Stephenson
Environmental Management Australia

REVIEW OF DOCUMENTS RELATING TO AIR QUALITY

DRAYTON SOUTH COAL PROJECT (SSD 6875)

PLANNING ASSESSMENT COMMISSION

MUSWELLBROOK NSW

PROJECT NO.: 5736/S24430/16

DATE OF PAC: 16-17 NOVEMBER 2016

PREPARED ON BEHALF OF DARLEY AUSTRALIA AND COOLMORE AUSTRALIA

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EXECUTIVE SUMMARY

The following report has been prepared by Peter Stephenson of Stephenson Environmental Management Australia (SEMA). This report provides a review and critique of the air quality assessment of the Drayton South Open Cut Coal Project (including reports prepared by Anglo American and the Department of Planning and Environment's Final Assessment Report). It concludes that:

- The predictions (output) of the model are unreliable because input data to the model was inadequate and/or incomplete (data flattened, 1.4 Mt of ROM from existing Drayton mine production omitted and other inconsistencies in emissions input data and calculations);

- Emissions inventory that forms part of this input data was selective and thus was not representative;

- Air Quality predictions for the life of the proposed Drayton South Coal Project were therefore NOT "conservative" and not worst case scenarios. In fact, not representative and present a bias or selective predicted outcome;

- Cumulative impact overlooked: Project assessment fails to incorporate background levels of particulate matter; and,

- DP&E Final Assessment Report does NOT address these issues nor does it add to knowledge base on Air Quality impacts in this matter.

Air quality in Upper Hunter region is at a critical point, hence any contribution of the mine will be significant. Air quality issues in the Upper Hunter have become more significant as national standards for air quality have recently tightened. In December 2015 national environment ministers met and agreed to adopt reporting standards for annual average and 24-hour $PM_{2.5}$ particle levels of 8 ug/m^3 and 25 ug/m^3, respectively. The ministers are aiming to further tighten these air quality standards to 7 ug/m^3 and 20 ug/m^3, respectively by 2025. Ministers also agreed to establish an annual average standard for PM_{10} particles of 25 ug/m^3. The National Environment Protection (Ambient Air Quality) Measure (NEPM) was varied to include these changes and registered on the Federal Register of Legislative Instruments on 3 February 2016 and the amended compilation published on 25 February 2016.

It is important for the PAC to note that Suspended Fine Particulate $PM_{2.5}$ and PM_{10} already exceeds EPA NSW criteria and deposited dust at criterion EPA NSW limits (from existing Drayton mine).

The background air quality assessment in the vicinity of the studs and adjacent to the existing mine is inadequate and so the impacts of the project on the studs (and on other receivers) cannot be properly assessed. Furthermore, the potential short term air quality impacts of the project on humans, livestock and studs have not been, and cannot be, assessed using the dispersion model.

The dust deposition monitoring data from Drayton Mine DDG D9 suggests a potential for significant dust impacts on the studs.

The emissions inventory upon which all of the predictions of impact on air quality have been based is materially biased and relies on 80% control of dust emissions from the Drayton South Project.

The nominated dust control measures are unlikely to be achieved continuously because they will require the application of a large volume of water for dust suppression on a daily basis throughout the 15 year life of the mine. Water supply is limited in the Hunter Valley. If control is not achieved (a worst case scenario) significant impacts on a project alone basis have been predicted. Furthermore, when this project alone impact is added to background, the cumulative impact is excessive.

Even if it is assumed that all predictions are correct and nominated controls achieved, the cumulative project impact fails to comply with existing air quality standards; that is, the cumulative impact of this Drayton South Coal Project will be dangerously dusty because it will be greater than the current 24-hour PM_{10} NEPM Impact Assessment Criterion of 50 ug/m^3 and annual PM_{10} NEPM Criterion of 25 ug/m^3 .

Furthermore, for every 10 ug/m^3 increase in PM_{10} there will be an associated 0.6% to 2% increase in hospital admissions for cardiovascular and pulmonary disease. (Pope and Dockery 2006). This work has been further developed and reviewed by Samoli et al in 2013 with the following conclusions of increases in $PM_{2.5}$ of 13 ug/m^3 had associated impacts of increases in all causes mortality of 0.72%; increases in cardiovascular mortality of 1.11% and respiratory mortality of 2.49%.

Similar trends in slightly larger respirable fine particles $PM_{2.5\text{-}10}$ when the ground level concentration increased to 11 ug/m^3 the associated impacts were increases in all causes mortality of 0.33%; cardiovascular mortality of 0.37% and respiratory mortality of 0.84%.

Therefore:-

- Ambient background air quality parameters should have been measured on a 24-hour average basis or same averaging period as the Impact Assessment Criterion or Design Ground Level Concentration (DGLC). By annualising air quality monitoring data, detail of the short term impacts is lost and unable to be resolved.

- Anglo American has used annualised ambient air quality monitoring and/or emissions inventory data to prepare selective 24-hour averages for comparison with the predicted project only impacts. This approach is potentially misleading and has compromised the resolution of the modelling impact predictions.

- Drayton Dust Deposition Gauge (DDG) Location D9 should be used as an indicator of typical deposited dust for the Coolmore and Darley Woodlands properties because it is of a similar proximity to the current Drayton mine as the proposed Drayton South project is to the studs.

- **If DDG D9 is used as an indicator**, it would be likely that there would be air quality exceedances on a monthly basis.

- The model inputs provided by Anglo American are not sufficiently representative of the likely impacts of the project and will therefore bias the predicted outcomes. In addition, the model input data is incomplete and more importantly in our view the nominated control measures are unachievable.

- Based on Anglo American's data under a worst case scenario the "project alone" impacts on air quality will exceed the relevant air quality limits from Year 4. When this project impact is added to background levels the cumulative impacts will substantially exceed the impact assessment criterion.

- Project Only predictions will exceed Impact Assessment Criteria when added to the Background air quality. Furthermore, these predictions have a potential to be gross underestimates if any of the nominated dust controls fail to meet the nominated 80% efficiencies which are optimistic. Worst case emissions cannot be predicted using optimistic dust control efficiencies.

Therefore, it is concluded that it is impossible to adequately assess short term impacts on humans, livestock and studs using the Pacific Environment Limited (PEL) environmental impact assessment prepared for the Drayton South Coal Project.

Furthermore, in another air quality project PEL, in their Upper Hunter Air Quality Particle Model report prepared for NSW EPA, concluded that annual $PM_{2.5}$ ground level concentrations will increase in Muswellbrook up to 2016 and then decrease up to 2021, because Drayton Coal mine will close and Drayton South will be further away from Muswellbrook. The air quality impact at the thoroughbred horse studs would therefore be expected to increase as Drayton South coal mine approached.

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1 INTRODUCTION

Peter Stephenson, Managing Director of Stephenson Environmental Management Australia (SEMA) was requested by Coolmore and Darley thoroughbred studs to undertake a review and critique of the air quality impact assessment documents relating to the Planning Assessment Commission (PAC) hearing regarding Drayton South Coal Project and the NSW Department of Planning and Environment (NSW DPE) assessment of the Project. Figure 1.1 presents the relative locations of the existing Drayton mine; the proposed Drayton South Coal Project; the Hollydene vineyard and reception centre and the Coolmore and Darley Woodlands thoroughbred stud farms.

This review was initially presented to the Commissioners of the review PAC in a public hearing held in Denman Hall on Thursday 10th September 2015 and re-presented with additional information at the most recent PAC conducted in Muswellbrook on 16 and 17 November 2016.

Reference documents reviewed during the preparation of this review are:

Anglo American Metallurgical Coal Pty Limited response to PAC Review Report including Houston Report and DPE proposed conditions of consent (29 March 2016).

Assessment Report Section 89E of the Environmental Planning and Assessment Act 1979, September 2016.

Bennett (2016) Professor Jeff, Peer Review of the Expert Report of Greg Houston, 22 June 2016.

Bennett (2016) Professor Jeff, Review of Supplementary Submissions by Hunter Thoroughbred Breeders Association, Coolmore Australia and Darley Australia on the Drayton South Coal Project, 21 August 2016

Department of Environment, National Environment Protection Council, National Environment Protection (Ambient Air Quality) Measure (amended) including variations to standards for particles (PM_{10} and $PM_{2.5}$), 25 February 2016.

Hansen Bailey (2015), Drayton South Coal Project **Environmental Impact Statement** (EIS) (May 2015), including **Pacific Environment Limited (2015)** EIS Appendix H Air Quality and Greenhouse Gas Impact Assessment (April 2015).

Hansen Bailey (2015), Drayton South Coal Project **Response to Submissions.** Prepared for Anglo American Coal Pty Ltd (24 July 2015), including **Jacobs (2015),** Appendix I Response to Submissions (Drayton South Air Quality **Peer Review)** conducted by Jacobs for the Department of Planning (17, 27 & 29 July 2015) **and Jacobs (2015),** Drayton South Coal Project Response to Air Quality Review (29 July 2015).

Katestone Environmental Pty Ltd (2011), NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining prepared for NSW Office of Environment and Heritage (June 2011).

NSW Department of Planning and Environment (DPE) (2015), State Significant Development Assessment Drayton South Coal Project (SSD 6875) - **Secretary's Environmental Assessment Report (SEAR)** Section 89E of the Environmental Planning and Assessment Act 1979 August 2015.

NSW Department of Planning and Environment (DPE) (2016), State Significant Development Assessment Drayton South Coal Project (SSD 6875) Assessment Report, September 2016 - **Final**

NSW Environment Protection Authority (2015) – New South Wales State of the Environment Report, 2015 (Section 8, Air) (2015).

NSW Planning Assessment Commission (2013) – Review Report on Drayton South Coal Project, (December 2013).

NSW Planning Assessment Commission (2015) – Drayton South Open Cut Coal Project Review Report, (November 2015).

Pacific Environment Limited (PEL) (2014), Upper Hunter Air Quality Particle Model (UHAQPM) (9 October 2014).

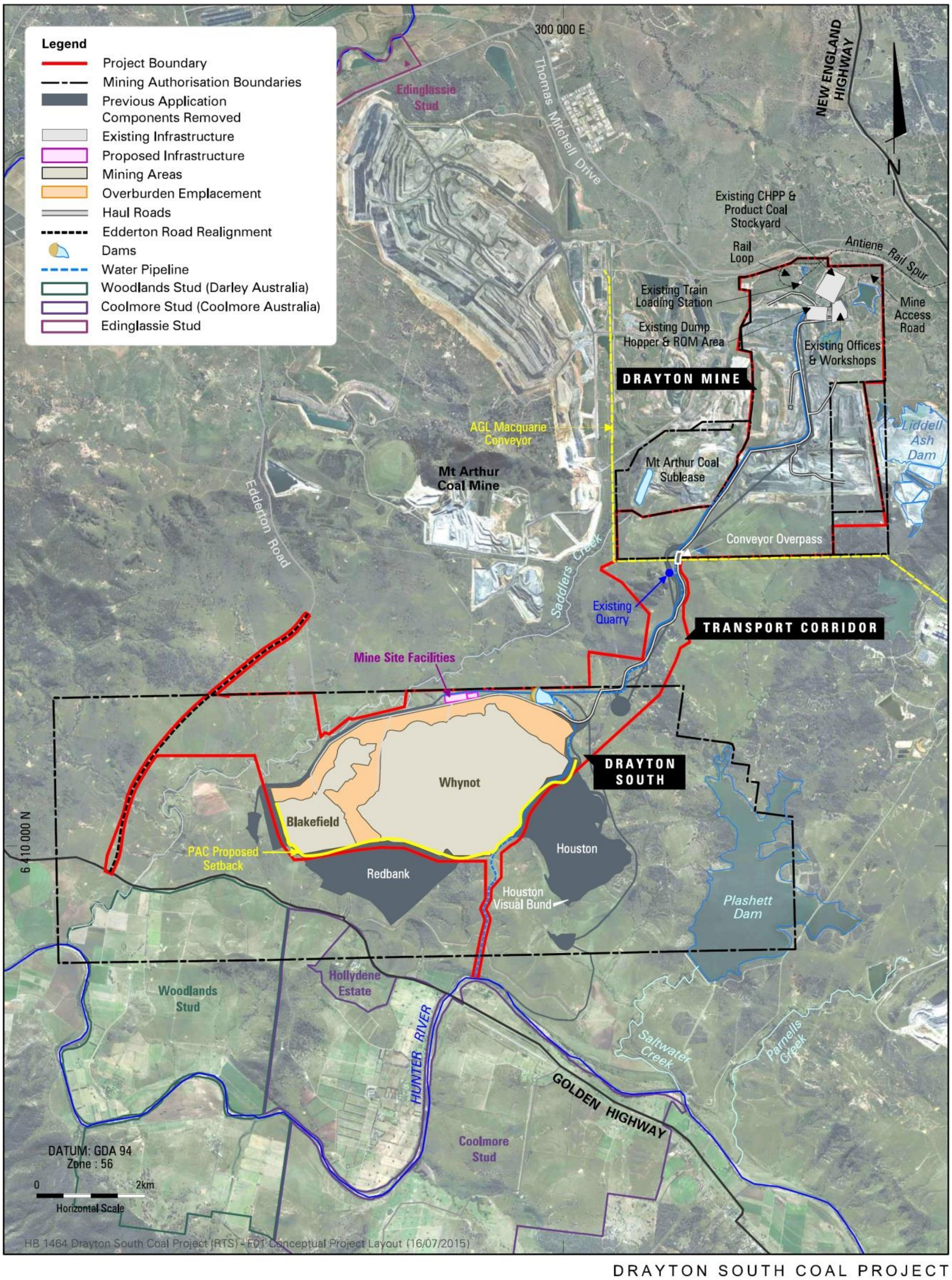
Pacific Environment Limited (PEL) (2015), Drayton South Coal Project – quantitative assessment of air quality impacts for Year 9 (July 2015).

Pacific Environment Limited (PEL) (2015) EIS Appendix H Air Quality and Greenhouse Gas Impact Assessment (April 2015).

PAE Holmes (2012), Drayton Coal Mine Pollution Reduction Program-Assessment and Best Practice (27 June 2012).

Samoli, E et al (2013), Associations between Fine and Coarse Particles and Mortality in Mediterranean Cities. Results of MED-PARTICLES Project. Environmental Health Perspectives (On-line 17 May 2013).

FIGURE 1-1 DRAYTON SOUTH COAL PROJECT SITE



2 AIR QUALITY PARAMETERS AND BACKGROUND AMBIENT AIR QUALITY

2.1 AIR QUALITY PARAMETERS

Air quality and greenhouse gas (GHG) emissions and their predicted impacts have been reviewed. The air quality parameters that need to be considered in coal mine assessments, which have known potential harm to health, include:

- Total Suspended Particles (TSP),
- Particulate Matter less than 10 microns (PM_{10}),
- Particulate Matter less than 2.5 microns ($PM_{2.5}$) and
- NO_2 emissions are the specific focus for air quality,
- 24 hour and annual averaging for PM_{10} and $PM_{2.5}$ is required for dispersion modelling output,
- 1-hour and annual averages for NO_2, and
- Dust Deposition of larger particles.

2.2 AIR QUALITY – IMPORTANCE OF PARTICLE SIZE

Figure 2.1 presents the relative sizing of PM_{10} and $PM_{2.5}$ particles to larger dust particles commonly referred to as total suspended particles (TSP) and the finer sub one micron aerosols and fumes. Gaseous molecules, such as oxides of nitrogen (NO_x) and nitrogen dioxide (NO_2) will be smaller than 0.01 micron.

Deposited dust will generally be greater than 100 microns depending on the density of the constituents in these particles. This deposited dust is collected in Dust Deposit Gauges (DDG) as referred to in Table 2.1 and Figure 2.2.

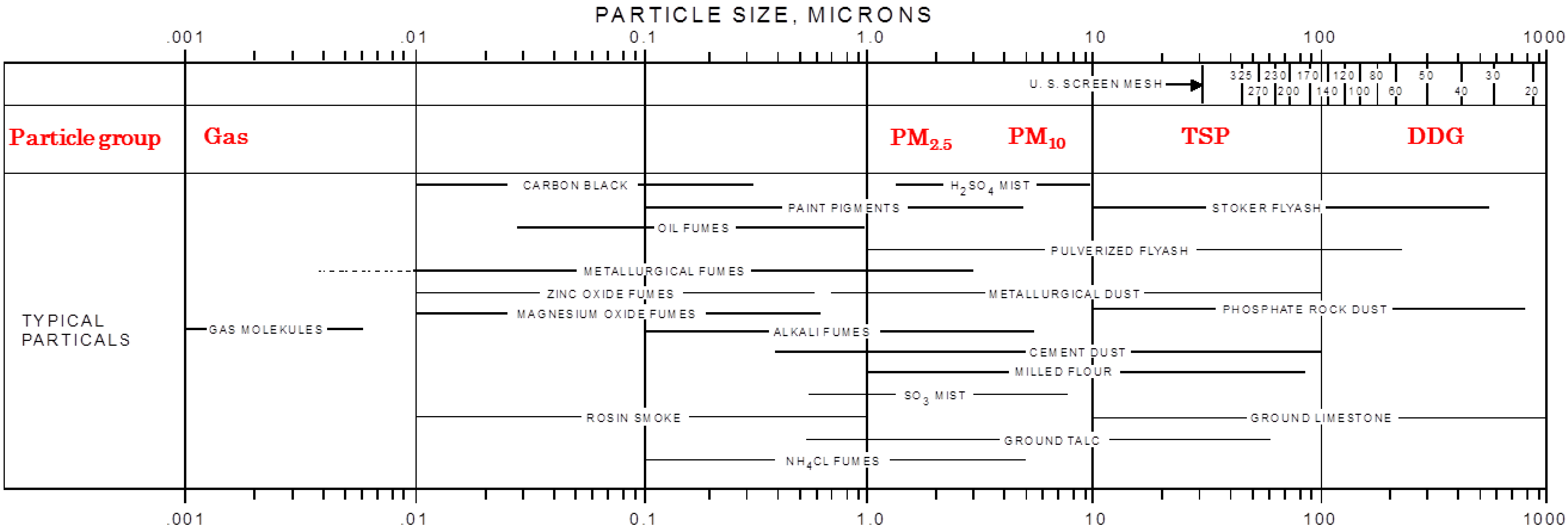
2.3 AIR QUALITY – APPLICABLE CRITERIA

Air Quality Criterion Limits, as defined in the National Environment Protection (Ambient Air Quality) Measure (NEPM) for PM_{10} currently are 50 micrograms per cubic metre ug/m^3 (24-hour average) and 30 ug/m^3 (annual average).

In December 2015 national environment ministers met and agreed to adopt reporting standards for annual average and 24-hour $PM_{2.5}$ particle levels of 8 ug/m^3 and 25 ug/m^3 respectively. The ministers are aiming to tighten these standards to 7 ug/m^3 and 20 ug/m^3, respectively by 2025. Ministers also agreed to establish an annual average standard for PM_{10} particles of 25 ug/m^3.

The National Environment Protection (Ambient Air Quality) Measure (NEPM) was varied to include these changes and registered on the Federal Register of Legislative Instruments on 3 February 2016 and the compilation of these amendments published on25 February 2016.

FIGURE 2-1 THE SIZE OF THE PARTICLE PROBLEM



3 BACKGROUND AMBIENT AIR QUALITY - INADEQUATELY ASSESSED

The reporting of the existing monitoring of ambient air quality is not representative of the air quality impacts on Coolmore and Darley Woodlands in the future if the project is approved:-

- Background ambient air quality should be measured in 24-hour average monitoring periods or in 1- hour average monitoring periods (depending on equipment used). These averaging periods are specified in the NSW EPA Approved Methods for Sampling and Analysis of Air Pollutants. However, Anglo has reported their monitoring data on annual average basis.

- A Tapered Element Oscillating Microbalance (TEOM) air quality monitor was not used previously, thus there is no real time data nor was a High Volume Air Sampler (HVAS) used to monitor existing 24-hour samples.

- The use of annualised data is problematic in this instance. It is not representative of actual 24-hour background air quality because it was derived from annual data divided by the number of days in a year. This approach assumes every day is the same throughout the four seasons of the year.

- One DDG (Number D9) was located downwind of the nearest boundary of the existing Drayton Mine. Refer Figure 3.1 and the red arrow highlighting the location of D9. This is probably the ONLY representative ambient air quality DDG for deposited dust impacts on Coolmore and Darley Woodlands studs. The fact that it is indicative of potential dust deposition impact on Coolmore and Darley Woodlands appears to have been overlooked in EIS.

- The data from DDG (Number D9) which is a measured as a 30-day monthly average, has also been annualised. DDG D9 has dust deposition rates that are higher than many of the other DDG's. Similarly, DPE and Jacobs choose not to address this point because it is considered to be on mine lease property, but failed to recognise that it could be a further indication of potential impact on Coolmore and Darley Woodlands.

The annual average dust deposition rates reported in Table 3.1 from DDG Number D9 are higher than many of the other DDG's. The reported level of 4.1 grams per square metre per month ($g/m^2/mth$) exceeds the prescribed limit of 4 ($g/m^2/mth$) (on a monthly basis). This has not been seen as significant in the Hansen Baily EIS. If similar dust levels were to occur during dry months at the studs (which is plausible based on the recorded data at DDG D9) this would be excessive, visible and unacceptable.

Therefore:-

- Ambient background air quality parameters should have been measured on a 24-hour average basis or same averaging period as the Impact Assessment Criterion or Design Ground Level Concentration (DGLC). By annualising air quality monitoring data, detail of the short term impacts is lost and unable to be resolved.

- Anglo American has used annualised ambient air quality monitoring and/or emissions inventory data to prepare selective 24-hour averages for comparison with the predicted project only impacts. This approach is potentially misleading and has compromised the resolution of the modelling impact predictions.

- Drayton Dust Deposition Gauge (DDG) Location D9 should be used as an indicator of typical deposited dust for the Coolmore and Darley Woodlands properties because it is of a similar proximity to the current Drayton mine as the proposed Drayton South project is to the studs.

- If DDG D9 is used as an indicator, it would be likely that there would be air quality exceedances on a monthly basis during the drier months of any year.

TABLE 3-1 ANNUAL AVERAGE DDG DATA NOT MONTHLY (NOTE SITE D9)

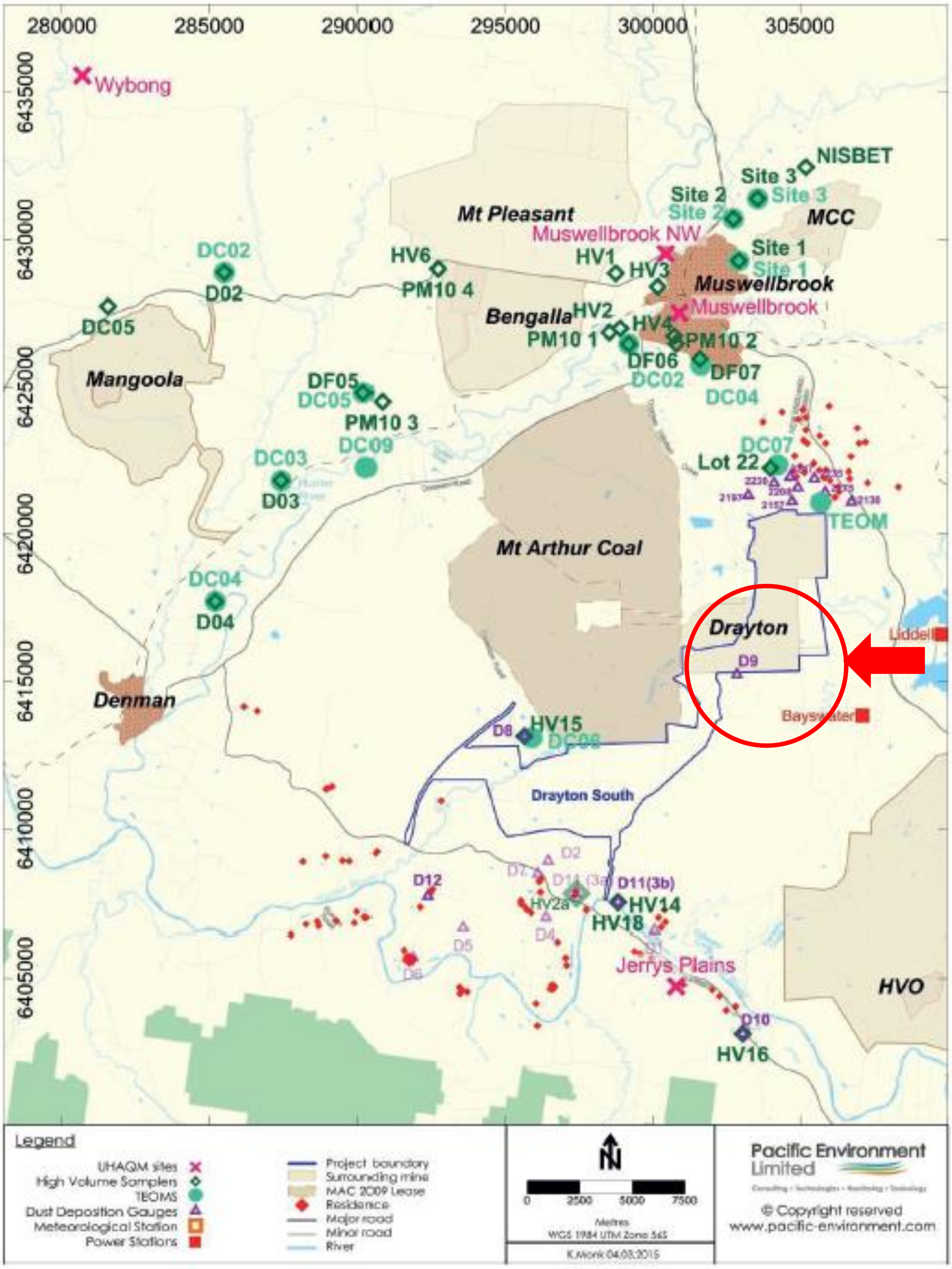
Year	D1	D2	D4	D5	D6	D7	D8	D9	D10	D11 (3a)	D11 (3b)	D12
1998	1.1	0.7	-	0.8	1.8	2.6	1.2	2.7	-	-	-	-
1999	1.4	1.1	2.4	1.2	1.2	0.8	2.1	2.6	-	-	-	-
2000	1.1	**4.1**	-	1	1.3	2.7	1.6	3.4	-	0.8	-	-
2001	1.2	1.8	-	1.2	1	-	1	2.6	0.9	0.9	-	0.7
2002	-	-	-	-	-	-	1.5	**4.1**	1.3	1	-	1.8
2003	-	-	-	-	-	-	0.8	2.3	0.9	0.9	-	0.8
2004	-	-	-	-	-	-	1.4	2.9	1.1	1.5	-	1.3
2005	-	-	-	-	-	-	0.8	2.5	0.9	0.9	-	0.9
2006	-	-	-	-	-	-	1.1	2.9	0.9	1	-	1.5
2007	-	-	-	-	-	-	1.1	2.4	0.9	1.4	-	1.1
2008	-	-	-	-	-	-	0.9	2.9	1	1.1	-	0.7
2009	-	-	-	-	-	-	1.1	3.8	1.5	1.6	-	2.1
2010	-	-	-	-	-	-	0.9	3.2	0.9	1.6	-	1.6
2011	-	-	-	-	-	-	1	-	1.6	2.3	-	2.2
2012	-	-	-	-	-	-	1.6	3.6	1.4	2.1*	1.4*	1.9
2013	-	-	-	-	-	-	1.8	3.1	1.9	-	1.4	3.5
2014	-	-	-	-	-	-	2.4	3.3	-	-	1.5	-

* Dust gauge D11 (3a) was removed in March 2012 and move to another site and renamed D11 (3b).

Note:

1. DDG deposition rates are measured in units of grams per square metre per month (g/m^2/mth).
2. Data in table 1 has taken 12 x one month data sets and averaged these to represent a single average month for each year in the table.
3. The limit for this ambient air quality parameter is 4 g/m^2/mth.
4. D9 is location of DDG closest to the current Drayton mine and would be a similar distance from mine activities as the boundary of Drayton South would be to Coolmore and Darley stud farms.

FIGURE 3-1 AIR QUALITY MONITORING SITES- NOTE SITE D9



4 EMISSIONS INVENTORY AND DUST CONTROL MEASURES – UNRELIABLE

The impact of ground level concentrations of airborne contaminants is predicted using a computer based dispersion model. Any dispersion model is totally reliant on the quality of the input data; in particular, the emissions inventory associated with the activities on the proposed mine site to be assessed. A robust emissions inventory is critical to achieve sound and representative dispersion modelling and thus predictions of air quality impacts.

The model inputs provided by Anglo are not sufficiently representative of the likely impacts of the projects and will therefore bias the predicted outcomes. In addition, the model input data is incomplete and more importantly in our view the nominated control measures are unachievable.

As a result the predictive analysis cannot be relied upon.

4.1 MODEL INPUTS INCOMPLETE

The Emissions Inventory for the Drayton South Coal Project, as presented in Tables A.1 to A.3: Year 4, 6 and 12 respectively – Drayton South Emissions Calculations, Appendix H EIS, is based on kg/yr of TSP presumably reliant on mine plans for years 4, 6 and 12. This data is presented in Table 7.4 pages H-55 to H-57 of Appendix H of EIS (Hansen Bailey).

However, the data presented is insufficient to determine shorter term impacts. The emissions have been averaged over a full year; some predicted project impacts have not been assessed (in particular, reduced efficiency of dust emission control techniques) and the projected emissions input data used is incomplete.

4.1.1 INADEQUATE DETAIL

Further resolution is required because all emissions have been averaged over 24-hour days per day for 365 days and not during the actual operational daylight shifts when peak emissions from the mine will occur.

The model inputs are based on emission factors which are an amalgam of selective AP-42 or NPI emission factors for PM_{10} and $PM_{2.5}$ derived from the projected TSP emissions as presented in Tables A.1 to A.3 in Appendix H of EIS. The emission inventory calculations for TSP, assuming the intensity of the operations are reasonable and controls proposed achievable, are generally in order; (with the exception of dozers on coal which is actually over estimated). However, the controls proposed may not be consistently achievable.

4.1.2 OMITTED DATA

The predicted emissions from the proposed 1.4 Mt of ROM from the existing Drayton mine have not been included in emissions inventory and model input file. Thus this part of the development has not been included in model predictions of air quality impacts.

4.1.3 INCOMPLETE DATA

In addition, there are apparent inconsistencies and calculation errors which indicate potential for misrepresentation of data; for example:-

- Page EIS H-163 equation for emission from bulldozers on coal is wrong and has been used throughout emission inventory spreadsheet by PEL. The correct formula as per NPI Table 2 Emission Factor Equations and Default Emission Factors for Various Operations at Coal Mines 1,2 on Page 15 is:
    - $EF_{TSP} = 35.6x\ (s)^{1.2}/(M)^{1.4}$
- PEL is inconsistent in their methodology, in that they have used USEPA AP-42 emission equations for all their TSP calculations, but have not used the USEPA emission factors/equations for other particle size ranges. The AP-42 document has both equations and scaling factors for TSP, PM_{15}, PM_{10} and $PM_{2.5}$.
- Section 11 of Appendix H lists graders as one of the types of equipment used on-site. Table 6.2 outlines that for the purpose of the Air Quality Assessment, grader speed has been assumed to be 8km/h which implies that emissions from graders were calculated and included in the Air Quality Assessment. However, particulate emissions from grading roads do not seem to have been included in the emissions inventory. There is no reference to any emission factors used for the estimation of these emissions in Appendix A of the Air Quality Assessment which lists details of emission estimations and emissions from graders does not appear in Table 7.4 which summarises TSP emissions from the project.
- Similarly, as also referenced by Jacobs, the EIS and Table 6.2 of PEL's Appendix H in the EIS indicate that larger trucks will be used from Year 10 onwards but particulate emissions from Haulpak dump trucks have been based on gross weights averaged at 177 tonnes for both fully loaded (308 t) and empty trucks returning to pit for the life of the project. As heavier trucks have higher particulate emission per vehicle, averaging truck weights can potentially reduce the resolution for short term high concentration particulate matter impacts.
- Dust particulate emissions will vary according to both tonnage capacity and vehicle speed.
- Wind speed is not considered in any of the emission factors for any dust emissions associated with erosion of exposed surfaces or stockpiles.

4.2 EMISSION CONTROL MEASURES

Anglo American has proposed unachievable control measures to avoid, minimise or mitigate the significant adverse impacts of the project on air quality. In my view these measures are unlikely to be achieved continuously for 24 hours per day for the 15 year life of the mine.

4.2.1 PROPOSED MEASURES

- PEL have calculated all emissions from overburden haulage with an average 80% dust control efficiency. It is this factor that has been used on all input data for dispersion modelling. Such optimistic control efficiencies cannot be used to predict worst case ground level impact.

- Similarly, Table 6.2 indicates that water will be used as the dust suppressant to control dust emissions from wind erosion from exposed areas and overburden emplacements.

- A control factor of 50% has been applied in the modelling of exposed areas of 80 to 104 hectares. The DPE SEAR and Final Assessment Report have not addressed this issue of feasibility of proposed controls and their subsequent actual efficiencies.

4.2.2 PROVEN ACHIEVABLE OBJECTIVES

Anglo claim they use Best Practice Management Measures and state an intention to achieve best practice. The Emissions inventories have been calculated using EPA/OEH, Coal Mine Particulate Matter Control Best Practice – Site-specific determination guideline, November 2011. This guideline draws on Katestone Environmental's Benchmarking Study of June 2011. This study was based on input derived from mining industry.

A review of Anglo American's performance record over the last 15 years at the existing Drayton mine (particularly taking into account the high incidence of non-compliance due equipment and human error) suggests that Anglo American or any subsequent operator of the Drayton South coal mine is unlikely achieve the very high level of dust control nominated unless a radically different approach to dust control is used.

To achieve the dust control proposed a very large amount of water will need to be delivered to the haul roads and exposed surfaces continuously throughout the operation of the mine. The Hunter is a traditionally dry region and water is a valuable and scarce commodity.

The current Drayton mine has undertaken to comply with best practice management measures in the Pollution Reduction Program presented in the PAE Holmes Report No.6763 of 27 June 2012. If the mine is currently complying with best practice, then the elevated levels of deposited dust at Dust Deposition Gauge (DDG) Location D9 demonstrates that the nominated control measures are unachievable.

As indicated earlier in this report DDG D9 should be used as an indicator of typical deposited dust for the Coolmore and Darley Woodlands properties. DDG D9 is located in a similar proximity relative to the current Drayton mine as the proposed Drayton South project will be to the studs.

4.3 IMPLICATIONS IF DUST CONTROL NOT ACHIEVED

All of these emission factors rely on the additional mitigation measures being implemented but do not address failure to apply mitigation measures.

The following table's use data provided by Anglo American and demonstrate the significant implications if the nominated dust control is not achieved. This represents a worst case scenario. Based on Anglo American's data under a worst case scenario the "project alone" impacts on air quality will exceed the relevant air quality limits from Year 4. When this project impact is added to background levels the cumulative impacts will substantially exceed the impact assessment criterion.

Tables 4.1, 4.3 and 4.5 show the absolute influence of these dust control measures on the predicted outcomes from the dispersion modelling. The data in the tables in red has been calculated by SEMA based on the factors presented in Tables 4.2, 4.4 and 4.6 calculated from total TSP dust emissions with nominated dust controls for the five major dust sources presented in the EIS and the difference if this nominated dust control is not achieved.

Therefore, it is considered that, in my estimation, the dust control measures proposed by Anglo and used as input data for the PEL dispersion model may have overestimated the effectiveness of the dust control up to a factor of three (3). This in turn, will translate to the modelling output predictions and the Hansen Bailey EIS conclusions regarding air quality impacts being **underestimated** by a factor of three.

TABLE 4-1 YEAR 4 PREDICTIONS (PROJECT ONLY): 80% CONTROL EFFICIENCY & NO BACKGROUND

24 Hour PM_{10} Impact (Project Only Contribution) (ug/m³)				
Year 4	226A		226B	
	80% Control	No Control	80% Control	No Control
1	8.6	24.9	9.0	26.1
2	7.0	20.3	7.3	21.2
3	6.7	19.4	7.2	20.9
4	6.6	19.1	7.1	20.6
5	6.1	17.7	6.4	18.6
6	5.4	15.7	5.9	17.1
7	5.4	15.7	5.6	16.2
8	5.3	15.4	5.6	16.2
9	5.1	14.8	5.6	16.2
10	5.0	14.5	5.4	15.7

Source: Hansen Bailey, Appendix H, EIS with Stephenson calculations in red based on Anglo American data

TABLE 4-2 YEAR 4 EMISSIONS: INFLUENCE OF CONTROLS ON DUST EMISSIONS AS INPUT TO MODEL

Year 4	TSP emissions No controls top source (kg/y)	TSP emissions No controls top 5 sources (kg/y)	TSP emissions No controls (kg/y)	TSP emissions With controls (kg/y)	EIS Nominated control efficiency
OB – Hauling excavator OB to emplacement area - Whynot	5,445,065	5,445,065	5,445,065	1,089,013	80%
CL – Hauling open coal to ROM pad - Whynot	111,528	743,520	743,520	111,528	85%
WE – OB dump& disturbed area - Uncontrolled	362,982	362,982	362,982	362,982	0%
WE – OB dump& disturbed area - Controlled	181,491	362,982	362,982	181,491	50%
CL – Hauling open coal in pit roads - Whynot	57,651	288,255	288,255	57,651	80%
Total	7,711,703	8,755,790	9,689,315	3,355,651	
UNDERESTIMATION by factor of	**2.3**	**2.6**	**2.9**		

Source: Hansen Bailey, Appendix H, EIS with Stephenson calculations in red based on Anglo American data

TABLE 4-3 YEAR 6 PREDICTIONS (PROJECT ONLY): 80% CONTROL EFFICIENCY & NO BACKGROUND

24 Hour PM_{10} Impact (Project Only Contribution) (ug/m³)						
Year 6	226A		226B		226C	
	80% Control	No Control	80% Control	No Control	80% Control	No Control
1	14	40.6	15.2	44.1	14.6	42.3
2	12.2	35.4	13	37.7	12.6	36.5
3	10.6	30.7	11.5	33.4	11	31.9
4	10.1	29.3	10.5	30.5	10.3	29.9
5	9.3	27.0	10.1	29.3	9.7	28.1
6	9.2	26.7	10	29.0	9.6	27.8
7	9.2	26.7	9.8	28.4	9.5	27.6
8	9.2	26.7	9.8	28,4	9.4	27.3
9	9	26.1	9.7	28.1	8.6	24.9
10	8.2	23.8	9	26.1	8.5	24.7

Source: Hansen Bailey, Appendix H, EIS with Stephenson calculations in red based on Anglo American data

TABLE 4-4 YEAR 6 EMISSIONS: INFLUENCE OF CONTROLS ON DUST EMISSIONS AS INPUT TO MODEL

Year 6	TSP emissions No controls top source (kg/y)	TSP emissions No controls top 5 sources (kg/y)	TSP emissions No controls (kg/y)	TSP emissions With controls (kg/y)	EIS Nominated control efficiency
OB - Hauling excavator OB to emplacement area Whynot	4,367,560	4,367,560	4,367,560	873,512	80%
OB - Hauling excavator OB to emplacement area - Whynot West	192,133	960,665	960,665	192,133	85%
CL - Hauling open coal to ROM pad - Whynot	122,012	813,413	813,413	122,012	0%
CL - Hauling open coal in-pit roads - Blakefield	97,916	489,580	489,580	97,916	50%
OB - Hauling excavator OB to emplacement area- Blakefield	78,734	393,670	393,670	78,734	80%
Total	7,279,935	9,446,468	11,010,126	3,785,887	-
UNDERESTIMATION by factor of	**1.9**	**2.5**	**2.9**		-

Source: Hansen Bailey, Appendix H, EIS with Stephenson calculations in red based on Anglo American data

TABLE 4-5 YEAR 9 PREDICTIONS (PROJECT ONLY): 80% CONTROL & NO BACKGROUND

24 Hour PM_{10} Impact (Project Only Contribution) (ug/m^3)						
Year 9	226A		226B		226C	
	80% Control	No Control	80% Control	No Control	80% Control	No Control
1	28.2	84.6	29.4	88.2	28.8	86.4
2	17.7	53.1	19.1	57.3	18.4	55.2
3	17.2	51.6	18.3	54.9	17.8	53.4
4	16	48.0	17.4	52.2	16.7	50.1
5	14.2	42.6	15.4	46.2	14.9	44.7
6	11.8	35.4	12.5	37.5	12.2	36.6
7	11.5	34.5	12.5	37.5	12.1	36.3
8	11.3	33.9	12.2	36.6	11.8	35.4
9	11	33.0	12	36.0	11.6	34.8
10	11	33.0	11.7	35.1	11.3	33.9

Source: Hansen Bailey, Appendix H, EIS with Stephenson calculations in red based on Anglo American data

TABLE 4-6 YEAR 9 EMISSIONS: INFLUENCE OF CONTROL ON DUST EMISSIONS AS INPUT TO MODEL

Year 9	TSP emissions No controls top source (kg/y)	TSP emissions No controls top 5 sources (kg/y)	TSP emissions No controls (kg/y)	TSP emissions With controls (kg/y)	EIS Nominated control efficiency
OB - Hauling excavator OB to emplacement area - Whynot	6,568,000	6,568,000	6,568,000	1,313,600	80%
CL - Hauling open coal to ROM pad - Whynot	181,787	1,211,913	1,211,913	181,787	85%
OB - Hauling partings to emplacement area - Whynot	77,949	389,745	389,745	77,949	0%
CL - Hauling open coal in-pit roads - Whynot	76,929	384,645	384,645	76,929	50%
WE - OB dump& disturbed area - Uncontrolled	348,556	348,556	348,556	348,556	80%
Total	9,273,411	10,923,049	12,170,546	4,019,011	-
UNDERESTIMATION by factor of	**2.3**	**2.7**	**3.0**	-	-

Source: Hansen Bailey, Appendix H, EIS with Stephenson calculations in red based on Anglo American data

5 PREDICTED IMPACTS

Predicted impacts are calculated by adding predictions from the model plus background to arrive at a predictive cumulative impact.

5.1 IMPACTS USING ANGLO AMERICAN DATA

For the reasons set out earlier in the report regarding the emissions inventory, the predicted impacts on air quality generated by the PEL model are unreliable and may not be representative. Even using Anglo's input data and assuming effective continuous nominated control measures the cumulative impact from the project will exceed the NEPM guidelines.

This outcome does not accord with "cautious approach" recommended by the Planning Assessment Commission when it assessed a prior version of the project[1]. Nor does it reflect the application of the "most stringent controls and conditions"[2]. It is inappropriate given the sensitivity of its location.

Furthermore, for every 20 ug/m^3 increase in PM_{10} there will be an associated 0.6% to 2 % increase in hospital admissions for cardiovascular and pulmonary disease. (Pope and Dockery 2006). This long term research reinforces the concept that a "cautious approach" is paramount.

Figures 5.1, 5.2 and 5.3 illustrate that these Project Only predictions will exceed Impact Assessment Criteria when added to the Background air quality. Furthermore, these predictions have a potential to be gross underestimates if any of the nominated dust controls fail to meet the nominated 80% efficiencies.

5.2 ASESSMENT OF SHORT TERM EXPOSURE

The PEL Appendix H assessment has been based on annual averages, which have then been divided by 365 days (a year) to derive the 24-hour PM_{10} input. This creates two problems. The predicted impacts generated by the model are also necessarily imprecise and the 24-hour average PM_{10} impacts may not be representative of what occurs in the shorter term or under unfavourable meteorology.

Due to the annualised nature of the model inputs, the model's predicted impacts are unable to define potential short term exposures. Accordingly, it is impossible to adequately assess short term impacts on humans, livestock and studs using the PEL assessment.

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1 Planning Assessment Commission(2013) – Review Report on Drayton South Coal Project,(December 2013), p26

2 Planning Assessment Commission(2013) – Review Report on Drayton South Coal Project,(December 2013), p27

Again it is reiterated that Annual averages "flatten" the data and do not show enough resolution for short term high concentration particulate matter impacts on human and equine air quality. Refer PEL page H-iii of Appendix H of EIS (Hansen Bailey 2015).

These predicted air quality impacts derived from annual average emission rates (Tables A1-A3 in Appendix H) and then added to the selected air quality monitoring data collected by Anglo American have been used to calculate cumulative air quality impacts. This selective accumulation has incorporated a bias into the final predicted cumulative impacts which materially biases the view of the project.

Table 4 of DPE SEAR summarises these cumulative PM_{10} impacts for residential receivers. It can be seen from this table that cumulative annual PM_{10} impacts are of the order of 70% of the current annual PM_{10} criterion. Similarly, 24-hour PM_{10} impacts peak at approximately 60% of the current 24-hour criterion.

However, these predictions are incremental and only refer to the proposed "project only" contribution and therefore are not cumulative and potentially misleading.

Nor do these calculated percentages refer to any more stringent NEPM or Impact Assessment Criterion.

Furthermore, the cumulative impact, which should include background or existing air quality, may be much greater for 24-hour PM_{10} and $PM_{2.5}$ ground level concentrations. Especially, if worst case ambient air quality monitoring data were added to worst case model predictions.

If the nominated dust control measures of 80% are not achieved then these impacts on air quality will be further exacerbated.

FIGURE 5-1 PREDICTED ANNUAL PM_{10} CONCENTRATION YEAR 9 - PROJECT ONLY

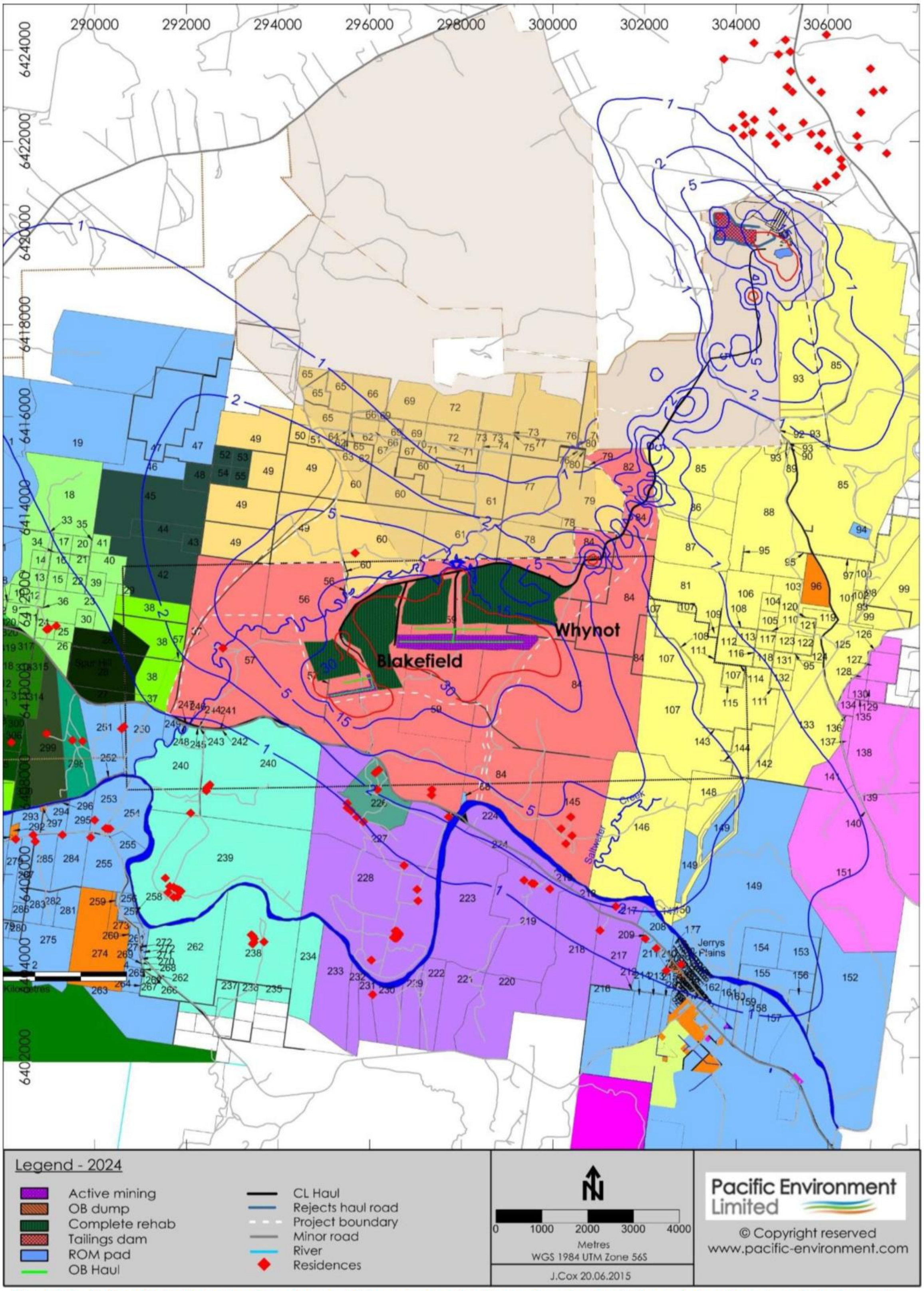

Figure 3-5: Predicted annual average PM_{10} concentrations due to emissions from Drayton South only - Year 9

Note: Figure 5.1 (RTS Figure 3-5) presents the predicted annual average PM_{10} for Year 9 of the proposed Drayton South Project only.

FIGURE 5-2 PREDICTED ANNUAL PM_{10} CONCENTRATION PROJECT AND BACKGROUND

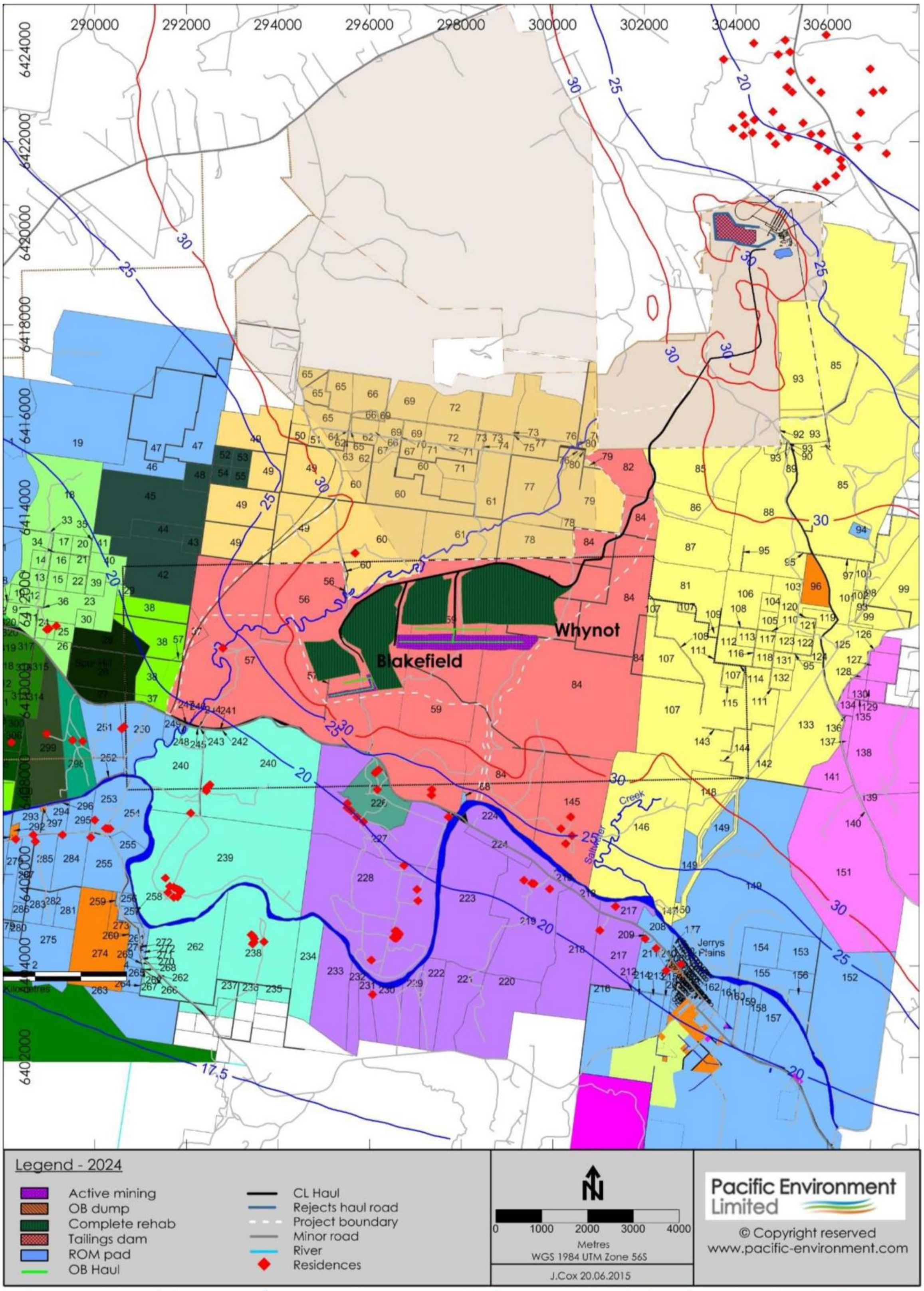

Figure 3-6: Predicted annual average PM_{10} concentrations due to emissions from Drayton South and other sources - Year 9

Note: Figure 5.2 (RTS Figure 3-6) presents the annual average PM_{10} ground level concentrations predicted for the Drayton South project added to the background ambient air quality which has been impacted on from other sources of PM_{10}.

The difference between Figures 5.1 and 5.2 is that Figure 5.2 has contours representing the accumulation of model predictions for the Project with the background ambient air quality (PM_{10}) which depicts PEL's prediction that the mine will only contribute 2 micrograms per cubic metre but when this is added to the background the cumulative impact is of the order of 20 – 25 micrograms per cubic metre. Such a cumulative impact would be at the current national maximum standard for annual PM_{10}.

It is again noted that the NEPM was varied on 3 February 2016 and more stringent annual average and 24-hour $PM_{2.5}$ particle level standards of 8 ug/m^3 and 25 ug/m^3, respectively have been introduced. National environment ministers have also agreed to establish an annual average standard for PM_{10} particles of 25 µg/m^3. Furthermore, $PM_{2.5}$ and PM_{10} particle level standards are proposed to be systematically tightened over the next 5 to 10 years by National Environment Protection Council (NEPC) and then most likely adopted by EPA NSW.

FIGURE 5-3 24HR AVERAGE PM_{10} CONCENTRATION PROJECT ONLY

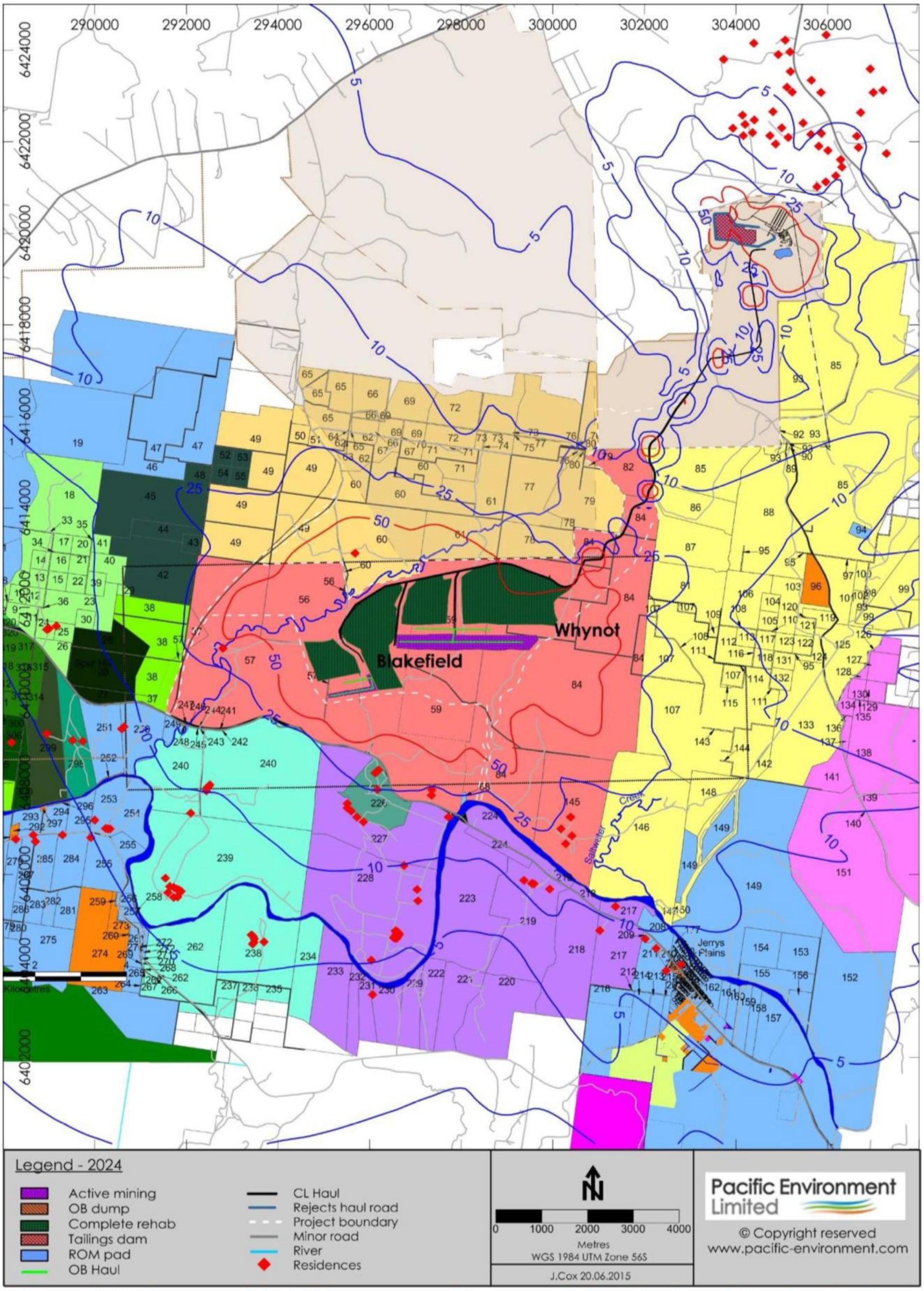

Figure 3-3: Maximum predicted 24-hour average PM_{10} concentrations due to emissions from Drayton South only - Year 9

Note: Figure 5.3 (RTS Figure 3-3) presents the Project Only predicted average 24-hour PM_{10} impact. RTS does not present a cumulative prediction for Project contribution plus background. This may be an oversight; otherwise it would appear to be misleading. It is considered that the predicted cumulative impact will exceed the criterion.

6 RESPONSE TO ANGLO AMERICAN CLAIMS

Anglo American claims in the RTS that no coal dust will reach the studs. This is unverified and in our view incorrect.

It is evident that a very large amount of dust associated with coal mining will be generated by the project. The EIS and RTS report Drayton South could generate 11,000 kilograms (kg) of dust per day with all nominated controls in place or 33,344 kilograms per day without dust control. (Refer Tables 4.2, 4.4 and 4.6 of this report which are derived from Table 7.4 of Appendix H page H-55 to H-57 in Hansen Bailey EIS).

It is also evident that this dust will impact on air quality at the studs. It is evident from analysis of Anglo American's own predictions that cumulative air quality impacts will exceed relevant criteria.

Anglo American–claims that there will be "no impact on farms beyond that of normal agriculture activities". Our research reveals that dust generated from normal agricultural soil management such as ploughing generates 4.5 kilograms per hectare.

To create the 11,000kg of dust per day that the Drayton South Coal project will generate, with all nominated dust controls, it would be necessary to plough 2,400 hectares in a day (or over 7,000 hectares if dust control is not maintained); which is just not possible. This would not be considered to be normal agriculture in the Hunter Valley.

This level of dust would create a dangerously dusty environment for the studs for the duration of the project's 15 year life of mining.

7 CONCLUSIONS

In the Final Assessment Report (FAR) the DPE has concluded that economic costs and benefits are the significant matters in their assessment. The FAR concludes that the environmental and social impacts can be resolved by Condition.

The basis of these conclusions regarding air quality is the dispersion modelling of emissions from the Drayton South project and their predicted impacts. This model assumes that all dust is emitted equally every hour per annum. Therefore, this approach will have no resolution of short term peaks (PEL RTS p114).

There is significant uncertainty in predicting cumulative 24-hour average ground level concentrations (GLCs). (PEL RTS p114);

$PM_{2.5}$ was modelled but without addition of background $PM_{2.5}$ ground level concentrations. The omission of background concentrations has skewed the significance of the ground level impacts for these fine particles.

The following data is misleading:

- EIS Table 7.3 Errors in calculations;
- EIS Table 4.1 Annual average DDG monitoring results close to monthly limit. Therefore, there is no resolution of short term monthly peaks and associated consequential damage of elevated and unreported dust fall-out;
- There will be an underestimation of emissions if dust suppression is not as nominated all of the operating time; consequential damage will be emissions of dust up to three (3) times higher than those used in the emissions input file for the dispersion model;
- 1.4 Mt of ROM from existing Drayton mine not included in emissions inventory and therefore not included in model predictions of air quality impacts;
- Dust Deposition Gauge (DDG) Location D9 should be used as an indicator of typical deposited dust for the Coolmore and Darley Woodlands properties because it is of a similar proximity to the current Drayton mine as the proposed Drayton South project is to the studs.

Incomplete Modelling:

- Additional dispersion modelling performed for RTS reports Year 9 peak GLC contours for PROJECT ONLY. Cumulative project plus background air quality impacts have not been presented as they were for Years 4, 6 and 12 in the EIS.

- Impact from Drayton South Coal Project on air quality on stud farms will be much greater than normal agricultural activities.

Therefore it is further concluded that:

- The cumulative Impact of this Project will be dangerously dusty because it is predicted by the PEL model that the current 24-hour NEPM PM_{10} limit of 50 ug/m^3, which is used as the Impact Assessment Criterion in NSW, will be exceeded.

- Furthermore, it is expected that this Criterion may be reduced to 40 ug/m^3 in the near future.

- For every 10 ug/m^3 increase in PM_{10} there will be an associated 0.6% to 2 % increase in hospital admissions for cardiovascular and pulmonary disease. (Pope and Dockery 2006).

- The air quality impact predictions of the PEL model are unreliable and unrepresentative, because of the misleading input data, and do not form a proper basis for the assessment of the project. Additionally, the predicted impacts will be significantly greater (up to three times) if nominated control measures are not achieved or are not continuously achieved.

- Ambient background air quality parameters should have been measured on a 24-hour average basis or same averaging period as the Impact Assessment Criterion or Design Ground Level Concentration (DGLC). By annualising air quality monitoring data, detail of the short term impacts is lost and unable to be resolved.

- Anglo American has used annualised ambient air quality monitoring and/or emissions inventory data to prepare selective 24-hour averages for comparison with the predicted project only impacts. This approach is potentially misleading and has compromised the resolution of the modelling impact predictions.

- Drayton Dust Deposition Gauge (DDG) Location D9 should be used as an indicator of typical deposited dust for the Coolmore and Darley Woodlands properties because it is of a similar proximity to the current Drayton mine as the proposed Drayton South project is to the studs.

- If DDG D9 is used as an indicator, it would be likely that there would be air quality exceedances on a monthly basis for most dry months of any year.

- The model inputs provided by Anglo are not sufficiently representative of the likely impacts of the projects and will therefore bias the predicted outcomes. In addition, the model input data is incomplete and more importantly in our view the nominated control measures are unachievable.

- Based on Anglo American's data under a worst case scenario the "project alone" impacts on air quality will exceed the relevant air quality limits from Year 4. When this project impact is added to background levels the cumulative impacts will substantially exceed the impact assessment criterion.

- Project Only predictions will exceed Impact Assessment Criteria when added to the Background air quality.

- Furthermore, these predictions have a potential to be gross underestimates if any of the nominated dust controls fail to meet the nominated 80% efficiencies.

Therefore it is further concluded, that it is impossible to adequately assess short term impacts on humans, livestock and studs using the PEL assessment. Using Anglo's own data it is evident that:

- Cumulative impact of mine (background plus Anglo predicted impacts) will lead to air quality exceedances

- Effectiveness of dust suppression measures overestimated

- Air quality impacts are underestimated

Cumulative impact is predicted to be dangerously dusty because it will be greater than the currently applicable NEPM Criteria, being:

- 24 Hour PM_{10} NEPM Criterion - 50 ug/m^3

- Annual PM_{10} NEPM Criterion - 25 ug/m^3

- 24 Hour $PM_{2.5}$ NEPM Criterion - 25 ug/m^3

- Annual $PM_{2.5}$ NEPM Criterion - 8 ug/m^3

APPENDIX A – PAC PRESENTATION SLIDES, NOVEMBER 2016

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Drayton South Coal Project - AIR QUALITY IMPACTS

Presented to

PLANNING ASSESSMENT COMMISSION
Muswellbrook, NSW
NOVEMBER 2016

Peter Stephenson
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Managing Director –Stephenson Environmental Management Australia
and Odour Research Laboratories Australia
Federal President, Air Pollution Control Equipment Manufacturers Association of Australia
Former Member of NSW Load Based Licensing Technical Review Panel
NATA Accredited signatory for Chemical Testing (Air Emissions)
Author – South Australia EPA Air Quality Monitoring Manual

Commissioned by Hunter Thoroughbred Breeders Association

1

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Summary

1. Air quality in Upper Hunter region is at critical point now – any further contribution of the mine will be significant
2. Cumulative impact overlooked: Project assessment fails to incorporate background
3. The air quality assessment undertaken underestimates impact
4. DP&E Final Assessment Report does NOT address these issues or does it add to knowledge base on Air Quality impacts in this matter

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Air quality in Upper Hunter region is at critical point

1. Suspended Fine Particulate PM2.5 and PM10 already exceed EPA NSW criteria

2. Deposited dust at criterion EPA NSW limits (from existing Drayton mine)

3

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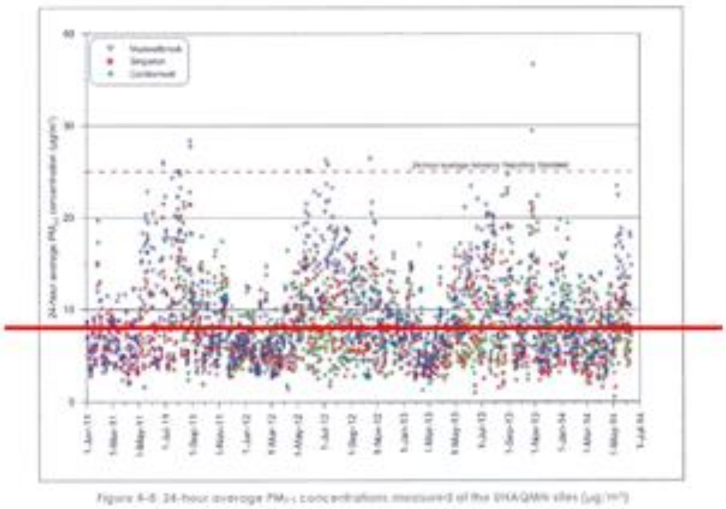
Upper Hunter air quality already exceeds EPA limits

eg Daily AVERAGE $PM_{2.5}$ CONCENTRATIONS (annual)



Annual $PM_{2.5}$ limit (8ug/m3)

NEPM commitment to reduce to 7 ug/m3 by 2025

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Anglo Consultant states that studs will be impacted by mine

Anglo consultant has advised NSW EPA that $PM_{2.5}$ impacts will shift from Muswellbrook to the stud farms if the Drayton South mine proceeds (UHAQPM 2014 report prepared for NSW EPA)

- **"annual average $PM_{2.5}$ in Muswellbrook will increase in 2016 but decrease in 2021 as Drayton mine closes and moves to Drayton South"**

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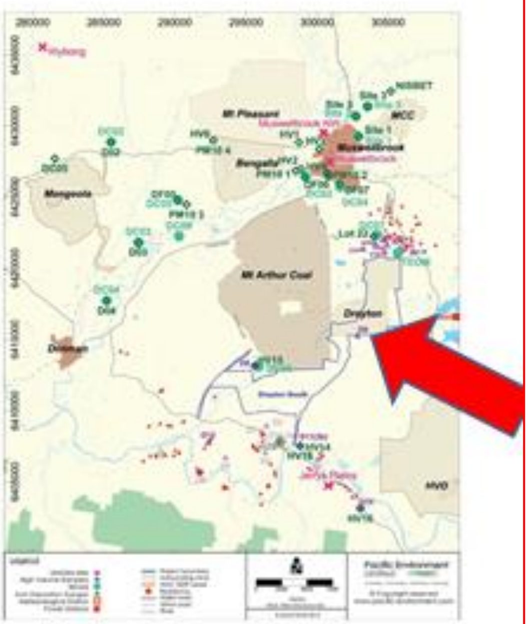
Dust deposition rates are at NSW EPA limits

Existing Drayton mine air quality monitoring site provides representative dust deposition data that shows impact of Drayton South on the studs (Note D9: similar location and wind direction of studs to Drayton South)

But D9 not used in EIS to predict dust deposition impacts.



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Dust deposition

1. D9 exceeds EPA limit (4g/m2/month)
2. Annual average results – not monthly

(This will tend to flatten peaks and hide exceedances .
EPA NSW Approved Methods require monthly averages)

Table 4.1: Annual average dust deposition data (insoluble solids) – 1998 to 2014 (g/m²/month)

Year	D1	D2	D4	D5	D6	D7	D8	D9	D10	D11 (3a)	D11 (3b)	D12
1998	1.1	0.7	-	0.8	1.8	2.6	1.2	2.7	-	-	-	-
1999	1.4	1.1	2.4	1.2	1.2	0.8	2.1	2.6	-	-	-	-
2000	1.1	4.1	-	1	1.3	2.7	1.6	3.4	-	0.8	-	-
2001	1.2	1.8	-	1.2	1	-	1	2.6	0.9	0.9	-	0.7
2002	-	-	-	-	-	-	1.5	4.1	1.3	1	-	1.8
2003	-	-	-	-	-	-	0.8	2.3	0.9	0.9	-	0.8
2004	-	-	-	-	-	-	1.4	2.9	1.1	1.5	-	1.3
2005	-	-	-	-	-	-	0.8	2.5	0.9	0.9	-	0.9
2006	-	-	-	-	-	-	1.1	2.9	0.9	1	-	1.5
2007	-	-	-	-	-	-	1.1	2.4	0.9	1.4	-	1.1
2008	-	-	-	-	-	-	0.9	2.9	1	1.1	-	0.7
2009	-	-	-	-	-	-	1.1	3.8	1.5	1.6	-	2.1
2010	-	-	-	-	-	-	0.9	3.2	0.9	1.6	-	1.6
2011	-	-	-	-	-	-	1	-	1.6	2.3	-	2.2
2012	-	-	-	-	-	-	1.6	3.6	1.4	2.1*	1.4*	1.9
2013	-	-	-	-	-	-	1.8	3.1	1.9	-	1.4	3.5
2014	-	-	-	-	-	-	2.4	3.3	-	-	1.5	-

* Dust gauge D11 (3a) was removed in March 2012 and move to another site and renamed D11 (3b).

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Underestimation of air quality impacts

- Air quality impact = emissions + background
  - –Project emissions underestimated
    - •modelling assumptions skew results, and
    - •dust control overstated
  - –Background ignored
- Project impacts underestimated
- •Cumulative impacts not assessed

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Project emissions underestimated: Effectiveness of dust control overstated

1. Dust suppression overstated @ 50%-80% control. Evident from analysis of yr 4, 6 and 9 data that 80% effective control predicted. To achieve compliance at the studs the Mine must achieve 80% control consistently throughout operations. This will require a massive water source in a traditionally dry region.
2. If 80% dust suppression target not achieved dust will be 2 to 3 times greater than predicted
3. Existing Drayton Mine already shows dust deposition at EPA limits with current dust control (Dust Stop) – therefore, more than 80% control will be needed

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Eg INFLUENCE OF DUST EMISSION CONTROL overstated

Year 9	TSP emissions No Controls top source (kg/y)	TSP emissions No Controls top 5 sources (kg/y)	TSP emissions No Controls (kg/y)	TSP emissions with controls (kg/y)	EIS nominated Controls
OB - Hauling excavator OB to emplacement area - Whynot	6,568,000	6,568,000	6,568,000	1,313,600	80%
CL - Hauling open coal to ROM pad - Whynot	181,787	1,211,913	1,211,913	181,787	85%
OB - Hauling partings to emplacement area - Whynot	77,949	389,745	389,745	77,949	0%
CL - Hauling open coal in-pit roads - Whynot	76,929	384,645	384,645	76,929	50%
WE - OB dump& disturbed area - Uncontrolled	348,556	348,556	348,556	348,556	80%
Total	9,273,411	10,923,049	12,170,546	4,019,011	-
UNDERESTIMATION by factor of	2.3	2.7	3.0	-	-

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MODEL ASSUMPTIONS SKEW RESULTS

- Model assumes all dust is emitted equally every hour per annum *(PEL p114 RTS)*
- Significant uncertainty in predicting cumulative 24 hour average GLC *(PEL p114 RTS)*
- Total dust impacts based on fixed ratio of TSP to PM_{10} and $PM_{2.5}$ –
  - Fixed ratios may not reflect actual dust mix particle sizes & conditions.
  - Thus underestimating impacts of small particles
- *Model predictions are compromised and may significantly underestimate air quality impacts*

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Background air quality ignored

- If background PM_{10} levels of approximately 25 ug/m3 are added to predictions at locations near the studs, the daily NSW EPA criteria of 50 ug/m3 will be exceeded. Similarly, annual 25 ug/m3 criterion will be exceeded.

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Cumulative impact not assessed

eg Project assessment of PM 10 not include background (annual and 24hr) : EPA criteria 25 ug/m3

Project only (2 ug/m3)

Project + other sources= 25-29 ug/m3

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YEAR 9 PROJECT ONLY Model Predictions: 80% CONTROL & NO BACKGROUND added

24 Hour PM_{10} Assessment			
Year 9	Project Contribution (ug/m^3)		
Sources	226A	226B	226C
1	28.2	29.4	28.8
2	17.7	19.1	18.4
3	17.2	18.3	17.8
4	16	17.4	16.7
5	14.2	15.4	14.9
6	11.8	12.5	12.2
7	11.5	12.5	12.1
8	11.3	12.2	11.8
9	11	12	11.6
10	11	11.7	11.3

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Conclusion

Using Anglo's own data it is evident that:

1. Cumulative impact of mine (background plus Anglo predicted impacts) will lead to air quality exceedances
2. Effectiveness of dust suppression measures overestimated
3. Air quality impacts are underestimated

If project is approved the Air Quality will diminish further; especially at studs

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APPENDIX B – CURRICULUM VITAE – PETER W STEPHENSON

PETER WILLIAM STEPHENSON

PRINCIPAL CONSULTANT / MANAGING DIRECTOR / LECTURER & VISITING EXAMINER/ EXPERT WITNESS

M.App.Sc., (Chemical Engineering & Industrial Chemistry), UNSW
Dip.App.Sc., (Biochemistry & Organic Chemistry), Swinburne Institute of Technology.
Environmental Impact Assessment Certificate, Sydney University

DISTINGUISHING QUALITIES

- Environmental management, mitigation and control
- Air quality and odour testing and management
- Air quality and odour impact assessment
- Odour and flavour chemistry
- Industrial and environmental noise
- Expert Witness

PROFESSIONAL APPOINTMENTS

Industry Representative, NSW Load Based Licensing Technical Review Panel (2000-2006)

Consultant to Oil companies and Australian Taxation Office (ATO) (1986 to 1998) to develop the Vapour Recovery algorithm which was used to determine tax rebates for recovered petroleum vapours that previously had duty paid.

Appointed to Commonwealth NGO National Environment Protection Measures Consultative Group

Appointed to UNSW Institute of Environmental Studies Advisory Committee

Associate Fellow, Australian Institute of Management

National President (2002 to present), Air Pollution Control Equipment Manufacturers Association (APCEMA)

Foundation Member, CH19/1 Subcommittee of Standards Association of Australia - Preparation of Stationary Source Emission Standards AS 4323.1, AS 4323.2 and AS 4323.3 – odour – Dynamic Olfactometry.

Committee Member (NSW Branch) and member of Clean Air Society of Australia and New Zealand (CASANZ)

Foundation Member (1982) & Federal Secretary (1989-1997) Training Activities Committee CAZANZ

Member, Air & Waste Management Association - formerly known as Air Pollution Control Association (USA)

Member, Health Safety & Environment Committee (1979-1991) Chamber of Manufactures of NSW

Member, Environmental Working Group, Australian Industry Group (1988 to present)

UNIVERSITY APPOINTMENTS

UTS Faculty of Design, Architecture & Building - Lecturer Environmental Management and Indoor Air Quality in the Built Environment.

UWS Faculty of Engineering - Lecturer

Macquarie University - Examiner - Graduate School of the Environment, 1993-1994

PUBLICATIONS, PRESENTATIONS AND PAPERS

AIR POLLUTION CONTROL EQUIPMENT MANUFACTURERS ASSOCIATION (APCEMA)

Lecturer: Topics include Air Quality; Dust & Fume Control; Odour Measurement & Control; Indoor Air Quality & Emission Measurement Instrumentation. 1990 to present. Approx 40 x 2-day seminars in Australia, NZ, Malaysia and Indonesia.

AUSTRALIAN SUSTAINABLE BUSINESS NETWORK (ASBN)

Lecturer,Facilitator: Odour & Emissions Management , Annual workshops 1999-2016

AUSTRALIAN INDUSTRY GROUP

Lecturer & Facilitator: Odour Management Workshops – 10 workshops 1995- 2011

ENVIRO 04 CONFERENCE

Ambient Air Odour Measurement for Air Quality Testing 2004, Sydney

AUSTRALIAN INDUSTRY GROUP

Presenter: NSW Environmental Legislative Updates - 2004, 2005 and 2006

AIR QUALITY ISSUES AND ALUMINA ISSUES

Albany International, Gladstone 2003,2005, Port Kembla 2004, Gosford 2006, Karratha 2008 & 2010

ODOUR MANAGEMENT FOR RETAIL FOOD BUSINESS

NSW DEC, South Sydney Regional Organisation of Councils, Sydney, 2004

ODOUR MEASUREMENT and CHEMISTRY OF ODOUR NEUTRALISING AGENTS

Industrial Odour Control Course, CASANZ Sydney, 1992

SAMPLING & CONTROL - AIRBORNE PARTICLE EMISSIONS FROM BAGASSE FIRED BOILERS

Air Pollution Control Equipment Sdn & PT ERA Rasada, Indonesia, 1992

ASBESTOS IN PUBLIC BUILDINGS - INDOOR AIR POLLUTION &HEALTH WORKSHOP

University of Sydney, 1990

CASE STUDY - ODOUR CONTROL - CHICKEN OFFAL RENDERING INDUSTRY

Air Pollution Control - presented to NSW State Pollution Control Commission, 1990

STEPHENSON ENVIRONMENTAL MANAGEMENT AUSTRALIA (SEMA)

Managing Director and Principal Consultant - 1983 – Present.

Stephenson Environmental Management Australia (SEMA) & Odour Research Laboratories Australia (ORLA) consult to industry, local, state and federal government utilities with independent advice in monitoring, analysis and control of:

- Emissions to atmosphere (NATA accredited) - stack, ambient, air toxics and odour
  - Odour measurement to AS4323.3 and AS4323.4 (NATA accredited olfactometry laboratory)
  - Odour impact assessment and management
  - Airborne occupational health contaminants (workplace)
  - Atmospheric dispersion modelling
  - Indoor air quality
  - Industrial and environmental noise
  - Environmental impact assessment
  - Environmental audits

SELECTION OF SEMA CONSULTANCY WORK

WASTE MINES GAS POWER STATIONS

Emissions monitoring and management at Glennies Creek, Teralba, Tahmoor in NSW and Oaky Creek (Glencore/Xstrata) and Daandine (Arrow Energy/Clarke Energy) in Central Queensland Bowen Basin.

UNDERGROUND COAL MINES, COAL PROCESSING AND ASSOCIATED VENTILATION EMISSIONS MONITORING

Appin, Tower (BHP Billiton), Blakefield South, Bulga Underground (Glencore/Xstrata) coal mines, Illawarra Coal & Coke (Corrimal & Coalcliff)

COAL FIRED POWER STATIONS

Emissions monitoring at NSW Power Stations (Bayswater, Liddell, Vales Point, Eraring, Mt. Piper, Wallerawang) and Callide C in Queensland.

LANDFILL and SEWERAGE DIGESTOR GASES as FUEL for WASTE GAS POWER STATIONS

Various sites in NSW

VAPOUR RECOVERY UNITS & VAPOUR EMISSION CONTROL SYSTEMS (VECS)

Emissions collection efficiency and recovered liquid product for Australian east coast fuel terminals including BP, Caltex, Esso, Vopak, Mobil, Shell , SMP and VIVA Energy

THERMAL OXIDISERS COMBUSTION CONTROL SYSTEMS

Shell Bitumen & printing companies - IPMG, Hannanprint, Offset Alpine and Fairfax

SOUTH AUSTRALIA EPA

Development of Air Sampling and Analysis Methods Manual

CROSS CITY TUNNEL NSW DEPARTMENT of PLANNING

Auditor for airborne emissions

EMISSIONS TO AIR INVENTORY

Emissions inventory of air discharged from Sydney Kingsford Smith Airport. Prepared inventory for inclusion in FAC Air Quality Management Plan

THIRD RUNWAY AIR QUALITY IMPACT STUDY & AIR QUALITY MONITORING

Sydney Kingsford Smith Airport – AQIS prepared for Kinhill Engineers on behalf of FAC and AQM over 3 years for Baulderstone during construction.

NORTH WEST TRANSPORT OPTIONS & STUDY (F2)

Air quality EIS for NSW RTA - Member F2 East Maunsell study team; Member F2 West Manidis Roberts /SMEC study team.

PARK STREET (CROSS CITY) TUNNEL

Air quality EIS for NSW Department of Main Roads. Member Wargon Chapman & Partners and Manidis Roberts study team. (1990)

SYDNEY HARBOUR TUNNEL

Portal and discharge stack dispersion studies plus on-going consultation to Sydney Harbour Tunnel Co. re airborne emissions and emission dispersion (1986 - 1993)

SYDNEY HARBOUR TUNNEL

Air quality EIS for NSW DMR. Member Cameron McNamara EIS study team. (1986)

BENNELONG POINT SYDNEY OPERA HOUSE CAR PARK

Air quality EIS and general consulting to NSW Department of Public Works re odour, dusts and airborne emissions

EASTERN DISTRIBUTOR, SYDNEY

Air quality EIS and working paper for Eastern Distributor NSW DMR. The air quality component of Jackson, Teece, Chesterman, Willis study team.

EASTWOOD COUNTY ROAD SCHEME

Air quality EIS for Eastwood Country Road Scheme NSW DMR. Member Cameron McNamara/Travers Morgan study team

NSW PUBLIC WORKS DEPARTMENT, NSW LOCAL GOVERNMENT COUNCILS (Wyong, Gosford, Great Lakes), SYDNEY WATER, MELBOURNE WATER

Air quality studies and odour control related to trunk sewer systems.

STACK, AMBIENT, AIR TOXICS & ODOUR FOR FOLLOWING:

AGL
Alcoa
Arrow Energy
Alstom Power
Austral Bricks
Australian Bulk Minerals
Australian Refined Alloys
Boeing
Bonds Australia
Boral
Borg
BP
Bridgestone TG
Caltex Refineries
Capral
Clarke-Energy
Cleanaway
Colgate
CSR
DIC Graphics
DSITIA
Dunlop
EDL
Elf Farm
Esso
Glencore Xstrata
Leighton Contractors, Cross City Tunnel
Macquarie Generation
Mobil
Nationwide Oils
O-I Australia
Orica
Qenos
PPG Australia
Renewed Metals Technologies
Shell Refining
Shoalhaven Starches
SMP
Tooheys LionCo
Veolia
VIVA Energy
Vopak
Woodside