



Hanson

ABN : 90 009 679 734

Blast Management Plan

(Incorporating a Blast Monitoring Program)



for the
East Guyong Quarry

June 2017



R.W. CORKERY & CO. PTY. LIMITED

Prepared by:



Hanson

ABN : 90 009 679 734

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(Incorporating a Blast Monitoring Program)

for the

East Guyong Quarry

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COMMONLY USED ACRONYMS

AS	Australian Standard
BS	British Standard
DP&I	Department of Planning and Infrastructure
ENCM	Environmental Noise Control Manual
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPL	Environment Protection Licence
PA	Project Approval



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1. INTRODUCTION

This *Blast Management Plan* (the Plan) has been prepared by R. W. Corkery & Co Pty Limited on behalf of Hanson Construction Materials Pty Ltd (the Company) for the East Guyong Quarry (the Quarry). The Quarry is located approximately 22km southeast of Orange and 36km west of Bathurst (**Figure 1**).

This Plan has been prepared in satisfaction of *PA Condition 3(13)* of Project Approval 06_0193¹ and describes the following.

- The activities approved under PA 06_0193.
- The consultation undertaken during preparation of this Plan.
- The legal and other requirements associated with management of blast emissions from the Quarry.
- The objectives and key performance outcomes for this Plan and the Quarry.
- Roles and responsibilities.
- Competence training and awareness.
- Surrounding residences and potential blast-related impacts.
- Blast management measures that would be implemented during construction and operation of the Quarry.
- Blast-related monitoring that will be undertaken.
- Evaluation of compliance with blast criteria.
- Corrective and preventative actions that will be implemented should exceedance(s) of the relevant criteria be identified.
- Complaints handling and response procedures that will be implemented.
- Incident reporting procedures.
- Publication of monitoring information.
- Plan review.

An Explosives Control Plan is provided in Section 10 and has been prepared in accordance with *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* (Schedule 2, Section 4).

All blasting is undertaken by qualified personnel or contractors that operate under that Company's safe work management protocols. Hanson currently contracts MAXAM Australia for blasting at the East Guyong Quarry. A Blast Management Safety Plan for the East Guyong Quarry has been prepared by MAXAM Australia and is included as **Appendix 1**. The Blast Management Safety Plan provides the MAXAM Australia protocols for blasting risk identification, risk mitigation, blast planning including blast design, monitoring and specific operational procedures to reduce risks to Quarry personnel, blast contractors and nearby residences.

The approved Quarry is fully described in the following documents and no further background information is provided in this Plan.

- *Environmental Assessment* dated September 2009 and associated technical reports prepared to support the application for PA 06_0193.
- Detailed Response to Public Exhibition Submissions (undated).
- Preferred Project Report (undated).

¹ All conditions in Project Approval 06_0193 are referred to as *PA Condition*

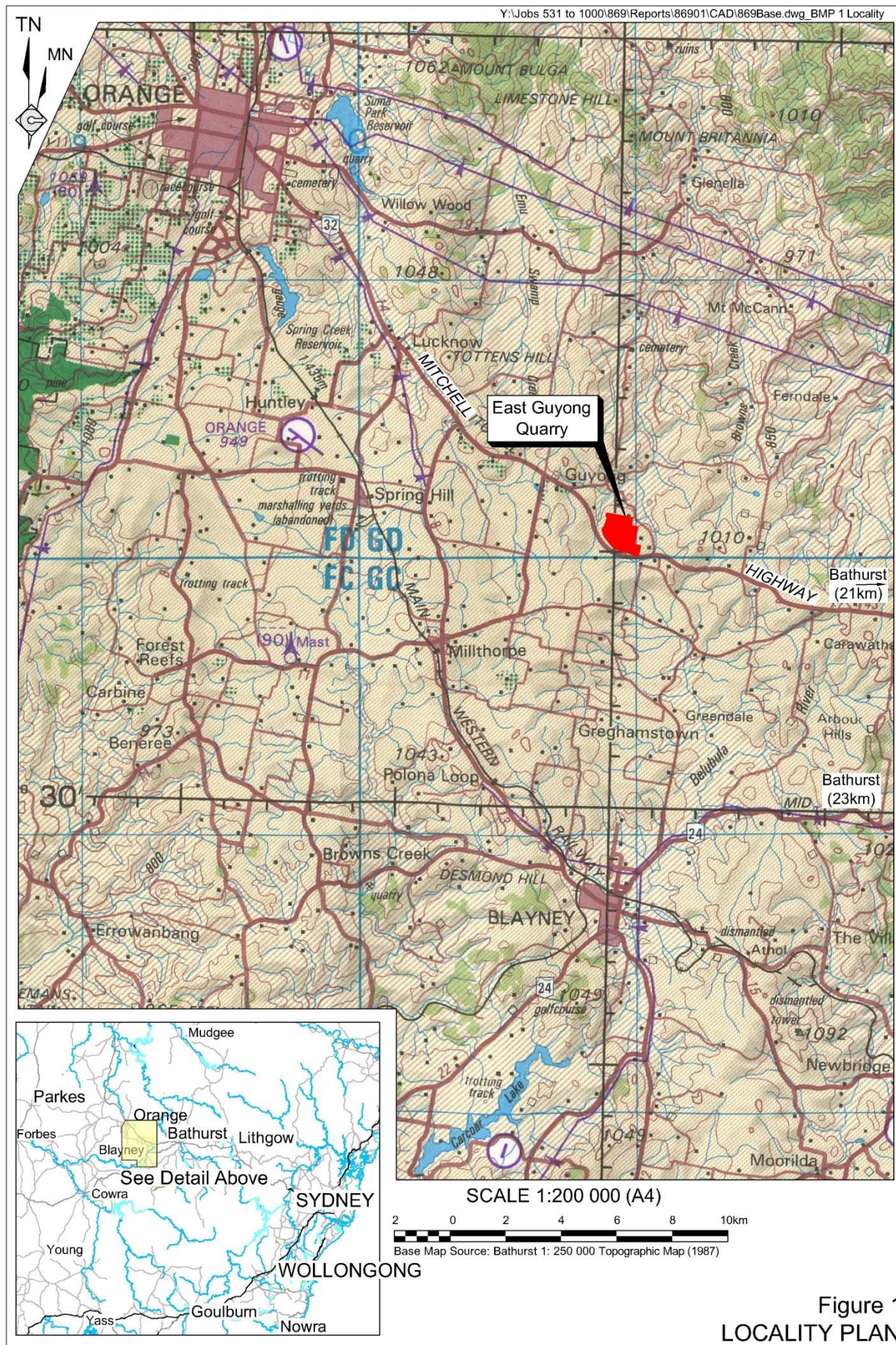


Figure 1
 LOCALITY PLAN

In addition, a range of other management plans have also been prepared to guide operations within the Quarry. These include the following.

- *Environmental Management Strategy.*
- *Asbestos Management Plan.*
- *Noise Management Plan.*
- *Aboriginal Cultural Heritage Management Plan.*
- *Soil and Water Management Plan.*
- *Landscape Management Plan.*
- *Air Quality Monitoring Program.*

2. APPROVED ACTIVITIES

The approved activities at the Quarry comprise the following (**Figure 2**).

- Establishment of an extraction area to extract basalt using standard drill, blast, load and haul techniques.
- Construction and use of a processing plant to process the extracted basalt to produce a range of quarry products, including aggregates and road base, and stockpiling of the resulting products adjacent to the processing plant.
- Construction of a site access road and intersection with the Mitchell Highway.
- Transportation of up to 400 000t per year of quarry products via the Mitchell Highway using truck and dog and B Double trucks.
- Construction of a range of bunds and mounds and establishment of native vegetation to provide visual screening for the quarry operations.

The approved quarry life is until 31 December 2042 and the approved hours of operation are as follows.

- Monday to Friday (non-daylight savings) – 6:00am to 6:00pm.
- Monday to Friday (daylight savings) – 6:00am to 8:00pm.
- Saturdays – 7:00am to 1:00pm.
- Sundays and public holidays – nil.

Product despatch between 5:00am and 6:00am and from 6:00pm to 10:00pm (non-daylight savings) and 8:00pm to 10:00pm (daylight savings), Monday to Saturday is permitted following negotiation of written agreements with the seven surrounding landholders nominated in *PA Condition 3(6)*.

3. LEGAL AND OTHER REQUIREMENTS

The Company was granted project approval (PA) 06_0193 by the NSW Land and Environment Court on 21 May 2012 pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The approval includes the required criteria that the Company must comply with during the life of the Quarry and sets out the core requirements of this Plan. Relevant blast-related conditions associated with this approval are reproduced in **Table 1**.

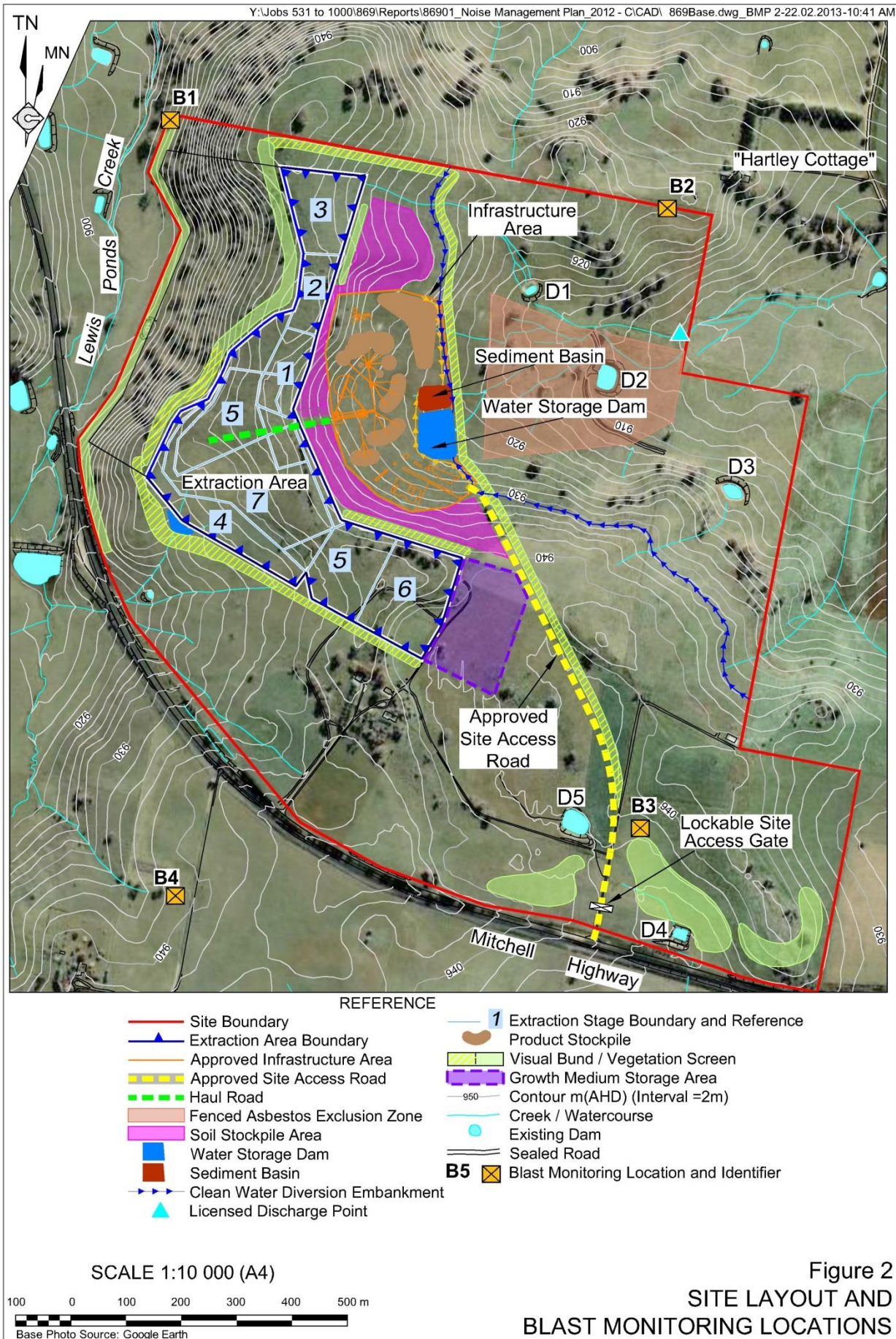


Table 1
Blast-related Project Approval Requirements

Page 1 of 4

Schedule (Condition)	Condition	Section Where Addressed						
BLASTING								
3(8)	<p>The Proponent shall ensure that the airblast overpressure level from blasting at the project does not exceed the criteria in Table 4 at any residence on privately-owned land.</p> <p><i>Table 4: Airblast overpressure impact assessment criteria</i></p> <table border="1" data-bbox="376 613 1238 775"> <thead> <tr> <th data-bbox="376 613 783 678">Airblast overpressure level (dB(Lin Peak))</th> <th data-bbox="783 613 1238 678">Allowable exceedance</th> </tr> </thead> <tbody> <tr> <td data-bbox="376 678 783 734">115</td> <td data-bbox="783 678 1238 734">5% of the total number of blasts in a 12 month period</td> </tr> <tr> <td data-bbox="376 734 783 775">120</td> <td data-bbox="783 734 1238 775">0%</td> </tr> </tbody> </table>	Airblast overpressure level (dB(Lin Peak))	Allowable exceedance	115	5% of the total number of blasts in a 12 month period	120	0%	11
Airblast overpressure level (dB(Lin Peak))	Allowable exceedance							
115	5% of the total number of blasts in a 12 month period							
120	0%							
3(9)	<p>Ground Vibration Impact Criteria</p> <p>The Proponent shall ensure that the ground vibration level from blasting at the project does not exceed the levels in Table 5 at any residence on privately-owned land.</p> <p><i>Table 5: Ground vibration impact assessment criteria</i></p> <table border="1" data-bbox="376 1010 1259 1144"> <thead> <tr> <th data-bbox="376 1010 783 1048">Peak particle velocity (mm/s)</th> <th data-bbox="783 1010 1259 1048">Allowable exceedance</th> </tr> </thead> <tbody> <tr> <td data-bbox="376 1048 783 1106">5</td> <td data-bbox="783 1048 1259 1106">5% of the total number of blasts in a 12 month period</td> </tr> <tr> <td data-bbox="376 1106 783 1144">10</td> <td data-bbox="783 1106 1259 1144">0%</td> </tr> </tbody> </table>	Peak particle velocity (mm/s)	Allowable exceedance	5	5% of the total number of blasts in a 12 month period	10	0%	11
Peak particle velocity (mm/s)	Allowable exceedance							
5	5% of the total number of blasts in a 12 month period							
10	0%							
3(10)	<p>Blasting Hours and Frequency</p> <p>The Proponent shall carry out blasting on site only between 9.00 am and 3.00 pm Monday to Friday. No blasting is allowed on Saturdays, Sundays and Public Holidays.</p>	9.2						
3(11)	<p>The Proponent may carry out on the site a maximum of:</p> <p>(i) 2 blasts a day; and</p> <p>(ii) 5 blasts a week, averaged over a calendar year.</p>	9.2						
3(12)	<p>Operating Conditions</p> <p>During quarrying operations on site, the Proponent shall implement best blasting practice to:</p> <p>(a) conduct blasting operations in accordance with AS 2187.2- Explosive Storage, Transport and Use;</p> <p>(b) minimise fly rock and dust and fume emissions from blasting;</p> <p>(c) protect travellers on the Mitchell Highway;</p> <p>(d) protect the safety of people and livestock and the serviceability of private property and public infrastructure;</p> <p>to the satisfaction of the Secretary.</p>	9.3 and 10 9.3.2 9.3 and 10 9.3 and 10						



Table 1 (Cont'd)
Blast-related Project Approval Requirements

Page 2 of 4

Schedule (Condition)	Condition	Section Where Addressed
BLASTING		
3(13)	<p>Blast Management Plan The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary. This plan must:</p> <p>(a) be submitted to the Secretary for approval prior to the commencement of blasting activities; and</p> <p>(b) include:</p> <ul style="list-style-type: none"> • a Blast Monitoring Program; and • measures to implement the requirements of condition 12. 	<p>1</p> <p>11</p> <p>9</p>
3(14)	<p>Blast Monitoring Program The Proponent shall prepare and implement a Blast Monitoring Program for the project to the satisfaction of the Secretary. This program must:</p> <p>(a) be submitted to the Secretary for approval prior to the commencement of blasting activities; and</p> <p>(b) include a protocol for evaluating blasting impacts on, and demonstrating compliance with, the blasting criteria in this approval for all privately-owned residences and other structures.</p>	<p>1</p> <p>12</p>
3(15)	<p>Public Notice The Proponent shall:</p> <p>(a) operate a blasting hotline and advertise the hotline number in a local newspaper at least twice a year, or operate an alternate system agreed to by the Secretary, to enable the public to get up-to-date information on the blasting schedule;</p> <p>(b) publish an up-to-date blasting schedule on its website; and</p> <p>(c) notify the landowner/occupier of any residence within 2 kilometres of the site about the blasting schedule, blasting hotline and its website at least three working days prior to blasting, to the satisfaction of the Secretary.</p>	<p>9.3.4</p> <p>9.3.4</p> <p>9.3.4</p>
3(16)	<p>Property Inspections At least 2 months prior to the commencement of blasting operations at the quarry, the Proponent shall advise the owners of privately-owned land within 2 kilometres of the proposed quarry, that they are entitled to a structural property inspection to establish the baseline condition of buildings and other structures on their property. If the Proponent receives a written request for a structural property inspection from any such landowner, the Proponent shall:</p> <ul style="list-style-type: none"> • within 2 months of receiving this request, commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to inspect the condition of any building or structure on the land, and recommend measures to mitigate any potential blasting impacts; and • give the landowner a copy of the property inspection report. 	<p>9.4</p> <p>9.5</p> <p>9.5</p>

Table 1 (Cont'd)
Blast-related Project Approval Requirements

Schedule (Condition)	Schedule (Condition)	Section Where Addressed
BLASTING		
3(17)	<p>Property Investigations</p> <p>If any landowner of privately-owned land within 2 kilometres of blasting operations, or any other landowner nominated by the Secretary, claims that buildings and/or other structures on his/her land have been damaged as a result of blasting at the project after the date of this approval, the Proponent shall within 2 months of receiving this claim:</p> <p>(a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to investigate the claim; and</p> <p>(b) give the landowner a copy of the property investigation report.</p> <p>If the independent property investigation confirms the landowners claim, and both parties agree with these findings, then the Proponent shall repair the damage to the satisfaction of the Secretary.</p> <p>If the Proponent or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.</p> <p>If the matter cannot be resolved within 21 days, the Secretary shall refer the matter to an Independent Dispute Resolution Process (see Appendix 3).</p>	<p>9.5</p> <p>9.5</p> <p>9.5</p> <p>9.5</p> <p>9.5</p>
4(2)	<p>If the results of the monitoring required in Schedule 3 identify that the impacts generated by the project on site are greater than the relevant impact assessment criteria, and there is no negotiated agreement in place to allow the impact, then within 2 weeks of obtaining the monitoring results the Proponent shall:</p> <p>(a) notify the Secretary, the affected landowners and tenants (including tenants of quarry owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the relevant criteria in Schedule 3.</p>	15
5(2)	<p>Management Plan Requirements</p> <p>The Proponent shall ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include:</p> <p>(a) detailed baseline data;</p> <p>(b) a description of:</p> <ul style="list-style-type: none"> • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; and • the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; 	<p>8</p> <p>3</p> <p>3</p> <p>4</p>

Table 1 (Cont'd)
Blast-related Project Approval Requirements

Page 4 of 4

Schedule (Condition)	Condition	Section Where Addressed
BLASTING		
5(2) (Cont'd)	<p>Management Plan Requirements (Cont'd)</p> <p>(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</p> <p>(d) a program to monitor and report on the:</p> <ul style="list-style-type: none"> • impacts and environmental performance of the project; and • effectiveness of any management measures (see (c) above); <p>(e) a contingency plan to manage any unpredicted impacts and their consequences;</p> <p>(f) a program to investigate and implement ways to improve the environmental performance of the project over time;</p> <p>(g) a protocol for managing and reporting any:</p> <ul style="list-style-type: none"> • incidents; • complaints; • non-compliances with statutory requirements; and • exceedances of the impact assessment criteria and/or performance criteria; and <p>(h) a protocol for periodic review of the plan.</p> <p><i>Note: At the discretion of the Secretary, some of these requirements may be waived where they are either not relevant or necessary.</i></p>	<p>9</p> <p>11</p> <p>12</p> <p>13</p> <p>12</p> <p>15</p> <p>14</p> <p>12</p> <p>12</p> <p>12</p> <p>17</p>
5(4)	<p>Revision of Strategies, Plans and Programs</p> <p>Within 3 months of the submission of an:</p> <p>(a) annual review under condition 3 above;</p> <p>(b) incident report under condition 6 below;</p> <p>(c) audit report under condition 8 below; and</p> <p>(d) any modifications to this approval,</p> <p>the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary.</p> <p><i>Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.</i></p>	<p>17</p>
5(6)	<p>Incident Reporting</p> <p>The Proponent shall notify the Secretary and any other relevant agencies of any incident associated with the project as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Secretary and any relevant agencies with a detailed report on the incident.</p>	<p>15</p>

Table 2 presents the relevant blast-related commitments from the Statement of Commitments incorporated within PA 06_0193 and where each is addressed in this Plan.

Table 2
Blast Statement of Commitments Requirements

Appendix 2		Section Where Addressed
BLASTING		
Operational Controls	<ul style="list-style-type: none"> Hard rock extraction and processing activities will be as follows: <ul style="list-style-type: none"> Drill and blasting only to occur during daylight hours Monday to Saturday. 	9.2
Environmental Management, Monitoring and Auditing	<ul style="list-style-type: none"> The proponent will obtain an Environment Protection Licence for the proposal in accordance with the Protection of the Environment Operations Act 1997. Three years after the commencement of the proposal, and every four years thereafter, the proponent will commission and pay the full cost of an Independent Environmental Audit of the proposal. 	3
	<ul style="list-style-type: none"> Within 7 days of detecting an exceedance of the limits/performance criteria in this approval or an incident causing (or threatening to cause) material harm to the environment, the proponent shall report the exceedance/incident to EPA and any relevant agency. The report will: <ul style="list-style-type: none"> describe the date, time and nature of the exceedance/incident; 	15
	<ul style="list-style-type: none"> <ul style="list-style-type: none"> identify the cause (or likely cause) of the exceedance/incident; 	15
	<ul style="list-style-type: none"> <ul style="list-style-type: none"> describe what action has been taken to date; and 	15
	<ul style="list-style-type: none"> <ul style="list-style-type: none"> describe the proposed measures to address the exceedance/incident. 	15
	<ul style="list-style-type: none"> Prior to the commencement of any operations, proponent will implement, publicise and list with a telephone company a contact phone number which will enable the general public to reach a person who can arrange appropriate response action to the enquiry. The proponent will maintain a register to record details of all enquiries received and actions undertaken in response. This record will be made available to the EPA as required. 	14

Table 3 presents the relevant blast-related requirements from the Environment Protection Licence.

Table 3
Licence Requirements

Condition Number	Condition	Section Where Addressed
BLASTING		
Environment Protection Licence		
L5.1	Hours of operation (blasting): blasting activities at the premises are restricted to the following hours: a) Monday to Friday: 9 am to 3 pm; and b) at no time on Saturdays, Sundays or Public Holidays.	9.2
L5.2	The frequency of blasting activities at the premises is restricted to the following: a) maximum of 2 blasts a day; and b) maximum of 5 blasts a week, averaged over a calendar year.	9.2
L5.3	The airblast overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) at any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	11
L5.4	The airblast overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	11
L5.5	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec at any noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	11
L5.6	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	11
M4.3	The licensee is required to undertake attended or unattended blast monitoring for every blast event undertaken and in accordance with any relevant Australian Standards to determine compliance with conditions L5.3 to L5.6.	11

4. OBJECTIVES AND OUTCOMES

Table 4 presents the objectives and key performance outcomes for this Plan and the Quarry.

Table 4
Objectives and Key Performance Outcomes

OBJECTIVES	KEY PERFORMANCE OUTCOMES
Blast	
(a) To ensure compliance with all relevant Project approval and Environment Protection Licence criteria and reasonable community expectations.	(i) Compliance is achieved with all relevant criteria nominated in the Project Approval 06_0193 and Environment Protection Licence and reasonable community expectations.
(b) To implement appropriate blast management and mitigation measures during all stages of the Project.	(ii) All identified blast management and mitigation measures are implemented to the extent required.
(c) To implement an appropriate monitoring program to establish compliance or otherwise with relevant criteria during all stages of the Project.	(iii) All identified monitoring is undertaken in accordance with the relevant procedures and at the relevant intervals.
(d) To implement an appropriate complaints handling and response protocol	(iv) Complaints (if any) are handled and responded to in an appropriate and timely manner.
(e) To implement continual improvement for investigating, implementing and reporting on reasonable and feasible measures to reduce blasting impacts.	(v) An appropriate continual improvement program has been implemented.
(f) To implement an appropriate incident reporting program, if required.	(vi) Incidents (if any) are reported in an appropriate and timely manner.

5. ROLES AND RESPONSIBILITY

Table 5 presents the roles and responsibilities for the implementation of this Plan.

6. COMPETENCE TRAINING AND AWARENESS

All relevant Company personnel and contractors and their employees will undergo Company and site-specific inductions incorporating blast management awareness training as part of the site induction program. The following areas will be covered in the induction.

- Awareness of the blast emission enhancing effects of temperature inversions and the times of day and meteorological conditions under which they may occur.
- Awareness of safety for travellers on the Mitchell Highway, surrounding residents and livestock.
- Awareness of explosive storage, transport and use in accordance with *AS2187.2 Explosive Storage, Transport and Use*.
- Minimising fly rock and dust emissions from blasting.
- Awareness of restricted blast operating hours and frequency.
- Awareness of community complaints protocols.
- Monitoring of blast emissions at required residences.

The Quarry Manager will be responsible for ensuring the appropriate blast management training is included in the induction for the relevant personnel.

Table 5
Roles and Responsibilities

ROLES	RESPONSIBILITIES
Operations Manager	Must ensure adequate resources are available to enable implementation of the Plan.
Quarry Manager	Accountable for the overall environmental performance of the East Guyong Quarry operations, including the following outcomes of this Plan. <ul style="list-style-type: none"> • Blast controls outlined in Section 9 are implemented. • Property inspections and investigations outlined in Section 9. • Implementation of blast training and awareness as outlined in Section 6.
Quarry Supervisor	Manage the implementation of the following components of this Plan. <ul style="list-style-type: none"> • Blast monitoring as outlined in Section 11. • Evaluation of compliance as outlined in Sections 12 and 13 and related follow-up actions. • Complaints handling and response as outlined in Section 14. • Incident reporting as outlined in Section 15. • Publication of monitoring data and reports as outlined in Section 16. • Review of this Plan as outlined in Section 17.
All personnel	Ensure training and awareness induction has been undertaken. Compliance with this Plan.

7. SURROUNDING RESIDENCES

Figure 3 displays the locations of residences within 2km of the Site.

8. ANTICIPATED BLAST-RELATED IMPACTS

8.1 INTRODUCTION

This section describes the potential airblast overpressure and ground vibration structural impacts of blasting and the blast emission levels that were predicted during the environmental assessment of the proposed activities. This information was used in the design of mitigation measures and monitoring procedures described in Sections 9 and 11 to ensure best practices are adopted for blast management for the Quarry. In addition, this information will be referred to in ensuring practices are developed for the continual improvement of blast management as described in Section 12.

8.2 POTENTIAL IMPACTS

8.2.1 Introduction

The following sub-sections are provided as background information for members of the public and others who may be unfamiliar with blasting operations and describes the various blasting-related criteria and impacts on built structures associated with blasting operations.

Air blast overpressure is a pressure wave that travels through the air following a blast, while ground vibration is caused by energy from the blast travelling through the intervening rock strata surrounding the blast location.

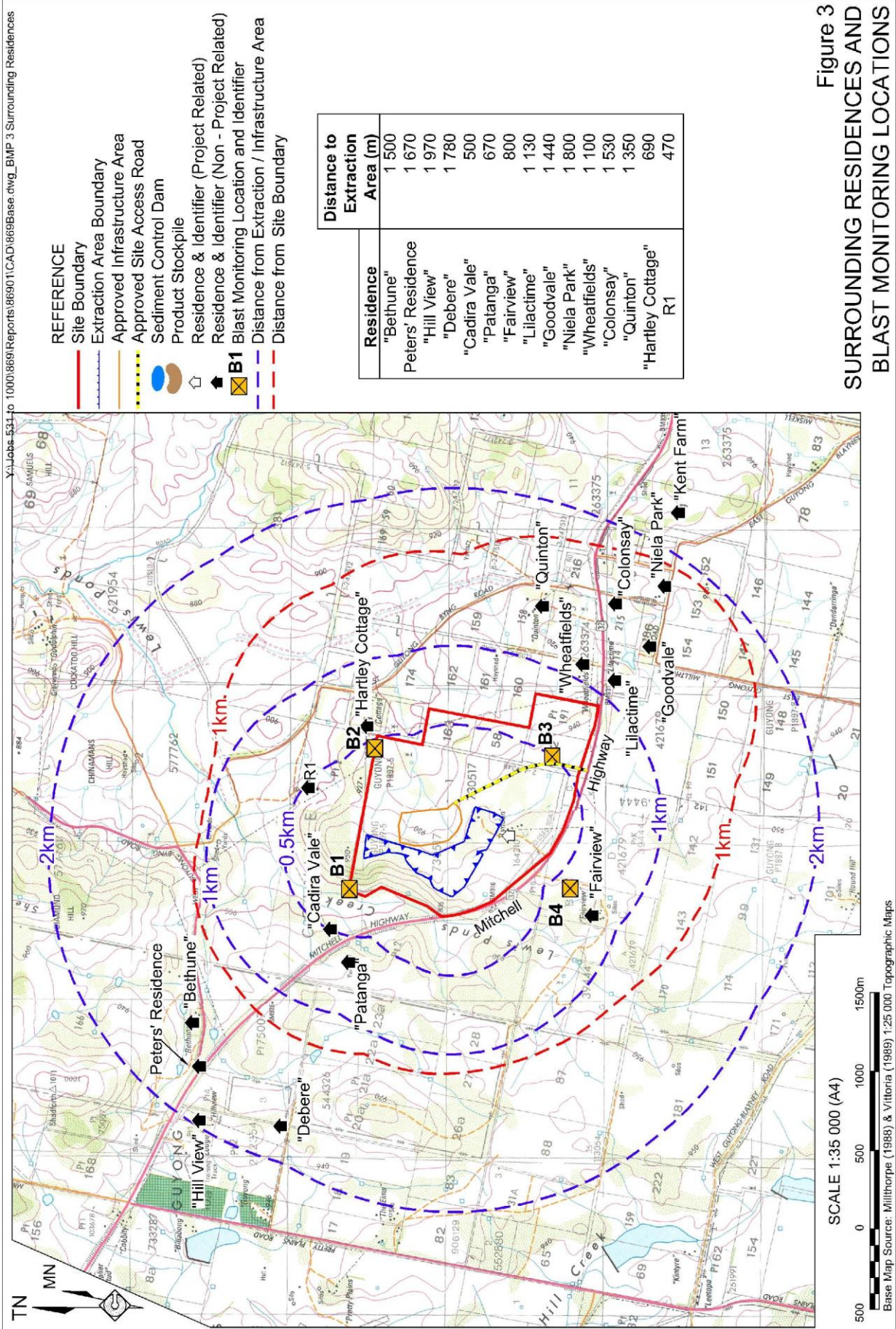


Figure 3
SURROUNDING RESIDENCES AND
BLAST MONITORING LOCATIONS

8.2.3 Airblast Overpressure Structural Impacts

Plaster that has cracked within residences is the type of damage that is monitored in most airblast overpressure complaints. However, it is window panes that fail before any other structural damage. The probability of damage to window panes exposed to a single airblast overpressure event is listed in **Table 6** (Heggies 2007).

Table 6
Airblast Overpressure Structural Impacts

Airblast Overpressure dB Linear	Level kPa	Probability of Damage	Effects on Window Panes
140	0.2	0.01%	No damage – windows rattle
150	0.6	0.5%	Very occasional failure
160	2.0	20%	Substantial failure
180	20	95%	Almost all fail

Source: Heggies 2007 Modified Table 10

8.2.4 Ground Vibration Structural Impacts

Guide values presented in the British Standard BS 7385 that have been assessed to determine the level of ground vibration that minimises risks for cosmetic damage to residential and industrial buildings are listed in **Table 7** (Heggies, 2007).

Table 7
Ground Vibration Structural Impacts

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4Hz to 15Hz	15Hz and above
1	Reinforced or framed structures. Industrial or commercial buildings.	50mm/s above 4Hz	50mm/s
2	Unreinforced or light frame structures. Residential or light commercial buildings	15mm/s to 4Hz increasing to 20mm/s to 15Hz	20mm/s to 15Hz increasing to 50mm/s to 40Hz

Source: Heggies 2007 Modified Table 9

8.2.5 Blasting Assessment Criteria – Human Comfort

PA Condition 3(8) and 3(9) identify the relevant blasting assessment criteria based not on structural damage criteria, but on human comfort and disturbance criteria, as follows.

- The maximum level for airblast is 115 dB Linear. The level of 115 dB Linear may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 120 dB Linear at any time.
- The maximum level for ground vibration is 5mm/s. The level of 5mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10mm/s at any time.

8.3 PREDICTED LEVELS OF BLAST EMISSIONS

During the environmental assessment, the predicted levels of airblast overpressure and ground vibration were assessed at the four nearest potentially affected residences to the Quarry (Figure 3) with the results presented in Table 8.

Table 8
Predicted Levels of Blast Emissions

Residence	Distance from Blasting	Ground Vibration (mm/s)	Airblast Overpressure (dB Linear)
“Cadira Vale”	750m – 340m	1.1 – 4.0 mm/s	111 – 119 dB Linear
“Hartley Cottage”	1 250m – 810m	0.5 – 1.0 mm/s	106 – 110 dB Linear
“Fairview”	1 480m – 920m	0.4 – 0.8 mm/s	104 – 109 dB Linear
“Lilactime”	2 025m – 1 720m	0.2 – 0.3 mm/s	101 - 103 dB Linear

Source: Heggies (2007) Modified Table 18

The results of the assessment are as follows.

- Predicted levels of ground vibration at all residences comply with the ANZEC general human comfort criterion of 5mm/s and with the BS 7385 structural damage criterion of 15mm/s at 4Hz.
- Maximum predicted ground vibration level of 4.0mm/s occurs at the “Cadira Vale” residence.
- Predicted levels of peak airblast at all residences comply with the ANZEC general human comfort criterion of 115 dB Linear except at “Cadira Vale”. The result of 119 dB Linear was a worst case scenario of the closest point of blasting during the life of the Quarry. Section 9.3 presents the measures that would be implemented to manage blasting operations during blasting in those sections of the Extraction Area closest to “Cadira Vale”.

In order to ensure that blasting emissions remain within the specified ANZEC criteria, a site blast emission site law will be established and is further discussed in Section 11.2.

9. MANAGEMENT MEASURES

9.1 INTRODUCTION

PA Condition 3(13) requires this Plan to describe the blast mitigation measures that will be adopted to ensure compliance with *PA Conditions 3(8)* and *3(12)* (**Table 1**). This section has been prepared in satisfaction of that requirement.

9.2 OPERATING HOURS AND FREQUENCY OF BLASTING

The Company will ensure that the operating hours and conditions identified in *PA Conditions 3(10)* and *3(11)* (**Table 1**) are strictly complied with.

The Quarry Manager will be responsible for ensuring the operating hours are included in the site induction and that no breaches of this condition will be tolerated.

9.3 OPERATING CONDITIONS

9.3.1 Blasting Operations

PA Condition 3(12)(a) requires all blasting to be undertaken in accordance with *AS 2187.2 Explosive Storage, Transport and Use*. The following lists the procedures that will be implemented to satisfy these requirements.

- Blasting will only be undertaken by qualified personnel or contractors.
- Ensure blasting contractors or personnel operate under *AS 2187.2 Explosive Storage, Transport and Use*.

The Quarry Manager will be responsible to ensure blasting is carried out to the relevant standard. An Explosives Control Plan is provided in Section 10.

9.3.2 Fly rock, Dust and Fume Management Measures

PA Condition 3(12)(b) requires all blasting to be undertaken to minimise fly rock, dust and fume emissions from the Quarry operations. To ensure that this requirement is met the following Company procedures will be implemented.

- Laser profiling of all blast faces.
- Bore tracking of all front holes to determine any deviations.
- Review of all drill logs to establish the competency of the rock.
- Establishing loading criteria after reviewing bore tracking.
- Adjustment of column height of blast hole, if required.
- Use of quality stemming.
- Avoid blasting in strong wind conditions.
- Minimise time between drilling and loading to reduce blast hole deterioration.
- Minimise moisture content within blast holes to reduce potential fumes.
- Ensure blasting personnel are competent.

The Quarry Manager will be responsible to ensure blasting operations are carried out to the relevant standard and Company procedure.

9.3.3 Management of Airblast Overpressure

As indicated in Section 8.3, airblast overpressure at “Cadira Vale” is predicted to be between 111 dB Linear and 119 dB Linear. As identified in *PA Condition 3(8)*, the relevant criteria for airblast overpressure is 115 dB Linear, with exceedances of this level permitted during no more than 5% of blasts in any 12 month period. In order to achieve compliance with this requirement, the Company will implement the following when blasting within the section of the Extraction Area closest to “Cadira Vale”, namely during Stage 3 of the Quarry.

- A blasting site law will be established to better predict site-specific blasting impacts during Stages 1 and 2 of the Quarry (see Section 11.2).
- Maximum instantaneous charges will be adjusted to ensure compliance with the 115 dB Linear criteria.
- Blasts will not be initiated, where practicable, during temperature inversions, when low cloud is present or when the wind is blowing from the southeast.

9.3.4 Safety Measures

PA Conditions 3(12)(c) and *3(12)(d)* requires the protection of travellers on the Mitchell Highway, people, livestock and the serviceability of private property and public infrastructure. To ensure that this requirement is met, the following will be implemented.

- Review location of blast and its proximity to Mitchell Highway, the presence of landholders or Company personnel, livestock, private and public infrastructure and determine the appropriate exclusion zone.
- Where required, blasts would be orientated such that fly rock would be directed away from the Mitchell Highway, residences, infrastructure or locations where people or livestock may be.
- Advise surrounding landholders within 2km of the blast three days prior to blasting of the date and times of blast.
- Advertise the telephone contact for the public to obtain the Quarry’s blasting schedule.
- Maintain an up-to-date blasting schedule on the Company’s website.
- Inspect all blasts to determine if fly rock has been propelled outside the blast envelope and investigate any instances as appropriate.
- Design blasts to minimise uncontrolled fly rock.

The Quarry Manager will be responsible to ensure that the relevant safety measures have been implemented prior to blasting within the Quarry.

9.4 PROPERTY INSPECTIONS

PA Condition 3(16) requires the Company, at least 2 months prior to the commencement of blasting operations at the Quarry, to advise the owners of privately-owned land within 2km of the proposed Quarry that they are entitled to a structural property inspection to establish baseline conditions of buildings and other structures on their property. To ensure that this requirement is met, the following will be implemented.

- Advise private landholders within 2km of the Quarry of their entitlement to a structural property inspection at least two months prior to blasting.
- Commission a suitably qualified, experienced and independent person, approved by the Secretary of DPE to inspect the condition of any building or structure within 2 months of receiving a request from a privately-owned landholder.
- Implement relevant recommendations by the independent person to mitigate any potential blasting impacts.
- Make available a copy of the report to the relevant landholder.

The Quarry Manager will be responsible for advising privately-owned residences of their entitlement for a structural property inspection and the potential provision of mitigation measures prior to blasting on site.

9.5 PROPERTY INVESTIGATIONS

PA Condition 3(17) requires the Company to investigate, within two months, any claims regarding blast-related damage to buildings or structures. To ensure that this requirement is met, the following will be implemented.

- On receipt of a written complaint, the Company will commission a suitably qualified, experienced and independent person, approved by the Secretary of DPE to inspect and investigate the alleged blast-related damage to privately-owned buildings or structures to determine the likely cause of the damage and prepare a report outlining the findings of the investigation.
- Make available a copy of the report to the relevant privately-owned landholder.
- Repair damage if it is confirmed by the report and both parties have agreed to the findings to the satisfaction of the Secretary.
- Refer the matter to the Secretary if both parties do not agree with the findings for resolution.
- Implement an Independent Resolution Process (see *Environmental Management Strategy*) if directed by the Secretary if the matter cannot be resolved within 21 days.

The Quarry Manager will be responsible to ensure claims of damage are managed according to the relevant requirements.

10. EXPLOSIVES CONTROL PLAN

10.1 INTRODUCTION

There will be no storage of explosives or explosive precursors at the Quarry, however the management of explosive material during blast preparation, firing and the management of unexpected situations such as misfires present a risk to the health and safety of Quarry personnel. Section 31 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* describes the measures required to manage risks to health and safety associated with the use of explosives. In order to satisfy these requirements at the Quarry, Hanson must ensure that explosives are:

- safe to handle;
- fit for their intended use;
- as insensitive as is reasonably practicable to shock, sparks, friction and the environment in which they will be stored, transported and used; and
- so far as is reasonably practicable, simple to store, use, transport and control.

In addition, Hanson must ensure that any dealing with an explosive is in compliance with the *Explosives Act 2003* and *Australian Standard AS 2187 Explosives—Storage, transport and use*.

Hanson ensures that all blast contractors have suitable blast safety protocols in place during blast-related activities.

An Explosives Control Plan has been prepared in accordance with Schedule 2, Section 4 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* and describes the control measures established through Quarry protocols. It references the MAXAM Australia Blasting Safety Management Plan (**Appendix 1**) that is currently implemented for blast operations, given that MAXAM Australia is currently contracted for blast operations.

10.2 LEGAL REQUIREMENTS

The legal requirements of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* with regards the Explosives Control Plan are described in Schedule 2, Section 4 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* and are provided below.

4 Explosives control plan

1. *An explosives control plan must set out the control measures for risks to health and safety associated with explosives at the mine or petroleum site taking into account:*
 - a) *the potential for unintended or uncontrolled detonation of explosives,*
 - b) *the characteristics of relevant explosives and the purposes for which they are to be used,*
 - c) *the characteristics of the places in which the explosives are to be used,*
 - d) *the full set of phases for the use of relevant explosives such as the charging and firing phases,*
 - e) *the potential for explosives to deteriorate,*
 - f) *the potential for the theft or misuse of explosives, and*
 - g) *the potential for the ejection of fly rock or other material as a result of the detonation of an explosive.*

2. *An explosives control plan must also set out the following:*
- a) *the procedures for inspecting, reporting, isolating and disposing of deteriorated or damaged explosives,*
 - b) *the procedures for finding, recovering and disposal of explosives that misfire,*
 - c) *the inspection, testing, reporting and maintenance procedures in relation to the equipment used at the mine or petroleum site for manufacturing, storing, transporting and delivering explosives,*
 - d) *the procedures and equipment used in storing and transporting explosives at the mine or petroleum site,*
 - e) *the procedures used for the accounting of explosives at the mine or petroleum site,*
 - f) *the arrangements for the keeping of a register identifying persons who are licensed under the Explosives Act 2003 to transport, use, store or handle explosives at the mine or petroleum site,*
 - g) *the procedures for ensuring that any person transporting, using, storing or handling explosives at the mine or petroleum site has any licence necessary under the Explosives Act 2003, and*
 - h) *the procedures in relation to consultation and co-operation to ensure that any transportation, use, storage or handling of explosives at the mine or petroleum site is conducted safely and in accordance with any conditions attached to the licence under which that transportation, use, storage or handling takes place.*

10.3 CONTROL MEASURES

Explosive Transport, Handling and Storage

All blast contractors will need to be licenced and qualified under the *Explosives Act 2003* for the transport, use, storage or handling of explosives. When contractors commence work at the Quarry, the Quarry Manager will review the relevant licences or notification such as they are satisfied that the nominated personnel for each task is suitably qualified and licenced for the transport, handling and storage of explosives to ensure compliance with legislation.

There will be no storage of explosives or explosive precursors at the Quarry. Therefore, all explosives or explosive precursors will be transported to the Quarry and any residual material removed by blast contractors to a suitable licensed magazine or storage facility. To that end, the transport, handling and storage of explosives will primarily be the responsibility of the relevant blast contractor in accordance with the Company's operating procedures.

Regardless of the above, all vehicles for the transport of explosives shall comply with the Australian Explosives Code (3rd Edition) and the Australian Dangerous Goods Code (7th Edition) for transport of explosives or Security Sensitive Ammonium Nitrate.

Blast Planning and Preparation

A thorough blast design process and blast planning procedures will be in place for each blast.

Explosives are carefully chosen based on purpose and blast method to be applied. All products will have the relevant Technical Data Sheet (TDS), Safety Data Sheet (SDS) and Emergency Procedure Guide information available.

Blast sites are prepared by removing unnecessary tools and equipment, nominating a shot firer in charge of the shot, denying unauthorised entry to the blast area and identifying the specifics of the area such as measuring blast holes and priming/loading/stemming.

Materials and equipment are inspected and tested prior to setting up a blast. As described in Section 9.3.2, the following procedures are implemented at the Quarry prior to blasting events to ensure that potential blasting impacts from fly rock, dust and blast fumes are mitigated.

- Laser profiling of all blast faces.
- Bore tracking of all front holes to determine any deviations.
- Review of all drill logs to establish the competency of the rock.
- Establishing loading criteria after reviewing bore tracking.
- Adjustment of column height of blast hole, if required.
- Use of quality stemming.
- Avoid blasting in strong wind conditions.
- Minimise time between drilling and loading to reduce blast hole deterioration.
- Minimise moisture content within blast holes to reduce potential fumes.

Blast Firing

Only thoroughly inspected and fully functional explosives are used for blasting. In addition, accessories are checked for damage and deterioration prior to preparing the primer.

During the charging phase, explosive column rise is measured to avoid overcharging of blast holes. Holes are dipped after loading to ensure the correct column height is applied and to control ground vibrations. Once charging is complete, tie-up commences and is conducted by approved personnel only. The initiation line and detonator are not connected until firing is imminent. For firing, a blast exclusion zone is established and warning procedures are followed prior to firing. After firing, the exclusion zone remains until the shot firer declares it 'all clear'.

Blast Risk Management

Risk identification and risk mitigation ensures safe management in accordance with licence requirements for all blasting related operations (see **Appendix 1**). All blasts shall be planned and designed to achieve the required production outcome with minimum impact by blast induced effects on the Quarry and surrounding environment. Primary risks and hazards include the following.

- Excessive blast vibration and/or overpressure causing damage to property in particular at the adjacent properties;
- Perceived levels of vibration and overpressure resulting in community complaint;
- Fly rock impacting personnel or property;

- Blast fumes impacting on those personnel in vicinity of blasting operations
- Explosive transport, security, handling and use.

Blast monitoring is described in Section 11 and the Quarry complaints procedures are described in Section 14.

The shot firer will supervise and sign off all accounting of explosives. Prior to its use on site, each explosive is recorded and identified by name, description, class and quantity.

Theft or misuse of explosives is reported to the Police and the Work Cover and all persons on the blast area must remain on site to provide assistance. The risk of theft or misuse is mitigated by secured storage off site. A reconciliation of explosives takes place before and after loading of the blast.

The risk of potential fly rock is reduced by ensuring a safe and thorough blast design and planning (as described above) and designation of an exclusion zone. Blasts will be directed away from Mitchell Highway, where possible. Blasts have vertical free faces profiled and adjacent blast holes are bore tracked after drilling, which allows for a blast hole design without inadequate burden to prevent fly rock. Stemming lengths will be designed adequately.

The shot firer inspects the shot for visible misfires after fumes have cleared. If misfires are found, a risk assessment is conducted prior to handling the misfire charge. A misfire report must be completed and misfires are managed as outlined in the blast contactors operating protocols.

Explosives Emergency Response

All emergency response procedures are described in the Pollution Incident Response Management Plan.

11. MONITORING

11.1 INTRODUCTION

PA Condition 3(14) requires that this Plan include a protocol for evaluating blasting impacts and demonstrating compliance with the blasting criteria at all privately-owned residences and structures. This sub-section has been prepared in satisfaction of that requirement.

11.2 BLAST MONITORING PROTOCOL

At a minimum, each blast will be monitored for airblast overpressure and ground vibration at the privately-owned residences identified in **Table 9**, subject to landholder agreement. The proposed monitoring locations are illustrated on **Figure 3**. **Table 9** presents the ownership details for each monitoring location.

Table 9
Blast Monitoring Locations

Blast Monitoring Location	Closest Residence	Landowner
B1	"Cadora Vale"	B Munro
B2	"Hartley Cottage"	S Gordon
B3	"Fairview"	D and S Harris
B4	"Lilactime"	S Warner and S Bestwick

Until sufficient blast monitoring data is available to establish a blast emission site law, additional blast monitoring will also be undertaken at additional locations within the Quarry. These locations will be selected for suitability of the relevant base rock type and the proximity of the structures to blasting locations. The addition blast monitoring locations will be reviewed and where necessary modified as a result of changes to the geographical location of blasting or changes to private land ownership. Blast monitoring locations B1 to B4 would not be modified with the prior consent of the Secretary.

All blast monitoring instrumentation will be installed, calibrated and maintained in accordance with both AS2187.2 - 2006 and the manufacturer's specifications.

The Quarry Supervisor will be responsible for blast monitoring.

12. EVALUATION OF COMPLIANCE

A blast monitoring report will be prepared within 7 days of each blast monitoring event. This report will include an assessment of the monitoring results against the criteria identified in *PA Conditions 3(8)* and *3(9)*.

The monitoring report will be reviewed by the Quarry Supervisor and a copy included within the *Annual Review*.

13. CORRECTIVE AND PREVENTATIVE ACTIONS

In the event that blast monitoring identifies an exceedance of the blast criteria identified in *PA Conditions 3(8)* and *3(9)* the exceedance will be investigated to determine the likely cause. The investigation will seek to determine:

- the date and time of the exceedance.
- whether the exceedance of the criteria was directly related to a blast source associated with the Quarry or if any other factors contributed to the exceedance;
- the primary cause of the incident;
- any contributing factors which led to the incident;
- whether appropriate controls were implemented to prevent the incident; and
- corrective and preventative measures that may be implemented to prevent a recurrence of the incident.

If it has been identified that the criteria have been exceeded, the Company will report and investigate the exceedance in accordance with the procedure identified in Section 15.

Corrective and/or preventative actions will be assigned to relevant Company personnel. Actions will be communicated internally through planning meetings and toolbox talks and outstanding actions will be monitored for their effectiveness upon completion.

14. COMPLAINTS HANDLING AND RESPONSE

The *Environmental Management Strategy* as required by *PA Condition 5(1)* includes a detailed complaints management procedure. This sub-section records the procedures that would be implemented following receipt of a blast-related complaint.



Blast-related complaints may be received via one of the following methods.

- Directly via the 24-hour, 7 day per week Company's general Emergency Line (1800 882 478). This number will be advertised widely in the local media, on signage at the Site entrance and on the Company web site www.hanson.com.au.
- Directly via a dedicated email address which will be advertised in a similar manner to the Community Information Line.
- Indirectly via the relevant government agencies.

Following receipt of any blast-related complaint, the Company will implement the following procedure.

1. The complaint will be reviewed by the Quarry Manager or their delegate to determine the nature, date and time of the blast emission.
2. Should the blast monitoring report indicate that no exceedance of the criteria identified in *PA Conditions 3(8)* and *3(9)*, the Quarry Manager will continue to consult with the complainant in relation to managing blast emissions within the Quarry.
3. Should the blast monitoring report indicate that an exceedance of the criteria identified in *PA Conditions 3(8)* and *3(9)* the Quarry Manager will notify the Department of Planning and Infrastructure and Environment Protection Authority and will implement the procedures identified in Section 13. In addition, the Quarry Manager will continue to consult with the complainant, as required, in relation to the complaint.

All complaints would be recorded using a proforma complaints record sheet.

15. INCIDENT REPORTING

In the event that an initial investigation concludes that an exceedance of an environmental criterion was directly attributed to activities associated with the Quarry, as described in Section 12, the event will be reported to NSW Department of Planning and Infrastructure, EPA and the relevant landholder(s) within 24 hours of confirming the exceedance.

Within 7 days of identifying the exceedance, the Company will submit a written report with regular updates on the status of the additional mitigation actions to the Secretary of DPE, EPA and, where relevant, the relevant landholder(s). In addition, a copy of all reports will be made publicly available on the Quarry website and will be included in the *Annual Review*.

The Quarry Manager will be responsible for incident reporting.

16. PUBLICATION OF MONITORING INFORMATION

All blast monitoring reports will be made publicly available on the Quarry website and will be included in the *Annual Report*.

All blast exceedance investigation reports will be made publicly available on the Quarry website within 7 days of being finalised and accepted by the EPA.

The Quarry Supervisor will be responsible for incident reporting.

17. REVIEW

In accordance with *PA Condition 5(4)*, this *Blast Management Plan* will be reviewed and, if required, revised within 3 months of:

- the submission of an annual review under *PA Condition 5(3)*;
- the submission of an incident report under *PA Condition 5(6)*;
- the submission of an audit report under *PA Condition 5(8)*; and
- any modification to the conditions of PA 06_0193.

Three years after the commencement of the proposal, and every four years thereafter, the Company will commission and pay the full cost of an Independent Environmental Audit of the proposal.

The Quarry Manager will be responsible for the review of this Plan.

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Appendices

(Total No. of pages including blank pages = 26)

- Appendix 1 **Blasting Management Plan**
(MAXAM Australia Pty Ltd) (24 pages)

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BLASTING MANAGEMENT PLAN

East Guyong Quarry

Hanson

August 2017



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Authored:

Disclaimer:

MAXAM takes all reasonable efforts to ensure an accurate understanding of client requirements. The information contained in this report is as accurate and up-to-date as possible based on this understanding. MAXAM accepts no liability to any person for any injury, loss or damage resulting from the use of or reliance upon the information contained in this report or for any injury, loss or damage resulting from the omission of any information in this report. No expressed or implied warranties are given other than those implied mandatory by Commonwealth, State or Territory legislation.

1. Scope

This Blast Management Plan (BMP) has been prepared for East Guyong quarry. This plan outlines:

- X The basis for ensuring safe practices and procedures for blasting operations at the site are adopted.
- X How the safety and minimisation of impact on personnel, plant and property both on site and at any neighbouring sites from blast effects will be achieved and maintained.
- X Proposed methods of blasting to ensure compliance with national recognised standards for blast emissions.

Parts of this plan may be required to be changed and modified as risks are identified or evolve, agreements are reached with stakeholders and as further information on blasting impacts comes to hand or if legislation changes. These changes will be communicated to effected parties as they occur by Hanson.

This BMP incorporates all aspects of explosives application at Hanson East Guyong site including planning, transport, blast preparation, charging and stemming, tie up, firing, monitoring, reporting and compliance.

2. Authority

It is the responsibility of all management personnel, HANSON and MAXAM, to be aware of and conduct safe work according to this BMP. The plan can only be altered with the approval of the both HANSON and MAXAM and only after risks associated with the change have been completed for any proposed changes. Where required external stakeholders may also be required to be consulted or approvals obtained.

MAXAM Area Manager. The person who has overall responsibility and control over handling, and use of explosives when MAXAM are on site. The Area Manager is also responsible for the scheduling of blast days and compliance related issues in regards to blasting operations.

Technical Services Officer and Technical Services Advisory team. The group of MAXAM technical specialists responsible for design and monitoring of blasting operations for the site. They report to the MAXAM Area Manager.

Drill and Blast Supervisor. The Supervisor responsible for the day to day operations and management of loading and firing operations. Reports to the MAXAM Area Manager.

Blast Controller. The person given responsibility, control and authority for the safety and coordination of each blast when initiated. Will generally be the Site Manager or site appointed person. Can be the shotfirer if task is appointed to him.

Shotfirer. The person in charge of the security, loading and firing of the shot on blast day. The Blast Controller and Shotfirer should not be the same person unless the site is small and can be adequately cleared and the blast exclusion zone maintained concurrently. Reports to the Drill and Blast Supervisor.

Blast Guard(s). The individual(s) supporting the Blast Controller in ensuring clearance distances are observed and the blast exclusion zone is secure. Generally will be a site familiar person who reports to the Site Manager.

Drill Rig Operator. Responsible for carrying out the drilling of the designed blast pattern. Reports to MAXAM or HANSON depending on commercial arrangements.

3. Definition Of Terms

ADG 7 means the Australian Dangerous Goods Code 7th edition.

AEC means Australian Explosives Code 3rd edition.

Blast Exclusion Zone means the area to be evacuated of personnel not involved with the blasting activity, during blasting times. The area will be change subject to the location of the blast and physical conditions.

Blast Area means the area immediately adjacent and surrounding the charging operations. Only personnel involved with firing, charging and tie-up are permitted in this area.

JSA means Job Safety I Assessment which is used as a risk and hazard assessment and mitigation tool.

Measure means to perform an action with the appropriate measurement tools. All personnel involved in an activity which requires measurement will be issued with the appropriate measurement tools.

MIC stands for Maximum Instantaneous Charge or the explosive that detonates within a nominated time window, usually 8ms.

PPV means Peak Particle Velocity which is the maximum velocity of a particle at a point where vibration is being measured

Site means the area bounded by the East Guyong quarry site

Record means to write an observation. All records will be handed to the Project Manager, and will be kept on file. All records are to be clearly legible.

SSAN means Security Sensitive Ammonium Nitrate.

4. East Guyong Site

The East Guyong Quarry is located approximately 22km southeast of Orange and 36km west of Bathurst. The monitor locations and distances are shown in Figure 1. Table 1 indicates the closest distances that the quarry site will approach each of these monitor location.

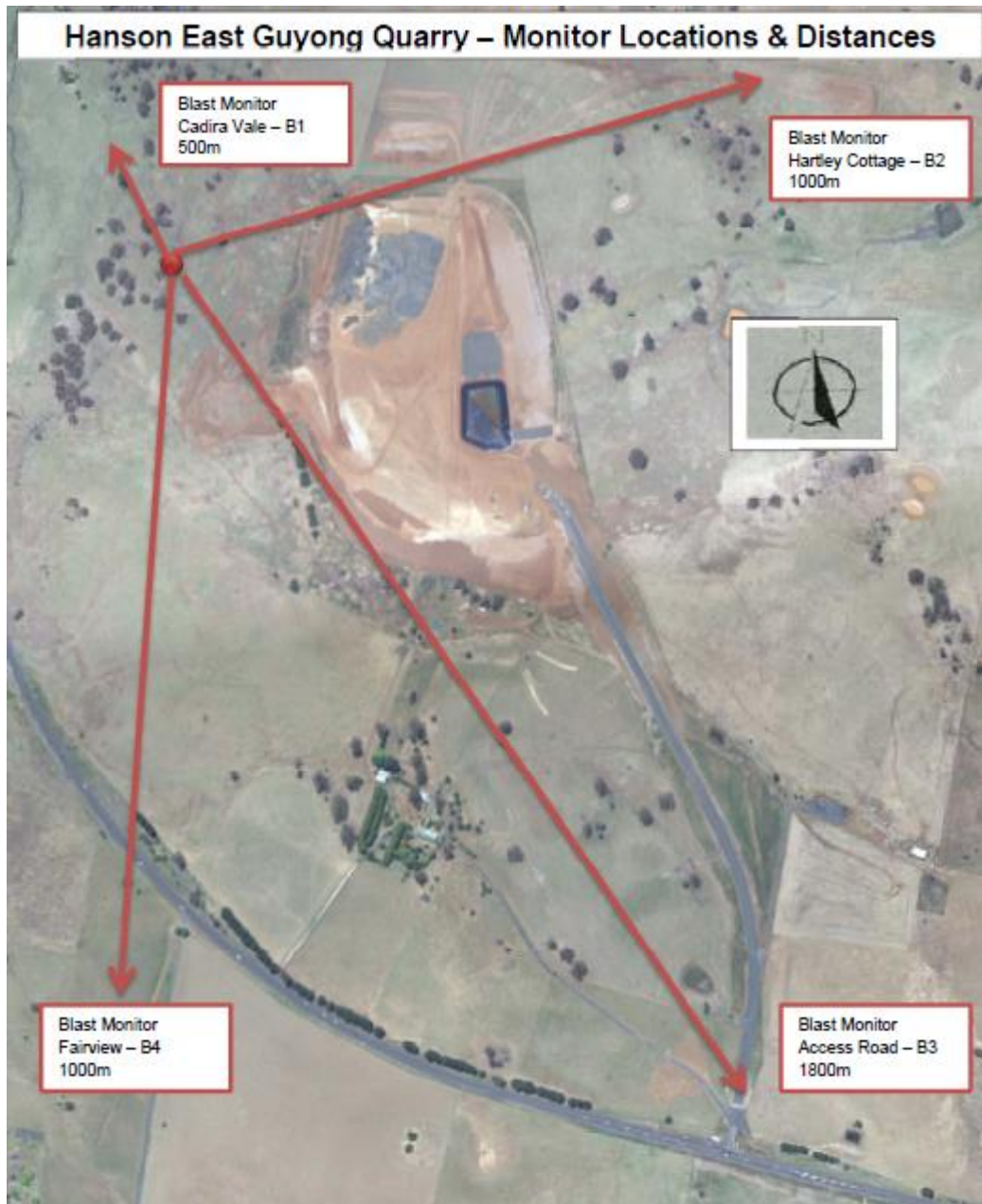


Figure 1. East Guyong Quarry Site, (Image from NOV 2013 Flyover)

Location	Distance	Comments
Cadira Vale	500m	W of site
Hartley Cottage	1000m	NE of site
East Guyong Access Road	1800m	SE of site
Fairview	1000m	SW of site

Table 1. Monitor locations and distances considered for Effects of Blasting

5. Risk Identification

All blasts shall be planned and designed to achieve the required production outcome with minimum impact by blast induced effects on the East Guyong site and surrounding environment.

Primary risks and hazards are:

Excessive blast vibration and/or overpressure causing damage to property in particular at the adjacent properties;

- a) Perceived levels of vibration and overpressure resulting in community complaint;
- b) Flyrock impacting personnel or property;
- c) Blast fumes impacting on those personnel in vicinity of blasting operations
- d) Security
- e) Handling
- f) and use.

6. Risk Mitigation – (Controls)

Specific measures in the first instance will include:

- a) Development of a Blast Management Plan for the Hanson East Guyong Quarry site (this plan);
- b) Estimates of vibration at the monitor locations;
- c) Blast planning and design process to achieve the required outcomes are in place including mitigation of flyrock and blast fume;
- d) Ensuring MAXAM blasting procedures adequately cover risks identified at Hanson East Guyong;
- e) Nomination of designated personnel to ensure compliance with legislation and security of explosives including:
 - Shotfirer's licences and qualifications;
 - Permits use explosives;
 - Permits to handle explosives;
 - Explosives storage licences and requirements;
 - Explosive transport licences and requirements;
 - Type of explosives, authorisations and availability;
 - Dangerous goods storage and transport requirements;
 - Licences to manufacture explosives;
 - The requirements set out by other government departments/authorities.
- f) Outline of methods of handling and use of explosives at the Hanson East Guyong site

7. Blast Vibration & Air Overpressure Limits

Project Approval (PA) 06_0193 specifies the blast-related criteria that apply to all blasting activities at the East Guyong Quarry. All blast designs shall plan for the vibration and air overpressure levels to be no more than the thresholds listed below. Where blast monitoring indicates that the criteria are exceeded, this information will be used to inform future blast designs and the methods of blasting shall be altered, if review of the monitoring results indicates this is necessary. Hanson East Guyong will be responsible for notifying the relevant residents and government agencies of the exceedance and plans to amend future blasting events.

MAXAM will be responsible for monitoring blast vibration and overpressure limits. This monitoring shall be in accordance with the methodology and equipment specifications outlined in AS2187.2

VIBRATION

The maximum allowable ground vibration limits will apply as per Condition 8 of Schedule 3 of PA 06_0193 and in accordance with AS 2187.2. These limits are in general stipulated for sensitive sites, place of habitation by human, as;

“Ground vibration peak particle velocity from blasting operations must not exceed 5mm/sec. for more than 5% of the total number of blasts carried out on the premises within the 12 month annual reporting period. And must not exceed 10mm/sec. at any time at any residence or noise sensitive location that is not owned by the licensee or subject of a private agreement between the owner of the residence and the licensee as to an alternative ground vibration level”.

For the purpose of monitoring, compliance and blast design planning the limits described above will be applied.

It is also noted that Table J4.5(B) in AS2187.2 (shown below) states that a ground vibration limit of 100mm/sec can be used for unoccupied structures of reinforced concrete or steel construction. These limits are based on known thresholds, plus margins of error, for damage to materials and structures.

TABLE J4.5(B)
RECOMMENDED GROUND VIBRATION LIMITS FOR CONTROL OF DAMAGE TO STRUCTURES (see Note)

Category	Type of blasting operations	Peak component particle velocity (mm/s)
Other structures or architectural elements that include masonry, plaster and plasterboard in their construction	All blasting	Frequency-dependent damage limit criteria Tables J4.4.2.1 and J4.4.4.1
Unoccupied structures of reinforced concrete or steel construction	All blasting	100 mm/s maximum unless agreement is reached with the owner that a higher limit may apply
Service structures, such as pipelines, powerlines and cables	All blasting	Limit to be determined by structural design methodology

AIR OVERPRESSURE

The maximum allowable air overpressure limits (Table 2) will apply as per Condition 9 of Schedule 3 of PA 06_0193 and generally in accordance with AS 2187 Part 2.

Table 2: Airblast overpressure impact assessment criteria

<i>Airblast overpressure level (dB(Lin Peak))</i>	<i>Allowable exceedance</i>
115	5% of the total number of blasts in a 12 month period
120	0%

It is noted that AS 2187 Part 2 differs from the limits specified in PA 06_0193 with the limits in AS 2187 Part 2 stipulated for sensitive sites as:

“115dBL for 95% of blasts carried out on the premises within the 12 month annual report period.

A 115dBL maximum is enforced unless an agreement is reached with the occupier that a higher limit may apply. In general a 133dBL maximum would be enforced for all structures in proximity that include masonry, plaster and plasterboard or unoccupied structures of reinforced concrete or steel construction”.

For the purpose of monitoring, compliance and blast design planning the limits in Table 2 will be applied.

With regard to conditions at the Hanson East Guyong site, consultation, communication and planning between Hanson East Guyong management, MAXAM technical services team personnel and the relative organisation requesting such variations must be formally agreed and variations to blast planning and design to be considerate of such restrictions. Agreed blast monitoring locations will be utilised after consultation by all parties concerned.

FLYROCK

All blasts shall be designed to ensure no fly rock will impact personnel safety or property. Rock affected directly by blasting activities shall remain within the blast exclusion zone. The blasts at the Hanson East Guyong site shall have vertical free faces profiled and all blast holes immediately adjacent to these free faces bore tracked after drilling. The information derived from this process shall be used to design and audit blast hole burdens to ensure explosive is not placed in blast holes with inadequate burden to prevent fly rock from occurring. The shot firer shall check the information supplied by the Technical Services officers to ensure it represents what is present at loading and firing time.

Stemming lengths shall be adequate to ensure fly rock is not produced from blasts at Hanson East Guyong site. Stemming practices on the bench shall be supervised by the shot firer to ensure the adequate stemming length is enforced.

Proposed Blasting Method

The proposed blasting method is based on:

Top Bench

- Bench Height = 15m
- Blasthole Diameter = 89mm
- Burden = 2.0m
- Spacing = 2.0m
- Bulk RIOFLEX MX explosive
- Approximately 55kg per blast hole
- Maximum MIC of 115kg
- Stemming length of 30 x Blasthole Diameter = 3.2m
- Minimum Load Burden = 3.1m
- Powder Factor = 1.00 kg/m³

Floor 1

- Bench Height = 15m
- Blasthole Diameter = 89mm
- Burden = 2.0m
- Spacing = 2.4m
- Bulk RIOFLEX MX explosive
- Approximately 55kg per blast hole
- Maximum MIC of 115kg
- Stemming length of 30 x Blasthole Diameter = 3.2m
- Minimum Load Burden = 3.1m
- Powder Factor = 1.00 kg/m³

Expected vibrations levels at the nearest neighbours using these blast parameters are presented in Table 3. These vibration levels are derived on a formula for prediction of ground vibration at a point based on distance from the blast to the monitoring point as well as the mass of explosive detonating, the MIC. In case top bench 1, MIC considered is 115kg and in case floor 1 MIC is 115kg. This formula is outlined in section J7.3 of AS2187.2. The “k” value is a site constant based on various factors including rock type, ground conditions, geometry of blast in relation to monitoring site and confinement of blasts. The data is inconsistent as there are so many nil triggers and the ones that do trigger are extremely low 0.28 - 0.7mm/s, in this quarry type of rock is Basalt. To calculate vibrations levels it is considered AS2187.2 that gives various “k” values and the best experience of industry for a “normal” blasting scenario is to use a “k” value of 1140. MAXAM has global experience with prediction of this value and for a new site this k value is a good starting point. A “k” value of 2500 is

also used to show that in more extreme blasting situations the expected variation in vibration levels, also shown in Table 3. Values at this greater “k” are also compliant.

Site	Distance	Expected Vibration Level using 1140 k value	Expected Vibration Level using 2500 k value	Comments
Cadira Vale	500m	1.05 mm/s	2.31 mm/s	
Hartley Cottage	1000m	2.62 mm/s	4.75 mm/s	
East Guyong Access Road	1800m	0.74 mm/s	1.61 mm/s	
Fairview	1000m	0.38 mm/s	0.83 mm/s	

Table 3. Expected Vibration levels based on proposed Blasting Parameters floor 2 and varying k values.

Site	Distance	Expected Vibration Level using 1140 k value	Expected Vibration Level using 2500 k value	Comments
Cadira Vale	500m	0.76 mm/s	1.67 mm/s	
Hartley Cottage	1000m	1.89 mm/s	4.15 mm/s	
East Guyong Access Road	1800m	0.53 mm/s	1.16 mm/s	
Fairview	1000m	0.27 mm/s	0.60 mm/s	

Table 4. Expected Vibration levels based on proposed Blasting Parameters floor 3,4,5,6 and varying k values.

It must be noted that all predicted vibration levels are well below the national recognised limits for disturbance at nearest neighbours. Vibration levels are higher using 1140 k value and 2500 k value than the ones that do trigger are extremely low 0.28 - 0.7mm. If “k” values above 2500 were seen at the Hanson East Guyong site then other measures may be taken to reduce vibration levels, such as reducing MIC.

COMPLAINTS

Hanson East Guyong shall establish a complaints register to deal with community complaints related to blasting.

Complainants will be contacted within 24 hours of notification to assess the nature of the complaint, take details and the complainant will be notified at that time of further action to be taken. With the permission of the complainant, subsequent monitoring at the site of the complainant for several blasts will take place, and the results will be reported to both the complainant, Hanson East Guyong Management & then placed on the East Guyong website, www.hanson.com.au.

8. Blast Planning Guidelines

As a minimum, the basis for blast planning will encompass the following:

Blast Design

Blast hole Burden and Spacing all be calculated to provide the result required. Minimum load burdens shall be 3.1m for an 89mm blast hole, for the prevention of fly rock.

Standard patterns will be developed and used as a standard in different lithology's and areas of the site if required. Free faces shall be developed to allow for the control of vibrations. All free faces in blasts (excluding the top surface) shall be profiled and blast holes on these free face bore tracked.

Faces shall be orientated to ensure air overpressure levels do not impact adversely on neighbouring sites.

Loading

Blast holes will be loaded with explosive to design weight or collar height (whichever comes first) to avoid the possibility of filling voids. The shot firer may use a maximum of 10% extra may be used in a blast hole if the required collar height was not reached. Any variation to this will require a SWMS to be conducted prior to loading of that blast hole.

Provide clear direction relating to the Loading Density of Rioflex Bulk Water Gel Suspension reference OPS 009.

Stemming

Adjustment of stemming height shall be accomplished according to sound engineering practice and site specific parameters. Good quality stemming shall be used – crushed aggregate of 10mm-14mm size. A starting point of 30 blast hole diameters for a stemming length of 3.2m shall be trialed for containment of explosion gases for prevention of fly rock and excessive air overpressure. If required this will be adjusted to ensure no fly rock as well as minimising oversize in the top section of the blast.

Initiation

The initiation sequence will be designed to allow adequate allowance for inter-hole or inter-row delay to enable progressive relief of burden to occur throughout a blast. This shall be produced in consultation with the shot firer and any variations recorded by the shot firer.

Blast Design Plans

A plan of the blast to be undertaken shall be produced by MAXAM indicating explosive quantity, blast hole location, blast hole depth, blast hole angle and stemming. Any variations to "normal" design will be indicated such that the shot firer has this information for loading and firing.

For drill and blast procedure details specific process steps and controls for safe and efficient Blasting reference OPS 007

9. Blast Records

Details of the blast shall be taken and maintained.

This information assists in the planning and implementation of further blasts and provides documentation in case of incident or complaint, and will include:

- a) Blast location and Number
- b) Environmental conditions at the time of the blast
- c) Monitoring equipment including type, serial number and location
- d) Video footage
- e) Details of measurements recorded during the blast
- f) Details of fly rock (if any)
- g) Details of incidents and complaints (if any)
- h) Details of actual hole depths and stemming heights
- i) Proposed modification to the blast plan for future shots (if any)

10. Transport of Explosives and Ingredients

Procurement of Explosives

The person ordering explosives and SSAN for use at Hanson East Guyong must be an authorised person; this will be a MAXAM person for the Hanson East Guyong site. The person ordering explosive product shall determine quantities from the plan produced by MAXAM technical services.

Transport of Explosives to site

All explosive products and precursors shall be under the control of MAXAM at all times. The explosives and precursors will be transported to site in a MSU and an explosive carrying vehicle from MAXAM's Depot.

All vehicles used for the transport of explosives shall comply with the AEC (for explosives) and the ADGC (for Dangerous Goods – SSAN). Regular inspections of vehicles shall be conducted to ensure compliance.

For the transport of accessories to site reference OPS33. To ensure that the handling, storage, packaging, preservation and delivery of products conform to specified requirements.

Vehicles carrying SSAN or explosives shall be secured from access, including product and vehicle, when left unattended.

All explosives shall be kept in their original boxes and transported in separate lockable receptacles for Class 1.1B, 1.4S and 1.1D explosives.

Any maintenance carried out in secure areas, on SSAN vehicles or equipment that contain residual product shall be authorised to do so and either under constant surveillance or be an authorised secure person.

Towing or extraction of explosive equipment shall only be done under supervision and in compliance with site or MAXAM procedures.

Product information

All products delivered shall have TDS, SDS and EPG information available.

Safety

There shall be no smoking or naked flames within 10 metres of an explosive vehicle.

Explosives are not to be dropped or mishandled.

Only personnel trained and passed out as competent in the use of handling explosives and their transport, may operate an explosives vehicle.

ALL SSAN and explosives must be accounted for including the recording of spills, usage and waste.

No person under the age of 18 years is permitted to work with, handle, charge or fire any explosive or blasting agent.

11. Storage and Accounting of Explosives and Explosive Precursors

Storage

There shall be no storage of explosives or explosive precursors at the East Guyong Site. All explosives or explosive precursors shall be transported to site and any residual removed to MAXAM operated and licensed magazine and storage facilities after blasting. These at present are located near Avenel but may alter depending on further business requirements.

Accounting

All accounting of explosives or explosive precursors at the East Guyong Site shall be supervised and signed off by the MAXAM shot firer. Cart notes shall be filled out showing the name, description, class and quantity of each explosive item and precursor to be used at the site.

12. Blast Set-Up

A shot firer shall be nominated in charge of the shot

Blast Site preparation

All unnecessary tools and equipment shall be removed before bringing explosives to the collar of the blast holes.

Entry into Blast Area

There is to be no unauthorised entry to a blast area.

Any unauthorised person must make contact with the Shot firer to seek approval to enter a blast area.

Measuring Blast holes

Every blast hole depth should be measured and recorded to nearest 100 mm (0.1 metre).

The shot firer shall record the depth of any short blast holes that cannot be re-drilled, anything unusual that may affect the blast performance (short, hot, damaged holes), and the location of such blast holes or features on the blast plan.

13. Loading and Stemming

Prior to loading activities commencing a pre-blast risk assessment shall be conducted of the blast area and access.

A Shot firer shall be nominated as being in charge of the shot.

The load plan and burdens of free face blast holes should be made available before commencing loading.

All persons involved shall be made aware of the plan, hazards, work flow and any particular unique factors in the blast. When loading the blast, progress loading such that firing can be completed early if necessary and any re-drilling can be conducted before the explosives are loaded in an area.

Any damaged or blocked holes shall be reported to the Shot firer

Priming

Should a booster or down-line be dropped down the hole and is irretrievable, it shall be reported to the Shot firer.

Only prime enough holes as they are to be loaded. Do not leave explosives accessible to unauthorised persons.

Primers are to be prepared at the hole and lowered in a controlled manner. Accessories shall be inspected prior to ensure they are not damaged. The top primer shall not be made up until required to be inserted into the blast hole.

Avoid unnecessary force when inserting detonators into primers. Insert the detonator completely enclosing it in the primer to protect this sensitive component from impact, friction or bending forces.

Immediately after inserting the detonator into the primer, place the charge in the blast hole. If a primer becomes stuck in a blast hole never push or pull to remove.

When pumped the bulk RIOFLEX product, ensure that the primer does not "float" with the product being pumped.

Secure the down hole lead and ensure excess lead is coiled neatly.

Loading of Blast holes

Holes shall be loaded in a systematic pre-determined sequence.

Regularly measure the explosive column rise during charging to detect cavities and avoid overcharging blast holes.

All holes shall be dipped after loading to ensure correct column height and/or rise is achieved. This will also assist in control of vibrations due to potential for increase in MIC.

All processes shall be done in a way that minimises the risk of damage to down-lines. Decking of blast holes may need to be considered if loading circumstances require.

Stemming

Only coarse aggregate approved by the Shot firer may be used as stemming.

Blast holes shall be checked prior to stemming to ensure the blast hole is loaded to the correct column length.

Stem the blast holes carefully to avoid damaging down-lines, and slowly to avoid the material from bridging in the blast hole above the designed stemming height.

14. Tying Up of Blasts

RIONEL System

Tie-up should not if possible to commence until all the charging is complete. If it does commence it shall be kept a minimum of 10m from any charging operation and the shot firer shall ensure no vehicular movement shall enter this 10m buffer.

Before tie-up begins all unnecessary personnel, equipment and explosives shall be removed to its appropriate location.

Only the shot firer or approved personnel are to be involved in the tie-up. All other people shall be off the shot.

Surface connectors are connected to their respective holes in accordance to the tie-up plan.

Once tie-up begins the shot firer shall ensure there is an authorised person in attendance of the shot at all times except during clearance and firing procedures have commenced or in the event of an electrical storm.

Clipping in of surface connectors is to be done in a planned methodical manner. Ensure the surface connector's lead line is not taut once connected.

If leads are caught, check the connection and ensure leads are firm in the block.

The initiation line and detonator are only to be connected immediately before firing.

Access to the initiating device must be guarded. Only the shot firer is to attach the initiation detonator when satisfied that the Blast Guards are in place and the initiating line is secured from inadvertent initiation.

15. Firing of Blasts

Blasting Times

Blast times will be between the hours of 9am and 3pm. No blasting outside of these times will be allowed.

Other Special Precautions

Emergency access shall be given to emergency vehicles whereby the guard would notify the Blast Controller and shot firer of the situation and hold the shot.

If in the opinion of the shot firer the proximity of an electrical storm is such as to constitute a danger to the process of charging and firing, the shot firer must ensure that work in connection with the charging and firing ceases, that all employees are withdrawn from that area of work, and that the Blast Guards remain in place to prevent access to the area.

The blast crew and Blast Controller shall document and report all unusual occurrences while preparing, loading or firing a shot and forward all comments to the Business Manager.

Any explosive found in a blast muckpile must be treated as a misfire.

If a blast is deemed to be at risk of producing fly rock that may result in damage to people or property, appropriate procedures must be implemented to eliminate this potential.

Establishing and Removing the Blast Exclusion Zone

Particular emphasis shall be placed on the safety of personnel. As such exclusion zones shall be established to ensure that the risk of impacting personnel is eliminated.

The MAXAM procedure shall be used for the establishment and removal of the blast exclusion zones including:

- A description of the zone and method of implementation;
- Personnel tasks and responsibilities;
- A description of the means of communication;
- The control of radio transmissions that may influence the communication or security of the shot;
- Timings and procedures for notification of personnel on-site and off-site;
- Identification of the location of, and the method of manning of, control points;
- The method to establish and notify the shot firer that the exclusion zones have been cleared;
- Method for immediate notification of and dealing with trespassers;
- Warning procedures prior to firing;
- What must occur if a misfire occurs during firing;
- The method of notification to return the whole of the exclusion zone to normal;

Site briefings shall be conducted for personnel involved with the establishment and removal of the exclusion zone.

When a blast cannot be initiated and is to remain loaded overnight, the firing control shall be made safe. When a site requires guarding, personnel shall be engaged to ensure that the shot firer has sufficient rest prior to firing the next day. Such personnel shall be briefed on hazards and a procedure for contacting a responsible person in the case of trespass.

The exclusion zone shall not be returned to normal until the 'all clear' for the blasting operation is given by the shot firer.

Post Blast Initiation

After the blast is fired the shot firer will lift radio silence and request that guards stay in position.

The shot firer shall wait until the fumes have cleared and it is safe to return to the shot.

The shot firer shall then inspect the shot for any visible misfires. If no evidence of misfires the shot firer shall announce "All Clear".

The Blast Controller shall announce the All Clear and release the Blast Guards from their positions.

Misfires shall be dealt with in accordance with MAXAM procedure "Dealing with Misfires".

16. Dealing with Misfires

A risk assessment shall be conducted prior to handling a known misfired charge. The MAXAM procedure for dealing with misfires shall be followed.

Only a shot firer may deal with and handle a misfire or a person under their direct supervision.

A misfire report must be completed for all misfires or suspected misfires.

The shot firer shall ensure all relevant misfires are reported to the Area Manager.

For the managing misfires reference D&B 006 Managing Misfires. This procedure outlines the requirements and steps of dealing with misfires.

When a misfire is identified it is then the responsibility of MAXAM and Hanson to contact the relevant authorities to notify of the misfire. In this instance

17. Explosives Emergency Response

In any explosive related emergency, priority consideration is the preservation of life. If there is any uncertainty as to whether the area is safe or not – immediately evacuate the area.

Assessment of any emergency shall consider the risk of fire or ignition sources that could lead to detonation.

If a fire is to be fought, only fight the fire with the equipment readily available.

In an emergency, call using the sites emergency response procedures.

All explosive incidents shall be reported to an Inspector of Mines / Explosives as soon as practicable.

An incident site should not be interfered with unless authorised by an Inspector of Mines / Explosives.

For the emergency evacuation procedure reference OPS 010. This Emergency procedure outlines the steps which are considered as necessary to ensure effective emergency evacuation procedures for all situations which may cause harm to persons, property or the environment and to ensure a timely response to any situation.

Incident Contact Details	
Health & Safety Incidents	1300 814 609
External Contacts	
Emergency Services (Fire, Police, Ambulance)	000
Environmental Protection Authority	131 555
Department of Primary Industries	1300 814 609
Poisons Info	131 126
Work Cover Authority	131 050
Resource Regulator	1300 814 609
Internal Contacts	
Quarry Manager- P Riini	0438 244 437
Production Supervisor- S Cumberland	0438 417 900
Radio	
Site UHF	Channel 24

18. THEFT OR LOSS OF EXPLOSIVE PRODUCTS.

Any theft or unaccountable loss of Explosive products must be reported to the Police and the Work Cover.

Once Explosive products are brought onto site, a reconciliation of products shall take place before loading of holes is commenced. This process shall be confirmed to the Quarry Manager and or Shot firer before loading takes place.

Only persons authorized to handle explosives products shall do so and under the guidance of the recognized Shot firer.

Once the loading of the blast is completed. A reconciliation of products used in the blast and products stored in the Accessories vehicle will take place. Any discrepancies shall be investigated and the cause identified. Tie up and loading information will be required for this to take place. Searching of the blast area shall take place and the magazine from which the accessories originated shall be contacted to confirm that quantities are correct.

No persons shall leave the site until all accessories are accounted for and reconciled. Should it be determined that accessories are unaccounted for them the Quarry Manager shall be notified. Police and Resource Regulator will also need to be contacted to report the possible theft of Explosive products. All persons on the blast area shall remain on site and provide assistance to Police and Mines Inspectors if requested to do so.

19. INJURY MANAGEMENT.

Any injury that occurs during blasting practices will be reported to the Shot firer in control of the blast. The Shot firer will then be guided by the MAXAM HSE 022 Injury Management procedure as well as the Hanson Procedures for Injury in the workplace.

All MAXAM procedures references in this document are available to Hanson Management via the MAXAM uSafe website.

