Pacific Air & Environment

DUST ASSESSMENT REVIEW

PROPOSED ASHTON COAL MINE, CAMBERWELL
Final Report

Prepared for:

PlanningNSW

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1. INTRODUCTION

PlanningNSW has engaged Pacific Air & Environment to review air quality aspects of the proposed Ashton Coal Project to be operated by White Mining limited. The proposed mine will be situated near Camberwell Village in the Upper Hunter Valley. This report contains the review findings.

The review is centred primarily on the EIS for the project prepared by HLA-Envirosciences dated November 2001. Pacific Air & Environment has reviewed the detailed technical report on air quality by Holmes Air Sciences (HAS), appearing as Appendix F of the original EIS report. The response document prepared by HAS (dated February 2002) on air quality issues raised by the EPA is also reviewed.

This review incorporates reference to submissions on the EIS by government agencies, residents and other parties; reports and EIS documents relating to studies on coal mines and air quality in the Hunter region; and other documents relevant to assessing the impacts of the proposal.

This review process also involved a site visit to Camberwell and an on site meeting with representatives of White Mining on April 18 2002.

2. REVIEW

2.1 Overall approach of the HAS report

The air quality assessment carried out by Holmes Air Sciences (HAS) has a primary emphasis on dust, which is widely regarded as the primary air quality issue associated with the Ashton Coal Project proposal. Reference is also made to the impacts of emissions from mine machinery and vehicles and from spontaneous combustion of coal. Emissions of greenhouse gases are also discussed.

Dust is the primary area of concern and accordingly it is the main focus of the HAS report and therefore of this review. The HAS report's approach in quantifying dust impacts is based on the quantification of impacts through dispersion modelling, and the comparison of the predicted impacts with relevant guidelines. A brief assessment has also been performed to predict the impacts of exhaust emissions from mine machinery and equipment, and a brief assessment of the potential greenhouse gas emissions from the project has also been made. This broad approach is typical of EIS assessments for proposed coal mines and indeed other projects. It reflects the requirements of determining authorities and general scientific practices.

The dust modelling and assessment procedure is based on several key components, which are examined in this review:

- the dispersion model, which essentially is a set of mathematical equations that predicts ground level concentrations or deposition rates based on various input data;
- the estimates of emissions from relevant sources used as an input to the dispersion model;
- the hourly meteorological conditions (for the course of a year) that provides the mathematical model with essential information for plume dispersion processes;
- the model output in the form of predicted ground level concentrations and deposition rates for selected averaging periods at selected receptor locations; and
- comparison of predicted dust concentration and deposition levels against relevant criteria or guidelines.

Scientific uncertainty is inherent throughout the assessment process, which needs to be addressed for a full appreciation of the quality of the assessment. Uncertainty is associated with all of the various elements of the assessment procedure: estimates of emissions, characterisation of meteorological influences on plume dispersion, mathematical treatment of the dispersion and deposition processes in the dispersion model, and relation between impact indicators and actual impacts. Therefore, the results of the air quality assessment cannot be considered as precise, and are better regarded as indicative.

2.2 Review of the dispersion model methodology

The EIS predictions of air quality rely on the ISC3ST model, which is a USEPA regulatory model. ISC3ST is a Gaussian plume model, which deals with the complex processes affecting ground level impacts in a very simplified manner. However, it is a widely used and generally acceptable model for many applications. ISC3ST is able to deal with particle deposition and time-varying emissions, and is widely used for modelling of dust emissions from open cut coal mines in Australia. AUSPLUME is another widely used steady-state Gaussian plume model.

According to the US EPA, ISC3ST is appropriate for the following applications:

- Industrial source complexes;
- Rural or urban areas;
- Flat or rolling terrain;
- Transport distances less than 50 kilometers;
- 1-hour to annual averaging times; and
- Continuous toxic air emissions.

The ISCST3 model is a US-EPA recommended dispersion model (Appendix A of the *Guideline on Air Quality Models*, US EPA, 2001a).

Gaussian plume models are based on a variety of assumptions and simplifications, one of the most important of which is the assumption of steady-state meteorology. The steady-state assumption states that the meteorological factors that determine plume dispersion act in a constant manner during each hour for which data is provided. Thus, once emitted, the plume is assumed to travel in a straight line at the same speed to the edge of the modelled domain until meteorological conditions change in the next hour. Changes in hourly average meteorological data are enacted instantaneously on the plume, allowing no interval of time for the plume to incrementally change speed, direction or distribution.

Assumptions inherent in steady state Gaussian plume dispersion models such as ISC3ST and AUSPLUME are not always valid, especially near a coastline or in complex hilly terrain, where plume dispersion influences are often more complex. Key assumptions of steady-state models may be summarized as follows:

- Meteorological parameters remain constant for the period of one hour.
- Meteorological parameters remain fixed over the entire modelling domain, which often includes all regions within 10-20 km of the source. This is particularly questionable near coastlines and complex terrain, where wind directions may vary significantly.
- Most meteorological parameters either remain fixed with height above the ground (including wind direction and hence wind sheer is ignored) or are assumed to vary according to generic formulae, which are seldom, if ever, validated for the site.
- The height of the mixing layer remains constant for the entire region. This is questionable in the vicinity of a coastline where the mixing height often varies considerably as a function of distance from the coast, or in complex, hilly terrain.

In reality a plume segment will move in varying directions and at varying speeds and will be dispersed at different rates as it moves away from the source. This behaviour is due to spatial variations in wind speed and direction, as well as other meteorological parameters, in response to factors such as heat fluxes, the underlying terrain and changing pressure gradients. Thus, significant deviations from the steady state assumption can result in uncertainties in the ground level concentrations of plume material.

In situations where non-steady state meteorological conditions are important (e.g. significant impacts occurring when the wind field varies over the area of interest), steady- state models are not adequate and more realistic three-dimensional models such as CALPUFF ought to be used. CALPUFF is a multi-layer, multi-species non-steady state puff dispersion model that can simulate the effects of time and space-varying meteorological conditions on pollutant transport, transformation and removal. A non-steady-state model is one in which the temporally and spatially variable atmospheric conditions are incorporated into the model. This gives a more realistic simulation of reality than the older, steady-state models such as ISC3ST and AUSPLUME.

The CALPUFF model contains algorithms for near-source effects such as building downwash, partial plume penetration, sub-grid scale interactions as well as longer-range effects such as pollutant removal, chemical transformation, vertical wind shear and coastal interaction effects. The model employs dispersion equations based on a Gaussian distribution of pollutants across the puff and takes into account the complex arrangement of emissions from point, area, volume and line sources.

As with any mathematical environmental model, CALPUFF represents a simplification of the many complex processes involved in determining the outcome, in this case ground level concentrations of pollutants. However, this model represents a major advance in modelling from the simple, steady state models such as ISC3ST.

The complex hilly nature of the terrain around the Ashton mine, and the location of Camberwell Village in a valley in relation to the proposed Ashton mine is such that ISC3ST might not be the best choice of model for assessing dust impacts. A more complex, three dimensional non-steady state model such as CALPUFF might result in different dust modelling results and therefore a different assessment of dust impacts.

Gaussian steady-state type models such as ISC3ST are likely to under-predict maximum impacts at receptors close to the emitting source (generally within 1000 m or so of the source), but generally tend to over-predict impacts at receptors further than 1000 m from the source. This is an inherent feature of the steady-state assumption employed in ISC3ST. It is difficult to assess the extent to which the relatively complex terrain surrounding the Ashton mine will bias dust predictions with ISC3ST.

While the ISC3ST model might not be the most sophisticated of the available models, the choice of model does not represent the largest source of uncertainty in the dust modelling. Far more uncertainty arises from the estimates of dust emission rates, from the quality of site-specific meteorological data, and the quality of terrain information. The largest individual source of uncertainty is likely to be the estimate of dust emission rates from sources.

Cumulative impact prediction has been included in the EIS and involves the inclusion of other mine emissions in the Hunter Valley region. Estimated emissions from Camberwell, Narama, Rix's Creek and the proposed Glendell mines are included in the cumulative impact modelling. These mines are separated by distances of up to 20 km and the steady-state assumption may not be adequate as a basis for modelling, at least to capture all significant impacts. The time and distance scales involved may lead to some situations where the locations or magnitudes of predicted impacts would be different from those obtained with a more sophisticated three-dimensional model. However, it is not considered to be necessary to use other models in the circumstances, as maximum impacts at any specific location are generally dominated by a nearby source, and the more distant sources have a relatively small influence.

2.3 *Air quality guidelines*

The EIS refers to health-based and amenity-based criteria for air quality and dust fallout (deposition), with criteria for TSP, PM_{10} and dust deposition rate. An attempt is made in the EIS to predict the short-term (24 hour) effects PM_{10} emissions from the mine. The EIS makes it clear that short term predictions of this nature are by their nature uncertain, and therefore the EIS uses meteorological data for two extremely windy days – "unfavourable conditions", as stated in the EIS. The EIS was not completely clear in its interpretation and understanding of the appropriate NSW EPA criteria discussed in *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (NSW EPA 2001)*. This was addressed in the response document by HAS (February 2002) to the EPA request for further information.

The use of PM_{10} (particles less than 10 microns in aerodynamic diameter) as an indicator of air quality has become important because of the health implications of exposure to fine particle pollution. This is especially the case in urban areas, where the predominance of vehicle emissions results in a high proportion of total particle emissions in the PM_{10} range. The finer part of the PM_{10} range, e.g. $PM_{2.5}$, is increasingly becoming the focus of health-related assessments, as it becomes clearer that these smaller particles are the dominant concern with respect to health. These fine particles can be inhaled and lodge in the lungs.

Around coal mines, the importance of potential health effects resulting from exposure to fine particles cannot be ignored, and it is appropriate to refer to PM_{10} levels as an indicator of impact. However, owing to the nature of the dust sources in coal mining, the proportion of PM_{10} to total dust emissions is not normally large and the predictions will tend to show relatively low impacts of PM_{10}. The EIS correctly highlights the recent increasing legislative attention paid to $PM_{2.5}$, but validly makes the point that coal mining operations tend to emit coarser rather than finer particles. Therefore $PM_{2.5}$ is expected to be a minor but not insignificant contributor to the total suspended particle (TSP) size distribution.

The more obvious and annoying aspect of dust from mining is its impact on amenity. The better indicators of amenity are TSP and dust deposition rate. However, annual average values of these indicators – as used in the EIS in line with EPA criteria - are not necessarily an accurate guide to the potential for annoyance and associated long-term stress in a community, as in many cases the exposure to elevated dust levels is highly episodic.

The EPA recommends maximum acceptable increases in annual average dust deposition based on existing levels and on the premise that a level of 4 $g/m^2/month$ is an acceptable upper limit for residential amenity.

It is, however, insufficient to rely solely on this general annual guideline as an indicator of the likelihood of acceptable or unacceptable levels of impact. The issue of episodic impacts has been raised in response to impact assessments of coal mines, and it is considered to be a relevant and important aspect of understanding the true impact of mining operations. Research in the Hunter Valley some years ago (Jakeman & Simpson, 1987) showed that even where measured dust deposition levels were below the EPA's acceptable level of 4 $g/m^2/month$, at least 40-60% of residents reported high levels of annoyance and frequently noticed dust.

In a recent review of dust deposition and nuisance in the UK, Vallack & Shillito (1998) noted that the distinction between monthly and annual mean values of dust deposition is important, because fugitive dust emissions (such as occur from coal mines) are often episodic in nature. For a given site, peaks in the monthly mean are usually much higher than the annual mean. In Australia, Williamson *et al.* (1978) proposed a monthly limit of 130 $mg/m^2/day$ (approximately 4 $g/m^2/month$) to be used as an acceptable upper limit for satisfactory residential conditions in cities. This implies a significantly lower acceptable limit for the annual mean deposition rate if there is significant month-to-month variation.

Vallack & Shillito (1998) report that complaints of dust nuisance can arise in individual months having average dustfall rates less than 100 mg/m^2/day (approximately 3 g/m^2/month) and that black coal dust is likely to cause complaint in months when the deposition rate is 80 mg/m^2/day (approximately 2.4 g/m^2/month).

One of the factors influencing the perception of dust impacts is the normal background level of dust deposition. The potential for annoyance will increase if there is perceived health risk from breathing in the dust. Because the perception of dust nuisance involves such a large subjective element, there is likely to be a wide range of opinion between residents of an area as to when dustfall becomes heavy enough to be unacceptable (Vallack & Shillito, 1998)

Nuisance and complaints can arise from daily or even shorter-term peaks in dust deposition, which may or may not be reflected in the monthly mean. The standard measurement methods for dust deposition, involving monthly exposure periods, make it impossible to assess the extent to which this occurs. Recent work in Europe has involved the development of short-term criteria for dust deposition and of methods for measuring or estimating short-term impacts (Vrin, *pers. comm.*, 2000). These developments involve the setting of nuisance limits based on daily deposition rates that equate to the formation of visible dust deposits on that time scale.

In the absence of such short-term measurements, Vallack & Shillito (1998) suggest that in UK residential areas and the outskirts of towns complaints are 'possible' when the monthly dust deposition rate exceeds 110 mg/m^2/day (approximately 3.3 g/m^2/month) and 'likely' when it exceeds 150 mg/m^2/day (4.5 g/m^2/month).

Hence, use of the annual average dust deposition rate (and the annual average TSP concentration) will tend to mask the underlying nature of the exposure to dust: in many cases, problems may arise from high short-term levels interspersed by longer periods of minimal exposure. Therefore, assessment based on annual average dust deposition rates, using a criterion of 4 g/m^2/month for example, is likely to only crudely indicate the potential areas affected by annoyance and complaints.

In summary, there is currently a generic difficulty in providing realistic and credible predictions of dust impact. There appears to be an element of cynicism in some communities such as that near the Bengalla and Mount Arthur North mine sites in relation to EIS predictions, and this is at least partly due to the fact that the current indicators of impact do not fully characterise the aspects that directly affect annoyance.

2.4 Meteorological data

Holmes Air Sciences used meteorological data collected in 1987 from weather stations at Ravensworth/Glendell. A comparison is made to more recent meteorological data (2000) collected from the Camberwell mine, and both data sets were found to show very similar wind patterns which are typical for the Hunter Valley. The 1987 data was used in preference to the more recent data set because of it was more complete (100% of a full year's data) that the Camberwell 2000 data. Further, the 1987 Ravensworth/Glendell data provides a more severe wind episode which was used as a "worst-case" scenario in modelling emissions under severe wind conditions.

It is accepted that the data are reasonably representative of the wind regime of the region, and are consistent with data from other nearby monitoring sites. The wind regime displays a dominance of WNW-NW and SE flows, which are aligned along the main axis of the Hunter River valley in the region. This wind regime results in relatively frequent direct impacts on Camberwell Village. This does not mean of course that winds from other directions do not occur, and indeed the impacts during these times are of key importance to the nearby sensitive areas. The meteorological data used is of high quality and represents well typical conditions in the upper Hunter Valley. However, a more realistic representation of meteorological variations in the area might be achieved through a combination of on-site meteorological monitoring and gridded meteorology, land use and topography data from TAPM (The Air Pollution Model, CSIRO Atmospheric Research, Australia).

2.5 Dust emissions modelling

2.5.1 General comments on estimating dust emissions

The dust emission rates from the Ashton Coal Project have been generated using emission factors, which use input data on various aspects of the mining activities and mine characteristics. Emission factors from the USEPA and from research conducted in the Hunter Valley have been applied. Factors exist for specific dust-generating aspects of the mines, e.g., overburden and coal handling and stockpiling, blasting, vehicle movements, wind erosion from exposed surfaces.

Owing to the variety of individual sources present in a large coal mine, and to the variable nature of emissions from many of those sources (e.g. varying according to wind speed, activity level, vehicle speed, material moisture content, etc), HAS has based their estimates on predicted Year 4 operating data – taken to be the year in which the impact on Camberwell Village will be the greatest. There appear to be no significant anomalies in the emissions data, and hence the application of the relevant emission factors is accepted as being reasonable.

The main issue in relation to the emissions estimates arises from the limited extent of measurements on which emission factors are based. Emission factors are approximations, which trade site specificity against ease of calculation and estimation. Therefore, emission factors applied to specific sites may be quite crude approximations of reality. There is inherent uncertainty in the equations and emission factors used and also uncertainty in parameters that need to be estimated and applied in the equations, for example material moisture content and wind speed. Further uncertainty arises from the changing nature of the particle size distributions. PM_{10}, or the fraction of the dust with an aerodynamic diameter less than 10 μm, is dependent on the type of material and will vary over a site and over time even for the same material type.

Therefore, dust emissions cannot be estimated accurately. Many of the emission factors used in the Ashton Coal Project EIS are derived from measurements at Hunter Valley coal mines and research by the US EPA, but this does not guarantee accuracy at any specific site. Their reliability is reduced further when generalised emission factors are used to estimate short term emissions variations.

Uncertainty in dust emissions must be regarded as particularly high when wind speeds are elevated. This arises from the non-linear relationship between wind erosion and wind speed. As wind speed increases, emission rates tend to increase at a faster rate, the result of which is that at higher wind speeds the calculated emission rates can vary significantly with only modest changes in wind speed. The estimates of dust emissions at high wind speeds are not based on a highly accurate predictive model. The emission rates relating to wind erosion have been estimated as follows: the emission factors have been used to estimate annual average emission rates. Hourly emission rates have been estimated using the assumed relationship between emissions and wind speed, and then the sum of the hourly rates has been scaled to ensure that the total annual emissions equal the assumed annual total. Given that high wind speed events are important in relation to short-term dust impacts, it is considered that the short-term emissions and ambient dust levels associated with high wind events are only very approximate.

The processes leading to wind erosion from exposed areas are complex. USEPA guidance on emissions from stockpiles, for example, indicates that depletion of available particles is an important factor, as is the degree of recent disturbance to the eroding surface. Furthermore, wind gusts or short-term wind speeds are critically important, and the hourly average wind speed is less important. The net result of these factors is that wind erosion effects may be far more 'peaky' than estimated in the modelling approach that has been adopted. This could have a significant effect on 24-hour average predictions.

The use of real time dust monitoring as proposed by White Mining will only aid in maintaining the average PM10 concentration to within guideline levels. No amount of monitoring on its own will mitigate dust emissions, as the monitoring cannot affect processes or dust emission factors.

It is likely that dust criteria at Camberwell will be exceeded in strong north-westerly wind conditions. Monitoring dust deposition is useful for obtaining an average dust deposition rate, but it cannot be used to stop, or mitigate, episodic high-dust events. A far better method of managing episodic dust events is to use short term predictive weather modelling as a guide for operational procedures. For example, the Alcoa Pinjarra mine in Western Australia uses 3-day short term weather forecasts in planning operations in order to minimise dust impacts, described in section 2.6.1 below.

2.5.2 *The background dust level*

The assessment of background dust levels reported by Holmes Air Science in the EIS is unclear, difficult to understand, and lacks a concise best-estimate summary of the existing background dust levels. The original EIS work relied on data taken from a total suspended particulates (TSP) monitor mounted on the Camberwell Church, a site known to be exposed to nearby recreational dust-generating activities. PM_{10} concentrations were inferred from the church-mounted TSP monitor, despite the fact that the monitor was exposed to nearby dust-generating activities. Data collected by a new PM_{10} monitor, mounted in a separate part of Camberwell Village was not effectively used in the assessment of background dust levels. These concerns were correctly identified by the EPA in its request for further information from HAS.

The response document by HAS (February 2002) is a substantial improvement in the methodology used to assess background dust levels in Camberwell Village. TSP data believed to be affected by bushfires between December 2001 and January 2002 were discarded, as were several anomalous TSP values. There is still considerable doubt about the validity of the remaining TSP data, given the proximity of the monitor to recreational dust-generating activities. PM_{10} data from a newly installed monitor does not seem to be contaminated by local episodic events, and therefore can be expected to be of high quality. Removal of PM_{10} data affected by the December 2001-January 2002 bushfires, and the conservative assumption of a PM_{10}/TSP ratio of 0.4, allows a reasonable estimation of the background TSP concentration.

It is the strong opinion of the reviewer that the Church mounted TSP monitor should be decommissioned and a TSP monitor installed at the same location as the PM_{10} monitor. This would remove the need for simplifying assumptions regarding the PM_{10}/TSP ratio, and would give more accurate information about the background air quality in Camberwell.

There are some broader concerns about the use of a single set of PM_{10} and TSP values to describe the background air quality, as this approach assumes that there is little temporal variation in the PM_{10} and TSP concentrations. Dust emissions from coal mines can be highly variable, and therefore the background concentrations of PM_{10} and TSP measured at a particular site can also be extremely variable. However, this approach is the one of the few ways of estimating the incremental impact of a particular coal mine project.

The existing amount of dust deposition in Camberwell Village has been determined by HAS by using data collected from a network of dust monitors operated by Camberwell Coal and Ashton Coal. This is the best available data, but as described in section 2.3, the use of annual average dust deposition rates (and the annual average TSP concentration) will tend to mask the underlying nature of the exposure to dust - high short-term levels interspersed by longer periods of minimal exposure. Therefore, assessment based on annual average dust deposition rates, using a criterion of 4 g/m^2/month for example, is likely to only crudely indicate the potential areas affected by annoyance and complaints.

2.5.3 *Incremental dust impact due to Ashton Coal Project*

The original assessment of the incremental dust impact due to the Ashton Coal Project reported by Holmes Air Science is unclear and difficult to understand. Their response document (February 2000) addresses some of the issues identified by the EPA, but still does not provide the required information in a concise and easily accessible manner. However, PAE agrees with the methodology used by HAS in its estimation of the incremental dust impact.

Modelling shows that control measures as typically applied on Hunter Valley mines are not sufficient if the mine's incremental emissions are to comply with the NSW EPA guidelines. However, with best practice engineering controls in place (including 80% control on haul roads and restricted operating hours), the mine by itself will comply with the US EPA 150 $\mu g/m^3$ 24-hour PM_{10} standard 100% of the time. These controls are still not sufficient to ensure compliance with NSW EPA 50 $\mu g/m^3$ 24-hour PM_{10} standards 100% of the time. For this, it was shown that both best practice controls and real time dust mitigation measures are essential, and the HAS report correctly identifies this.

It is clear that the incremental impact due to Ashton will only meet NSW EPA air quality guidelines if stringent "best practice" dust mitigation methods are employed, which include the cessation of mining activities if 24-hour average PM_{10} concentrations trigger-points are reached, as measured in Camberwell Village. The effectiveness of the mitigation methods is discussed in section 2.6.

2.5.4 *The cumulative dust impact*

Cumulative dust impacts (proposal plus background plus other mines) were discussed in the original HAS report and in the HAS response document (February 2000). The response document explains omissions in the original HAS report and highlights the data sources used in the modelling of cumulative dust emission.

The dust background levels include neighbouring mine emissions (data from June 2001 to January 2002). Additional modelling in the response document indicates that estimates of the dust contribution from distant mines and biogenic sources are justified and appear reasonable. Further, the treatment of potential dust emissions from the proposed Glendell mine appears reasonable.

The total dust contribution includes the combined effects of the background dust concentration, the contribution from other mines (near and distant) and the Ashton coal proposal. Modelling in the HAS response document implies that the Ashton mine will cause the NSW EPA 50 $\mu g/m^3$ 24-hour standard to be exceeded approximately 15% of the time at the closest residence, if real time dust mitigation practices are not employed. However, staged mitigation techniques are proposed, commencing from when the 24 hour PM10 concentration in Camberwell reaches 50 $\mu g/m^3$. It is difficult to assess the effectiveness of the staged dust mitigation techniques, and therefore a statement of the portion of Camberwell likely to experience exceedences of the EPA criteria is not possible.

The US EPA 150 $\mu g/m^3$ 24-hour standard, according to the modelling provided, should not be exceeded. The US EPA 150 $\mu g/m^3$ 24-hour standard was the basis for consent for the Mt Arthur North project. White Mining has undertaken to stop all mining activities when the 24 hour running average PM_{10} concentration measured in Camberwell Village exceeds 150 $\mu g/m^3$.

The portion of Camberwell village likely to experience changes in amenity due to dust deposition episodic events in impossible to predict, given the high degree of uncertainty involved in the prediction of short term episodic events.

These modelling analyses highlight the importance of real time dust mitigation control measures, and their effectiveness is discussed in section 2.6 below.

2.5.5 Dust effects on nearby residences

The Ashton coal mine will have an effect on nearby residences, despite the use of real time operational best practice controls. Three categories of affected residences in or near Camberwell Village have been identified. The closest residences, along the ridgeline adjacent to Glennies Creek Road (Category 1 residences) are either owned by Glendell Mine or subject to compulsory purchase orders. Residences close to the Ashton mine (Category 2) have either agreed to "no objection" to the mine or will be purchased by White Mining. Category 3 residences are the remaining houses in Camberwell Village. These residents have been given the option of purchase at market value of their properties. The boundaries of each category of residence have not been clearly identified ("close to Ashton" v "all other houses within the Village") and it is suggested that the numbered residences in the HAS report be assigned to each category for further clarification. Camberwell village consists of 51 properties, four of which are land only and one of which is the community hall.

Although these analyses seem reasonable in terms of set EPA goals, a previous discussion highlighted the importance of perceived impacts of dust emissions by residents affected. In this case, it is possible Residence 41 and other residences nearby could experience some annoyance especially in times of peak emissions, despite control measures.

The post-event response nature of the proposed real time control measures implies that peak dust emissions could exceed nominated 24-hour average guidelines, thus causing annoyance to residences in Camberwell Village. It is far more likely that residences will experience annoyance from peak short-term dust emissions rather than 24 hourly or monthly average concentration and deposition rates. Although quantification or prediction of episodic events is not included in the EIS report, the impact on residences from short term (or episodic) events can be significant. It is suggested that more work be conducted on estimating episodic events in order to quantify frequency and their impact on nearby residents.

White Mining has evidently taken particular measures of compensation in relation to neighbouring residences by either purchasing those properties or establishing legal agreements with landowners. These measures seem reasonable given the potential impacts on the Village.

2.6 Dust mitigation methods

Dust control methods have been grouped into three classes. Planning controls relate to large-scale, long-term methods aimed at minimising dust emissions. These methods include restricting the mine surface area and operating hours, construction of earth shields and tree plantations, rapid rehabilitation of overburden emplacements, and locating coal handling facilities as far as practicable from Camberwell Village. Coal stockpiles will be below ground level, protecting them from wind erosion.

Engineering controls relate to small-scale, short term methods to minimise dust. Typical engineering controls include watering haul roads, watering stockpiles, partially enclosing conveyers and fitting drills with dust control devices.

The most advanced dust control methods suggested by White Mining (operational controls) involve a network of real-time dust monitoring stations within Camberwell Village and around the mine. A staged series of mitigation techniques is implemented depending on the wind direction and the running 24 hour average PM_{10} concentration. Mitigation techniques range from suspending blasting operations to complete suspension of all dust generating conditions.

Pacific Air & Environment's assessment is that these techniques, if fully utilised, represent the most effective dust mitigation methods achievable, and are representative of best practice procedures. However, it is extremely difficult to accurately assess and predict the efficacy of these techniques, and any estimate of their efficiency is likely to be inaccurate.