HSEQ-6-09-F01

# Blast Management Plan

## Dunmore Quarry

## May 2019

# Table of Contents

# 1. General Information

## 1.1 Forward

This BMP has been prepared to satisfy Regulatory Conditions specified within Boral's Drilling and Blasting Standard HSEQ-6-09, the Environmental Protection Licence 77 and the Development Consent DA 470-11-2003

This Blast Management Plan has been developed as the result of a site risk assessment and documents the key processes and controls to be adhered to when undertaking blasting activities onsite. The Site Risk Assessment is attached (Refer to **Attachment A** – Safe Work Method Statement (Drilling and Blasting) HSEQ-6-09-F06.

## 1.2 References considered within the BMP

In addition to the above Regulatory Conditions, this BMP aims to meet the requirements set out in:

- AS 2187.2:2006 Explosives – Storage and Use – Use of Explosives
- Australian Code for the Transport of Explosives by Road or Rail (AEC).
- Code of Practice – Elevated Temperature and Reactive Ground, Australian Explosive Industry and Safety Group (AEISG), 2007

## 1.3 Rock Formation

The predominant geological feature of the area: Basalt massive with areas of columns. Density 2.7

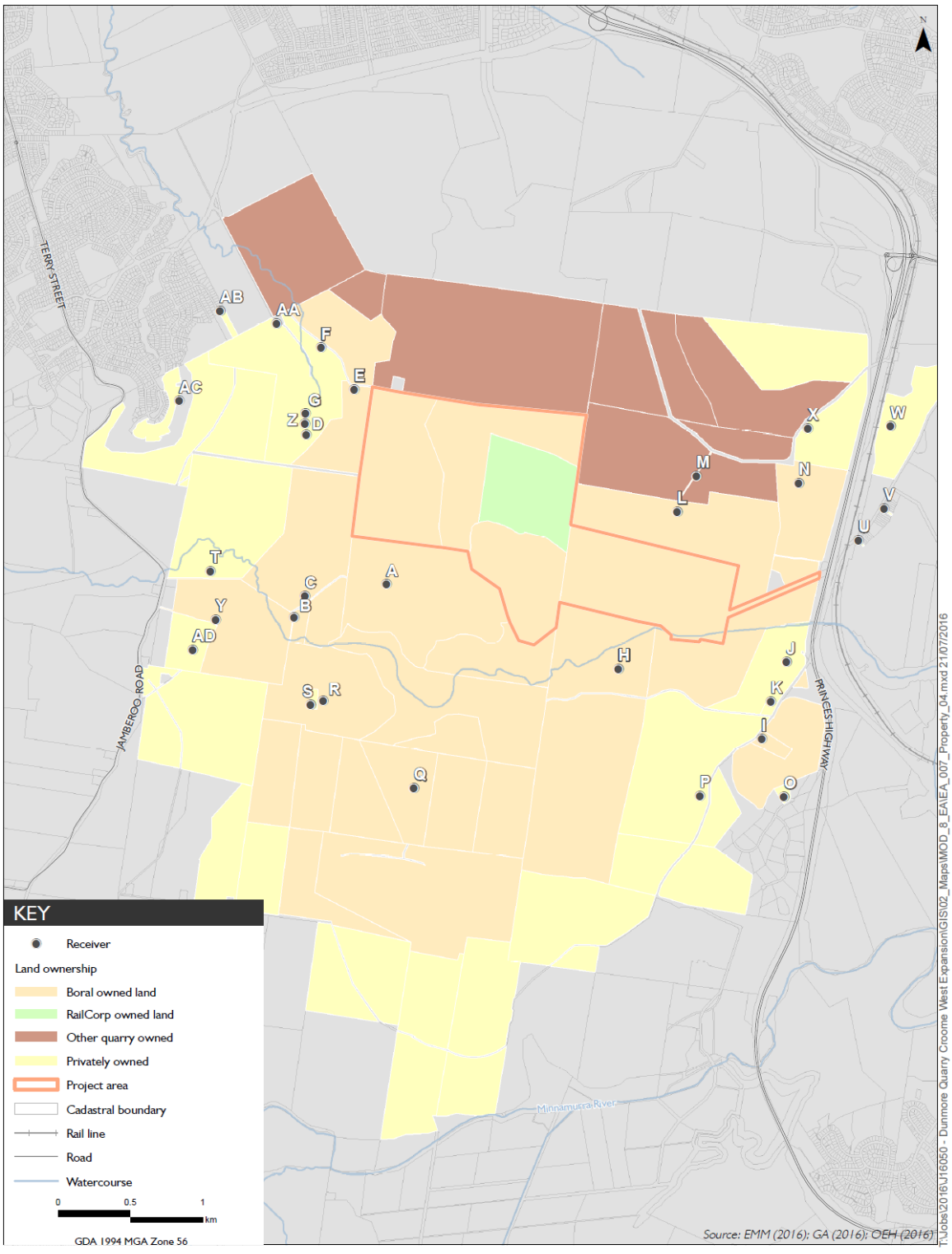
The following features, fractures, faults, clay seams, geotechnical anomalies or other characteristics in the rock include:  Massive with areas of columns. Sth Croome exhibits a large section of soft/clay.

## 1.4 Locality Plan


**Figure 1:** Locality plan of Dunmore Quarry (Source: Google Maps)

The locality plan above shows Dunmore Quarry outlined in Red. The closest suburbs are Minnimurra to the South East, Shell Cove to the North East and Albion Park to the North West. The Princess Highway is to the East of the Quarry running in a North/South direction. The closest residential properties to the site have been marked in figure 2 with the respective land owners noted. Dunmore Quarrys site boundary is marked on the map within the red boundary lines.

Lot 10, DP 977931 (McParland property) was previously owned by Tom and Dot McParland and is now part of Boral's land immediately to the south of the Croome Farm extraction area in the western section of Dunmore Quarry. The lot referred in condition 4(20) (lot 10 DP 977931) is now known as Lot 10 DP 1125853. Boral formally acquired the McParland property on 8 July 2016. The main residence on the property is approximately 500 metres to the south west of the Croome Farm extraction area and is the closest residence impacted by blasting.




EMM

Surrounding land ownership
Dunmore Quarry Modification 8
Environmental Assessment

**Figure 2:** Neighbouring properties and Land ownership

## 1.5 Cultural History and Sites to be Preserved

**McParland Property**

The McParland Property was purchased by Boral during the expansion process associated with Mod 9 of the Development Consent.

**Sites to be Preserved**

Through consultation with the previous owner of the McParland property, a number of features were identified as having significance to be incorporated into this plan. These items were:

- Primary Residence – the original house was constructed in 1923, with additions and alterations made by Dennis and Robyn in recent years. Immediately to the south is a small detached cottage (circa 1890's) which is connected to the primary residence via a covered walkway;
- Flour Mill – a Georgian style stone building constructed circa 1830's with Latite field stones and mortar which was made using material from Aboriginal Middens;
- Butter Mill – the age, style and construction the same as the Flour Mill; and
- Hay shed – a timber framed structure with a tin roof built circa 1830's. The timber used was locally sourced and unmilled. An awning was later added to the structure around all sides.

**Protection of Heritage Values on sites to be preserved**

Boral has worked with Orica, blast service provider, to develop blast parameters to manage and monitor blast impacts on the heritage values of the buildings on Lot 10 DP977931 (McParland Property)

| Parameter | Airblast overpressure level | Peak particle velocity | Allowable exceedance |
|---|---|---|---|
| **Criteria** | 130 dB(Lin Peak) | 30 (mm/s) | 5% of the total number of blasts over a period of 12 months |
| **Frequency** | During every blast | During every blast | - |
| **Sampling method** | AS2187.2-1993 | AS2187.2-1993 | - |

Boral will also engage an independent engineer to undertake an annual dilapidation report on the buildings on Lot 10. This report will assist in providing advice to both Boral and Orica on the blast parameters and ongoing management practices for protecting the heritage values of the buildings on Lot 10.

# 2. Drill & Blast Organisational

## 2.1 Table of Authorised Personnel & Service Providers

| D&B Role | Name | Position & Organisation | Date Approved | Approved By |
|---|---|---|---|---|
| **Mine Manager** | Brodie Bolton | Quarry Manager | | |
| **Blast Designer / Engineer** | Orica Quarry Services | Nominated Shotfirers | | |
| **Blast Supervisor** | Brodie Bolton | Production manager | | |
| | Matthew Banks | DSS Quarry manager | | |
| | | | | |
| **Shot Firer** | Orica Quarry Services | Nominated Shotfirers | | |
| **Trainee Shot Firer** | Orica Quarry Services | Nominated Shotfirers | | |
| | | | | |
| | | | | |
| **Driller** | As nominated by Boral Drill & Blast | As nominated by Boral Drill & Blast | | |
| **Transport, Use, Storage and handling** | Orica Quarry Services | As nominated by Orica | | |
| **Disposing of Deteriorated or Damaged Explosives** | Orica Quarry Services | As nominated by Orica | | |

## 2.2 Drill & Blast Personnel Prerequisites & Delegated Authorities

| D&B Role | Prerequisite & Authorities |
|---|---|
| **Mine Manager** | • All Mine Managers shall have control and management of the work that necessitates the use of the explosive.<br>• All Mine Managers shall have the control and management of the place where the explosive is used.<br>• All Mine Managers who oversee blasting activities shall hold a Shot Firer's Certificate of Competency issued by the statutory body (where they are required to do so).<br>• To maintain competency, Mine Managers who are expected to oversee blasting activities need to conduct a minimum of one blast per year (at any site). As a minimum, this shall include carrying out the blast design and supervising the loading and firing of the shot.<br>• An experienced Shot Firer shall oversee this process and sign off before the Mine Manager is permitted to oversee any further drill and blast operations.<br>• If the Mine Manager has not achieved or maintained the Company's minimum competencies to supervise a drill and blast operation, the Mine Manager shall appoint a Blast Supervisor in addition to the appointed Shot Firer to perform the shot who has been deemed competent to supervise blasting at that site together with the Mine Manager. |
| **Magazine Keeper** | • The Magazine Keeper shall be at least 18 years of age.<br>• The Magazine Keeper shall be appointed by the Mine Manager in writing and approved by the Regional Manager .<br>• The Magazine Keeper must have adequate training to perform the duties specified in AS 2187.1-1998 Explosives Storage, Transport and Use-Storage, Clause 4.2.2 and ***Explosive Storage Security Plan HSEQ-6-09-F12.*** |
| **Competent Persons to Handle Explosives** | • Persons required to handle explosives shall possess the relevant licence and/or qualifications in accordance with the legislation. |
| **Blast Guards** | • Blast Guards shall be appointed in writing by the Blast Supervisor on the day of the blast.<br>• Blast Guards shall have adequate knowledge of the site to locate the designated guard location and effectively communicate with the Shot Firer and Blast Supervisor.<br>• Blast Guards shall be competent in undertaking the role. |
| **Trainee Shot Firer** | • Trainee Shot Firers shall have attended the Blasting training course and be in the process of obtaining their minimum number of blasts required by legislation. |
| **Shot Firer** | • A Shot Firer shall hold the national competency, a state explosive licence and a relevant statutory permit (this will need to include endorsement for the type of blast that they are going to conduct).<br>• Once licensed by the statutory authority, a Shot Firer is not permitted to act in their own capacity until they have performed 12 blasts under the supervision of an experienced Shot Firer.<br>• On obtaining the status of experienced Shot Firer, a Shot Firer shall perform their full duties at least once every year.<br>• If they have not performed a blast for more than 12 months, another experienced Shot Firer will need to supervise and confirm they are still competent. |

| D&B Role | Prerequisite & Authorities |
|---|---|
| | • Accountability of explosives. |
| **Driller** | • A Driller shall hold the national competency (MNQOPS312A: Conduct Surface Drilling Operations), as a minimum. |
| **Blast Supervisor (only where the Mine Manager does not perform the role themselves)** | • The Blast Supervisor shall be authorised by the Regional Manager to perform the role.<br>• The Blast Supervisor shall be appointed by the Mine Manager in writing to perform the role for each blast.<br>• The Blast Supervisor shall hold a Shot Firer's Certificate of Competency issued by the statutory body (where they are required to do so).<br>• The Blast Supervisor shall conduct a minimum of one blast per year (at any site). At a minimum, this shall include carrying out the blast design and supervising the loading and firing of the shot.<br>• An experienced Shot Firer shall oversee this process and sign off before the Blast Supervisor is permitted to oversee any further drill and blast operations. |

# 3. Approved Operating Requirements

## 3.1 Mining Licence/Work Plans Regulatory Conditions

Dunmore Quarry operates drilling and blasting activities in accordance with a Ministerial consent granted in November 2004, issued for the Development Application DA 470-11-2003 and the Environmental Protection Licence 77. The following table outlines the Regulatory Conditions which have been considered.

| Licence Reference | Date of Issue | Regulatory Conditions |
|---|---|---|
| DA 4 (16) | Nov 2004 | The Applicant shall ensure that the airblast overpressure level from blasting at the development does not exceed the criteria in Table 4 of the consent at any residence or sensitive receiver on privately-owned land. |
| DA 4 (17) | Nov 2004 | The Applicant shall ensure that the peak particle velocity from blasting at the development does not exceed the criteria in Table 5 of the consent at any residence or sensitive receiver on privately – owned land. |
| DA 4 (18) | Nov 2004 | Blasting operations at the site may only take place:<br>a) between 9am and 5pm Monday to Saturday inclusive;<br>b) are limited to 2 blasts each day; and<br>c) at such other times as may be approved by EPA. |
| DA 4 (19) | Mar 2011 | During blasting operations, the Applicant must: |

| | | |
|---|---|---|
| | | a) take all reasonable steps to:<br>i) protect the safety of people in the surrounding area;<br>ii) protect public or private infrastructure/property in the surrounding area from any damage; and<br>iii) minimise blast-related dust and fume emissions; and<br>b) operate a suitable system to enable members of the public to get up-to-date information on the proposed blasting on the site, to the satisfaction of the Secretary |
| EPL 77 | | • Conditions L6.3 and L6.4 |

## 3.2 Site Operating Hours

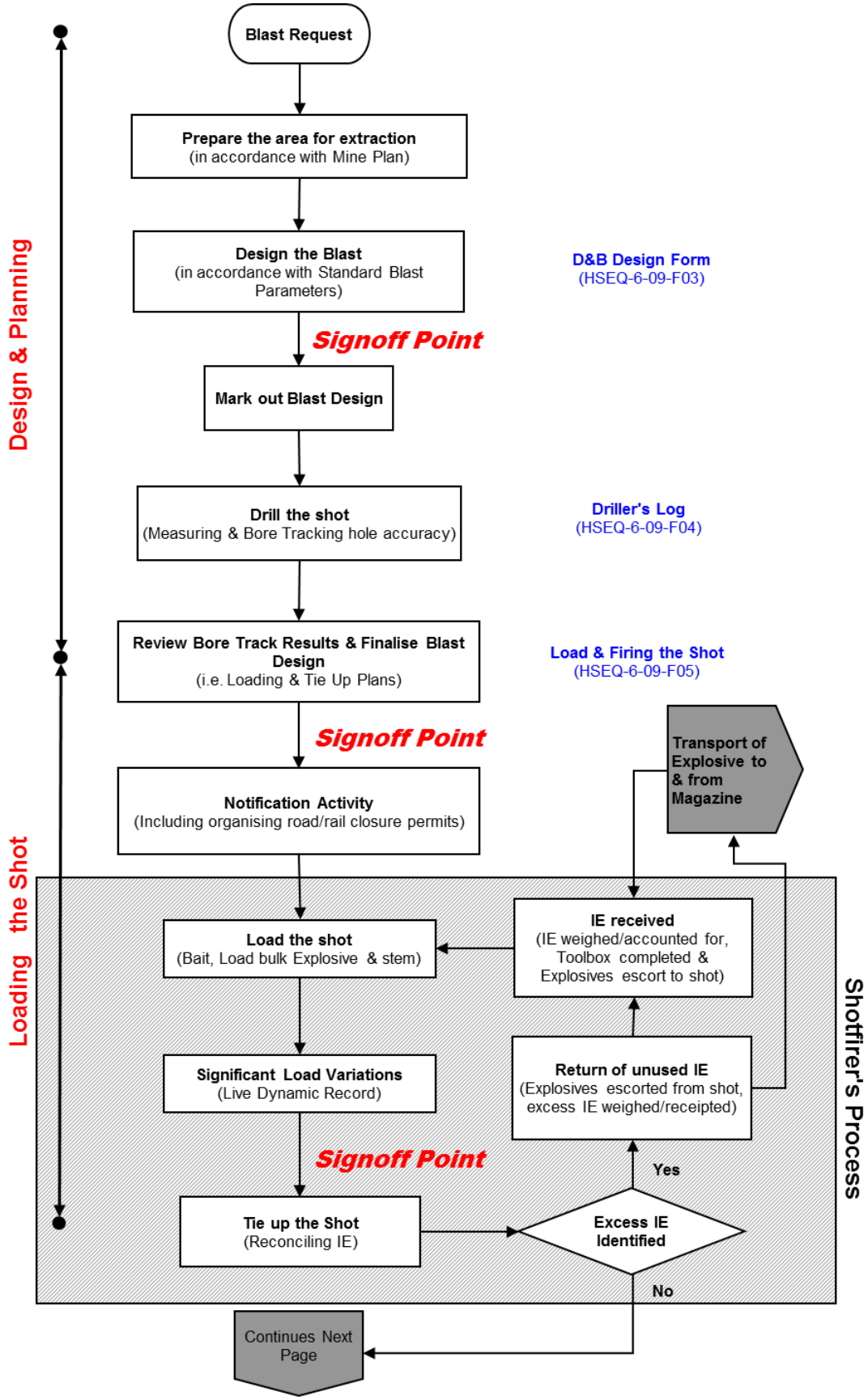
Dunmore Quarry is an approved 24 hour, 7 days per week operation. Its shift arrangements are as follows:

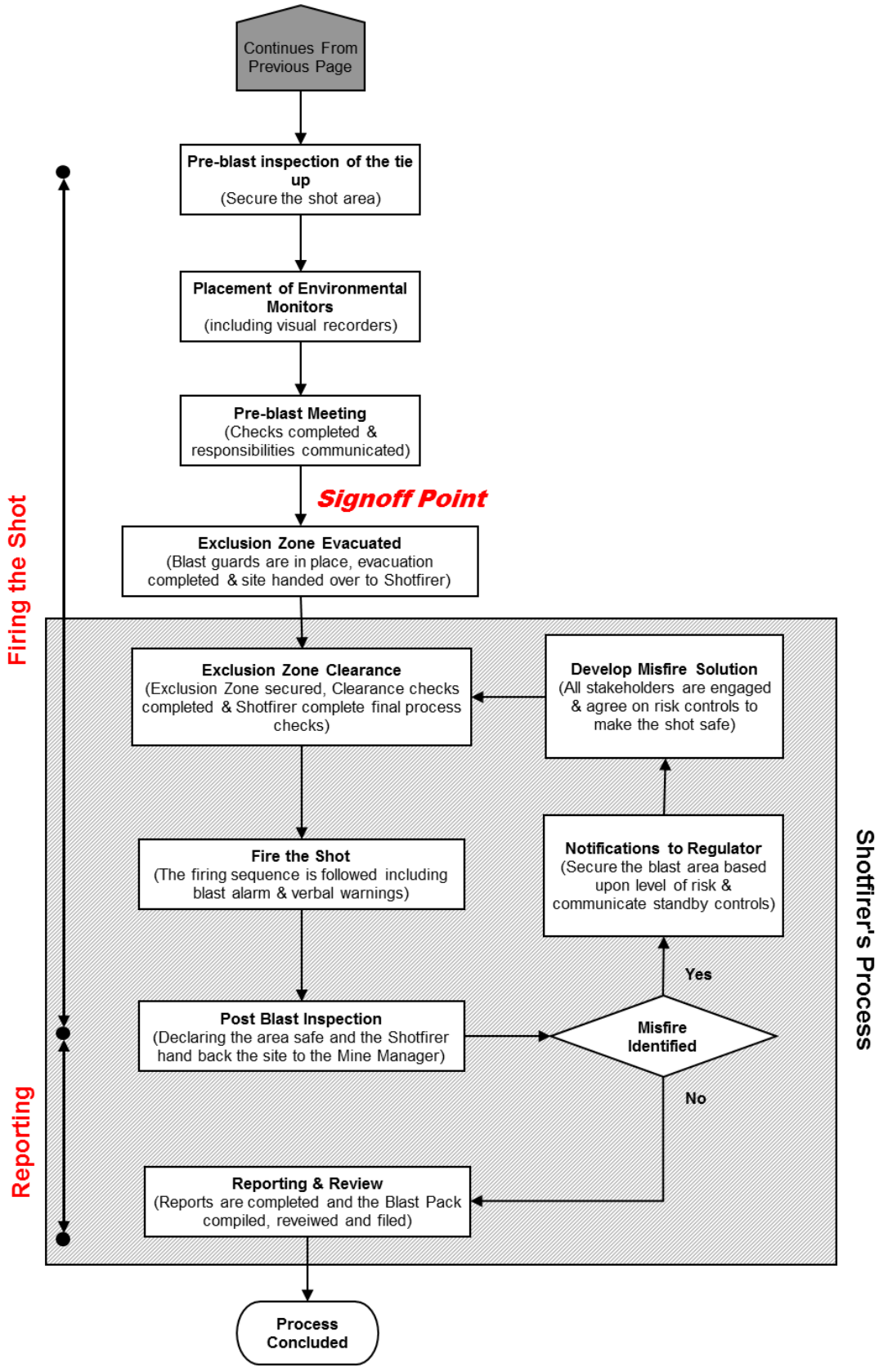
| Shift | Start Time | Finish Time | No. of workers |
|---|---|---|---|
| Monday to Friday - Morning | 6:00 am | 2:30 pm | 30 |
| Monday to Friday - Afternoon | 2:30 pm | 10:30 pm | 13 |
| Monday to Friday - Nights | 10:30 pm | 6:00 am | 5 |
| Saturdays | 6:00 am | 12:00 pm | Varies |

## 3.3 Blasting Times

In accordance with the development consent and environmental protection licence, blasting occurs between 9:00 am and 5:00 pm Monday to Saturday, and no more than 2 times per day or at such other times as may be approved by the EPA.

## 4. The Overview of the Drill & Blast Process – Flowchart/Forms






A Safe Work Method Statement (SWMS) addressing the above process is attached (Refer to **Attachment A** - Drill and Blast operations on an existing Quarrying Operation with an existing Approved \ Pit Plan). Where changes occur as part of a specific Drill & Blast program, this SWMS will be amended accordingly and a copy retained within the Blast Pack.

Standard Blasting Parameters

The site's Standard Blasting Parameters have been determined based on geotechnical investigation and site blasting risk assessment in accordance with the Company's Drilling and Blasting Standard. Any modifications to Standard Blasting Parameters must be approved by Regional General Manager (Quarries), with supporting documentation attached as part of a Modification Control Procedure.

### 4.1 Blasting Parameter - See Orica SIS (See Attachment B)

### 4.2 Presplit Parameters - See Orica SIS (See Attachment B)

Please note that the Site Information Sheet changes over time due to the operation of the site. The SIS shown in Attachment B is indicative only.

## 5. Blast Exclusion Zone

### 5.1 Engineered Exclusion Zone

Dunmore Quarry does not use an Engineered Exclusion Zone. Please see Section 6.2 Default Exclusion Zone Requirements.

An externally accredited blasting consultant has modify the default Exclusion Zone (as outlined within Boral's Drilling and Blasting Standard requirements) through a formal process which:

- Considers geological information,
- Reviews drilling and blasting parameters to identify a "Maximum Loading Scenario" which takes into account Maximum Charge, Minimum Burden, Minimum Stemming and Hole Angle.
- Uses a scientific method to model and predict maximum throw and trajectory of flyrock.
- Calculates an exclusion Zone Based on the following Factors of Safety
    - Protection of Buildings Plant and Equipment – Safety Factor 2.0
    - Protection of People – Safety Factor 4.0
    - Public or Critical Infrastructure – Safety Factor [Insert factor]

The Blast Consultant has also identified the triggers that would force a review of the Engineered Exclusion Zone. That is, any change to the sites Standard Blasting Parameters that extend the Maximum Loading Scenario as defined by Flyrock Modelling.

If there are technical concerns or if a hazard is discovered whilst loading the shot, and this hazard cannot be controlled with the placement of an artificial burden, a risk analysis is to be carried out to determine if the minimum safe distances need to be increased for the shot. The Shot Firer shall ensure that the minimum distances are determined and communicated prior to the placement of blast guards.

## 5.2 Default Exclusion Zone Requirements

In the absence of a formal risk analysis, undertaken by an externally accredited blasting consultant, the following minimum Exclusion Zone distances shall apply:

- For non-blast personnel 800m in front of the shot and 400m to the side and rear of the shot.
- Blast personnel must be positioned greater than 400 metres from the shot and not positioned in the direct line of fire and within retreat distance of a protective structure (i.e. fixed plant or blasting bell).
- No mobile plant is to be within 300 metres of the initiation point without signed site manager's approval.
- Where a blast is to occur within 100 metres of fixed plant an appropriate blasting specialist shall be engaged to design and control the loading and firing process.

# 6. Blast Notification Protocols

Through ongoing consultation a blast notification protocol has been developed. The protocol will continue to be reviewed and amended were required. Any amendments to this blast management plan are to be approved by the Secretary (DPE).

The notification protocol is as follows:

- In accordance with operational approvals, notifications are to be given to all persons/operations whom may be alarmed/effected by the blasting process. (see Section 6.1 and 6.2)
- A Blast Sign is erected at the entrance to the Dunmore Quarry site. This sign details the next planned blast; ie "The Next Blast will occur on", "the date in full" and the Approximate "Time of Blast".
- A red flashing light located on the Dunmore Quarry Blast Sign is activated on the morning of the planned blast. Alerting workers, contractors and visitors to the site of the planned blast.
- Approximately 60 seconds before the blast an audible alarm is activated at the quarry as a final warning of the impending blast.

The following tables detail notification & approvals required for this site.

## 6.1 Internal Notifications

Prior to the morning of the blast and also on the morning of the blast quarry staff and relevant contractors onsite are notified of the planned blast through the use of toolbox talks and discussions.

## 6.2 Neighbours

On the morning of the blast a member of the Drill and Blast team notifies the members of the Blast Notification List. The preferred method of contact either text message or phone call is used to notify the residence the approximate time of the impending blast. If required or requested further follow calls are made before the blast.

External Blast Notification details are listed and coordinated for each blast using a Blast Notification List. See **Attachment C** for details. This list is amended as required, following updated contacts and as residents request notification.

# 7. Monitoring Program

All blast activities at Dunmore Quarry are visually recorded and monitored for air blast overpressure and ground vibration impacts at key locations around the quarry. Results are used for continuous improvements for blasting and for investigation any un-expected exceedances. The placement of the detection device is to be in-accordance with the manufacturer's details (i.e. concrete plinth etc).

The Mine Manager (or their delegate) will retain all blast reports (for a minimum of four years) and prepare a monthly summary of all blast activity conducted. An annual summary of the blast monitoring results will be compiled and submitted to the EPA within the Annual Return for the Licence: EPL 77, and also submitted to the DPE in the Annual Review for Dunmore Quarry.
The table below details the parameters which are to be monitored.

| **Parameter** | **Airblast overpressure level** | **Peak particle velocity** | **Allowable exceedance** |
|---|---|---|---|
| **Criteria** | 115 dB(Lin Peak) | 5 (mm/s) | 5% of the total number of blasts over a period of 12 months |
| | 120 dB(Lin Peak) | 10 (mm/s) | 0% |
| **Frequency** | During every blast | During every blast | - |
| **Sampling method** | AS2187.2-1993 | AS2187.2-1993 | - |
| Source: DA 470-11-2003,. EPL 77 | | | |

## 7.1 Placement of Blast Monitors


| Monitoring Station | Entry Address | Station Description | GPS Coordinates |
|---|---|---|---|
| A | Entry is from the end of Croome Road. | The monitoring position is located approx. 115m South East of the Benny residence on the Boral property line. | Latitude: -34.599995065<br>Longitude: 150.800225506 |
| B | Entry is from the rear gate of the quarry or alternately from Croome Vale Road. | The monitoring position is located approx. 85m North of the McParland residence on a solid rock floater. | Latitude: -34.60787<br>Longitude: 150.805488 |

## 7.2 Placement of Visual Recorders

High speed visual recording equipment will be placed to record the behaviour of all faces and benches under blast conditions. Multiple pieces of recording equipment may be required depending on the complexity of the blast.

## 7.3 Meteorological Assessment

Meteorological data will be evaluated prior to blasting, and as close as practical to the time of blasting. The expected weather conditions and their effect on the airblast level (as well as dust and fumes) generated by blasting will be considered and blast plans and/or timing altered, if necessary.

Meteorological conditions that will be considered are:

- Prevailing winds including their direction and velocity.
- Time of day.
- Seasonal effects on weather patterns.
- Cloud cover.

Blasting will be avoided, where possible, under the following meteorological conditions:

- When winds are blowing from the blast site to the nearest receiver at a strength (>10m/s) likely to enhance blasting impacts.
- When there is heavy low-level cloud.

The above meteorological triggers may be amended based on best practice or on the basis of blast monitoring.

## 7.4 Non Compliance And Corrective Action

In the event that the monitoring results from a blast identify an exceedance of the air blast overpressure and/or ground vibration criteria at a licenced blast monitoring location, Dunmore Quarry will, report the incident immediately to the EPA and the Secretary and will initiate investigations as to the cause.

Within 7 days days of providing this notification, Dunmore Quarry will provide the EPA and the Secretary with a written report, consistent with the relevant conditions of the EPL and schedule 5 condition 7 of the consent:

- Identifying the date, time and degree of the exceedance.
- Identifying the cause or likely cause of the exceedance.
- Describing the actions taken in relation to the exceedance.
- Identifying any measures being undertaken to minimise the risk of future exceedance of blasting criteria.

## 8. Complaints Handling

Any general complaint received relating to any blast will be managed in accordance with the following.

- Details of the complainant and complaint will be recorded within SIMS.
- Boral representatives will liaise with the complainant to identify the nature and source of the issue and obtain supplementary information.
- Investigations will be initiated to verify or otherwise the basis of the complaint.
- Results of the investigation will be provided to the complainant and the Environmental Protection Authority (should the regulator become involved) together with advice as to any changed blast management practices to be implemented as a consequence of the investigation.
- A sign shall be posted at the entrance of the quarry with contact details for complaints handling.
- Complaints will be reflected in the complaints register published on the Boral Dunmore Quarry website
- A summary of all blasts complint will aslso be included in the Annual Review

## 9. Continuous Improvement of Blast Design

Boral will liase with Orica from time to time for the purpose of continuous improvement of blast design at Dunmore Quarry.

## 10. Review of the Blast Management Plan

Will be reviewed as per schedule 4 condition 5 of the development consent.

## 10.1 Authorisation Control

| Document Version | Update Inclusions | Approval required by | Date of Approval | Signed Approval |
|---|---|---|---|---|
| Version 1<br>Rod Wallace (E & C Advisor Quarries NSW) | Initial Document | Greg Price (GM Quarries & Recycling NSW | 21/01/2008 | |
| Version 2<br>N. Constantine (OHS Advisor) | - Internal Edits<br>- Meet Australian Standards<br>- Integrate with Boral Standard Operating Procedure | Todd Kalajzich (Quarry Manager) | 07/02/2013 | |
| Version 3<br>R. Lawton (Env. Coordinator) | - >3 years since last review<br>- Contacts updates<br>- Internal edits | B. Bolton (Quarry Production Manager) | 26/08/2016 | |
| Version 4<br>R. Lawton (Env. Coordinator) | - Following review from DPE&E: Included further detail regarding incident reporting ; and included action to investigate management of heritage values of buildings on Lot 10 97731. | | 11/11/2016 | |
| Version 5<br>S.McLean<br>(Production Supervisor)<br>R.Johnson<br>(Environment Operations Manager) | - >1 Year since last review.<br>- Updated to reflect conditions in EPL77 and Development Consent DA 470-11-2003<br>- Change of blast monitor locations | B. Bolton (Quarry Manager) | 27/3/2018 | |
| Version 6<br>Ben Williams<br>(Env. Coordinator) | Updates to figures<br>Updates to Notification List<br>Current SWMS added | B.Bolton<br>(Quarry Manager) | 26/2/2019 | |
| Version 7<br>Rod Johnson<br>(Enviro Ops Manager) | Updates to plan following feedback/comments from DPE | B.Bolton<br>(Quarry Manager) | 10/5/2019 | |

| | | | | |
|---|---|---|---|---|
| Version 8<br>Rod Johnson<br>(Enviro Business Partner) | Updates to plan following feedback/comments from DPE<br>(May 2019) | B.Bolton<br>(Quarry Manager) | 27/5/2019 | |

## Attachment A: Safe Work Method Statement (Drilling & Blasting)

| Division: | Business Unit: | Date: | SWMS No: 1 |
|---|---|---|---|
| Construction Materials & Cement | **Quarries & Recycling (NSW)** | **23/6/17** | |

**Site Address:**

**Dunmore Quarry, Tabbitta Road, Dunmore, NSW 2529**

**Work Activity:**

**Drill and Blast operations on an existing Quarrying Operation with an existing Approved \ Pit Plan**

**(NOTE:** This SWMS does not cover the establishment of pit design and blasting parameters of the green field site**)**

| Plant and Equipment to be used: | Competencies and Qualifications: |
|---|---|
| Drill rig, Float, MMU Light vehicles, Laser profiler, Bore-track equipment | Certificate III Surface Drilling Operations Shot Firer's Competency |
| **Emergency planning required?** **Yes:** ☒ **No:** | **Relevant legislation and/or guidance material:**<br>• Act and Regulations.<br>• Code of Practice<br>• AS1657 Platforms and Walkways.<br>• AS 2187 Transport and Handling of Explosives.<br>• State/Territory Environmental legislation.<br>• GRP-HSEQ-6-09 Drilling and Blasting<br>• Boral HSEQ Management System.<br>• HSEQ-2-09-F01 Emergency Response Plan |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | **Administration and Legislation** | | | | | | | | | |
| 1 | Obtain Legislative Approvals | • People responsible for undertaking blasting activities on site are able to access relevant licences, permits or legislative approvals needed for blasting activities | 4 | 3 | H | • Development Consent<br>• Blast Management Plan<br>• Responsible individuals undertake Boral's Blast Supervisor Training<br>• Shotfirers licence<br>• Australian Standards | 4 | 1 | M | |
| 2 | | • Other Licencing Requirements | | | | • Licence to purchase explosives<br>• Licence to manufacture explosives<br>• Licence to transport explosives<br>• Licence to store explosives<br>• Licence to Transport Dangerous Goods<br>**Note: Boral (NSW/ACT) have a national contract with an Explosives Supplier (Orica), who are responsible for the supply, manufacture and transport of explosives used on Boral sites.**<br>**Boral (NSW/ACT), does not permanently store explosives on any of its sites.**<br>**Overnight storage of explosives within a licenced explosives vehicle is permitted on sites where a security guard is present – See Sleeping of Shots.** | | | | Explosives Supplier |
| | **Transport and Security of Explosives** | | | | | | | | | |
| 3 | Transport to and From Site | • Equipment does not meet | 4 | 3 | H | • Transport is undertaken by explosives supplier.<br>• Licence to manufacture is supplied by supplier | 4 | 1 | M | Explosives Supplier |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | Australian Explosives Code (AEC) requirements. | | | | | | | | |
| 4 | On site transportation | • Vehicle Collision, Roll Over<br>• Major spillages of explosives or ingredients<br>• Premature detonation of explosives vehicle<br>• Emergencies involving Explosive Vehicle<br>• Miss-Identification of explosive vehicle | 4<br><br><br><br><br>5 | 3<br><br><br><br><br>2 | H<br><br><br><br><br>E | • Site Induction<br>• Explosives vehicle escorted to and from shot, via the most direct and appropriate route<br>• Explosives vehicle signposted as per Dangerous Goods legislation<br>• Explosive vehicles have RIGHT OF WAY on site at all times – positive communication to be enforced when travelling on site<br>• Bench Preparation is established beforehand with PART B of Drill and Blast Design Form HSEQ-6-09-F03<br>• Vehicle designed and maintained to AEC standards.<br>• Detonators and High Explosives stored and separated correctly<br>• No ignition sources in explosives vehicle<br>• No smoking within 15 metres of explosive vehicle<br>• Only diesel powered vehicles are permitted to carry explosives or be within the delineated blast area.<br>• Explosives Emergency (Mining) Procedure;<br>HSEQ-2-09-F01 Emergency Response Plan, Section 5.7 | 4<br><br><br><br><br>5 | 1<br><br><br><br><br>1 | M<br><br><br><br><br>M | Site Manger<br>Blast Supervisor<br>Orica Shotfirer,<br>MMU Operator |
| 5 | Security of Explosives | • unauthorised access to shot<br>• Lost/Suspended Security Clearance or Licence<br>• Loss or theft of explosives | 4 | 3 | H | • Only licenced personnel are to handle explosives. Licences and Security Clearances are collected locally at each site at during annual induction.<br>• Shotfirer's Security Clearance and Licence are to be acknowledged as sighted by Mine Manager/Blast Supervisor on every shot.<br>• Shot perimeter is bunded and signposted to prevent unauthorised access. | 4 | 1 | M | Shotfirer<br>Blast Supervisor<br>Site Manger |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | | | | | • Explosives are not stored on site overnight. Explosives are delivered for use on site on the day of loading and firing.<br>• If a shot is required to be slept, all holes are to be stemmed and no surface detonators are to be in place and regular security inspections are to be established by risk assessment.<br>• Explosives are counted and reconciled against number of holes loaded prior to shot being fired.<br>• Where initiating explosives do not reconcile, Mine Manager and Shotfirer to investigate to determine if theft is likely cause, and report to Police and regulatory authorities as per Emergency Explosives Emergency (Mining) Procedure;<br>HSEQ-2-09-F01 Emergency Response Plan, Section 5.7 | | | | |
| | **Blasting History and Consultation** | | | | | | | | | |
| 6 | Establish/develop Blasting parameters to suit individual site requirements | • Limited information for new operations<br>• Close proximity to critical infrastructure or sensitive receivers<br>• No constraints placed on blast design<br>• No process for blast design modification<br>• Loss of blasting History | 4 | 3 | H | • Consult with geologists and mine planning professionals to establish blast design parameters and identify any geological changes within pit. In particular, new sites are to be assessed for any Hot or Reactive ground.<br>• Conduct small trial blasts to determine environmental sensitivity.<br>• Blast Management Plan to identify Critical Infrastructure Sensitive Receivers<br>• Establish Standard Blasting Parameters to define limits to blast design.<br>• Establish process to evaluate, assess and approve departures from standard blast parameters.<br>• Establish ‘shot pack’ that specifies and holds records for all documents that relate to the blast. Shot packs are to be stored on site and periodically audited. | 4 | 1 | M | Drill & Blast Manager<br><br>Site Manager |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | **Environmental Impacts** | | | | | | | | | |
| 7 | Establish blast monitoring | • Regulatory requirements and limits for blasting unknown<br>• Atmospheric conditions on day of blast cause overpressure exceedance.<br>• Variations to hole loading that may cause environmental impact. | 3<br><br><br><br><br>3 | 3<br><br><br><br><br>3 | H<br><br><br><br><br>H | • Blast Management Plan identifies blasting times and limits for overpressure and vibration.<br>• Standard Blast Parameters also define environmental monitoring points and limits for vibration and overpressure for blast designer.<br>• Quarry Manager may cancel shot at any time.<br>• Part H of HSEQ-6-09-F05 Loading and Firing form reviews blasting control risks and specifically asks if prevailing weather conditions and the risk of breeching an environmental licence condition be considered.<br>• Procedure established to sleep shots when necessary.<br>• Holes that are found to have problems which may increase risk of environmental exceedance (ie. bridged hole), are to be assessed by Quarry Manager and Shotfirer and controls put in place. | 1<br><br><br><br><br>1 | 1<br><br><br><br><br>1 | L<br><br><br><br><br>L | Site Manger<br>Blast Supervisor |
| | **Roles and Responsibilities** | | | | | | | | | |
| 8 | Competency of those involved in blasting operations | • Individuals not competent<br>• Individuals not fit to undertake duties | 4<br><br><br>4 | 3<br><br><br>3 | H<br><br><br>H | • Mine Managers and Blast Supervisors are to hold shot firing competency.<br>• Mine Managers and Blast Supervisors are to be trained in the Boral Drill and Blast process and forms before they can undertake drill and blast duties.<br>• Random and Blanket Drug and Alcohol Testing<br>• Observed Impairment training for managers and supervisors. All blast personnel shall be fit for work prior to commencing blasting operations as per Boral Standard HSEQ 4-01 Fit for Work – Fit for work declaration also included in induction. | 2<br><br><br>2<br><br>3 | 1<br><br><br>1<br><br>1 | L<br><br><br>L<br><br>L | Drill & Blast Manager<br><br>Mine Manger<br>Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| 9 | | • Roles and responsibilities are not understood | 4 | 3 | H | • Blast Management Plan identifies Roles and Responsibilities. Forms F03 and F05 which guide the Drill and Blast process identify who is responsible to sign-off each stage of the process, and defines what they need to ensure has taken place.<br>• Mine Managers and Blast Supervisors are to be trained in the Boral Drill and Blast process and forms before they can undertake drill and blast duties. | 1 | 1 | L | SiteManger<br>Blast Supervisor<br><br>Drill & Blast Manager |
| | **Planning – Blast Request** | | | | | | | | | |
| 10 | Establish forward production schedule. | • Current production interferes with next blast activities.<br>• Insufficient raw feed | 3<br>3 | 3<br>3 | H<br>H | • Establish Pit Plans that provides free faces for profiling and clear access to blast zones (i.e. more than 2 working faces).<br>• Forward planning earlier enough to comfortably carry out drill & blast and still hold buffer stock. | 1<br>1 | 1<br>1 | L<br>L | Site Manager |
| 11 | Identify location, volume and delivery date. | • Blast occurs outside approved Pit Plan.<br>• Blast occurs in the wrong rock location<br>• Delivery date is not achievable (pressure to cut corners).<br>• Unsafe bench & faces (i.e. geological risks) within proposed | 4<br>3<br>3<br>4 | 2<br>2<br>3<br>2 | H<br>M<br>H<br>M | • Ensure that an approved Pit Plan is in place.<br>• Confirm blast area with Site Supervisor by walking the area and physically identified with paint (including RL & GPS).<br>• Blast Planning process to commence 2 shots ahead of current production (this is not meaning the shot is on the ground)<br>• Complete Parts A&B of the Drill and Blast Design form and implement controls. | 1<br>1<br>1<br>1 | 1<br>1<br>1<br>1 | L<br>L<br>L<br>L | Site Manager |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | blast area | | | | | | | | |
| 12 | Establish Blast Identification No. and put together the Blast File. | • Loss of records | 2 | 2 | M | • Record as per Boral record keeping requirements | 1 | 1 | L | Site Manager |
| 13 | Procure Drill and Blast resources and materials to carry out activities. | • Site personnel not skilled in the process.<br>• Obtaining non-competent providers of services<br>• Ordering incorrect IE & Bulk explosives | 3<br>3<br>3 | 2<br>2<br>3 | M<br>M<br>H | • Drill & Blast Team to coordinate and conduct training for site personnel with Drill & Blast responsibilities.<br>• Drill & Blast Team to source and monitor performance of external service providers.<br>• Site Blasting Perimeters are developed and enforced. | 1<br>1<br>1 | 1<br>1<br>1 | L<br>L<br>L | D&B Manager<br>D&B Manager<br>D&B Manager |
| 14 | Identify unique blasting requirements (i.e. Blasting for mobile, blasting for large rock, loading equipment, proximity to sensitive buildings/ services etc.). | • These items have not been identified, leading to unsafe outcomes.<br>• Site Manager un-aware of local services and proximity | 3<br>3 | 3<br>3 | H<br>H | • Blast request specifically prompts for specific site requirements & non-specific blast requirements.<br>• Undertake the Drill and Blast Risk Assessment as basis for the site's Blast Management Plan.<br>• Site Manager to understand the requirements of the site's Blast Management Plan. | 1<br>1 | 1<br>1 | L<br>L | Site Manager |
| | **Preparing the Area for Extraction** | | | | | | | | | |
| 15 | Clear overburden/ dress area. | • Unsafe bench gradients.<br>• Mobile plant over | 4<br>4 | 3<br>2 | H<br>H | • Undertake a risk assessment to determine implication to Blast Plan (i.e. Geometry), access roads and the selection of drill rig and blasting plant.<br>• Dress face with FCR or appropriate material.. Mobile plant | 1<br>2 | 1<br>1 | L<br>L | Site Manager<br>Site Manager |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | face | | | | to work 90 degrees to the face. | | | | |
| 16 | Establish the face bunding. | • Wrong height<br>• Fall from Height | 3<br>4 | 2<br>2 | H<br>H | • Establish edge protection or bund on crest (FCR or Dust) - height of half wheel height of largest machine that operates within shot area<br>• Paint 'no-go' line at two metres from crest | 3<br>2 | 1<br>1 | L<br>L | Site Manager<br>Surveyor |
| 17 | Establish the perimeter bunding including the entry / exit points. | • Perimeter bunding too close to high wall (i.e. Face).<br>• Risk of Mobile Plant/ Light Vehicle access to area when shot is loaded or damaging holes | 4<br>3 | 2<br>3 | H<br>H | • Perimeter to be delineated to be positioned away from the high wall face. Options include bunding or flagging.<br>• Establish and identify light vehicle/plant parking area outside of shot perimeter. Entry and Exit of blast area must be blocked with sign stating "No Unauthorised Access" | 1<br>1 | 1<br>1 | L<br>L | Site Manager<br>Site Manager |
| 18 | Assess geological risks. | • Unsafe bench & faces (i.e. geological risks) within proposed blast area | 4 | 2 | H | • Review with the blast designer Parts A&B of the Drill and Blast Design form (HSEQ-6-09-F03), and implement additional controls.<br>• Seek expert for issues around ground stability (i.e. potential for greasy back or dislocation etc).<br>• Update BMP with specific control measures. | 1<br>1 | 1<br>1 | L<br>L | Site Manager<br>Site Manager |
| | **Design the Blast** | | | | | | | | | |
| 19 | Commission Blast Designer. | • Blast designer not qualified for blast type | 4 | 2 | H | • Preferred prequalified Service Provider.<br>• The approval process must identify the competency/proficiencies of the Blast Designer.<br>• Drill & Blast Manager to establish and communicate | 1<br>1<br>1 | 1<br>1<br>1 | L<br>L<br>L | Procurement<br>D&B Manager<br>D&B Manager |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | • Blast designer not experienced | 4 | 2 | H | contractual and operational requirements with Blast Designer.<br>• Service provider is to provide competency/proficiency levels for various types of blast design; including escalation protocols. (to be included in the Blast Pack). | 1 | 1 | L | Procurement<br>D&B Manager |
| 20 | Blast proposal developed by surveyor / blast designer. | • Design unsuitable/unsafe | 3 | 3 | H | • Blast designer is to refer to the site's Standard Blasting Parameter and previous blast performance records.<br>• Competent person to undertake task | 3<br>1 | 1<br>1 | M<br>L | Blast Designer<br>Site Manager<br>D&B Manager |
| 21 | Blast proposal is submitted to site manager for review and approval. | • Manager not qualified to review and accept design | 3 | 3 | H | • Site Manager is to review the Blast Proposal against the site's Standard Blasting Parameters and determine any escalation requirements due to technical abnormalities.<br>• The Standard mandates competency requirements and where absent, the General Manager is to appoint a support person (i.e. Shot Firer or Blast Supervisor) to oversee. | 2<br>2 | 1<br>1 | L<br>L | Blast Designer<br>Site Manager<br>D&B Manager<br>General Manager |
| 22 | The approved Blast Proposal is converted into the "Drill Plan" and by the appointed Blast Designer. | • Laser profile has not been used to develop the Drill Plan | 4 | 2 | H | • Site Manager is to approve and check that the laser profile has been incorporated into the Drill Plan<br>**Note: Buffer Blasting does not require laser profiling** | 2 | 1 | L | Site Manager |
| 23 | The approved Blast Proposal is converted into the "Loading and Tie Up Plan" and by the appointed Blast Designer. | • The Drill Logs and Bore Track Data has not been use to develop the "Loading and Tie Up Plan" | 4 | 2 | H | • Refer to the "Drill Log" and "Bore Track" step that will provide information for the "Loading Plan & Tie Up Plan" development.<br>• Site Manager is to approve and check that the "Load and Tie Up Plan". | 2<br>2 | 1<br>1 | L<br>L | Site Manager |
| 24 | The "Loading & Tie Up Plan" is submitted to the Site Manager for review and approval. | • Manager not qualified to review and accept the "Loading & Tie Up Plan" | 4 | 2 | H | • The Standard mandates competency requirements and where absent the Operation Manager is to appoint a support person (i.e. Shot Firer or Blast Supervisor) to oversee.<br>• Explosive provider is to develop risk assessment to justify | 2 | 1 | L | Site Manager |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | • Non Standard timing plan is specified. | 3 | 2 | M | the reasons for non-standard timing sequencing and model implications to MIC and burden relief. If blast does not conform to Standard Blasting Parameters (as defined in BMP), variation is to be authorised by Regional GM. | 2 | 1 | L | Blast Designer |
| | **Mark out Blast Design** | | | | | | | | | |
| 25 | Laser Profile to survey face and determine the true "AB Line" and position staffs at both ends and spray paint line. | • "AB Line" is in the wrong orientation | 3 | 3 | H | • Competent operators in the use of the laser profiler. | 1 | 2 | L | Drill & Blast Manager |
| | | • Survey equipment not operating correctly | 2 | 2 | L | • Profiler is within calibration date. | 1 | 1 | L | Surveyor |
| | | | | | | • Profiler is checked against two known RLs to confirm accuracy of profiler prior to commencing mark out of the drill holes. | 1 | 1 | L | Surveyor |
| | | • Interaction with HME, Light vehicles and people | 4 | 2 | H | • Site Induction and familiarisation with site layout.<br>• Positive Radio communication.<br>• Approved access to pit/ aware of HME movements. | 1 | 1 | L | Site Manager |
| | | • Falls from a height | 4 | 2 | H | • Face Bunding and High Wall protection is in place | 1 | 1 | L | |
| | | • Slips, trips and falls | 3 | 2 | M | • Floors/Benches are clear of trip hazards | 1 | 1 | L | Site Manager |
| | | • Working/parking under high faces | 4 | 2 | H | • Face Bunding and High Wall Protection is in place<br>• Establish and identify light vehicle parking area outside of shot perimeter. | 1 | 1 | L | Site Manager |
| 26 | Mark out the remainder of the shot | • Marking out is not to design and out of square. | 3 | 3 | H | • Establish a method to ensure that each rows and square to the AB Line using "345 Triangle", Optical Square, and profiler. | 1 | 1 | L | Person appointed to mark out |
| | | • Uneven floor below shot | 2 | 2 | L | • Measure levels at sufficient point to ensure that undulations are not reflected in the floor below. | 1 | 1 | L | |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | • Working in proximity to rear high wall face | 3 | 2 | M | • Shot Perimeter delineation is in place | 1 | 1 | L | |
| | **Drill the Shot** | | | | | | | | | |
| 27 | Appoint Drill Contractor. | • Mobile Plant is not suitable for the shot. | 3 | 2 | M | • Use only Boral approved Contractors<br>• Make sure the rig is suitable for the shot - some rigs are more suitable to different geology and gradient etc. If drilling on steep terrain, verify safe operating limit of machine earmarked for drilling. Carry out Risk Assessment as necessary. | 1 | 1 | L | Drill and Blast Manager<br>Site Manager |
| | | • Driller not competent | 3 | 2 | M | • Competent against National Competency Units in accordance with D&B Standard or VOC. | 1 | 1 | L | Drill and Blast Manager |
| | | • Contractors SMP not adequate for work being undertaken | 3 | 2 | M | • Work in accordance with the D&B Standard and associated processes (i.e. SWMS)<br>• SWMS distributed to Site Managers for review and approval | 2<br>2 | 1<br>1 | L<br>L | Drill & Blast Manager<br>Site Manager |
| 28 | Float Mobile Plant onto site. | • Struck by | 3 | 2 | M | • Loading & Unload is carried out in accordance with relevant Boral Standards and associated SWMS. | 1 | 1 | L | Site Manager |
| | | • Rollover | 4 | 2 | H | • Competent and experienced operator<br>• Site Supervision is to be present at the time of loading and unloading. | 4 | 1 | M | Drill Operator<br>Site Manager |
| 29 | Inspect Mobile Plant. | • Mobile Plant not fit for work. | 3 | 2 | M | • Mobile Plant is to be inspected by a competent person using BCM's Specifications. Mobile Plant and Vehicle 'Fit for Purpose' inspection. | 1 | 1 | L | Site Manager |
| 30 | Undertake Contractor Management Process | • Contractor not approved to work onsite | 3 | 2 | M | • Supply Contract in place<br>• Site Induction, Review SWMS<br>• Complete the "Contractor Work Details", form and ensure | 1 | 1 | L | D&B Manager<br>Site Manager |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | | | | | that associated controls are in place.<br>• Job details and documentation recorded in the “Task Authorisation Register”. | | | | |
| 31 | Drill Operator to collect Drill Plan from the Site Manager and receive any specific briefing. | • Loss of Drill Plan | 2 | 1 | L | • Ensure that the Blast File contains all master document/records and forms to be used in the process of drill and blast. Only copies are to be issued for use in the field.<br>• A soft copy is to be maintained in accordance with BCM Record Management Procedures. | 1<br>1 | 1<br>1 | L<br>L | Site Manager<br>Site Manager |
| 32 | Tram mobile plant to shot area. | • Interaction with other operations onsite<br>• Drill rig roll-over | 2<br>4 | 2<br>2 | M<br>H | • Shift Supervisor to brief (i.e. toolbox) site operational personnel about presence of drilling operations.<br>• Drill Rig to have mast in ‘Tramming’ Position<br>• Driller to operate within manufacturers specification | 2<br>2 | 1<br>1 | L<br>L | Site Manager<br>Drill Operator<br>Drill Operator |
| 33 | Set up Mobile Plant on the “AB Lines” and drill front row. | • Not align to the AB & XY Line (i.e. Azimuth)<br>• Excessive deviation on front row.<br>• Plant over face | 3<br>4 | 3<br>2 | H<br>H | • Check drill angle against the design angle using the inclinometer on drill rig mast.<br>• Drill checks the drill hole depths<br>• Establish method for orientating/checking mast to be square to “AB Line”<br>• Guide tube to be used when drilling front row.<br>• Bore Track “AB Line” (i.e. the complete row)<br>• Bunding – Edge Protection | 2<br>3 | 1<br>1 | L<br>L | Drill Operator<br>Surveyor<br>Site Manager<br>Drill Operator |
| 34 | Drilling activities (i.e. changing drill rod/bit). | • Manual Handling | 3 | 2 | M | • Operate in accordance with drill specific SWMS.<br>• Drilling SWMS available on site. | 2<br>2 | 1<br>1 | L<br>L | Drill Operator<br>Drill and Blast Manager |
| 35 | Drill remaining holes. | • Not aligned to the XY Line (i.e. Azimuth) | 3 | 3 | H | • Check drill angle against the design angle using the inclinometer on drill rig mast. | 2 | 1 | L | Drill Operator |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | • Drill accuracy impacting on Blast Result | 3 | 3 | H | • Driller checks the drill hole depths<br>• Establish method for orientating/checking mast to be square to “AB Line”<br>• Bore Track random holes (apart from face holes), at an appropriate time near the completion of drilling activities.<br>• Establish Driller Score Card to determine driller accuracy. | 2<br>2<br>2<br>2 | 1<br>1<br>1<br>1 | L<br>L<br>L<br>L | Surveyor<br>Surveyor |
| 36 | Review Driller Log. | • Holes are not to plan | 2 | 2 | M | • Driller to report variations to the Site Manager (or Blast Supervisor) on a daily basis. | 2 | 1 | L | Drill Operator |
| 37 | File Driller Log. | • Loss of records | 2 | 2 | M | • Ensure that the Blast Pack contains all master document/records and forms to be used in the D&B process. | 2 | 1 | L | Site Manager/Blast Supervisor |
| 38 | Place stemming in various locations on the shot. | • Incorrect size stemming<br>• Interference with the holes – collapse of holes | 3<br>3 | 2<br>3 | M<br>H | • Aggregate is to be approximately 10% of hole diameter (quarry usually 10mm).<br>• A spotter is to guide FEL operator around the shot (PPC&E + Communication device) | 1<br>3 | 1<br>1 | L<br>M | Site Manager<br>Site Manager |
| **Finalise Blast Design (i.e. Loading & Tie Up Plan)** | | | | | | | | | | |
| 39 | Blast Designer to check drill logs against original design | • Variances are not within tolerance of the original design.<br>• Geological anomalies increase risk when applying standard blast | 3<br>3 | 2<br>2 | M<br>M | • Two (2) working before the day of loading the shot, the Site Manager (or Blast Supervisor) is to provide Driller Logs to Blast Designer to determine any variance in the Blast Design. Any changes are to be incorporated within the Load Plan and Tie-Up Plan.<br>• Drill Logs are to accurately record the drilling conditions of each hole.<br>• Two (2) working before the day of loading the shot, the Site Manager (or Blast Supervisor) is to provide Driller | 2<br>2<br>2 | 1<br>1<br>1 | L<br>L<br>L | Site Manager<br>Blast Designer<br>Driller<br>Site Manager<br>Blast Designer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | design (i.e. clay etc) | | | | Logs to Blast Designer to determine any variance in the Blast Design. Any changes are to be incorporated within the Load Plan and Tie-Up Plan. | | | | |
| 40 | Site Manager and Blast Supervisor is to review finalised Blast Design before the loading of the shot. | • The review & approval process is not completed by the Site Manager (or Blast Supervisor). | 4 | 2 | H | • Blast Supervisor Training<br>• Before mobilising to load and fire the shot, Explosives Supplier to receive written authorisation by Site Manager to load and tie up the shot under Drill and Blast Design Form HSEQ-6-09-F03, PART F: AUTHORISATION TO LOAD & TIE UP THE SHOT | 2 | 1 | L | Drill and Blast Manager<br><br>Site Manager |
| | **Notifications** | | | | | | | | | |
| 41 | Communicate with neighbours and customers about the intended Blast (i.e. 24hrs and local requirements for road closures). | • Persons within exclusion zones<br>• Community courtesy to prevent alarm. | 3<br>3 | 3<br>2 | H<br>M | • Undertake a risk assessment concerning who may gain access to the quarry or its exclusion zones;<br>○ neighbours;<br>○ co-located facilities;<br>○ any sensitive or vulnerable facilities (i.e. air space, inhabited underground areas, schools), and;<br>○ Public road authorities. | 2<br>1 | 1<br>1 | M<br>L | Site Manager/Blast Supervisor |
| | | • Notification is not received | 3 | 2 | M | • Display Blast time & date at entry to Quarry<br>• Emails are issued to read receipt. Diarised evidence of phone calls. Complete Record form and issue to the Pre-Blast meeting for checking. | 1 | 1 | L | |
| | | • Shot brought forward (i.e. Due impending storm) | 3 | 2 | M | • Reissue verbal communications and seek approval from recipient. Complete Record form and issue to the Pre-Blast meeting for checking. | 1 | 1 | L | |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | | | | | | | | | |
| **Load Shot – Secure Area** | | | | | | | | | | |
| 42 | Entry to site by explosive vehicles. | • Un-authorised Entry | 4 | 2 | H | • Use only approved suppliers. Site induction. Review of SWMS & issuance of permits. | 2 | 1 | L | Site Manager |
| | | • In-correct amount of explosives delivered to site | 3 | 2 | M | • Weighing in and out of the MMU Vehicle. | 2 | 1 | L | Shotfirer |
| | | • Vehicle to Vehicle Collision | 4 | 2 | M | • Escort Explosive Vehicles whilst onsite<br>• Explosives vehicle escorted to and from shot, via the most direct and appropriate route | 2 | 1 | L | Blast Supervisor |
| 43 | Shot Firer secures area. | • Non-qualified, un-inducted, un-licensed people and equipment permitted within secured are. | 3 | 3 | H | • Site induction, Review of SWMS & permits.<br>• Blast Supervisor is to identify any other activities adjacent to explosives loading operations, and assess and amend the Inner Exclusion Zone as appropriate (Minimum 50 meters from in front of blast free-face) taking into consideration the nature of work, frequency and duration of exposure.<br>The Inner Exclusion Zone shall be identified by being cordoned off with flagging tape, flags, hazard blast cones, signage or other suitable means visible at all times to restrict unauthorised entry. | 2 | 1 | L | Blast Supervisor<br>Shot Firer |
| | | • Drilling activities being undertaken in close proximity to hole loading activity. | 5 | 3 | E | No holes to be loaded within 15 meters of drilling activity.<br>Loading limit to be defined and delineated by Shotfirer.<br>Shot to be reduced in size and/or drill to relocate away from explosives loading activities. | 5 | 1 | M | Shotfirer<br>Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
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| | | | C | L | R | | C | L | R | |
| | | | | | | | | | | |
| 44 | Shot Firer dips the shot. | • Over loading of holes, loss of holes, toe & oversize | 4 | 3 | H | • Shot dipped to confirm drilled length.<br>• Variations recorded on HSEQ-6-09-F05 Form – Load and Firing the Shot. | 1 | 1 | L | Shot Firer |
| 45 | Shot Firer to develop loading strategy. | • Trucks drive over baited holes, un-authorised access to secured area.<br>• Loading strategy is not defined and risks not identified<br>• Unsafe/unstable weather condition | 4<br>4<br>4 | 3<br>3<br>2 | H<br>H<br>H | • Undertake a documented Take 5.<br>• Toolbox the team about Loading Strategy for the shot that addresses:<br>○ Roles and responsibilities<br>○ Traffic Management Plan.<br>○ Overview and variation to the loading plan<br>○ Sequence of work<br>• Blast Supervisor and Shot Firer are to consider the weather conditions and any postponement where necessary. Where the shot is loaded and the weather conditions become unsafe the shot is to be secured / vacated and evacuate the site to a point outside the Exclusion Zone. The Site Emergency Response Plan is to consider this type of emergency scenario. | 3<br>3<br>2 | 1<br>1<br>1 | L<br>L<br>L | Shot Firer<br>Shotfirer<br>Shotfirer<br>Blast Supervisor |
| 46 | Explosive emergency encountered during Loading and Firing procedure | • Emergencies involving Explosives<br>• Fire in the Vicinity of Magazines or Shot Areas<br>• Electrical Storm approaching | 5 | 5 | E | • Follow the Explosives Emergency (Mining) procedure Form - HSEQ-2-09-F01 Emergency Response Plan, Section 5.7 | 3 | 1 | L | Mine Manager, Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | Loaded Shot<br>• Fire in direct contact with Magazine or Shot<br>• Premature Detonation in Blast Area's Storage or Transport of Explosives<br>• Detonation of Holes<br>• Detonations Caused by Hot or Reactive Ground<br>• Detonation in Vehicles or Magazines<br>• Unclear Causes of Detonation | | | | | | | | |
| 47 | Toolbox talk with the Blast Crew. | • Uncoordinated load & tie up – misfire etc | 4 | 2 | H | • As above | 2 | 1 | L | Shot Firer |
| **Load Shot – Place IE and Load Bulk Explosives** | | | | | | | | | | |
| 48 | Transport Initiating Explosives (IE) to shot. | • Start Inventory not in place | 3 | 2 | M | • Check that the starting inventory has been done before opening and laying out. Inventory must coincide with order and delivery docket. | 2 | 1 | M | Shot Firer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| 49 | Locate bulk Mobile Manufacturing Unit (MMU) to the shot. | • Not close enough to the furthest hole.<br>• Runs over / damages holes/down lines.<br>• Struck by | 1<br>4<br>2 | 2<br>2<br>2 | L<br>H<br>M | • Run out hoses to ensure correct proximity.<br>• Bench inspection.<br>• Do not place out the IE until the truck is correctly positioned.<br>• Spotter is in position. | 1<br>1<br>1 | 1<br>1<br>1 | L<br>L<br>L | MMU Operator |
| 50 | Position hoses to start pumping. | • As above | 2 | 1 | L | • As above | 1 | 1 | L | MMU Operator |
| 51 | Lay out the IE on the shot. | • IE is lost down the hole or in fine drill cuttings<br>• Uncontrolled explosion | 2 | 2 | M | • Place and not drop IE near hole. Keep hole-savers in place until ready to place IE in hole<br>• Keep primers and detonators separate up until the point of actually baiting the hole. | 2 | 1 | M | Shot Firer |
| 52 | **Place Bottom IE**<br>Place detonator in the bottom primer, lower detonator and primer into hole and secure the down line. | • Un-controlled explosion.<br>• Faulty manufacturer resulting in the detonator is exposed beyond the shrouding of the primer.<br>• Down line falls into the hole. | 5<br>3<br>3 | 2<br>2<br>2 | H<br>M<br>M | • Qualified, licenced and competent in explosive handling.<br>• Keep primers and detonators separate up until the point of actually baiting the hole.<br>• Inspect and reject faulty IE before loading.<br>• Secure the line at the surface. Use “spider” lead holder (can be supplied by Orica), or wrap lead around object (rock), ensuring the end of lead is exposed and lead is secured. | 3<br>3<br>2 | 1<br>1<br>1 | L<br>L<br>L | Shot Firer<br>Shot Firer<br>Shot Firer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| 53 | Run out product and perform gassing check before the commencing loading. | • Product does not initiate correctly | 3 | 2 | M | • Undertake “Cup Test” to ensure that gassing is occurring before loading holes. | 2 | 1 | L | MMU Operator |
| | | | | | | • MMU Operator is to randomly sample and monitor the Bulk Product gassing progress using an approved test method (i.e. Multiple Cup Test). Must comply with suppliers SOP. | 2 | 1 | L | MMU Operator |
| 54 | **Place Top IE**<br>Place detonator in the top primer, lower detonator and primer into hole and secure the down line. | • Un-controlled explosion. | 5 | 2 | H | • Qualified, licensed (Workcover Security Clearance) and competent explosive handling.<br>• Keep primers and detonators separate up until the point of actually baiting the hole. | 3 | 1 | L | Shot Firer |
| | | • Faulty manufacture resulting in the detonator being exposed beyond the shrouding of the primer. | 3 | 1 | L | • Inspect and reject faulty IE before loading. | 1 | 1 | L | Shot Firer |
| | | • Down line falls into the hole. | 3 | 2 | H | • Secure the line at the surface. Use “spider” lead holder (can be supplied by Orica), or wrap lead around object (rock), ensuring the end of lead is exposed and lead is secured. | 1 | 1 | L | Shot Firer |
| | | • Bulk hose becomes entangles (including dragging) with the lines of the Top Primer. | 3 | 2 | H | • Members of the Blast Crew are assigned to manage the placement of the Bulk Hose as it passes over the shot. | 2 | 1 | L | Shot Firer<br>Blast Crew |
| 55 | Start loading hole in accordance with Loading Strategy (usually start with the | • Hose too short to reach the bottom of the hole. | 3 | 2 | M | • Test hose length before laying out the IE. | 1 | 1 | L | MMU Operator & Hose handler |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | hole furthest away from the MMU). | | | | | | | | | |
| | | • Overloading / overcharging of hole. | 4 | 2 | H | • Dip holes before loading and load in accordance with Load Chart.<br>• Maintained line of sight communication between hose handler and MMU Operator. Hose Handler is to identify Hole ID to the MMU Operator who does not allow hole to be overloaded beyond 10% of Load Design. Where this occurs the Shot Firer is to investigate. | 3 | 1 | L | Shot Firer<br>MMU Operator & Hose handler |
| | | • Truck discharge meter out of calibration | 3 | 2 | M | • Undertake a bucket weight test to check and adjust calibration. | 1 | 1 | L | MMU Operator |
| | | • Losing Bottom Down Line down the holes. | 3 | 3 | H | • Down line is secured by holding in operators hand whilst pumping | 1 | 1 | L | Shot Firer |
| | | • Damaging and losing Top Primer next to the hole whilst loading | 3 | 3 | H | • Team to work away from loaded and primed holes to avoid contact with hose | 2 | 1 | L | Hose Handler |
| | | • Incorrect hose technique whilst loading the hose (i.e. Discontinuity in loading column and overloading) | 3 | 2 | M | • Competent Hose Handler. | 3 | 1 | L | Service Provider |
| | | • Explosives in hole | 3 | 2 | M | • Competent Hose Handler.<br>• Notify Shot Firer of 'run-away'. Shot Firer to reassess | 3 | 1 | L | Hose Handler |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | not rising due to 'run-away'. | | | | loading strategy for that hole. | | | | Shot Firer |
| 56 | Pull bottom line to ensure placement with in bulk explosive. | • Bottom IE not in Bulk Explosive and fails to initiate correctly. | 3 | 2 | M | • Pull Bottom IE approx 1 metre into Bulk Explosive. | 1 | 1 | L | Hose handler |
| 57 | Catch top primer in bulk explosive whilst loading. | • Top Primer not in contact with Bulk Explosive | 3 | 2 | M | • Competent Hose Handler who is able to demonstrate the correct procedure for the placement of the Top Primer **Or** Consider the alternative loading technique using a 1 inch PVC pipe to insert Top Primer approx 1 metre below the top surface of the Bulk Explosive. | 2 | 1 | L | Hose Handler |
| | | • If bottom IE does not detonate and Top IE is not in contact with the Bulk Explosive – resulting in un-initiated column or low power explosion. | 3 | 3 | H | • As above | 2 | 1 | L | |
| | | • Top Primer & line gets sucked into the hole. | 3 | 3 | H | • Top line secured by holding lead<br>• Re-prime hole prior to stemming with another primer and detonator. Note loss of IE on HSEQ-6-09-F05 form and load sheet. | 2 | 1 | L | Shot Firer |
| 58 | Continue loading sequence in accordance with the Loading Plan. | • As Above | | | | • As Above | | | | Blast Crew |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| 59 | Check Column Rise to confirm that the bulk has reached stemming height (i.e. Final Density). | • Excessive Stemming and in-efficient detonation. | 2 | 2 | L | • Shot Firer to measure and direct stemming activities accordingly. | 1 | 1 | L | Shot Firer |
| | | • Insufficient Stemming and in-efficient Detonation/flyrock | 3 | 3 | H | • Shot Firer to measure and direct stemming activities accordingly.<br>• Remove excess explosives from column with 'sucker pipe'. | 2 | 2 | L | |
| 60 | Stem / deck according to the loading specification / design / Shot Firer's instructions. | • Manual Handling Risk | 3 | 3 | H | • Undertake a Manual Handling Risk Assessment & implement controls. | 2 | 1 | L | D&B Team |
| | | • Fly Rock | 3 | 3 | H | • Stemming to Standard Blast Parameters.<br>• Correct material used for stemming. | 3 | 1 | M | Shot Firer |
| | | • Environmental Exceedances | 3 | 2 | M | • Appropriate stemming material and depth<br>• Timing Design with standard Blast Parameters | 2 | 1 | L | Shot Firer<br>Blast Designer |
| | | • Face Burst | 4 | 3 | H | • Face Profiling, Boretracking and Stemming | 2 | 1 | L | Shot Firer<br>Blast Designer |
| | | • Shot Firer carries out actions in response to serious variation without approval from the Site Manager & the Blast Supervisor. | 3 | 2 | M | • Site Manager & Blast Supervisor is to approve all significant variance to the loading of the front row holes prior to stemming. All approved variations to be recorded on HSEQ-6-09-F05 form. | 1 | 1 | L | Site Manager/ Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| 61 | Sleeping Shot | • General Risk | 4 | 3 | H | • Where necessary to sleep a shot, a risk assessment will be completed by persons with the appropriate expertise and authorised by the Mine Manager (or authorised Blast Supervisor). | | | | Site Manager/ Blast Supervisor |
| | | • Degradation of Down lines | 4 | 3 | H | • Shots will not be slept for more than seven (7) days. | 3 | 1 | L | |
| | | • Security of Shot Boundary | 4 | 2 | H | • The shot boundary will remain in place with a flashing light erected at all corners and at 50-metre intervals, otherwise a licenced Security Guard or the Shot Firer will be present for the entire time the shot is slept. | 4 | 1 | M | |
| | | • Security of Explosives Vehicle | 4 | 2 | H | • Explosives vehicle is parked and locked in a secure area. A licenced Security Guard or the Shot Firer will be present for the entire time the explosives vehicle is unattended. | 3 | 1 | L | |
| | | • Theft of Explosives | 4 | 1 | M | • All surface detonators will be removed and returned to the Magazine Keeper and/or the supplier. This is so no explosives remain on the surface of the shot other than secured lines. This rule applies regardless of how many nights the shot has been slept. The shot will be inspected at intervals reasoned to be necessary in the risk assessment. | 1 | 1 | L | |
| | | • Premature Detonation<br>• Electrical Storm | 4 | 3 | H | • If an unexpected electrical storm occurred while the shot is being slept, the site will be evacuated according to the exclusion zone distance requirements until the storm passes. | 4 | 1 | M | |
| | | • Wild Animals damaging down | 4 | 3 | H | • Where there is a risk of wild animals (goats) grazing or damaging downlines, down lines to be buried in dust to prevent risk of damage | 4 | 1 | M | |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | lines | | | | | | | | |
| | **Load Shot – Tie up** | | | | | | | | | |
| 62 | Review Tie Up Plan. | • Un-controlled blast sequence | 3 | 3 | H | • Check that the surface connectors are as specified according to design. | 1 | 1 | L | Shot Firer |
| 63 | Source surface detonators from the accessory vehicle (i.e. J Clips) and place in accordance with the Tie Up Plan (i.e. at the hole). | • Un-controlled blast sequence<br>• Holes/rows are missed. | 3<br>3 | 3<br>2 | H<br>H | • Check that the surface connectors are as specified according to design.<br>• Reconciliation process and Pre-blast Inspection Process. | 1<br>2 | 1<br>2 | L<br>L | Shot Firer<br>Shot Firer/Blast Supervisor |
| 64 | Connect surface detonators to down lines (.ie. Top and Bottom down lines) along the “Echelon” row. | • Incorrectly connected (i.e. Crossovers)<br>• Malfunction of Surface Detonator | 3<br>3 | 3<br>2 | H<br>H | • “Clip and slide” down lines in “J” clip connectors in a upwards direction for ease of inspection. Tails of down line coiled neatly and secured to a rock for ease of inspection.<br>• Inspect for soft “J” clips and replace. Do not step on surface connectors. Do not overload “J” clips (i.e. No more than 4 leads) | 1<br>1 | 1<br>1 | L<br>L | Shot Firer<br>Shot Firer |
| 65 | Establish the Control Row and connects each Echelon to the Control Row. | • Misfire | 3 | 3 | H | • Shot Firer is the sole person responsible for undertaking this task of establishing the Control Row and connecting the Echelon to it. | 3 | 1 | L | Shot Firer |
| 66 | Position and clearly identify the Initiation Point (including holes). | • Un-controlled blast sequence | 3 | 3 | H | • Shot Firer is the sole person responsible for undertaking this task of establishing the Initiation Point and connecting the Control Row to it. | 3 | 1 | L | Shot Firer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| 67 | Reconciliation of IE and bulk explosive. | • Un-accounted loss or stolen IE and Bulk Explosive | 4 | 2 | H | • All Blast Crew are to advise immediately the loss of IE.<br>• Accessory Vehicle/magazine keeper is to count IE stock and provides the Delivery Docket to the Shot Firer.<br>• Police checks on all person involved in handling of Explosive (ie Un-supervised Handling Licences - UHL )<br>• Reconcile to the delivery docket and the number of holes loaded to determine discrepancies. A copy of the reconciled delivery docket is to be retained on file.<br>• Where IE usage does not reconcile to the number of holes loaded the Shot firer is to investigate the cause of the discrepancy. Failing this the Site Manager and the Shot firer must investigate and determine whether or not the discrepancy resulted from a thief or a process error. All thefts are to be reported to the authorities. | 3<br>3<br>3<br>3<br>3 | 1<br>1<br>1<br>1<br>1 | L<br>L<br>L<br>L<br>L | Blast Crew<br>Accessory Vehicle/ Magazine Keeper<br>Manager/Blast Supervisor<br>Shot Firer<br>Shotfirer Site Manager |
| 68 | Weigh Bulk Explosive MMU and hand over delivery docket. | • Unknown use of Bulk Explosives | 3 | 2 | M | • Weigh out and provide delivery docket. | 3 | 1 | L | MMU Operator & Weighbridge Operator |
| | **Pre-Blast Inspection of the Tie Up** | | | | | | | | | |
| 69 | Secure the shot. | • Damage to leads and down lines | 3 | 3 | H | • Access restricted to the Shot Firer and those that Shot Firer has directed to be involved in Blast Inspection. | 1 | 1 | L | Shot Firer |
| 70 | Check the tie up of the shot. | • Tie up faults are not detected before firing the shot resulting in misfire | 3 | 2 | H | • Shot firer and Blast Supervisor are to walk the shot checking that the tie up is effective and in accordance with the Tie Up Plan | 3 | 1 | L | Shot Firer & Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | | | | | | | | | |
| | **Placement of Environmental Monitors** | | | | | | | | | |
| 71 | Identify the required monitors as per the Blast Management Plan. | • In-appropriate monitors used (i.e. Sensitivity for data range) | 2 | 2 | L | • Research and specific equipment (document within the Blast Management Plan) | 1 | 1 | L | Service Provider |
| | | • Monitoring equipment is neither serviceable or calibrated | 2 | 2 | L | • Calibrate is to be within date and recorded before use. Prefer to use monitoring equipment within in-built self-diagnostics. | 1 | 1 | L | Service Provider |
| 72 | Position Environmental Monitor. | • Locations are not positioned as per the Environmental Protection Licence. | 2 | 2 | L | • Survey locations in accordance with the EPL and DA and append to the Blast Management Plan. | 1 | 1 | L | Site Manager |
| | | • Locations detect false noise/ data/ events | 2 | 2 | L | • Blast time for the shot is to be recorded along with the environment observations to assist with the interpretation of the relevant data (i.e. This will enable the ruling out of extraneous data) | 1 | 1 | L | Site Manager |
| | | • Monitor is not set up correctly | 3 | 2 | M | • Physically mark locations where monitoring equipment is to be placed and for the mounting to be constructed in accordance with the monitor's manufacturers instructions (i.e. Concrete Plinth). | 1 | 1 | L | Site Manager |
| 73 | Set monitors to start reading/recording. | • Power source fails | 2 | 2 | L | • Charge before use | 1 | 1 | L | Service Provider |
| | | • Calibration varies whilst monitoring | 2 | 2 | L | • Calibration and handle in accordance with manufacturer's details. | 1 | 1 | L | Service Provider |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| 74 | Secure data collected by the monitors. | • Data is lost | 2 | 2 | L | • Competent Operator<br>• Record Management Procedures. | 1<br>1 | 1<br>1 | L<br>L | Shot Firer |
| 75 | Analyse results. | • Incorrect interpretation of data collected | 2 | 2 | L | • Competent Operator<br>• Report Results to stakeholders | 1 | 1 | L | Service Provider<br>Drill & Blast Manager |
| | | • Future Blast exceedances | 2 | 2 | L | • Log results for blast against distance and direction/bearing to establish or refine the Standard Blasting Parameters | 1 | 1 | L | Service Provider |
| | **Pre-blast Meeting** | | | | | | | | | |
| 76 | Prepare for meeting. | • Not all steps in the process have been completed and/or signed off. | 3 | 3 | H | • Confirm that all processes have be completed and authorised before proceeding to the Pre-blast Meeting.<br>• Use HSEQ-6-09-F05 Form. | 3 | 1 | M | Blast Supervisor |
| 77 | Notify persons required to be in attendance. | • Not everyone is in attendance at the Pre-Blast Meeting to ensure clear communication of responsibilities and accountabilities for the blast | 3 | 3 | H | • Meeting is not to start until all attendees are present. | 1 | 1 | L | Blast Supervisor |
| | | • Person attending the meeting are not competent in the task to assigned; nor able to accept/own | 3 | 3 | H | • Only select competent (i.e. Trained in the role given & procedures) and responsible persons to attend and given responsibilities. | 1 | 1 | L | Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | responsibility | | | | | | | | |
| 78 | Undertake meeting and action controls. | • Communication is not clear. | 2 | 2 | L | • Establish an Agenda for the Pre-blast meeting<br>• Use HSEQ-6-09-F05 Form. | 1 | 1 | L | Blast Supervisor |
| | | • Not all the information is known or available at the meeting. | 2 | 2 | L | • The Blast Supervisor is to chair the meeting and bring all records as reference to the meeting. | 1 | 1 | L | Blast Supervisor |
| | | • Identified controls are not actioned. | 3 | 2 | M | • The meeting is not to proceed unless all process up this point have been documented and signed off. | 1 | 1 | L | Blast Supervisor |
| | | • Responsibilities & authority of individuals at any one time during the blasting process is not communicated/ understood. | 3 | 2 | H | • The Blast Supervisor is to communicate during the meeting when he is in charge and when the Shot firer is in charge. | 1 | 1 | L | Blast Supervisor |
| | **Exclusion Zone Evacuation** | | | | | | | | | |
| 79 | Blast guards are positioned at all entry point to the exclusion zone. | • The Exclusion Zone is insufficient. | 4 | 3 | H | • Undertake Exclusion Study to determine parameter boundaries and areas to be cleared during a blast. | 2 | 1 | L | Blast Supervisor |
| 80 | Follow the Emergency Response Plan for the evacuation of the clearance zone | • Incorrect evacuation procedures are applied | 3 | 3 | H | • Review the Emergency Response Plan for the site and ensure that appropriate siren/clearance/processes are in place to deal with a Blast Process. | 3 | 1 | L | Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | including the use of a siren. | | | | | • Dunmore Quarry evacuates using Radio Communication, Sign-in register and toolbox record sheets. | | | | |
| 81 | Check Site Attendance records and confirm where - about of all persons within the exclusion zone (i.e. Two for fixed plant environment etc.). | • Persons within the exclusion zone unaccounted for | 4 | 3 | H | • Check attendance records for complete site evacuation<br>• Shot firers clearance is comprehensive. Blast Supervisor to be in attendance during clearance to answer any questions and advising of site layout and possible areas of entry to exclusion zone. | 3<br>3 | 1<br>1 | L<br>L | Blast Supervisor |
| 82 | Blast Supervisor confirms that all Blast Guards are in position and confirms attendance of personnel at evacuation points. | • Poor communication<br>• Blast guards not aware of their responsibilities<br>• Uncontrolled access to exclusion zone. | 2<br>3<br>4 | 2<br>3<br>3 | L<br>H<br>H | • Alternate radio channels nominated at pre blast meeting<br>• Mobile phone back up<br>• Responsibilities outlined at pre blast meeting<br>• Training for blast guards in roles and responsibilities and able to demonstrate typical responses to possible security breaches<br>• Blast Supervisor to identify any new access points prior to pre blast meeting. | 1<br>2<br>2 | 1<br>1<br>1 | L<br>L<br>L | Blast Supervisor |
| 83 | Blast Supervisor hands over the Exclusion Zone responsibility to the Shot Firer. | • Shot Firer does not understand his responsibilities for the blast<br>• No clear point in the process for handover to Shot Firer | 3<br>2 | 3<br>2 | H<br>L | • Shot firer trained in the Boral Standard, forms and responsibilities and the blasting checklist clarifies the necessity to conduct a Shot Firers “clearance” to his satisfaction.<br>• Part J of Load and Firing the Shot form to be used as a “hold point” for hand over from Blast Supervisor. | 2<br>1 | 1<br>1 | M<br>L | Blast Supervisor & Shot Firer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | **Exclusion Zone Clearance** | | | | | | | | | |
| 84 | Shot Firer acknowledges the handover by confirming that the Blast Guards are in place and exclusion zone is secured. | • Poor communication | 2 | 2 | L | • Pre blast meeting outlines handover step | 2 | 1 | L | Shot Firer & Blast Supervisor |
| | | • Blast guards are not aware of handover to Shot Firer and who is now in control of the blast | 3 | 2 | M | • Radio call from shot firer to check blast guard positions and to confirm he is in now control of the blast. | 3 | 1 | L | |
| | | • Blast Supervisor continues to control the process and give instructions | 3 | 2 | M | • Pre blast meeting outlines handover step and responsibilities once handover is completed. Blast Supervisor to forward any concerns to the Shot Firer. | 3 | 1 | L | |
| 85 | Undertake Shot Firers Clearance to confirm that the exclusion zone is cleared (i.e. Drive around, walk, radio etc) | • Shot firer unfamiliar with site and exclusion zones | 3 | 3 | H | • Blast Supervisor to familiarise the Shot Firer or accompany the Shot Firer with the clearance and provide site information/exclusion zones. | 2 | 1 | L | Shot Firer |
| | | • Clearance not conducted | 4 | 3 | H | • Shot Firer is responsible for the outcome of the blast | 3 | 1 | L | Shotfirer |
| | | | | | | • Blast Supervisor to audit shot Firers clearance to ensure Shot Firer is competent. | 3 | 1 | L | Blast Supervisor |
| | **Fire the Shot** | | | | | | | | | |
| 86 | Roll out the lead in line (including throwing the line over the face) or connect | • Slip Trips & Falls, | 3 | 2 | M | • Do not cross the two metre safety threshold or stand on bunding when throwing lead-in-line over the face. Communication device is always carried in the field. | 3 | 1 | L | Shot Firer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | 'Remote Initiation Device'. | • Falls over faces | 3 | 2 | M | • Must be 2 metres away from drop off point (i.e. crest). | 1 | 1 | L | |
| | | • Walking under faces – Struck by falling rocks | 4 | 2 | H | • Must be half the face height away from the toe at all times.<br><br>**OR** Use "Remote Initiation Device" | 1 | 1 | L | |
| | | • Unsafe initiation method. | 3 | 1 | L | • Only "Nonel" and "Unitronics" are permitted to initiate blast. Shot Firer is only permitted to tie in the "lead in line", or connect 'Remote Initiation Device', to the "initiation hole" within the "5 minute call". | 2 | 1 | L | |
| 87 | Radio confirmation of firing sequence | • Blast guards unaware of the stages of the blasting process | 3 | 2 | M | • Radio sequence to clarify the following steps;<br>  • Blast guard check (" Blast guard 1,2,3 etc are you in position and area secure") and confirmed by guards<br>  • Shot firers clearance completed. "Radio silence, blast will be fired in approx. …minutes"<br>  • Check guard position status again<br>  • 1 minute call<br>  • Activate blast siren<br>  • 30 second call<br>  • 10 second call and siren maintain radio silence<br>  • Firing now | 2 | 1 | M | Shot Firer/ Blast Supervisor |
| | | • Blast guard breach. | 3 | 3 | H | • Responsibilities outlined at pre blast meeting<br>• Training for blast guards in roles and responsibilities and able to demonstrate typical responses to possible security | 2 | 1 | M | Site Manager & Blast Supervisor |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | | | | | breaches. | | | | |
| | | • Trespasser (i.e. Person, motorbike, aeroplane etc) spotted within or approaching the exclusion zone. | 3 | 2 | M | • Blast guard communicates with the Shot Firer and blast sequence stops. Area is again cleared, made safe and blast sequence recommenced. (Shot Firer in consultation with the Blast Supervisor considers turning off siren to listen for presence of further trespasser where there it posses a greater risk) | 2 | 1 | L | Blast Supervisor<br>Blast Guards |
| 88 | Fire the shot | • Misfire (i.e. Lead-in-line fails to initiate to the shot) | 3 | 3 | H | • Use “Remote Initiation Device” **or** Only “Nonel” and “Unitronics” lead in lines to initiate blast.<br>• Pre-blast inspection (i.e. check tie ins).<br>• Competent Shot Firer to National Competent & licence standards<br>• Shot Firer is to be in possession of the initiation device at all times. | 2 | 1 | L | Shot Firer |
| | | • Fly rock incident | 4 | 3 | H | • Emergency Procedures address response to persons being struck by fly rock<br>• Shot Firer & Assistant are positioned:<br>○ Greater than 400m from the shot,<br>○ Not in the direct direction of the blast<br>○ And within a retreat distance of a protective structure (ie fixed plant or blasting bell). | 3 | 1 | L | Blast Supervisor & Shot Firer |
| | | | 3 | 3 | H | • No mobile plant can be positioned within 300 metres from the initiation point without signed approval from the Blast Supervisor | 3 | 1 | L | Mine Manager /Blast Supervisor & Blast Designer |
| | | | 4 | 3 | H | • Non Blasting personnel shall remain greater than 800 metres from the front of the shot or 400 metres from the side/rear. Note: Reduced distances can be achieved with the support of a formal risk assessment undertaken by an | 3<br>3 | 1<br>1 | L<br>L | |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | • Face burst | 4 | 2 | H | external accredited blast consultant.<br>• Face profiling<br>• Bore track<br>• Bore tracking results and completed Drillers Log to be forward to the Blast Design/Engineer to confirm/amend Loading/Tie Up Plan<br>• False burdens<br>• Decking | 3 | 1 | L | Blast Supervisor & Shot Firer |
| | | • Run Away on the front row (load sheets used as part of loading the shot) | 4 | 2 | H | • Maximum kg's specified for each face row hole.<br>• False burdens<br>• Decking | 3 | 1 | L | Shotfirer |
| | **Post Blast Inspection** | | | | | | | | | |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| 89 | Post inspection of blast by Shot Firer | • Persons entering blast area prior to Shot Firers post inspection presuming area is safe | 3 | 2 | M | • Shot Firer makes radio call for guards to remain in position. | 2 | 1 | L | Shot Firer |
| | | • Fumes (i.e. NOx) | 3 | 2 | M | • Shot Firer to conduct visual inspection from a safe distance to identify any hazardous gasses | 2 | 1 | L | |
| | | • Misfire present | 3 | 2 | M | • Shot Firer to conduct post blast inspection to identify possible misfire or geological hazards. In the case of a partial misfire, if the shot can be reinitiated, Shot Firer is to advise guards of misfire event and hold positions, replace unfired surface IE that may have been damaged by the partial misfire and refire the shot. Shot Firer is to carry out this activity with the blast supervisor and investigate the cause of the partial misfire as well as carry out any risk assessment as necessary to refire the shot. | 2 | 1 | L | |
| | | | | | | • Mine Manager to notify regulator once shot is secured after the misfire event. | 1 | 1 | L | |
| | | • Slips Trips & Falls whilst on muck pile | 3 | 2 | M | • Shot Firer not to access within 2 meters of a crest. Shot Firer to identify safe access to any suspect areas of the shot that require detailed inspection. Shot Firer must be 'spotted' by the Shot Firer assistant during a muck pile inspection. Communication device is always carried in the field (Mobile Phones are prohibited on the shots for electronically initiated shots). | 1 | 1 | L | |
| 90 | Inspect all critical / public infrastructure within the Exclusion | • Derailment, car crash | 4 | 2 | H | • Prior to releasing the guards the Shot Firer is to inspect all critical / public infrastructure within the Exclusion Zone as | 2 | 1 | L | Shot Firer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | Zone (i.e. Railway, Public Roads) | | | | | identified within the Blast Management Plan. | | | | |
| | **Make Area Safe** | | | | | | | | | |
| 91 | Roll up Lead in Line | • Manual Handling | 2 | 1 | L | • Replace Lead In Lines with “Remote Initiation Device” | 1 | 1 | L | Shot Firer |
| 92 | Shot Firer release the Blast Guard (this is the act of handing back the site to the Blast Supervisor) | • Can not contact the Blast Guard | 2 | 1 | L | • Radio protocol where persons onsite are to repeat the instruction (i.e. Acknowledge the message)<br><br>**Note:** Where the Blast Guard does not respond send someone to retrieve them and investigate the issue of failed communication. | 1 | 1 | L | Shot Firer & Blast Supervisor |
| 93 | Blast Supervisor undertakes a safety inspection of the areas to identifying any further risk controls. | • Un-safe work area (i.e. unstable faces, surface cracks, drop offs) | 3 | 2 | M | • Blast Supervisor issues instruction to control site risks. | 1 | 1 | L | Blast Supervisor |
| 94 | Re-instate the bunding on exposed crest (drop offs) | • Fall from height<br><br>• Plant (i.e. HME) drop off whilst replace bund | 3 | 2 | M | • Bunding to half wheel height of largest mobile plant onsite<br><br>• Push (not drag) “back bund” forward to the crest (ie drop off) at right angles to the face | 3<br><br>2 | 1<br><br>1 | L<br><br>L | Blast Supervisor |
| 95 | Clearing debris from roads | • LV crashes/tyre damage etc | 2 | 1 | L | • Clear roadways. | 1 | 1 | L | Blast Supervisor |
| 96 | Remove Blast Signage | • Mis-communication | 2 | 1 | L | • Remove Blast Signs | 1 | 1 | L | Shotfirer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | **Retrieve Blast Monitoring Devices** | | | | | | | | | |
| 97 | Drive to Blast Monitoring (i.e. DVD & Blast Monitor) location. | • Working alone (injuries, abuse etc). | 2 | 1 | L | • Assistant is to report to the Shot Firer the results within an agreed timeframe and that searches to be undertaken when communication does not occur within the agreed time.<br>• Assistant is to carry a communication device, water and first aid equipment.<br>• Competent licenced driver. | 1 | 1 | L | Shot Firer |
| 98 | View monitor results and report any exceedance to the Blast Supervisor immediately via a secure communication device. | • Non-competent operator | 2 | 1 | L | • Operators of monitoring devices are to be competent in the device's use and application (i.e. against OEM requirements & national accredited training competencies).<br>• Comply with manufacturers instruction and SOP for monitoring. | 1 | 1 | L | Shot Firer |
| | | • Monitor fails to record calibration during monitoring period. | 2 | 2 | L | • Post internal diagnostic testing undertaken and PM for regular testing of equipment. Shot Firer to ensure monitor is recalibrated annually as per manufacturers requirements. | 1 | 1 | L | Shot Firer |
| | | • Loss of data | 2 | 2 | L | • Record loss of data and/or faulty monitor within the Shot Firer's report | 1 | 1 | L | Shot Firer |
| | | • Verified exceedances are not notified to the regulator. | 2 | 2 | L | • All exceedances are to be cross referenced to validate results. The Blast Management Plan details notification requirements and responsibilities assigned to the Blast Supervisor | 1 | 1 | L | Blast Supervisor |
| 99 | Secure monitor within purpose designed carrying case & transport back to base | • Damage device in transit | 2 | 2 | L | • All devices are to be carried in a purpose designed carry case and not unrestrained. | 1 | 1 | L | Shot Firer |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | for download of data. | • Loss of data | 2 | 2 | L | • Record loss of data and/or faulty monitor within the Shot Firer's report | 1 | 1 | L | Shot Firer |
| | **Reporting** | | | | | | | | | |
| 100 | Shot Firer's report completed prior to leaving site on the day of the blast | • Non compliance with Australian Standards & licensing requirements | 2 | 2 | L | • Standard form provided for the purpose of the Shot Firer to given an account of the overall blast activities. (HSEQ-6-09-F05 Form) | 1 | 1 | L | Shot Firer |
| | | • Loss of data and recall in the event of an investigation | 2 | 2 | L | • Compliance auditing is to be implemented to ensure the Standard and associated SWMS are adhered too. | 1 | 1 | L | Drill & Blast Manager |
| 101 | Improve D&B Outcomes by reporting on poor performance etc | • Failing to continually improve or questioning success of D&B processes | 2 | 2 | L | • Obtain Auxiliary Service Provider's Report/Records for their involvement (i.e. Non Conformance Reports etc)<br>• Regular meetings with site management to discuss outcomes of blasting. | 1 | 1 | L | D&B Manager & Site Manager |
| | **Record Keeping** | | | | | | | | | |
| 102 | Blast contents compiled into the Blast Pack (i.e. folder) | • Loss of records | 2 | 2 | L | • Blast Pack is to be owned by the sites Blast Supervisor and contain copies of all records at the time that they are generated (i.e. Not wait for the Supplier records to be sent at a later time) | 1 | 1 | L | Blast Supervisor |
| 103 | File Review & Closure - Blast Pack is forwarded to the Site Manager for sign off and filing | • Repeated blast failures due to non review and adopt of learnings<br>• Incomplete | 3 | 2 | M | • Site Manager is to be held accountable to reconcile Blast Packs and undertake review within 1 week of the shot. | 1 | 1 | L | Site Manager |

| Step No. | What are the tasks involved? | What are the Hazards? | Initial Risk | | | What controls must be used? | Final Risk | | | Who is responsible ? |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | C | L | R | | C | L | R | |
| | | records | 2 | 2 | L | • Compliance auditing is to be implemented to ensure the Standard and associated SWMS are adhered too. | 1 | 1 | L | D&B Manager |
| 104 | Original Blast file scanned and filed in accordance with Boral's record management requirements | • Loss of records | 2 | 2 | M | • Filed in accordance with Boral's record management requirements | 1 | 1 | L | Blast Supervisor |

This Safe Work Method Statement (SWMS) was prepared and reviewed by:

| Prepared by / Review Team | | | |
|---|---|---|---|
| **Name:** (Please print) | **Position:** (Please print) | **Signature:** | **Date** |
| Alex Nicetin | Strategic Projects Manager | | 23/6/17 |
| Glenn Troy | Quarry Manager | | |
| Brodie Bolton | Production Manager | | |

| Authorisation | | |
|---|---|---|
| **Declaration:**<br>I have checked this Safe Work Method Statement (SWMS) and confirm that it is authorised for use. | | |
| **Responsible Supervisor Name:** | **Signature:** | **Date** |
| | | |

| Work Activity Instruction/Training Record | | |
|---|---|---|
| **Declaration:**<br>I confirm that the persons listed below have reviewed and been given instruction in this Safe Work Method Statement (SWMS) and were given the opportunity to ask questions and clarify any areas of uncertainly. To be best of my knowledge these persons gained a full understanding of the work method and the required health and safety controls to be applied for this job. | | |
| **Responsible Supervisor Name:** | **Signature:** | **Date** |
| | | |

The following employees/contractors have reviewed and been given instruction in this Safe Work Method Statement (SWMS):

| Training Record | | | | |
|---|---|---|---|---|
| **Name:** *(Please Print)* | **Position/Company:** | **Employee/Contractor:** | **Signature:** | **Date:** |
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| Training Record | | | | |
|---|---|---|---|---|
| **Name:** *(Please Print)* | **Position/Company:** | **Employee/Contractor:** | **Signature:** | **Date:** |
| | | | | |
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| To do a SWMS you: |
|---|
| 1. Discuss with relevant employees, contractors and Health and Safety Representatives the tasks, associated hazards, risks and controls. |
| 2. Write the work tasks in the sequence they will be done in the 'What are the tasks involved?" column. |
| 3. Write the hazards and risks for each work task in the "What are the hazards?" column. |
| 4. Assess the hazards for the risk they present without any controls in place using the tables ***HSEQ-1-03-A02 Risk Matrix***. Write the consequence in the "C" column, Likelihood in the "L" column and risk rating in the "R" column. This is the initial risk rating. |
| 5. In the 'What controls must be used?' column, select the hazard or risk and then work through the controls. Choose a control measure (and how it is to be used). Use the Hierarchy of Controls and Priority for Action tables in ***HSEQ-1-03-A02 Risk Matrix*** to work out appropriate controls. |
| 6. Re-assess the risk of each hazard after controls have been put in place and write it in the "Final Risk" column. This is the residual risk. NOTE—you cannot start work until the residual risk is at least "medium". |
| 7. In the "Who is Responsible" column write in the initials of the person who will be responsible for that step. |
| 8. The people who did the SWMS fill in the fields in the "Prepared by/Review Team" section. |
| 9. The SWMS is given to a supervisor responsible for the work who reviews and then fills in the fields the "Authorisation" section, including signing off the declaration. |
| 10. Each team member is briefed on the SWMS before they start work. Ensure the team knows that work is to immediately stop if the SWMS is not being followed. |
| 11. All persons involved in the task must write their details and sign in the "Training Record" section that they understand and agree to the control measures to be implemented before starting work. |
| 12. The supervisor of the task must sign off that all persons involved in the task have been consulted in the development and implementation of control measures identified. |
| 13. Observe work being carried out. If controls are not adequate, stop the work, review the SWMS, adjust as required and re-brief the team. |
| 14. Keep this SWMS for the duration of the work. If the task is likely to be repeated in the future, consider writing a site Standard Operating Procedure. |
| Note—in Boral you can only write a SWMS if you have been assessed and signed off as competent. |

I.

II.

| TABLE 1: Qualitative Measurement of the Maximum Credible Outcome of an Event | | |
|---|---|---|
| **Value** | **Description** | **Impact** |
| 1 | Incidental | **Health:** Illness or effect with limited or no impact on ability to function and treatment is not necessary.<br>**Safety**: Injury such as First Aid, usually dealt with in-house.<br>**Environment:** No discernable impact or measurable impairment on habitat, species or natural environment (air, water, land).<br>**Regulatory:** No risk of punitive actions and any intervention limited to an observation.<br>**Community/Reputation:** Isolated complaint from a local individual. |
| 2 | Minor | **Health:** Mild illness or health effect which requires some treatment and/or has some functional impairment but is usually easily medically manageable.<br>**Safety:** One or more injuries which require treatment by a medical professional or as a hospital outpatient, but are not serious (e.g. no time lost).<br>**Environment:** Localised and measurable short term impact on habitat, species or natural environment.<br>**Regulatory:** Risk of punitive action unlikely and any intervention limited to field report (or similar).<br>**Community/Reputation:** Clustering of complaints and risk of local media interest. |
| 3 | Moderate | **Health:** Illness or significant adverse health effect needing a high level of medical treatment or management.<br>**Safety:** One or more injuries which are serious enough to result in lost time, non-permanent disabling injuries, or overnight hospitalisation as an inpatient.<br>**Environment:** Localised and measurable medium term impact on habitat, species or natural environment.<br>**Regulatory:** Formal intervention, typically issuing of an Improvement Notice at a site and unlikely to escalate if complied with. Fine up to AUD 100K (or equivalent) without criminal proceedings.<br>**Community/Reputation:** Coordinated community concern at a local level, and limited local media coverage. |
| 4 | Major | **Health:** Illness or chronic exposure resulting in significant life impacting effects<br>**Safety:** Minor permanent disabling injury e.g. loss of finger(s) or extended temporary impairment and/or hospitalisation.<br>**Environment**: Extensive and measurable medium term impact on habitat, species, or natural environment.<br>**Regulatory:** Formal, high level intervention (e.g. prohibition notice) at a site, and risk of further interventions at other sites. Significant fine or penalty likely for Corporate (greater than AUD 100K or equivalent).<br>**Community/Reputation:** Community alarm at a regional level, and adverse and longer running local/regional media coverage. |
| 5 | Severe | **Health:** Serious illness or chronic exposure resulting in fatality or significant life shortening effects.<br>**Safety:** Death or significant permanently disabling injury e.g. blindness, loss of hand(s), quadriplegia.<br>**Environment:** Destruction of important populations of habitat, species, or natural environment.<br>**Regulatory:** Significant prosecution action, including risk to Company Officers.<br>**Community/Reputation:** Widespread community unrest and/or adverse national/international media coverage. |

| TABLE 2: Qualitative Measurement of How Likely or Probable the Consequence will Occur | | |
|---|---|---|
| **Value** | **Description** | **Impact** |
| 5 | Almost Certain | The event is expected to occur several times a year at a site/local level. |
| 4 | Likely | The event is expected at a site/local level in the foreseeable future (next few years) / Occurs within the Company more than once per year. |
| 3 | Possible | The consequence is possible at a Company workplace at some time in the foreseeable future (next 10 years) / Has happened at the Company in past 10 years / Occurs annually within the Industry. |
| 2 | Unlikely | The consequence is possible in the Company / Has occurred in the Industry. |
| 1 | Rare | The consequence is not expected in the Company / Has never been heard of in the Industry. |

| TABLE 3: Qualitative Risk Matrix – Levels of Risk | | | | | |
|---|---|---|---|---|---|
| **Likelihood** \ **Consequence** | Incidental (1) | Minor (2) | Moderate (3) | Major (4) | Severe (5) |
| Almost Certain (5) | M | H | E | E | E |
| Likely (4) | M | M | H | E | E |
| Possible (3) | L | M | H | H | E |
| Unlikely (2) | L | L | M | H | H |
| Rare (1) | L | L | L | M | M |

| TABLE 4: Hierarchy of Control | |
|---|---|
| **Control** | **Description/Example** |
| 1. Elimination | Is there a need to use the plant, process or substance that created the risk (e.g. using a cordless drill to eliminate tripping or snagging of a power lead or using CCTV to observe a silo being filled to eliminate climbing up a ladder to observe)? |
| 2. Substitution | Can the hazardous item be substituted with another item that has less risk (e.g. using a scaffold rather than a ladder, using extra-low voltage <50 Volt for switchgear, package cement in 20kg bags rather than 40kg bags)? |
| 3. Isolation | Can the hazard be isolated from the person (e.g. machine guards, sound enclosures, lagging on hot pipes)? |
| 4. Engineering | Can the risk be minimised by isolating, enclosing or redesigning the plant, substance or process (e.g. machine guards, mechanical lifting aids, exhaust ventilation, relocation, trolleys or workstation design)? |
| 5. Administrative | E.g. job rotation, SOP, training and signs. |
| 6. Personal Protective Equipment (PPE) | The least-desirable method which shall only be used in combination with other controls or if other controls are not suitable. Employees issued with PPE shall have it fitted correctly and be trained in its use and maintenance. |

| TABLE 5: Priority for Action | |
|---|---|
| **Risk Level** | **Action** |
| E - Extreme Risk | **Intolerable**. Stop and seek specialist advice. Immediate interim risk reduction required. Long-term risk reduction plan must be developed, approved by Divisional Management, and implemented. |
| H - High Risk | **Tolerability to be endorsed by management.** Additional long-term risk reduction required. If no further action can be reasonably taken, Divisional management (DMD/EGM) approval must be sought to continue the activity. |
| M - Medium Risk | **Tolerable, provided risk is ALARP (As Low As Reasonably Practicable).** Reasonable safeguards and management systems must be in place commensurate with risks. |
| L - Low Risk | **Tolerable and continual improvement required.** Manage risk in accordance with agreed procedures, and seek to reduce risk over time. |

**NOTE:** In all cases risk must be reduced to as low as reasonably practicable (ALARP).

## Attachment B: Orica Site Information Sheets (SIS)

Please note that the Site Information Sheet changes over time due to the operation of the site. The SIS shown in Attachment B is indicative only.

# Site Information Sheet

Dunmore

Production Blasts 0.72 PF(Hard Massive Areas)

Unitronics

Approved for use: Alex Nicetin — Date 1/03/2018

Jonathon Keller — 1/03/2018

**SIS Valid Until: 2/03/2019**

Maximum 12 Months From Date of Approval

| Site Details | |
|---|---|
| Quarry | Dunmore |
| Customer | Boral Metro |
| BA Number | BA 2678 |
| Quarry Street Address | 38 Tabbita road, Dunmore, NSW 2529 |
| Quarry Postal Address | 38 Tabbita road, Dunmore, NSW 2529 |
| Orica Plant | Mauran QS |
| Blast Type | Production Blasts 0.72 PF(Hard Massive Areas) |
| Invoice Volume Method | Not Applicable - Materials & Time Only |

| Contacts | |
|---|---|
| **Customer Site Personnel** | |
| Brodie Bolton(QM) | 0401 896 866 |
| Stu McLean(Prod. Supervisor) | 0401 895 524 |
| Alex Nicetin (Strategic Projects) | 0401 897 026 |
| **Orica Quarry Services Personnel** | |
| Chloe Quinn (Territory Manager) | 0436 007 225 |
| Brenden Wood (Snr Supervisor) | 0412 108 571 |
| Jonathon Keller (Snr Blast Technician | 0423 849 246 |

**Geology & Density**

Basalt large columns with areas of hard massive. Density 2.7 g/cc

**Rock Structure**

Mostly large columns with areas of very hard massive structure on top bench

| Pattern Data | | | |
|---|---|---|---|
| Hole Diameter (mm) | 89 | | |
| Pattern type | Staggered | | |
| Bench Type | Free Face | | Tolerance |
| Powder Factor kg/m³ | 0.72 | 0.7 | ± 0.05 kg/m³ |
| Bench Height | 15 m | 20 m | ± 2m |
| Pattern Ratio | 1.15 | 1.14 | n/a |
| Burden | 2.9 m | 3 m | ± 0.1m |
| Spacing | 3.3 m | 3.4 m | ± 0.1m |
| Min. Stemming | 2.2 m | | ± 0.2m |
| Target Face Burden | 3.5 m | | For blasts outside these tolerances or Class, contact Tech Services |
| Maximun Face Burden | 3.9 m | | |
| Minimum Face Burden | 3.1 m | | |
| Subdrill | 1 m | | |
| Front Row Sub-Drill | 1 m | | |
| Target Drill Angle | 10 ° | | |
| Drill Angles | 0 ° - 20 ° | | |
| MIC per 8ms | Single hole firing at Monitor | | |

| Alternate Front Row Holes | | | |
|---|---|---|---|
| Hole Size | Bdn (B) | Min (B) | Stemming (m) |
| 102 | 4 m | 3.6 m | 2.7m |

| Loading Data | | | | |
|---|---|---|---|---|
| Bulk Explosive | Centra Gold | Centra Gold ES | Centra Gold GT | |
| Loading Option/Use | Primary | Optional | Optional | |
| Density | 1.2 | 1.1 | 1.2 | g/cc |
| RWS | 112 | 99 | 115 | % |
| RBS | 168 | 136 | 172 | % |
| Charge/meter | 7.5 | 6.8 | 7.5 | kg/m |
| Min charge face burden | 3.1 | 2.8 | 3.1 | m |
| Packaged Explosive | PowerFrag 65 | PowerFrag 55 | Magnum 32 | |
| Loading Option/Use | Front Hole | Front Hole | Front Hole | |
| Weight | 1.25 | 0.89 | 0.19 | kg |
| Length | 0.33 | 0.33 | 0.20 | m |
| RBS | 183 | 183 | 201 | % |
| Charge per metre | 3.8 | 2.7 | 0.9 | kg/m |
| Min charge face burden | 2.4 | 2.0 | 1.2 | m |

| Initiation Data | | | | |
|---|---|---|---|---|
| Initiating Explosives | Unitronics | | | |
| Initiation Type | Semi Throw/Standup | | | |
| | Loose muckpile suitable for FEL or Excavator | | | |
| Initiation Use | Timing | | Electronics | MIC Control |
| Unitronic or Ikon | Top det to fire same delay as bottom | | 30-50ms/m | Single Hole |
| Control Row Delay | 53ms | | Burden relief | Single Hole |
| Echelon Delay | 41ms | | 30-50ms/m | |
| Bottom Initiation | Top Primer | H | Downline | EBS Equa |
| | Bottom Primer | H | Downline | EBS Equa |
| Minimum Charge Length to Double Prime | 10 | | | |

**Blast Procedure & General Comments**

General Site Rules
- UHF: Channel 27
- Firing times generally between Monday to Friday 9am-5pm

Shot Design
- Designs must Target RL's from pit template and follow the pit design lines.
- Designs above catch benches must have no sub-drill on the catch bench and within 2m either side of new crests, to protect against overblasting and damage to catch bund crests.
- This S.I.S covers the HARD MASSIVE area of the pit, identified on top benches SE&SE corners. Tip look for the light grey coloured rock present in the face.
- Designs on terminal walls must be pre-split ( pre-splits/mid-splits are not covered by this S.I.S and MUST be reviewed by TSE before markout).
- If bench heights falls outside this S.I.S calculate a pattern size using a 1.15 ratio to achieve consistent PF

- Double Benching is not permitted without written authorisation from Boral Management.

Loading/Tie-up
- Initiation designs must target single hole firing at the residential monitor. McParlands monitor is non-reportable and is monitoring for the quarry interest only. Limits to be advised.
- Target burden reliefs of 30-50ms/m.
- Timing can be massaged to achieve single hole firing at monitor by adding/subtracting time from overlapped hole firing times.

**Site Aerial View**

| Monitor | | |
|---|---|---|
| Nearest Residence Monitor | 115 dbl | 5 mm/s |
| McParlands Monitor | N/A dbl | TBC mm/s |

| Tolerances | |
|---|---|
| Bench Height | + / - 2 m |
| Powder Factor | + / - 0.05 kg/m^3 |
| Charge Separation | 1.8m |
| Re-drill | - 0.5 m |
| Backfill | + 0.3 m |

Any proposed blast designs that do not conform to this SIS must be accompanied by Orica's "SIS Departure" application, and obtain written approval from Boral's appointed person before proceeding with the design.

**Site History / Notes**

Previous SIS
Bench Heights = 6-8m, 8-13m, 13-20m
Tie-up = 42ms /25ms or 65ms/25ms
Powder Factor = 0.78, 0.72

Reason for Change
Bench Heights = Pit design changed to 15m benches, with some around 20m on top development area
Tie-up = Unitronics single hole firing at new monitor(nearest residence) McParlands monitor is now a non-reportable location
Powder Factor = 0.72( after review of multiple blasts, potential to reduce further)

## Attachment C: Blast Notification List

| | Organisation | Contact Person | Preferred Contact Method and details | | Notification Period | Approval Required |
|---|---|---|---|---|---|---|
| | | | Phone | Email | | |
| 1 | Resident – Fogarty/ MacParland Property | Robyn and Denis Fogarty | H: (02) 4236 0290<br>M: 0410 468 290 | - | Day of Blast | No |
| 2 | Resident - Dunster | Dunster | H: (02) 4256 2406 | - | Day of Blast | No |
| 3 | Resident - Maloney | Jason Maloney Dairy Farm | SMS<br>M: 0405 193 481 | - | Day of Blast | No |
| 4 | Resident - Pemberton | Alan Pemberton | M: 0411 210 141 | - | Day of Blast | No |

**Last revised 27/02/19. Please note that section is left blank in the public document for submission to website.**