Cowal Gold Operation

Blast Management Plan

Evolution MINING
Cowal

January 2015

COWAL GOLD MINE
BLAST MANAGEMENT PLAN

Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DP&E Approval Date
All	BLMP-01-H Document No. 72681	Original	DECCW, DoP	August 2003
Figure 2	Addendum (dated April 2009) Document No. 273650	Amendment to reflect new location of blast monitoring site "BM04 - Bird Breeding".	DECCW, DoP	15 May 2009
All	BLMP01-J (May 2010) Document No. 338450	Revised to reflect Development Consent modified on 10 March 2010.	DECCW, DoP	A revised BLMP incorporating DECCW comments was submitted to the DP&I on11 June 2010. DP&I provided comments on 14 August 2012.
All	BLMP01-K (December 2012) Document No. 685110	Revised to reflect DP&I comments dated 14 August 2012.	DP&I	Approval of the BLMP remained pending up until the NSW Minister for Planning granted approval of the CGM's modified Development Consent on 22 July 2014.
All	BLMP01-L (January 2015) Document No. 642384	Revised to reflect Development Consent as modified on 22 July 2014.	EPA, DP&E	10 December 2015

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

The Cowal Gold Mine (the CGM) is located approximately 38 kilometres (km) north of West Wyalong in New South Wales (NSW) (Figure 1). Barrick (Cowal) Pty Ltd (Barrick) is the owner and operator of the CGM. Barrick is a wholly owned subsidiary of Barrick (Australia Pacific) Pty Ltd.

Development Consent for the CGM (including the Bland Creek Palaeochannel Borefield water supply pipeline) was granted by the NSW Minister for Urban Affairs and Planning under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 26 February 1999 (DA 14/98). Development Consent (DA 2011/64) for the operation of the eastern saline borefield was granted by the Forbes Shire Council on 20 December 2010.

Barrick was granted approval by the NSW Minister for Planning to modify the Development Consent (DA 14/98) for the CGM Extension Modification under Section 75W of the EP&A Act on 22 July 2014. The CGM Extension Modification involves the continuation and extension of open pit mining and processing operations at the CGM for an additional operational life of approximately 5 years (i.e. to 2024). The general arrangement of the approved CGM is provided in Figure 2.

A copy of the Development Consent (DA 14/98) for the CGM (as modified on 22 July 2014) is available on the Barrick website (www.barrick.com).

1.1 OBJECTIVES AND SCOPE

Objectives

The primary objective of this Blast Management Plan (BLMP) is to establish a blast management strategy for the CGM that complies with the Development Consent conditions, through provisions to:

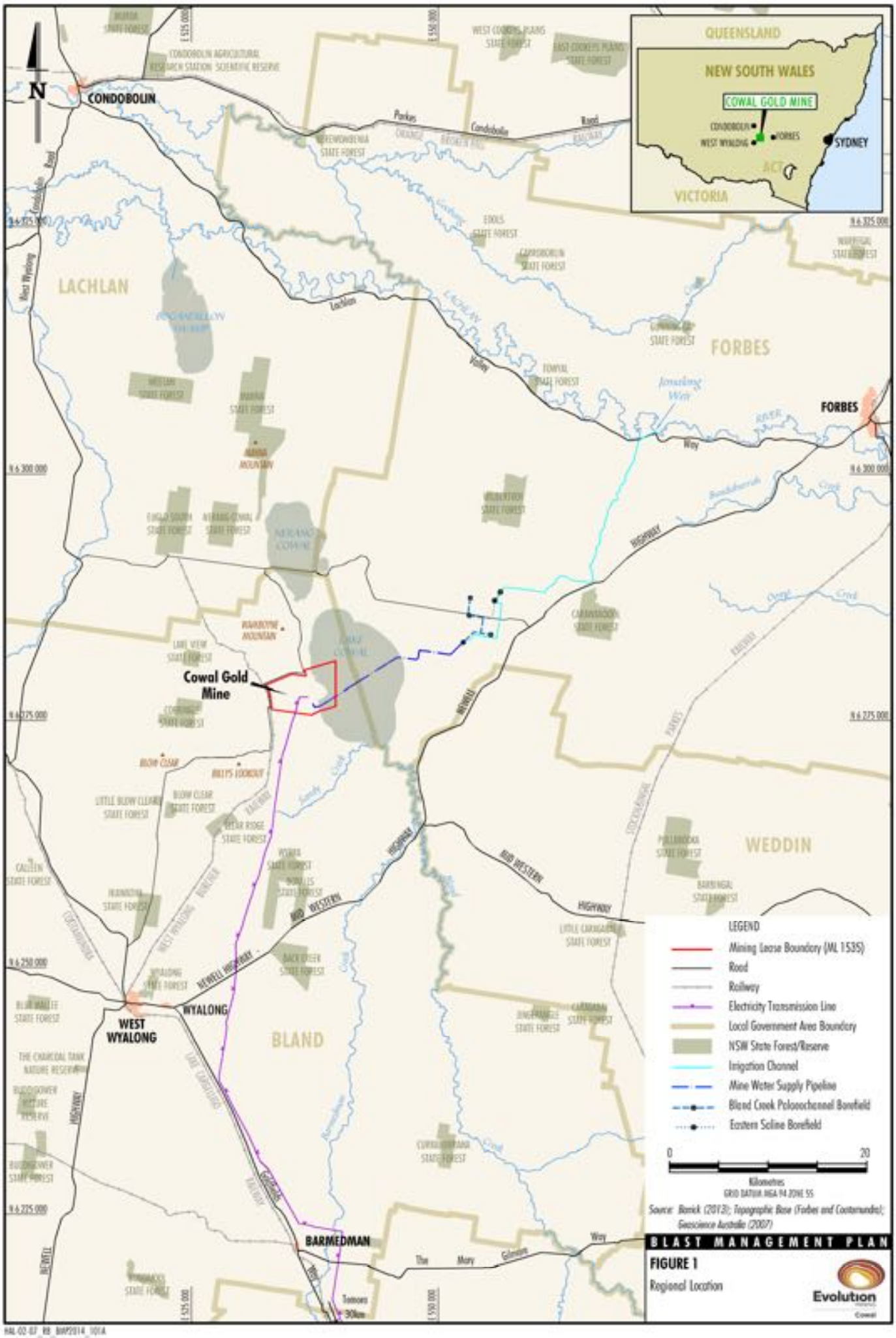
- measure and demonstrate compliance with the blast impact assessment criteria and operating conditions;
- review and assess blast monitoring data and evaluate blasting impacts on privately-owned residences; and
- report on the implementation and effectiveness of blast management measures in the Annual Review.

Scope

This BLMP has been prepared to reflect the modified Development Consent approved by the NSW Minister for Planning on 22 July 2014 under section 75W of the EP&A Act, in accordance with the revision requirements of Condition 9.1 of the Development Consent.

In accordance with the Development Consent condition requirements, the NSW Environment Protection Authority (EPA) has been consulted during the preparation of this BLMP.

This BLMP addresses both the ground vibration and noise effects emanating from blasting at the CGM. Noise effects associated with blasting are measured as overpressure, which is the measurable effect of a blast on air pressure, including measurement of generated energy which is below the limit of human hearing (Richard Heggie Associates, 1997). Other non-blasting noise effects of the CGM are addressed in the Noise Management Plan (NMP). Dust and fume emissions from blasting at the CGM are addressed in this BLMP. Dust emissions from sources other than blasting are addressed in the CGM Air Quality Management Plan (AQMP).



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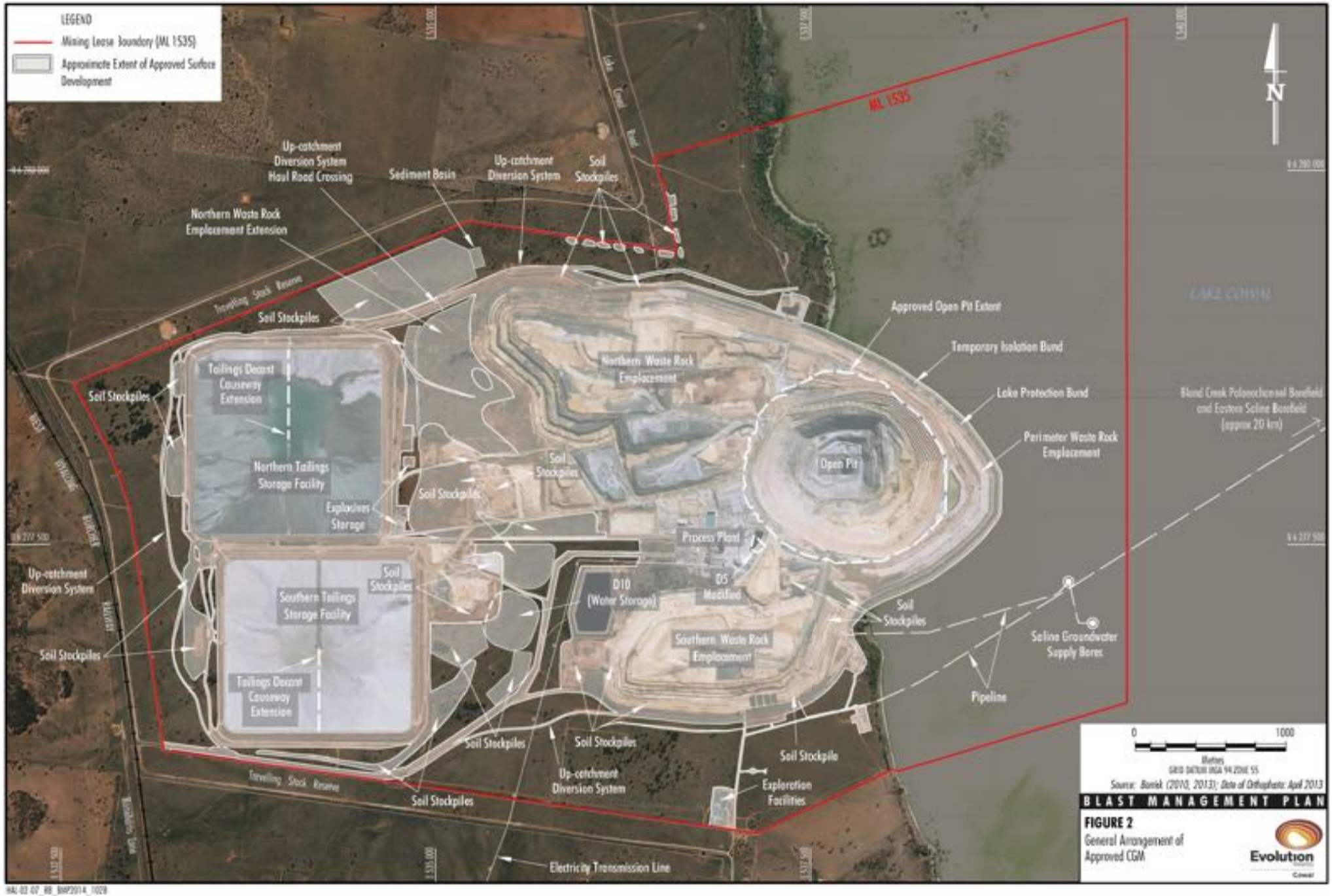

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The remainder of this BLMP is structured as follows:

Section 2: Presents the statutory requirements relating to blast emissions from the CGM.

Section 3: Identifies the blast impact assessment criteria and other relevant blast emissions criteria.

Section 4: Discusses the predicted blast impacts associated with the CGM, the blast design and control measures that may be implemented to achieve best management practice and outlines the CGM's blasting schedule.

Section 5: Describes management measures that will be implemented in the event of an exceedance of the blast impact assessment criteria.

Section 6: Details provisions for the implementation of best management practice to protect the safety of people, public and private infrastructure/property and livestock.

Section 7: Describes the Blast Monitoring Programme to be undertaken to assess compliance with the blast impact assessment criteria and to evaluate and investigate the effectiveness of blast emission reduction measures implemented.

Section 8: Details the incident investigation procedures in the event of an exceedance of the blast impact assessment criteria.

Section 9: Details complaint recording and reporting procedures.

Section 10: Outlines the independent review process in the event that a landowner considers blast levels are in exceedance of the blast impact assessment criteria.

Section 11: Presents community consultation requirements including the Community Environmental Monitoring and Consultative Committee which provides opportunities for landholders or community members to discuss specific issues of concern.

Section 12: Details the Independent Environmental Audit (IEA) requirements and the Independent Monitoring Panel (IMP) review procedures.

Section 13: Presents the Annual Review reporting requirements and the requirements for review of this BLMP.

Section 14: Lists the references cited in this plan.

Section 15: Lists the abbreviations and acronyms used in this plan.

2 STATUTORY REQUIREMENTS

2.1 DEVELOPMENT CONSENT CONDITIONS

This BLMP has been prepared in accordance with the requirements of Development Consent Condition 6.3(e). The requirements of Condition 6.3(e) and other conditions relevant to this BLMP are outlined in Table 1 below.

Table 1
Development Consent Conditions Relevant to this BLMP

<table>
<tr><th>Development Consent Condition</th><th>Section</th></tr>
<tr><td>6.3 Blast Management</td><td rowspan="2">This BLMP</td></tr>
<tr><td>e) <u>Blast Management Plan</u>
The Applicant shall prepare and implement a Blast Management Plan for the development to the satisfaction of the Secretary. This plan must:</td></tr>
<tr><td>(i) be prepared in consultation with the EPA;</td><td>Section 1.1</td></tr>
<tr><td>(ii) describe the measures that would be implemented to ensure compliance with the blast criteria and operating conditions of this approval; and</td><td>Sections 4 to 9</td></tr>
<tr><td>(iii) include a monitoring program for evaluating and reporting on compliance with the blasting criteria and operating conditions of this approval.</td><td>Sections 7, 8 and 13</td></tr>
<tr><td>a) <u>Impact Assessment Criteria</u>
The Applicant shall ensure that blasting on site does not cause any exceedence of the criteria in Table 6.
Table 6:Blasting impact assessment criteria
<table>
<tr><th>Location & Time</th><th>Airblast overpressure (dB(Lin Peak))</th><th>Ground Vibration (mm/s)</th><th>Allowable exceedence</th></tr>
<tr><td>Residence on privately-owned land – Anytime</td><td>120</td><td>10</td><td>0%</td></tr>
<tr><td>Residence on privately-owned land – Monday to Saturday during day</td><td>115</td><td>5</td><td>5% of the total number of blasts over a period of 12 months</td></tr>
<tr><td>Residence on privately-owned land – Monday to Saturday during evening</td><td>105</td><td>2</td><td>5% of the total number of blasts over a period of 12 months</td></tr>
<tr><td>Residence on privately-owned land – Monday to Saturday at night, Sundays and public holidays</td><td>95</td><td>1</td><td>5% of the total number of blasts over a period of 12 months</td></tr>
</table>
However, these criteria do not apply if the Applicant has a written agreement with the relevant owner to exceed the limits in Table 6, and the Applicant has advised the Department in writing of the terms of this agreement.</td><td>Section 3.1</td></tr>
<tr><td>b) <u>Blasting Frequency</u>
The Applicant may carry out a maximum of 1 blast a day on site. This condition does not apply to blasts required to ensure the safety of the mine or its workers.
For the purposes of this condition a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.</td><td>Sections 3.1 and 4.3</td></tr>
</table>

Table 1 (Continued)
Development Consent Conditions Relevant to this BLMP

Development Consent Condition	Section
c) Property Investigations *If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on the site, and the Secretary agrees an independent investigation of the claim is warranted, then within 2 months of receiving this claim the Applicant shall:* *(i) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to investigate the claim; and* *(ii) 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 Applicant shall repair the damage to the satisfaction of the Secretary.* *If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Applicant or the landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.*	Section 6.2
d) Operating Conditions *The Applicant shall:* *(i) implement best management practice to:*	
• *protect the safety of people and livestock in the areas surrounding blasting operations;*	Sections 6.3 and 6.4
• *protect public or private infrastructure/property in the surrounding area from damage from blasting operations; and*	Sections 6.1 and 6.2
• *minimise the dust and fume emissions of any blasting;*	Section 5
(ii) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site; and	Section 4.3
(iii) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this approval, *to the satisfaction of the Secretary.*	Section 7

In addition to the above, the following Development Consent Conditions are also relevant to this BLMP:

- Condition 8.1(b)(i) outlines the notification requirements in the event of an exceedance of the blast impact assessment criteria and is addressed in Section 8.
- Condition 8.2 outlines the independent review process in the event that a landowner of privately-owned land considers the CGM to be exceeding the blast impact assessment criteria. This condition is reproduced in full and discussed in Section 10.
- Consent Condition 3.2(b)(x) requires the development of a Flora and Fauna Management Plan (FFMP) and monitoring of potential impacts on birdlife in bird breeding areas and is addressed in Section 4.
- Consent Condition 9.1(d) establishes the requirements for a Community Environmental Monitoring and Consultative Committee (CEMCC) and is addressed in Section 11.
- Consent Conditions 9.2(a) and 9.2(b) establish the requirements for an IEA and an IMP. These conditions are discussed in Section 12.
- Consent Conditions 9.1(b) and 9.1(c) establish the reporting and review requirements for this BLMP and are reproduced in full and discussed in Section 13.
- Consent Condition 9.4(a)(v) outlines the requirements for a complaints register. This condition is reproduced in full and discussed in Section 9.

2.2 ENVIRONMENT PROTECTION LICENCE (EPL) 11912

Additional requirements that relate to blast management and monitoring are provided in Environment Protection Licence (EPL) 11912. These include:

- Condition L5 which requires the licensee to comply with overpressure and ground vibration criteria. This condition is addressed in Sections 3, 4 and 5.
- Conditions M5 and M6 which require the licensee to provide a telephone complaints line and keep a record of all complaints made in relation to pollutants arising from a licensed activity. These conditions are addressed in Section 9.
- Condition M7 which requires the monitoring of airblast overpressure and ground vibration levels at a number of sites in the vicinity of the CGM and for monitoring instruments to meet the requirements of the applicable Australian Standard. This condition is addressed in Section 7.
- Condition R2 which requires the licensee to notify the EPA of incidents causing or threatening material harm to the environment. This condition is addressed in Section 8.

2.3 CONDITIONS OF AUTHORITY ML 1535

The NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy Conditions of Authority for Mining Lease (ML) 1535 includes requirements that relate to blasting. These include:

Blasting

27. (a) Ground Vibration

The lease holder must ensure that the ground vibration peak particle velocity generated by any blasting within the lease area does not exceed 10 mm/second and does not exceed 5 mm/second in more than 5% of the total number of blasts over a period of 12 months at any dwelling or occupied premises, not owned by the lease holder or a related corporation, as the case may be, unless determined otherwise by the Environment Protection Authority.

(b) Blast Overpressure

The lease holder must ensure that the blast overpressure noise level generated by any blasting within the lease area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5% of the total number of blasts over a period of 12 months, at any dwelling or occupied premises, not owned by the lease holder or a related corporation, as the case may be, unless determined otherwise by the Environment Protection Authority.

The above conditions are consistent with the Development Consent blast impact assessment criteria (except for evening periods, Sundays and public holidays during which more stringent criteria apply) (Sections 2.1 and 3).

The Conditions of Authority for ML 1535 also includes environmental performance reporting requirements associated with the Annual Environmental Management Report (AEMR). Contemporary reporting requirements for the Annual Review (formerly the AEMR) are described in Section 13.

3 BLASTING CRITERIA

3.1 BLAST IMPACT ASSESSMENT CRITERIA

In accordance with Development Consent Condition 6.3(a), Barrick will comply with the blast impact assessment criteria in Table 2. Meeting this criteria is considered to be part of best management practice, which is required to be implemented in accordance with Development Consent Condition 6.3(d)(i).

Table 2
Blast Impact Assessment Criteria

Location & Time	*Airblast overpressure (dB(Lin Peak))*	*Ground Vibration (mm/s)*	*Allowable exceedance*
Residence on privately-owned land – Anytime	120	10	0%
Residence on privately-owned land – Monday to Saturday during day	115	5	5% of the total number of blasts over a period of 12 months
Residence on privately-owned land – Monday to Saturday during evening	105	2	5% of the total number of blasts over a period of 12 months
Residence on privately-owned land – Monday to Saturday at night, Sundays and public holidays	95	1	5% of the total number of blasts over a period of 12 months

dB (Lin Peak) – decibels (Linear Peak).
mm/s – millimeters per second.
Day – the period from 0700 to 1800.
Evening – the period from 1800 to 2200.
Night – the period from 2200 to 0700.

However, as provided in Development Consent Condition 6.3(a), these criteria do not apply if Barrick has a written agreement with the relevant private landowner to exceed the limits in Table 2, and Barrick has advised the NSW Department of Planning and Environment (DP&E) in writing of the terms of this agreement.

In accordance with Development Consent Condition 6.3(b), Barrick will carry out a maximum of 1 blast a day on site. This condition does not apply to blasts required to ensure the safety of the mine or its workers. Development Consent Condition 6.3(b) provides that a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.

In accordance with Development Consent Condition 6.3(e)(iii), Barrick will implement the monitoring programme described in Section 7 to evaluate blasting impacts and demonstrate compliance with the above blast impact assessment criteria.

The blast monitoring data will be assessed regularly (Sections 7 and 8) and blast design and control measures modified as required in order to achieve compliance with the blast impact assessment criteria (Section 3).

The results of the blast monitoring programme will be reported in the Annual Review and will be published on Barrick's website (Section 13).

3.2 OPERATING CONDITIONS

In accordance with Development Consent Condition 6.3(d), Barrick will:

(i) implement best management practice to:

- protect the safety of people and livestock in the areas surrounding blasting operations;
- protect public or private infrastructure/property in the surrounding area from damage from blasting operations; and
- minimise the dust and fume emissions of any blasting;

(ii) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site; and

(iii) carry out regular monitoring to determine whether the development is complying with the relevant conditions of this approval.

Table 1 outlines where within this BLMP, the above operating conditions are addressed.

3.3 AUSTRALIAN STANDARD

Appendix J of Australian Standard (AS) 2187.2:2006 *Explosives – Storage and Use* is the applicable standard for blast monitoring at the CGM. Complying with this Australian Standard is considered to be part of best management practice, which is required to be implemented in accordance with Development Consent Condition 6.3(d)(i).

AS 2187.2:2006 provides guidance in assessing blast-induced ground (and structural) vibration and airblast effects on buildings and their occupants.

Recommended vibration limits for human comfort and structural building damage are generally based on international standards (or studies) as presented in Appendix J Tables J4.5(A) and J4.5(B) respectively of AS 2187.2:2006. Similarly, recommended airblast limits for human comfort and structural damage are presented in Appendix J Tables J5.4(A) and J5.4(B) respectively.

Where applicable, further discussion of the requirements of AS 2187.2:2006 with regard to blast monitoring is provided in the following sections.

3.4 ANZEC CRITERIA

The EPA advocates use of the Australian and New Zealand Environment Council (ANZEC) (1990) guidelines entitled *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* for limiting potential residential annoyance effects due to blasting (Appendix A). Complying with this guideline is considered to be part of best management practice, which is required to be implemented in accordance with Development Consent Condition 6.3(d)(i).

The recommended criteria and provisions within the ANZEC (1990) guideline can be summarised as follows:

- The recommended maximum level for ground vibration is 5 millimetres per second (mm/s), peak vector sum (PVS) (Appendix A - Section 2.2.1). It is recommended however that 2 mm/s be considered as the long term regulatory goal for the control of ground vibration (Appendix A - Section 2.2.3).

- The PVS level of 5 mm/s for ground vibration may be exceeded for up to 5% of the total number of blasts for a period of 12 months. The level should not exceed 10 mm/s at any time (Appendix A – Section 2.2.2).
- The recommended maximum level for airblast overpressure is 115 decibels (dB) (Linear Peak) (Appendix A – Section 2.1.1).
- The airblast overpressure level of 115 dB (Linear Peak) may be exceeded for up to 5% of the total number of blasts for a period of 12 months. The level should not exceed 120 dB (Linear Peak) at any time (Appendix A – Section 2.1.2).
- Blasting should generally only be permitted during the hours of 9.00 am to 5.00 pm Monday to Saturday and should not take place on Sundays or Public Holidays (Appendix A – Section 2.3.1).
- Blasting should generally take place no more than once per day (Appendix A – Section 2.3.2).

The ANZEC guideline recognises that mines may not be able to comply with the blasting time and day restrictions outlined in Sections 2.1 and 2.3 (Appendix A - Section 2.4). Accordingly, Barrick will comply with the criteria and times outlined in Table 2.

The complete ANZEC guideline is provided in Appendix A.

4 BLAST EMISSION PREDICTIONS AND DESIGN/CONTROL

4.1 BLAST EMISSION PREDICTIONS

Predictions of the level of CGM blast emissions at the nearest potentially affected residences were conducted by SLR Consulting (2013). The predictions were based on a Maximum Instantaneous Charge (MIC) of 172 kilograms (kg) and a typical CGM blast design (SLR Consulting, 2013).

A typical CGM blast design is summarised in Table 3.

Table 3
Typical Blast Design Details

Blast Design Parameter	Typical Dimension	Range
Number of Holes	350	200 to 500
Number of Rows	9	3 to 12
Hole Diameter	165 mm	115 to 200 mm
Hole Inclination (to vertical)	0	0 to 20°
Bench Height	9 m	5 to 18 m
Burden	4.4 m	3 to 6 m
Spacing	5.3 m	4 to 7 m
Subdrill	1.3 m	0.6 to 1.8 m
Stemming Depth	3.6 m	3 to 4.5 m
Delay Timing	NONEL	N/A
Column Explosive	Emulsion	ANFO/Slurry/Emulsion
Powder Factor	0.82 kg/bcm	0.60 to 1.00 kg/bcm
MIC	172 kg	50 to 350 kg

Source: SLR (2013)
ANFO = ammonium nitrate fuel oil.
° = degree.
MIC = maximum instantaneous charge.
m = metres.

The assessment found the following (SLR Consulting, 2013):

> *With a blast MIC of 350 kg, the predicted ground vibration and airblast levels are below the most stringent structural damage criterion of 12.5 mm/s and 120 dBLpk (decibels linear peak) at all privately owned receivers. Similarly, with a blast MIC of 350 kg, the predicted 5% exceedance ground vibration and airblast levels are below the daytime (exclusive of Sundays/Public Holidays) human comfort criteria of 5 mm/s and 115 dBLpk at all privately owned receivers.*
>
> *Furthermore, with a blast MIC of 50 kg, the predicted 5% exceedance ground vibration and airblast levels are below the daytime Sundays/Public Holidays human comfort criteria of 1 mm/s and 95 dBLpk at all privately owned receivers, except at Coniston. The predicted airblast level at Coniston of 98 dBLpk is moderately (3 dB) above the criterion. However as discussed in Section 2.3, the existing CGM airblast monitoring results show that the (actual) measured airblast levels (on Sundays/Public Holidays) are below human comfort criterion of 95 dBLpk at Coniston.*
>
> *Barrick would continue to conduct blasting on a Sunday/Public Holidays only in accordance with relevant blast criteria. Blast monitoring would continue at Coniston to confirm that compliance with blast criteria is maintained. Should blast monitoring indicate that blast overpressure is approaching the criteria of 95 dBLpk, blast sizes would be modified (eg MIC would be reduced).*

Bird Behaviour Monitoring

The "*Cowal Gold Project 2005 Annual Environmental Management Report*" (Barrick, 2006) includes a summary of bird observations during the first 10 blasts at the CGM. The observation was overseen by Dr Peter Gell from the Geographical and Environmental Studies Department of the University of Adelaide. Dr Peter Gell has been involved in monitoring and reporting on waterbird populations and breeding activities at Lake Cowal since 1992. The four fauna specialists who conducted the monitoring found that there was no abrupt change in the behaviour of any bird species to any blast and no evidence that any bird perceived any blast (Gell, 2005). Further observations by Dr Gell in 2011 during a blast event identified no discernible reaction to the noise (or other effects) associated with the blast (Gell, 2011).

Predictions of the level of blast emissions near bird breeding areas were conducted by SLR Consulting (2013), which found:

> *The predicted results indicate that the maximum airblast level at the closest monitored bird breeding area (Bird Breeding Area South [NO3]) would be 110 dB. Given the proposed continuation of blast and bird behaviour monitoring in accordance with the "Cowal Gold Project Flora and Fauna Management Plan" (Barrick, 2003), as well as the contingency measures in place in the event that assessment and monitoring results indicate that adverse impacts are occurring on fauna, Modification blasting would be unlikely to significantly impact any fauna species.*
>
> *Similarly, the predicted results indicate that the maximum airblast level would remain below the lowest livestock behaviour reaction noise level of 125 dB at distances of 750 m or greater from the blast site.*

In accordance with Development Consent Condition 3.2(b), monitoring of bird breeding behaviour will continue to be conducted and the contingency measures outlined in the FFMP implemented should impacts be identified.

4.2 BLAST DESIGN AND CONTROL MEASURES

Blast design will be an iterative process and the results from the blast monitoring programme (Section 7) will be used to refine blast designs as part of best management practice, which will be implemented to protect the safety of people, livestock, public or private infrastructure/property and minimise the dust and fume emissions of any blasting, in accordance with Development Consent Condition 6.3(d)(i).

Non-electric (NONEL) or similar blast initiation systems will be used where practicable to minimise the probability of exceedances of the blast impact assessment criteria outlined in Table 2. Column explosives will be primarily Emulsion (Table 3).

AS 2187.2:2006 details general operating practices that blast operators will conform with and provides guidance of the various options available for controlling ground vibration and airblast. The CGM's Blasting Standard Operating Procedure 'Blasting MIN-SOP-35' (Blasting SOP) has been prepared in consideration of the AS 2187.2:2006 general operating practices.

These controls will be adopted to comply with the blast impact assessment criteria (Table 2) and are summarised in Table 4.

Consistent with AS 2187.2:2006, data from the on-site meteorological station will be used to determine whether conditions are suitable for blasting, as outlined in Section 7.2.

Table 4
Ground Vibration and Airblast Controls

Variables	Ground Vibration			Airblast		
	Influence on ground motion			Influence on overpressure		
	Significant	Moderately Significant	Insignificant	Significant	Moderately Significant	Insignificant
1. Within the Control of Blasting Operators						
Charge mass per delay (MIC)	X			X		
Delay interval	X			X		
Burden and spacing		X		X		
Stemming: amount			X	X		
Stemming: type			X	X		
Charge length and diameter			X		X	
Angle of blast hole			X			X
Direction of initiation		X		X		
Charge mass per blast			X			X
Charge depth			X	X		
Covering of detonating cord			X	X		
Charge confinement	X			X		
Blast hole deviation	X					
2. Not in Control of Blasting Operators						
General surface			X		X	
Type and depth of overburden	X			X		
Wind and weather conditions			X	X		

Source: AS 2187.2-2006 – Table J2

Further detail on these blast controls is provided in AS 2187.2:2006.

4.3 BLAST SCHEDULE

In accordance with Development Consent Condition 6.3(b) and as discussed in Section 3.1, Barrick will carry out a maximum of 1 blast event per day on site. However, this condition does not apply to blasts required to ensure the safety of the mine or its workers.

The daily blast event at the CGM would be restricted to within the hours of 9.00 am to 5.00 pm in accordance with the ANZEC (1990) guideline and will be scheduled and designed to comply with the requirements outlined in Development Consent Condition 6.3(a) (Table 2). However blast timing is subject to production scheduling requirements and/or weather restrictions.

Barrick operates a Community Information/Complaints Hotline (02 6975 3454) which enables the public to obtain up-to-date information on the CGM's proposed blast schedule as required by Development Consent Condition 6.3(d)(ii). The CGM's Community Information/Complaints Hotline operates 24 hours a day, seven days a week, and is advertised in relevant local newspapers on a quarterly basis.

5 BLAST MANAGEMENT MEASURES

All blasts will be designed to comply with the blast impact assessment criteria (Section 3). In the event that monitoring indicates exceedance of the blast criteria, the management measures described in this Section will be considered and applied where necessary. In addition to these measures to modify the blast operations, the blast operations may also be relocated as required to achieve compliance with the blast criteria.

In accordance with Development Consent Condition 6.3(d)(i), best management practice will be implemented to protect the safety of people, livestock and public or private infrastructure/property in the areas surrounding blasting operations. Implementation of these management measures is considered to be a part of best management practice.

Airblast Overpressure Management Measures

The airblast overpressure management measures that would be implemented (as necessary) are largely sourced from AS 2187.2-2006 and are summarised in Table 5.

Table 5
Airblast Overpressure Management Measures

Management Measure	Summary Description of Effect
Reduce the MIC or charge mass per delay, to the lowest possible level.	The level of airblast is inversely proportional to the MIC, the lower the MIC the lower the airblast.
Keep face heights to a practical minimum.	As the face height determines the blast hole depth and therefore in turn the MIC, reducing the bench height consequently reduces the MIC.
Ensure stemming type and length is adequate.	Use a stemming length of no less than the burden dimension and use aggregate of an appropriate size which “locks” in the blast hole to prevent the escape of the gases from the explosives.
Eliminate exposed detonating cord. Investigate alternative initiation methods.	Detonating cord has a very high velocity of detonation generating high airblast levels. NONEL initiation “burns internally” and does not contribute to the airblast level from blasting.
Eliminate secondary blasting (instead of popping, use rock breaker or drop hammer).	Secondary blasting of oversize rock should be minimised as the explosives are less confined which may result in high airblast levels.
Reduce the need for toe shots (e.g. better control of drill patterns).	Drill the blast holes below the level of the bench floor (subdrill) so that no rock is left at the base of the blast bench (toe).
Orientate faces where possible so that they do not face directly towards residences.	The forward movement of the blast face generates the major component of airblast so orientate the face away from receivers where possible.
Ensure that all delays are designed to eliminate wave front reinforcement.	Design the detonator delay sequence to provide at least 8 ms between the blast holes on a given delay time to avoid overlap.
Vary the direction of initiation.	Airblast levels are reinforced in the direction of initiation of the detonators. Orientate initiation direction away from receivers.
Exercise strict control over the burden, spacing and orientation of all blast drill holes.	Less than design burden and spacing (i.e. reduced rock cover) facilitates “blow outs” resulting in high airblast levels.
Take particular care where the face is already broken or where it is strongly jointed, sheared, or faulted.	This requires either “lighter” charging or “decking” with an inert material across the respective zones in order to avoid blowouts resulting in high airblast levels.
Consider deck loading where appropriate to avoid broken ground or cavities in the face (e.g. from back break).	Decking refers to separating explosives within a blast hole using an inert material, usually stemming (see above).

After: AS 2187.2; EPA (pers. comm., 5 May, 2003) and Richard Heggie Associates (pers. comm., 25 July 2003)

Due to the technical complexities and interrelationships of variables associated with blasting (including geology, weather and production requirements), it is not appropriate to specify in a BLMP which blast overpressure management measure to implement under a particular exceedance scenario (Richard Heggie Associates pers. comm., 21 July 2003). It will remain the responsibility of the Blasting Supervisor in co-operation with the Environmental Manager in consultation with the EPA, to determine the appropriate overpressure management measure (or combination of measures) that should be applied to address an exceedance.

Barrick will implement adaptive management of blasting at the CGM. Following the implementation of any management measures, continued blast monitoring will provide feedback on the effectiveness of the management measures and to determine whether any additional management measures are required.

Dust and Fume Management

Blasting activities have the potential to result in dust and fume emissions. Dust emissions from blasting are controlled by adequate stemming of the blast and are covered in the AQMP.

Blast fumes are typically associated with using ANFO and wet holes. ANFO will react with water and produce fumes, however this is more prevalent for a blast design that uses straight ANFO.

As described in Section 4.1, the CGM's blast design includes a wet product (Emulsion) which is used to minimise blast fumes. Blast fumes are very rare when using an Emulsion product, unless a reactive ground or wet ground is present, which may produce some fume emissions.

Blasting activities at the CGM will be undertaken in accordance with CGM's Blasting SOP which includes control procedures for priming, loading and stemming operations to minimise blast emissions. These procedures involve conducting a review by the Blasting Supervisor of risk factors prior to blasting including meteorological conditions (e.g. prevailing winds or heavy rain) and ground conditions (e.g. presence of heavily rain affected ground).

Where particular conditions or risk factors are known to increase the likelihood of a blast producing unacceptable dust or fume emissions, the blast design (Section 4.2) will be modified, and management measures described in this section will be implemented to minimise blast emissions, where practicable.

6 SAFETY

6.1 PROTECTION OF PUBLIC INFRASTRUCTURE

There is no public infrastructure within 400 m of the active open cut mining area that could potentially be affected by blasting activities. Blasting activities within the pit are located approximately 1.15 km from the on-site electricity transmission line substation, approximately 5 km from the West Wyalong Burcher Railway and approximately 2.25 km away from Lake Cowal Road.

6.2 PROTECTION OF PRIVATE INFRASTRUCTURE/PROPERTY

Property Investigations

In accordance with Development Consent Condition 6.3(c), if the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting at the CGM and the Secretary of the DP&E agrees an independent investigation of the claim is warranted, then within 2 months of receiving this claim Barrick will:

(i) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to investigate the claim; and

(ii) 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 Barrick will repair the damage to the satisfaction of the Secretary of the DP&E.

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

The blast design and control measures described in Section 4 will be used to minimise blast emission impacts to private infrastructure and property. The blast monitoring procedures and response and management measures that will be implemented in the event of an exceedance of the blast impact assessment criteria are discussed in Sections 5, 7 and 8.

6.3 PROTECTION OF LIVESTOCK

Blasting operations at the CGM are restricted to within the open pit. There is no livestock grazing permitted within ML 1535. The perimeter Travelling Stock Reserve is at its closest proximity, located approximately 2 km from blasting activity within the open pit. Accordingly it is expected that no livestock would be affected by flyrock.

Furthermore, any livestock agisted on mine-owned land (outside ML 1535) adjacent to the open pit (i.e. when lake conditions permit) are unlikely to be affected by flyrock given any potential grazing areas are located approximately 2 km from the open pit at its closest proximity.

6.4 PROTECTION OF PERSONS DURING BLASTING

The CGM's Blasting SOP details the procedures that will be undertaken to control personal safety during blasting. The Blasting SOP includes implementation of a minimum 400 m exclusion zone for all blasts in addition to personal protective equipment requirements and emergency and evacuation procedures.

7 MONITORING PROGRAMME

7.1 BLAST MONITORING

In accordance with Development Consent Condition 6.3(e)(iii), Barrick will implement the following monitoring programme to evaluate blasting impacts and demonstrate compliance with the blast impact assessment criteria.

The following monitoring locations will be used to evaluate blast emissions from the CGM (Figure 3):

- BM01 – 'Gumbelah' residence;
- BM02 – 'Hillgrove' (Barrick-owned) residence;
- BM03 – 'Coniston' residence;
- BM08.1 – 'Cowal North' residence; and
- BM10 – CGM open pit (reference).

The monitoring locations listed above have been developed in consideration of the requirements of Development Consent Condition 6.3 and those properties which are afforded acquisition rights.

The measurements at residences will be taken within 30 m of the building in accordance with ANZEC (1990) guidelines (Appendix A – Section 3.3).

Blast monitoring will record the following for each blast, as agreed with the EPA (EPA, pers. comm., 5 June 2003):

- location of blast monitoring site;
- time and date of monitoring;
- blast number and location of blast;
- peak vector sum (PVS - mm/s);
- wave form trace; and
- air overpressure peak (dB [Linear Peak]).

Each monitoring unit will be fitted with suitable equipment to monitor all blasts. As required by EPL Condition M7.1(b), blast monitoring units/instrumentation will comply with the requirements of AS 2187.2/2006.

Detailed climatic and atmospheric conditions including temperature and wind speed and direction at the time of blasting will be monitored at the CGM meteorological station (Figure 3) and will be recorded for each blast. Periodic calibration of all monitoring units including the meteorological station will be undertaken in accordance with the manufacturer's specifications.

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7.2 DETERMINATION OF APPROPRIATE WEATHER

7.2.1 Meteorological Monitoring

Data from the on-site meteorological station will be used to determine whether conditions are suitable for blasting operations at the CGM. The meteorological monitoring station will be maintained for the life of the CGM to:

- assist in the prediction of noise, dust and blasting impacts; and
- to provide data at the time of each blast as part of the blast design iterative process.

7.2.2 Weather and Blast Correlation

Data from the on-site meteorological station will be used to establish correlations between weather conditions and blast monitoring results to establish appropriate site specific weather conditions for blasting operations at the CGM. Meteorological conditions will be recorded with each blast (Section 4.2).

Prior to Blasting

Meteorological conditions will be examined as soon as practicable prior to blasting and from the weather data, a prediction made as to whether air blast overpressure levels (and dust and/or fume emissions) outside of the CGM area (i.e. at non-company owned residences and other blast monitoring locations shown on Figure 3) are likely to be increased above the levels expected under prevailing conditions. If an exceedance of the blast impact assessment criteria (Section 3) (or any other relevant criteria) is predicted to occur, blasting will be rescheduled until more favourable weather conditions prevail.

Blasting will generally be avoided during temperature inversions (where practicable). Barrick's blast schedule (Section 4.3) has been developed in consideration of when temperature inversions are typically less prevalent.

7.3 BLAST MONITORING REPORT

Blast monitoring results will be reviewed on a monthly basis and an annual Blast Monitoring Report will be prepared by an independent specialist which includes a summary of the annual monitoring results and a review and analysis of the results against the blast impact assessment criteria. A summary of the annual blast monitoring data will be included in the Annual Review (Section 13) and be made available on Barrick's website.

If blast monitoring results indicate an exceedance of the blast impact assessment criteria at the relevant blast monitoring locations, the incident investigation procedures will be implemented (Section 8).

8 INCIDENT INVESTIGATION AND NOTIFICATION PROCEDURES

In accordance with the Development Consent, an incident is defined as *a set of circumstances that causes or threatens to cause material harm to the environment; and/or breaches or exceeds the limits or performance measures/criteria in the Development Consent.* Accordingly, a blast incident would be a non-compliance with the blast impact assessment criteria (Section 3.1) that is confirmed to be attributable to the CGM based on the outcome of the compliance assessment protocol.

8.1 COMPLIANCE ASSESSMENT PROTOCOL

The results of blast monitoring will be compared against the relevant blast impact assessment criteria. The blast impact assessment criteria (Section 3.1) require that blasting must not:

- exceed 120 dB(L) or 10 mm/s at any residence on privately-owned land at any time;
- exceed 115 dB(L) or 5 mm/s at any residence on privately-owned land Monday to Saturday during the day for more than 5% of the total number of blasts over a period of 12 months;
- exceed 105 dB(L) or 2 mm/s at any residence on privately-owned land Monday to Saturday during the evening for more than 5% of the total number of blasts over a period of 12 months; or
- exceed 95 dB(L) or 1 mm/s at any residence on privately-owned land Monday to Saturday at night and on Sundays and public holidays for more than 5% of the total number of blasts over a period of 12 months.

In the event of an exceedance of the above criteria, an assessment will be conducted to:

- Confirm the timing of the exceedance.
- Confirm the Location of the exceedance.
- Exclude non-mine related or external factors (e.g. can the exceedance be attributed directly to the CGM). This will include consideration of the meteorological conditions recorded at the time of the blast.
- Confirm if the airblast overpressure or ground vibration limits during the relevant day, evening and night time periods have been exceeded for more than 5% of the total number of blasts over a period of 12 months.
- Confirm if Barrick has an agreement with the relevant owner of the residence on privately-owned land to exceed the blast impact assessment criteria.

If the above assessment determines that Barrick is in non-compliance with the blast criteria, then management measures detailed in Section 5 will be implemented to prevent or mitigate against any further non-compliances. The notification protocol for reporting a blast incident is provided in Section 8.2 below.

8.2 INCIDENT NOTIFICATION PROTOCOL

In the event the compliance assessment protocol determines Barrick to be in non-compliance with the blast impact assessment criteria, Barrick will implement the following procedure:

- Within 24 hours of the compliance assessment (Section 8.1), the incident will be reported to the Environmental Manager and the Community Relations Manager, and the General Manager and Mining Manager will be notified.

- Barrick will report the incident to the EPA, the DP&E and any relevant affected landholder as soon as practicable after Barrick becomes aware of the incident.
- Barrick will conduct the following review and assessment procedures to determine the likely cause of the incident and to identify appropriate mitigation measures:
  - review of the blast design to identify possible explanations for the non-compliance (i.e. whether suitable blast controls were implemented in the blast design and were implemented correctly); and
  - review of the blast monitoring results and meteorological data to identify whether meteorological conditions may have contributed to the problem.
- In accordance with Development Consent Condition 9.3(a) and Condition R2.2 of the EPL, Barrick will provide written details of the incident to the Secretary of the DP&E and the EPA within seven days of the date the incident occurred, including details of measures taken or proposed to be taken to prevent or mitigate recurrence of the incident. Additionally, as required by Development Consent Condition 8.1(b)(i), regular monitoring results will be provided to the relevant affected landowner until Barrick is in compliance with the blast impact assessment criteria.

It will be the responsibility of the Environmental Management in consultation with the General Manager, Mining Manager and Community Relations Manager to implement the procedures above.

9 COMPLAINTS REGISTER

A complaints register will be maintained by the Community Relations Manager in accordance with EPL Condition M5.1.

Information recorded in the complaints register with respect to each complaint will include:

- date of complaint;
- the method by which the complaint was made;
- nature of complaint; and
- response action taken to date (if no action was taken, the reasons why no action was taken).

An initial response will be provided to the complainant within 24 hours. Preliminary investigations into the complaint will commence within 48 hours of complaint receipt.

A summary of the complaints register will be displayed on the Barrick website in accordance with Development Consent Condition 9.4(a)(v) and will be updated on a monthly basis.

Dispute Resolution

In the event that dispute resolution is necessary or where blasting levels are subsequently demonstrated to be below the relevant criteria (Section 3), the resolution process will be one of informed discussion involving the complainant and Barrick. Barrick may also refer the dispute (with the complainant's agreement) to the CGM's CEMCC for mediation (Section 11). In the event that the complainant is still dissatisfied, the matter may be referred to the DP&E for consideration of further measures. Every effort will be made to ensure that concerns are addressed in a manner that results in a mutually acceptable outcome.

10 INDEPENDENT REVIEW PROCESS

In accordance with Development Consent Condition 8.2, the following independent review process will be undertaken in the event that an owner of privately-owned land considers the CGM to be exceeding the blast impact assessment criteria (Table 2) (or any other criteria defined in the Development Consent).

8.2 Independent Review

If an owner of privately-owned land considers the development to be exceeding the criteria in this consent, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land.

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision, the Applicant shall:

(a) commission a suitably qualified, experienced and independent expert, whose appointment has been approved by the Secretary, to:

- *consult with the landowner to determine his/her concerns;*
- *conduct monitoring to determine whether the development is complying with the relevant impact assessment criteria in condition 6 of this consent; and*
- *if the development is not complying with these criteria then:*
  - *determine if more than one mine or development is responsible for the exceedance, and if so the relative share of each mine or development regarding the impact on the land; and*
  - *identify the measures that could be implemented to ensure compliance with the relevant criteria; and*

(b) give the Secretary and landowner a copy of the independent review.

11 COMMUNITY CONSULTATION

Community Environmental Monitoring and Consultative Committee

A CEMCC has been established for the CGM in accordance with Development Consent Condition 9.1(d). Development Consent Condition 9.1(d) is reproduced below:

> ***9.1 Environmental Management***
>
> *(d) Community Environmental Monitoring and Consultative Committee*
>
> *(i) The Applicant shall establish and operate a Community Environmental Monitoring and Consultative Committee (CEMCC) for the development to the satisfaction of the Secretary. This CEMCC must:*
>
> - *be comprised of an independent chair and at least 2 representatives of the Applicant, 1 representative of BSC, 1 representative of the Lake Cowal Environmental Trust (but not a Trust representative of the Applicant), 4 community representatives (including one member of the Lake Cowal Landholders Association);*
> - *be operated in general accordance with the Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects (Department of Planning, 2007, or its latest version).*
> - *monitor compliance with conditions of this consent and other matters relevant to the operation of the mine during the term of the consent.*
>
> *Note: The CEMCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.*
>
> *(ii) The Applicant shall establish a trust fund to be managed by the Chair of the CEMCC to facilitate the functioning of the CEMCC, and pay $2000 per annum to the fund for the duration of gold processing operations. The annual payment shall be indexed according to the Consumer Price Index (CPI) at the time of payment. The first payment shall be made by the date of the first Committee meeting. The Applicant shall also contribute to the Trust Fund reasonable funds for payment of the independent Chairperson, to the satisfaction of the Secretary*

As required, the CEMCC is comprised of:

- four community representatives (including one member of the Lake Cowal Landholders Association);
- one representative of the Lake Cowal Foundation;
- one representative of the Wiradjuri Condobolin Corporation;
- one representative of the Bland Shire Council;
- an independent chairperson; and
- two representatives of Barrick.

The CEMCC will continue to provide opportunities for members of the community to attend CEMCC meetings to discuss specific issues relevant to them. This will be achieved by landholders making a request to the CEMCC regarding a particular issue, or by the landowner registering a complaint in the complaints register. Landowners who register complaints may be invited to join in discussion of the issue at the next CEMCC meeting. Items of discussion at these meetings will include (but not be limited to) mine progress, reporting on environmental monitoring, complaints, rehabilitation activities and any environmental assessments undertaken.

12 INDEPENDENT ENVIRONMENTAL AUDIT AND INDEPENDENT MONITORING PANEL

Independent Environmental Audit

An IEA will be conducted in accordance with Development Consent Condition 9.2 and may include blast-related issues. Development Consent Condition 9.2 is reproduced below.

9.2 Independent Auditing and Review

(a) Independent Environmental Audit

(i) By the end of July 2016, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:

- *Be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;*
- *Include consultation with relevant regulatory agencies, BSC and CEMCC;*
- *Assess the environmental performance of the development and assess whether it is complying with the requirements in this consent and any other relevant approvals (such as environment protection licences and/or mining lease (including any assessment, plan or program required under this consent);*
- *Review the adequacy of any approved strategy, plan or program required under this consent or the abovementioned approvals; and*
- *Recommend measures or actions to improve the environmental performance of the development, and/or strategy, plan or program required under this consent.*

Note: This audit team must be led by a suitably qualified auditor, and include ecology and rehabilitation experts, and any other fields specified by the Secretary.

(ii) Within 3 months of commissioning this audit, or as otherwise agreed by the Secretary, the Applicant shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of these recommendations as required. The applicant must implement these recommendations, to the satisfaction of the Secretary.

In accordance with the recommendations from the IMP's *Third Annual Report of the Independent Monitoring Panel for the Cowal Gold Project (October 2007)*, Barrick will continue to conduct IEAs annually, instead of triennially as defined in Condition 9.2(a)(i).

Independent Monitoring Panel

An IMP has been established in accordance with Development Consent Condition 9.2(b) to review the IEAs, Annual Reviews and all environmental monitoring procedures and results (including blast monitoring results and blast management measures).

Development Consent Condition 9.2(b) provides:

9.2 Independent Auditing and Review

(b) Independent Monitoring Panel

(i) The Applicant shall at its own cost establish an Independent Monitoring Panel prior to commencement of construction. The Applicant shall contribute $30,000 per annum for the functioning of the Panel, unless otherwise agreed by the Secretary. The annual payment shall be indexed according to the Consumer Price Index (CPI) at the time of payment. The first payment shall be paid by the date of commencement of construction and annually thereafter. Selection of the Panel representatives shall be agreed by the Secretary in consultation with relevant government agencies and the CEMCC. The Panel shall at least comprise two duly qualified independent environmental scientists and a representative of the Secretary.

(ii) The panel shall:

- *provide an overview of the annual reviews and independent audits required by conditions 9.1(b) and 9.2(a) above;*
- *regularly review all environmental monitoring procedures undertaken by the Applicant, and monitoring results; and*
- *provide an Annual State of the Environment Report for Lake Cowal with particular reference to the on-going interaction between the mine and the Lake and any requirements of the Secretary. The first report shall be prepared one year after commencement of construction. The report shall be prepared annually thereafter unless otherwise directed by the Secretary and made publicly available on the Applicant's website for the development within two weeks of the report's completion.*

Recommendations from the IMP's Annual State of the Environment report (available on Barrick's website) and Barrick's responses, will be described in the Annual Review (Section 13).

13 ANNUAL REVIEW AND REVIEW OF THIS BLMP

Annual Review

An Annual Review will be prepared in accordance with the requirements of Development Consent Condition 9.1 and will be submitted to the Secretary of the DP&E by the end of July each year, or as otherwise agreed with the Secretary. Development Consent Condition 9.1 is reproduced below:

9.1 Environmental Management

b) Annual Review

By the end of July each year, or as otherwise agreed with the Secretary, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary. This review must:

(i) describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year;

(ii) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against the:

- *the relevant statutory requirements, limits or performance measures/criteria;*
- *the monitoring results of previous years; and*
- *the relevant predictions in the EIS;*

(iii) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;

(iv) identify any trends in the monitoring data over the life of the development,

(v) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and

(vi) describe what measures will be implemented over the next year to improve the environmental performance of the development.

Condition 26 of the Conditions of Authority for ML 1535 also has requirements for Annual Review (formerly the AEMR) reporting which are generally consistent with the requirements of Development Consent Condition 9.1(b). The requirements of Condition 26 are detailed below.

Annual Environmental Management Report (AEMR)

26. (1) Within 12 months of the commencement of mining operations and thereafter annually or, at such other times as may be allowed by the Director-General, the lease holder must lodge an Annual Environmental Management Report (AEMR) with the Director-General.

(2) The AEMR must be prepared in accordance with the Director-General's guidelines current at the time of reporting and contain a review and forecast of performance for the preceding and ensuing twelve months in terms of:

(a) the accepted Mining Operations Plan;

(b) development consent requirements and conditions;

(c) Environment Protection Authority and Department of Land and Water Conservation licences and approvals;

(d) any other statutory environmental requirements;

(e) details of any variations to environmental approvals applicable to the lease area; and

(f) where relevant, progress towards final rehabilitation objectives.

> *(3) After considering an AEMR the Director-General may, by notice in writing, direct the lease holder to undertake operations, remedial actions or supplementary studies in the manner and within the period specified in the notice to ensure that operations on the lease area are conducted in accordance with sound mining and environmental practice.*
>
> *(4) The lease holder shall, as and when directed by the Minister, cooperate with the Director-General to conduct and facilitate review of the AEMR involving other government agencies and the local council.*

The Annual Review will report on the following blasting related issues:

- a summary of all blast monitoring results;
- measures employed to minimise/prevent excessive blast emissions;
- blasting related complaints and amelioration measures undertaken in the event of any confirmed exceedances of blast criteria;
- review of the performance of blast control measures and the monitoring program by a suitably qualified person; and
- CEMCC decisions relating to CGM blast issues.

In addition, amendments to the *Protection of the Environment Operations Act, 1997* (POEO Act) that commenced on 31 March 2012 requires licencees to publish pollutant monitoring data that has been collected as a result of a licence condition, in accordance with section 66(6) of the POEO Act and written requirements issued by the EPA.

In accordance with the above requirements, blast monitoring data collected in accordance with condition M7 of the EPL will be made publicly available on Barrick's website.

Review of this BLMP

In accordance with Condition 9.1(c) of the Development Consent, this BLMP will be reviewed, within three months of the submission of:

- an Annual Review under Condition 9.1(b);
- an incident report under Condition 9.3(a);
- an audit under Condition 9.2(a);
- an Annual State of the Environment Report under Condition 9.2(b);
- the approval of any modification to the conditions of the Development Consent; or
- any direction of the Secretary under Condition 1.1(c).

Where this review leads to revisions of the BLMP, then within four weeks of the review, the revised BLMP will be submitted for the approval of the Secretary of the DP&E (unless otherwise agreed with the Secretary). The revision status of this BLMP is indicated on the title page of each copy.

This BLMP will be made publicly available on Barrick's website (www.barrick.com), in accordance with Condition 9.4(a)(iii) of the Development Consent. A hard copy of the BLMP will also be kept at the CGM.

14 REFERENCES

Australian and New Zealand Environment Council (1990) *Technical Basis for Guidance to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.

Australian Explosives Industry and Safety Group Inc. (2011) *Code of Good Practice: Prevention and Management of Blast Generated NOx Gases in Surface Blasting.*

Barrick Australia Limited (2006) *Cowal Gold Project 2005 Annual Environmental Management Report.*

Gell, P.A. (2005) *Lake Cowal Waterbird Monitoring Survey: Progress Report – October 2005.*

Gell, P.A. and Peake, P. (2011) *Lake Cowal Waterbird Monitoring Survey: Progress Report January 2011*.

Independent Monitoring Panel (2007) *Third Annual Report of the Independent Monitoring Panel for the Cowal Gold Project.*

North Limited (1998) *Cowal Gold Project Environmental Impact Statement*.

Richard Heggie and Associates (1997) *Cowal Gold Project Noise, Transportation and Blasting Impact Assessment*. Prepared for North Limited.

SLR Consulting (2013) *Cowal Gold Mine Extension Modification Noise and Blasting Impact Assessment.*

15 LIST OF ABBREVIATIONS AND ACRONYMS

AEISG	Australian Explosives Industry and Safety Group Inc.
AEMR	Annual Environmental Management Report
ANFO	ammonium nitrate fuel oil
ANZEC	Australian and New Zealand Environment Council
AS	Australian Standard
AQMP	Air Quality Management Plan
Barrick	Barrick (Cowal) Pty Ltd
BLMP	Blast Management Plan
CEMCC	Community Environmental Monitoring and Consultative Committee
CGM	Cowal Gold Mine
DA 14/98	Development Consent for the CGM including the Bland Creek Palaeochannel Borefield water supply pipeline
DA 2011/64	Development Consent for the operation of the Eastern Saline Borefield
dB	decibel
DP&E	NSW Department of Planning and Environment
EIS	*Cowal Gold Project Environmental Impact Statement (North Limited, 1998)*
EP&A Act	NSW *Environment Planning & Assessment Act, 1979*
EPA	Environment Protection Authority
EPL	Environment Protection Licence
FFMP	Flora and Fauna Management Plan
IEA	Independent Environmental Audit
IMP	Independent Monitoring Panel
kg	kilogram
km	kilometre
m	metre
MIC	Maximum Instantaneous Charge
ML	Mining Lease

mm/s	millimetres per second
NMP	Noise Management Plan
NSW	New South Wales
pers. comm.	Personal Communication
POEO Act	NSW *Protection of the Environment Operations Act 1997*
PVS	Peak Vector Sum

APPENDIX A

TECHNICAL BASIS FOR GUIDELINES TO MINIMISE ANNOYANCE DUE TO BLASTING OVERPRESSURE AND GROUND VIBRATION (ANZEC, 1990)

Australian and New Zealand Environment Council

TECHNICAL BASIS FOR GUIDELINES TO MINIMISE ANNOYANCE DUE TO BLASTING OVERPRESSURE AND GROUND VIBRATION

September 1990

AUSTRALIAN AND NEW ZEALAND ENVIRONMENT COUNCIL

TECHNICAL BASIS FOR GUIDELINES TO MINIMISE ANNOYANCE DUE TO BLASTING OVERPRESSURE AND GROUND VIBRATION

To promote uniform environmental standards throughout Australia, the Council has released a number of Technical Bases relating to noise and other factors. The Technical Bases are intended to be used as the basis for State and Territory environmental control strategies.

Published Technical Bases relating to noise are listed at the back of this document. These documents recommend acceptability criteria for noise and vibration and, where appropriate, describe measurement procedures to be followed.

This document has been prepared by the Environmental Noise Control Committee, which is one of a number of specialist committees established to provide advice to ANZEC, through Standing Committee, on specific areas of environmental concern.

Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration

1. SCOPE

1.1 This document specifies recommended comfort criteria for:

- airblast overpressure level;
- ground vibration peak particle velocity;
- time of blasting; and
- frequency of blasting.

The intent of these criteria is to minimize annoyance and discomfort to persons at noise sensitive sites (e.g. residences, hospitals, schools etc) caused by blasting.

1.2 The recommended criteria apply to mining, quarrying, construction and all other operations which involve the use of explosives for fragmenting rock.

1.3 The recommended criteria apply only to the minimisation of annoyance and discomfort arising from blasting. The control of damage from blasting is the responsibility of State/Territory mines authorities and reference should be made to these bodies to ascertain recommended damage criteria

1.4 The recommended criteria are for guidance only and may be varied if necessary to suit local site conditions.

2. RECOMMENDED CRITERIA

2.1 Airblast Overpressure

2.1.1 The recommended maximum level for airblast overpressure is 115 dB(Lin Peak).

2.1.2 The level of 115 dB may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dB(Lin Peak) at any time.

2.1.3 The airblast overpressure values referred to in 2.1.1 and 2.1.2 apply when the measurements are performed with equipment having a lower cut-off frequency of 2 Hz or less. If the instrumentation has a higher cut off frequency then a correction of 5dB should be added to the measured value.

Equipment with a lower cut-off frequency exceeding 10 Hz should not be used for the purpose of measuring airblast overpressure.

2.2 Ground Vibration

2.2.1 The recommended maximum level for ground vibration is 5 mm/sec (peak particle velocity (ppv).

2.2.2 The ppv level of 5 mm/sec may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/sec at any time.

2.2.3 Experience has shown that for almost all sites a ppv of less than 1 mm/sec is generally achieved. It is recognised that it is not practicable to achieve a ppv of this level at all sites and hence a recommended maximum level of 5 mm/sec has been selected. However, it is recommended that a level of 2 mm/sec (ppv) be considered as the long term regulatory goal for the control of ground vibration.

2.3 Times and Frequency of Blasting

2.3.1 Blasting should generally only be permitted during the hours of 9.00 am - 5.00 pm Monday to Saturday. Blasting should not take place on Sundays or Public Holidays.

2.3.2 Blasting should generally take place no more than once per day. (This requirement would not apply to minor blasts such as for clearing crushers, feed chutes, etc).

2.3.3 The restrictions on times and frequency of blasting referred to in 2.3.1 and 2.3.2 do not apply to:

- those premises where the effects of the blasting are not perceived at noise sensitive sites; and
- major underground metalliferous mining operations.

2.4 Acceptable Variations

It is recognised that under some circumstances or at certain mines blasting that cannot comply with the criteria referred to in 2.1, 2.2 and 2.3 will have to be carried out. Environmental authorities should apply controls for such blasting with appropriate consideration to the circumstances applying.

3. DETERMINATION OF AIRBLAST OVERPRESSURE LEVEL AND PEAK PARTICLE VELOCITY

3.1 Instrumentation

3.1.1 An Australian Standard laying down specifications for blast monitoring instrumentation is in the process of being prepared. Until this document is published individual environmental authorities will assess and, where appropriate, approve monitoring procedures proposed to be used in their State/Territory.

3.1.2 The monitoring equipment should have been calibrated within two years prior to the date of any test.

3.2 Test Procedure

3.2.1 An Australian Standard laying down specifications for blast monitoring procedures is in the process of being prepared. Until this document is published individual environmental authorities will assess and, where appropriate, approve monitoring procedures proposed to be used in their State/Territory.

3.2.2 It is particularly important in respect of ground vibration measurement that the vibration transducer be coupled to the ground in an approved manner.

3.3 Measurement Location

3.3.1 Measurements should be taken within the grounds of, 'noise sensitive sites' (e.g. residences, hospitals, schools, etc). For the purposes of this document 'noise sensitive sites' includes the land within 30 metres of any building.

3.3.2 Airblast overpressure levels may be measured at any point on, 'noise sensitive sites' which is located at least 3.5m away from any building or structure.

3.3.3 Ground vibration levels may be measured at any point on 'noise sensitive sites' which is located at least the longest dimension of the foundations of a building or structure away from such building or structure.

4. WEATHER EFFECTS

4.1 When temperature inversion is known to exist blasting should be avoided, if practicable.

ANZEC TECHNICAL BASES RELATING TO NOISE

TITLE	DATE
Technical basis for regulations for the control of noise from new motor vehicles, other than motor vehicles, in Australia	May 1979
Technical basis for regulations for the control of noise from in-service trucks and buses in Australia	Feb 1980
Technical basis for the noise labelling of new air conditioners in Australia	Aug 1980
Technical basis for proposed noise control standard for lawnmowers and edgecutters	June 1981
A comparison of methods for measuring the noise of individual motor vehicles	Jan 1984
Technical basis for the regulation of noise-labelling of new air conditioners in Australia	July 1984
Technical basis for the regulation of noise-labelling of new pavement breakers and mobile air compressors in Australia	May 1985
Technical basis for the tonal adjustment of the measured sound pressure level of environmental noise	Aug 1986
Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration	Sept 1990