



**TARRAWONGA MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

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WHC_PLN_TAR_BLAST MANAGEMENT PLAN

BLAST MANAGEMENT PLAN

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ACRONYMS USED THROUGHOUT THIS DOCUMENT

AS	-	Australian Standard
AEMR	-	Annual Environmental Management Report
BMP	-	Blast Management Plan
CCC	-	Community Consultative Committee
EPA	-	Environment Protection Authority
DP&E	-	Department of Planning and Environment
EPL	-	Environment Protection Licence
DRE	-	NSW Trade and Investment – Division of Resources and Energy
MIC	-	Maximum Instantaneous Charge
ML	-	Mining Lease
TCM	-	Tarrawonga Coal Mine/Tarrawonga Coal Pty Ltd



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1 INTRODUCTION

The Tarrawonga Coal Mine (TCM) is located approximately 15km northeast of Boggabri, 10km north of the former Canyon Coal Mine (in closure) and south of, and adjacent to, the Boggabri Coal Mine (Figure 1). The mine site is contained within Mining Leases (ML) 1579, 1685 and 1693 as shown in Figure 1. The mine is being developed by Tarrawonga Coal Pty Ltd (TCM), a joint venture between Whitehaven Coal Mining Pty Ltd (70%) and Idemitsu Boggabri Coal Pty Ltd (30%) and operates under Environment Protection Licence (EPL) 12365 and Project Approval (PA) 11_0047.

This Blast Management Plan (BMP) has been prepared to ensure that the blasting associated with the mine's operations are in compliance with criteria stated in PA 11_0047 and EPL 12365. To ensure this, the BMP has been prepared in accordance with Condition 3(21) of PA 11_0047.

The following sub-sections identify the monitoring locations and the nature of the monitoring equipment to be used, equipment setup and post-blasting procedures as well as blast information analysis and reporting procedures. To ensure this document represents an effective on-site management tool, information on invitations for pre-blasting property inspections and investigations, blasting mitigation measures, blast notification procedures and complaint management procedures are also recorded.

This BMP has been prepared in consultation with the EPA and the Tarrawonga Community Consultative Committee (CCC), as representatives for interested members of the local community who would potentially be affected by blasting. Consultation records are provided in Appendix 1.

Information regarding blast management and performance to date is available in the site's Annual Environmental Management Reports (AEMR)/Annual Reviews.



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2 STATUTORY REQUIREMENTS

2.1 PA 11_0047

This Blast Management Plan (BMP) follows the management plan requirements specified in Schedule 5 Condition 3 of PA 11_0047 and complies with the requirements of Schedule 3 Condition 21, which states:

Blast Management Plan

The Applicant shall prepare and implement a Blast Management Plan for the development to the satisfaction of the Director-General. The program must:

- (a) be submitted to the Secretary for approval by the end of May 2013;*
- (b) be prepared in consultation with the EPA and interested members of the local community who would potentially be affected by blasting;*
- (c) propose and justify any alternative ground vibration limits for public infrastructure in the vicinity of the site;*
- (d) describe the measures that would be implemented to ensure:*
 - best management practice is being employed; and*
 - compliance with the relevant conditions of this approval;*
- (e) include a road closure protocol for blasting within 500 metres of a public road, that has been prepared in consultation with council;*
- (f) include a specific blast fume management protocol to demonstrate how emissions will be minimised, including risk management strategies if blast fumes are generated;*
- (g) include a monitoring program for evaluating blasting performance, which includes*
 - compliance with the applicable criteria; and*
 - minimising blast fume emissions; and*
- (h) include a Leard Forest Mining Precinct Blast Management Strategy, that has been prepared in consultation with other mines within the Leard Forest Mining Precinct, to minimise cumulative blasting impacts.*

In accordance with Schedule 3 Condition 14 of PA 11_0047, Conditions 11(a) and (b) of ML 1579, Conditions 10(a) and 10(b) of ML 1693 and Conditions L5.1 – L5.7 of Environment Protection Licence (EPL) 12365 the airblast overpressure and ground vibration blasting criteria is as follows:



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Table 1 Blasting Criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately-owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
All public infrastructure	-	50 <i>(or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, to the satisfaction of the director general)</i>	0%

However, these criteria do not apply if TCM has a written agreement with the relevant landowner to exceed the criteria, and TCM has advised the Department in writing of the terms of this agreement.

It is noted that the ground vibration limit for all public infrastructure is 50mm/s or a limit determined by the structural design methodology in AS 2187.2-2006, or its latest version, to the satisfaction of the Secretary. At this stage, Tarrawonga does not propose to alter the limit from 50mm/s. If a revised limit is required, Tarrawonga will consult with the Secretary and update the BMP accordingly.

PA 11_0047 Schedule 3 Conditions 15 and EPL 12365 restrict blasting operations to 1 blast per day, unless an additional blast is required following a blast misfire. Furthermore, PA 11_0047 Schedule 3 Conditions 16 restricts blasting operations to 4 blasts a week, averaged over a calendar year. Blasting operations will be carried out between 9am and 5pm Monday to Saturday inclusive.

The monitoring locations where the blasting criteria are assessed are specified in EPL 12365, as outlined in Section 5.1.2.

All aspects of blast management will be undertaken in accordance with AS 2187.2-2006 - Storage and Use – Use of Explosives, a copy of which will be retained at the site office.

Schedule 3 Condition 17 of PA 11_0047 provides detail on the process to be undertaken for baseline property inspections (also refer to Section 4.1) whilst Schedule 3 Condition 18 details the process to be undertaken where claims of blasting damage are received (also refer to Section 4.3).

PA 11_0047 Schedule 3 Condition 19 (a) requires that TCM implements best practice blasting management in relation to protecting the safety of people and stock within the surrounding area; protecting private and public infrastructure/property in the surrounding area from damage; minimising the emission of dust and fume of any blasting; and minimising blasting impacts on heritage items in the vicinity of the site. These matters are addressed throughout Section 3.

Blasting activities are coordinated between the Leard Forest Mining Precinct Mines in accordance with PA 11_0047 Schedule 3 Condition 19 (b) and with details provided in Section 4.2.2.



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PA 11_0047 Schedule 3 Condition 19 (c) requires TCM to provide a public information system for blasting schedule, details of this system are provided in Section 4.2.1.

TCM intends on blasting within 500m of a public road as part of its operations this is addressed in Section 3.4 in accordance with PA 11_0047 Schedule 3 Condition 20 (a).

2.2 Mining Leases and EPL 12365

Requirements specified in ML 1579, ML 1685 and ML 1693 and EPL 12365 mirror those listed in the Project Approval and have been referred to in the relevant sections of this Plan.

2.3 Other Statutory Requirements

Other relevant statutory requirements relevant to blasting include, but are not limited to:

- Dangerous goods and explosives notifications and licencing with WorkCover NSW in accordance with the *Work Health and Safety Act 2011*, *Work Health and Safety Regulation 2011* and *Explosives Act 2003*.
- Implementation of an Explosives Management Plan and management of notifiable incidents under the *Work Health and Safety (Mining) Act, 2013*.



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3 **BLASTING CONTROLS AND MANAGEMENT PROCEDURES**

Tarrawonga Coal Mine seeks to minimise air blast overpressure, ground vibration levels, flyrock, fume, dust and odour from blasting activities. Control of ground vibration, overpressure and flyrock impacts will be achieved by implementing the procedures and safe guards indicated as follows:

- Comply with the relevant procedure prior to the commencement of any blast by referring to the internal documents *WHC_PLN_OC_EXPLOSIVES MANAGEMENT PLAN*, *WHC_PLN_TAR_EXPLOSIVES SECURITY WHC_PRO_OC BLAST PLANNING, DESIGN & RECORD KEEPING*; and *WHC_PRO TAR_BLAST FUME MANAGEMENT*.
- Undertake a pre-blast environmental assessment with consideration given to meteorological conditions such as cloud cover, wind speed and direction and the strength of temperature inversions prior to each blast;
- Comply with blast loading and pre blast designs, unless risks are determined by the Shotfirer at the time of loading that may be mitigated through changes to design;
- Use of suitable quality stemming material and the use of adequate stemming lengths to ensure maximum internment of explosive charges, therefore minimising overpressure; and
- Use of monitoring data to establish and estimate the likely overpressure and vibration levels during the design process of subsequent blasts.

The internal documents relating to explosives management include information on storage, issue and transport of explosives and bulk products, shot planning, drilling blast holes, blast monitoring, relevant legislation, training, review, auditing and explosives safety requirements. The documents are prepared and implemented in accordance with relevant legislation and in consultation with WorkCover NSW and the Mines Inspector from the Department of Trade and Investment. They are not provided with this BMP on the basis of the security sensitive information they contain. They can be provided on a case by case basis to Department representatives or auditors as required.

3.1 **Structural and Human Impacts**

The Tarrawonga Coal Project Environmental Assessment assessed the potential for structural damage from blasting at surrounding project related and privately owned properties. The assessment identified that the potential for a marginal exceedance of structural damage vibration criteria was limited to the project related "Blair Athol" residence, located to the south-east of the project site, later in the project life. The residence will be vacated when structural damage criteria exceedances are predicted and a structural inspection will be undertaken prior to reoccupation if monitoring confirms that an exceedance in blast criteria occurred.



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Predicted overpressure and ground vibration levels at all other receivers are such that the potential for structural damage or impacts on human comfort resulting from blasting is negligible.

The blasting assessment also identified that there is no expected impact from blasting on the proposed low permeability barrier to be constructed on the eastern perimeter of the final extent of the open cut pit. It is proposed that the final design of the low permeability barrier would consider the potential impacts from blasting on the consolidation of the soil-bentonite mixture and the subsequent differential settlement to the adjacent geological sequences and keying in of the cut-off barrier. Upon completion of the design and construction of the low permeability barrier, this management plan will be updated to reflect any additional requirements identified for protection of the barrier from blast related impacts.

Property inspections are discussed in Section 4.1.

There is no other land, with the exception of public roads, which falls within 500m of blasting operations over the life of the mine.

3.2 Aboriginal and Non – Aboriginal Heritage

The nature of the known artefacts (isolated finds, artefact scatters and culturally modified trees) suggests that blasting is likely to have minimal impact on these features, with no predicted impacts from blast vibration and flyrock. Known artefact sites within the blast exclusion zone will be subject to regular inspections, as part of the site monthly inspection regime, to verify blasting activities is not causing any damage, or impacting upon those artefact locations.

A non-aboriginal heritage site (survey marker tree) is located near receiver 1d. This tree is predicted to be subject to vibration levels marginally in excess of 10 mm/s, the structural damage criterion of buildings. It is noted however that, generally speaking, trees are less susceptible to blast vibration damage than buildings and no periodic monitoring of the tree is proposed.

3.3 Livestock

Avoidance of impacts on livestock from flyrock is managed via a procedure for blast clearance and firing which requires consideration to be given to the location of livestock when developing the Blast Clearance Plan. Where livestock are identified as being within the blast clearance zone, appropriate measures will be taken to relocate livestock from this location prior to blasts proceeding. At no stage throughout the life of the mine will blasting activities be within 500 metres of privately owned land.

3.4 Management of Road Closures

A *Tarrawonga Coal Mine Road Closure Management Plan* (Appendix 2) has been developed in consultation with Narrabri Shire Council (NSC), for approval by the Secretary, to put in place protocols and procedures to minimise impacts on the local community. The main objectives are to:



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- Ensure safety and protection of the public, residents, property and livestock;
- Coordinating blast schedules with neighbouring mines to minimise cumulative impacts of blasting;
- Notify in advance relevant stakeholders, including the public and nearby properties, of blasts that will temporarily close local roads;
- Minimise road closures and the potential impacts on road users, local residents and businesses, through avoiding peak traffic periods;

Blasting is planned to be undertaken within 500 metres of Goonbri Road within the next 3 years. Prior to submission of this BMP for approval by the Secretary, Whitehaven contacted landholders and tenants of properties closest to the proposed road closures who will likely be most affected by the closures. The local school bus driver was also contacted. No concerns were noted from those contacted.

3.5 Air Vibrations (Overpressure)

Noise (the audible part of the air vibration spectrum) and airblast (the remaining sub-audible part of the air vibration spectrum) generation can be controlled by ensuring that all, or nearly all, of the explosion energy is consumed in fragmenting and displacing the overburden by the time the gases vent (via the broken burden rock and/or ejected stemming material) into the atmosphere.

This objective would be met by ensuring that:

- Where practicable, the blast face is orientated away from or at an oblique angle to nearby residences;
- Blasthole spacing is implemented in accordance with blast design;
- The burden distance and stemming length are carefully selected and then implemented precisely;
- Appropriate materials (eg. 20mm aggregates) are used for stemming;
- Charges detonate in the correct sequence and with inter-row delays that provide good progressive release of burden; and
- The maximum weight of explosive detonated in a given delay period (the Maximum Instantaneous Charge - MIC) is limited to conservative and proven levels.
- Conducting blasting both before the establishment, and after the break-up, of low-level atmospheric temperature inversions which typically occur after 4:00pm and can remain until 8.00am.



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3.6 Ground Vibrations

When a confined explosive charge detonates, a fraction of the liberated energy is manifested as seismic energy (ie. as ground vibrations). The magnitude of ground vibrations depends upon:

- The MIC for the blast;
- The distance between the blast and a residence or sensitive structure; and
- The characteristics of the intervening material (rock, soils, geological structures, etc) through which the ground vibration wave propagates.

Ground vibration would be controlled by ensuring:

- The minimum practicable weight of explosive detonates at an instant (ie. minimising the MIC) by using the maximum number of delay periods in each blast; and
- Most of the energy liberated by the charge(s) on a given delay number is consumed in providing good fragmentation, adequate displacement and/or a loose, highly dig-able muckpile, rather than in creating ground vibrations (ie. by ensuring that the burden distance and effective sub-drilling are not too large).

3.7 Dust and Other Post-Blast Emissions

Control of blast associated dust generation, odour and fumes will be achieved by the following:

- Blast design will be developed in accordance with the *WHC_PRO_OC_BLAST PLANNING, DESIGN & RECORD KEEPING*. The scope of this procedure is to allow safe blasting of overburden and coal, while ensuring suitable fragmentation and muck pile profile to match the chosen digging equipment, whilst remaining within the environmental limits set for the mine.
- Undertaking a pre-blast environmental assessment with consideration given to meteorological conditions such as cloud cover, wind speed and direction and the strength of temperature inversions prior to each blast;
- Minimising the potential for the delay in firing of shots which have been loaded, especially into wet holes, considering the restrictions of existing weather conditions;
- Ensuring that blasts are fired in suitable weather conditions that lower the potential for blast generated dust and/or fumes to be blown towards neighbouring properties. A blast notification checklist is used to determine the wind speed and wind direction conditions for which the decision will be made on whether to proceed or postpone the blast;
- If category F or G inversion conditions are detected and/or wind speeds are greater than 7m/s emanating from the West or North West, blasting may be



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delayed if it is considered these conditions pose a risk to environmental compliance, until more favourable weather conditions are encountered;

- After the blast initiation, monitor and photograph and/or video any blast fume to record the direction of travel and dispersion of the fume cloud, this will be undertaken from two directions where practical;
- WHC_PRO_Tarrawonga Blast Fume Management (Appendix 3) will be adhered to by all relevant associated personnel; all actions identified in this plan will be implemented where applicable;
- Pollution Incident Response Management Plan (PIRMP) is applicable across all Tarrawonga Coal Mine operations subject to EPL 12365 and is implemented in the event of a pollution incident; and
- In the event a blast fume cloud is created and is travelling in the direction of local residences, the fume cloud will be continually monitored by the Environmental Officer, Blast Controller and Shot Firer as well as blast sentries and every endeavour will be made to contact nearby personnel and residents as soon as possible to inform them of any impending fume with advice to remain indoors until the fume has passed.

When a blast is initiated, some dust would be created as a result of:

- Partial or complete ejection of the stemming column;
- The escape of explosion gases through discontinuities and cracks in the face; and/or
- Impacts between rock fragments and between rock fragments and the active floor of the mine.

Blast-generated dust would be minimised by ensuring that stemming columns are not ejected for considerable distances into the atmosphere. Stemming column lengths would be such that their ejection velocities are low.

Additionally, the blasting team uses aggregates for blasthole stemming and nonel delay-type or electronic detonators to initiate charges. The use of nonel-type delay or electronic detonators avoids the requirement for detonating cord downlines and, with the absence of detonating cord trunklines (ie. surface lines), prevents the dust cloud that is formed when such trunklines detonate on a dry dusty surface.

3.8 Impacts on the Proposed Low Permeability Barrier

Blast controls or measures that shall be implemented to reduce the potential impacts of blasting on the proposed low permeability barrier will be addressed and appended to this management plan upon completion of the final design of the low permeability barrier.



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3.9 Cumulative Blast Management Strategy

TCM along with Boggabri Coal Mine and Maules Creek Coal has developed the Leard Forest Mining Precinct Blast Management Strategy in order to minimise cumulative blasting impacts. The Leard Forest Mining Precinct Blast Management Strategy (refer Appendix 4) has been approved by the Department of Planning and Environment and implemented accordingly.



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4 INSPECTIONS AND NOTIFICATIONS

4.1 Pre-Blasting Inspections

As a requirement of Condition 4(1), within 3 months of Project Approval, TCM notified in writing the owners of any privately owned land within 2 kilometres of the approved open cut mining pit/s that they are entitled to ask for a property inspection, to establish the baseline condition of any buildings or structures on their land, or to have a previous property inspection report updated.

In accordance with Condition 3(17) of PA 11_0047, if TCM receives a written request from the owner of any privately owned land within 2 kilometres of the approved open cut mining pit on site for a property inspection to establish the baseline condition of any buildings and/or structures on their land, or to have a previous property inspection report updated, then within 2 months of receiving this request TCM will:

- (a) Commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties, to:
- (b) Establish the baseline condition of the buildings and/or structures on the land or update the previous property inspection report;
- (c) Identify any measures that should be implemented to minimise the potential blasting impacts of the development on these buildings and/or structures; and
- (d) Give the landowner a copy of the new or updated property inspection report.

4.2 Pre-Blasting Notification

4.2.1 Public Notification

Prior to TCM commencing, surrounding landholders were contacted to determine if they required notification prior to each blast; residents can update notification requirements at any time and periodically. TCM will reinvite residents to update their notification requirements on a bi-annual basis.. TCM provides notification to any person who expresses an interest in being notified about the blasting schedule at the mine. Notification consists of an email, phone call or text message (depending on the individual's preference) 24 hours prior to the blast and/or on the day of the blast. This notification procedure has been successfully implemented for approximately 8 years.

Notification to the general public about proposed blasting dates and times is provided via the blast notification sign at the entrance to the mine site. In addition, details about each upcoming blast (including date, time and road closure information) will be provided under the "Community" tab on the Whitehaven Coal website (www.whitehavencoal.com.au) once the system is activated. It is anticipated that this will initiated within 3 months of approval of this plan.



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4.2.2 Liaison with Adjacent Mines

TCM, Boggabri Coal Mine and Maules Creek Coal Mine have developed the BTM Blast Management Strategy which specifies that 24 hours' notice be provided prior to a proposed blast. Notification is in the form of an email or text message to all relevant mine personnel. Where possible, TCM schedule blasts to initiate at 11:00am, 12:00pm & 2pm (generally), Boggabri Coal schedules blasts to initiate at either 10.30am or 3pm (generally), and Maules Creek Coal schedules blasts to initiate at 1pm (generally). This ensures cumulative impacts are avoided if blasts are scheduled on the same day at both mines. Personnel from all three mines liaise accordingly (e.g. via email or phone) if blast times need to be altered.

Cumulative impacts that may be generated between the TCM and Whitehaven's Rocglen Coal Mine are managed by the Environmental Officer's for both Tarrawonga and Rocglen mines ensuring blasts are not scheduled for the same time.

4.3 Property Investigations

In accordance with Schedule 3, Condition 18 of PA 11_0047, if any owner of privately-owned land within 2 kilometres of blasting operations, or any other landowner nominated by the Secretary, claims that the buildings and/or structures on his/her land have been damaged as a result of blasting on site, then within 2 months of receiving this claim in writing from the landowner, the Proponent shall:

- (a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties, to investigate the claim; and
- (b) give the landowner a copy of the property investigation report.

If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Proponent shall repair the damages to the satisfaction of the Secretary.

If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Proponent or landowner disagrees with the findings of the independent property investigation, either party may refer the matter to the Secretary for resolution.



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5 MONITORING AND REPORTING

5.1 Monitoring Program

5.1.1 Parameters Measured and Monitoring Frequency

EPL 12365 specifies the following monitoring parameters to be monitored. Monitoring must be undertaken for each blast as specified in Table 2.

Table 2 Monitoring Parameters

Parameter	Units of Measure	Frequency	Sampling Method
Blast Noise	DB(Lin Peak)	Every Blast	Type 1 Noise Blast Logger
Blast Vibration	mm/s	Every Blast	Geophone Logger or Similar

In addition to blast monitoring at the nominated sites, TCM also completes an Environmental Blast Checklist (Appendix 5) which includes a notification checklist, pre-blast weather conditions assessments every hour prior to the blast (commencing at 5 hours prior to the blast) and at the time of the blast and a post-blast assessment which includes fume rating (5).

In addition to monitoring of blast overpressure, vibration and fume, each blast is monitored visually for any ejection from the shot face. All blasts are also captured via video for playback in the event of a blast not performing to expectations. This allows for subsequent review and identification of possible contributors to a blast outcome.

5.1.2 Monitoring Locations

EPL 12365 currently requires monitoring to be conducted at the "Tarrawonga" property (EPL ID N1). The "Tarrawonga" property has been acquired by Whitehaven and is now project related. Therefore the blast monitor will be relocated to the "Braymont" property located to the South-Southwest of the mine (Figure 2). This relocation will take place once a variation to EPL 12365 has been approved by the EPA. In the meantime, blast monitoring will continue at the "Tarrawonga" residence as it will continue to provide indicative blasting impacts given its close proximity to the Tarrawonga site.

In addition to point N1, monitoring is also conducted at the project related "Matong" property for TCM purposes to account for any identified impacts to the South East of the mine (Figure 2). In accordance with DP&E and EPA consultation advice, it is proposed to relocate this monitor to Coomalgalah located to the east of operations. This relocation will take place once a variation to EPL 12365 has been approved by the EPA. In the meantime, blast monitoring will continue at the "Matong" location as it will continue to account for blasting impacts to the south-east of the Tarrawonga site.



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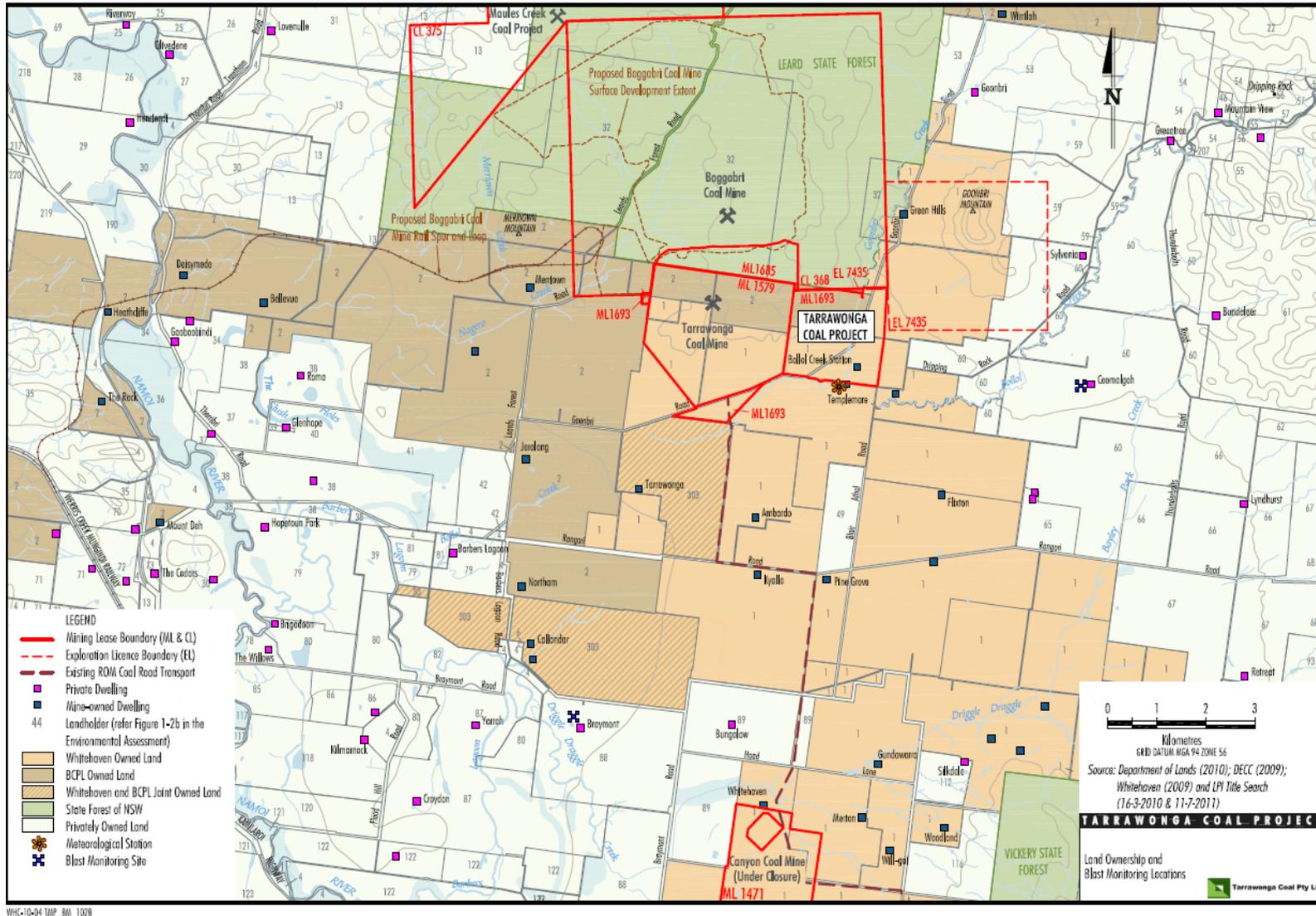


Figure 2 Land Ownership and Blast Monitoring Locations



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5.1.3 Permanent Blast Monitors

Permanent blast monitors are currently established at the project related “Matong” property and “Tarrawonga” property (refer to Section 5.1.2 for further details) to monitor air-blast overpressure (dBL) and peak particle velocity in a radial, vertical and transverse direction (mm/s), i.e. ground vibration. After each blast, information gathered on a blast can be downloaded via the internet or wireless download. These are then analysed by the blast technician and the environmental officer to check compliance with blasting criteria. The monitors are subject to quarterly maintenance inspections by the supplier, as well as annual calibration.

The blast monitors do not require any pre-blast set up and operate continuously. The monitors do not require any post-blast download, with data available from the host platform immediately following the blast. The blast results will be delivered to the key personnel (Operations Manager, Drill and Blast Engineer and Environmental Officer) via text message and email immediately following the blast. Further analysis of blast results can then be undertaken by accessing the web platform. The monitors are compliant with Australian Standard AS 2187.2-2006.

5.1.4 Blast Fume Monitoring and Reporting

Blast fume monitoring will be undertaken for every blast by the Environmental Officer, Drill and Blast Engineer and/or WHC technical staff. The results of the blast will be recorded and any incident of fume will undergo internal investigation and ranking. The relevant statutory authorities will be notified of any level 3 fume event leaving the premises and any level 4 or 5 fume event. Fume is rated on the Australian Explosives Industry and Safety Group Inc. – Code of Good Practice: Prevention and Management of Blast Generated NO_x Gases in Surface Blasting.

5.2 Reporting

Blast monitor results are available to relevant Whitehaven personnel, including the Environmental Department, immediately following the blast via SMS, email or online. The Environmental Blast Checklist is filed onsite once completed.

Blast monitoring results are reported via quarterly Community Consultative Committee (CCC) meetings and annually to relevant government agencies through the AEMR/Annual Review.

Blast results are reported in accordance with EPL 12365 in the monthly monitoring report on the Whitehaven website (www.whitehavencoal.com.au) and Annual Returns.

Reporting of exceedances is discussed in Section 6.1.2.



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6 MANAGEMENT OF INCIDENTS, EXCEEDANCES, NON COMPLIANCES AND COMPLAINTS

6.1.1 Blasting Related Incidents

Safety related incidents (such as misfires) will be recorded and managed via the Whitehaven incident management process. Such incidents are managed in accordance with the Coal Mine Health and Safety Act 2002 and Coal Mine Health and Safety Act Regulation 2006, including notification to DRE NSW and the District Check Inspector by the site's Manager Mining Engineering.

6.1.2 Blasting Criteria Exceedance

6.1.2.1 Agency Notification

In the event that the monitoring results of a blast identify an exceedance of:

- Peak vector sum velocity (ground vibration) – 5mm/s (ppv); and/or
- Peak overpressure – 115dB_L,

TCM will initiate investigation as to the cause of the exceedance.

It is noted that the above criteria are able to be exceeded for up to 5% of the blasts in any one year but not to exceed a:

- Peak vector sum velocity (ground vibration) - 10mm/s (ppv); and/or
- Peak overpressure – 120dB_L.

As required by Conditions 5(8) and 5(9) of PA 11_0047 and EPL 12365 Condition R2, TCM must notify DP&E and EPA of any blasting related non-compliances or exceedances as soon as practicable after TCM becomes aware of the issue. Additionally, within 7 days of the date of the incident, TCM must provide DP&E and EPA with a detailed written report on the incident. The report would include details such as the date, time and nature of the non-compliance or exceedance, the cause or likely cause, the action taken to date and proposed measures to minimise potential for non-compliances or exceedances with future blasts.

Exceedances will also be reported in the blasting discussion in the AEMR/Annual Review.

6.1.2.2 Landholder Notification

As required by Condition 3 of Schedule 4 of PA 11_0047, results obtained showing an exceedance of blasting criteria, TCM will notify the affected landowners and tenants in writing of the exceedance as soon as practicable, and provide regular monitoring results to each of these parties until the mine is complying with the relevant criteria.

6.1.3 Complaints

Any complaints received will be managed in accordance with complaints management protocol described as follows:



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- A publicly advertised telephone complaints line will be in place to receive complaints during operating hours and record complaints at other times.
- Each complaint received will be recorded on a Complaints Register, which will include the following details:
 - The date and time of complaint.
 - Any personal details the complainant wishes to provide or if no such details are provided a note to that effect.
 - The nature of the incident that led to the complaint.
 - The action taken by TCM in relation to the complaint, including any follow-up contact with the complainant.
 - If no action was taken by TCM, the reason why no action was taken.
- The Environmental Officer will be responsible for ensuring that an initial response is provided within 24 hours of receipt of a complaint (except in the event of complaints recorded when the mine is not operational).
- Additional measures will be undertaken as required to address the complaint. This may include visiting the complainant, or inviting the complainant to the mine site.
- Once the identified measures are undertaken, the Environmental Officer will sign off on the relevant complaint within the Complaints Register.
- If necessary, follow-up monitoring or will take place to confirm the source of the complaint is adequately mitigated.
- A copy of the Complaints Register will be kept by TCM and made available to the Tarrawonga Coal Mine Community Consultative Committee (CCC) and the complainant (on request). Complaints are also listed on the Whitehaven website (www.whitehavencoal.com.au) and a summary of complaints received every 12 months will be provided to DP&E, NSC, GSC, EPA, DRE and the CCC through the AEMR/Annual Review.

Based on the nature of individual complaints, specific contingency measures may be implemented to the (reasonable) satisfaction of the complainant. The Group Environment Manager retains ultimate responsibility to ensure that complaints received are properly recorded and addressed appropriately.

6.1.4 Property Investigations

Schedule 3, Condition 18 of PA 11_0047 allows a landholder to request a property investigation if the landholder claims that blasting at TCM has damaged their property, as detailed in Section 4.3.



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6.1.5 Unforeseen Impact Protocol

Unforeseen impacts in relation to blasting are generally considered to be in relation to criteria exceedances or non-compliances (eg. failure to monitor) and complaints, which are addressed in Section 6.



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7 DOCUMENT REVIEW AND CONTINUOUS IMPROVEMENT

This document will be reviewed following any significant changes (ie. changes to monitoring locations) and in accordance with Schedule 5, Condition 5 of PA 11_0047 which states:

5. *Within 3 months of the submission of an:*

(a) *annual review under condition 4 above;*

(b) *incident report under condition 8 below;*

(c) *audit under condition 10 below; or*

(d) *any modification to the conditions of this approval,*

the Proponent shall review, and if necessary revise, the strategies, plans and programs required under this approval to the satisfaction of the Secretary.

Each review will be undertaken in consultation with relevant stakeholders and will be submitted to the Secretary for approval.

TCM will investigate and implement ways to improve the environmental performance of the project over time. This will be achieved by keeping abreast of best practice in the industry for blast management and monitoring options and reporting on outcomes of blasting in the AEMR/Annual Review.

8 RESPONSIBILITIES

Drill & Blast Manager

- Planning for adequate resources to implement this BMP;
- Delegating tasks associated with this BMP when responsible personnel are unavailable and/or absent;
- Undertake root cause analysis for all non-compliances and participate in incident investigations; and
- Document and procedural reviews associated with blasting activities.

Operations Manager

- Planning for adequate resources to implement this BMP;
- Delegating tasks associated with this BMP when responsible personnel are unavailable and/or absent; and
- Undertake root cause analysis for all non-compliances and participate in incident investigations.

Drill & Blast Engineer

- Adherence to blasting procedures and management plan;



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- Minimise any environmental impact associated with blasting;
- Ensuring that all blasting activities are undertaken so that they comply with this management plan and all licence and consent conditions;
- Coordinate blasting activities with surrounding mines to minimise cumulative impacts;
- Report any incidences or complaints immediately to the Environmental Officer; and
- Providing advice regarding vibration or overpressure management initiatives where necessary.

Shot Firer/Blast Crew

- Ensuring that all blasting activities are undertaken so that they comply with this management plan and all licence and consent conditions;
- Coordinate blasting activities with surrounding mines to minimise cumulative impacts;
- Report any incidences or complaints immediately to the Environmental Officer; and
- Providing advice regarding vibration or overpressure management initiatives where necessary.

Environmental Officer

- Ensure that all procedures detailed in this management plan are followed and implemented;
- Receiving and reporting any complaints in relation to blasting;
- Ensuring that blast monitoring is conducted according to the BMP and results are routinely collected and monitored;
- Report the results of any blast monitoring in accordance with the conditions of PA 11_0047; and
- Monitor the prevailing and predicted weather conditions.

Drill Crew

- Drill in accordance with drill pattern designs and adherence to direction provided by Supervisor/Drill & Blast Engineer;
- Report any abnormalities whilst drilling; such as water or cavities.



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Appendix 1 Consultation with EPA, Tarrawonga CCC & DP&E

EPA Response

From:	Kharl Turnbull [Kharl.Turnbull@epa.nsw.gov.au]	Sent:	Mon 6/05/2013 4:26
To:	Danny Young		
Cc:			
Subject:	Tarrawonga Environment Management Plans		

Hi Danny

Thank you for forwarding the following Tarrawonga Environment Management Plans for our records:

Noise Management Plan
Blast Management Plan
Air Quality and Greenhouse Gas Monitoring Plan

The Environment Protection Authority (EPA) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/ conservation management, not to be directly involved in the development of strategies to achieve those objectives.

Should you have any further enquiries please do not hesitate to contact me.

Regards

Kharl Turnbull
Regional Operations Officer- North Branch | NSW Environment Protection Authority |
Phone ☎: (02) 6773 7000 | Fax 📠: (02) 6772 2336 | ✉ kharl.turnbull@epa.nsw.gov.au

Suggested Changes from Tarrawonga CCC

Section 3.2

CCC suggestion

Contact neighbours most likely to be affected by blasting prior to submission of the BMP to ensure they are aware of the proposed road closure procedure.

TCM response

Neighbours contacted regarding the proposed road closure procedure prior to submission of the BMP.

TCM advice

Error noted in text. TCM advised that the sentence stating that blasting would not occur within 500m of Goonbri Road was incorrect and that it will be updated to state that blasting will occur within 500m of Goonbri Road within the next 3 years.

Section 5.1.2

CCC suggestion

Review blast monitoring location as open cut moves past "Templemore".

TCM response

Section 5.1.2 now states that the location for blast monitoring to the South East will be revised as mining progresses and/or during the next review of this Plan.

Section 7

CCC suggestion

Review period should be more frequent than every two years.



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TCM response

Section 7 states that the BMP will be reviewed at least every two years and following any significant changes (ie. changes to monitoring locations) or in the event of multiple exceedances where blast management needs to be re-evaluated. This frequency is considered acceptable.

Road Closure Management Plan

CCC suggestion

Road closure times should avoid peak traffic hours (7:30am – 9:00am and 3:30pm – 5:30pm and the Road Closure Management Plan should specifically exclude blasting during these times.

TCM response

Road Closure Management Plan to state:

Blasting is not permitted before 9am which will avoid peak traffic times in the morning. Whitehaven will avoid blasting during the peak afternoon time between 3:30pm and 5:30pm but reserves the right to blast until 5pm, in accordance with the Project Approval.

DP&E Comments on Tarrawonga Blast Management Plan Ed1 Rev3 May 2013

Page/section	Comment
General	<p>The EA (Noise and Blast Appendix) identified a number of measures that were going to be incorporated into the Blast MP including:</p> <ul style="list-style-type: none"> - mine owned residence 1d would be vacated when exceedance of structure damage criteria is predicted to occur, followed by structural inspection prior to reoccupation; - measures to be put in place to avoid flyrock impacts on livestock (on mine owned land?) <p>Missing components from the Blast MP as required under Sch 3 condition 21 (f) include a specific blast fume management protocol to demonstrate how emissions will be minimised, including risk management strategies if blast fumes are generated.</p> <p>- suggest you refer to and use the AEISG "Code of Good Practice for the Prevention and Management of Blast Generated NOx Gases in Surface Blasting (Ed 2 Aug 2011). An example of a blast fume protocol developed for Hunter mine which includes a blast fume management and mitigation plan as Appendix E can be found at: http://www.riotintocoalaustralia.com.au/documents/MTW_BMP_as_approved_by_DG_on_31.10.2012.pdf</p> <p>c) propose and justify any alternative ground vibration limits – need to discuss this, noting that Goonbri road is public infrastructure and need to comply with ground vibration of 50mm/s</p> <p>Missing components to demonstrate compliance with conditions Operating conditions: 3-19 (a)– minimise blasting impacts on heritage items in the vicinity of the mine – some discussion needed particularly in relation to Aboriginal heritage sites and potential for impacts due to blasting. 3-20 (b) land outside site not owned by Proponent – confirm apart from public roads that there is any privately owned land within 500m of blasting over the life of the mine.</p>
2	Other relevant statutory requirements to include also relate to Dangerous Goods storage (see below) and as indicated in s6.1.1.1 blast incidents under Coal Mine Health and Safety Act and Reg.
3	What is the document "WHC_PLN_TAR_EXPLOSIVES MANAGEMENT" – what are the relevant procedures, some outline is needed of contents of this procedure? how long is this document, can it be included as an Appendix for reference? Assume it covers explosives storage and meeting any requirements under Explosives Act 2003 and Regulation and Dangerous Goods under the Work



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Page/ section	Comment
	<p>Health & Safety Act 2011? In addition to the identified blast management mitigation measures commitments should be included regarding training/ qualifications/ licensing of the blasting personnel.</p> <p>Are there any pre-blast and post blast check lists used by Whitehaven staff and blast contractors to demonstrate that mitigation measures have been taken? If so reference these.</p>
3.7	Update Leard Precinct Blasting Strategy status – advice provided to Boggabri Coal that OK but needed to update blast monitoring locations for Tarrawonga. See comments below on monitoring locations.
4 Inspections & Notifications	Include section covering Sch 3 condition 18 – Property Investigations where landowners within 2km of blasting operations, or any other landowner nominated by the DG claims damage.
4.2 Pre Blasting Notification	Sch 3 condition 19 requires that the Proponent operate a suitable system to enable the public to get up to date information on the proposed blast schedule on site. In addition to the blast notification sign at the entrance suggest similar approach as used by Werris Creek with blast notification details on the website. How do people know that they have to register an interest to being notified – has the company door knocked all potentially affected receivers within a certain distance? Remove 'generally' from sentence Notification will generally consist of.... and should be based on preference of landowner following registering interest in being notified.
5 Monitoring and Reporting	Monitoring should include fume monitoring using visual NOX fume rating scale and video monitoring of blast events. See comments above regarding requirement for Blast Fume Protocol and reference to AEISG Code
5.1.2 Monitoring Locations	<p>What is the status of ownership Tarrawonga now? If mine owned may be better relocating to Jeralong as next closest privately owned receptor – subject to landowner approval? There should also be a commitment to undertake targeted blast monitoring using the portable blast monitors at privately owned receptors on the basis of investigation of any blast complaints received.</p> <p>Update Figure 2 to reflect recent acquisitions.</p>
5.2 Reporting	Blast monitor reports should extend to fume rating and generation / management of blast fumes.
6.1.4	There are no land acquisition rights in the approval conditions for blast damage, Sch 4 condition 5 refers to relevant acquisition criteria which relate to noise and air only.
7	Review needs to be undertaken in accordance with Sch 5 condition 5 – that is within 3 mths of annual review, incident report, audit, modification, with revision if necessary following review. That is the proposed minimum 2 year review is not consistent with the approval conditions. Amend accordingly. Where there are revisions to the MP then further consultation is required.



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D&PE Comments on Blast Management Plan - November 2014

JonesW ▾

Page 9 12/12/2014 12:44:39 PM

Suggestion: a number of other Consent Conditions such as Schedule 3 Condition 15, 16, 17, 18, 19 and 20 are addressed in this and following sections. Please identify and refer to these conditions in this section.

Another alternative is to tabulate this information with each blast related condition and where in the BMP each condition is addressed.

JonesW ▾

Page 11 21/11/2014 1:16:25 PM

Suggestion: include discussion on survey marker tree from Appendix C - Page 66 of the Noise and Blasting Assessment.

JonesW ▾

Page 11 21/11/2014 1:17:16 PM

Suggestion: please document proposed mitigation measures.

JonesW ▾

Page 13 21/11/2014 1:18:32 PM

Suggestion: Please define what scale of inversion triggers this mitigation

JonesW ▾

Page 13 21/11/2014 1:19:58 PM

Suggestion: for blast fume should video the shot from at least two directions, generally at least ninety degrees apart (to accommodate for sun direction etc)

JonesW ▾

Page 14 21/11/2014 1:22:02 PM

Suggestion: This section should also contain significant text on blast design and geology of material being blasted.

JonesW ▾

Page 14 21/11/2014 1:22:51 PM

Suggestion: Ensure consistency use of acronyms TCM and TCPL.

JonesW ▾

Page 15 21/11/2014 1:24:23 PM

Suggestion: consider periodically reasking residents if they require notification periodically - potentially once every two years?

JonesW ▾

Page 15 21/11/2014 1:25:46 PM

Suggestion: Section 3.9 documents that BMS is yet to be developed, please ensure correct status is consistently reported.

JonesW ▾

Page 19 21/11/2014 1:27:38 PM

Suggestion: previous section confirms this monitor has been relocated to Braymont.

JonesW ▾

Page 19 21/11/2014 1:27:53 PM

Suggestion: Consider an additional section relating to monitoring blast fume management.

JonesW ▾

Page 19 21/11/2014 1:28:24 PM

Suggestion: Consider an additional section relating to reporting blast fume management.

JonesW ▾

Page 22 21/11/2014 1:29:17 PM

Suggestion: Director General is now referred to as Secretary.

JonesW ▾

Page 22 21/11/2014 1:31:20 PM

Suggestion: This section needs to be detailed more thoroughly, need to consider:

Drill and Blast Manager
Drill and Blast Engineer
Drill Crew
Blast Crew
Shotfirer
Technical Services Manager
H&S Manager
etc

JonesW ▾

Page 25 21/11/2014 1:32:35 PM

Suggestion: Include DP&E provided comment via Steve O'Donoghue (May 2013) and Wayne Jones (Nov 2014).

JonesW ▾

Page 27 21/11/2014 1:33:28 PM

Suggestion: Almost consistent with Section 4.2.2.

JonesW ▾

Page 28 21/11/2014 1:34:15 PM

Suggestion: add "and documented in a revision of this Blast Management Plan.



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Appendix 2 Tarrawonga Coal Mine Road Closure Management Plan



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Appendix 3 WHC_PRO_Tarrawonga Blast Fume Management



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Appendix 4 Leard Forest Mining Precinct Blast Management Strategy



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Appendix 5 Environmental Blast Checklist



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WHC_PLN_TAR_ROAD CLOSURE MANAGEMENT PLAN

Objectives	To safely manage temporary road closures when blasts are within 500m of a public road or when it is considered a blast may adversely affect that road.
Scope	Temporary road closure of any public road within 500m of Tarrawonga blasting activities. In particular: <ul style="list-style-type: none"> • Goonbri Road; and • Dripping Rock Road
Key Environmental Issues	Disruption to traffic on public roads during temporary road closures due to blasting at Tarrawonga.
Performance Criteria	Ensure the public are well informed of any temporary road closures on Goonbri Road and Dripping Rock Road due to blasting at Tarrawonga and ensure minimal disturbance to traffic during blasting periods.
Control Measures	<p>Prior to Road Closure:</p> <p><u>Tarrawonga neighbours</u></p> <p>Those neighbours who have requested to be notified of blasts including the closure of local roads, will be advised by telephone on the day of the blast by the Environmental Officer or Site Clerk for Tarrawonga Coal.</p> <p><u>Narrabri Shire Council (NSC)</u></p> <p>The Director of Engineering Services will be notified at least two working days prior to the blast. It must be noted, however, that due to circumstances out of TCM's control (most notably weather conditions) at least two days notice is not always achievable. In these circumstances, TCM will provide as much notice as possible. The same will apply where prior notice has been provided but the shot is delayed.</p> <p>A Traffic Control Plan (TCP) will be prepared in accordance with NSC and Australian Standards and be lodged with Council for approval. A copy of this approved TCP must be kept on site during the traffic control operation. Prior to final notification a list of authorised personnel undertaking control operations will be submitted to Council including certificate numbers and expiry dates.</p> <p>Road closures will be performed at a time to minimise impact on road users and the local school bus run. Blasting is not permitted before 9am which will avoid peak traffic times in the morning. Whitehaven will avoid blasting during the peak afternoon traffic time between 3:30pm and 5:30pm but reserves the right to blast until 5pm, in accordance with the Project Approval.</p> <p>Blasts will generally be scheduled to occur at approximately 11:00am, 12 noon or 2:00pm to maintain consistency of blast times.</p> <p>At the time of Road Closure:</p> <p><u>Emergency Services</u></p> <p>Should any emergency services approach a road closure point and be required to pass to attend an emergency, the traffic controller will arrange for the emergency service vehicles to be escorted through the road closure station as soon as the route can be made safe. This may include contacting the blast controller to temporarily delay the firing of the blast.</p> <p><u>Traffic Control</u></p> <p>Traffic control points will be established on the affected road. These locations will remain relatively constant, however may require some modification due to prevailing conditions</p>



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Control Measures (continued)	<p>on the day of blasting. At a minimum a control point will be established at the intersection of the Goonbri Road and the Tarrawonga Haul Road and at the intersection of Goonbri Road and Dripping Rock Road. Control points will be revised as the pit progresses in an easterly direction. Any changes will be undertaken in consultation with NSC and documented in a revision of this BMP.</p> <p>As a minimum, the traffic control points will include two (2) sentries for the purpose of traffic control, together with all equipment necessary for the safe control of the road. All sentries will be in two-way contact with the blast controllers. The control of traffic on a public road will only be undertaken by qualified and authorised personnel. Persons controlling traffic shall have the 'Traffic Controller' certification (level 1 blue certificate) whilst persons requiring to set up and work with Traffic Control Plans shall have the 'Apply Traffic Control Plans' certification (level 2 yellow certificate).</p> <p>All road sentries will travel to the road closure points and open all necessary signage advising of the temporary road closure due to blasting. Once all signage is positioned the sentries will await direction from the blast controller.</p> <p>Traffic control point signage will consist of permanent fold out signs situated adjacent to the road.</p> <p>Vehicle approach speeds shall be restricted to 60km/h, which will be managed via road signs.</p> <p>Once the blast is ready to be fired, the traffic controllers will be directed to close the road. The road sentry shall drive the entire route to ensure all vehicles are clear of all road closure points. Once the area has been confirmed to be clear of vehicles the road sentry will notify the blast controller and the blast will be fired in accordance with the site procedure for blasting. At the completion of the blast, the "all clear" is given by the Shot-firer.</p> <p>Once the blast has been fired the Shot-firer will instruct the road sentry to drive the entire route to confirm the road has not been impacted by the blast (fly rock or damage). The road sentry will remove any fly rock that impacts on the road. At the conclusion of this process the road will then be reopened to traffic.</p> <p>All necessary signage will be closed at the conclusion of the road closure and be padlocked shut by the road sentry.</p>
Frequency	<p>Blasting frequency and requirements for road closure will vary with mine development. There will be no more than one blast per day, unless in the case of a misfire, and a maximum of four blasts per week, averaged over 12 months. Where road closure is required, it is expected that the road will be closed for approximately 15 minutes for each blast.</p>
Incident Management	<p><u>Incident Reporting</u></p> <p>Incident reporting as per procedures identified in the Environmental Management Strategy for the Site.</p> <p><u>Complaints Management</u></p> <p>Complaints management as per procedures identified in the Environmental Management Strategy.</p> <p><u>Incident Response – Exceedance or Complaint</u></p> <p>Investigate event and identify operational location, timing and climatic conditions to</p>



**TARRAWONGA MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

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WHC_PLN_TAR_ROAD CLOSURE MANAGEMENT PLAN

	determine if additional management measures are required.
Performance Reporting	Any incidents will be reported in the Annual Environmental Management Report/Annual Review
Key Documents	Project Approval PA 11_0047 – Schedule 3, Condition 21 Blast Management Plan Environmental Management Strategy



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WHC_PRO_TAR_BLAST FUME MANAGEMENT

WHITEHAVEN COAL

TARRAWONGA COAL MINE BLAST FUME MANAGEMENT PROCEDURE

Approval	Name	Position	Signed	Date
Document Owner:	Graham Cope	Drill & Blast Manager		
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WHC_PRO_TAR_BLAST FUME MANAGEMENT

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WHC_PRO_TAR_BLAST FUME MANAGEMENT

1. **SCOPE**

This procedure outlines the specific blast fume management actions to be implemented at Tarrawonga Coal Mine (TCM) in line with the strategies outlined in the Australian Explosives Industry and Safety Group (AEISG) Code of Practice – Prevention and Management of Blast Generated NO_x Gases in Surface Blasting (2011) and WHC-STD-OC-Explosives.

The procedure applies to the Project Area and all personnel involved in the purchasing of explosives, blast design, drilling, loading and firing of explosives.

2. **BACKGROUND**

Blasting fumes are comprised of a group of gases known as Oxides of Nitrogen or NO_x, a combination of post blast gases which are predominantly nitrogen dioxide, but may also include small amounts of nitrous oxide, nitric oxide, carbon monoxide and carbon dioxide. The two main gases, nitric oxide (NO) and nitrogen dioxide (NO₂) are found as by-products in the post-blast gases of ammonium nitrate-based explosives, and are generated in greater quantities where incomplete or low-order detonation occurs. Nitric oxide is colourless, but nitrogen dioxide ranges in colour from yellow to dark red / purple depending on the concentration and size of the gas cloud.

Fume generation can be attributed to a number of primary causes that, either singularly or combined, can be managed to minimise or mitigate the production of NO_x. These causes are discussed in detail in the AEISG Code of Practice, and are listed below:-.

1. Explosive formulation and quality assurance
2. Geological conditions
3. Blast design
4. Explosive product selection
5. On bench practices
6. Contamination of explosive in the blast hole

Blasting fumes can be harmful to humans if inhaled in sufficient quantities and/or over a prolonged period of time. These fumes can pose a risk to members of the blast crew and sentries in close proximity, or other mine workers exposed in the event that fumes travel outside the immediate blast clearance area without dispersing. Risks to persons outside the mining area also need to be addressed in the event that large fume clouds travel outside the mine lease on to private or public land.

3. **RESPONSIBILITIES**

Role accountabilities for management of the six AEISG primary causes of fume are provided in detail in Appendix 5.1 and summarised in Table 1.



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Table 1 Role Responsibilities

Primary Cause of Blast Fume	Accountable Roles for Management
Cause 1: Explosive formulation and quality assurance	<ul style="list-style-type: none"> Explosives supplier Drill and blast engineer Shotfirer Magazine keeper
Cause 2: Geological conditions	<ul style="list-style-type: none"> Mine geologist Drill and blast engineer Shotfirer Drill operators
Cause 3: Blast design	<ul style="list-style-type: none"> Shotfirer Drill and blast engineer
Cause 4: Explosive product selection	<ul style="list-style-type: none"> Shotfirer Drill and blast engineer
Cause 5: On bench practices	<ul style="list-style-type: none"> Drill operator Shotfirer MMU operator Drill and blast engineer Drill supervisor
Cause 6: Contamination of explosives in the blast hole	<ul style="list-style-type: none"> Drill operator Shotfirer MMU operator Drill and blast engineer

4. PROCEDURE

4.1 BLAST DESIGN AND PLANNING

Design

Blast designs will be developed to consider:

- Geological constraints such as weak or hard bands of overburden, coal bands and faults.
- Blast performance requirements in terms of fragmentation, heave, dig rates, etc.
- Control of potential blast impacts including flyrock, fume, overpressure, vibration etc.

Blasts design mitigations may include:

- Reducing bench heights or ensuring adequate relief in deep holes.
- Selecting explosives products appropriate to the blast design and ground conditions.
- Following manufacturer's recommendations for priming, timing and sleep time of bulk explosives.
- Increasing the level of control and QA/QC checks on deeper shots.
- Providing appropriate separation of blast holes and explosive decks.
- Reducing the powder factor or modifying the timing, depth or size of a blast.



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Geology

Where clay or other unfavourable geological conditions are identified, explosive product selection will be modified to suit conditions. When blasting in soft ground, or areas with a history of producing blast fume, increased blast clearance may also be required to ensure the safety of personnel.

Sleep Time

All blasts will be designed and planned to be fired within 5 days of first being loaded. Approval from the Operations Manager is needed for shots requiring longer sleep times up to a maximum of 7 days. The prevailing and forecast weather conditions as well as the Fume Risk rating and manufacturers recommendations will be taken into account when planning the required blast sleep time.

Explosive Selection

The following table and text define the relative risk levels of fume generation at TCM and explosive product selection guidelines.

Table 2 Blasting Areas at TCM

STRATA	GROUND CONDITION	FUME RISK
Weathered Conglomerate	Weathered/ localised clayey	Low
Braymont Seam		
Weathered Conglomerate	Weathered	Low
Bollol Creek Seam		
Massive Sandstone/ Conglomerate	Dry/ Localised mudstone channels	Low
Jeralong Seam		
Competent Conglomerate	Dry/ Localised wet at coal level	Moderate
Merriown Seam		
Sandstone/ Siltstone	Dry	Low
Velyama Seam		
Massive Sandstone/ Conglomerate	Dry/ Localised wet at pit floor low point	Moderate



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Nagero Seam

Since January 2014, Whitehaven Coal has contracted LDE Pty Ltd to supply and load down hole bulk explosive products for all open cut mines including TCM. LDE specialise in low density explosives suited for blasting in 'soft' ground conditions and allowing effective rock breakage at lower powder factors than higher density explosives, with reduced potential for fume generation.

Indicative explosive products typically used for the TCM ground conditions include:

Clayey/Weathered – ANFO, XL90, XL100, XL110, HiDex

Wet - Generic Pumped Emulsion GPE70, GPE80, XMP139, HiDex

Dry – ANFO, XL90, XL100, XL110, HiDex

TCM preferentially uses hybrid explosives which differentiate from standard explosives as the base material used in the manufacture is Ammonium Nitrate Mineral Oil (ANMO) and includes EPS (Expanded Polystyrene balls) to lower the explosive density. XLoad explosive product range numbering indicates the product density (i.e. XL100 = 1.0g/cm³) while Generic Pumped Emulsion and Load Through Water product range numbering indicates percentage emulsion (i.e. GPE70 – 70% Emulsion).

LDE have self calibrated load cells on auger explosive load trucks and implement a QA system to test and confirm the specification of the bulk explosive formulations used.

Technical and Safety Data Sheets of all products used are maintained on site.

4.2. METEOROLOGICAL CONDITIONS

- Before each blast, weather conditions will be assessed by the site Environmental Officer, or alternate, in accordance with the Environmental Blast Checklist. Shots will not be fired during adverse weather conditions, unless for safety reasons, or to minimise further deterioration of the product due to extended sleep time.
- Any shot that is fired during adverse weather conditions must be approved by the Operations Manager.
- Relevant parameters for consideration prior to firing a shot will be:
 - Wind speed and direction
 - The presence of a temperature inversion
 - Low continuous cloud cover
- The assessment of weather conditions will use meteorological data in the form of real-time wind speed and direction.
- When wet weather is forecast prior to or during loading of shots, product selection will be adjusted to suit as required.
- If there is a risk of blast fume, the Shotfirer must extend the blast danger zone to allow for the safety of all personnel. This is particularly important if a shot has had an extended sleep time, where water intrusion may have affected the bulk explosive, and when firing misfires.
- The site plan in Appendix 5.3 illustrates the site layout at TCM with blast clearance zones identified (example). Potentially sensitive locations eg Boggabri Coal Mine and Goonbri



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Road, will be considered when firing blasts, particularly where the risk of significant post-blast fume generation has been identified.

- Main Pit Blasting – If inversion conditions are detected or wind speeds are greater than 7m/s emanating from the West or North West, blasting may be delayed if it is considered these conditions pose a risk to environmental compliance, until more favourable weather conditions are encountered; *(n.b. this condition is subject to approval by DP&E Environmental Blast Management Plan)*
- Northern Extension Blasting (unless otherwise agreed with Boggabri Coal Mine - BCM) may be delayed given :
 - Wind speed < 1.5m/s
 - Wind speed > 6.0m/s
 - Wind direction window → NO FIRING BETWEEN 50° and 90° unless prior consent has been given for firing in this window for safety concerns

4.3. **BLAST MONITORING & FUME RATING**

For each blast the following monitoring will be carried out:

1. Fixed vibration monitors – measures the peak blast overpressure (DBL) and peak ground vibration (mm/s). Portable blast monitors will be used if the fixed monitors are inoperable.
2. A video record of every blast fired will record the shot initiating, blast movement and post blast fume generation. This will then be reviewed to improve future blasting performance and to further minimise blast fumes, flyrock or vibrations. All records will be kept on site for a minimum of two years.
3. All blasts will be rated for fume levels on a scale between 0 - 5, based on the AEISG COP (Appendix 5.2), refer section 5.1.4 of Blast Management Plan. In the event that a blast produces fume that rates a 3 at its highest extent and leaves the mine site, or if it rated at 4 or 5, notification will be provided in accordance with Schedule 5 Condition 8, at the earliest opportunity to the Department of Planning and Environment.
4. An Environmental Blast Checklist will be used for each blast. This includes a notification checklist; pre-blast weather conditions assessment prior to and at the time of the blast (commencing at 5 hours prior to the blast); and a post-blast assessment which includes fume rating.

4.4. **BLASTING WITHIN 500M OF A PUBLIC ROAD OR PROPERTY**

- If blasting is to be carried out within 500m of a public road, the road will be closed for the duration of the blast. The road will be reopened once an inspection has indicated it is free of significant fly-rock and/or dust/fumes as described in WHC PRO – OC – Blast Clearance and Firing.
- Tenants who may live on a WHC owned property near the blast area will be notified of the planned blasting date and time.
- Should an unexpected fume cloud occur, neighbouring properties in line with the fume cloud will be notified in accordance with the site PIRMP, and if necessary evacuated.
- The date, time and location of the blast/s will be posted on appropriate signs, located on the mine site access roads.



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4.5. **BLAST EXCLUSION ZONES AND TIMING**

- Establishment of exclusion zones, refer example in Appendix 5.3, and the time of blasts will be conducted in accordance with the WHC PRO – OC – Blast Clearance and Firing.
- Blasting will be carried out on the site between 9:00am and 5pm Monday to Saturday inclusive. No blasting will be undertaken on Sundays, public holidays, or at any other time without the written approval of NSW Department of Planning and Environment and notification to NSW EPA.

4.6. **TECHNICAL AND SAFETY DATA SHEETS**

- Copies of all relevant Technical and Safety Data sheets shall be supplied to the Drill and Blast Engineer and Shottfiringers by the Explosives Manufacturer. Copies will be kept on site for reference.
- The type of explosive product used for individual blasts will be selected to minimise the potential for fume generation.

4.7. **INCIDENT AND HAZARD MANAGEMENT**

- Blast fume incidents will be managed in accordance with the WHC-STD-Incident and Hazard Management which provides a generic process that is to be followed for all health, environment and safety incidents that may occur at WHC.
- In the event of NO_x exposure (or suspected exposure) medical assistance should be engaged, and the Medical Advice from the AEISG COP (Appendix 5.4) provided to medical personnel.
- The basic precautions are:
 - No personnel will enter the fume.
 - Personnel will move away from the path of the fume.
 - If indoors and the fume is heading towards you, close all windows and doors and stay inside.
 - If in a vehicle, wind up windows, close doors, stay inside vehicle and use recirculated air conditioning if possible.
 - Those exposed to NO_x gases should seek immediate medical treatment and consideration should be given to placing those exposed under observation for at least 24 hours after exposure.

4.8. **INVESTIGATION – POST FUME INCIDENT**

- Should an excessive blast fume (level 3 or higher that is not localised) be generated from a blast, a fault tree (refer to Figure 1 below) will be used during the ICAM incident investigation to identify contributing factors that caused the excessive blast fume.
- Once the contributing factors have been identified, an appropriate action plan will be developed to mitigate and reduce the generation of fume from future blasts.



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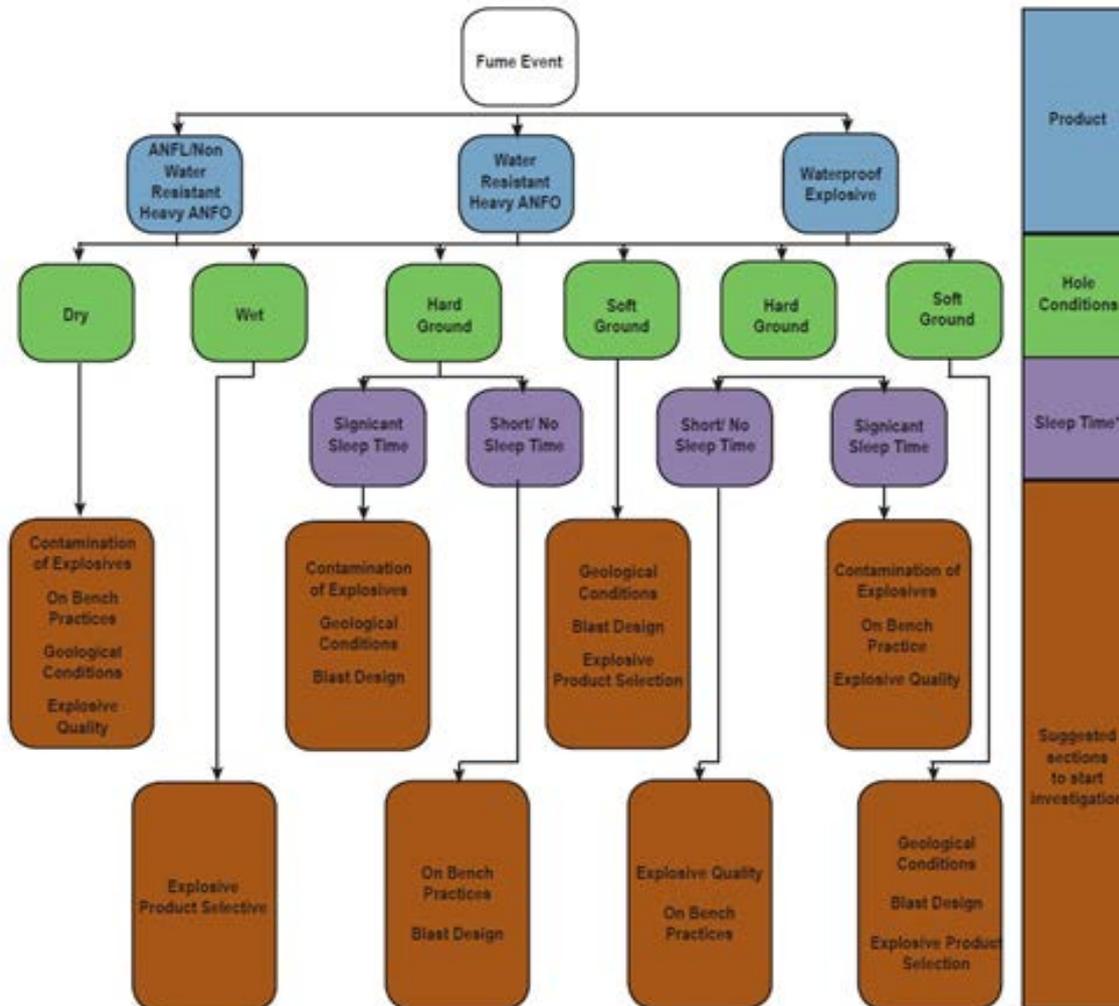


Figure 1 Fault Tree (Source: AEISG, 2011)

4.9. REPORTING

Blast fume reporting includes:-

- All blast fume events (Level 1 and above) are reported as Environmental Incidents;
- Significant blast fume events Level 3 and above are investigated using the ICAM incident investigation method in accordance with WHC_PRO_OC_BLAST FUME MANAGEMENT;
- Blast fume events Level 3 that leave the mine site or Level 4 & 5 fume events are to be reported to DP&E Lead Compliance Officer for the Northern Region at the earliest opportunity; and
- All blast fume events leaving the mine site boundary require consideration of the sites Pollution Incident Response Management Plan (PIRMP) regulatory/emergency and community notification protocols.



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4.10. AUDITING

This document will be reviewed, and if necessary revised, every 3 years by the Drill and Blast Manager, and in accordance with Schedule 5 Condition 5 of PA 11_0047 ie within 3 months of the submission of:-

- Annual Review;
- Incident report;
- Independent Environmental Audit; or
- Any modification to the conditions of PA 11_0047.
-

4.11. EDUCATION AND TRAINING

- All employees will have a general blast fume awareness session delivered through the induction program.
- Additional education and awareness programs will be provided, on an ongoing basis, for relevant personnel working near blast areas such as sentries and drill and blast contractors. Training for relevant personnel (Drill and Blast Engineer, Shotfirers, Drillers, OCE's, drill and blast contractors) will be undertaken in accordance with WHC-OC-Training and Competency Management Plan, and covers:
 - The identification and rating of post-blast fumes.
 - The potential health impacts of fume gases.
 - Potential causes of blast fume.
 - Fume mitigating actions as detailed in this procedure.

5. APPENDICES

5.2. NOX GASES CAUSES AND CONTROL MATRIX

Cause 1: Explosive formulation and quality assurance			
Potential Cause	Likely Indicators	Possible Control Measures	Responsibilities
Explosive product incorrectly formulated	Abnormal product appearance, poor blast performance, fume generation. Incorrect test results.	Explosives formulated to an appropriate oxygen balance to minimise the likelihood of post-blast fume. Explosives supplier to test and provide QA reports for formulations where any change in ingredients. Explosives/Precursor supplier to provide relevant Technical Data Sheets and Manufacturing directions.	Explosive Supplier Shotfirer



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Precursor delivered to mine site out of specification	Traceable to a precursor which has degraded between manufacture and use. Poor blast Performance	Investigate with supplier of explosive precursors. Precursor supplier to provide relevant Technical Data Sheets and Manufacturing directions.	Explosive Supplier
Inadequate mixing of raw materials	NOx emitted from blast holes loaded from a specific delivery system. Product appearance abnormal	Visual check. Density check. Ensure compliance with supplier's / manufacturer's instructions. Explosive supplier to provide QA reports on testing	Explosive Supplier Shotfirer
Product past use by date	Difficulty achieving final density. Separation Crystallising Fines Colour variation Poor blast performance	Once per trucko ensure the product is within the manufacturers specification i.e. pH, density, viscosity	Explosive Supplier D&B Engineer Magazine Keeper
Failure to conduct quality tests	Incomplete documentation/ practices	Conduct observations per shot and/or audits quarterly to ensure compliance with procedures. All blast crew to be trained in the potential consequences of failing to ensure the characteristics of the product loaded.	D&B Engineer
Cause 2: Geological conditions			
Potential Cause	Likely Indicators	Possible Control Measures	Responsibilities
Lack of relief in weak/soft strata. Inadequate confinement.	Recording areas of weak/soft strata. Fume generation Sympathetic detonation Flyrock	Understand geology of each shot and design blast (timing and explosive product) to ensure adequate relief. Minimise blast size and depth. Appropriate explosives product selection. Change design to suit	Mine Geologist D&B Engineer



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Potential Cause	Likely Indicators	Possible Control Measures	Responsibilities
		conditions.	
Dynamic water in holes	<p>Preceded by the observation of slumped blast holes. Usually when using non water-resistant explosive products</p> <p>Loss of product whilst loading blast hole.</p>	<p>Minimise or eliminate sleep time of shot.</p> <p>Measure recharge rates if dewatering, and choose explosive products according to manufacturer's recommendations.</p> <p>Record slumped holes and use this information to build understanding of pit hydrology.</p> <p>Selection of appropriate explosives product</p>	<p>Shotfirer</p> <p>D&B Engineer</p> <p>Geologist</p>
Explosive product seeping into cracks	<p>Slumping</p> <p>Not achieving collar height during loading</p> <p>Poor reconciliation between design and loaded explosives volumes</p>	<p>Maintenance of accurate drill records which are used to map geological conditions.</p> <p>Record and monitor blast holes which are slumped or require excessive explosive product to reach stemming height, but where water is not present.</p>	<p>Drill Operators</p> <p>Shotfirer</p> <p>D&B Engineer</p>
Moisture in clay	<p>Fume</p> <p>Incorrect explosive</p>	<p>Consider water resistant explosive products and how this may impact sleep time.</p>	<p>D&B Engineer</p> <p>Geologist</p>
Blast hole wall deterioration between drilling and loading e.g. cracks, voids, hole contraction	<p>Traceable to specific geological areas</p> <p>Poor drill and load reconciliation</p>	<p>Employing different drill techniques for soft ground</p> <p>Minimise time between drilling and loading.</p> <p>Use hole savers/water while drilling.</p> <p>Ensure benches are unaffected by back-break from earlier blasts e.g. pre-splits.</p>	<p>Drill Operators</p> <p>D&B Engineer</p>
Cause 3: Blast Design			
Intra-hole explosive desensitisation in decked blast holes	<p>Fume</p> <p>When using decks only, inconsistent blast performance</p>	<p>Appropriate separation of explosive decks.</p> <p>Initiator timing.</p>	<p>D&B Engineer</p> <p>Shotfirer</p>



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Explosive desensitisation due to the blast hole depth	Fume Poor blast performance Poor dig rates	Reduce bench height. Ensure adequate relief in deep holes. Follow manufacturer's recommendations on explosive product selection and blast design for deep holes i.e. decking where appropriate.	D&B Engineer
Inappropriate priming and/or placement	Residue product Inconsistent blast performance Misfire	Follow manufacturer's recommendations on explosive product initiation.	D&B Engineer Shotfirer
Excessive confinement (Incorrect Timing and Pattern Design)	Fume Specific to blasts known to be confined Poor dig rates No free face present Excessive powder factor	Understand geology of each shot and design blast (timing and explosive product) to ensure adequate relief in all strata. Consider incorporation of a free face, reduction of powder factor, modified timing, depth of blast.	D&B Engineer
Desensitisation of explosive column from in-hole detonating cord initiation	Fume Inconsistent blast performance Only in areas where in-hole cord initiation is used	Follow manufacturer's recommendations on compatibility of initiating systems with explosives.	D&B Engineer Shotfirer
Primer of insufficient strength to initiate explosive column	Poor blast performance All blasts using a particular primer type/ size	Follow manufacturer's recommendations on compatibility of initiating systems with explosives.	D&B Engineer
Failure to identify potential causes of fume generation	Limited experience designers Inadequate analysis or records	Follow WHC_PRO_OC_BLAST PLANNING, DESIGN & RECORD KEEPING.	D&B Engineer
Excessive energy in weak/ soft strata desensitising	Fume In specific areas known to contain	Understand geology of each shot and design blast (timing and explosive product) to match,	D&B Engineer Geologist



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adjacent explosive product columns	weak/soft strata	e.g. reduction of powder factor.	
Cause 4: Explosive Product Selection			
Potential Cause	Likely Indicators	Possible Control Measures	Responsibilities
Explosives product selected not suitable for the prevailing ground conditions (water, rock mass strength)	Fume Poor blast performance	Follow manufacturers recommendations on explosive product application. Review of the site design records/ results for previous blasts in similar strata.	D&B Engineer Shotfirer
Non water-resistant explosive products loaded into wet or dewatered holes	Fume Poor blast performance	Follow manufacturer's recommendations on explosive product selection. Regular education of shot crew on explosive product recommendations from supplier. Discipline in on-bench practices. Weather forecasts to be obtained and considered.	Shotfirer D&B Engineer
Cause 5: On Bench Practices			
Potential Cause	Likely Indicators	Possible Control Measures	Responsibilities
Inter-hole explosive desensitisation	Fume Blast holes drilled too close together. Blast hole deviation Inconsistent blast performance	Reduce bench height or ensure adequate relief in deep holes. Product selection. Initiation/timing Increased control on deeper designs/ GPS drilling assist Review product selection, adjusting for actual drilling.	Drill Operator D&B Engineer Shotfirer
Hole condition incorrectly identified	Slumping of holes Unexpected material in drill cuttings	Dip all holes prior to loading. Record wet, dewatered and dry holes on blast plan and use this information as a basis for explosive product selection. Minimise time between drilling and loading, especially in soft and clay strata. Note: Enough	Shotfirer



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		<p>time should be allowed for any dynamic water in the hole to be identified.</p> <p>Minimise sleep time.</p> <p>Training/competence of blast crew.</p>	
Blast not drilled as per plan	Can be correlated with inaccurately drilled patterns	<p>Maintenance of accurate drilling records and their review with amendment of blast design if required to compensate for inaccuracies.</p> <p>Record checks by engineer and Shotfirer</p>	<p>Drill Supervisor</p> <p>D&B Engineer</p> <p>Shotfirer</p>
Inadequate mixing of raw materials	Frequent NOx fume in all areas associated with loading from a specific delivery system Product appearance abnormal	<p>Visual check</p> <p>Density check</p>	<p>Shotfirer</p> <p>MMU Operator</p>
Poor bench preparation not allowing for water run-off.	<p>Pooling of water</p> <p>Hole collars show effects of water damage</p>	<p>Ensure all loose material removed.</p> <p>Cut drains where required.</p> <p>Adequate inspection required prior to handing area over to drill team.</p>	Drill Supervisor
Dewatering of holes diverts water into holes previously loaded with dry hole explosive products	<p>Only when using non water-resistant explosive products</p> <p>Fume generation</p>	<p>Adjust explosive product selection according to manufacturer's recommendations.</p> <p>Bench cleaned up for effective water run-off.</p> <p>Training/competence of blast crew.</p> <p>Location of dry hole explosive products considered in dewatering discharge locations</p>	Shotfirer



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Rainfall on a sleeping shot.	Slumping of holes Poor blast performance	Review rainfall forecasts for planned sleep time of shot and select explosive products according to manufacturer's recommendations. Maximum sleep times will be followed according to the specifications details on the Technical Data Sheets (TDS) for each explosive product. Minimise sleep time for dry blast hole explosive products if rain is predicted. Bench cleaned up for water runoff. Seal top of blast holes to prevent water ingress e.g. with gas bags. Consider removing water affected product. Consider early firing of blast.	Shotfirer Drill Supervisor
Blast not loaded as per blast plan	Not achieving collar height during loading Poor reconciliation between design and loaded explosives volumes	Training/competence of blast crew. Effective supervision. Communication of loading requirements. Record actual loadings e.g. product, quantity, height.	Shotfirer D&B Engineer
Blast hole deterioration between drilling and loading	Fume Inconsistent column rise while loading Poor drainage Traceable to specific geological areas	Minimise time between drilling and loading. Use hole savers. Optimise drilling practices to minimise hole damage though rock cracking etc. Where practicable design blast to minimise impact to next bench.	Drill Operator D&B Engineer Shotfirer
Cause 6: Contamination of explosive in the blast hole			
Potential Cause	Likely Indicators	Possible Control Measures	Responsibilities



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Explosive product mixes with mud/ sediment at bottom of hole.	Water/mud identified in hole Blasts containing wet/dewatered blast holes only	Optimise drilling practices to minimise blast hole damage. Ensure appropriate loading practices are followed during charging. Ensure primer is positioned in undiluted explosive product. Insert gas bag to separate mud/ sediment from explosive product. Use blast hole savers Use end of loading hose dispersers to minimise contamination. Decking to eliminate contact with known dynamic water. Verify correct hose handling practices are in place. Use suitable, safe dewatering techniques. Training/competence of blast crew.	Drill Operator Shotfirer MMU Operator
Penetration of stemming material into top of explosive column (fluid/ pumpable explosive products only)	Fume Increased stemming usage Blasts charged with fluid/ pumpable explosive products only	Use appropriate stemming material. Ensure explosive product is gassed to manufacture to specifications before stemming. Seal top of explosives column prior to stemming e.g. gas bag.	Shotfirer MMU Operator
Moisture in ground damaging explosive product	Wet ground occurrence Fume generation Consistent level of surrounding groundwater	Explosives product selection. Use hole liners where product not water resistant. Load wet holes first and dip remaining holes prior to loading. Adjust explosive product selection according to manufacturer's/supplier's recommendations.	Shotfirer MMU Operator D&B Engineer
Contamination of explosives column by drill cuttings	Hole collars not consistent size Inside of hole	Verify correct hose handling practices are in place e.g. operator competence,	Drill Operator Shotfirer



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during loading	collars show disturbance Column rise varied from design	procedures, use explosives supplier's personnel. Training/competence of blast crew. Minimise vehicle contact near blast holes. Use hole savers.	MMU Operator
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WHC_PRO_TAR_BLAST FUME MANAGEMENT

5.3. FUME RATING SYSTEM

Level	Typical Appearance
Level 0 No NOx gas	
Level 1 Slight NOx gas	
1A Localised	
1B Medium	
1C Extensive	
Level 2 Minor yellow/orange gas	
2A Localised	
2B Medium	
2C Extensive	
Level 3 Orange gas	
3A Localised	
3B Medium	
3C Extensive	
Level 4 Orange/red gas	
4A Localised	
4B Medium	
4C Extensive	
Level 5 Red/purple gas	
5A Localised	
5B Medium	
5C Extensive	

(Source: AEISG, 2011)

Assessing the amount of NOx gases produced from a blast will depend on the distance the observer is from the blast and the prevailing weather conditions. The intensity of the NOx



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gases produced in a blast should be measured on a simple scale from 0 to 5 based on the table above. The extent of the NOx gases also needs to be assessed and this should be done on a simple scale from A to C where:

A = Localised (i.e. NOx gases localised across only a few blast holes)

B = Medium (i.e. NOx gases from up to 50% of blast holes in the shot)

C = Extensive (i.e. extensive generation of NOx gases across the whole blast).

Level	Colour	Pantone Number
Level 0 No NOx gas		Warm Grey 1C (RGB 244, 222, 217)
Level 1 Slight NOx gas		Pantone 155C (RGB 244, 219, 170)
Level 2 Minor yellow/orange gas		Pantone 157C (RGB 237, 160, 79)
Level 3 Orange gas		Pantone 158C (RGB 232, 117, 17)
Level 4 Orange/red gas		Pantone 1525C (RGB 181, 84, 0)
Level 5 Red/purple gases		Pantone 161C (RGB 99, 58, 17)

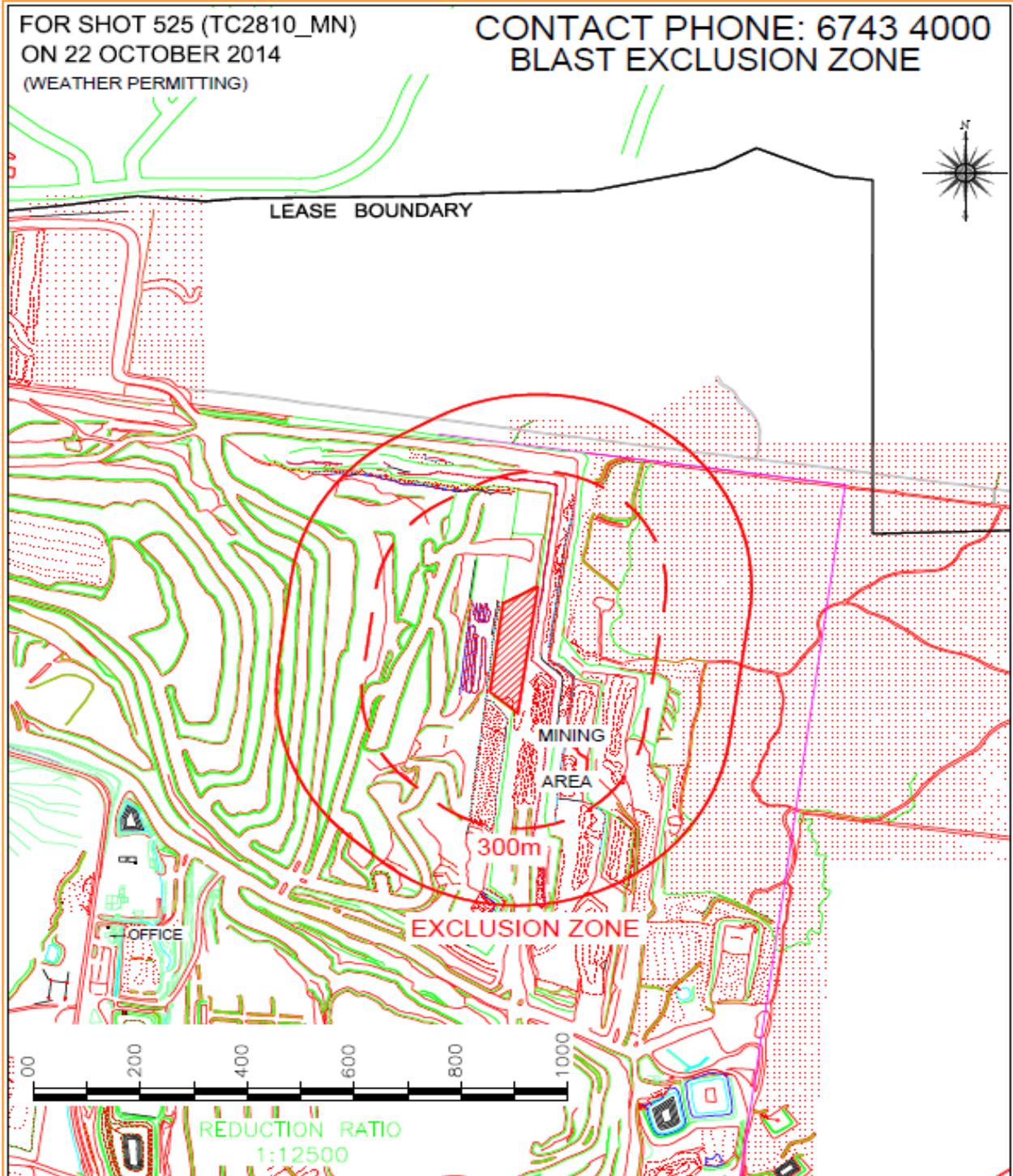


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WHC_PRO_TAR_BLAST FUME MANAGEMENT

5.4. TCM SITE PLAN AND BLAST CLEARANCE EXAMPLE



Designed by ZN	Drawn by PT	Checked by	Approved by - date	File name BLAST EX ZONE	Date 21 October 2014	Scale AS SHOWN
TARRAWONGA COAL PTY LTD				TARRAWONGA MINE SITE BLAST EXCLUSION ZONE		
				Edition A	Sheet A4	



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WHC_PRO_TAR_BLAST FUME MANAGEMENT

5.5. MEDICAL ADVICE

Advice to Medical Staff

in the Treatment of Those Who Have Been Exposed to NO_x Gases.

The patient may have been exposed to NO_x. This is a gas usually produced on mines after the use of explosives. NO_x consists of multiple combinations of nitrogen and oxygen (N₂O, NO, NO₂, N₂O₄, N₂O₃, N₂O₅). Nitrogen dioxide (NO₂) is the principle hazardous nitrous gas. NO_x irritates the eyes and mucous membranes primarily by dissolving on contact with moisture and forming a mixture of nitric and nitrous acids. But this is not the only mechanism by which injury may occur. Inhalation results in both respiratory tract irritation and pulmonary oedema. High level exposure can cause methhaemoglobinaemia. Some people, particularly asthmatics, can experience significant broncospasm at very low concentrations.

The following effects are commonly encountered after NO_x exposure:

ACUTE

- Cough
- Shortness of breath
- Irritations of the mucous membranes of the eyes, nose and throat

SHORT TERM

- Pulmonary oedema which may be delayed for up to 4-12 hours

MEDIUM TERM

- R.A.D.S. (Reactive Airways Dysfunction Syndrome)
- In rare cases bronchiolitis obliterans which may take from 2-6 weeks to appear

LONG TERM

- Chronic respiratory insufficiency

High level exposure particularly associated with methhaemoglobinaemia can cause chest pain, cyanosis, and shortness of breath, tachapnea, and tachycardia. Deaths have been reported after exposure and are usually delayed. Even non irritant concentrations of NO_x may cause pulmonary oedema. Symptoms of pulmonary oedema often don't become manifest until a few hours after exposure and are aggravated by physical effort. Prior to transfer to you the patient should have been advised to rest and if any respiratory symptoms were present should have been administered oxygen. The patient will need to be treated symptomatically but as a base line it is suggested that the following investigations are required:

- Spirometry
- Chest x-ray
- Methheamoglobin estimation

Because of the risk of delayed onset pulmonary edema it is recommended that as a precaution the patient be observed for up to 12 hours. As no specific antidote for NO_x exists, symptoms will have to be treated on their merits.



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WHC_PRO_TAR_BLAST FUME MANAGEMENT

6. DEFINITIONS

Adverse Weather	Includes rainfall, lightening, low continuous cloud, presence of upper class inversion, wind speeds greater than 7m/s from W or NW (Main pit) or, unless otherwise agreed with BCM, outside 1.5-6m/s (Northern extension), winds between 50-90 degrees (Northern extension).
Dewatered hole	Wet hole removed of water with no water recharge
Dry hole	Hole identified as being dry in the bottom and no wet or damp sides
Wet hole	Hole identified as containing free water
Wet weather	>20mm rainfall

7. REFERENCES

- AEISG Code of Practice – Prevention and Management of Blast Generated NOx Gases in Surface Blasting, 2011
- Australian Standard AS2187 Part 2-2006, Use of Explosives
- WHC-PLN-OC-Explosives Management
- WHC-PLN-OC-Blast Management
- WHC-PLN-TAR-Blast Management Plan
- WHC-PRO-OC-Loading and Stemming Blast Holes
- WHC-PRO-OC-Tying up shots
- WHC-PRO-OC-Working in a Blast Area
- WHC-PRO-OC-Blast Clearance and Firing
- WHC-PRO-OC-Blast Planning and Record Keeping WHC-STD-OC-Explosives
- WHC-CHK-Blasting
- WHC-CHK-Shotfirers

Revisions	Revision Description	Who Consulted	Date
1	New document	Drill & Blast Team Environmental Team	Feb 2014
2	Revision following DP&E comments	Drill & Blast Team Environmental Team	Feb 2015

BLAST MANAGEMENT STRATEGY

For Boggabri – Tarrawonga – Maules Creek Complex

JULY 2014

Idemitsu Australia Resources
Boggabri Coal Pty Ltd

Whitehaven Coal Pty Ltd
Tarrawonga Coal Pty Ltd, Maules Creek Coal Mine



DOCUMENT CONTROL				
Version	Date	Prepared by	Reviewed by	Approved by
01	January 2013	J McDonough / B Dillon	B Bird	J Green
02	June 2013	B Bird	J Green	J Green
03	July 2014	B Bird	D Martin, L Johnson	D Martin
04				

Distribution Control

Controlled copies will be distributed to and retained by relevant personnel including key Boggabri Coal Pty Limited (BCPL), Boggabri Coal Expansion Project (BCEP), Whitehaven Coal, agency and Contractor representatives.

Company	Position
BCPL	Environment Superintendent
BCEP	Environment Representative
Whitehaven Coal (Tarrawonga)	Group Environmental Manager
Whitehaven Coal (Maules Creek)	Environmental Manager
Department of Planning and Environment (DPE)	Planning Officer
Contractors	Project Manager

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Glossary

Glossary	
AEMR	Annual Environmental Management Report
BCEP	Boggabri Coal Expansion Project
BCM	Boggabri Coal Mine
BCPL	Boggabri Coal Pty Limited
BLMP	Blast Management Plan
BLMS	Blast Management Strategy
BTM Complex	Boggabri-Tarrawonga-Maules Creek Complex
CCC	Community Consultative Committee
CL	Coal Lease
DP&I	NSW Department of Planning and Infrastructure (now DPE)
DPE	NSW Department of Planning and Environment
EA	Environmental Assessment
EP&A Act	<i>Environmental Planning and Assessment Act, 1979</i>
GHG	Greenhouse Gas
IAR	Idemitsu Australia Resources Pty Limited
MCC	Maules Creek Coal Project
Mtpa	Million Tonnes Per Annum
OEH	NSW Office of Environment and Heritage
PAC	NSW Planning Assessment Commission
ROM	Run of Mine
TCM	Tarrawonga Coal Mine

1. Introduction

1.1 Background and purpose

The purpose of this cumulative Blast Management Strategy (BLMS) is to document the approach that will be taken by mines within the Boggabri-Tarrawonga-Maules Creek Complex (BTM Complex)¹ to monitor and collectively manage cumulative blasting impacts. This strategy details the relevant cumulative blasting impact assessment criteria for each mine and outlines the cumulative blast management protocols that will be implemented within the BTM Complex.

The BTM Complex is an existing mining precinct centred within and around the Leard State Forest, approximately 15 km northeast of Boggabri in the Narrabri Shire local government area. The BTM Complex includes the existing Tarrawonga Coal Mine (TCM) in the south, the Boggabri Coal Mine (BCM) to the north and the proposed Maules Creek Coal Mine (MCC) to the northwest, which is currently under construction. BCM is managed by Boggabri Coal Pty Limited (BCPL), a wholly owned subsidiary of Idemitsu Australia Resources Pty Limited (IAR). MCC is managed under a joint venture between Whitehaven Coal Limited (75%), ITOCHU Australia Limited (15%) and J-Power Australia (10%). TCM is also a joint venture operation, with ownership shared between Whitehaven Coal Mining Limited (70%) and BCPL (30%). A summary of the ownership details for mines within the BTM Complex is provided below in Table 1.1.

Table 1.1 Management and ownership of BTM Complex mines

Mine	Management	Ownership	Share
Boggabri Coal Mine	Boggabri Coal Pty Limited	Idemitsu Australia Resources	100%
Maules Creek Coal Mine	Maules Creek Coal Joint Venture	Aston Coal 2 Pty Limited (owned 100% by Whitehaven Coal Limited)	75%
		Itochu Coal Resources Australia Maules Creek Pty Ltd (ICRA MC)	15%
		J-Power Australia (J-Power)	10%
Tarrawonga Coal Mine	Tarrawonga Coal Pty Limited (TCPL) - Tarrawonga Joint Venture	Whitehaven Coal Mining Limited	70%
		Boggabri Coal Pty Limited	30%

Project applications for the continued operation of BCM (application number 09_0182) and the development of the MCC (application number 10_0138) were determined by the NSW Planning Assessment Commission (PAC) in July and October 2012 respectively, under delegation by the NSW Minister for Planning and Infrastructure. Subsequent to this, the (then) Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPAC), now the Commonwealth Department of the Environment (DoE), granted conditional approval for both the BCM Extension (EPBC 2009/5256) and the MCC Project (EPBC 2010/5566) on 11 February 2013. Given the level of public interest in these projects and the potential for cumulative impacts, approvals were granted subject to stringent conditions related to the management of cumulative impacts.

¹ In previous environmental assessments and approval documents this group of mines has been referred to as the Leard Forest Mining Precinct. For the purposes of this strategy and all other relevant cumulative impact management documents, all references to the 'Leard Forest Mining Precinct' have been replaced with the term 'BTM Complex'.

The TCM application for continuation of mining was approved on 22 January 2013, with similar cumulative impact management conditions to those detailed in the BCM and MCC. The (now) DoE granted EPBC approval (EPBC 2011/5923) to the Tarrawonga project on 11th March 2013.

Approval conditions require the preparation of a suite of regional strategies for environmental management, developed in partnership by all three mines of the BTM Complex. This BLMS has been developed to serve as the regional strategy for blast management within the BTM Complex, in accordance with each project's approval requirements. Approval conditions relevant to the management of cumulative blast impacts within the BTM Complex are detailed in Table 1.2.

Table 1.2 Approval requirements for cumulative blasting impact management

Project/ Approval	Condition	Details
Boggabri Coal Mine Project Approval 09_0182	Schedule 3, Condition 20	During mining operations on site, the Proponent shall... (b) co-ordinate the timing of blasting on site with the timing of blasting at other mines within the Leard Forest Mining Precinct to minimise the cumulative blasting impacts of the mines; and
	Schedule 3, Condition 22	The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Director-General. The plan must... (h) include a Leard Forest Mining Precinct Blast Management Strategy that has been prepared in consultation with other mines within the Leard Forest Mining Precinct to minimise cumulative blasting impacts*.
Maules Creek Coal Mine Project Approval 10_0138	Schedule 3, Condition 23	During mining operations on site, the Proponent shall... (b) co-ordinate the timing of blasting on site with the timing of blasting at other mines within the Leard Forest Mining Precinct to minimise the cumulative blasting impacts of the mines; and
	Schedule 3, Condition 25	The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Director-General. The plan must... (h) include a Leard Forest Mining Precinct Blast Management Strategy that has been prepared in consultation with other mines within the Leard Forest Mining Precinct to minimise cumulative blasting impacts of all mines within the precinct*.
Tarrawonga Coal Mine	Schedule 3, Condition 19	During mining operations on site, the Proponent shall... (b) co-ordinate the timing of blasting on site with the timing of blasting at other mines within the Leard Forest Mining Precinct to minimise the cumulative blasting impacts of the mines;
	Schedule 3, Condition 21	The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Director-General. The plan must... (h) include a Leard Forest Mining Precinct Blast Management Strategy that has been prepared in consultation with other mines within the Leard Forest Mining Precinct to minimise cumulative blasting impacts*.
		<i>*The Leard Forest Mining Precinct Blast Management Strategy can be developed in stages and will need to be subject to ongoing review dependent upon the determination of and commencement of other mining projects in the area.</i>

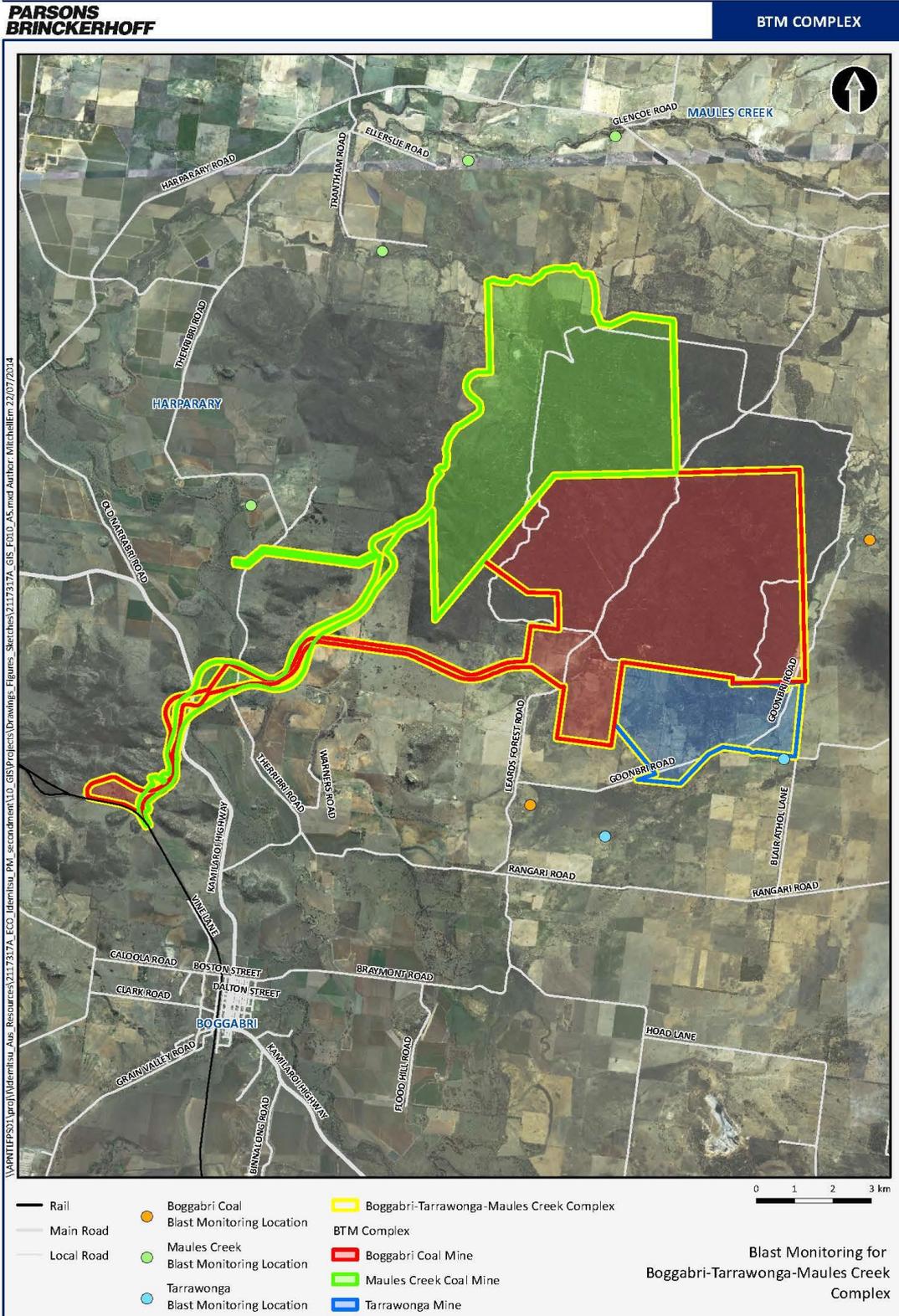


Figure 1.1 Location of the BTM Complex mines

1.2 Document structure

The structure of this report is as follows:

- **Section 1** provides an introduction to the BLMS, including the background to the BLMS, and the scope of the BLMS.
- **Section 2** provides an overview of the BTM Complex mines (BCPL, TCM, MCC).
- **Section 3** outlines the requirements for regional strategies.
- **Section 4** describes blast management criteria for each individual mine
- **Section 5** describes existing monitoring networks and the use of predictive meteorological forecasting to guide blasting activities.
- **Section 6** outlines strategies for cumulative impact management, communication, incident management and reporting.
- **Section 7** discusses strategies for the management of corrective and preventative actions.
- **Section 8** describes the document control process for this BLMS.
- **Section 9** provides a list of references used in this document.

1.3 Scope

This document is the overarching strategy for management of blasting within the BTM Complex.

Individual mines will manage their ongoing operations and associated blast management impacts in accordance with their site specific BMPs. Statutory requirements relating to blasting will be provided in each individual site's management plan.

It is envisaged that any extensions to mining operations in the BTM Complex will be incorporated into this strategy in the future.

2. The BTM Complex

2.1 Boggabri Coal Mine

The Boggabri Coal Mine is an existing open cut mine located within and adjoining the Leard State Forest, approximately 15 km northeast of the town of Boggabri in the Narrabri Shire local government area (the Project). The current operations include an open cut pit, infrastructure area, water management structures and a 17 km private haul road to the Boggabri coal loading rail terminal.

The original development consent for BCPL (DA36/88) allowed the mine to produce 5 million tonnes per annum (Mtpa) of run of mine (ROM) coal by open cut methods with mining operations undertaken 24 hours a day, seven days a week. However, a 2011 modification restricted the extraction rate to 3.5 Mtpa of ROM coal as part of a 2 year extension to mining operations. A modification, approved in June 2012, allowed for an increase in height of the overburden emplacement area (OEA) by 55 m. This modification was submitted to allow for the continuation of operations until an earlier major project application was assessed. The earlier major project application was lodged under the now-repealed Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and was approved by the PAC, under delegation by the Minister in July 2012.

The Boggabri Project Approval (DA 09_0182) allows Boggabri to extend its mining operations for a further 21 years, and increase its production rate to 7 Mtpa of ROM coal from a total resource of 145 Mt. The Project includes operation of existing ancillary equipment; construction of a new coal handling and preparation plant; a 17 km rail spur line; bridges over the Namoi River and Kamilaroi Highway; a rail load-out facility located at the mine; upgrade of the overburden and coal extraction haulage fleet (with an option for a drag-line); upgrade of electricity transmission lines; and other ancillary infrastructure.

A modification (Modification 3) was lodged in November 2013 to allow BCPL to transport coal from site by road until the rail spur is commissioned, which was approved in March 2014.

2.2 Maules Creek Coal Mine

The proposed Maules Creek Coal Mine is located directly to the northwest of Boggabri Coal Mine. There is an existing development consent covering coal mining within an area delineated as Coal Lease 375 (CL 375). This consent has been commenced, but no extraction of coal has occurred. Aston Resources Pty Limited, which has subsequently been acquired by Whitehaven Coal, submitted a project application under Part 3A of the EP&A Act seeking a contemporary Project Approval for coal mining and ancillary activities within this area.

The project application sought approval for extraction of up to 13 Mtpa of ROM coal for 21 years. Other key features of this Project include transportation of coal by rail to Newcastle; and development of site infrastructure including the CHPP and associated facilities; train loading facility; rail spur and loop; a mine access road; communications and power reticulation; explosives storage; and a water pipeline from the Namoi River.

The Maules Creek Coal Project (MCC) application (number 10-0138) under the now-repealed Part 3A of the EP&A Act was granted approval by the DP&I in October 2012. Condition 16 (g) of the Project Approval (as detailed in Table 1-2) also requires the preparation of a BLMS for the BTM Complex.

Two modifications to the project have subsequently been lodged. Modification 1, lodged in April 2013, sought approval for construction and operation of high voltage transmission lines and an associated

switching station, following detailed design; a minor extension to an existing 11 kV transmission line; and realignment of the CHPP area and associated facilities. Project approval was received in July 2013. Modification 2 was lodged in February 2014 seeking approval for an optimised design for key water related infrastructure components (raw water pipeline and pump station). This modification was approved in March 2014.

2.3 Tarrawonga Coal Mine

The Tarrawonga Coal Mine is an existing coal mining operation which obtained approval by the (now) DP&I to extract 2 Mtpa of ROM coal in 2005 (DA88-4-2005). TCPL, a subsidiary of Whitehaven Coal, submitted a project application in July 2011 for an extension of open cut mining operations with an increased production rate to 3 Mtpa of ROM coal for a further 17 years from 2013 to 2030. Key features of the Project include construction of a services corridor, including haul road link; use of upgraded facilities at Boggabri Coal Mine, including the proposed rail loop and spur; construction of new mine infrastructure and service facilities; waste rock emplacement expansion; and realignment of a section of Goonbri Creek. This project application was determined by the PAC on 22nd January 2013 and included the requirement that the proponent shall prepare and implement a Blast Management Plan for the Project that must include a BLMS for the BTM Complex.

A modification was lodged with the DP&I in May 2013 to allow for the processing of up to 3 Mtpa of ROM coal from Tarrawonga Coal Mine at the Boggabri Infrastructure Facilities in Coal Lease (CL) 368, and the associated transport of up to an additional 3 Mtpa of product coal along the private Boggabri rail spur. This modification is currently being assessed.

A further modification was lodged with the DP&I in February 2014 to allow continued trucking of Tarrawonga coal to the Whitehaven CHPP located north of Gunnedah post commissioning of the Boggabri Coal CHPP and rail spur. This modification is currently being assessed.

3. Regional strategies

The conditions of approval for the Boggabri Coal Mine and Maules Creek Coal specifically require the three mines of the BTM Complex produce joint strategies for:

- noise management
- blast management
- air quality management
- water management
- regional biodiversity (developed over 3 stages)
- biodiversity offsets.

Additionally, the conditions require cooperation and consultation between the mines with respect to:

- Aboriginal heritage conservation
- operational noise and air quality management, including online communications of onsite activities and monitoring; operating conditions and reactive dust management; and air quality and Greenhouse Gas (GHG) management
- transport, specifically options for transporting workers
- management of social impacts
- membership of Community Consultative Committees (CCC).

This BLMS addresses the requirement for a BLMS over the BTM Complex area and outlines the process that will be followed to scope, select and deliver joint monitoring and data management for blasting. Consultation for the BLMS is described in Appendix A.

4. Blasting criteria

4.1 Boggabri Coal Mine

The relevant blasting criteria have been extracted from the most recent BCPL Project Approval, and are summarised in Table 4.1.

Table 4.1 Boggabri Coal Mine blasting assessment criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
All public infrastructure	-	50 (or alternatively a specific limit determined to the satisfaction of the Director-General by the structural design methodology in AS2187.3-2006, or its latest version)	0%

The process for day to day management of compliance with respect to these conditions is outlined in the BCPL Blast Management Plan (BLMP).

4.2 Maules Creek Coal

The relevant blasting criteria have been extracted from the most recent Maules Creek Project Approval (project application 10_0138) and are summarised in Table 4.2.

Table 4.2 Maules Creek Coal blasting assessment criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
All public infrastructure	-	50 (or alternatively a specific limit determined to the satisfaction of the Director-General by the structural design methodology in AS2187.3-2006, or its latest version)	0%

The process for day to day management of compliance with respect to these conditions will be outlined in the MCC BLMP.

4.3 Tarrawonga Coal Mine

Relevant blasting criteria have been extracted from the recommended conditions of approval for project application 11_0047 for the Tarrawonga Coal Mine, and are summarised in Table 4.3.

Table 4.3 Tarrawonga Coal Mine blasting assessment criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
All public infrastructure	-	50 (or a limit determined by the structural design methodology in AS2187.2-2006, or its latest version, to the satisfaction of the Director-General	0%

4.4 BTM Complex

Table 4.4 summarises the current assessment criteria for the three mines of the BTM Complex.

Table 4.4 BTM Complex blasting assessment criteria

Criteria	Boggabri	Tarrawonga	Maules Creek
Blasting Hours	9AM – 5PM	9AM – 5PM	9AM – 5PM
Blasting Days	Monday to Saturday inclusive, excluding public holidays. Blasting outside of these days require written approval of the Director-General	Monday to Saturday inclusive, and no blasting is allowed on Sundays, public holidays or at any other time without the written approval of the Director-General	Monday to Saturday, excluding Sundays and public holidays unless prior approval from Office of Environment and Heritage (OEH) is given.
Blasting Frequency	1 blast per day, unless an additional blast is required following a blast misfire; and 4 blasts a week, averaged over a calendar year (i.e. maximum of 208 blasts per annum).	1 blast per day, unless an additional blast is required following a blast misfire.	Up to an average of 4 blasts per week, or approximately 200 blasts per calendar year.

The EA for Boggabri Coal Mine (for application 09_0182) also includes the following commitment: *'Boggabri Coal will manage its blasting practices such that the recommended DECCW guidelines, existing at the time of approval; will be met at all privately owned receivers'*. (Hansen Bailey, V.1, p. 86)

The EA further states that:

'blast events will continue to be coordinated with the adjacent Tarrawonga Mine and any other future mining operations in the area to avoid any potential cumulative impacts' (Hansen Bailey, V.1, p. 86).

The assessment criteria for the three mines, as outlined in Table 4.4, have been considered in preparation of the BLMS. Day to day management of blasting activities for the mines is detailed in their respective BLMPs.

5. Blast monitoring

5.1 Existing monitoring network

The mines of the BTM Complex already have comprehensive blast management systems in place. The existing blast monitoring network will continue to be used. The locations of monitors within the existing blast monitoring network are shown in Figure 1.1.

It is expected that little change will be required to the existing blast monitoring network to continue to ensure compliance with respect to blasting in the BTM Complex. However, there will need to be additional cooperation between mines of the BTM Complex, to minimise the potential for cumulative impacts. Protocols described in this BLMS will be used with the existing monitoring programs to ensure that blasting schedules are coordinated to avoid cumulative impacts on sensitive receivers.

5.2 Predictive forecast meteorology

It is proposed that more extensive changes will be made to the air quality networks within the BTM Complex in order to manage compliance. The changes, which are detailed in the BTM Complex Air Quality Management Strategy, include a proposed predictive forecast meteorology system, with half hourly forecasts up to 48 hours in advance. This system will download global meteorological data and forecasts on a daily basis that will be used to guide the planning of blasting activities.

As with any predictive forecast, confidence reduces with longer predictions, however the half hourly 48-hour forecasts will provide useful information for guiding the drilling and loading of blasts at each mine within the BTM Complex. The forecasts for the next 24-hour and 12-hour periods will provide more confidence in predictions for the day ahead and how weather may affect the proposed schedule for firing a blast.

Once the proposed meteorological system is configured and operating, the outcomes will be evaluated by a competent meteorologist or atmospheric science professional against actual meteorological data and the meteorological system will be validated and improved, where possible.

6. Cumulative blast management

6.1 Mitigation of cumulative blast impacts

The key management measure for the mitigation of cumulative blast impacts will be scheduling of blasts to ensure each mine fires their blast at separate times. Processes to mitigate blasting impacts associated with operations will be addressed in each mines' individual BLMPs. Each mine has or will develop a BLMP that outlines a consistent approach for the scheduling of blasts in consultation with other mines in the BTM Complex.

At least 24 hours' notice will be provided prior to a proposed blast. If there is no conflict regarding the scheduled blast times, there will be no further correspondence. If there are conflicting blast times between the mines, a revised schedule for firing the blasts will be agreed upon. The schedule will be developed to ensure blasts are fired with a considerable time gap between them to reduce any potential cumulative impacts.

If a late change to the blast schedule has occurred on any operation, outside the 30 minutes prior or 30 minutes after the scheduled time, then the mine operator is required to communicate these changes to the other operations. This will avoid any blasts to occur concurrently and avoid the cumulative impact of blast ground vibration and overpressure.

Cumulative air quality impacts will be dependent on blast locations, metrological conditions, time of blast events and dispersion of individual dust and fumes from each blast. A predictive forecasting tool will be investigated by the BTM complex which may assist in scheduling of blast events across the Complex.

6.2 Communication

Regular meetings will be held by the BTM Complex to discuss monitoring results and future operational events. Meeting minutes will be documented and distributed to each site.

When blasting criteria are identified as exceeded as a consequence of blasts from two or more mines, discussions will be held within the BTM Complex and the agencies and affected landholders (where an exceedance occurs on privately-owned land). This will include confirmation from the BTM Complex as to the blast time and identified time of exceedance from monitor reports to assist in identifying if the impact was due to more than one blast, or if it relates to single mines blasting activities.

The mines of the BTM Complex will also, if required, share baseline property inspection reports that are completed at the request of neighbouring landholders, in accordance with each site's Project Approval. Process to identify main source of blasting impacts

If there is uncertainty around the source of a blasting related incident (e.g. exceedance of assessment criteria or damage to a neighbouring building or other infrastructure), a meeting will be held by the BTM Complex representatives to review relevant data and investigate the cause of the incident. If the cause cannot be determined, then the BTM Complex will engage a suitably qualified expert to undertake an independent blast impact investigation. The outcomes of the investigation will help determine the responsibility of the mines for any corrective actions.

6.3 Blasting related incidents

Blasting related incidents such as misfires or exceedances of assessment criteria will be reported and managed in accordance with each mines' BLMP and incident management process. Incidents will be managed in accordance with the requirements of the *Protection of the Environment Operations Act 1997*, *Coal Mine Health and Safety Act 2002* and *Coal Mine Health and Safety Act Regulation 2006*.

6.4 Reporting

Management reports will be prepared regularly, noting performance against criteria. External reporting will include:

- individual Company websites
- Community Consultative Committees (CCCs)
- Annual Environmental Management Reports (AEMRs)
- annual returns
- exceedance reporting.

7. Corrective and preventative actions

7.1 Blasting criteria exceedance

If the monitoring results of a blast identify an exceedance of the mines relevant criteria, written notification of the exceedance will be provided to the other mines within the BTM complex, in addition to any investigation undertaken according to the respective mine's BLMP.

7.2 Unpredicted contingency

Unpredicted events, such as storms or earth tremors, will be identified and reported as impacting on vibration results on a case by case basis.

8. Document control

The BLMS has been developed with the input of representatives of BCPL, TCM and MCC.

8.1 Review and revision

The BLMS will be reviewed and revised at least every two years or on an 'as required' basis to incorporate improvements identified by the BTM Complex or appropriate requirements of government agencies. It will be the collective responsibility of the BTM Complex to review the BLMS.

9. References

Notice of Modification DA 88-4-2005 MOD 1 for the Tarrawonga Coal Mine.

Notice of Modification DA 36/88 2011 MOD 2 for the Boggabri Coal Mine.

Boggabri Coal Pty Limited, Boggabri Coal Mine Blast Management Plan (2012), Boggabri Coal Pty Limited, NSW

Whitehaven Mining Pty Limited, Tarrawonga Mine Blast Management Plan (2012), Whitehaven Mining Pty Limited, NSW

Appendix A

Regulatory Consultation

Consultation	Date	Details	Response
Boggabri Coal BLMP and BTM Complex BLMS lodged with the (then) DP&I	17.01.2013	BLMS for BTM Complex and BLMP lodged with DP&I.	Comments were received from the (then) DP&I in April 2013. Comments received were incorporated in Revision 2 of the BLMS.
Boggabri Coal CCC Meeting April 2013	30.04.2013	BLMP and BLMS was presented to the CCC for comment.	The BLMP and BLMS were presented to the CCC, with opportunity for feedback given. No further comment was received.
Blast Management Plan for Tarrowonga Coal Mine sent to EPA for comment	06.05.2013	The management plan contains details of the proposed BLMS for the BTM Complex	The EPA received the management plan and responded on 06.05.2013 that "the Environment Protection Authority (EPA) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/ conservation management, not to be directly involved in the development of strategies to achieve those objectives"
Blast Management Plan for Boggabri Coal Mine sent to EPA for comment	June 2013	The management plan contains details of the proposed BLMS for the BTM Complex	The EPA received the management plan and responded on 18.06.2016 that 'The Environment Protection Authority (EPA) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/ conservation management, not to be directly involved in the development of strategies to achieve those objectives'.
Revised Boggabri Coal BLMP and BLMS lodged with (then) DP&I	July 2013	Revised BLMS and BLMP lodged for approval.	Further comments were received and addressed on 14.6.2013. Plans were relodged and approved on 31 July 2013.
Whitehaven Coal joint CCC Meeting November 2013	19.11.2013	The BLMS was presented to the CCC meeting.	The BLMS was reviewed and discussed at the meeting. Comments were considered in preparation of this version of the BLMS.
Blast Management Plan for Boggabri Coal Mine sent to EPA for comment	28.01.2014	The management plan contains details of the proposed BLMS for the BTM Complex	The EPA received the management plan and responded on 12.02.2014 that "the Environment Protection Authority (EPA) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/ conservation management, not to be directly involved in the development of strategies to achieve those objectives"

Consultation	Date	Details	Response
Blast Management Plan for Tarrawonga Coal Mine presented to CCC	08.05.2014	BLMP was presented to CCC for comment.	BLMP was signed off at the May CCC meeting on May 8 th .
Blast Management Plan for Maules Creek Coal Mine sent to EPA and community members for comment	20.06.2014	The management plan contains details of the proposed BLMS for the BTM Complex	The EPA received the management plan and responded that “the Environment Protection Authority (EPA) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental/ conservation management, not to be directly involved in the development of strategies to achieve those objectives”



WHITEHAVEN GROUP

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WHC_CHK_ENVIRONMENTAL BLAST CHECKLIST TARRAWONGA

Shot Number		Shot Type	
Scheduled Date		Location of Shot	
Scheduled Time		Product	

Pre Blast - Day Before Shot

Action	Yes/No	Date	Time	Comment
Has the 7 day weather forecast for Gunnedah been observed and saved				
Are conditions forecast to be suitable for blasting				
Has the OCE been informed of forecast conditions				
Has the email notification of blast exclusion zone, date and time been sent (by survey department) and saved				
Has notification been made (by site admin) to:				
Name and contact details withheld				
Name and contact details withheld				
Has message been added to the On-Site system (by site admin)?				
Has the "Community" tab on the website been updated				(not yet applicable)

Pre Blast - Day of Shot

Action	Yes/No	Date	Time	Comment
Is the blast monitor system status check OK for both monitors?				
Has the notice board at the site entry been updated (by shot firer)?				
Was the blast rescheduled?				

Weather Conditions Check

Time	Wind Speed	Wind Direction	Temp Inversion Category	Clear/Cloudy/Overcast/Raining	OCE informed (if conditions are unfavourable)	Is blast OK to proceed
5 hours prior:						
4 hours prior:						
3 hours prior:						
2 hours prior:						
1 hour prior:						
0.5 hours prior:						



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WHC_CHK_ENVIRONMENTAL BLAST CHECKLIST TARRAWONGA

Post Blast								
Action	Yes/No	Date	Time	Comment				
Were photos of the blast taken and if so, what location								
Was there any blast fume present (refer to overleaf)				Blast Fume Rating				
				1	2	3	4	5
				A		B		C
Blast monitor results/monitor report received from Ecotech and saved to server								
Blast categorised and shot number entered in Dynamaster web platform								
Any complaints received								
Environmental Blast Monitoring Spreadsheet updated								
Weather Conditions at Time of Blast								
Date/Time	Wind Speed	Wind Direction	Temp Inversion Category	Clear/Cloudy/Overcast/ Raining				
Blast Results								
	Peak Overpressure/Air Blast (dB)	Peak Vibration/Resultant (mm/s)	Compliant Yes/No					
Tarrawonga Station								
Matong Station								
Further Comments:								

Completed by	Position	Signature	Date