Pinjarra Refinery Efficiency Upgrade

Alcoa World Alumina Australia

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 1122
December 2003

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (days)
14 Nov	**EPS document received by EPA**	**0**
14 Nov	**Advice requested by EPA**	**0**
26 Nov	**Advice received by EPA**	**12**
10 Dec	**EPA report and recommendations to the Minister**	**14**

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Contents

1. Introduction

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to a proposal by Alcoa World Alumina Australia to construct and operate an upgrade to the seed filtration facility and associated plant from 3.6 to 4.2 million tonnes of alumina per annum at Pinjarra.

The EPA was advised of the proposal in August 2003. Based on the information provided, the EPA considered that while the proposal had the potential to have an effect on the environment, the proposal could be readily managed to meet the EPA's environmental objectives. Consequently it was notified in *The West Australian* newspaper on 1 September 2003 that, subject to preparation of a suitable Environmental Protection Statement (EPS) document, the EPA intended to set the level of assessment at EPS.

The proponent has prepared the EPS (Environ, 2003a), which accompanies this report. The EPA considers that the proposal described can be managed in an acceptable manner subject to the commitments to the proposal being legally binding.

The EPA therefore has determined under Section 40 (1) of the *Environmental Protection Act 1986* that the level of assessment for the proposal is EPS, and this report provides the EPA advice and recommendations in accordance with Section 44 (1).

2. The proposal

The proposal is to upgrade the Pinjarra Alumina Refinery. The proposal involves an upgrading of the seed filtration facility to improve its efficiency in order to increase the alumina production by approximately 17% to approximately 4.2 million tonnes per annum. This will require an increase in the bauxite mining rate at Alcoa's Huntly bauxite mine and additional bauxite grinding, slurry storage and calcination facilities. The key characteristics of the proposal are shown in Table 1. The location and regional setting of the Pinjarra refinery is shown on Figures 1 and 2.

Table 1: Key characteristics of the Pinjarra Refinery Efficiency Upgrade

Characteristic	Units	Current Refinery	Upgraded Refinery
Alumina Production	Mtpa	3.5 (+ 0.1 Mtpa continuous improvement in alumina production)	4.2
Refinery Operations		Continuous operation	Continuous operation
Bauxite Mining Rate	Mtpa	20.6	22.6
Project Life	yrs	>50	>45
Refinery Footprint	ha	250	250
Construction Period	yrs	-	2
PLANT			
SAG mill		6	7

Characteristic	Units	Current Refinery	Upgraded Refinery
Bauxite storage bin		6	7
Slurry storage tank		7	8
Digestion area pumps and piping			Increased capacity
Digestion area vents			Capture vent emissions and send to an RTO
Digestion area evaporators		7	8
Mud thickeners		9	Evenly distribute flow across existing thickeners
Mud washers		5 units of 5 total of 25	Convert two existing mud washer units to single washer unit with larger capacity (i.e. 2 units of 5, to 1 unit of 6)
Causticiation			Install new tanks, pumps and piping for the causticisation process
Seed filtration		-	Install a new seed filtration facility
Precipitation vessels		120	No addition
Calciners		6	Install a seventh calciner, and upgrade the ESP's on 3 existing calciners.
Oxalate kiln			Upgrade capacity Install a new wet scrubber and RTO
REFINERY INPUTS			
Bauxite	Mtpa	13	15
Caustic Soda	tpa	210,000	245,000
Lime	tpa	176,000	195,000
Water	MLpa	6,130	7400
REFINERY OUTPUTS			
Atmospheric Emissions Particulates (from stacks) NO_x CO VOCs	tpa	 190 1,120 815 180	 140 640 815 162
Greenhouse Gases Net CO_2 –Refinery with Alinta Cogeneration Project	tpa tCO_2/t alumina	2,045,000 (2) 583 (2)	2,347,000 (2) 564 (2)
Noise		Compliance with *Environmental Protection (Noise) Regulations 1997*	Compliance with the *Environmental Protection (Noise) Regulations 1997*
Bauxite Residue	Mtpa	6.41	7.73

Notes:

(1) Data presented for Current and Upgraded refinery does not include inputs or outputs from the Alinta Cogeneration Project, although they have been considered in the context of cumulative air quality impacts upon nearby residences.

(2) Includes Pinjarra refinery energy savings associated with the Alinta Cogeneration Project Stages I and II.

Abbreviations:

CO_2	= carbon dioxide
ESP	= electrostatic precipitator
ha	= hectares
MLpa	= million litres per annum
Mtpa	= million tonnes per annum
NO_X	= oxides of nitrogen
RTO	= Regenerative Thermal Oxidiser (thermally destroys VOCs and other combustible components)
SAG	= semi autogenous grinding
tCO_2/t alumina	=tonnes carbon dioxide per tonne of alumina
VOCs	= volatile organic compounds
yrs	= years

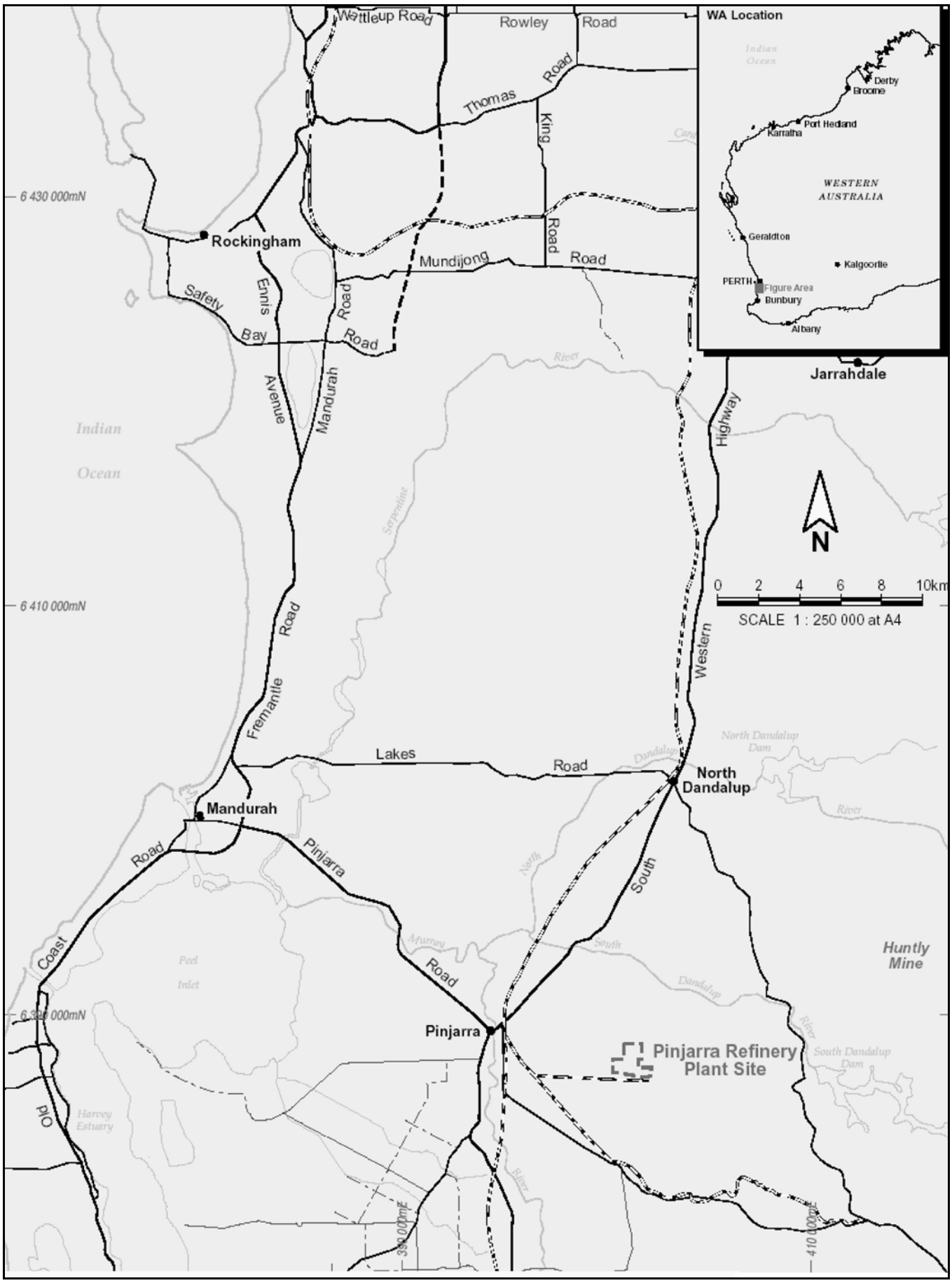

Figure 1: Location of the Pinjarra Refinery (Source: Environ, 2003a).

Figure 2: Aerial Photograph of the Pinjarra Refinery and adjacent residential areas (Source: Environ, 2003a)

3. Consultation

During the preparation of the EPS, the proponent has undertaken consultation with government agencies, environmental interest groups and industry groups with a direct interest in the project as well as other key stakeholders. Consultation was undertaken with the local community via press releases made to the local newspapers inviting participation. A list of organisations consulted, the comments received and the proponent's response are included in Section 7 and Appendices D and E of the EPS (Environ, 2003a).

In order to facilitate stakeholder involvement and participation, the proponent established a Stakeholder Reference Group (SRG) for the proposal. The SRG was established through a collaborative process whereby members of the community were empowered to determine both the makeup and membership of the SRG. This was accomplished by means of a stakeholder workshop. Approximately 160 community members received direct invitations to attend the workshop. This group included neighbours of the refinery, people who had already indicated an interest in the proposal, people who had previously lodged complaints or notifications about refinery activities, townspeople, local business people and various stakeholder groups including local government. This was augmented by advertisements in the local press advising the broader community that any person interested in the proposal was welcome to attend. The process resulted in 38 community members attending the workshop, representing a wide range of interests. The workshop:

- determined the makeup of the SRG;
- confirmed the individual membership of the SRG; and
- identified the main issues of interest to the various community groups.

A group of 12 members was selected by the community workshop attendees to represent the stakeholder interest groups on the SRG. The duties of the SRG were to:

- consider economic, environmental and social issues associated with the Efficiency Upgrade;
- review mechanisms to manage identified issues (e.g. environmental impacts and social implications) and the advice of the Expert Review Panel;
- review key proponent draft documents submitted to environmental regulatory agencies;
- request investigations and assessments via working groups; and
- assist in communicating information on the project and progress to other stakeholders.

To assist the SRG in the review of the technical reports, the proponent provided resources in the form of an Expert Review Panel. The SRG assisted in choosing the experts for the panel.

During the consultation a broad range of issues was raised which are tabulated in Appendix D of the EPS (Environ, 2003a). Key environmental issues were residue dust emissions, air emissions and impact on health, greenhouse gas emissions, noise emissions, increased mining rate and residue deposition, and water usage.

The proponent has stated that it is its intention that the SRG process will continue beyond the environmental approval.

4. Relevant environmental factors

The summary of all of the environmental factors and their management is outlined in Table E2 of the EPS (pages xv-xviii, Environ, 2003a).

In the EPA's opinion the following are the environmental factors relevant to the proposal:

a) Air quality including odours and dust;

b) Greenhouse gas emissions;

c) Noise; and

d) Water supply.

4.1 Air quality including odours and dust

Description

The proponent expects that the efficiency upgrade at Pinjarra will result in the following changes:

- reduction in emissions of NO_X, particulates, benzene, arsenic, cadmium and nickel of between approximately 25% (particulates) and 75% (nickel);
- reduction in average emissions of acetaldehyde of approximately 10%, and a reduction in peak emissions of approximately 15%;
- increase in emissions of formaldehyde and mercury of approximately 10% and 20% respectively; and
- little change in emissions of CO, SO_2, toluene and xylenes.

The Pinjarra Refinery has a substantial buffer zone separating it from the nearest residences. The nearest residences outside of the refinery boundary are rural residences approximately 4 kilometres to the south of the processing area, near the southern boundary, and 2 kilometres to the north east, near the property boundary. The Pinjarra townsite is situated approximately 6 kilometres to the west and the Carcoola town site approximately 6 kilometres to the north west (Figure 2).

Assessment

The EPA's objective for this factor is to ensure that gaseous emissions:

- both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problem; and
- ensure all reasonable and practicable measures are used to minimise the discharge of gaseous emissions.

In order to assess the potential changes in ambient air quality and consequential health impacts, the proponent commissioned an air dispersion modelling study (SKM, 2003) and health risk study (Toxikos, 2003) based on the air dispersion model output.

Air Quality

Ground level concentrations (GLCs) of 21 pollutants were predicted by means of dispersion modelling using Ausplume[1]. The air dispersion modelling indicated that:

- the highest GLCs for both short-term (i.e. ≤ 8-hour) and long-term (i.e. annual) averaging periods are predicted to occur near the locations of two rural residences to the north east on the Darling Scarp;

- the maximum and annual average GLCs predicted for both before and after implementation of the proposal are well below the NEPM Standards [2] for NO_2, CO, SO_2 and PM_{10}, the NEPM Advisory Reporting Standard for $PM_{2.5}$, and the draft NEPM Investigation Levels for benzene, formaldehyde, toluene and xylenes;[3]

- the 1-hour average concentrations of nitrogen dioxide (post upgrade) at the Darling Scarp location with the highest GLC is predicted to be less than 60% of the NEPM standard, while other pollutants range from 0.01% (toluene) to 7.0% ($PM_{2.5}$) of the NEPM guideline;

- the 1-hour average concentrations of nitrogen dioxide (post upgrade) at the Pinjarra town site is predicted to be 14.1% of the NEPM standard, while other pollutants range from 0.006% (toluene) to 2.9% ($PM_{2.5}$) of the NEPM guideline.

- Odour impacts after the proposal is implemented are expected to reduce as the 1-hour average GLCs for Acetaldehyde[4] are 55% lower and Volatile Organic Compounds (VOCs) 43% lower at the Pinjarra town-site.

An expert review (CH Environmental, 2003) commissioned by the proponent/Stakeholder Reference Group of the Air Quality Data Report (ENVIRON, 2003b) and the Air Dispersion Modelling Report (Sinclair Knight Merz, 2003) confirmed that "appropriate methodology has been applied in the derivation and analysis of data" and that the "models used have been selected on the basis of providing conservative results". The review noted that particle and metal emissions from area sources such as stock-piles and the Residue Disposal Area (RDA)

[1] Ausplume is the Victorian Environmental Protection Authority's Gaussian dispersion model, which has wide regulatory acceptance throughout Australia. It was chosen because it produced the most conservative (highest) predictions of the models considered (see section 6.3.4.1.2 of the EPS).
[2] National Environment Protection Measures ambient air guidelines and their status are discussed in section 6.3.3.1 of the EPS.
[3] The predicted PM_{10} and $PM_{2.5}$ GLCs did not include fugitive dust from the residue disposal area.

had not been included in the reports. It was acknowledged, however, that both the determination of emission rates from area sources and modelling of their dispersion are difficult to do, consequently the results would be highly uncertain. The use of monitoring information, including analysis of the metal composition of ambient particles was suggested as an alternative. The proponent has proposed doing more work to identify the composition of dust from the RDA.

The EPA considers on advice from the Air Quality Branch of the Department of Environmental Protection that the proponent has assessed an appropriate set of pollutants and that the predicted air quality impacts are conservative and are acceptable when compared with relevant health standards. The EPA also considers that the air dispersion modelling needs to be validated by comparison with actual monitoring following completion of the proposed upgrade.

Health Risk Assessment

Besides comparing the air dispersion modelling results with the NEPM standards and guidelines, the model output was used to carry out a further analysis in the form of a Quantitative Health Risk Assessment.

The health risk and toxicological report (Toxikos, 2003) concluded that the health risk assessment "indicates little likelihood of health effects being caused by either acute or chronic exposure of the general public to refinery emissions from the Alcoa Pinjarra Refinery".

The health risk assessment report (Toxikos, 2003) was submitted by the proponent for expert review. The review report (Weinstein, 2003) noted the "overall impression of scientific rigour and completeness" in the health risk assessment report. The assessment was seen as a screening exercise rather than a Health Risk Assessment in the traditional sense and it was stated that there is "no indication of a health risk posed by any emission component". The health risk assessment had identified nitrogen oxides, arsenic and mercury as being key pollutants that could contribute to health risk from the refinery and so the expert review suggested a "rigorous hazard surveillance system" for these pollutants.

The EPA notes that, whilst the proposal includes air pollution control equipment which will reduce pollutants such as NO_X arsenic and VOCs, the net emission of mercury and formaldahyde will increase. However, the EPA considers on advice from the Department of Health that the Health Risk Assessment is conservative on a number of levels and notes that the overall exposure risk is expected to decrease following completion of the proposed

[4] Odorous emissions from alumina refineries are caused by emissions of trace levels of volatile organic compounds. Research (Coffey and Ioppoo-Armanios, 2003) at Alcoa's Wagerup Refinery indicates that acetaldehyde contributes in the order of over 90% of odours. The Pinjarra refining process closely parallels that

upgrade. The EPA also considers that, as the Health Risk Assessment is based on a number of assumptions from the air dispersion modelling, the Health Risk Assessment needs to be re-evaluated after the air dispersion modelling has been validated following the completion of the proposed upgrade. At that time fugutive dust from the Residue Disposal Area can be included in the assessment.

The EPA notes that the proponent has made the following commitments:

- to install best practice pollution control equipment in order to achieve approximate reductions of 10% of VOC emissions, 25 % of particulate emissions from the calciners, 90% of CO emissions from the Oxalate kiln, and an offset of general refinery NO_x emissions by installation of low NO_x burners in the power station (Commitment No.1);
- to improve dust management at the Residue Disposal Areas (Commitment No.2);
- to determine the composition of the residue dust (Commitment No.3) ; and
- to carry out further monitoring to improve understanding of atmospheric emissions (Commitment No.3).

In view of the above, it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor, provided that Ministerial Condition No.6 is applied to the proposal, which requires the proponent to:

- prepare and implement an Air Quality Management Plan to monitor air quality and the performance of air pollution control equipment, and provide a contingency plan for planned or unplanned shut-down of the equipment;
- carry out monitoring to validate the air dispersion modelling within six months of commissioning the upgrade; and
- in the event that the validation of the model indicates unacceptable risk, immediately investigate and implement measures to reduce the risk.

4.2 Greenhouse gas emissions

Description

Operation of the proposed upgraded facility will result in the net emission of approximately 2,347,000 tonnes of CO_2 per annum. This represents an increase of 302,000 tonnes of CO_2 per annum. However, the upgrade will provide opportunities to improve the energy efficiency of equipment installed so that the net CO_2 emission intensity will improve by 3.3% from 583 to 564 kg of CO_2 per tonne of alumina produced.

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at Wagerup.

Assessment

The EPA's objective for this factor is to ensure that greenhouse gas emissions meet acceptable standards and that all reasonable and practicable measures are taken to minimise greenhouse gas discharge.

The EPA notes that, whilst the proposal will result in an increase of 302,000 tonnes of CO_2 per annum, a 3.3% improvement in efficiency is anticipated on a kg of CO_2 emitted per tonne of alumina produced basis.

The EPA is aware that the proponent is currently involved in a number of greenhouse programs including the Greenhouse Challenge.

It is the EPA's opinion that that the proposal can be managed to meet the EPA's objective for this factor provided that Ministerial Condition No.7 is applied to the proposal.

4.3 Noise

Description

Existing noise emissions from the Pinjarra Refinery are in compliance with the *Environmental Protection (Noise) Regulations 1997.* The refinery has received a limited number of complaints relating to normal refinery operation (SVT, 2003).

Without noise abatement measures there is a potential for noise emissions to increase as a result of the proposal. Best practice noise control measures have been incorporated into the efficiency upgrade design.

Assessment

The EPA's objective for this factor is to protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards.

Noise modelling by Herring Storer Acoustics (2003a) has indicated that, provided the proposed noise control measures are installed, the proposal will have minimal effect on the noise emissions and the refinery will remain in compliance with *Environmental Protection (Noise) Regulations 1997*. The report focussed on predicted noise levels for the nearest residences to the south of the refinery.

An independent review of this noise modelling work was carried out by SVT (2003) on behalf of the proponent. SVT supported the choice of modelling software as being appropriate and indicated that the model inputs were representative of worst case conditions. It was noted that there appeared to be good agreement between measured and predicted results at a location south of the refinery and that compliance with the Regulation was indicated at the nearest residences to the south.

SVT requested additional information from Herring Storer Acoustics relating to the noise level predictions for residences to the north of the refinery. SVT was satisfied that borderline compliance with environmental noise limits was indicated in this case and noted that Herring

Storer Acoustics believe that the model over predicts levels at this location[5]. Further work is required to validate this.

The EPA considers on advice from the Department of Environmental Protection that the upgraded refinery can meet the *Environmental Protection (Noise) Regulations* 1997, provided best practice noise control measures are incorporated into the design. The EPA notes that the predicted noise levels at the nearest rural residences to the north of the refinery are marginal.

The EPA also notes that the proponent has made the following commitment (CommitmentNo.4):

- To have in place and implement a Noise Management Plan, which includes:
    1. monitoring at the nearest receptor locations; and
    2. noise control measures to be incorporated into the upgrade design;

in order to demonstrate compliance with the *Environmental Protection (Noise) Regulations 199*7.

In view of the above it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor. The EPA has not considered noise impacts at the Huntly mining operations.

4.4 Water supply

Description

The Pinjarra Refinery obtains its make-up water requirement from surface and underground sources. The surface water supply impoundments (on Oakley and Barritt Brooks) are operated under surface water licences issued by the Department of Environment. Groundwater is abstracted, mainly from the Cattamarra Aquifer, under groundwater licences.

The surface water impoundments are operated so as to allow downstream flows which exceed environmental water requirements. Groundwater abstraction is maintained below the sustainable yield of the aquifer. In drought years there is a provision which allows Alcoa to increase groundwater abstraction for a short period, subject to favourable groundwater monitoring results.

The Efficiency Upgrade will require an additional 1,100 megalitres of water per annum, which is a 13% increase on the existing refinery water requirement. A number of options have been considered to meet these requirements but no decision has been made to date. The preferred option is to reuse effluent from the Mandurah waste water treatment plant. This option would require construction of a pipeline from Mandurah and would require a separate Environmental Impact Assessment.

Assessment

The EPA's objectives for this factor are to:

- maintain the integrity, functions and environmental values of watercourses; and

[5] See the appended Herring Storer Acoustics fax in SVT (2003) for a detailed explanation

- maintain the quantity of groundwater so that existing and potential uses, including ecosystem maintenance, are protected.

The EPA notes that Alcoa's use of water from Oakley and Barritt Brooks, and abstraction of groundwater, is currently regulated by licences issued by the Department of Environment. An additional water allocation from these sources can only be obtained after approval of changes to the licences by the Department of Environment.

The EPA is aware that the proponent's other options include use of town water (least preferred option), water savings by means of conservation initiatives or reuse of effluent from the Mandurah waste water treatment plant. Whilst the proponent intends to maximise water conservation, the reuse of effluent from the Mandurah waste water treatment plant is preferred over the use of town water for the remaining water requirement. The Mandurah waste water treatment plant effluent reuse option would require construction of a pipeline from Mandurah and would require a separate Environmental Impact Assessment.

The EPA notes that the proponent has made the following commitments (Commitments 5a and 5b):

- to have in place a Water Use Minimisation Program which includes:
    1. current water conservation initiatives; and
    2. identification of targets and opportunities for continuous improvement in water minimisation and reuse/recycling
- to refer new water supply proposals with a potential for environmental impact to the EPA.

In view of the above, it is the EPA's opinion that adequate measures are in place to ensure that arrangements for provision of the increased water supply, other than by water conservation initiatives, or purchase of town water, will be assessed separately.

The EPA concludes that this factor can be managed to meet the EPA's objectives, provided that the proponent's commitments to have in place a Water Use Minimisation Program and to refer any alternative water supply proposal that has a potential for environmental impacts to the EPA, are applied to the proposal.

5. Conclusions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA concludes that the factor of air quality including odours and dust can be managed to meet the EPA's objective that gaseous emissions, both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problem, provided that Ministerial Condition No.6, which requires the proponent to carry out air quality monitoring to validate air quality and Health Risk Assessment modelling results, and the proponent's commitments to use best practice pollution control equipment and carry out further emission source monitoring, are applied to the proposal.

The EPA concludes that the factor of greenhouse gas emissions can be managed to meet the EPA's objective to ensure that greenhouse gas emissions meet acceptable standards and that all reasonable and practicable measures are taken to minimise greenhouse gas discharge, provided that Ministerial Condition No.7 is applied to the proposal.

The EPA concludes that the factor of noise can be managed to meet the EPA's objective of protection of the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring that noise levels meet statutory requirements and acceptable standards, provided that the proponent's commitment, to have in place and implement a Noise Management Plan which includes further monitoring at the nearest receptor locations and noise abatement measures to be included in the upgrade design, is applied to the proposal.

The EPA concludes that the factor of water supply can be managed to meet the EPA's objectives to:

- maintain the integrity, functions and environmental values of watercourses; and
- maintain the quantity of groundwater so that existing and potential uses, including ecosystem maintenance, are protected;

provided that the proponent's commitments to have in place a Water Use Minimisation Program and refer any alternative water supply proposal, which has a potential for environmental impacts, to the EPA, are applied to the proposal.

6. Recommendations

The EPA considers that the proponent has demonstrated in the EPS document that the proposal can be managed in an environmentally acceptable manner and provides the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is for the Pinjarra Refinery Efficiency Upgrade.
2. That the Minister considers the report on the relevant environmental factors as set out in Section 4.
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions and proponent commitments as set out in Appendix 2.
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

CH Environmental, 2003. Desktop Review Pinjarra Alumina Refinery Efficiency Upgrade.

Coffey and Ioppolo-Armanios, 2003. *Identification of the odour and chemical composition of alumina refinery air emissions*. Coffey PS and Ioppolo-Armanios M, 2nd IWA International Conference on Odours and VOCs, International Water Association, 14th-17th September 2003, Singapore. 2003.

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Herring Storer Acoustics, 2003a. Acoustical Assessment of Efficiency Upgrade at Alcoa Pinjarra Refinery for Alcoa World Alumina Australia.

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SVT, 2003. Review of Acoustic Consultancy Work Undertaken for Alcoa's Pinjarra Efficiency Upgrade Project for Alcoa Australia. Report No. AV/03/10/001.

Toxikos, 2003. Health Risk & Toxicological Assessment of Emissions from the Upgraded Alcoa Pinjarra Alumina Refinery.

Weinstein, P., 2003. Pinjarra Refinery Efficiency Upgrade Review of Draft Health Risk and Toxicological Assessment Report. School of Population Health University of Western Australia.

Appendix 2

Recommended Environmental Conditions

and Proponent's Commitments

Statement No.

RECOMMENDED CONDITIONS AND PROCEDURES

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PINJARRA REFINERY EFFICIENCY UPGRADE

Proposal: The construction and operation of an upgraded seed filtration facility and associated plant in order to increase the alumina production to approximately 4.2 million tonnes per annum, as documented in schedule 1 of this statement.

Proponent: Alcoa World Alumina Australia

Proponent Address: Pinjarra Refinery
South West Highway
PO Box 172
PINJARRA WA 6208

Assessment Number: 1498

Report of the Environmental Protection Authority: Bulletin 1122

The proposal referred to above may be implemented by the proponent subject to the following conditions and procedures:

1 Implementation and Changes

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment

determines, on advice of the Environmental Protection Authority, is not substantial, the proponent may implement those changes upon receipt of the approval of the Minister for the Environment.

2 Proponent Commitments

2-1 The proponent shall implement the environmental management commitments documented in schedule 2 of this statement.

3 Proponent Nomination and Contact Details

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

3-3 The nominated proponent shall notify the Department of Environmental Protection of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

4-1 The proponent shall substantially commence the proposal within five years of the date of this statement or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment will determine any dispute as to whether the proposal has been substantially commenced.

4-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement to the Minister for the Environment, prior to the expiration of the five-year period referred to in condition 4-1.

The application shall demonstrate that:

1. the environmental factors of the proposal have not changed significantly;

2. new, significant, environmental issues have not arisen; and

3. all relevant government authorities have been consulted.

Note: The Minister for the Environment may consider the grant of an extension of the time limit of approval not exceeding five years for the substantial commencement of the proposal.

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program and submit compliance reports to the Department of Environmental Protection which address:

1. the status of implementation of the proposal as defined in schedule 1 of this statement;

2. evidence of compliance with the conditions and commitments; and

3. the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

5-2 The proponent shall submit a performance review report every five years after the start of the operations phase, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, which addresses:

1. the major environmental issues associated with the project; the targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets;

2. the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable;

3. significant improvements gained in environmental management, including the use of external peer reviews;

4. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and

5. the proposed environmental targets over the next five years, including improvements in technology and management processes.

5-3 The proponent may submit a report prepared by an auditor approved by the Department of Environmental Protection under the "Compliance Auditor Accreditation Scheme" to the Chief Executive Office or the Department of Environmental Protection on each condition/commitment of this statement which requires the preparation of a management plan, programme, strategy or system, stating that the requirements of each condition/commitment have been fulfilled within the timeframe stated within each condition/commitment.

Note: Alternatively, the proponent shall submit appropriate documentation directly to the Department of Environmental Protection to determine whether the requirements of the conditions and commitments have been met.

6 Air Emissions

6-1 Prior to the commissioning of the processing plant, the proponent shall prepare an Air Quality Management Plan, that includes:

1 details of air pollution control equipment;
2 a description of air quality and air pollution control equipment emission monitoring to be undertaken during construction, commissioning, and operation of the plant;

3 monitoring locations, sampling frequency, sampling methods, analytical test methods and quality assurance/quality control procedures; and

4 a contingency plan for unplanned or planned shut-down of the pollution control equipment;

to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

6-2 The proponent shall implement the Air Quality Management Plan required by condition 6-1 to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

6-3 The proponent shall make the Air Quality Management Plan required by 6-1 publicly available to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

6-4 Within six months following commissioning, the proponent shall validate/revise the air quality predictions and the Health Risk Assessment carried out for the Environmental Protection Statement using actual monitoring data, to the

requirements of the Minister on advice of the Environmental Protection Authority.

6-5 In the event that the validation of the Air Dispersion model and the Health Risk Assessment referred to in 6-4 indicates unacceptable risk, the proponent will immediately investigate and implement measures to reduce the risk to the satisfaction of the Minister for the Environment on advice of the Environmental Protection Authority.

Note: In the preparation of advice to the Minister for the Environment, the Environmental Protection Authority expects that the advice of the following agencies will be obtained:

- Department of Environmental Protection (Air Quality Management Branch)
- Department of Health.

7 Greenhouse Gas Emissions

7-1 Prior to commissioning, the proponent shall prepare a Greenhouse Gas Emissions Management Plan to:

- ensure that "greenhouse gas" emissions from the project are minimised through use of best practice to minimise the total net "greenhouse gas" emissions and / or "greenhouse gas" emissions per unit of product; and

- manage "greenhouse gas" emissions in accordance with the *Framework Convention on Climate Change 1992*, and consistent with the National Greenhouse Strategy;

to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

This Plan shall include:

1. calculation of the "greenhouse gas" emissions associated with the proposal, as required by the Environmental Protection Authority[1];

2. estimation of the "greenhouse gas" efficiency of the project (per unit of product and/or other agreed performance indicators) and comparison with the efficiencies of other comparable projects producing a similar product, both within Australia and overseas;

3. actions for the monitoring and annual reporting of "greenhouse gas" emissions and emission reduction strategies;

[1] The current requirement of the Environmental Protection Authority is set out in: *Minimising Greenhouse Gas Emissions, Guidance for the Assessment of Environmental Factors, No. 12* published by the Environmental Protection Authority (October 2002). This document may be updated or replaced from time to time.

4. a target set by the proponent for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product and as a percentage of total emissions over time, and annual reporting of progress made in achieving this target. Consideration should be given to a contribution from renewable energy sources such as solar, wind or hydro or conversion to cleaner energy sources (fuel swapping); and

5. consideration by the proponent of entry (whether on a project-specific, company-wide arrangement or within an industrial grouping, as appropriate) into the Commonwealth Government's "Greenhouse Challenge" voluntary cooperative agreement program. Components of the agreement program include:

    1. an inventory of emissions;
    2. opportunities for abating "greenhouse gas" emissions in the organisation;
    3. a "greenhouse gas" mitigation action plan;
    4. regular monitoring and reporting of performance; and
    5. independent performance verification.

7-2 The proponent shall implement the Greenhouse Gas Emissions Management Plan required by condition 7-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

7-3 Prior to commissioning, the proponent shall make the Greenhouse Gas Emissions Management Plan required by condition 7-1 publicly available, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Procedures

1 Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Environmental Protection Authority will provide that advice to the Department of Environmental Protection for the preparation of written advice to the proponent.

2 The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environmental Protection.

3 Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environmental Protection.

Notes

1 The Minister for the Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of

Environmental Protection over the fulfilment of the requirements of the conditions.

2 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986*.

3 Within this statement, to "have in place" means to "prepare, implement and maintain for the duration of the proposal".

4 Compliance and performance reporting will endeavour to be in accord with the timing requirements of the *Alumina Refinery (Pinjarra) Agreement Act 2002*.

Schedule 1

The Proposal (Assessment No. 1498)

The proposal is to upgrade the Pinjarra Alumina Refinery. The proposal involves an upgrading of the seed filtration facility to improve its efficiency in order to increase the alumina production by approximately 17% to approximately 4.2 million tonnes per annum. This will require an increase in the bauxite mining rate at Alcoa's Huntly bauxite mine and additional bauxite grinding, slurry storage and calcination facilities. The key characteristics of the proposal are shown in Table1. The location and regional setting of the Pinjarra refinery is shown on Figures 1 and 2.

Table 1 Key characteristics of the Pinjarra Refinery Efficiency Upgrade

Characteristic	Units	Current Refinery	Upgraded Refinery
Alumina Production	Mtpa	3.5 (+ 0.1 Mtpa continuous improvement in alumina production)	4.2
Refinery Operations		Continuous operation	Continuous operation
Bauxite Mining Rate	Mtpa	20.6	22.6
Project Life	yrs	>50	>45
Refinery Footprint	ha	250	250
Construction Period	yrs	-	2
PLANT			
SAG mill		6	7
Bauxite storage bin		6	7
Slurry storage tank		7	8
Digestion area pumps and piping			Increased capacity
Digestion area vents			Capture vent emissions and send to an RTO
Digestion area evaporators		7	8
Mud thickeners		9	Evenly distribute flow across existing thickeners
Mud washers		5 units of 5 total of 25	Convert two existing mud washer units to single washer unit with larger capacity (i.e. 2 units of 5, to 1 unit of 6)
Causticiation			Install new tanks, pumps and piping for the causticisation process
Seed filtration		-	Install a new seed filtration facility
Precipitation vessels		120	No addition
Calciners		6	Install a seventh calciner, and upgrade the ESP's on 3 existing calciners.
Oxalate kiln			Upgrade capacity Install a new wet scrubber and RTO
REFINERY INPUTS			
Bauxite	Mtpa	13	15

Characteristic	Units	Current Refinery	Upgraded Refinery
Caustic Soda	tpa	210,000	245,000
Lime	tpa	176,000	195,000
Water	MLpa	6,130	7400
REFINERY OUTPUTS			
Atmospheric Emissions	tpa		
Particulates (from stacks)		190	140
NO_x		1,120	640
CO		815	815
VOCs		180	162
Greenhouse Gases			
Net CO_2 –Refinery with Alinta Cogeneration	tpa	2,045,000 (2)	2,347,000 (2)
Project	tCO_2/t alumina	583 (2)	564 (2)
Noise		Compliance with *Environmental Protection (Noise) Regulations 1997*	Compliance with the *Environmental Protection (Noise) Regulations 1997*
Bauxite Residue	Mtpa	6.41	7.73

Notes:

(1) Data presented for Current and Upgraded refinery does not include inputs or outputs from the Alinta Cogeneration Project, although they have been considered in the context of cumulative air quality impacts upon nearby residences.

(2) Includes Pinjarra refinery energy savings associated with the Alinta Cogeneration Project Stages I and II.

Abbreviations:

CO_2 = carbon dioxide
ESP = electrostatic precipitator
ha = hectares
MLpa = million litres per annum
Mtpa = million tonnes per annum
NO_X = oxides of nitrogen
RTO = Regenerative Thermal Oxidiser (thermally destroys VOCs and other combustible components)
SAG = semi autogenous grinding
tCO_2/t alumina =tonnes carbon dioxide per tonne of alumina
VOCs = volatile organic compounds
yrs = years

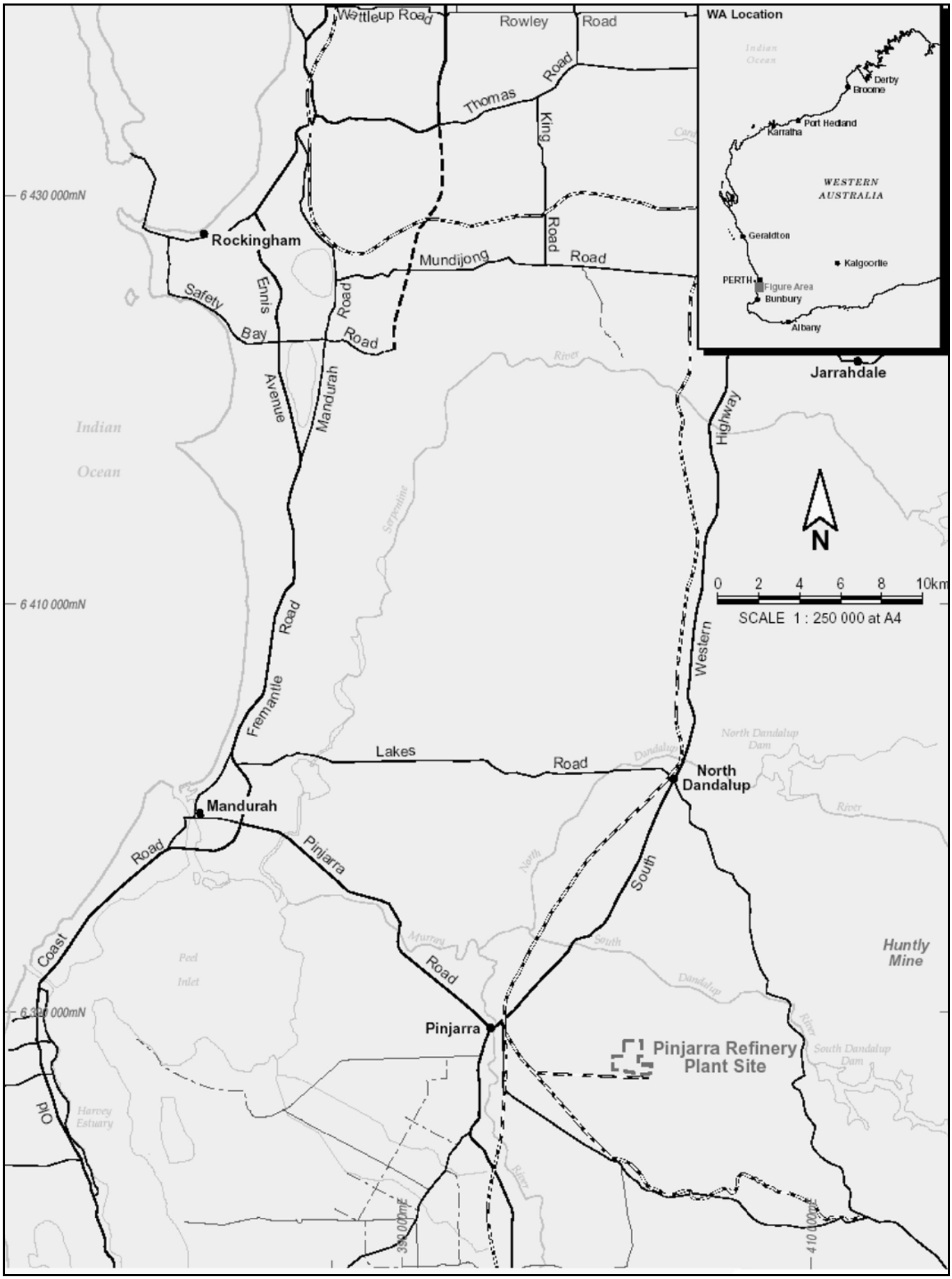

Figure 1: Location of the Pinjarrra Refinery efficiency upgrade (Source: Environ, 2003a).

Figure 2: Aerial Photograph of the Pinjarra Refinery and adjacent residential areas (Source: Environ, 2003a)

Schedule 2

Proponent's Environmental Management Commitments

December, 2003

PINJARRA REFINERY EFFICIENCY UPGRADE, PINJARRA

(Assessment No. 1498)

Alcoa World Alumina Australia

Proponent's Environmental Management Commitments – December 2003

TITLE OF PROPOSAL (Assessment No. 1498)

Note: The term "commitment" as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the objective of the commitment;
- the 'action' to be undertaken by the proponent;
- the timing requirements of the commitment; and
- the body/agency to provide technical advice to the Department of Environmental Protection.

No.	Topic	Objective	Action	Timing	Advice
1	Air emissions	To minimise emissions to air.	Install air pollution control equipment to achieve: 1. a reduction of approximately 10% in VOC emissions; 2. a reduction of approximately 25% in particulate emissions from the calciners; 3. a reduction of over 90% in CO emissions from the Oxalate kiln; and 4. an offset of the increase in general refinery NO_X emissions by installing low-NO_X burners in the power station.	Prior to commissioning.	

No.	Topic	Objective	Action	Timing	Advice
2	Air emissions	To minimise fugitive dust emissions from the Residue Disposal Area.	1) Prepare a Dust Management Plan for the Residue disposal Area which includes: • an upgrade of the existing sprinkler system; and • review of operational controls. 2) Implement the Dust Management Plan	Prior to commissioning of the Efficiency Upgrade. During operation	DEP (Air Quality Monitoring Branch)
3	Air emissions source monitoring.	To improve understanding of emissions to air.	Have in place an air emissions monitoring program to monitor: 1. targeted emissions sources; and 2. the composition and particle size distribution of dust from the residue Disposal Area. Implement the monitoring program.	Prior to commissioning During operation	DEP (Air Quality Monitoring Branch)
4	Noise	To comply with the requirements of the *Environmental Protection (Noise) Regulations 1997.*	Have in place a Noise Management Plan that includes: 1. monitoring at the nearest receptor locations to north and south of the refinery; 2. noise controls to be incorporated in the Efficiency Upgrade design . Implement the Noise Management Plan.	Prior to construction During construction and operation.	DEP (Noise Section)

No.	Topic	Objective	Action	Timing	Advice
5	Water supply	To protect water resources.	Have in place a Water Use Minimisation Program which includes: 1. current water conservation initiatives; 2. identification of opportunities and targets for continuous improvement by means of operational change, use of best practicable technology and maximisation of water reuse/recycling; Refer new water supply proposals that are not subject to licensing by the Department of Environmental Protection, and which have a potential for environmental impact, to the EPA.	Prior to commissioning. .	WRC

Abbreviations:

DEP	Department of Environmental Protection	CO	carbon monoxide	VOCs	volatile organic compounds
EPA	Environmental Protection Authority	NO_X	Nitrogen oxides	WRC	Water and Rivers Commission