3 October 2013

Coolmore Australia
Denman Road
Jerry's Plains NSW 2330

Attention: Hellen Georgopoulos

Dear Hellen,

Re: Review of the Drayton South Coal Project 'Preferred Project Report'

We reviewed the Drayton South Coal Project Environmental Assessment (EA) in January 2013 for Coolmore Australia (Coolmore) and Darley Stud (Darley). You have now commissioned Gilbert & Sutherland to review the Drayton South Coal Project Response to Submissions Report ('the Response Report', prepared by Hanson Bailey in May 2013) and a Preferred Project Report ('the PPR', prepared by same in August 2013). Our aim was to assess whether the issues highlighted in our review of the EA had been addressed in the Response Report and/or rectified in the updated proposal for development of the Drayton South Coal Project. A copy of our January 2013 review is attached to this document as Attachment 2.

Background

The Drayton South EA was publicly exhibited between 7 November and 21 December 2012, after which numerous submissions were made to the Department of Planning and Infrastructure (DPI). The Response Report was prepared at the request of DPI.

In March 2013, the Minister for Planning & Infrastructure issued a request to the Planning Assessment Commission (PAC) to review the Drayton South Coal Project. In May 2013, that request was delayed by the Minister to allow further time for DPI to review the Response Report with a particular focus on the potential impacts on the nearby thoroughbred horse breeding studs – members of the HTBA.

Between publishing the EA and the Minister delaying the PAC review request, the proponent (Anglo American) further changed the proposal, rendering parts of the EA obsolete. As a result of these changes, the Director General requested called for a PPR to be prepared, which Hanson Bailey provided in August 2013.

Our approach

Given limited time, our review of the PPR and the Response Report focused on any changes to the project proposal since preparation of the EA with respect to the affects of those changes on;

- the concerns highlighted in our original review
- the risks posed to the thoroughbred horse breeding studs
- the risks posed to the environment.

Overview and advice

Our review of the PPR and Response Report identified the following key changes to the original proposal;

- Changed infrastructure requirements (including the haul road and discharge pipeline) resulting in a new Project Boundary.
- A redesigned Houston Visual Bund that we understand seeks to align with the option proposed in the public submission received from Coolmore Australia.
- A significantly altered final landform encompassing a smaller final void, reduced slope of the highwall and an attempt to achieve a more natural landscape.
- A further retreat from Saddlers Creek.

A number of environmental aspects were considered in our original EA review including water, agricultural land use, ecology, soil and land capability, geochemical impacts, stygofauna, non-aboriginal heritage, equine health, acoustic impact, air quality and traffic. The Response to submissions report contains additional explanations and information (particularly with respect to ecology and styygofauna) that has addressed a number of our earlier concerns.

However, the changes posed in the PPR with respect to the configuration and impacts of the Final Landform are substantial. They represent a significant shift in the Proponent's approach to material handling and site rehabilitation. Consequently, these changes have caused the Proponent to make new predictions about the surface and groundwater impacts of the project and to change its assessments of the short, medium and long-term risks associated with surface and groundwater resources in the region. The importance of these changes and our ongoing concerns regarding equine health and air quality are outlined below in the following sections.

Surface water issues

The surface water impact assessment addendum of the PPR (prepared by WRM) states:

> *'With regards to surface water impacts, the revised conceptual final landform design is the only amendment that requires further assessment'.*

Hanson Bailey engaged WRM to update the final landform/water balance model and associated surface water impact assessment that we have previously reviewed. As such, all previous advice remains valid with additional/updated comment herein provided regarding the revised conceptual final landform design.

Our review of the updated final void balance model identified significant concerns regarding the predictive capability of the model in representing the potential long-term conditions and impacts of the final mine void water. Whilst the basic methodology may seem appropriate, there are fundamental and critical assumptions that do not appear based in science nor do they represent real-world behaviours over time. In particular, the behaviour of the final void salinity and salt accumulation appears to be erroneously influenced by an entirely subjective and unsupported assumption – that of a 1ML/day constant movement of water from the void to the backfill, even under hydraulic conditions that would result in flow from the backfill into the void.

For clarity, the modelling has adopted an arbitrary and unsupported assumption that there would be 1ML/day seeping from the void to the backfill every day. This is simulated as occurring during times when water is simulated to be flowing from the backfill to the void (i.e. in the opposite direction at a reported long-term average of 1.33ML/day). The critical implication is that this assumption drives the modelled removal of salts from the void and therefore avoids the potential hypersalinity that was evident in the original proposal.

The design described in the PPR now has the floor of the void perched above Saddlers Creek and the Hunter River. Consequently, the potential for future migration of hypersaline water from the void to the receiving environment is significantly increased. In our opinion, this requires significantly rigorous additional scrutiny. This has not happened.

The paucity of information provided in respect of inputs and calculations means that we cannot fully interrogate the basis of these assumptions and outcomes. Further more detailed examination of this matter is strongly recommended.

Groundwater issues

The PPR and Response Report provide additional information in respect of groundwater issues and a third party peer review (by a Dr Merrick) of the groundwater model has

been undertaken. Nonetheless, a number of points in respect of the groundwater model (GWM) identified by our EA review remain unaddressed. These may be summarised as follows.

The data indicates that the project area supports three distinct groundwater systems:

a. Alluvium associated with the Hunter River and its tributaries;

b. Weathered bedrock (regolith) near ground surface; and

c. Low permeability Permian aquifers associated with the Wittingham Coal Measures.

As noted in our EA review, the model's approach of combining the alluvium with the regolith as Layer 1 was not justified and remains so. These two layers have different hydraulic properties, landform characteristics and areas of potential influence. It is also important to note that in this locale, where the alluvial water is an important resource and landscape feature upon which stakeholders and the environment rely, the modelling approach adopted by the proponent fails to provide a proper assessment of the mine impacts on the alluvium alone. This is problematic.

This lack of modelling regard for the alluvium is in contrast to the deeper layers. The model incorporates 18 layers within the deeper coal seam strata which (at AGE's own description) do not contribute vertical flow. Our observation is that the modelling is focused primarily on the deeper aquifers associated with the coal resource with little regard for the shallow aquifers where the potential for stakeholder impact is greatest.

Another key issue is that, in a region that features many coalmines exhibiting a range of extraction methods and working configurations, cumulative impacts of this proposal have essentially been ignored in the model. The close proximity of the various operating coalmines to each other is such that localised impacts cannot and should not be considered in isolation.

The impacts on groundwater are complex (both locally to the shallow aquifers and regionally to the deep aquifers), and require further demonstration and visual presentation (by way of a 'semi-regional impact conceptual model'). Whilst it is appreciated that this may have been beyond AGE's terms of reference for the Drayton South study, it is important that the regional impacts are elucidated, as they will be cumulative in this landscape.

We remain concerned that the GWM has not specifically modelled potential impacts to the groundwater flow systems and quality from flooding (or a drought-dominated regime). The proponent has carried out limited sensitivity analysis, being +/- 50% of parameter values. Even at that limited range, the sensitivity analysis identified that the GWM is sensitive to recharge (and hydraulic conductivity). It is our view that a more appropriate

range for this analysis would be +/- 100% of parameter values.

As a consequence of the proponent's changed final landform proposal, the floor of the final void is now elevated above the bed level of both Saddlers Creek and the Hunter River, thus resulting in an increase in the hydraulic gradient and a consequential increase in risk to the alluvial aquifers and these waterways. The import of this is, linked to surface water interactions, water quality may decline.

From a groundwater perspective, the revised Final Landform proposal represents a greater risk to than the previous proposal. The EA described a final void that acted as a groundwater sink. Now, the floor of the final void has been lifted and the void water balance model has been altered to force a 1ML/day loss. This means that the final void is now predicted to act as a groundwater reservoir and upon discharge increase the environmental risk.

Our EA review considered the monitoring network to be inadequate, especially in monitoring impacts to the alluvia aquifer systems. This remains the case and our previous advice that additional shallow monitoring bores be installed along Saddlers Creek and its confluence with the Hunter River remains valid.

Equine health

Dr. Andrew Paxton-Hall, Veterinarian, previously provided a review of the Equine Health Impact Assessment (summarised in Attachment 2, Section 10) for the Drayton South Coal Project and has undertaken a further review of the PPR and Response Report. A summary of key points raised in Dr Paxton-Hall's review is provided below, with the full report provided as Attachment 1.

The majority of issues raised in my earlier review of the Equine Health Assessment have not been addressed nor rectified by the preparation of the PPR. These issues remain a concern and are briefly reiterated below;

- Extraneous light sources remain an issue for breeding equines.
- Endotoxin-laden dust is agreed to cause transitory respiratory conditions in the adult equine. However, it needs to be stated that other pollutants of similar size, of types consistent with coal dust and heavy machinery burning diesel, have been proven to cause major lung pathology in equines. Young foals' susceptibility to dust of all types needs to be established, especially in a paddock situation, as research is limited. Many of the animals on a breeding property are foals.
- Increased noise levels are likely to affect horses. It is noted that long term resident equines in some situations can be become desensitized to loud noises that are constant or repetitive however this is unlikely to be the case for the surrounding

equine breeding properties which have a fluid horse population depending on the time of year. That is, animals come and go on a regular basis so there would be many instances of blasting and other noises being a novel sound for a particular animal that could distress an animal to the point where it injures itself or its handlers.

Air quality

Dr. Carl Fung, Advitech Environmental, previously provided a review of Air Quality Impact Assessment (summarised in Attachment 2, Section 12) for the Drayton South Coal Project and has undertaken a further review of the PPR and Response Report. A summary of key points raised in Dr Fung's review is provided below, with the full report provided in Attachment 1.

The proponent has offered additional explanation due to public responses. However, it would appear that a number of technically specific issues have not been covered adequately. These technicalities will have varying degrees of influence on the air quality impacts that will be experienced at neighboring properties including horse studs.

The proponent has attempted to improve the impact of the proposed mine by improving a variety of site dust control measures as well as adjusting for silt and soil moisture content. However, it is not clear how these will be achieved or enforced.

The proponent has accepted that forecast climate change (temperature, moisture, wind speed) may marginally increase the predicted ground level dust concentrations generated by the Project however they have not demonstrated whether air quality will continue to be within acceptable bounds.

Summary

We remain of the view that the studies undertaken in support of the Drayton South Coal Proposal, specifically those related to surface water, groundwater, equine health and air quality, contain significant omissions, inconsistencies and analysis that appears favourable to the proposal.

The additional information presented by the Proponent, together with the reviews and responses, have not altered our position with respect to the assessment of surface water and groundwater impacts, nor the impacts to air quality and the associated consequences for equine health.

Our concerns have not been alleviated by the changes to the proposal. Indeed, some of the risks have increased. Whilst now peer-reviewed, the groundwater model still fails to

give due and appropriate consideration to the alluvial aquifers where the potential for stakeholder impact is greatest.

The PPR's proposed lifting of the floor of the final void above the local watercourses and its consequent increased risk of future migration of potentially hypersaline water is a significant issue and detailed examination of this matter is strongly recommended.

The net result of these remaining proposal deficiencies is that the likely impacts to the Hunter Thoroughbred Breeding industry and the surrounding environment have either not been identified and assessed, or have been downplayed.

We attach our original review of the EA including the summary reviews undertaken by various sub-consultants of the important environmental aspects associated with the Drayton South mining proposal as Attachment 2 of this report. Full versions of each of the summary reviews can be provided to the PAC upon request.

Please do not hesitate to contact this office if you require any further details or elaboration.

Yours sincerely,

Owen Droop
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Director/Senior Environmental Scientist/Engineer
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Enclosures Attachments as referenced

Attachment 1

1. ‘Review of response to submissions relating to equine health issues for the proposed Drayton South Coal Mine’, prepared by Andrew Paxton Hall

2. ‘Review of Proponent Response, Drayton South Coal Project’, prepared by Advitech 3 October 2013.

REVIEW OF RESPONSE TO SUBMISSIONS RELATING TO EQUINE HEALTH ISSUES FOR THE PROPOSED DRAYTON SOUTH COAL MINE

1. Air Quality

1:1 Particulate Size

The statistics commonly quoted to determine air quality for humans and extrapolated for equines are based on larger sized particulate matter (PM10) or greater. These larger sized dust particles are generally not respired by equines and so have little potential effect on equine health. I agree with the proposition that it is the smaller dust particles (<PM5) that are of concern for equine health. They are able to readily penetrate the non-ciliated lower respiratory tract.

It is this penetration that is significant in that it has been demonstrated that it is the endotoxins, bacteria and fungi that are attached to smaller dust particles (< PM2.5) that are deleterious. They cause Inflammatory Airway Disease, a very common ailment in horses in Australia. It has been suggested that such airborne contaminants are in such low concentration in pastured animals as to be of no concern. However, it is agreed that such studies on **pastured animals** are **very limited**, particularly for **foals.**

Therefore, in this instance and this locale, the production of dust of low particulate size from a mine could still be enough to cause a significant respiratory problem on the equine properties when combined with natural (organic) contaminants present on every farm. Possibly half of equines on neighbouring properties to the proposed mine could be foals, the youngest and most susceptible animals to respiratory diseases including Rattles, a severe respiratory disease of foals. This is already endemic in the Hunter Valley.

1:2 Dust and Noxious Gases

In addition to the contaminants discussed above, it is also known that Coal Dust can also transport noxious gases (Hydrogen Sulphide) and pollutants

(Ozone, Sulphur Dioxide, Nitrogen Dioxide and Carbon Monoxide). The safety for equine health from such potential contaminants in this scenario needs to be demonstated and in my view, has not been in this case.

It has been shown in studies in the USA that equines working in and near coal mines developed a specific condition called Equine Spontaneous Coal Mine Pneumoconiosis. This condition was shown to be caused by Coal Dust contaminants Ozone and Nitrous Oxide (Davis GW et al 1974) which caused (1) interstitial fibrosis, epithelial bronchiolar hyperplasia with muscular hypertrophy and alveolar emphysema, (2) silicotic nodular fibrosis and granulomatous inflammatory reaction to lymph nodes and (3) focal granulomatous tonsillitis. Even though this occurred in animals near a mine, it nonetheless demonstrates a susceptibility to coal dust contaminants.

2. **Noise and Vibration**

Horses are by nature potentially flighty animals that can be unpredictable and can react to noises and other external stimuli very quickly with sometimes disastrous consequences for themselves and human handlers. It is noted that long term resident equines in some situations can be become desensitised to loud noises that are constant or repetitive. The equine breeding properties surrounding this potential mine have a fluid horse population depending on the time of year. That is, animals come and go on a regular basis so there would be many instances of blasting and other noises being a novel sound for a particular animal that could potentially distress an animal to cause self harm.

Additionally, whilst long term residents may become desensitised to repetitious noise that is not the case for blast noise. The blast interval is such that for the thoroughbreds, such noise is almost always problematic.

3. **Extraneous Light Effects**

Background: The reproductive cycle of a mare is greatly influenced by the available light she is exposed to (phototropic stimulation). Naturally, this means that as daylight length increases during late winter into spring, the

mare's pineal gland will begin to stimulate ovarian activity and the mare's reproductive cycle will become active after a winter of non-cycling (anoestrus). Conversely, as summer daylight length wanes, the mare will react to decreasing daylight length and stop her reproductive cycle.

Indeed, this process is commercially manipulated by equine studs to get mares to cycle as early as possible in the breeding season to better utilise stallions and to produce foals that will be born as early as possible the following year. This will give those horses an inherent size advantage when they begin to race. An accepted husbandry technique is to place mares under controlled lighting conditions to extend the light that the mare is exposed to in late winter to simulate an early spring. In non-pregnant mares this will induce cycling earlier than would have occurred naturally. In pregnant mares, gestation is reduced and foaling occurs earlier meaning these animals can be placed back in foal as quickly as possible.

The controlled artificial light process can be employed positively in two ways but recommendations can vary slightly. One is to turn lights on by timer switch to extend the total continuous daylight length to 16 hours. The other is a pulse of light for one-two hours 9.5 hours after sunset. (Equivet Australia) The recommended strength of the light needs to only be about two foot-candles (this is approximately a strength enabling a newspaper to be read) to induce activity. It has been reported that some mares may cycle with even less light strength.

However, mares that are exposed to too much light will have adverse effects. These mares will fail to cycle properly. (Taylor-MacAllister, Freeman) Also, it is recommended that mares are allowed to enter an anoestrus state by allowing them to respond to decreasing daylight length.

The significance here is that extraneous light is a potentially important issue for horse breeding. Uncontrolled light periods of sufficient strength and extended duration at the beginning and end of the breeding season could have a significant negative effect on breeding operations affecting management and reproductive performance of mares. Anecdotally, it has been shown that mares kept in holding yards and exposed to light strengths far less than those accepted for influencing mares in a controlled setting have induced oestrus

cycling to commence. Stray light is therefore an environmental issue that must be considered when considering a development adjacent to an equine breeding property. In this case, like the other impacts it does not to have been considered adequately, in my view.

Andrew Paxton-Hall BVSc

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Review of Proponent Response

Drayton South Coal Project

Gilbert and Sutherland

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Endorsements

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Prepared By	[redacted]	Carl Fung Lead Consultant - Environmental Engineering	03-OCT-2013

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1. INTRODUCTION

Advitech Pty Limited (Advitech) was engaged by Gilbert and Sutherland to critically review the Response to Submissions lodged by Hansen Bailey on behalf of Anglo American Metallurgical Coal in May, 2013 for the proposed Drayton South Coal Project.

It should be noted that this report was prepared by Advitech for Gilbert and Sutherland ("the customer") in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

2. REFERENCES

The analysis has been conducted on the basis of the following references:

Hansen Bailey, 2013. *Drayton South Coal Project Response to Submissions.*

Gilbert and Sutherland, 2012-2013. *Personal communications and supplied information*.

Katestone Environmental Pty Ltd, 2009. *Air Quality Impact Assessment for the Proposed Bayswater B Power Station Project KE0906696.*

NSW Department of Environment and Conservation, 2005. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.*

NSW Office of Environment and Heritage, 2011. *Generic Guidance and Optimum Model Settings for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments of Air Pollutants in NSW, Australia.*

PAEHolmes, 2012. *Drayton South Air Quality and Greenhouse Gas Impact Assessment, 3617B.*

Sinclair Knight Merz, 2005. *RFQ NO. 0027/2004 Improvement of NPI Fugitive Particulate Matter Emission Estimation Techniques.*

Website (Port Waratah Coal Services Export Statistics) http://www.pwcs.com.au/pages/about/stats.php.

Website (ACARP/SKM dust forecast risk system) http://huntervalleyenv.globalskm.com/dust.html.

Website (Climate Change in Australia) http://www.climatechangeinaustralia.gov.au.

3. AQIA CRITICAL REVIEW

Table 1 lists Advitech's critical review and commentary on the 2012 PAEHolmes AQIA and subsequent Hansen Bailey Response to Submission May 2013. The 2012 AQIA was undertaken by PAEHolmes on behalf of Hansen Bailey.

Table 1: Critical Review of PAEHolmes 2012 AQIA & Public Submission Document May 2013

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
Section 4.1	-	PAEHolmes have supported their AQIA report using various TSP and PM_{10} monitoring stations in the vicinity of the project. These monitoring stations have been used to support background particulate concentrations in the study. According to PAEHolmes, the HVAS are not continuous but records 24hr average PM_{10} and TSP every 6th day. Therefore, it is possible that not all background levels are reported and that certain weather events that exacerbate background concentrations will be missed. It is known that mines in the vicinity of the project site have had continuous dust and weather monitoring for the past 3-5 years. This data could potentially provide more precise measurement of dust than the HVAS units currently operational. These mines include but not limited to Peabody Energy Wambo coal mine and the Ashton coal mine. HVAS precision can be prone to significant variation (up to ±40% inaccuracy) if not properly maintained. There is no demonstration that HVAS units mentioned in this AQIA present reliable outputs. The proponent should demonstrate that HVAS units used to substantiate parts of this report were maintained according the AS3580.9.3, AS3580.9.6 or some other recognised management system.	Largely not addressed. The inadequacy of the HVAS recording system has been accepted by proponent.
Section 4.1.1	Table 4-1	The proponent has avoided any statement/observation that indicated dust deposition rate data (D9-D12) is generally increasing with each monitoring year. This observation may link into ever increasing mining intensity for the region.	Proponent has made specific comment. Advitech's statement relates to the period 2005 onwards. Charts for D9 to D12 show an increasing linear trend with time.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
Section 4.1.1	Figure 4-2	It is observed that the elevated dust level at D9 caused by the NSW dust storm (22-24 September 2009) is not represented at D10, D11 and D12. An explanation of this irregularity is required.	Proponent has not made specific comment.
Section 4.1.2 Section 7.5	-	PAEHolmes states that "main sources of particulate matter in the area include nearby mines, coal-fired power stations, with minor emissions from traffic on sealed and unsealed roads, local building, construction and agricultural activities." It is Advitech's opinion that power station cumulative contributions (either current or potential future) are not adequately captured by the existing HVAS monitoring network. As a result, there is some concern that air impacts from power stations (and potentially other sources) are underestimated. If there is an underestimation, then this could lead to fewer dust exceedence events than would otherwise occur for project identified sensitive receptors. Additional commentary relating to the background monitoring is included below: ▪ The PAEHolmes report (Section 7.5, pg51) mentions that power station particulate contributions (i.e. Liddell and Bayswater) are captured by the current monitoring network used in this assessment. The monitoring network being HV4, HV2a, HV5, Lot 9, Pringles and Lot 22. PAEHolmes later admits that the monitoring network is sparsely located (pg. 53). ▪ On pg51, PAEHolmes concludes that the incremental dust background from the proposed Bayswater B 2000 MW power station is negligible at sensitive receptors. However, review of the Katestone Environmental 2009 report in conjunction with the PAEHolmes 2012 report reveals the following: a) It is unclear which sensitive receptor reported the maximum PM_{10} 24hr increment value of 0.13 $\mu g/m^3$. b) It is unclear which fuel option PAEHolmes have chosen in	Proponent has not made specific comment. Largely not addressed.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		their increment comparison, i.e. gas or coal fired. c) The incremental value quoted by PAEHolmes appears to reflect the maximum PM_{10} 24hr increment for the 'gas fired option' (refer to Figure 64, Kaystone report). A comparison with the 'coal-fired option' indicates much higher predicted GLC. In general, when compared to gas GLC isopleths, coal air impacts are up to 2 times higher (refer to Figure 52, Katestone report). If it was extrapolated, the probable current plus future total air impacts (based on installed power station MW generation capacity) to include Bayswater B (2,000 MW), Bayswater (2,000 MW) and Liddell (2,640 MW), then presumably an estimate of probable current plus future levels to be approximately 7 times higher than the value of 0.13 $\mu g/m^3$ published by PAEHolmes. This would result in a more marked contribution from power stations and could conceivably be in the order of 1 $\mu g/m^3$, not 0.13 $\mu g/m^3$ as quoted by PAEHolmes. It should be noted that the Bayswater B proposed power station was modelled at a preferred stack height of 300 m. Existing Bayswater and Liddell power station stacks are much lower at 248 m and 168 m respectively. It is conceivable that with a lower stack height, dispersion characteristics for existing power stations will be less favourable than Bayswater B, and hence an expectation that particulate GLC's will be higher than extrapolated previously. ▪ There is a presumption that the existing monitoring network captures all power station particulate emissions. However, reviewing a representation of both annual and 24hr PM_{10} from the Katestone report suggests Bayswater B air impacts to be non-uniform within the modelling domain. Therefore, it is quite feasible that HVAS monitoring units will not pick up representative 'background' from power stations. This is also complicated by the one in every sixth day operation of the	

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		HVAS units.	
Section 4.2	-	The proponent has concluded that the year 2005 is the most representative year for air dispersion modelling. Their conclusion is based upon % wind calms and wind roses for two weather stations (Saddlers Creek and Macleans Hill). It appears that no other meteorological or climatic measure (e.g. rainfall, long term min and max temperatures etc.) has been used to justify their chosen year. Furthermore, there appears to be no evidence that PAEHolmes has interrogated the Jerry's Plains BOM weather station to compare wind roses or other meteorological statistics. Real time air monitoring systems for both meteorology and dust (TSP and PM_{10}) are now established within the vicinity of the project. Advitech can verify that real time monitoring systems have been operating for the past 3-5 years. As such, it is possible for PAEHolmes to select a more recent year for dispersion modelling purposes, and in addition put themselves in a much better position to apply NSW OEH level 2 contemporaneous dust evaluations without the need for advanced statistical methods to substantiate cumulative dust impacts (refer to section 8.3.2 pg67).	Proponent has made specific comment. The basis appears to largely remain with wind calms being the parameter to select representative meteorological dataset. Why not other parameters such as wind direction, rain etc.
Section 4.2.1	Appendix A	The proponent has referred the reader to Appendix A. Appendix A does not include wind rose information for Macleans Hill or, for that matter, the Drayton weather station (refer to Section 5.3). It would be of value to the reader to understand the wind rose characteristics of these other inner grid domain surface observational locations. Justification/explanation is required of whether they are representative and appropriate for this specific assessment, as well as give good comparison between each other. PAEHolmes has indicated that the Saddlers creek data is >90% complete. Similar quantification of missing data is required for all weather stations used in this assessment. A more complete meteorological observational dataset will improve the representativeness of the final CALMET wind field.	Proponent has not made specific comment.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
Section 4.2.2	Table 4-5	There appears to be no year-by-year comparison of climatic statistics that may substantiate why 2005 was the best year to model the project. It should be noted that another major air impact assessment in the Hunter Valley (PWCS T4, February 2012) presented a more rigorous justification of modelled year and elected the year 2010 after comparisons of the annual wind roses and statistical evaluation of the wind speed records for several weather stations between 2006-2011. There appears little evidence of a similar approach for the proponent of the Drayton South project.	Proponent has made limited specific comment but once again considers wind calms as a proxy for meteorological representativeness.
Section 5.1	Appendix F	PAEHolmes states that a TAPM generated 3D data file in 3 km grid was used to generate the final inner domain wind field. This level of model resolution may not detect the adjacent valleys that surround the project site and, not surprisingly, would yield data that may not be representative of the location. The proponent should justify that a 3 km grid is sufficient to support the final CALMET meteorology wind field. However, to simulate local meteorology on the scale needed for surrounding areas, based on TAPM generated data, it is suggested that PAEHolmes re-run TAPM with a four nest configuration, which would simulate 3D meteorological data with 1 km grid resolution.	Proponent has not made specific comment. Not addressed.
Appendix F	Table E2	Values of TERRAD, R1MAX, R2MAX, R1, R2. The value of TERRAD appears too large. The value of TERRAD is determined based on an analysis of the characteristic length scale of the surrounding terrain. If it is too large, then the hill several valleys away is seen, instead of the one nearby. A simple	Proponent has not made specific comment. Not addressed.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		rule of thumb is 'ridge-to-ridge divide by 2, rounded up'. Analysis of Figure 5-5 suggests a ridge to ridge line distance of approximately 8 km, therefore a TERRAD value of 4 km. PAEHolmes should justify why a TERRAD value of 10 km was applied for the inner domain. The values of R1MAX (0.3 km), R2MAX (0.3 km), R1 (0.1 km) and R2 (0.1 km) appear very small - especially when considered in relation to the inner domain topography. Typically for observation sites in flat terrain, values of R1 and R2 would be larger than in mountainous terrain where a station's flow is limited by the valley segment. However such small values suggest that PAEHolmes does not want to give much weighting to surface meteorological observations. PAEHolmes should justify why such small values were chosen.	
Section 5.2	-	PAEHolmes has stated that default TAPM terrain values (resolution approximately 1 km) dataset provided, and default land use and soils data sets for TAPM, were used for the outer domain. The accuracy of land use categories and resolution of terrain are important for adjusting initial TAPM mesoscale meteorological data winds to include terrain and land use effects for plume dispersion. Reporting of which year land-use dataset has been based is required, as well as justification/explanation of whether this is representative and appropriate for this specific assessment.	Proponent has not made specific comment. Not addressed.
Section 5.3		PAEHolmes states that 90 m DEM data sourced from NASA was applied for the inner domain. Terrain data should be of sufficient scale to represent the local terrain and PAEHolmes should justify that 90 m DEM data is sufficient for the purpose of the study.	Proponent has not made specific comment. Not addressed.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		Justification/explanation is required of whether 90 m DEM data resolves smaller valleys that might be important for this specific assessment. This is particularly important for sensitive receptors located close to the boundary of the proposed project. Higher resolution 30 m DEM terrain data is easily available and should be used where warranted.	
Section 6	Table 6-2	PAEHolmes has assumed particular control factors for dust control. For example, surface stabilisation - watering is assumed to reduce dust emissions by 50%. PAEHolmes has not justified how this control will be achieved, or confirmed what this watering rate is required to achieve this control.	Proponent has made specific comment. ▪ The proponent has attempted to improve the mine developments impact by improving a variety site dust control measures (e.g. aerial seeding) as well as adjusting for silt and soil moisture content. They have indicated quite significant reduction in silt % (generally over a range of emission sources) and increase in soil moisture % (generally in the same categories). They claim this improves air quality for mine years 10 and 15. A review of Appendix C may indicate whether representative sampling was done. This may influence the ultimate emission inventory input. It is not clear how these tighter control factors will be achieved or enforced. ▪ It is difficult to determine the accuracy of 70% emission reduction from aerial seeding (stated in submission of 70%) as the success of aerial seeding will be dependent upon whether it is used in isolation, or in conjunction with hydromulch, topsoil stripping and longer term maintenance etc. The EET Manual for Mining (Version 3.1 January 2012) states emission reductions from wind erosion vary from 30% for primary rehabilitation up to 100% for fully rehabilitated (release) vegetation
Section 4.2.2, Section 7.0 Section 7.4		There appears to be no discussion or comment by PAEHolmes regarding the issue of regional climate change and how climate change may impact on surface wind speeds, rainfall, air temperature, evaporation, periods of wind calm and other	Proponent has made specific qualitative comment but lacks any quantitative examination of how climate change may influence off-site impacts. .

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		meteorological parameters that have the potential to influence the dispersion of dust from the project site. Assessment and explanation of impacts under these conditions between planned project years 2013-2040 is required. The Climate Change in Australia web site (developed by CSIRO and the Bureau of Meteorology in partnership with the Department of Climate Change and Energy Efficiency) presents probable climate change scenarios for Australia. Advitech suggests PAEHolmes and the proponent consider these forecasting models and provide appropriate response(s) in the AQIA. Advitech's review of the Climate Change in Australia web site suggests that wind speeds in the Hunter Valley may expect increases of up to 30% over the next 20-30 years. If CSIRO projections are correct, and there is evidence that they are accurate-to-date then, proportionally, wind erosion and vehicle dust emissions will rise by a similar value. Consequently there is a concern that the number, magnitude and geographical extent of off-site dust exceedences from the proposed project may rise. It is our understanding that wind erosion and vehicle dust emissions are generally the highest contributor of dust emissions. This is generally reflected in the PAEHolmes emissions inventory tables. For example Table 7-5 pg48 presents wind speed dependent and wind speed independent dust contributions from other mines. Project site specific dust emissions are also mentioned in the report. PAEHolmes noted wind speed dependent and independent dust contributions (Section 7.4, pg47-48). They have made certain justification that 73.2% for all off-site emissions are independent of wind speed. The remainder of emissions are dependent on wind speed and therefore is at risk of increasing over time due to the	▪ The proponent has accepted that forecast climate change (temperature, moisture, wind speed) may marginally increase the predicted ground level dust concentrations generated by the Project. They have not demonstrated whether air quality will continue to be within acceptable bounds. Largely not addressed.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		effects of increased wind speed. PAEHolmes have provided no sensitivity analysis as to the increase in off-site impacts associated with climate change impacts associated with the project. A significant proportion of dust emissions are generated from stockpile wind erosion emissions. These have been estimated using wind independent default factors of 0.4 kg/ha/hr for TSP. These defaults are originally derived from a 1983 SPCC study, which was conducted close to a mine site in the Hunter Valley. The continued application of default (wind independent) values raises concern as most of the NPI air quality equations and guidelines are based on the US EPA's AP-42 (1995). In fact there is a listed equation providing a wind speed parameter for the calculation of erosion from stockpiles (US EPA's AP-42 equation for wind erosion). SKM (2005) undertook a review of the SPCC 1983 study and determined that the default value of 0.4 kg/ha/hr was highly specific to a location and ore type. In addition the value was not based on measurements, but was likely an estimate using US EPA's AP-42 and typical Hunter Valley values with a silt content of 7% (for coal and overburden, NERDDC, 1986 Table 8), number of rain days (80) and with 13.4% of the wind greater than 5.4 m/s (as taken from the Bureau of Meteorology site at Kurri Kurri). Needless to say, a predicted increase in surface wind speed due to climate change may render the SPCC 1983 reference basis less relevant and potentially contribute to an under prediction in off-site air impacts. The application of wind independent stockpile TSP emissions should be reviewed for continued acceptance by government and modellers. If a similar proportional increase to the default stockpile erosion value is simulated (due to wind speed increases as a result of climate change), it would be our expectation that the	

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		number of predicted off-site exceedences will also increase.	
Section 7.5		PAEHolmes have presented a methodology to estimate the contribution of distant mines and other sources. The analysis has examined the meteorological year 2005 and determined 'other contributions' by calculating 'the contribution' as the difference between the predicted 2005 project and surrounding 2005 mine emissions and available 2005 HVAS monitoring records. Advitech believes that PAEHolmes may have determined the 2005 'other contribution' background, but not accounted for increases in 'other contribution' dust emission intensity for the present day. In other words, Advitech believes that 'other contributions' are underestimated. It would be expected that mining intensity between 2005 and 2012 has increased markedly. This in part is described by reported dust deposition rate data (D9-D12) in Table 4-1. A cursory review of Port Waratah Coal Services ship export tonnages since 2005 indicates a 22% increase in terminal coal exports to 97.8 Mtpa (2011). Consequently, Advitech believes that 'other contributions' will be higher than otherwise represented in the PAEHolmes report.	Proponent has not made specific comment.
Section 7.5	Table 7-8 and 7-9	Comparison between the assumed PM_{10}/TSP ratio as outlined in Section 7-2 does not compare well with PM_{10}/TSP ratios outlined in Table 7-8 and Table 7-9. The PM_{10}/TSP ratio in these tables varies between 0.34 and 0.67. Generally, the PM_{10}/TSP ratio would be expected to be relatively constant. Further explanation is required of why this occurs within the dataset being used to underpin the assessment, as well as justification for the adopted PM_{10}/TSP ratios.	Proponent has not made specific comment.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
Section 8.3		Although it appears that the application of the Monte Carlo method to describe cumulative impacts has been applied in previous AQIA (and therefore presumed acceptable by the NSW OEH), the report does not make any reference to specific documented communication from the NSW OEH for its approved application. According to Section 5.1.1 of NSW DEC document, "The use of an approach other than those above (i.e. Accounting for background concentrations Level 2 assessments) should be discussed with the Air Technical Advisory Services Unit of DEC." A continued review of the proposed Monte Carlo method raises another question since the approach is based on probability and necessarily simulates scenarios with lower risk than the official NSW DEC level 2 methodology. Our understanding of the Monte Carlo method for this project highlights potential concern with the applied method. PAEHolmes has approached the exercise by creating only 1 model year and combining this with 1 observed year through 250,000 permutations. This, on face value, appears to be a fairly limited assessment. Justification is required for why monitoring data for a single year was used rather than data for all available observed monitoring years. The detail and the approach of the proposed methodology require, at minimum, more explanation to show how and why this is a suitable assessment and, at worst, this lack of detail implies that an accurate estimation of cumulative impacts is not actually sought. Furthermore, it may have been easier for PAEHolmes to model the proposed project with a more recent modelled year whereby direct application of the EPA Level 2 assessment criteria be applied. As mentioned previously, Advitech is aware that continuous meteorological and dust monitoring networks have been established over the past 3-5 years. Lastly, the proposed Monte Carlo method does not tell the reader what particular days and at what times of the day dust	Proponent has made specific comment. Issues still outstanding. Advitech has concerns about the following: ▪ Accuracy of basic inputs into the Monte Carlo simulation. This extends to various facets of the AQIA including met data, emission inventory estimates, background data validity, representativeness of background data etc. ▪ 250,000 random selections to generate a probability distribution may not seem sufficient. It is not clear if the value of 250,000 is achieving a particular level of confidence? In order to examine every possibility/ combination, the selected number could conceivably be in the order of 850,000 (i.e. 1 in 365 x 1 in 2325). Therefore a reduced number of random selections may impact on the number of day exceedences. ▪ Monte Carlo is examining realistic outcomes not necessarily worse-case outcomes as indicated by NSW OEH Level 2 guidelines. Increasing the number of random selections may improve the gap between Monte Carlo and NSW OEH Level 2 guidelines.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		exceedences may likely occur. This output may positively assist in air quality management plan control measures.	
Section 8.10	Table 8-11	It is assumed that the table value represents the 98%ile, not the 98.6%ile.	Proponent has not made specific comment.
Section 8.10		PAEHolmes has assumed the following: "Blocks of land that have the same owner and are contiguous have been considered as a single area". This may not be necessarily be true for neighbouring properties such as Coolmore and Darley. These properties may have multiple land titles that, in aggregate, constitute a supposed total land ownership. PAEHolmes should ensure that their assumption is valid.	Proponent has not made specific comment.
Section 9		The introduction appears not to connect with previous sections, especially in relation to off-site dust exceedences.	Proponent has not made specific comment.
Section 9.2		There is no mention of the current Hunter Valley dust risk forecasting system already established by ACARP/SKM. There is no suggestion how this project may fit into such a forecasting system or how the forecasting outputs from this system could be used as an air quality management tool for the proposed project. Lastly, there appears to be no discussion as to whether surrounding sensitive receptors already fall within frequent 'high risk' forecast days.	Proponent has not made specific comment.
Appendix A		This section only shows Saddlers Creek wind roses. There is no wind roses information for Macleans Hill and Drayton meteorological stations. This data underpins critical assessment	Proponent has not made specific comment.

PAEHolmes 2012 Report Reference	Subsection	Advitech Comment (PAEHolmes 2012 AQIA)	Advitech Comment (Hansen Bailey Public Submission Response May 2013)
		assumptions and should be included.	
Appendix D.2		PAEHolmes makes a statement that an increase in $PM_{2.5}$ during winter is likely the result of domestic wood burning and would explain why the annual average is close to or exceeds the NEPM standard. There appears to be a total disregard for power station $PM_{2.5}$ contributions, and it would be expected that during strong atmospheric inversion conditions (that can occur during winter) that these could also be significant contributors to $PM_{2.5}$. Over the 2010-2011 period, both the Liddell and Bayswater power stations emitted an aggregate 229,000 kg $PM_{2.5}$.	Proponent has made specific comment. It is now known from the recently released Fine Particulate Characterisation Study (Upper Hunter) that wood smoke is a dominant contributor (approx. 40%) with coal mining (approx. 20%) and power stations (approx. 20%) constituting the other significant fractions.

Attachment 2 – 'Review of inadequate Drayton South Coal Project Environmental Assessment', Gilbert & Sutherland Pty Ltd, 15 January 2013

15 January 2013

Coolmore Australia
c/- MinterEllison
GPO Box 521
Sydney NSW 2001

Attention: John Whitehouse

Dear Sir,

Re: Review of Inadequate Drayton South Coal Project Environmental Assessment

You instructed Gilbert & Sutherland (G&S) to review the Drayton South Coal Project Environmental Assessment (EA) on behalf of Coolmore Australia (Coolmore) and Darley Stud (Darley). The EA was prepared by Hansen Bailey (HB) to for the assessment of a proposed development of a coalmine neighbouring Darley and Coolmore's thoroughbred breeding operation near Jerrys Plains, New South Wales.

The development proposal described in the EA outlines a relocation of mining activities by Anglo American Metallurgical Coal Pty Ltd (Anglo) from the Drayton Coal Mine to a new mine lease, and, if approved, would be known as the Drayton South Coal Project ('the proposal'). The venture entails additional open-cut and highwall mining in an effort to win up to 7 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal over a 27-year period from a site located adjacent to the Coolmore operation.

Anglo lodged a project application (ref: 11_0062) under Part 3A of the *Environment and Planning and Assessment Act 1979*. The NSW Department of Planning and Infrastructure published the Director General's Requirements (DGRs) for the EA on 3 August 2011. In seeking to address the DGRs, HB prepared an EA for the proposal, which you provided to us.

You requested we review the EA on a technical basis, providing an assessment of studies associated with the EA, with particular focus on:

- Surface Water and Groundwater Studies
- Socio-Economic Impact Assessment
- Visual Impact Assessment
- Air Quality Assessment

You also requested that we make a preliminary assessment of further studies also associated with the EA, listed in Attachment 1. A summary of the key outcomes is provided together with further commentary within Attachment 1.

Summary of outcomes

Anglo's application to win up to 7 million tonnes per annum of run-of-mine coal over a 27-year period at the Drayton South site, adjacent to Coolmore, appears to be underpinned by an inadequate environmental assessment and, as such, no confident appraisal of the proposal can be made. Our principal concerns with the EA, based on outcomes of the individual reviews, are as follows:

Surface Water and Groundwater:

- The reported mine water balance modelling fails to provide any justifiable basis for the conclusions drawn.
- The probabilistic values reported are not statistically valid. The form of the analysis is potentially misleading. Furthermore, in our view the analyses do not support the interpretation of the results provided.
- The stated assumptions concerning both runoff volumes and total dissolved solids (TDS) concentrations indicate to us that the potential impacts of the proposal on the quantity and/or quality of surface water resources have not been adequately understood or assessed.
- There is a generic treatment of the potential impacts throughout the EA, with the result that interrelated impacts remain unknown, or are not acknowledged nor assessed.
- The final mine void waters are predicted to increase in salinity for at least the next 100 years and the EA states that "… it is likely that TDS concentrations will continue to increase over time as water evaporates and salt loads increase", but the EA fails to adequately assess the potential impacts, management or mitigation of these increases.
- The apparent plan to leave the legacy of a final void as a steadily increasing salt-sink, together with the conclusion that there would be no groundwater outflow from the pit "for about 700 years", are not based on any credible assessment.
- The groundwater modelling fails to adequately characterise ambient groundwater conditions including depressurisation, groundwater qualities and

the quantification of leakage (both potential and actual) from the alluvial aquifers. Accordingly, it cannot be used for predictive purposes.

- Given that there are known cumulative impacts from existing operations, the groundwater model fails to acknowledge or assess the groundwater impacts resulting from the proposal, or that they are likely to be compounded by the impacts from the adjacent mining projects.

Socio-Economic Impacts:

- The cost benefit analysis (CBA) and economic impact assessment (EIA) erroneously assume that open-cut coal mining and thoroughbred breeding studs are compatible operations. This assumption, on the part of the consultants, unfortunately leads to the economic benefits of the proposal being overstated.
- A 'spot price' for thermal coal price has been used in the analysis that is some 30 percent higher than current forecasts by the World Bank and Bureau of Energy and Resource Economics.
- Mining is highly price-sensitive and recent price reductions have led to the closure of a number of projects. If this scenario were to eventuate for Drayton South open-cut coal mine when coupled with the closure of the local thoroughbred industry (because the two industries are incompatible) the deleterious regional social and economic impacts would be significant.
- Application of NSW Treasury's standard discount rate (7%) to a project which involves a trade-off between open-cut coal mining with a finite life (26 years) and a sustainable high value agricultural industry that could operate in perpetuity is concerning. It biases decision-making towards short-term development over sustainable business endeavours.

Visual Impact Assessment:

- The VIA does not adequately address the DG's Requirement to provide "*a detailed assessment of… visual impacts on the thoroughbred breeding industry*".
- The VIA conclusions regarding visual impact are ill-founded given specific inadequacies within the VIA including inappropriate assumptions, omissions and misunderstandings.
- The VIA fundamentally misunderstands the importance of the visual factors underpinning the success of Coolmore and Darley (and the thoroughbred industry generally).
- The assessment focuses only on a small selection of viewing locations, taken from the ground-level only, fails to illustrate the extent of visual impact, or include adequate representations of the change to visual conditions that would occur because of the proposed project.

- *In toto*, the VIA represents an incomplete assessment of the impacts both on Coolmore and Darley. The definitive conclusions drawn in the VIA of "limited impact" seem to conflict directly with the available evidence, including several passages within the VIA itself.

Air Quality Impacts:

- There are inadequacies with the AQIA pertaining to the modelling data upon which the assessment has been based, as well as the underlying assumptions, methods and conclusions of the dust emission simulation modelling.
- It is possible that not all background dust data is reported and that certain weather events that exacerbate background conditions will be missed.
- The proponent has avoided any statement/observation that dust deposition rate data (D(-D12) is generally increasing with monitoring year. This observation be as a result of ever increasing mining intensity in the region.
- No recognition of, or explanation for, the variation of the PM_{10}/TSP ratio between 0.34 and 0.67 when it would be expected to remain relatively constant. This goes against the quality of the data underpinning the entire assessment.
- There is insufficient meteorological/climatic justification for selection of year 2005 as the representative year for air dispersion modelling.
- A 3 km grid was used to generate the final inner domain wind field. This level of model resolution may not detect the adjacent valleys that surround the project site and may yield data not representative of the location. This is particularly significant as key regional assets such as Coolmore and Darley abut the project boundary and are within 1 km of operational areas of the proposed project.
- There is no discussion of regional climate change and it may impact on surface wind speeds, rainfall, air temperature, evaporation, periods of wind calm and other meteorological parameters that have the potential to influence the dispersion of dust from the project site. For example, review of the Climate Change in Australia web site suggests that wind speeds in the Hunter Valley may expect increases of up to 30% over the next 20-30 years.

Other issues:

- The Strategic Regional Land Use Plan for Upper Hunter (September 2012) acknowledges the importance of the cluster of the thoroughbred horse breeding businesses in the area and major investments in the region's stud farms, horses and supporting infrastructure. The various reports comprising the EA fail to address the significance of long-term agricultural land use in the region, and do not fully consider the economic, social, health, environmental and amenity impacts of the proposal.

- A recurring problem throughout many of the EA's appended reports is that they fail to adequately address the broader and often interrelated impacts of the proposal. The second significant failure is the lack of acknowledgment and assessment of the cumulative impacts of existing mines, together with this proposal, on the local community and business operations.
- Any EA that provides a skewed view of the likely impacts of the proposal risks presenting to the reader is a partisan document. Despite the known impacts of open-cut coal operations in this region, the summary risk assessment in the EA attributes only a 'medium' risk rating to issues relating to surface water, ground water, noise, blasting and agricultural impacts and a 'low' rating to the social issues associated with the proposal. Furthermore, the mitigation and management strategies provided against a number of key areas lack sufficient detail. In some instances, these do not actually represent 'mitigation'.
- The Agricultural Impact Assessment (AIA) does not comply with the requirements of an agricultural impact assessment. The focus of the AIA is on the site itself and the offset site, with only a cursory examination of the surrounding properties. Consequently, the report fails to address the relevant issues.
- When considered in combination with the Economic Impact Assessment, the AIA does not address the impacts on the neighbouring enterprises including Coolmore or Darley. The impacts of the proposal on farm productivity and land values for neighbouring properties (aside from one property in the acquisition zone) should be included in the analysis.
- Both the Equine Health Impacts (EHI) report and the dust assessment fail to consider the impacts on horses, particularly the risks to foals (which potentially constitute up to 50% of the animals on Coolmore). Additionally, there are inconsistencies in the comparison of 'race day' noise measurements (measured in dB(A)) with projections of blasting over-pressure (measured in dBL). Whilst the EA acknowledges that peak noise at high levels would be "the most unsettling" to horses, the acoustic report fails to adequately address these impacts on Coolmore.

These failings, in combination with omissions and shortcomings in terms of the EA's wider economic, agricultural, social and environmental assessments, mean that the true impacts of the proposal have not been (and cannot be) meaningfully assessed on the basis of the information in the EA. The failure to assess the existing landscape values and mitigation measures before mining represents either ineptitude (at best) or deliberate omission.

In summary, our review of the studies supporting the Drayton South Coal Proposal highlight significant omissions, inconsistencies and favourable analysis for the proposal whilst discounting impacts to Coolmore, Darley and surrounding properties. The key

elements of our review follow as an attachment to this letter. For completeness, we propose to provide the advice received from our sub-consultants under separate cover.

We trust this is acceptable. Should you require further details or elaboration, please contact the undersigned.

Yours faithfully,

Owen Droop
Director/Principal Water Resource Engineer
BE(C v)(Hons) BNatRes RPEQ MIEAust

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Principal Engineer
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By ☐ Cour er ☑ Ema ☐ Facs m e ☐ Post
Enclosures

Attachment 1

1 Background

Anglo American Mettallurgical Coal Pty Ltd (Anglo) is the proponent of the Drayton South Coal Project, which proposes open-cut and highwall mining operations to extract up to 7Mtpa of ROM coal over a period of 27 years from a site located approximately 10km north-west of Jerrys Plains and 13km south of Muswellbrook.

1.1 Review scope

Gilbert & Sutherland Pty Ltd (G&S) was commissioned to review the Environmental Assessment (EA) prepared for the Drayton South Coal Project. Specifically G&S was tasked to undertake and/or coordinate:

- a “mid-ranging” review to form the basis of a submission regarding the EA on the groundwater, surface water, socio-economic, visual impact and air quality assessments; and
- an “overview” or preliminary review of selected studies within the EA.

The scope of works associated with the “mid-ranging” review is detailed in our letter dated 10 August 2011 focusing on surface water and groundwater resources (quantity, quality, interactions, current uses), hydrogeology and surface water hydrology and the mine’s water balance. The “overview or preliminary review” is to cover any obvious and significant omissions or errors within assessment methodology and/or results, and to highlight possible areas requiring further review/assessment to support (or disprove) conclusions stated in EA reports.

The EA has been compiled in response to the requirements of the Director General of the New South Wales Department of Planning and Infrastructure (the DGRs) for the Drayton South Coal Project (11_0062) dated 3 August 2011.

The reports reviewed are:

- Drayton South Coal Project Environmental Assessment by Hansen Bailey August 2012 (Sections 1-12 only, Appendices A to E were not provided)
- Surface Water Impact Assessment by WRM Water & Environment Pty Ltd
- Groundwater Impact Assessment by Australasian Groundwater and Environmental Consultants Pty Ltd
- Agricultural Impact Assessment by Scott Barnett & Associates
- Ecology Impact Assessment by Cumberland Ecology
- Economic Impact Assessment by Gillespie Economics
- Social Impact Assessment by Hansen Bailey

- Soils and Land Capability Impact Assessment by Environmental Earth Sciences
- Geochemistry Impact Assessment by RGS
- Stygofauna Impact Assessment by Eco Logical Australia
- Visual Impact Assessment by VP&d
- Non-Aboriginal Heritage Impact Assessment by AECOM
- Aboriginal Archaeological and Cultural Heritage Impact Assessment by AECOM
- Equine Health Impact Assessment by Dr Nicholas Kannegeiter
- Acoustic Impact Assessment by Bridge Acoustics
- Traffic and Transport Impact Assessment by DC Traffic Engineering Pty Ltd
- Air Quality and Greenhouse Gas Impact Assessment by PAEHolmes

A map showing the location of the Coolmore site is provided as Drawing 01 and a further map showing the location of the Drayton South Coal Project relative to the Coolmore property is provided as Drawing 02.

2 Surface Water

2.1 Summary outcomes

The reported water balance modelling fails to provide justifiable bases for the conclusions drawn in the report. The probabilistic values reported are not statistically valid and the forms of analyses are potentially misleading. They do not support the interpretation of the results provided.

The underlying assumptions of the water balance modelling regarding the behaviour of the mine waters, particularly with respect to the EA's volumetric treatment over the life of the proposal, require further justification. The treatment of data and erroneous statements relating to probability undermine any justification for the statements of likelihood assigned to the modelling results.

None of the runoff and recharge parameters or water quality assumptions adopted within water balance modelling were subjected to meaningful sensitivity testing. Without these sensitivity analyses, the relative effects of individual parameters remains unknown.

The EA's adopted TDS assumptions for various mine catchment types are not justified and appear at odds with the water quality data reported.

The outcomes of assumptions for runoff characteristics appear low when compared with documented information. This has significant implications for the operation of the mine and the likelihood of disruption to coal extraction activities.

This combination of runoff and TDS assumptions, none of which appears to have been appropriately interrogated or tested for sensitivity, provides us with little confidence that the potential impacts of the proposal on the quantity and/or quality of surface water resources are adequately understood or assessed.

In terms of mine water management, the design of the dirty water system (i.e. surface water runoff from areas that are disturbed by mining operations, such as overburden and haul roads) relies on the discharge of captured water wherever possible, on the basis of water quality. These captured waters and their associated water quality criteria are problematic when both storages and criteria are exceeded.

Inherent constraints, such as the proposal's dispersive soils, represent long-term management challenges. However, standard management practices or contingencies are exposed by events such as prolonged wet weather or system failure. The EA presents insufficient detail and clarity regarding management of dirty water onsite. Ironically, the proposed use of dust suppressants has the effect of increasing the discharge of mine waters.

The EA states that "*runoff must be managed to ensure that downstream water quality is*

within the adopted water quality compliance criteria", yet fails to define one specific discharge criterion, leaving it to licence conditions. This approach is symptomatic of a generic treatment of the proposal's potential impacts by the EA, where the interrelated impacts remain unknown, are not acknowledged nor adequately assessed.

The EA predicts a final mine void exhibiting unchecked salinity increases (estimated to be 7,000mg/L without reaching equilibrium) yet remains silent about the potential impacts, management or mitigation of these increases. The apparent plan is to leave the void as a steadily increasing salt-sink. The EA quotes an approximate final void water level of 117m AHD and compares this to an assumed pre-proposal potentiometric level of 137m AHD. From this, the conclusion is drawn (within the EA documents) that there would be no groundwater outflow from the pit *"for about 700 years".*

Unfortunately, these assumptions are unreliable on two counts: firstly, the selection of the pre-proposal potentiometric level has not been explained and secondly, if the volumetric surface water modelling is unreliable (as we suspect it is), then the EA's estimated water level in the final void would change. Whilst this would have significant impacts on the final void management and potential saline impacts on the receiving environment, these remain further unknowns. (We also address this point below.)

The potential implications for the long-term impacts of this salinity on the Hunter River and other water users (of both surface water and groundwater) in the area are also unknown. Furthermore, a significant drop in TDS is noted at the beginning of the EA's simulation, implying that rainfall/runoff inflows into the void are assumed to have a low TDS. Again, this is not necessarily supported by the data. The data indicate higher TDS initially and over time, without the (potentially unrealistic) dilution effects of rainfall/runoff that have been assumed in the EA.

The EA's discussion of licensed water users or "basic landholder rights" is limited to the selected quoting of various sums of water from the Water Sharing Plan (WSP). No consideration is given to those water users that may be impacted, nor does the EA indicate the location or characteristics of any potentially impacted users, enterprises or sensitive receiving environments. As a result of an underpinning 're-use' philosophy of the proposed Water Management Plan, it is possible that all waters intercepted during dry periods will be reused onsite. This means that the largest mine-induced reduction in unregulated flow would occur during those periods in which it would have the greatest impact on already low flows. These impacts on the downstream receiving environment and surrounds remain unknown.

In fact, the EA fails to discuss the relative values of the local watercourses from commercial, aesthetic and ecological perspectives. In respect of the requirement to obtain unregulated water access licences as a result of the proposal, the EA is vague.

Furthermore, the information is so lacking that the potential interception of overland flow, the potential impacts on the existing unregulated river access and the effects on the proposal of not securing the requisite licences are simply not considered to any meaningful degree.

Whilst we cover the aesthetic impacts of the proposal and their rudimentary treatment within the EA later in this document, it is of note that changes to the hydrological regime would impact environmental flows and could also impact groundwater dependent ecosystems (GDEs) which have not been identified in the EA.

2.2 Review findings

The Surface Water Assessment (SWA) prepared by WRM Water & Environment Pty Ltd was required to meet a number of the Director General's Requirements (DGRs), as issued by the NSW Department of Planning and Infrastructure (DPI) on 3 August 2011. The applicable DGRs are listed herein in indented italics, together with our comments and observations in respect of the adequacy of the SWA in addressing these requirements.

2.2.1 Key Issues - Water

> *Detailed site water balance for the Drayton complex as proposed, including a description of site water demands (including access to any flows within the Hunter River regulated source), water disposal methods, water supply infrastructure and water storage structures*

Approach and interpretation of results

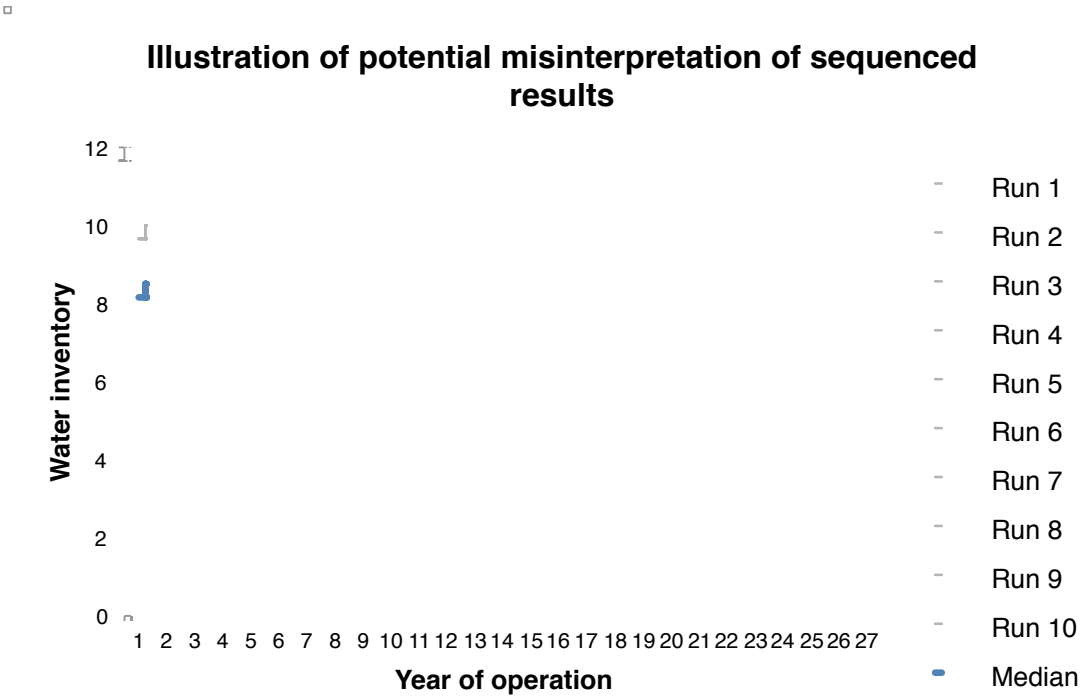
The validity of any numerical assessment of potential impacts on the quantity and quality of surface water is wholly dependent on the ability of the models employed to accurately represent variable conditions. The long-term behaviour of the quality and volume of mine waters requiring management, the impacts of mine operations and the fate of contaminants all rely on the veracity of the estimates proffered.

In this case, the reported water balance modelling fails to provide a justifiable basis for the conclusions drawn in the report. The probabilistic values reported are not statistically valid and the forms of analyses are potentially misleading. They do not support the interpretation of the results provided.

The underlying assumptions of the water balance modelling regarding the behaviour of the mine waters, particularly with respect to the EA's volumetric treatment over the life of the proposal, require further justification. For example, the statistical description of water balance results to a 1% level of reporting cannot be justified. The modelling employed a data set (drawing from 114 years of data from 1893 to 2006) but provided only 88 sequences. Both the use of these data and the partial selection of sequences are inadequate to support the quoted probabilities of 1%.

Additionally, the data adopted (1893-2006) also neglects conditions between 2006 and 2012, a period which includes both an extended dry period and significant wet conditions. These data treatments undermine any justification for the statements of likelihood assigned to the modelling results.. Furthermore, quoting simulated maximum and minimum values as “likely upper and lower bounds” is both incorrect and potentially misleading.

It appears that the ‘percentile outcomes’ for out-of-pit storage inventory (as represented in Figure 5.3 of the report) are a summary of the 88 sequences. This means they represent the probability of storage volumes being equaled or exceeded on any specific date, rather than providing a clear illustration of the likelihood of storage conditions over the life of the mine. While seemingly innocuous, this approach to reporting is potentially significantly misleading in terms of providing an understanding of the likelihood and duration of significant storage buildup (or shortfall) over the life of the project. Reporting in this way implies a significantly lower likelihood of experiencing wet or dry conditions during the life of the project than in reality. As a simple illustration, the chart below depicts a stylised water balance for an imaginary project with a 27-year life. The grey lines represent the mine water balance as simulated for each of 10 different climatic sequences. As illustrated, all climatic conditions reach a maximum level of 10, whereas the median of all results reaches no higher than approximately 8.



The water balance modelling outcomes, as stated on page 55 of the report, are not supported by the information provided within the report and are potentially incorrect and misleading. One example is the statement that "*there is a 50% chance that there will be no build up of water in the active mining areas*". This conclusion does not seem to be drawn from the information provided. Furthermore, statements such as "*the 50th percentile probability represents the 'most likely' scenario"* are inaccurate, potentially misleading and bely a potentially fundamental misinterpretation of water balance modelling results.

Additional issues surround the assumptions regarding the runoff coefficient. The outcomes of the adopted AWBM parameters appear low compared with known, reported information. This could have significant implications for the Mine Water Management Plan and Mine Plan with the volume of water requiring management at various stages of the proposal mine life potentially varying significantly from that estimated. For example, active mine areas have been assumed to exhibit a runoff coefficient of approximately 0.3 (i.e. 30% of rainfall reports as runoff), yet experience for mines in the Upper Hunter has indicated that runoff coefficients of 0.5 are normal (and higher coefficients are possible). The outcomes adopted for 'minesite' areas are also questionable – an outcome runoff coefficient of 0.05 has been applied, when values of 0.10 are more generally adopted (for example in the determination of harvestable rights) and have been reported for the Hunter Region.

Substantive water quality assessments rely on baseline data describing key parameters such as total dissolved solids (TDS) and electrical conductivity (EC) to estimate the mass of relative salt loadings and concentrations. However the EA's adopted TDS assumptions for various mine catchment types are not justified and appear at odds with the water quality data reported.

Furthermore, sensitivity testing of the outcomes of adopted runoff parameters is needed to assess potential impacts. None of the runoff and recharge parameters or water quality assumptions adopted within water balance modelling were subjected to meaningful sensitivity testing. Without such sensitivity analyses, the relative effects of individual parameters remains unknown. Such testing was not done.

The combination of runoff and TDS assumptions, none of which appears to have been appropriately interrogated or tested for sensitivity, provides us with little confidence that the potential impacts of the proposal on the quantity and/or quality of surface water resources are adequately understood or assessed.

In our opinion, the adoption of outcomes on the basis of approximately 4 years of site storage volume behaviour, without meaningful justification or sensitivity testing of longer-term outcomes, is a concern.

Water balance conclusions

The reported water balance information does not provide a clear and justifiable basis for the conclusions drawn in the report. The probabilistic values reported are not statistically valid and the form of analysis with regard to likely mine water volume behaviour over the life of the project is potentially misleading and does not support the interpretation of results provided.

The underlying assumptions of the water balance model require further justification. In particular, sensitivity testing of the outcomes of adopted runoff parameters is required to assess potential impacts. A related issue is the water quality assumptions adopted within water balance modelling, with similar lack of sensitivity testing of key assumptions. This is discussed in more detail below.

Detailed modelling and assessment of the potential impacts of the project on:

- *Quantity and quality of existing surface and groundwater resources*

The modelling and assessment of potential impacts on the quantity and quality of surface water are dependent on the ability of the model to represent the realistic variability of conditions and long-term behaviour of the quality and volume of mine water requiring management.

There is insufficient detail provided in the report to confirm whether an appropriate understanding of the baseline conditions can be gained from the data. The report quotes 420 samples, without definition of how many samples were collected for each site.

The total dissolved solids (TDS) values for S1/S2 were adopted for undisturbed areas in the model. Given that this is a key input to the model and that a different assumption could have a significant effect on the outcomes, more justification is needed that these values are representative of what can be expected. The ranges and medians for TDS and electrical conductivity (EC) as provided in the report are listed below. Again, it should be noted that these values are based on 420 samples of unknown location.

- EC for Saddlers Creek (W1-W4) is approximately 5,000 to 10,000 μS/cm
- TDS for Saddlers Creek is approximately 5000 mg/L (median)
- EC for S1 & S2 is approximately 100 to 500 μS/cm
- TDS for S1/S2 is approximately 150 mg/L (median)

A key water quality assumption underpinning the reported outcomes is that *"EC values for site catchments are much lower indicating that surface runoff from vegetated areas not affected by groundwater flows may produce lower EC"*. This is presumably based on the results for S1/S2, but appears at odds with results for the undisturbed catchments downstream of Drayton Mine, which report ECs of between 2,000 and 5,000 μS/cm. Also,

the report states that *"runoff draining Drayton Mine catchments has similar water quality characteristics to the natural catchments with runoff that is saline and slightly alkaline"*. However, ECs range from 3,000 to 7,000 µS/cm.

Table 1 below summarises the reported quality information, with comparison against adopted values in the water balance model underpinning the report and the quantity/quality impact assessment.

A point to note is that 'minesite' as a catchment type represents major areas of the water balance and so sensitivity of outcomes to different EC assumptions (in association with potentially low runoff assumptions described above) is potentially significant.

Table 1: Summary of reported water quality information and adopted model assumptions

	Draytons South	Downstream Drayton Mine	Drayton Mine	Adopted for modelling
Mining area	n/a	n/a	5,149 – 6,250 µS/cm (west Void)	4,000 µS/cm
Industrial / handstand	n/a	n/a	3,265 – 4,053 µS/cm (Access Rd Dam)	2,000 µS/cm
Cleared / prestrip	n/a	n/a	n/a	2,000 µS/cm
Spoil	n/a	n/a	n/a	2,000 µS/cm
Rehabilitated spoil	n/a	n/a	3,435 – 4,830 µS/cm (Savoy Dam)	1,000 µS/cm
Minesite / Undisturbed	77 – 342 µS/cm (S1/S2) 770 – 6,970 µS/cm (W1-W4)	1,306 – 3,580 µS/cm	n/a	200 µS/cm

Notes:
1. n/a = not available in reported information
2. All data quoted from SW report and where EC data only available, converted to TDS via conversion of 0.75 consistent with SW report.

The report shows that water from the minesite will contain sodium-dominated salts. As soils in the vicinity of the site are known[1] to be sodic, this addition of sodium could pose a real issue for erosion management; high levels of sodium in water can increase the erosion potential of sodic soils.

[1] Env ronmenta Earth Sc ences June 2012 So & Land Capab ty Impact Assessment Drayton South Coa Project

Charts of recorded data in the 'calibration' section indicate a consistent and ongoing increase in salinity, generally from 3,000 to 5,000 mg/L TDS between 2007 and 2011. This is during what has been a period of increasing storage volume, indicating that runoff for the minesite area is likely to be generally saline, as consistent with the reported Drayton water quality data and at odds with adopted modelling assumptions.

With regard to assumptions for Hunter River salinity, while stating that "*there is a broad scatter of EC for low flows < 1,000 ML/d"*, there is no discussion of the broad range of EC for flows > 1,000 ML/d (of the order of -50% to +100%), and the adopted approach to assessment via a single logarithmic relationship neglects this variability. The report provides no information, scientific justification or sensitivity testing of the simplified flow versus salinity relationship adopted for the Hunter River.

Salinity conclusions

The adopted TDS assumptions for various mine catchment types have not been justified and appear at odds with the water quality data reported.

The combination of runoff and TDS assumptions, neither of which have been robustly justified or tested for sensitivity, provides no confidence that the potential impacts of the project on the quantity and/or quality of surface water resources are adequately understood.

In our opinion, the conclusions of the report on the basis of the water balance modelling are not supported by the information provided.

- *Affected licensed water users and basic landholder rights*

The discussion of licensed water users or basic landholder rights is limited to a general quote of total values from the Water Sharing Plan[2], without consideration of those water users that may be affected nor an indication of the location and characteristics of any potentially impacted users.

The discussion of impacts on the Jerrys Plains water source is limited to a simple *"average annual"* value, which indicates interception of up to approximately 700 ML/a on average. This is followed by the comment that water access licenses "*may only be required"* for a portion of the expected interception. However, considering the seemingly conservatively low runoff assumptions (as noted above), it is possible that this underestimates realistic interception volumes.

[2] Hunter unregu ated and a uv a water sources Water Shar ng P an August 2009

A point of note is that unregulated flow is, by its very nature, highly variable. A meaningful discussion of impacts should therefore address flow characteristics of more importance to the users of the unregulated licenses, such as frequency and duration of no flow and periods of flow following rainfall.

Due to the underpinning 're-use' philosophy of the proposed Water Management Plan, it is possible that all interception during drier periods will be reused onsite, meaning that the greatest mine-induced reduction in unregulated flow would occur during those periods in which it would have the greatest impact on flows which are already low.

The report provides no discussion of the potential to obtain the unit shares required for the project. It should be noted that existing unregulated river access licenses in the Jerrys Plains Water Source already total some 2,573 unit shares.

- *The riparian, ecological, geomorphological and hydrological values of watercourses both on site and downstream of the project*

The report provides no discussion of the values of the watercourses.

- *Environmental flows*

The report provides no discussion of environmental flows.

- *Flooding*

The Saddlers Creek assessment has been undertaken as a separate model, with a normal depth downstream boundary condition. A discussion regarding outcomes based on this boundary condition, in comparison with boundary conditions related to potential Hunter River levels at Saddlers Creek, would provide greater justification for conclusions reached in the report.

There is no illustration of Hunter River flood levels. The report comments that all infrastructure will be above the 100-year flood level, yet these levels are not indicated within reporting.

A detailed description of the proposed water management system for the Drayton complex as proposed (including all infrastructure and storages)

There is insufficient detail and clarity regarding management of 'dirty water' onsite (i.e. surface water runoff from areas that are disturbed by mining operations, such as overburden and haul roads). The proposed Water Management Plan (WMP) adopted discharge of dirty water off-site under an assumption that runoff from disturbed areas "*does not contain contaminated material or high salt levels"*. Given the potential for fuel spills, oil leaks etc associated with haul roads, and the reported salinity levels for dams

catching runoff from the existing Drayton Mine spoil areas, this assumption requires further justification. A description of the implications to the proposal if this water is unable to be released should also be provided.

The report also details that "*this runoff must be managed to ensure that downstream water quality is within the adopted water quality compliance criteria*", yet provides no definition of the specific compliance criteria to be applied.

A detailed description of measures to minimise all water discharges

The report is required to provide a "*detailed description of all measures to minimise water discharges"*, yet the proposal actually opts toward reduced water usage to minimise water requirements and thus does not minimise discharge.

The design of the dirty water system is based on the discharge of captured water wherever possible, on the basis of assumed water quality. As described above, the issues associated with captured water reaching quality criteria must be addressed.

A detailed description of measures to mitigate surface water and groundwater impacts (including a comprehensive rehabilitation plan for Saddlers Ck).

The reporting mentions that a rehabilitation plan for Saddlers Creek has been undertaken, yet provides no "*comprehensive rehabilitation plan for Saddlers Creek"* as required by the DGRs.

2.2.1 Key Issue – Rehabilitation & Final Landform

The report describes a final void with consistently increasing salinity, estimated at 7,000mg/L and rising. Yet there is no discussion of potential impacts, management or mitigation. The implied plan is to leave the void as a steadily increasing salt sink.

The report quotes that the final void water level will remain stable at 117m AHD, which is 20m lower than the EA's selected potentiometric level. From this the conclusion is drawn that there will be no groundwater outflow from the pit "*for about 700 years*" Owing to the potential seriousness associated with changes to the above conclusions, these statements require significant justification, with discussion of potential implications for the long-term impacts on the Hunter River and other water users (of both surface water and groundwater) in the area.

Furthermore, a significant drop in TDS is noted at the beginning of the simulation, implying that rainfall/runoff inflows into the void are assumed to have a low TDS. However, this is not necessarily supported by the data (as described above). The data actually indicates the potential for significantly higher TDS initially and over time, without the potentially unrealistic dilution effects of rainfall/runoff that have been assumed in the modelling.

Specific concerns relating to both the final void assessment results and in particular the interpretation thereof include:

- No recognition of the highly uncertain nature of the groundwater modelling upon which the very long-term outcomes are based.
- The uncertainty in the approach and minimal detail committed to final void behavior outcomes (approximately one page in SW report) are particularly concerning given that the model indicates a change in the long-term behaviour of the void from a “sink” (i.e. drawing water from the natural surrounding aquifers) to a losing system in which (the now hyper-saline) void water seeps back into the surrounding aquifers and local watercourses.
- No meaningful discussion is provided regarding the effect on groundwater and surface water resources in either the initial period (i.e. steadily increasing TDS towards hyper-salinity and continued drawdown of connected aquifers) or the simulated very long-term conditions of flow of this now hyper-saline void water back into the natural system.

Notwithstanding the significant, unrecognised uncertainty in the model results, the time-scales attributed to changing void behaviour and any consequent impacts are of a scale (i.e. hundreds and thousands of years) which would preclude any potential for management or mitigation of the impacts by the company and would become by default a legacy borne by the local and regional communities as well as a long-term liability for the State.

2.2.2 Surface water/groundwater interactions

Surface water and groundwater interactions in the Upper Hunter region are significant in respect of the hydrological regime and groundwater availability and use. Consequently, any changes in surface water characteristics are likely to influence the groundwater resources of the area. Similarly, any changes in groundwater levels will have the potential to cause significant impacts on instream values.

With significant changes affecting the Upper Hunter over recent years, the surface water and groundwater resources have become increasingly vulnerable and valuable. The Hunter Valley system is currently considered ‘highly stressed’ due to the over-allocation of water resources. Concerns around groundwater are related to impacts on quality and supply, resulting from:

- Drainage of aquifers into mine workings.
- Filling of voids of abandoned works.
- Discharge of saline/acidic water from mine workings and mine waste dumps to aquifers or connected surface waters.
- Depressurization of aquifers affecting the supply of water to other users.

- Connection of high quality aquifers with inferior quality aquifers, and associated impacts on overall quality.

No acknowledgment of the significant surface water/groundwater interactions is provided, nor has any meaningful assessment of potential impacts of the proposal been reported in the EA documents.

3 Groundwater

3.1 Summary outcomes

The EA reports that a Groundwater Numerical Model (GWM) formed the basis upon which a groundwater impact assessment for the proposal and conclusions were founded. No independent peer review of the model is reported in the EA. Furthermore, there are a number of perceived deficiencies in the GWM that require justification or clarification before the results can be relied upon for any predictive purpose.

A crucial omission from the EA is a clear explanation of model's integration with surrounding existing impacts. This is of particular importance given that there are cumulative impacts from existing operations. The EA fails to acknowledge that the groundwater impacts resulting from the proposal are likely to be compounded by the impacts from adjacent mining projects. Re-activation of Saddlers Pit at Mt Arthur Coal Mine is expected to influence groundwater levels in the Saddlers Creek alluvium.

Notably, the simulation results indicate that the impact of the Mt Arthur Underground Project could add to the reduction of flow and discharge towards Saddlers Creek along a six-kilometre section, directly downstream of the proposal extension, whereby groundwater drawdown does not exceed 2m at the creek. Given the relatively thin saturated thickness of the alluvium, a 2m drawdown would represent a significant groundwater impact to any existing user, dependent vegetation or GDE.

The efficacy of any GWM is a function of the robustness of the data used in the model. This is particularly true of the monitoring of the existing groundwater condition. In that regard, the baseline monitoring for this proposal has been insufficient. This is true both spatially and temporally, so much so that it compromises the model's treatment of ambient groundwater conditions including depressurisation, groundwater qualities and the quantification of leakage (both potential and actual) from the alluvial aquifers.

The groundwater monitoring proposal does not clearly integrate and consolidate all of the disparate monitoring, including on adjacent leases, say, within the assessed impact radius of 4km. The water quality results should be assessed against the ANZECC Guidelines for Fresh and Marine Water Quality (2000), not the NHMRC Australian Drinking Water Guidelines (2004).

A questionable outcome of the GWM is the prediction that the depressurisation zone will have *"very limited leakage impacts"* to the Hunter River alluvial aquifer, given that the report also states that the model is *"likely to under-predict the amount of upward leakage"* into the Hunter River alluvium. These two statements are difficult to reconcile.

The EA's inconsistencies in reporting and issues with sampling associated with stygofauna in groundwater are of concern. For Coolmore in particularly, the proposal has the potential to reduce groundwater quality due to the removal of stygofauna.

3.2 Review findings

The Groundwater Impact Assessment for the Drayton South Coal Project dated July 2012 was prepared by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE). The report has been reviewed by Eric Rooke Principal Hydrogeologist from Gilbert & Sutherland in view of the Director General's Requirements (DGRs), as issued by the NSW Department of Planning and Infrastructure (DPI) on 3 August 2011.

3.2.1 Groundwater monitoring

Groundwater monitoring has been insufficient (spatially and temporally) to inform the project on ambient groundwater conditions (depressurisation, groundwater quality, quantifying leakage from the alluvial aquifers).

No historical (Anglo) groundwater monitoring bores (MBs) are located in the alluvium of Saddlers Creek and the alluvial aquifer of the Hunter River. Only recently, the network was expanded to include bores located within the Hunter River alluvium and the Saddlers Creek. The MBs network previously established by Anglo comprise paired and discrete bores located at 13 sites. These monitored for water levels, pH and electrical conductivity. Three new MBs were installed in Saddlers Creek alluvial aquifer and two new MBs in the Hunter River alluvial aquifer in July/Aug 2011. Paired bores have also been installed, one at each site constructed in the alluvial sediments and another in coal measures. A total of nine new MBs were installed at four sites situated between Drayton South, Saddlers Creek to the north and northwest, and the Hunter River in the south and southeast.

A network of five vibrating wire piezometers was recently installed to record bore pressure within individual coal seams and interburden layers. The AGE report indicates an intended expansion of the network with the addition of the Drayton South groundwater monitoring program. However, these are not included in the current model. In addition, MBs should have been located at the tailings and rejects emplacements areas to obtain baseline data as seepage form these areas is anticipated. This has not been done.

It may be noted that AGE provided initial training to geologists that supervised the drilling, installation and construction of the monitoring bores. It is unclear whether licenced drillers were employed.

3.2.2 Groundwater Numerical Model (GWM)

This review focuses on the GWM because it is the major tool that has been used to assess the potential impacts *"including cumulative impacts on groundwater"* from the proposed Drayton South Coalmine Project. It is unclear whether the model has been independently peer-reviewed; if it has not then it should be. The outputs of a GWM include:

- Estimates of groundwater inflows to the open-cut void over the project life and post-project.
- Predictions of the zone of influence of dewatering and the level and rate of drawdown at specific locations.
- Predictions of the magnitude of any drainage from the alluvial aquifers into the underlying Permian strata.
- Predictions of the impact of mine dewatering on groundwater discharges to surface flows and other groundwater users.
- Identification of areas of potential risk where groundwater impact mitigation/control measures may be necessary.

If a GWM fails to represent/replicate the real-world hydrogeological conditions, then its outputs have the potential to produce inaccurate and spurious results. The GWM appears to be flawed. The following queries/criticisms are made of the GWM.

The GWM consists of 18 layers, the upper layer representing the alluvium and weathered bedrock (regolith), and the bottom layer representing Maitland Group. Intermediate layers of Permian coal measures and individual coal seams are separated by interburden. Hydraulic conductivity was reduced continuously with depth to account for increasing confining stress and the model was calibrated by adjusting the hydraulic conductivity. The structure of the groundwater flow model was based on the Anglo geological model where data was available. The Anglo geological model provided good control of geological structure and coal seam geometry/thickness within the study area and for the area that extends south towards the Hunter River. However, groundwater monitoring bores in the Permian Coal seams only monitor the uppermost seams; i.e. 'Whybrow or Redbank' coal seams. In addition, the GWM neither incorporates nor accounts for (or justifies the absence of) any of the geological structures that are present, notably:

- The Muswellbrook Anticline – increased hydraulic gradient near the eastern boundary associated with steeply dipping strata
- The Randwick Park Fault (NNW trending graben structure) located in the western part of the study area
- A number of smaller, localised faults within the graben.

The cells located where the Jerrys Plains subgroup crop out were set as inactive in the GWM. This requires justification. Coal measures outcrop in the north of the study area and along the strike of the Muswellbrook Anticline. Whether these represent recharge cells or not is unclear.

Previous numerical modelling results from surrounding mining projects were compared with the results from Drayton South Project simulations to assess the potential cumulative

impacts. The explanation of model integration is unclear – a crucial issue, given there are cumulative impacts from existing operations.

The data indicate that the area supports three distinct groundwater systems:

- Alluvium associated with the Hunter River and its tributaries;
- Weathered bedrock (regolith) near ground surface; and
- Low-permeability Permian aquifers associated with the Wittingham Coal Measures.

It is unclear why the GWM combines the alluvium with the regolith as Layer 1 when they have different hydraulic properties and areas of influence, and sets 18 layers when the deeper coal seams (at AGE's own admission) do not contribute vertical flow. It would appear that it is only the upper two coal seams that are hydraulically participating or 'connected'. Although groundwater levels are sustained by recharge, they are controlled by surface topography, surface water levels and aquifer permeability. Representation of the topography (natural ground surface) appears to be wanting.

As indicated by AGE, there are steep slopes associated with numerous sub-creeks including in areas of proposed highwall mining. And yet AGE acknowledges that *"The orientation of eroded valleys and drainages is governed to a significant extent by regional joint weakness"… "Discharge from the model was via river cells assigned along Hunter River, Saddlers Creek and the major ephemeral drainage alignments. The elevation of the riverbed was set by subtracting an inferred riverbed depth from the topographic surface elevation. This incision depth of the rivers and creeks in the model was as follows: Hunter River - 10 m below topography; Saddlers Creek - 5 m below topography; Other ephemeral drainages - 1 m below topography".* This aspect of the GWM is unsatisfactory and in conjunction with Layer 1 (that combines alluvium/colluvium) is a crude representation of critical sub-surface conditions. It requires explanation and justification.

The model domain boundary conditions have been set as 'no flow' boundary, which seems highly unusual or incorrect. Instead it is seen that the eastern boundary (Jerrys Plains subgroup crops out near Muswellbrook Anticline), the southern boundary (southern limit of Hunter River alluvium) and the northern boundary (adjacent to Hunter River beyond the influence of the mining operations and perpendicular to regional flow direction) should each be set as a general head boundary (GHB). This is a serious issue that needs explanation as it has implications for the flux/water balance calculation/outputs.

The calibrated model claims to provide a good match between the observed and modelled heads. In the alluvial aquifers this is based on few data points and in the Permian measures the predicted groundwater levels were generally higher than the

observed water levels. Average absolute residual observed vs. simulated SWLs was 10.08 m. and for NOW registered bores representing SWLs in the Hunter River alluvium, this average absolute residual was 9.11 m. This is not considered to be a good match.

Following is a summary of queries to statements in the AGE report relating to the GWM.

Report Statement	Comment
"Groundwater flow occurs from areas of high pressure to areas of low pressure and is generally away from prospective mining areas"	Further explanation is required in regard to prospective mining areas.
"hydraulic conductivity values used for the alluvial areas of Layer 1 were distributed and were allowed to vary slightly to reflect the thickness of the unit. Higher values of hydraulic conductivity were applied to areas of greater alluvial thickness, and conversely, lower values were applied in areas of thinner alluvium. This application of hydraulic conductivity was designed to account for the likelihood of more permeable units to exist in thicker sections of the alluvial profile. The maximum hydraulic conductivity (horizontal) calibrated for the Hunter River alluvium was 7.9 m/day, and the maximum value calibrated for the Saddlers Creek alluvium was 0.87 m/day".	Further explanation is required as to how this was decided in the face of little data for the alluvia. Also, the 1:100,000 mapping of the extent of the alluvia needs field checking/ verification.
"*long-term average of 3.6 ML/day of recharge entering the groundwater system, all of this volume is presumed to be discharged at the surface in drainages".*	The report needs to state whether it discharges to the surface – this is critical in terms of environmental values.
"Assessment of the steady state water budget for the alluvial systems indicated that flow from the surrounding geology into the alluvial units (i.e. flux) was 0.27 ML/day for the Hunter River alluvium and 0.31 ML/day for the Saddlers Creek alluvium".	The value 0.27ML/day for Hunter Alluvium is questioned.
"The simulated mining area inflows shown in Figure 40 are a combination of contribution from inflow from the Permian coal measures (including the regolith unit) and a contribution from the backfilled spoil. The inflow rates indicated on Figure 40 suggest that groundwater derived from the Permian coal measures will approach a maximum of about 900 ML/year (i.e. 28 L/s) in Year 10"	This is not insignificant.
"The model simulates a continuous aquifer system and does not include the minor faults, igneous intrusions and variability in hydraulic conductivity in the area – the impact of these features would be to lower the simulated seepage rate"	This statement needs justification and explanation.
"Layer 1 represents the regolith and alluvial areas of Saddlers Creek and the Hunter River. Impacts in this shallow zone are restricted to the immediate vicinity surrounding the mining areas, this being a maximum distance of about 600 m to the west and south of the mining areas at Year 27".	The impacts need explanation – are these to the proposed mine or to the environment?

3.2.3 Impact on Alluvial Aquifers

Analysis of fluxes indicates a pre-mining net upward seepage for the Hunter River alluvium of the order of 0.27 ML/day. However, the model is likely to under-predict the amount of upward leakage into the Hunter River alluvium, as a no-flow boundary exists along the southern boundary of the Hunter River alluvium. Assuming that the Permian unit located on the southern side of the Hunter River alluvium will provide a comparable flux, it may be appropriate to assume that the Hunter River alluvium will receive a seepage flux of the order of about 0.5 ML/day. Again, justification is required for this assumption.

There is limited public domain data available for the Saddlers Creek alluvial aquifer.

AGE quotes that *"Recent drilling and monitoring bore installations indicate this unit is thin, averaging less than 10 m thickness. NOW data indicates Hunter River alluvium to the immediate south of the study area is up to 13 m thick with basal gravel varying between about 2.5 m and 4 m in thickness, overlain by silt with minor clay".* For the geomorphology, this appears a low estimate. These alluvial aquifers would be expected to be thicker (say 20 m) with a thicker saturated thickness.

3.2.4 Cumulative Impact on Alluvial Aquifers

Model predictions support the evolution of a complex depressurisation of strata as a result of multi-seam extractions. Impact in the shallow regolith zone is mostly within the zone (within the longwall panel footprint) where loss of the water table is predicted by vertically downward drainage induced by subsidence cracking. Beneath this (subsidence) zone, the rock mass will be variably but significantly depressurized with pressure losses extending about 3 to 4 kilometres beyond parts of the panel footprint. Vertical leakage rates between the alluvial deposits associated with Saddlers Creek and the underlying coal measures may be affected. It would have been better to have an impact assessment conceptual visualisation that includes cumulative impacts from the surrounding coalmines and mine projects including this project.

Mining in the Saddlers Creek area will reduce the rate of the groundwater discharge from the Permian aquifers to the alluvial aquifer of Saddlers Creek. By 2011 the flow direction in the Permian aquifer is reversed with flow being from Saddlers Creek towards the South Pit Extension, stabilising on a rate of 0.09 ML/day by about 2019. At this time the northern part of the Saddlers Creek alluvium will be hydraulically separated from the underlying Permian aquifer due to the ongoing groundwater drawdown. The creek alluvium however will still receive direct recharge from rainfall and surface runoff, and will retain some of its natural ephemeral surface flow. By 2016 an additional minor impact on Saddlers Creek is caused by dewatering and depressurisation associated with mining of the Glen Munro and Woodlands Hill Seams in the southern part of Saddlers Pit, leading to a reversal of

groundwater flow into the Pit. The rigorous deduction emanating from the model is compromised by a generalised statement about compensation by direct recharge to the alluvium. The dynamic will be altered, as recharge is an ongoing phenomenon not a compensatory input to the groundwater hydraulics.

The simulation results indicate that the impact of the MAU Project may add to the reduction of flow and discharge towards Saddlers Creek along a 6 km-long section, directly downstream of the South Pit Extension whereby groundwater drawdown does not exceed 2m at the creek. Given the ambient thin saturated thickness of the alluvium, a 2m drawdown is considered a significant impact.

4 Review of the Environmental Assessment

The Environmental Assessment dated August 2012 was prepared by Hansen Bailey for Anglo American Metallurgical Coal Pty Ltd. The report is largely a summary document providing details on the proposal over the life of the coalmine and key aspects of specialist reports commissioned to address the Director General's requirements. The report was reviewed by Katy Bell, Environmental Scientist at G&S.

In summary, the Environmental Assessment largely meets the Director General's Requirements for Environmental Assessment, as issued by the NSW Department of Planning and Infrastructure (DPI) on 3 August 2011. However, some inadequacies were observed, centered on the assessment of risks in the project and the reporting of potential impacts and mitigation strategies. A number of examples illustrating these inadequacies are provided below.

4.1 Comments on scope/omissions

A number of key assessment aspects are detailed in the Environmental Assessment, including (but not limited to) the impacts, management and mitigation associated with air quality, greenhouse gas, noise, blasting, equine health, ecology, Aboriginal archaeological and cultural heritage, surface water, groundwater, stygofauna, and agriculture. Each of these aspects are covered in more detail in the provided individual reports (as listed below), and as such detailed responses to these sections are provided as individual reviews.

- Drayton South Geochemistry Impact Assessment
- Drayton South Aboriginal Cultural Heritage Impact Assessment
- Drayton South Ecology Impact Assessment
- Drayton South Soils Impact Assessment
- Drayton South Air Quality and GHG Impact Assessment
- Drayton South Economic Assessment
- Agricultural Impact Assessment
- Equine Health Impact Assessment
- Drayton South Groundwater Impact Assessment
- Drayton South Non-Aboriginal Heritage Impact Assessment
- Drayton South Social Impact Assessment
- Drayton South Stygofauna Impact Assessment
- Drayton South Surface Water Impact Assessment
- Drayton South Traffic and Transport Impact Assessment

The following points constitute generalised comments about the content of the Environmental Assessment and a number of examples to illustrate its inadequacies.

Approach to risk assessment

There are inconsistencies between the generalised reporting of the risk assessment and the results presented in Table 25 (Revised Risk Rating). For instance, the report details that "*the revised risk assessment revealed that most of the environmental and social issues identified posed low to medium risk*"[3]. However, Table 25 details ecological issues as having a "significant" risk rating. As ecological issues are such a critical component of the broader termed "environmental issues", this significant risk rating should not be down-played.

Furthermore, in our opinion, the risk assessment significantly underestimates the risk associated with specific issues onsite. For example, the assessment defines the risk to groundwater as "medium". However, impacts to groundwater will include depressurisation of aquifers, drawdown of the water table, removal of linkages between upper aquifers and the lower Permian (preventing natural upwelling) and the prevention of surface recharge due to the placement of overburden. These impacts would appear to be significant or high, not "medium" as described in the report. Additionally, the assessment defines the risk to stygofauna as "low", when as a result of the impacts on groundwater (some of which are listed above), the population of stygofauna is likely to be deleteriously affected.

Issues with reporting of impacts and mitigation strategies

The style and ordering of reported impacts provides a skewed view of the likely impacts of the project. Further, the mitigation and management strategies provided against a number of key areas are lack sufficient detail and in some areas do not actually represent 'mitigation'. Specific examples around issues with the reporting of impacts and mitigation strategies are listed below:

- The dust mitigation and management section provides only vague descriptions of the measures to be implemented. For example it states that they will "*implement available measures to keep visible dust low* and that *production processes will be modified to ensure effective management*"[4] but provides no detail on what these available measures may be or how production processes could be modified. These details are required in order for a proper assessment of the adequacy of mitigation measures to be made.

[3] Hansen Bailey 2012 Drayton South Coal Project Environmental Assessment page 157
[4] Ibid page 163

- The listed mitigation and management strategies for greenhouse gas emissions would not actually provide any mitigation of emissions.[5] The measures described relate to monitoring of emissions and the setting of targets, but provide no means to actively reduce the emissions associated with the project.
- The review of noise and vibration impacts on horses examined the actual noise levels experienced by horses during major event at racecourses. This information was then used to predict how horses might respond to the noise and blasting impacts of the project.[6] However, these events/impacts are not equivalent comparisons. Blasting will occur up to five times a week, unlike the exposure a horse would have at a racing carnival, which would occur at significantly lower frequencies. Additionally, the background noise associated with the mine would be continual, unlike the noise experienced by horses at a racecourse, which would be restricted to discreet events.
- The information provided in the ecological impacts section does not follow a logical sequence. For instance, the section detailing impacts on vegetation communities begins with impacts on exotic species and regrowth vegetation, which are not of major concern.[7] The most critical impacts, such as those on Threatened Ecological Communities (TECs), are not discussed until later in the report. This ordering has the potential to skew reader perception of the true impacts of the project.
- The impacts on fauna from the removal of vegetation are claimed to be mitigated through staged clearing and development of the offsite offset area.[8] This claim fails to recognise:

- The competition resulting in the nearby woodlands from the addition of new species from the project site. Nearby suitable habitats would presumably have well-established fauna communities of their own (at equilibrium), meaning the addition of further animals from the project site would result in high levels of competition for food and shelter.
- The natural instinct of displaced species to return home to the project site.
- The impact on offsite species from the removal of wildlife corridors. The removal of trees will not just impact the species identified as inhabiting the project site, but will also impact on those that travel through the area, and there is no real mitigation for this in the short term.

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[5] Ib d page 167
[6] Ib d page 192
[7] Ib d page 232
[8] Ib d page 235

- The long-term consequences of fragmentation, edge effects and reduction in patch size. Studies have shown that in many cases, fragmentation and the resulting patch sizes can result in similar biodiversity outcomes to direct habitat removal.[9]
- Disturbance of nocturnal or hibernating colonies. A significant proportion of the animals surveyed at the site are nocturnal, meaning they would have restricted capacity to naturally migrate when clearing would commence (i.e. in daylight hours). Disturbance of colonies in winter torpor can lead to loss of energy reserves and starvation. Disturbance of colonies in summer would disrupt the rearing of young and result in potential losses to new generations[10].
- There is reduced likelihood that migrating animals will find suitable, nearby habitats, owing to the fact that the habitat types these animal live in are acknowledged as rare in the Hunter Valley.

• The report details that the mechanism providing security of offsets will be made by Anglo in consultation with the relevant agencies, and may include:

- Conservation agreements between landowners and the Minister for the Environment under the NPW Act;
- Conservation covenants under Section 88 of the Conveyancing Act 1919;
- Application to change the zoning regulation that dictates land use;
- Dedication of land to the National Parks reserve estates; and
- Land acquisition and management of the land under private ownership with conditions of commitment.

• Without a definitive conclusion on the mechanism to secure offsets into the future, we are unable to assess if the offsets provide any ability to compensate for losses from the project.

4.2 Key issues for Coolmore, Darley and neighbouring properties

The key issues for Coolmore, as related to the Environmental Assessment, include the impacts of dust, noise and vibrations on horses. Owing to the broad nature of the Environmental Assessment, the assessment of impacts and mitigation determined for this area are dealt with in the Equine Health Impact Assessment.

[9] Cumber and Eco ogy 2012 Eco ogy Impact Assessment page 182
[10] Ib d page 139

4.3 Agricultural Land Use

Agricultural Impact Assessment by Scott Barnett & Associates Pty Ltd dated July 2012 has been assessed by Dr Phil Matthew, Principal Agricultural Scientist at G&S, against the NSW DPI guideline: NSW Govt Strategic Regional Land Use Policy Delivery – Guideline for agricultural impact statements. In summary:

- The focus of the agricultural impacts is on the site itself and the offset site, with a cursory examination of the surrounding properties and consequently the report fails to address the issues.
- The analysis below suggests the report does not fully comply with the requirement of an agricultural impact assessment.
- The economic analysis does not address the impacts on the neighbouring farms with most of the assessment based on the site and the off-set site.
- There is no sensitivity analysis of the assumptions and values used in the assessments.
- There is no uncertainty analysis in either report.

The following table sets out the requirements of an Agricultural Impact Assessment as detailed in the Guideline for agricultural impact statements by the NSW Department of Planning and Infrastructure (March 2012) and identifies inadequacies of the document provided.

Component of statement	Site		Surrounds	
	Section(s)	Adequacy	Section(s)	Adequacy
Detailed assessment of the agricultural resources and agricultural production of the project area				
The location and area of land to be temporarily removed from agriculture during operation of the project, and the period of time				*n/a*
The location and area of land to be returned to agricultural use post-project, and its productive potential relative to pre-project				*n/a*
The location and area of land that will not be returned to agriculture, including areas to be used for environmental plantings or biodiversity offsets				*n/a*

Component of statement	Site		Surrounds	
	Section(s)	Adequacy	Section(s)	Adequacy
The agricultural enterprises to be undertaken on any buffer and/ or offset zone lands for the life of the project				*n/a*
A comparison with enterprises undertaken on the land prior to the project				*n/a*
Identification of the agricultural resources and current agricultural enterprises within the surrounding locality of the project area				
Contain maps/ information for areas within the locality surrounding the project		Figure 3 soil landscape		
Soil characteristics, including soil types and depth	3.3	No detailed description - Addresses the soils by making reference to EES report appendix Q of the EA	3.3	Inadequate – brief description based on soil landscapes
Topography/ slope	3.2	Inadequate – no reasonable description	3.2	Inadequate – no reasonable description
Key agricultural support infrastructure (e.g. roads, railways, processing facilities);	4.1.3		4.1.3	
Water resources and other water users' extraction locations;	2.4 8.2	Other water users not identified	8.2	Other water users not identified
Location and type of agricultural industries; and		Mapping of activities on site not done		Mapping not undertaken
Climate conditions	3.1	Inadequate - Minimalist approach with no interpretive information	3.1	Inadequate - Minimalist approach with no interpretive information
Current agricultural enterprises				
Location				Not undertaken

Component of statement	Site		Surrounds	
	Section(s)	Adequacy	Section(s)	Adequacy
Production levels	5.0	Focus of assessment on the development site		Inadequate - Minimalist approach with no interpretive information
Identification and assessment of the impacts of the project on agricultural resources or industries				
General	*7.0, 8.0, appendix 5*	Inadequate risk assessment appears to not be undertaken – reference to an appendix that contains criteria but no assessment	*7.0, 8.0, appendix 5*	Inadequate risk assessment appears to not be undertaken – reference to an appendix that contains criteria but no assessment
The effects of the project on agricultural resources				
Consequential productivity effects of this on agricultural enterprises, including productivity impacts of any water moved away from agriculture and any water quality issues as they affect agriculture, farm productivity, land values and flow on impacts to community		Not assessed as relevant by report		Not assessed as relevant by report
Uncertainty associated with the predicted impacts and mitigation measures, as well as consequences and the likelihood that these uncertainties will be realised	Section 8			Uncertainty analysis not undertaken
Further risks such as weed management, biosecurity, subsidence, dust, noise, vibration and traffic conditions.				Noise referenced to appendix G of EA, Vibration not assessed – especially the impact of mining blasting with the exception of identifying it as not an issue – no data presented, traffic referenced to report in Appendix S of EA

Component of statement	Site		Surrounds	
	Section(s)	Adequacy	Section(s)	Adequacy
Account for any physical movement of water away from agriculture				
General	*8.2*	Asserts Project does not require water supplementation – • does not specify water requirement for the extreme event 99% dry year • indicates application for an allocation will be required for this event.	*8.2*	No description or assessment of Hunter River Groundwater - Makes reference to the groundwater study by AGE
Assessment of socio-economic impacts				
General	*8.5, 8.6, 8.7*	Not applicable sections do not address this issue – covered by separate report by Gillespie economics		Not applicable sections do not address this issue – covered by separate report by Gillespie economics – • economic assessment does not evaluate the land value impacts on surrounding properties eg. farm borrowing potential etc. • no sensitivity analysis of assumptions or values • no test of reliability on the outcomes.

Component of statement	Site		Surrounds	
	Section(s)	Adequacy	Section(s)	Adequacy
Identification of options for minimising adverse impacts on agricultural resources, including agricultural lands, enterprises and infrastructure at the local and regional level				
General	*9.0 9.1, 9.2, 9.3, 9.4*		*9.0*	
Project design review/ alternatives;	*9.0 9.1, 9.2, 9.3, 9.4*			Not addressed
Proposed monitoring programs to assess predicted versus actual impacts as the project progresses;	*9.0 9.1, 9.2, 9.3, 9.4*			Monitoring procedures and objectives not identified
Trigger response plans and trigger points at which operations will cease, be modified or remedial actions will occur to address impacts, including a process to respond to unforeseen impacts;	*9.0 9.1, 9.2, 9.3, 9.4*			No trigger levels or contingencies identified
The proposed remedial action to be taken in response to a trigger event;	*9.0 9.1, 9.2, 9.3, 9.4*			No remedial actions identified
The basis for assumptions made about the extent to which remedial actions will address and respond to impacts; and	*9.0 9.1, 9.2, 9.3, 9.4*			Not addressed
Demonstrated capacity for the rehabilitation of disturbed lands to achieve the final land use and restore natural resources.	*9.0 9.1, 9.2, 9.3, 9.4*			Not addressed
Demonstrated planning for progressive rehabilitation that minimises the extent of disturbances.	*9.0 9.1, 9.2, 9.3, 9.4*			Not addressed

Component of statement	Site		Surrounds	
	Section(s)	Adequacy	Section(s)	Adequacy
Document consultation with adjoining land-users and government departments				
General	6	1.	6	No detailed description - only a summary of EA discussion
Including consultation undertaken at the exploration licence stage				
Consultation with relevant government agencies				4 agencies
Consultation with impacted landholders and community groups				8 landholders
The issues identified and measures to address these issues				10 regulator issues, 12 landholder issues listed
The outcomes of the consultation				Relates outcomes to sections in report – not addressed specifically
Any commitments for further consultation				Nil

5 Ecology

A review of the Ecology Impact Assessment for the Drayton South Coal Project by Cumberland Ecology dated June 2012 has been undertaken by Katy Bell, Environmental Scientist at G&S. Key findings are summarised below.

5.1 Adequacy of the report

The Ecological Impact Assessment (the 'Assessment') includes a comprehensive investigation of the project site. The methodology and reporting of current conditions appears adequate and provides an accurate description of the project site. However, whilst the Assessment acknowledges a number of significant ecological impacts associated with the project, the mitigation/compensatory measures are lacking and based on the information provided, it is impossible to ascertain whether the proposed measures would provide adequate/suitable compensation. Specific examples and comments on such inadequacies are provided below.

5.2 Comments on scope/omissions

The Assessment acknowledges that the nature, magnitude and location of most open-cut coal monitoring projects means that in the majority of cases broad areas of forest, woodland, open grassland and threatened species habitat will be cleared.[11] However, under this project the Assessment claims that onsite and offsite offsets will mean there is a net gain to biodiversity in the area.[12] Whilst a net gain may be achieved in the long term, it must be acknowledged that there will be a significant loss of biodiversity at the inception of the mine (due to large scale land clearing) and that any gain in biodiversity through rehabilitation/regeneration of offset areas is not guaranteed.

Rehabilitation of mine areas will only occur in the medium to long term and will take significant time to reach current biodiversity levels (and for the establishment of important habitat features, including large trees, understory, hollows, logs on ground, etc), provided that the rehabilitation is successful. In the initial phases, management of the offset property would provide no net gain on current biodiversity levels as this parcel of land is already vegetated. Only after the establishment of fencing, replanting and weed removal strategies would gains be observed.

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[11] Cumberland Ecology 2012 *Drayton South Coal Project Ecological Impact Assessment* page 75
[12] Ibid page 1048

In addition, the assessment does not recognise the substantial losses of fauna in the area that will result from the large-scale land clearing activities associated with the project. The Assessment states that animals found to be occupying trees will be safely removed before clearing and relocated to nearby woodlands,[13] that the majority of species are highly mobile[14] and that part of the habitats will be retained, reducing impacts on flora and fauna. This fails to acknowledge the extent of the impacts resulting from the following factors, which in most cases would be death of the fauna.

- The competition resulting in the nearby woodlands from the addition of new species from the project site. Nearby suitable habitats would presumably have well-established fauna communities of their own (at equilibrium), meaning the addition of further animals from the project site would result in high levels of competition for food and shelter.
- The natural instinct of displaced species to return home to the project site.
- The impact on offsite species from the removal of wildlife corridors. The removal of trees will not just impact the species identified as inhabiting the project site, but will also impact on those that travel through the area, and there is no real mitigation for this in the short term.
- The long-term consequences of fragmentation, edge effects and reduction in patch size. Studies have shown that in many cases, fragmentation and the resulting patch sizes can result in similar biodiversity outcomes to direct habitat removal.[15]
- Disturbance of nocturnal or hibernating colonies. A significant number of the animals surveyed at the site are nocturnal, meaning they would have restricted capacity to naturally migrate when clearing would commence (i.e. in daylight hours). Disturbance of colonies in winter torpor can lead to loss of energy reserves and starvation. Disturbance of colonies in summer would disrupt the rearing of young and result in potential losses to new generations.[16]
- There is reduced likelihood that migrating animals will find suitable, nearby habitats, owing to the fact that the habitat types in which these animals live are acknowledged as rare in the Hunter Valley.

[13] Ib d page 8 3
[14] Ib d page 121
[15] Ib d page 182
[16] Ib d page 139

5.3 Key issues for Coolmore, Darley and neighbouring properties

The report acknowledges that "*the largest direct impact of the project is the removal of native vegetation that, in addition to providing habitat for native flora and fauna, also performs an important role in regulating ecosystems health*".[17] Changes to biodiversity of habitats in proximity to Coolmore and the overall ecosystem health of region should have been recognised.

Aside from large-scale changes to ecosystem health in the region, Coolmore may experience increased levels of native fauna migrating across, and potentially inhabiting, the property.

[17] Ib d page 173

6 Soil and Land Capability

Dr Phil Matthew, Principal Agricultural Scientist at G&S, has reviewed the report *Soil and Land Capability Impact Assessment, Drayton South Coal Project* by Environmental Earth Sciences dated June 2012.

The review considers the adequacy of the method for the soil and land capability assessment for the Drayton South Coal Project and its interpretations and outcomes.

6.1 Method

Key issues that have been identified in the methodology are:

- The scale of mapping is unspecified; the maps appear to be 1:50,000.
- A 30 test pit observation density does not comply with Mackenzie et al. 2008 guidelines of 1 per 100ha (table 14.4). If using a medium intensity survey, the 4600 ha site would require some 46 observation sites of which 15-35% would be detailed descriptions and 1-5% would be deep drilling profiles for lab samples and 55 to 83% would be ground obs.
- The method appears not to have used a systematic unique mapping area (UMA) approach to delineate mapping units or the report does not report the analysis or outcomes.
- The observation density is at the lower end of the recommended rate for 1:100,000 scale.
- The criteria to determine agricultural capability have not been specified.
- The criteria for assessment of land suitability have not been specified.

6.2 Interpretations and outcomes

Key issues in relation to the overall report and its analysis are:

- The scale of mapping and the corresponding accuracy of the maps raise the potential for there to be significant variability in the soil and land types on the site.
- The lack of clear criteria for the assessment of capability and suitability makes the assessment appear subjective with little objective base.
- Given the scale and subjectivity of assessment, the reliability of the soils, suitability and capability maps will be questionable.

7 Geochemical Impact Assessment

Dr Phil Matthew, Principal Agricultural Scientist at G&S, reviewed the April 2012 report by RGS titled *Drayton South Coal Project Geochemical Impact Assessment of Overburden and Coal Reject Materials*. The comments on the adequacy of the report relate to three components:

- Sampling
- Data
- Interpretations.

7.1 Sampling

There is no justification for the sampling locations except for a reference to previous studies and the assistance of Anglo coal employees. The sampling location selection requires adequate description including a justification of the logic. All sample locations appear to be on the edges of the mine area. In addition, the borehole locations do not appear to give a representative description of the materials because a large segment of the proposed mined area is un-sampled. No assessment is provided of the statistical relevance of the sample locations and samples taken to the mine site as a whole unit of management. The sample regime does not appear to conform with the relevant guidelines, for example DITR *2007 Leading Practice Sustainable Development Program for the Mining Industry: Managing Acid and Metalliferous Drainage,* Feb 2007 Canberra, in particular Table 1.

7.2 Data

Section 5.4 water extracts

The results in Table 6 of the report appear to have some anomalies: e.g. the ion balances of the cations and anions do not appear appropriate, electrical conductivity and ions do not balance, etc. There may be some error in analysis or the data itself.

7.3 Interpretations

The following sections of the report require review:

Section 5.4 Multi-Elements in Water Extracts

- The analysis relies on the ANZECC guidelines as an assessment tool to identify the impacts. This is inappropriate, as the impacts should be assessed against the existing water quality of the surface and ground waters.
- ANZECC guideline values are not referenced correctly: e.g. ANZECC Table 3.4.1 or Table 4.3.2.

- Mixed indications are given of what receptors have been selected as the guideline (stock waters, aquatic ecosystems or irrigation?).
- No justification is given for the selection of the receptors.

Section 5.5 KCL tests

The issues raised above in relation to Section 5.4 apply, namely:

- The analysis relies on the ANZECC guidelines as an assessment tool to identify the impacts. This is inappropriate, as the impacts should be assessed against the existing water quality of the surface and ground waters.
- ANZECC guideline values are not referenced correctly: e.g. table ANZECC table 3.4.1 or table 4.3.2. (The second appears to be correct.)
- Mixed indications are given of what receptors have been selected as the guideline (stock waters, aquatic ecosystems or irrigation?).
- No justification is given for the selection of the receptors.

In addition, the use of composite samples means the guideline value must be reduced by a multiple of the composite e.g. eight samples in composite means the guideline value of 5 is now 0.63. This is not reflected in the report and is essential to the interpretations.

Section 6.2.2 Water Quality

This section makes reference to the available ground and surface water data at Saddlers Creek but does not show it. This is a significant omission and needs correction. The impact should be assessed against the background data, and not ANZECC. In addition, there is no statistical representation of the background data against the test results from the overburden and coal rejects.

7.4 General

The report does not assess the heterogeneity of the material nor does it map the relevant geological units in relation to the testing undertaken. Groundwater flow relationships are not assessed in relation to the results and no conclusions may be drawn about the impacts from this report. The risk assessment is inadequate.

7.5 Response to Director General's Requirements

As noted above, the risk assessment is inadequate. In the area of water quality modelling, the impacts are not adequately addressed. The management and disposal of rejects waste are also not addressed adequately.

8 Stygofauna

A review of the *Drayton South Coal Project: Stygofauna Impact Assessment* by Eco Logical Australia dated 30 March 2012 has been undertaken by Katy Bell, Environmental Scientist at G&S. Key findings are summarised below.

8.1 Adequacy of the report

In short, the report fails to provide an accurate description of stygofauna species present in the Saddlers Creek Alluvial Aquifer (SCAA). Without a comprehensive assessment of taxa, we are unable to conclude with certainty the presence of rare or threatened species or the diversity of species present in the population. This makes an assessment of potential impacts and thus required mitigation measures impossible.

The report concludes that *"the Project is only anticipated to have a minimal impact on the aquifer and will pose no threat to the stygofauna community"* (page 29). Yet the impacts on the aquifer, as acknowledged in the report, are those of greatest threat to the stygofauna community, and could adversely impact upon the population by removal of their habitat (or by significant changes to their habitat that make it uninhabitable).

The conclusions also state that there is *"no threat posed to any rare or significant stygofauna taxa"* (page 29). Yet the report acknowledges that the September/October samples are not indicative of the entire population (page 24) and that taxonomic classification of species is difficult due to a lack of research in NSW (page 21). This means that i) rare species potentially may not have been picked up during sampling, despite being present, and ii) that species could have possibly been inaccurately identified (especially as one was identified from limited remains and not a whole organism).

Specific comments on inconsistencies in reporting and issues with sampling are provided below.

8.2 Comments on omissions

Inconsistencies in reporting

There does not seem to be a logical connection between literature citations of potential impacts on stygofauna, acknowledged habitat changes and conclusions of impacts on the population. Please see the following points for examples.

- The report states that as mining proceeds, draw down of SCAA will occur at a greater rate than recharge. Furthermore, the report states that the project will affect the upward flux of water entering the SCAA from the Permian aquifer. (This will be reduced from 0.31ML/day to a predicted level of about 0.12ML/day.) Additional impacts on groundwater level and recharge regimes will result from

changes to topography, which will reduce the infiltration of rainfall and surface water flows (page 27). Due to the limited ability of stygofauna to migrate and the complete removal of habitats and connections between habitats where stygofauna may exist (which would essentially occur from the changes listed above), the project has the capacity to detrimentally impact upon the population of stygofauna in the SCAA. Yet it is concluded that the project does not threaten the stygofauna community (page 29).

- The report concludes that even though mining will impact the Permian aquifers, there will be no impact on stygofauna, as no stygofauna are known or are likely to occur in the Permian strata (page 28). However, the report earlier states that it is "possible" that stygofauna are present in the Permian aquifer (pages 25-26).
- The report acknowledges that runoff and seepage from overburden and reject emplacement will be slightly alkaline and contain low and moderate concentrations of soluble salts (page 28). The report also states (as validated by numerous studies including Humphreys 2006, Hancock et al 2005 and Leys et al 2003) that as aquifers are relatively stable with little or no daily fluctuation to water quality parameters, many stygofauna are sensitive to rapidly changing conditions (page 6). Despite this, the report draws the conclusion that the leachate is unlikely to impact on the stygofauna that are known to occur in the area (page 28).

Issues with sampling

- The report states that the hyporheic zone often contains groundwater taxa (page 12). The presence of stygofauna in the hyporheic zone of many ecosystems is confirmed in numerous studies (Tomlinson & Boulton 2008, Hancock et al 2005 and Hancock 2002). Yet the assessment involved no sampling of the hyporheic zone in its evaluation of stygofauna impacts.
- The report acknowledges that considering the young age of bore MB02 (where the SCAA stygofauna species were found), it is unlikely that the samples collected are representative of the aquifer community (page 24). This implies that there is the potential for much higher species diversity across the aquifer, and that the study cannot be used as the basis for an assessment of diversity and therefore the potential impacts on the community.
- Three (3) months has been acknowledged as the minimum time required for stygofauna colonisation following bore construction (Western Australia EPA 2003, 2007). 24 bores were sampled in September, with many of these re-sampled in October. Sampling in October returned no results. Owing to stygofauna's limited ability to migrate and sensitivity to habitat changes, one could presume that the one-month period between sampling was not sufficient for stygofauna to recolonise the areas around the bores in the network.

- The report states that many stygofauna species in NSW remain undescribed due to the lack of prior research in the region (page 21). This is confirmed in recent peer-reviewed studies, including Tomlinson & Boulton 2008 and Humphreys 2006. With this acknowledgment of limited taxonomic knowledge across the field, one could conclude that perhaps there is not absolute confidence in the identification of species and therefore the conclusion of species diversity levels. Furthermore, the report claims that no threatened species were identified, but as there have been limited taxonomic studies in the area there is limited confidence in i) the positive identification of species in this study, and ii) the current knowledge around rare and threatened species within the taxa.

8.3 Key issues for Coolmore, Darley and neighbouring properties.

The report acknowledges the role of stygofauna in maintaining groundwater quality (page 6), which is supported by peer-reviewed studies of stygofauna, for example Hancock et al 2005. This means that their removal, which is a likely consequence of the project, could result in a decline in groundwater quality in the SCAA. However, considering the other impacts on groundwater resulting from the project (depressurisation, drawdown, removal of linkage with the Permian aquifer, etc), the effects from removal of stygofauna may be inconsequential.

References

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9 Non-Aboriginal Heritage Impact Assessment

Pamela Kotteras, Team Leader Cultural Heritage from Biosis, has provided an overview of the Drayton South Coal Project Heritage Impact Assessment prepared by AECOM dated 27 June 2012. The review addresses the Director General's requirements as they relate to non-Aboriginal heritage and, in particular:

- Assessment of potential impacts on non-Aboriginal heritage values of the locality related to its settlement of Europeans and its pastoral history.

The guidelines identified by the DGRs are as follows:

- NSW Heritage Manual (NSW Heritage Office &DUAP)
- The Burra Charter (The Australian ICOMOS charter for places of cultural significance.

A copy of the report by Biosis is provided as a further attachment to this report and the key issues are summarised below.

9.1 Key issues

The report would benefit from more detailed research, specifically with respect to the items identified below:

- The significance of the Nissen (spelled "Nissan" in the report) Huts is not convincing. The report would be substantially improved with a contextual history of the Nissen Huts in the Singleton area.
- An assessment of landscape values and mitigation measures prior to the modification of the landscape as a result of the project should be considered. The NSW Heritage Branch publication Assessing Heritage Significance (2001) makes specific mention of cultural landscapes and therefore, having been an important pastoral area, an assessment of the landscape is warranted.

The review also identifies a number of shortcomings in the heritage assessment, and in particular:

- The historical content does not contain referencing
- The report lacks photographs
- The assessment of the national significance of the Strowan Homestead is not supported by the research
- References to the southwest portion of the site being within the Singleton LGA
- Aboriginal Archaeological and Cultural Heritage Impact Assessment

Samantha Higgs, Senior Archaeologist from Biosis, has provided a review of the

Aboriginal Archaeological and Cultural Heritage Impact Assessment Drayton South Coal Project prepared by AECOM dated 20 May 2012. The review addresses the Director General's requirements as they relate to non-Aboriginal heritage and, in particular:

- Description of the Aboriginal objects and declared Aboriginal places located within the proposed development, their cultural value and the significance to Aboriginal people; and
- Description of how the requirements for consultation with Aboriginal people have been met and details of the views of the Aboriginal people regarding the likely impact of the project.

A copy of the report by Biosis is provided as a further attachment to this report and the key issues are summarised below.

9.2 Summary of Assessment

In general, the report is comprehensive and well written (with the exception of poor spelling and grammar). The assessment has been completed in accordance with the guidelines in the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (DECCW 2010) in terms of the background research, archaeological survey, site recording, assessment and information contained within the report.

The Aboriginal consultation for the project has been undertaken in accordance with the requirements of the Aboriginal Cultural Heritage Consultation requirements for proponents (DEEW 2010) and is considered to be comprehensively detailed to satisfy guideline requirements. The review identifies some issues around responses to Aboriginal community comments, and in particular, the Wonnarua Nation Aboriginal Corporation's call for further consultation and other specific objections to the project.

10 Equine Health Impact Assessment

Dr Andrew Paxton-Hall, Veterinarian, has provided a review of the Equine Health Impact Assessment for the Drayton South Coal Project prepared by Dr Nicholas Kannegeiter dated July 2012, together with a commentary on Dr Kannegeiter's 22 April 2012 Literature Review entitled 'The effects of dust on the equine lower respiratory tract'.

A summary of key points raised in Dr Paxton-Hall's review is provided below.

10.1 Key Matters Raised

1) Extraneous light is a potential environmental issue for breeding equines. Light of sufficient strength and duration could affect breeding animals if not controlled.
2) Endotoxin-laden dust is agreed to cause transitory respiratory conditions in the adult equine. However, it needs to be stated that other pollutants of similar size, of types consistent with coal dust and heavy machinery burning diesel, have been proven to cause major lung pathology in equines. Young foals' susceptibility to dust of all types needs to be established, especially in a paddock situation, as research is limited. Many of the animals on a breeding property are foals.
3) Noise and vibration from mining could affect horses. Horses may be susceptible to explosion noise. Given that the equine population on a breeding stud is fluid, assumptions regarding desensitisation over time to mining effects may be just that and individual differences may be an issue.

11 Acoustic Impact Assessment

Glenn Wheatley, Team Leader/Senior Consultant from Renzo Tonin, has provided an overview of the Drayton South Coal Project Acoustic Impact Assessment prepared by Bridges Acoustics dated 16 July 2012. The review addresses the Director General's requirements and also considers the Equine Health Impact Assessment and Traffic and Transport Assessment in relation to noise impacts.

11.1 Key matters raised

The report concludes that there are no potentially affected properties with regard to noise. However, a number of matters are outlined in the report that may impact on this conclusion. As an example, the operational noise assessment relies on background noise monitoring carried out between 23 June and 5 July 2011 at Location M2, which is adjacent to the Strowan residence. Background noise levels have been determined on the basis of short-term and long-term noise logging that include extraneous noise from local sources including air conditioners, water pumps and insect noise (which will not occur throughout the year and should be excluded from the monitoring results). These extraneous noise sources should be removed from monitoring results whereby the background noise levels should be lower.

The rail noise assessment focuses on the proportional noise level increase as a result of the project and relies on other unapproved development in the area, rather than assessing actual noise exposure at affected receiver locations. As a result of this consideration, the proportional increase of the proposal is diluted. If the project-related increase in rail noise exceeds a 0.5dB threshold, then a more detailed assessment would be required. The continual and incremental increase in rail noise associated with individual projects discounts the cumulative impact of multiple projects in the area, which may result in noise levels above the policy trigger levels.

The potential impact of blasting pressure on horses cannot be assessed as weighted noise levels for raised days (measured in dB(A)) cannot be compared to dBL levels that have no weighting. The issue of peak noise level emergence above background noise level, and the subsequent impact on horses, does not appear to be addressed in the report.

12 Air Quality Impact Assessment

Simon Welchman, Director of Katestone Environmental, has provided an overview of the Drayton South Coal Project Air Quality Impact Assessment prepared by PAEHolmes dated 2 August 2012. The review addresses the Director General's requirements and also considers the requirements of the Office of Environment and Heritage (OEH) for conducting air quality impact assessment studies in the document titled 'Approved Methods for the Modeling and Assessment of Air Pollutants in NSW' (December 2005).

12.1 Key Matters Raised

- The proposal will increase ground-level concentrations of nuisance dust (as indicated by TSP and dust deposition rates) and dust that can affect human health (PM10 and PM2.5) across the Coolmore property.
- Cummulative annual average ground-level concentrations of PM10 and TSP are below the criteria on the northwestern edge of the Coolmore property in Years 10 and 15.
- The incremental dust deposition rate is well below 2 g/m2/month.
- The cumulative 24-hour concentrations of PM10 are likely to exceed the criterion across the Coolmore property for the years 5,10 and 15. There is insufficient information to determine the number of exceedences per year.
- Whilst the report states that ground-level concentrations will be minimised through monitoring and mitigation measures and best practice will be implemented, the study has not demonstrated that these will be sufficient to achieve compliance with the criterion.
- No discussion has been included regarding the significance of the predicted concentrations of PM10 and other dusts from the mine on horses.

Further to the preliminary review above, Dr. Carl Fung, Advitech Environmental, has provided a more detailed assessment of the Drayton South Coal Project Air quality Impact Assessment. A summary of the findings is provided below;

In general, the AQIA do not provide sufficient data at appropriate detail to comprehensively review adopted assumptions and accuracy of data used. For example:

- Appendix A does not include wind rose information for Macleans Hill upon which the selection of 2005 as representative year for air dispersion modelling was based.
- There are irregularities between monitoring stations in the recorded data that has been provided (e.g. the September 2009 dust storm is not represented at all monitoring stations).

- It is possible that not all background dust data is reported and that certain weather events that exacerbate background concentrations will be missed.
- The proponent has avoided any statement/observation that indicated dust deposition rate data (D9-D12) is generally increasing with monitoring year. This observation may link into ever increasing mining intensity for the region.
- No recognition of, or explanation for, the variation of the PM10/TSP ratio between 0.34 and 0.67 when it would be expected to remain relatively constant. This goes against the quality of the data underpinning the entire assessment.

Further, there are several concerns regarding the air dispersion modelling as reported. These include:

- There is insufficient meteorological/climatic justification for selection of year 2005 as the representative year for air dispersion modelling.
- Air impacts being attributed to power stations (and potentially other sources) are potentially underestimated. If there is an underestimation, then this could lead to fewer off-site predicted dust exceedence events than would otherwise occur at project identified sensitive receptors.
- A 3 km grid was used to generate the final inner domain wind field. This level of model resolution may not detect the adjacent valleys that surround the project site and may yield data not representative of the location. This is particularly significant as key regional assets such as Coolmore and Darley abut the project boundary and are within 1 km of operational areas of the proposed project.
- The selected critical CALMET parameter values TERRAD, R1MAX, R2MAX, R1 and R2 appear inconsistent to accepted methodology. The value of TERRAD appears too large for the inner modelling domain, while the selected values of R1MAX, R2MAX, R1 and R2 are small with less weighting being given to surface meteorological observations. No justification has been given for why such small values were chosen.
- There is no discussion of regional climate change and it may impact on surface wind speeds, rainfall, air temperature, evaporation, periods of wind calm and other meteorological parameters that have the potential to influence the dispersion of dust from the project site. For example, review of the Climate Change in Australia web site suggests that wind speeds in the Hunter Valley may expect increases of up to 30% over the next 20-30 years.
- The detail and the approach of the proposed Monte Carlo methodology requires, at a minimum, more explanation to show how and why this is a suitable assessment approach and, at worst, this lack of detail implies that an accurate estimation of cumulative dust impacts is not available.

13 Traffic and Transport Impact Assessment

Cambray Consulting has provided a 'without prejudice' critique of the Drayton South Coal Project Traffic and Transport Impact Assessment prepared by DC Traffic Engineering and dated 20 April 2012. The full report is provided as a separate attachment and the key findings are summarised below.

13.1 Key findings

The report identifies the Denman Road/ Mitchell Drive intersection as a priority-controlled intersection. On the basis of information provided, the planned intersection upgrade is likely to be required in 2014 – before the construction period for the Drayton South mine commences – to ensure that the intersection operates safely and within acceptable limits of operation.

Similarly, the intersection of New England Highway and Thomas Mitchell Drive is a priority-controlled intersection with a geometry that will not have sufficient capacity to accommodate traffic associated with the proposed mine and adjacent mines. On the basis of information provided, the planned intersection upgrade is likely to be required in 2014 – before the construction period for the Drayton South mine commences – to ensure that the intersection operates safely and within acceptable limits of operation. In both cases, Cambray believe that it may not be appropriate for Drayton South works to commence without proposed upgrade works in place.

Cambray also identify a number of safety deficiencies based on horizontal geometry and sightlines for the Drayton Mine Access Road/Thomas Mitchell Road intersection. As this intersection provided sole access to the mine, it should be incumbent on the project proponents to demonstrate that the intersection geometry complies with relevant standards and will operate safely.