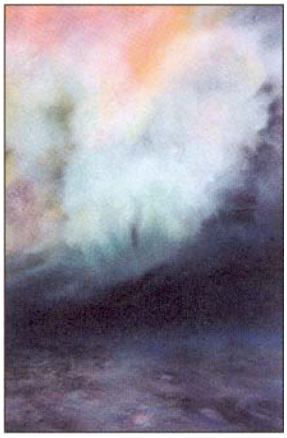

Katestone Environmental

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Health and Emissions Working Group
Wagerup 3 Refinery Expansion
PO Box 252
Applecross WA 6153

25th January 2005

Attention: Bradley Chenoweth, facilitator

Re: DESKTOP REVIEW OF THE CSIRO PHASE 1, 2 AND 3A REPORTS FOR ASSESSMENT OF THE ALCOA WAGERUP REFINERY EXPANSION

Dear Bradley,

Katestone Environmental has been commissioned by Alcoa to supply independent expert advice, in the form of a desktop review of project studies related to Alcoa's Wagerup 3 refinery expansion, in order to assist the Emissions and Health Working Group. The project reports to be included in this desktop review are:

- "Meteorological and Dispersion Modelling Using TAPM for Wagerup Phase 1: Meteorology" Prepared for Alcoa World Alumina Australia by CSIRO Atmospheric Research, November 2004. – Final report

- "Meteorological and Dispersion Modelling Using TAPM for Wagerup Phase 2: Dispersion" Prepared for Alcoa World Alumina Australia by CSIRO Atmospheric Research, November 2004. – Draft report

- "Meteorological and Dispersion Modelling Using TAPM for Wagerup Phase 3a: HRA (Health Risk Assessment) Concentration Modelling – Current Emissions Scenario" Prepared for Alcoa World Alumina Australia by CSIRO Atmospheric Research, 10 December 2004. – Draft final report

The desktop review is intended to assess the reports to determine if the information is adequate, whether the methodologies used are adequate in determining the impacts on air quality due to the refinery and whether the conclusions drawn from the work are appropriate. This review is not intended as an audit of the provided input information (eg. the completeness of the emissions inventory), an evaluation of the process or technology, or an assessment of the air quality impacts of the project; these tasks are for the governing environmental authorities. This review focuses on the modelling methodology and the conclusions drawn from it.

One issue that has made this review quite difficult is the lack of understanding of the importance of some of the model uncertainties on the overall outcomes of the study. The results presented in the Phase 3a report are simply a list of concentrations predicted at a range of receptor locations for a large set of pollutants. The results are not compared to any ambient air quality guidelines (we believe this is being done in a subsequent report) and the results of the health risk assessment (HRA) had not been finalised when this review was undertaken. We have tried to concentrate the review on what is important for a HRA. However, without knowing if the risk levels that have been predicted are well below acceptable levels or close to the recommended acceptable level, our task has been made more difficult. For this reason we have tended to be conservative and have identified any issues that we believe would be important if the predicted levels resulted in a risk close to the recommended level.

The situation at Wagerup is very complex and a large number of highly regarded experts in the field of atmospheric science have been involved in one way or another in trying to identify the cause of community complaints. To date the definitive answer as to the exact cause of the odour and health problems at Wagerup has not been determined.

The use of TAPM for assessing the air quality impacts of the proposed Wagerup Refinery expansion was agreed on by the study team and authorities as the most appropriate model to predict the impacts from the Wagerup Refinery Stack sources. This was to be tested in the initial two reports (Phase 1 – meteorology and Phase 2 - dispersion) and then used in the final Phase 3 report to determine the ground level concentrations of all pollutants for input into the HRA. TAPM is a complex model that not only predicts the dispersion of plumes but also generates it's own meteorological fields. It is very computationally intensive and therefore takes a long time to simulate the atmospheric processes for a one-year period. Ideally for an assessment where the annual contributions are important and it is know that there is significant inter-annual variability in the region, more than one year should be assessed. Due to the computationally intensive nature of TAPM this is rarely done.

It is commendable that CSIRO has tested the TAPM scheme against many data sets and that many other researchers and consultants throughout Australia and many other countries have used the model. The performance of TAPM is quite mixed it appears to be more useful than many comparable models. It has been recognised by the developers that there are circumstances in which the model over-predicts surface wind speeds and may have problems with dispersion in complex terrain. We point out that any model or measurement process has associated errors for which it is important to estimate the likely influence on the conclusion of a given study.

Our understanding of the focus of the study undertaken by CSIRO wasn't to determine if the model, in relative terms, adequately predicts the meteorology and dispersion compared to its performance elsewhere, but to determine if the model is suitable for assessing the meteorological conditions and dispersion mechanism that results in known complaints and high ground level concentrations in Wagerup area due to the Refinery emissions.

To achieve the latter, the study needs to show that the model biases (or errors) are clearly defined in terms of model capability (i.e. the model may not be able to simulate a feature such as the eddies generated when winds come over the escarpment) or poor performance (e.g. frequency of winds in a certain direction) and then review the predicted impacts of pollutants on the environment in light of these limitations.

Our major criticism with the work undertaken by CSIRO for this study is the failure of CSIRO to incorporate and account for their own recommendations and identified errors in the model for earlier stages of the work into the Phase 3 study. The main example of this is the under-prediction of winds in the critical light to moderate wind speed range and from the north. This should be proven to not impact on the outcomes of the dispersion modelling and subsequent health risk assessment inputs, which means not only maximum short-term concentrations but also long-term averages. The other significant example is the use of a different configuration for the final modelling (Phase 3) compared to the dispersion verification study (Phase 2). We believe that some of these issues are being addressed by CSIRO for the final report.

Generally to use of TAPM for modelling the Refinery plumes should be suitable, and is probably the best available model. Most of the issues raised in our review will help quantify the uncertainties and justify its use. We have asked for more information to be included in the final report for various stages of the work and that the main question of "is the model predicting the right answer for the right reason" be answered.

If you have any questions about the review please contact me directly.

Yours sincerely

Christine Killip

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