Increase in alumina production to 3.3 million tonnes per annum at Wagerup Alumina refinery, and associated bauxite mining activities

Alcoa of Australia Ltd

Report and recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 779
May 1995
1. Introduction and background

1.1 The purpose of this report

This report and recommendations provide the Environmental Protection Authority’s (EPA) formal advice to the Minister for the Environment on the environmental acceptability of the proposed increase in alumina production from Alcoa of Australia Ltd’s alumina refinery at Wagerup.

1.2 Previous assessments by the Environmental Protection Authority

1978 Environmental Review and Management Programme

In May 1978 Alcoa submitted an Environmental Review and Management Programme (ERMP) describing a proposal to produce alumina at Wagerup at a rate of 4 million tonnes per annum (Mtpa). The EPA received over 200 submissions from the public and government agencies, including a detailed report from the Technical Advisory Group (TAG) set up by the State Government and comprised of experts from the key government agencies. TAG advised the EPA that, whilst some expansion appeared justified of Alcoa’s alumina production (which at that time was generated from the Kwinana and Pinjarra refineries), this should not occur without changes to better control of bauxite mining operations throughout the Darling Range. TAG pointed out that significant environmental issues remained unresolved, including the impacts of dieback spread and mining on flora, fauna and water quality, combined with the uncertainty of successful rehabilitation methods.

On the basis of advice (principally from TAG), the EPA adopted a precautionary approach and recommended against the State approving the ERMP (EPA 1978). Instead, the EPA recommended that construction of the alumina refinery could proceed, but that there should be no further expansion of the Wagerup refinery beyond 2 Mtpa without the approval of the State. The EPA made a number of specific recommendations related to the protection of flora and fauna, forest conservation, water quality in the catchment, land use issues, recreational activities and co-ordination of research committees (Appendix 1). The EPA’s most serious criticism of the draft ERMP related to the Company’s position at the time that bauxite mining took priority over other land uses.

Alcoa subsequently revised its ERMP and resubmitted it in September 1978, with a proposal to produce alumina to a maximum of 2 Mtpa. The revised ERMP was approved by the EPA and the State Government in October 1978. The proposal was commissioned in 1984 and operated at a rate of 0.67 Mtpa.

1989 Consultative Environmental Review

The Wagerup operations were further assessed by the EPA at CER level in 1989, when Alcoa proposed to expand its operations to 1.5 Mtpa of alumina. The EPA decided to formally re-assess the proposal because of the considerable elapsed time since the ERMP was assessed in 1978. The EPA assessed the Consultative Environmental Review (CER) in the context of significant changes in the scope of the project in relation to predicted impacts and changes to environmental management programmes, and compared the proponent’s performance against the commitments made in the 1978 ERMP.

The EPA received 5 submissions from government agencies and conservation bodies and, on the basis of this advice, concluded that the expansion was environmentally acceptable, subject to a number of recommendations and commitments by the company. These recommendations (Appendix 2) included liaison with the Department of Conservation and Land Management
assessment of possible tonal components in the conveyor noise; and

- recommendations for appropriate noise control measures to ensure conveyor noise complies with the 35 dB(A) criterion.

(ii) Alcoa shall implement such noise controls as are necessary to ensure compliance prior to commencement of the proposed operations.

(iii) Noise monitoring shall be carried out by a recognised acoustical consultant following completion of the noise control measures, in consultation with the DEP, to ensure compliance, the results of the monitoring to be reported to the DEP prior to the commencement of the proposed operations.

**REFINERY**

The noise criteria to be used in this assessment will be both the Noise Abatement (Neighbourhood Annoyance) Regulations 1979, (the current prescribed standard for noise under the EP Act) and the proposed regulations as currently drafted. As indicated in the discussion above on criteria for noise of mining operations, the 1993 draft regulations under the EP Act do not reflect the current position of the DEP. The current draft would specify Maximum Allowable Noise Levels of approximately 35 to 40 dB(A) for this area, depending on the proximity of residences to the South-Western Highway.

The noise level contours presented in Sheets 1 and 2 of the HSA report show the noise levels predicted for the existing refinery, for calm conditions and for a light northerly breeze, respectively. As the proposed upgrade is only likely to increase noise levels by 1 dB(A) above the existing levels, this contour map serves to illustrate both scenarios.

The contours on Sheet 2 represent a worst case in terms of the residences to the south of the refinery, including the Yarloop townsit. These predictions show the 35 dB(A) contour encompassing that part of the Yarloop townsit north of Johnston Road and 4 residences to the south of the refinery. The noise levels at these 4 residences would lie in the range 42 to 50 dB(A). With a southerly breeze, the residence about 1.5 km to the north of the refinery would also be expected to receive noise levels of approximately 45 dB(A).

The HSA report also demonstrates that the noise character is tonal at 500 Hz (Appendix 3 of the HSA report), which would increase its annoying effect.

Under the current Noise Abatement (Neighbourhood Annoyance) Regulations 1979, the nearest residence in the area to the south of the refinery, off Bancell Road, could be classed as A1, for which the Assigned Outdoor Neighbourhood Noise Level would be 30 dB(A) at night. If the predicted level of 50 dB(A) is adjusted by adding 5 dB(A) to account for its tonal effect, the adjusted level of 55 dB(A) exceeds the Assigned level by 25 dB(A). In terms of this nearest residence, therefore, the existing operations of the refinery result in a substantial breach of the current legislation.

Residences in Yarloop which are well away from the South-Western Highway would be classed as A2 under the current regulations, for which the Assigned level would be 35 dB(A) at night. The predicted levels of typically 35 to 45 dB(A) in these areas, when adjusted for the tonal component, would exceed the regulations by 5 to 15 dB(A).
Residences along the Highway would be classed as B1 or B2, with Assigned noise levels of 40 or 45 dB(A) at night. For those residences in the town south of the 40 dB(A) contour, the predicted noise levels may be acceptable, while for those along the Highway north of the 40 dB(A) contour, the predicted noise levels may exceed the Assigned levels by up to 10 dB(A).

The current draft of the proposed regulations would specify Maximum Allowable Noise Levels for these areas of 35 dB(A) to 40 dB(A) at night. Again, the predicted noise levels, when adjusted for tonal components, would exceed these levels to a significant extent at the nearest residences and the impact would extend over a considerable number of residences in the Yarloop townsite.

This impact was acknowledged in the HSA report and in the letter from the proponent. The HSA report identifies some of the major noise sources contributing to this impact, which provides the starting point for a noise management plan. It is accepted that the time frame for implementation of such a plan would extend beyond the anticipated life of the current regulations, thus the proposed regulations should be used as the goal for noise reduction measures.

Accordingly it is recommended that a noise management plan be developed for the refinery, involving the following elements:

(i) Development of a program of noise control measures designed to reduce noise emissions to comply with the current draft of the proposed regulations. A copy of the plan, including detailed timelines for the completion of the measures specified in the plan, shall be forwarded to the DEP by 30 June 1995.

(ii) This plan should also address the related issue of noise from the Public Address system in the refinery, as identified in the HSA report.

(iii) Implementation of the program of engineering noise control measures and other appropriate measures to ensure compliance with the current draft regulations shall be completed before startup of the expanded refinery.

(iv) A report demonstrating compliance shall be forwarded to the DEP prior to startup, the report to contain details of proposed reference points (where noise is dominated by the refinery) for future noise monitoring purposes.

TRANSPORTATION

The purpose of addressing transportation noise is to identify the extent of areas adjacent to the main road and railway routes which may be affected by road/rail noise and whether the affected areas may increase as a result of the proposed expansion.

The assessment of transportation noise is based on the proponent's letter dated 10 February 1995 and a report by Herring Storer Acoustics (HSA) dated 13 February 1995. The five areas of study are:

• Rail traffic using the line within the refinery.
• Rail traffic using the line south of the refinery.
• Rail traffic into Bunbury port.
• Road traffic along South-Western Highway.
• Road traffic along Willowdale Road.

Rail Noise Criteria -

The criteria which the DEP would recommend for rail noise (as used by HSA) are:

• Maximum level, $L_{A_{max}} = 80$ dB(A)
• "Average" level, $L_{A_{eq,24h}} = 55$ dB(A)

The maximum acceptable levels are 5 dB(A) above these levels. These are based on the "Environmental Noise Control Manual" of the EPA of New South Wales, Page 163-1. In addition to the above, the DEP recommends a target level for planning purposes of 65 dB$L_{A_{max}}$.

Westrail is understood to be considering railway noise criteria to be incorporated into its Environment Management Manual but has not as yet published its noise standards or control policies. The current draft noise regulations do not cover railway noise.

Noise From Rail Traffic on Refinery Loop -

The baseline noise levels used in the HSA report are accepted as the basis for this assessment. They are taken from measurements conducted at 15 metres from a typical freight line, as follows:

• Maximum level, $L_{A_{max}} = 88$ dB(A)
• "Average" level, $L_{A_{eq,24h}} = 81$ dB(A)

The proponent's letter indicates that rail traffic on the refinery loop will increase from 5 to 7 trains per day as a result of the proposed expansion. The HSA report predicts noise levels at the nearest residence 400 metres to the south, resulting from 7 trains per day on the rail loop, to be as follows:

• Maximum level, $L_{A_{max}} = 66$ dB(A)
• "Average" level, $L_{A_{eq,24h}} = 39$ dB(A)

The method of calculating the reduction in noise level from the baseline levels at 15 metres back to 400 metres is not stated in the HSA report. The predicted level at 400 metres distance is accepted for the case of a northerly wind (blowing towards the residence) which acts to increase the $L_{A_{max}}$ level to a greater extent than the $L_{A_{eq,24h}}$ level.

The predicted level is well within the 80/55 dB(A) criteria for $L_{A_{max}}/L_{A_{eq,24h}}$, and is marginal in relation to the target level of 65 dB$L_{A_{max}}$ for planning purposes. The fact that the target planning criterion may be exceeded at distances of up to 400 metres needs to be recognised by local Councils in considering potential residential developments along the railway.

Noise From Rail Traffic Between Wagerup and Bunbury -

The HSA report assesses the impact of the proposed expansion in terms of the likely increase in noise levels at 15 metres from the railway. It concludes that the maximum level of 88 dB(A) will not change, while the "average" level will increase from 67.7 dB$L_{A_{eq,24h}}$ at the existing rate of flow of 34 trains per day to 68.0 dB$L_{A_{eq,24h}}$ at the predicted rate of 36 train movements per day, an increase of only 0.3 dB. The HSA report describes this increase as negligible.
There appears to be an error in the HSA report in relation to the number of train movements used in the predictions. The use of 7 train movements per day on the Wagerup loop is accepted, as each arrival/departure constitutes one movement. However, once on the Wagerup-Bunbury line, each train constitutes 2 movements, one going and the other returning. The numbers of movements on the Wagerup-Bunbury line should therefore be 34 existing movements, comprising 6 movements for alumina trains, 2 movements for caustic soda trains and 26 other movements. The maximum levels of predicted train movements would be 10 movements for alumina, 4 for caustic soda and 26 other movements, causing a total of 40 movements per day.

The predicted increase in $L_{A_{eq,24h}}$ noise level for the increase from 34 to 40 train movements is calculated to be 0.7 dB(A). While it is accepted that even this revised predicted increase in noise level is small, of greater interest is the extent of the area either side of the railway which is potentially affected by the noise. Using the HSA baseline data for train noise levels at 15 metres distance, the DEP has estimated the affected area, for the existing and proposed rail traffic, as follows:

<table>
<thead>
<tr>
<th>Distance From Track - Metres</th>
<th>Existing Traffic (34 trains/day)</th>
<th>Proposed Traffic (40 trains/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Level, $L_{A_{max}}$</td>
<td>$= 80$ dB(A)</td>
<td>38m</td>
</tr>
<tr>
<td>&quot;Average&quot; Level, $L_{A_{eq,24h}}$</td>
<td>$= 60$ dB(A)</td>
<td>57m</td>
</tr>
<tr>
<td>&quot;Average&quot; Level, $L_{A_{eq,24h}}$</td>
<td>$= 55$ dB(A)</td>
<td>135m</td>
</tr>
</tbody>
</table>

These estimates assume:

(i) The $L_{A_{max}}$ level reduces by 6 dB(A) for each doubling of distance from the track.

(ii) The $L_{A_{eq,24h}}$ level reduces by 4 dB(A) for each doubling of distance from the track.

The most critical result above is the $L_{A_{eq,24h}}$ criterion of 55 dB(A), which increases from 135m to 153m as a consequence of the proposed increase in rail traffic. The $L_{A_{eq,24h}}$ criterion of 60 dB(A) has been included above as an indication of the extent of area subject to unacceptable noise. The estimated distances of 57m and 64m for the existing and proposed traffic, respectively are less than the distances related to the $L_{A_{eq,24h}}$ criterion of 55 dB(A), but are still greater than the $L_{A_{max}}$ criterion. As noted above in relation to the Wagerup rail loop, the $L_{A_{max}}$ criterion of 65 dB(A) as a planning target may be exceeded at distances of up to 400 metres.

At this stage there are no data to indicate how many residences are included in the affected area, or how many additional residences are in the predicted 18m increase in the affected area. As a first step it must be recognised that, while rail transport has environmental advantages over road transport, noise being one of these, rail traffic does at present affect an area up to 135 metres wide on both sides of the railway between Wagerup and Bunbury, and this area will increase as traffic increases.

Secondly, consideration needs to be given as to who should take responsibility for amelioration of these impacts as far as is practicable. The traffic component originating from Alcoa's Wagerup refinery constitutes approximately 24% of the existing traffic and up to 30% of the proposed traffic on this line. As a major user, therefore, Alcoa could be regarded as having at least a part responsibility in this area. Westrail, however, as operator of the line must clearly carry the major responsibility for its noise impact. While Westrail is considering a series of policy measures in
relation to freight noise, at this stage there are no specific details in terms of either the noise level at which they would take effect or in terms of the measures themselves.

Thirdly, the affected areas identified above need to be used by local Councils as a planning measure to ensure new residences are not constructed in these areas without the incorporation of appropriate architectural solutions.

Taking the above considerations together, it is recommended that:

(i) Westrail and Alcoa conduct a joint study to:

- assess the numbers of residences or other noise-sensitive premises along the Wagerup-Bunbury line within the noise contours representing $L_{Aeq,24h}$ criteria of 55 dB(A) and 60 dB(A); and

- identify and cost options for noise control measures aimed at minimising noise levels at or inside these premises.

(ii) A report on the study shall be forwarded to the DEP prior to startup of the proposed expansion.

(iii) Westrail shall draw up planning guidelines for local Councils along the Wagerup-Bunbury line to minimise residential encroachment and to ensure that where noise-sensitive uses are proposed within the affected area, appropriate architectural solutions are incorporated.

**Rail Traffic Into Bunbury Port**

The HSA report conclusion that rail traffic into the Bunbury port will not result in a significant impact because there are no residences within 200 metres of the line is accepted in the light of the estimates made above. However, the train movements used by HSA again appear to be in error, as the 11 trains per day represent 22 movements in and out of the port. Recalculating the extent of the affected area as above, on obtains distances of 41 metres for the $L_{Aeq,24h}$ criterion of 60 dB(A) and 97 metres for the 55 dB(A) criterion, on both sides of the track.

When these results are coupled with the 400 metre distance to the 65 dB(LA,max) planning criterion, it is clear the railway noise is a factor which needs to be recognised by the City of Bunbury in considering proposals for future development on any of the properties which encroach within this area.

**Road Traffic Criteria**

The HSA report quotes the Main Roads Department policy for design of new roads as the relevant criteria. These are based on $L_{A10(18h)}$ values of 68 dB(A) or 63 dB(A) in cases where a significant increase in noise is predicted to occur. The DEP endorses these criteria as levels above which the MRD should take preventative action, with the following reservations:

(i) In the planning of new residential areas near roads, an $L_{A10(18h)}$ level of 56 dB(A) should be used, to represent a level at which no more than 10% of the population would be "highly annoyed" by the traffic noise.

(ii) Where the traffic stream includes a large number of heavy vehicles at night, the $L_{A10(18h)}$ is not an appropriate descriptor and suitable criteria need to be used to assess the likelihood of sleep disturbance.
In the present case, the assessment involves increases in traffic movements on existing roads, thus the assessment takes into consideration both the existing noise levels and the predicted increases. **An increase in the L$_{A_{10(18h)}}$ of 2 dB(A) is regarded as significant where the L$_{A_{10(18h)}}$ is already above 55 dB(A).**

**Traffic along South-Western Highway -**

The HSA report predicts an L$_{A_{10(18h)}}$ level of 69 dB(A) at 10 metres from the Highway, increasing to 69.3 dB(A) as a result of the expansion. The predicted increase of 0.3 dB(A) is not considered significant in itself. However, it should be recognised that the area affected by traffic noise (L$_{A_{10(18h)}}$ above 56 dB(A)) will increase from an estimated 150 metres to 160 metres on both sides of the road. **This needs to be recognised by the relevant local Councils in considering residential development proposals along the Highway.**

The most noticeable effect of the proposal will be the extending of the trucking times for lime from Kwinana, from 6.00 am - 2.15 am to 6.00 am - 3.45 am. The main areas where this will impact are in the towns of Pinjarra and Waroona. It is therefore recommended that the proponent evaluate alternatives that either maintain or reduce the present trucking hours.

**Traffic Along Willowdale Road -**

The traffic noise levels predicted in the HSA report are well within the L$_{A_{10(18h)}}$ criterion of 56 dB(A) for planning purposes when extrapolated to the nearest residences some 200 metres from the road. Since the vast majority of this traffic will pass during the day or at shift change times, the noise impact is considered insignificant.

John Macpherson  
Environmental Officer  
Pollution Prevention Division  
9 March 1995

Alcoa Wagerup 240295JMc