

## Appendix 2

Anvil Hill Coal Project

Independent Hearing and Assessment Panel

*Air Quality*

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## Appendix 2

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## INTRODUCTION

Under Section 75G(1)(a) of the Environmental Planning and Assessment Act 1979, the Minister for Planning has appointed an Independent Hearing and Assessment Panel (Panel) to provide impartial technical advice to the Department of Planning in regard to the Anvil Hill Coal Project.

The Terms of Reference require the panel to:

1. consider and advise on the:
  - a) following impacts of the project:
    - noise and blasting;
    - air quality, in particular dust impacts; and
    - flora and fauna, in particular vegetation offsets.
  - b) relevant issues raised in submissions in regard to these impacts; and
  - c) adequacy of the proponent's response to the issues raised in submissions; and
2. Identify and comment on any other significant issues raised in submissions or during the panel hearings.

I have been appointed to the Panel to review the air quality and greenhouse emissions estimation aspects of the project. The following report and my findings include consideration of relevant submissions, responses to submissions and the EA assessment. The EA Air Quality Assessment, prepared by a reputable air quality consultancy (Holmes Air Sciences), is a thorough, comprehensive and detailed study that follows an accepted methodology. I concur with most elements of the Air Quality Assessment, but I disagree with some of the assumptions used in the assessment and have reached some alternative conclusions, as explained in this review. I have also provided some additional recommendations, which are over and above those in the EA.

With respect to greenhouse gas emissions, the proponent's response to submissions provides a thorough estimate of direct and indirect emissions associated with the proposed mine.

## SUBMISSIONS

### Issues Raised in Hearing

The Panel heard a large number of submissions on air quality and greenhouse gas emissions. The main issues raised in submissions are listed below.

#### Government Agency Submissions

The main points of the Department of Environment and Conservation (DEC) submission were:

- Background PM<sub>10</sub> concentrations may be underestimated
- Use of a calibration factor to adjust predicted 24-hour average PM<sub>10</sub> concentrations may lead to underestimation of impact
- Background PM<sub>10</sub> should be included in 24-hour average PM<sub>10</sub> concentration predictions

### Interest Group and Community Submissions

The main issues raised were:

- Greenhouse gas emissions estimation
- The contribution to global warming of greenhouse gas emissions from the mine and from coal combustion
- Coal dust from open trains
- Use of climatic data from Jerrys Plains
- Diesel emissions
- Impact of dust on pasture for grazing animals
- Dust impact on vineyards
- Dust impacts on surface water
- Cumulative effects of dust from other mines
- Absence of assessment of ultrafine<sup>1</sup> dust particles (PM<sub>2.5</sub>), which represent the greatest health hazard
- Fence deterioration from acid gases and particles depositing and causing corrosion
- Serious respiratory ailments in foals and yearlings caused by dust
- Human health impacts such as asthma
- Effects of dust on drinking water quality from rainwater tanks
- Perceived inadequacies in the background monitoring
- SO<sub>2</sub>, NO<sub>x</sub> and CO emissions
- Odours
- Unreliability of model predictions of dust impacts, based on experience in Muswellbrook
- Extent of dust 'impact zone', particularly in areas downwind of mine in southeast winds
- Silica dust and associated health impacts
- Gases and fumes from blasting
- Increase in 'acid rains' which plague the area

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<sup>1</sup> Technically, 'ultrafine' refers to particles with an aerodynamic diameter of less than 0.1 µm.

- Dust from the coal handling plant and cumulative dust from other mines
- Visual range and dust.

### **Adequacy of Response to Submissions**

The proponent's responses to air quality issues raised in submissions are contained in 'Response to Submissions, Part B'. For the most part, the responses are adequate and well explained, and generally support the basis of the results presented in the EA Air Quality Assessment. There are some aspects, however, which are not accepted, and which have been identified specifically in this review. These include:

- Reliance on a 90% level of dust control for haul roads;
- Assumptions about the level of emissions from some other sources; and
- Estimation of atmospheric stability classes in the dispersion modelling.

These issues have been considered with respect to their effect on predicted dust impacts, which are addressed throughout this report.

Some of the issues raised in submissions highlight a potential shortcoming in the criteria and modelling techniques that are currently used in NSW, and in many other jurisdictions. One of the key areas is the inability of current methods to adequately deal with short-term dust events, of duration significantly less than 24 hours, occurring in association with dry windy conditions. Other submissions highlighted the perception that cumulative impacts of mining in the Hunter Valley are not adequately addressed by current methodologies. These are issues that cannot be adequately resolved specifically by the current assessment, as research is necessary to develop or find appropriate methods and criteria.

In relation to greenhouse gas emissions, the proponent submitted a revised inventory of estimated greenhouse gas emissions, which superseded the Energy and Greenhouse Assessment (Appendix 11 of the EA). This comprehensive inventory addresses criticisms of incompleteness, and is consistent with a ruling from the Land Environment Court Proceedings 40870 of 2006 (*Peter Gray v The Minister for Planning, Director-General of the Department of Planning and Centennial Hunter Pty Ltd*).

## **BASELINE CONDITIONS AND METEOROLOGY**

An important aspect of an air quality assessment is to identify baseline conditions, such as existing (background) dust levels, and to obtain representative meteorological data for the study area.

### **Background Air Quality**

The EA Air Quality Assessment incorporated the results of a baseline air quality monitoring program operated by the proponent, measuring dust deposition at 20 sites and the concentration of PM<sub>10</sub> at 2 sites. TSP was also measured at one of the PM<sub>10</sub> monitoring sites. Given that dust is the main air quality issue associated with the direct operation of the mine, the monitoring program is adequate to characterise existing air quality according to the criteria set out by the DEC.

The DEC submitted that the calculation of background PM<sub>10</sub> used in the modelling of annual average PM<sub>10</sub> underestimated the annual average concentration by about 2 µg/m<sup>3</sup>. In 'Response to Submissions Part B', the proponent explains the various issues associated with quantifying background PM<sub>10</sub> and it is accepted that the selected value in the EA is a reasonable estimate. However, it should be considered in relation to the broader issue of model uncertainty, which means that all model predictions are subject to some error and are therefore not precise. This has implications for the assessment of model predictions and the general approach that ought to be adopted by Centennial in the acquisition of private properties around Anvil Hill.

## Meteorology

Meteorological data was used in the modelling in two ways: to provide the necessary information on wind and turbulence in the lower atmosphere to estimate the dispersion of dust from the mine, and to calculate dust emissions that are dependent on wind speed and/or rainfall. Centennial established two weather stations near Anvil Hill, at Wybong Road and Coolabah Road. Data from the Wybong Road site were used to develop an hourly meteorological file for the model year. This is appropriate, given that the selected dispersion model, ISC3, can use data from only one weather station. The quality of the directly measured data (wind direction, wind speed, temperature, rainfall, sigma theta) is considered to be acceptable.

Rainfall data from Jerrys Plains was used for emissions estimation, and the Proponent has explained why this is an adequate approach. The approach taken is common for air quality assessments where local data are not available.

To test the assumption implicit in the EA that the Wybong Road weather station data provided an adequate basis for predicting dust dispersion around the proposed mine, I ran a meteorological model (TAPM) for the area, taking into account terrain effects, and utilising a fine grid resolution of terrain data. The model was only run for two months (January and July), so the results are merely indicative. Because it utilised data from the Wybong Road site amongst its complex calculations, it is well calibrated to the local conditions.

The results suggest that the influence of terrain leads to a consistent steering of winds in the region to the northwest of the mine, so that flow in that area is predominantly more directly southeasterly than at Wybong Road, where the dominant direction is from the east-southeast. Apart from this effect of the terrain, which would have only minor effects on model predictions, TAPM indicated no significant complexities in the local winds that might significantly affect the model predictions.

## Air Quality Assessment Criteria

Table 1 below summarises the air quality assessment criteria relevant to the particulate matter concentrations.

Pollutant	Standard/Goal	Averaging Period	Agency
Total suspended particulate matter (TSP)	90 µg/m <sup>3</sup>	Annual mean	NHMRC
Particulate matter <10 µm (PM <sub>10</sub> )	50 µg/m <sup>3</sup>	24-hour maximum	DEC
	30 µg/m <sup>3</sup>	Annual mean	DEC
	50 µg/m <sup>3</sup>	(24-hour average, 5 exceedances permitted per year)	NEPC

**Table 1: Air quality assessment criteria for particulate matter concentrations**

Table 2 below sets out the criteria for dust deposition.

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m <sup>2</sup> /month	4 g/m <sup>2</sup> /month

**Table 2: NSW DEC criteria for dust fallout (insoluble solids)**

The criteria that are used to assess the impacts of dust emissions from the mine are consistent with the normal requirements of the DEC and in line with other assessments in NSW. However, the criteria may not adequately delineate the impact zone arising from the effect of intermittent short-term episodes of dust, occurring over periods of some hours or days, which are associated mainly with dry windy conditions. This issue is not unique to

the Anvil Hill proposal and simply reflects an inability of current techniques and regulatory assessment criteria to deal with this difficult issue, which probably accounts in part for perceptions among some in the community that dust impacts are often not fully accounted for by impact assessments and monitoring programs.

A further issue arising from the DEC submission on the EA Air Quality Assessment is the treatment of short-term (24-hour) PM<sub>10</sub> concentrations. In the EA, background PM<sub>10</sub> is not added to the predicted Anvil Hill mine contribution. The EA notes that this procedure has been accepted by DEC for other recent mine proposals. DEC's submission to the Panel highlights the non-inclusion of background PM<sub>10</sub>, and this seems to differ from the claim in the EA regarding other recent mining projects. However, the Response to Submissions Part B as well as the EA Air Quality Assessment (section 3) provide a reasonable justification for the methodology adopted in the EA.

The 50 µg/m<sup>3</sup> criterion for 24-hour PM<sub>10</sub> is not particularly well suited to the assessment of extractive industries' dust emissions, owing to the particle characteristics of these activities relative to urban particle pollution, for which the criterion was actually developed. Therefore, I consider that although the important amenity or nuisance aspect of mine dust may not be fully accounted for by the currently accepted criteria, there is no robust alternative set of criteria or methodologies readily available to enable a more focused assessment on short-term nuisance potential.

With respect to health concerns about mine dust, it is important to note that much of the PM<sub>10</sub> generated by mining activities is in the upper part of the size range, i.e., greater than the fraction below about 2 µm, which contains the finer particles more likely to penetrate deep into the lungs and lead to potential health effects. The Response to Submissions Part B satisfactorily indicates why the impact of PM<sub>2.5</sub> emissions was not assessed, and also presents model results showing that the extent of the impact zone influenced by PM<sub>2.5</sub> is significantly smaller than that caused by PM<sub>10</sub> and TSP.

## MODELLING

### Model Selection and Calibration Factor

The Proponent's air quality consultant, Holmes Air Sciences selected the Industrial Source Complex Short-Term Model version 3 (ISC3) to model plume dispersion. ISC3 has wide application in Australia for mining dust assessments, being both relatively simple in formulation and having the capability to address pit retention, i.e., dust that settles in the pit rather than escaping from the pit and being dispersed more widely.

I note one aspect of ISC3 that is not consistent with AUSPLUME (the regulatory Australian model), that being the magnitude of the dispersion coefficients that describe the effect of atmospheric turbulence on diffusing or spreading the plume as it moves downwind of the source. The ISC3 diffusion parameters result in a narrower plume than would be predicted by AUSPLUME. This may result in overprediction of short-term impacts in locations directly downwind of the source, and underprediction in locations some distance laterally from the centreline of the plume. Appendix C of the EA details how the models differ.

DEC expressed concern in its submission to the Panel that a correction factor used by the Proponent in the prediction of 24-hour PM<sub>10</sub> concentrations may have led to the underestimation of 24-hour average PM<sub>10</sub> concentrations. The correction factor was developed in order to improve predicted dust levels, correcting for the anomalies in the dispersion coefficients noted above.

Holmes Air Sciences conducted a separate study that compared modelled and measured dust levels at Bengalla mine near Muswellbrook, leading to the adoption of a correction factor of 1.6 for 24-hour average PM<sub>10</sub> concentration predictions for the Anvil Hill air quality assessment. Subsequently, the Proponent's Response to Submissions (Part B, Section 4) showed that a modified version of ISC3 (ISCMOD), which used the same diffusion parameters as AUSPLUME, yielded very similar predictions without the need for a correction factor.



Accordingly, information supplied to the Panel strongly suggests that the application of a correction factor of 1.6 to the ISC3 results for 24-hour PM<sub>10</sub> concentrations was justified and resulted in a better basis for prediction than using ISC3 results uncorrected.

## **Meteorology**

In line with normal practice, a meteorological file containing relevant data for every hour of a one-year period was developed for the dispersion modelling. The file contained directly measured parameters (wind direction, wind speed, temperature) and parameters derived from calculations, i.e., mixing height and stability.

Mixing height estimation provides reasonable estimates, although I note that the combination of methods used for day and night introduces some irregularities in predicted mixing height behaviour, especially at night. However, these will not have affected significantly the model predictions of dust impact.

Stability class estimation has been based on the sigma theta method, which is identified in the DEC Approved Methods as the least preferred of three methods for stability estimation. The choice of method was dictated by the nature of the data measured by the weather station. Review of the meteorological file indicates that it has been developed in line with DEC recommendations, but – a consequence of the guidance being imperfect – moderate to highly unstable conditions occur sometimes at inappropriate times of day throughout the year, such as shortly after sunrise and shortly before sunset. This is inconsistent with the preferred Turner method of stability class estimation used by the USEPA. The overprediction of unstable conditions is matched by an apparent underprediction of stable classes. This anomaly will have contributed to a slight (unquantified) underprediction of dust impacts. This is an issue that has been incorporated into a re-evaluation of the predicted mine impacts in section 0.

## **Emission estimates**

The emissions data used in the dispersion model were estimated using emission factors published in either the National Pollutant Inventory (NPI) Emissions Estimation Techniques (EET) Manual for Mining (NPI, 2001) or the report of the National Energy Research and Demonstration Council Project 921 (NERDCC 1988), which measured emissions from some Hunter Valley mining activities. Both of these sources are acceptable, although it is noted that in the case of some emissions sources, the use of the NERDCC data resulted in lower estimated emissions that would have been derived from the NPI EET Manual.

Emission factors utilise relationships between various operational and environmental parameters (e.g., vehicle activity, wind speed, rainfall, particle size distributions) on the one hand, and emission rates on the other. Hence, estimated rates of mining activity are one of the inputs to estimating emissions. Operational data used to calculate particulate emissions (presented as ‘intensity’ in the Tables of Appendix B of the Air Quality Assessment) have not been confirmed separately, but appear to be reasonable.

The emission rates estimated for some sources are based on emission factors that yield lower estimates than those obtained from the NPI Manual. These sources are topsoil stripping, loading material, dumping overburden, unloading ROM coal, loading coal to stockpiles, and loading coal to trains. The resulting potential for underestimation of total emissions is not large, but is significant and considered in light of other aspects of the modelling in section 0.

A more significant issue in relation to the emissions estimates is the treatment of haul road emissions. The EA assumes a 90% control efficiency on haul roads. This assumption does not provide the basis for a conservative assessment and is unlikely to be achievable on a consistent basis. It is noted that some submissions to the Hearing provided compelling evidence that other existing mining operations do not always comply with strict conditions to control haul road dust. Operational conditions almost inevitably include situations where, for whatever reason, proposed or required levels of dust control are not always achieved.

To consistently achieve 90% control efficiency on haul road dust emissions, the proponent has indicated that a combination of frequent watering and chemical suppressants might be applied. In theory this is reasonable, but in

practice such high performance may not be consistently achievable. Success will depend on the application of techniques that have not been identified in detail. The implication of this issue is addressed in section 0. The emission rates of TSP are reported in the Air Quality Assessment but PM<sub>10</sub> emissions are not reported. Section 6 of the air quality assessment report lists a distribution of particles as:

- PM<sub>2.5</sub> is 4.68% of the TSP; and
- PM<sub>2.5-10</sub> is 34.4% of TSP.

This indicates that about 39% of total TSP is PM<sub>10</sub>. While this ratio is broadly consistent with expectations for the mining operation as a whole, it appears to have been applied across all sources whereas ideally, as indicated in the NPI Manual, different particle size distributions should be applied to different sources. For example, dozers on topsoil have a PM<sub>10</sub>:TSP ratio of 24%, whilst drilling has a ratio of 52% and wind erosion 50%. However, in light of the broader issue of model uncertainty, this simplifying approach is unlikely to have introduced significant errors into the calculations.

Another technical issue associated with the modelling of particle deposition was the technique described in section 6 of the EA Air Quality Assessment, involving a simplified approach based on using three source groups corresponding to different particle size categories. I tested this approach against a more standard approach of dealing with particle size categories and found that there were no significant errors or differences except in the close proximity to emission sources. These differences had no significant impact on the results in the areas around the mine lease area.

## RESULTS AND ASSESSMENT

The EA Air Quality Assessment shows the predicted maximum 24-hour PM<sub>10</sub>, annual average PM<sub>10</sub>, annual average TSP and annual average dust deposition. For the annual average results, the enhanced (bold) contours presented in the Air Quality Assessment Figures 12 to 16 indicate the level at which the predicted contribution from the mine and the existing background combine to equal the relevant DEC criterion. However, in the case of maximum 24-hour PM<sub>10</sub> the bold contour represents the 50 µg/m<sup>3</sup> contour attributable only to the mine emissions. The reasoning for this has been explained by the Proponent and is accepted as being reasonable in the case of assessing impacts of predominantly crustal dust emissions (rather than predominantly combustion-generated fine particles). Other recent mine assessments have used this approach.

However, my review of the modelling approach for the Anvil Hill proposal has revealed a number of specific issues that might lead to underprediction of the dust impacts. The most potentially significant of these are:

- The non-conservative approach to haul road dust control efficiency;
- Possible underestimation of emissions from topsoil stripping, loading material, dumping overburden, unloading ROM coal, loading coal to stockpiles, and loading coal to trains; and
- Overestimation of unstable dispersion conditions, and associated potential for underestimation of predicted dust impacts.

When considered in detail, these sources of potential underestimation are not individually large, but in combination are considered to be significant enough to not accept the assessment of the mine impacts as presented in the EA. Instead, I consider it more appropriate to rely on the modelling scenarios that are based on an assumed 75% efficiency of haul road dust control. Accordingly, the model results based on 75% control were supplied by Homes Air Sciences to enable an alternative assessment.

The assumption of 75% efficiency is probably pessimistic given the undertakings that have been made by the proponent with respect to dust control. It is reasonable to expect that actual performance will lie between 75% and 90%. However, by basing the assessment on the 75% control scenario, I consider that an adequate margin then exists to compensate for the other potential sources of underestimation indicated above.

Accordingly, the results generated by Holmes Air Sciences for the 75% haul road control scenario are presented below in Figure 1. Comparing this set of results to those presented in the EA Air Quality Assessment, a number of

additional residences appear in the impact zone at some time in the life of the mine. They are identified in Table 3.

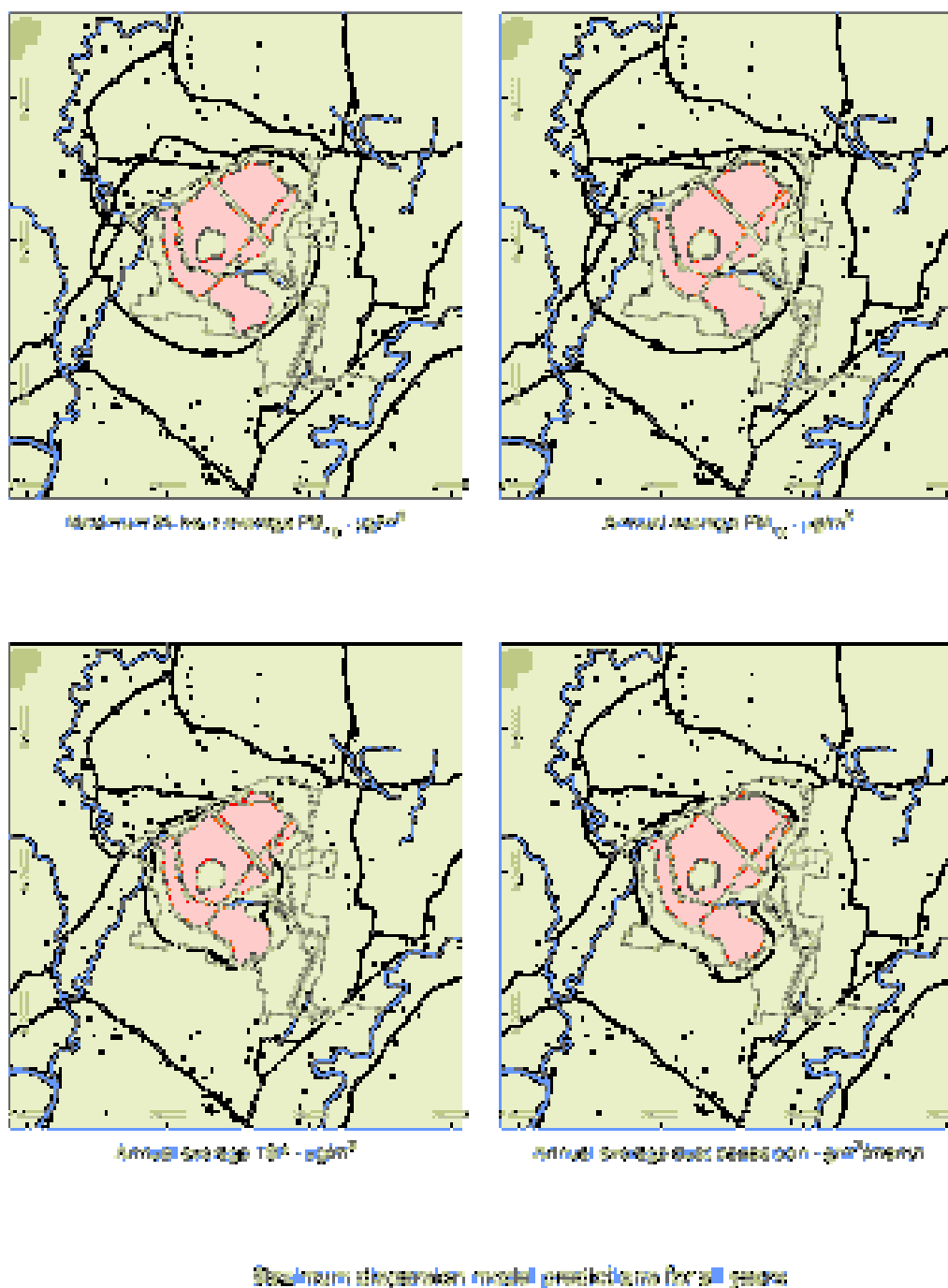


Figure 1: Model results based on 75% efficiency of haul road dust control (Source: Holmes Air Sciences)

Property No.	24-hour Maximum PM <sub>10</sub>	Annual average PM <sub>10</sub>	Annual average TSP	Annual average dust deposition
57	√	√		
28	√	√		
33D	√	√		
51	√	√		
33K	√			
72	√	√		
80	√			
92	√	√		
44	√	√		
33A	√			
33B	√			
90	√			
33C	√			
33J	√	√		
2			√	
83				√
84				√
60		√		
49		√		
33G		√		

**Table 3: Properties potentially affected by mine dust and not identified in the EA Air Quality Assessment**

It is noted that in its submission, the DEC identified additional properties, not identified above, which might be adversely affected by dust. However, the DEC's assessment applied a somewhat different process, including neglect of the model calibration factor and addition of background to 24-hour average PM<sub>10</sub>. Those issues have been addressed in this review and I do not believe they should be handled in that way, based on the evidence provided to the Panel.

It is a fact that all air quality modelling contains inherent uncertainties, and it is also true that the available criteria do not fully address all aspects of dust impacts, particularly in relation to the nuisance potential from deposition. Therefore, it may well eventuate that, over time, either more or fewer properties than have been identified will be adversely affected by dust. Therefore, effective ongoing monitoring, dust management and community consultation will be an essential requirement for the mine, given the unprecedented number of residences potentially affected. Any excursions of significant dust impacts beyond the identified impact zone would be of serious concern, given the numbers of properties involved.

The primary issue with the predicted dust impacts is the potential for nuisance, associated with excessive dust deposition, which tends to be concentrated over time into discrete events. Residents may also be annoyed by the visual impacts of elevated dust levels from the mine (and other sources) at times. As indicated in section 0, the criteria currently in use for particulate matter assessment do not fully account for such effects.

The health implications associated with mine dust, although real, are limited by virtue of the fact that the bulk of mine-generated dust particulate matter is not small enough to lodge deep in the lungs. Therefore, predicted exceedances of the 50 µg/m<sup>3</sup> criterion do not necessarily point to the potential for major health effects. It is noted that in some States the maximum 24-hour PM<sub>10</sub> concentration goal to be applied in such cases is 150 µg/m<sup>3</sup>. The

case of PM<sub>10</sub> dominated by mechanically generated earth dust deserves somewhat different consideration from the assessment of fine particles generated by combustion sources, which are predominantly much smaller than 2.5 µm and are most directly responsible for adverse health effects associated with particulate matter.

## DUST MONITORING AND MITIGATION

### Construction

Construction activities associated with the mine development will involve the development of infrastructure such as the mine access road, CHPP, mine facilities area, coal handling and train loading infrastructure and the rail spur and loop. The EA proposes dust management measures that include the use of water carts, the defining of trafficked areas, the imposition of site vehicle speed limits and constraints on work under extremely unfavourable weather conditions.

These proposed measures in principle would be adequate. A real-time dust monitoring system, with the ability to alert key site personnel when dust levels exceed pre-defined management thresholds, would be a preferred feature of the dust management system during construction, and would also serve the same function once the mine became operational, if approved. Such a system would provide a means for immediate response to any developing dust problems.

### Mine Operation

The EA Air Quality Assessment identifies proposed measures for controlling both wind-blown dust and dust generated by mining. These measures are identified in Tables 13 and 14 of the Air Quality Assessment. Such measures are standard practice for mines in NSW, and are considered to be appropriate. It is important that should the mine proceed, these measures are in place and fully effective at all times.

The EA proposes a monitoring program that would include one weather station, two high volume PM<sub>10</sub> monitors and dust deposition gauges at the existing locations. It also suggests the inclusion of a real-time dust monitoring and management system to minimise dust-generating activities at times of adverse weather conditions. I consider the real-time system to be an essential feature of the monitoring and management program.

## GREENHOUSE GAS EMISSIONS

The EA Energy and Greenhouse Assessment (Appendix 11), is a relatively simple document that addresses only direct and indirect emissions associated with the mine. These emissions are referred to by the World Business Council for Sustainable Development and the Resources Institute *Greenhouse Gas Protocol 2004* as 'scope 1' and 'scope 2' emissions. Scope 1 emissions are those associated with the combustion of fuels and industrial processes within the boundary of the mining operation. Scope 2 emissions are associated with the mining operation's consumption of purchased electricity produced by another organisation.

The Assessment does not include 'scope 3' emissions, which include other indirect emissions as a result of the mining operation's activities that are not from sources owned or controlled by the organisation (e.g. end use of the coal).

The Panel heard a large number of submissions expressing concern about the greenhouse gas emissions from the mine, including the scope 3 emissions. The Land and Environment Court recently ruled that these emissions should be reported.

Accordingly, Part A of the response to submissions included a detailed accounting of Scope 1, 2 and 3 greenhouse gas emissions. Review of this document reveals that it is by and large a detailed and well presented

account of the total emissions expected from the mine and its product end use, fulfilling the requirements of the Court ruling. I concur with the general findings of the revised assessment.

## **CONCLUSION AND RECOMMENDATIONS**

### **Conclusion**

The Air Quality Assessment and relevant aspects of the proponent's responses to submissions provide a thorough, detailed account of the expected impacts of dust emissions from the proposed Anvil Hill mine. Overall, the assessment is based on accepted methodologies, in line with current practice in NSW.

The review has found that the impact of dust is likely to be somewhat greater than predicted in the Air Quality Assessment, and some additional properties have been identified as being potentially within the dust impact zone, mainly because of the influence of 24-hour PM<sub>10</sub> predictions. Of those additional properties, one is not on the current (January 2007) list of properties either owned by Centennial or under negotiation. Most/All of these additional properties are contained within the noise impact zone.

It is matter of concern that such a large number of residences are expected to be adversely affected by dust from the proposed mine. Centennial should be aware that the property acquisition program may need to be expanded further if actual mine performance does not meet the levels expected.

### **Recommendations**

- It is recommended that the Wybong Road weather station be continued in operation at its present location, that PM<sub>10</sub> monitoring continue at the current two monitoring locations, as a minimum, and that dust deposition monitoring continue at the current locations.
- It is recommended that, should the mine proceed, a real-time dust monitoring and dust management system be implemented to provide the basis for reduction of dust generating activities during adverse weather conditions.
- It is recommended that an effective complaints management system and community consultation program be established, including the provision of monitoring data to the community via the Internet.
- It is recommended that after 12 months' operation of the mine, a dust model validation study be conducted. Should the validated model predict that properties other than those identified in the Air Quality Assessment and in this review will be adversely affected by mine dust, then the program of property acquisitions should be amended accordingly.

### **Wider issues and concerns**

This review of air quality impacts and management associated with the Anvil Hill mine raised some issues that extend beyond the scope of this specific project, namely:

- the inability of the methods and criteria currently applied in NSW to adequately deal with a) the prediction and assessment of nuisance effects associated with dust deposition events that occur over short periods (less than 24 hours) and b) visual amenity caused by increased regional and local levels of suspended particulate matter. It is recommended that the Department in liaison with the DEC investigate the feasibility of introducing improved methods and criteria to address these issues, which are significant to communities near large extractive industries. Note that dust deposition criteria currently in use have linkage to community survey work conducted in the Hunter Valley in the 1980s, and more recent monitoring data might be of use in a similar, updated study; and
- given the apparent differences between the DEC's submission and the position of Holmes Air Sciences on the matter of how 24-hour PM<sub>10</sub> impacts ought to be evaluated (i.e., with or without background?), it is recommended that the Department, in liaison with the DEC, work towards clarifying the preferred methodology and criteria for predicting and assessing PM<sub>10</sub>.