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
		Regulations.	the 2000 and 2001 noise reduction program).	design through to operational phases.	refinery and conveying system.
Noise – Bunbury Port	*To comply with statutory requirements on a stand-alone basis*	The noise emissions from Alcoa's Bunbury Port facility currently comply with the assigned levels in the *Environmental Protection (Noise) Regulations 1997*.	Acoustic consultants have predicted that following the modification to the dust collector fan, current worst-case noise levels will be 32 dB(A) at the south-western residence and 31 dB (A) at the north-eastern residence.		After reviewing the existing model and the design changes associated with the proposed expansion, acoustic consultants concluded that provided low-noise new equipment is selected and the duplicate conveyor is enclosed, the proposed changes to the Alcoa facility should have no noticeable noise impacts at nearby residences.
Water Supply	*To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected.*	Current refinery and residue water supply comes from : • Rainfall collected in Fresh Water Reservoirs • Rainfall Runoff from Plant Area • Rainfall Runoff & Drainage from Residue & Liquor Pond Areas • Surface Water Sources (Licence) - Nth & Sth Yalup Br (1600MLpa) - Black Tom Br (2500 MLpa) - Harvey R Main Drain (4400MLpa) • Groundwater (550 MLpa)	The water requirement for the Proposal is expected to be an additional 1.1 GLpa under average rainfall and runoff conditions (see Table 4; Section 5.3.3) and potentially up to 4.8 GLpa under drought conditions (see Table 5; Section 5.33). Based on available data, CENRM (2005) estimated that an additional 28 GL allocation is available from the Harvey River Main Drain pumpback station.	Water supplies for the Proposal will be managed in accordance with the Water Supply Management Plan.	Alcoa will ensure additional water sourcing has no appreciable adverse environmental impact on surface or groundwater in the area.

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Social Surroundings					
Archaeological Heritage and Ethnographic Issues	*Ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.*	Twenty seven Aboriginal archaeological sites have been recorded within an 8 km radius of the Wagerup refinery. One site is located immediately outside the Proposal area on the southern edge of the existing RDA.	The Proposal will be constructed within the boundary of the existing refinery and will therefore not disturb any known Aboriginal heritage sites. The Proposal will be implemented in accordance with the LTRMS and will not disturb any known Aboriginal heritage sites.		There will be no impact on archaeological heritage and ethnographic issues.
Public Safety Risk	*To ensure that risk from the proposal is as low as reasonably achievable and complies with acceptable standards and EPA criteria including Guidelines and Criteria for EIA No 2, Guidance for Risk Assessment and Management: Off-site Individual Risk from Hazardous Industrial Plant.*	A Public Safety risk assessment has been undertaken for the existing Wagerup refinery and the Proposal. This risk assessment focussed on accidental events which may have an acute impact on members of the public.	A range of hazards were identified that had potential consequences outside of the immediate workplace. Analysis determined if these risks offered potential to affect areas outside Alcoa's boundary where the public risk criteria apply. .	The maintenance and performance monitoring of the controls associated with the identified hazards for the existing plant, expansion and on-going operations are addressed within the Wagerup Safety Management System (which meets the requirements of AS 4801 "Occupational Health and Safety Management Systems) and the Alcoa Major Hazard Management System. .	No appreciable increase in public safety risk as a result of the Proposal...
Visual Impact	*Visual amenity of the area adjacent to the Proposal*	Parts of the refinery, especially the 100m tall multiflue stack, are	The footprint of equipment associated with the Proposal will be	Alcoa currently has a Visual Amenity Strategy for the Wagerup	Residue areas will become more visible, especially relating to height.

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
	should not be significantly impacted by the proposal.	visible from many areas around the refinery. The residue areas are also visible from some locations. Light spill at night is visible for many kilometres.	within the confines of the existing Wagerup Refinery. Expansion of the refinery will also require expansion of the existing residue area within the proposed 30 year residue footprint, which will be to the west and north of the existing residue area in accordance with the LTRMS. The most obvious difference at the refinery will be the addition of a second tall multiflue stack. If the Cogeneration option is pursued, two cooling towers will be visible from many locations. If the boiler option is selected a 75 m stack will be visible. The most obvious difference in the residue area will be the increase in height from the existing elevation of around 20 m to 40 m above ground level, in accordance with the endorsed LTRMS.	residue area. This strategy will be expanded to consider the future residue areas required for the Proposal. This includes enhancing screening vegetation around the refinery and RDA. Appropriate measures for management of light spill for the Proposal will be selected in consultation with plant operations and maintenance personnel to ensure adequate lighting requirements for safe working are maintained.	A second tall calciner multiflue stack and either a second boiler stack or two powerhouse cooling towers will also be visible from some locations around the refinery.
Transport	*Ensure that roads are maintained and road traffic managed to meet an adequate*	The road freight movements associated with the Proposal represents approximately 12% of	The Proposal will result in an increase of road freight vehicles to a total of around 280 vehicles per week	A transport coordinator will be nominated for the Proposal, whose role will be to evaluate transport	There will be an increase in road and rail movement to and from the refinery. Transport management

Environmental Factor	EPA Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
	standard of level of service and saftey. *Ensure that transportation and storage of fuels/chemicals complies with the Australian Dangerous Goods Code; and ensure the requirements of Main Roads Western Australia are met.*	all freight movements, or 1.5% of all vehicle movements on South West Highway in this locality. This represents an average of 167 one-way freight movements. Total one-way train movements average four to seven trains per day.	(one-way). During the construction phase there is the potential for an estimated 400 additional passenger vehicles on average travelling to and from the refinery on a daily basis. Increases in the number of road vehicles, has the potential to increase traffic congestion, risk of accidents along the main transport routes, and road wear. Increases in train length will increase the duration of level crossing times.	routes both on and off the Wagerup refinery site and to ensure that equipment is delivered to Wagerup in a manner that meets all legislative and Alcoa standards. The transport coordinator will prepare the traffic management plan for the Proposal.	plans will minimise this impact.