BLAST MANAGEMENT PLAN

HANSON SANCROX QUARRY

DATE 5th May 2020

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DISTRIBUTION LIST

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REVISION LIST

DATE	NAME	REVISION DETAILS
11/09/2019	Scott Blair	Initial Draft
27/04/2020	Stephen Kenworthy	Hanson Review
05/05/2020	Scott Blair	Orica update

DISCLAIMER

Blast Management Plan – Hanson Sancrox Quarry

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HANSON SANCROX QUARRY

LOCATION

Hanson Sancrox Quarry is located approximately 8.5km West of Port Macquarie NSW and 8.5km East of Wauchope NSW on the Pacific Hwy, Sancrox NSW (Figure 1). The Quarry is located approximately 246km from the Orica Kurri Kurri Plant.

Figure 1 – Hanson Sancrox Quarry Location

SCOPE OF WORK

This Blast Management Plan (BMP) has been prepared for the Hanson Sancrox Quarry. This plan outlines:

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

Orica Quarry and Construction Services (Orica Q&C) have been engaged by Hanson to provide a Total-Load-Service (TLS) to the Sancrox Quarry.

The rock type in this area is predominately Arenite with areas of varying rock types and structure, the rock density is measured at 2.7g/cc

Blasting is permitted to take place on site between the hours of 9:00am and 3:00pm Monday to Friday, excluding public holidays.

Blast monitoring is to be conducted at Two (2) localities surrounding the quarry, “Telephone Tower” and “McMullan House”, however, monitoring may be requested at other locations. Overpressure and Vibration measurements results will be reported the Quarry after the blast event has occurred to ensure compliance has been adhered to. Blast results will be analysed and uploaded to Orica’s blast management system BlastIQ™ within 24 hours of the blast event. Locations can be identified using the following map and have also been located using GPS.

Production blasts will be designed to be within 0.8 -1.0 powder factor, and loaded primarily with wet bulk products consisting of Centra™ Gold 1.2 g/cc and Centra™ Gold Greater GT 1.2g/cc.

OVERVIEW OF BLAST MANAGEMENT PLAN

INTRODUCTION

The objective of the BMP is to ensure the safety of all personnel is maintained and appropriate environmental controls are in place. A Blast Management Plan is required to conform to AS2187.2.

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

This BMP incorporates all aspects of explosive application at Hanson Sancrox site, including:

- Blast design
- Planning,
- Transport,
- Blast preparation,
- Charging/stemming,
- Tying up or scanning/logging,
- Firing the blast,
- Monitoring,
- Reporting and
- Compliance

The process of developing the Blast Management Plan commences with a site visit by Orica personnel to record and assess the Mine Safety Management Plans are in place on the Sancrox Quarry site. Orica personnel conduct a Risk Assessment to identify risks that people may be exposed to while working on the customer site.

The Blast Management Plan comprises the following documents;

- Site Information Sheet – Site specific guidelines developed by Orica Technical Services for pattern, loading and initiation design.
- Orica's Customer Site Risk Review– A review of safety processes already existing at the site.
- Risk Assessment – Assessment of all risks associated with blasting operations at the site. Identifies site-specific gaps in exiting procedures, including the Shotfirer's Standard Operating Procedures (SSOPs).
- Shotfirer's Standard Operating Procedures - a set of existing Orica Procedures that are used to manage blasting operations and control blasting risk. A copy of these is readily available to the shotfirer either in hard copy or electronically.
- Hanson Site Procedures (Sancrox Quarry Blast Management Plan Site Procedures 2020)

SAFETY IN HANSON SANCROX

Hanson Sancrox operate under the “Zero Harm” environment.

“No job is too important that it cannot be done safely”.

Hanson operates an externally accredited risk management system designed to meet the requirements quarry and concrete products which includes the design, production, supply and delivery to pre-specified and company standards.

The Integrated Risk Management System (IRMS) has been established to ensure that all activities are carried out in a manner which minimizes risk to all people who work at, or visit Hanson sites; minimizes environmental impact and ensures that our customers receive quality products and services. All activities will comply with:

- The commitments formalised in Hanson’s Policies, Principles, Visions and Values.
- All relevant Australian standards, statutory regulations; Codes of Practice & Voluntary Agreements

Hanson uses the ICARE system to **I**dentify, **C**ontrol and **R**educe **E**xposure. This is carried out using a booklet or online system to record and report on

- Hazards
- Improvement suggestions
- Safety conversation
- Near hits
- Take 1
- Day in the life

ICARE entries are conducted on a regular basis through all areas of the quarrying process, including blasting. Where observations have been conducted and issues identified in Blast Management then these observations will be used to investigate changes to the BMP, if necessary.

LEGISLATIVE REFERENCES, CODES OF PRACTICE AND STANDARDS

The following have been identified as specifically relevant to the activities to be undertaken:

- Explosives Act of 2003 (NSW)
- Explosives Regulation of 2005 (NSW)
- Australian Standard 2187.2 2006 Explosives – Storage and use – Use of explosives
- AS:2187 Explosives – Storage transport handling and use.
- Australian Explosives Code (AEC) (6th Edition)
- NSW Work Health and Safety Act 2011
- NSW Work Health and Safety Regulation 2017
- NSW Work Health and Safety (MPS) Act 2013
- NSW Work health and Safety (MPS) Regulation 2014

SITE RISK ASSESSMENT

The attached Risk Assessment specifies the following information required by AS2187.2;

- Details of adjacent structures or services that influence the blast design
- Details of reports, drawings and records consulted.
- Environmental considerations for airblast overpressure, ground vibration.
- Testing for Reactive Ground and or Evidence of Elevated Temperature
- Details of communication systems
- Warning procedures.
- Traffic management plan.
- Details of the exclusion zone.
- Influence of weather.
- Loading in poor light conditions or reduced visibility.
- Blast fume emissions

ORICA SHOTFIRER'S STANDARD OPERATING PROCEDURES

The Shotfirer's Standard Operating Procedures (SSOPs) are a full set of procedures that refer to other important documents generated by the blast design and execution process. These are the Site Information Sheet (SIS), and the Job Pack. The SIS contains the drill and blast design parameters agreed with Sancrox Quarry site management, and other important aspects including environmental considerations, Maximum Instantaneous Charge (MIC), general layout parameters, and tolerances. The Job Pack contains the actual working documents, including survey data, actual blast layout, site plan and Risk Assessments. Together these documents address the following items of the Blast Management Plan specified by AS2187.2.

ORICA SITE INFORMATION SHEET (SIS)

The SIS is developed by Orica Technical Services to aid Orica Surveyors and Shotfirers in best design practices for the results required on the site. Should the need arise for practices outside of the SIS, Technical Services approval must be granted before proceeding.

HANSON SANCROX QUARRY SITE RISK REVIEW

The Orica Customer Site Risk Review specifies the following items required by AS2187.2;

- Permits/licenses required for the project.
- Identification and position of the person responsible for the project including project safety and security.
- Identification and position of person who has given approval to use explosives on the project.
- Key appointments and responsibilities.
- Shotfirer's details.

DRILLING PROCEDURES

Drilling procedures will be managed by Hanson's drilling procedures.

All Contract Drillers must be inducted to Hanson via the CAMS System. All Drillers must also have been given a site orientation to Sancrox Quarry.

When arriving at site, the Driller must be taken to the area(s) of the pit to be drilled and supplied with a copy of the Drill Log and Blast Design.

When the Drill arrives at site, the following actions need to be taken:

- The Drill inspected with the use Mobile Equipment Checklist followed and filled out, and mobile equipment tag attached.
- Service records for the machine sighted.

On completion of the front row of drill holes, the blast contractor must boretrak the front holes to ensure that severe deviation has not occurred. In the event that there is enough deviation that causes the front burden to be compromised, the driller must re-drill these holes to ensure that they are as per the blast design.

HANSON SITE PROCEDURES

The Site is responsible for managing the following aspects of the Blast Management Plan as captured within Hanson's "Sancrox Quarry Blast Management Plan Site Procedures 2020";

SPECIFIC WH&S AND BLAST MANAGEMENT ITEMS

HIGH RISK CONSTRUCTION ACTIVITIES

The following High-Risk Construction Activities are expected to occur on this job:

Entering a Trench more than 1.5m deep	N
Using explosives;	Y
Entering a confined space;	N
Using a hazardous substance;	Y
Working where the person could fall at least 2.0m;	Y
Doing asbestos work or demolition work;	N
Working near moving powered mobile plant at a workplace;	Y
Working in, over or adjacent to water where there is a risk of drowning;	N
Working on, or adjacent to, a road or railway;	Y
Working on or near a pressurised gas distribution mains or pipes;	N
Working near exposed energised electrical installation;	N
Other work that could result in death or bodily harm:	Y

The following activities are NOT covered by this risk assessment as these are activities to be undertaken by other parties than Orica:

- Drilling Blastholes - the Hanson drilling operator/supervisor is to prepare and implement their own Safe Work Method Statement (SWMS).

RESPONSIBLE PERSONS

Licences and Technical Appointments

Person	Skill / Competency / Licence	Expires
Aaron McDowell	NSW Expl Licence #XBLS –101959. Shotfirer Responsibility	23/04/2024
John Dunn	NSW Expl Licence #XBLS – 101897 Shotfirer Responsibility	04/12/2023
Courtney Kremer	NSW Expl Licence #XBLS – 101897 Shotfirer Responsibility	04/11/2020
Peter Morrison	Orica Surveyor Surveyor Responsibility	N/A
Scott Blair (TSR)	Senior Blasting Technician NSW Expl Licence #XBLS – 101954 Blast Design and Risk Management	17 December 2024
Jonathon Keller (TSR)	Senior Blasting Technician NSW Expl Licence #XBLS – 101832 Blast Design and Risk Management	24 July 2023
Brenden Wood	Orica Territory Manager Overarching Operational Responsibility	
Robert Kearney	Orica Kurri Kurri Supervisor Operational Responsibility	

The Shotfirer and Technical Services representative (TSR) for each blast in a project may vary from time to time. The responsible Shotfirer for each blast is named on the front of the Orica Job Pack Folder and within the blast details page in Orica's Blast Management System BlastIQ™.

The Orica Shotfirer will provide supervision of Orica activities. The Shotfirer will inspect and assess the work area before starting work and will have the final authority regarding all aspects of the work related to Orica's contract while onsite.

The Orica Technical Services representative is responsible for cross checking the Shotfirer's work and updating the Site Information Sheet and blast designs as required when the blast design parameters change.

CONSULTATION

Orica Quarry Services operate a system of blast classification from Class 3 (simple blasts) to Class 6 (complex blasts). The blast design must be cross checked and reviewed by others, with the level of review being commensurate with the class of blast. Full details are contained in the Orica Shotfirer's Standard Operating Procedures (SSOP's).

Orica use the "Take 5" system for conducting daily pre-start assessment of working conditions and on-the-spot hazard assessment. If further risk assessment is deemed to be required, Job Safety and Environmental Risk Analysis (JSERA) forms are utilised requiring sign-off from its participants, and further controls implemented.

Orica uses a centralised data base (Enablon™) to manage incident reporting and auditing processes.

ELECTRICAL EQUIPMENT

Orica may require the following equipment to be brought to site:

- Laptop computer and chargers,
- Video camera and charger,
- UAV/Drone,
- Survey Equipment and Charger and
- Electronic Blasting equipment and charger.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

The minimum standard of PPE required by Orica is:

- Hard Hat, Safety Boots, Safety Glasses
- Long sleeves and long trousers (hi-visibility)
- Hearing Protection, Respiratory Protection, Face Shields if required
- Category 5 Gloves When operating (gloves to be carried on persons at all times).
- Dust Masks (when required e.g. working near drill)

HAZARDOUS SUBSTANCES

The Orica Technical Service representative will provide Safety Data Sheets to Hanson for all explosives and ancillary chemical items brought on site. Up to date SDS's for all Orica products can be obtained from www.oricaminingservices.com and BlastIQ™.

LIFTING EQUIPMENT

Orica do not plan to bring any lifting equipment to site.

PLANT

Orica propose to bring light vehicles (Shotfirer & Surveyor Vehicles) and a Heavy Rigid Explosives Mobile Manufacturing Unit (MMU) to site. All MMU's operate under the NHVAS (National Heavy Vehicle Accreditation Scheme). For further details contact the local Territory Manager. (All vehicles to be inspected and approved by Hanson prior to use on site).

SUPPLY OF EXPLOSIVES

All explosives and related accessories will be supplied by Orica from their licenced plant at Kurri Kurri, NSW. All unused initiating explosives will be securely stored in the registered magazines on the Shotfirer's vehicle prior to leaving site (reconciliation to be carried out by both Hanson and Orica prior to shotfiring vehicle leaving site). All unused bulk explosive precursors will be returned to Kurri Kurri in the MMU. All stock is reconciled to ensure nothing is missing (Magazines will be locked at all times).

WORKPLACE INSPECTION AND AUDITING

Orica has a number of internal auditing processes to ensure company standards are being upheld and to maintain high standards of work. Such audits are stored within Orica's data bases and may be accessed upon request to the relevant Orica site supervisor.

WARNING SIGNS AND CONTROL MEASURES

Warning signs and flagging will be erected around the blast area. The blast area is designated by the Shotfirer and is generally 10m from the last loaded blast holes.

All industry standards are to be in place including edge protection and fall prevention systems before any tasks is initiated.

ACCIDENTS AND INCIDENTS

All accidents and incidents are to be reported to Hanson and Orica. See the list in Appendix D for details of contacts to be notified.

FIRE PROTECTION

Fire extinguishers on light and heavy vehicles are checked daily as part of the Orica Pre-Start checklist. Light Vehicles are equipped with one 1.5kg dry chemical extinguisher.

ENVIRONMENTAL LIMITS

All blasts will be designed to generate overpressure and ground vibration results below those limits specified in the blasting consent approvals below:

- The airblast overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time at any residence or noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.
- The airblast overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) at any residence or noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.
- Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at any time at any residence or noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.
- Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec at any residence noise sensitive locations for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.

To determine compliance with the above conditions:

(a) Airblast overpressure and ground vibration levels must be measured at any point within 1 metre of any affected residential boundary or other noise sensitive location such as a school or hospital for all blasts carried out in or on the premises; and

(b) Instrumentation used to measure the airblast overpressure and ground vibration levels must meet the requirements of Australian Standard 2187.2 of 1993.

- Blasting operations at the premises may only take place between 9:00am-3:00pm Monday to Friday. Blasting is not permitted on public holidays, Saturdays or Sundays.
- Offensive blast fume must not be emitted from the premises.

Measurements for the nearest affected residence (the McMullen House) must therefore generally be below 115dBL overpressure and 5mm/s peak particle velocity The limits that are specified for the “Telephone Tower” are set at 120dBL overpressure and 10mm/s peak particle velocity.

MONITORING

Overpressure and vibration monitoring will be conducted by trained Orica personnel using “Instantel Minimate”™ blast monitors upon request from Hanson. Monitors are calibrated regularly and monitoring practices are outlined in the SSOP’s which complies with the recommendations set out in Australian Standard 2187.2 Appendix J.

DUST CONTROL

Dust is produced during blasting from the initial detonation and from rocks breaking against each other. The rock geology will contribute greatly to the dust generated during blasting. Where dust produced from blasting activities is a concern, dust control measures can be put into place. These include:

- Firing only with favourable wind conditions
- Wetting down the floor areas in front of the blast to minimise the dust cloud which is generated from the floor dust. (Hanson responsibility)

FUME CONTROL

Offensive blast fume must not be emitted from the premises.

Offensive blast fume means post-blast gases from the detonation of explosives at the premises that by reason of their nature, duration, character or quality, or the time at which they are emitted, or any other circumstances:

a) are harmful to (or likely to be harmful to) a person that is outside the premises from which it is emitted, or

b) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted.

Fume produced from blasting can be caused by many factors including geological conditions, poor product formulation resulting in incomplete reactions, insufficient water resistance, as well as the degree of confinement. Product quality will be managed through quality control e.g. regular auditing and the use of the correct bulk emulsion products. Where possible, blasts will not be confined as designs will be planned to blast towards the free face.

PERMITS AND LICENCES REQUIRED

All blasting permits and licences have been obtained from Hanson and are available on site.

ORICA JOB PACK

The blast designs and blast records will be contained in the standard Orica “Job pack”. A job pack is prepared for each blast and is kept on file by the local Orica plant office and within BlastIQ™. Hanson has been provided with access to the BlastIQ website and files may be downloaded from the website. The job pack contains all standard records of the blast including:

- Pre-blast survey data and boretraking (if applicable);
- As-drilled depths and locations of all blast holes;
- Record of short or blocked blast holes;
- As-loaded record of all short or blocked blast holes;
- Types and quantities of initiating explosives and packaged explosives used;
- Types and quantities of bulk explosives used;
- Initiation plan including charge mass per delay (MIC) and method of initiation;
- Vibration and Air blast records.

BLASTIQ – BLAST DATA/RECORD MANAGEMENT

Orica will utilise the online BlastIQ™ Blast management system to store all records and data associated with blasting at the Hanson Sancrox Quarry Site.

RISK ASSESSMENT - BLASTING OPERATIONS

Assessment designed to comply with AS / NZS 4360:2004 “Risk Management”

Main elements: (from AS / NZS 4360:2004)

- Communicate & Consult
- Establish Context
- Identify Risks
- Analyse Risks
- Evaluate Risks
- Treat Risks
- Monitor & Review

COMMUNICATE & CONSULTATION STEPS:

- □ Consider costs, payment and liability for Orica conducting the risk assessment.
- □ Physically visit and “walk” the area of any blasting proposal.
- □ Convene a meeting in a location with whiteboard / write-up capability.
- □ Gather a team of persons familiar with the site and blasting objectives.
- □ Review the objectives of any blasting proposal.
- □ Specify a “typical” blast design that might be anticipated.
- □ List potential hazards associated with setting up, charging and firing a blast.
- □ Describe the expected environmental and other potential effects of such a blast.
- □ Locate site plans covering the full potential range of vibrations, airblast, and flyrock.
- □ Identify all onsite equipment, services, and facilities within target ranges.
- □ Use the assessment sheets provided to identify the hazards, determine the risk and identify the controls associated with each potential target or hazard.
- □ Document these on the risk management forms. (Blast Risk Notification & JSREA)
- □ Determine whether each hazard can be safely reduced and managed.
- □ Ensure every appropriate person on site is familiar with assessments and the procedures in place to ensure safety work practises.
- □ Measure and record blast outcomes and effects.
    - □ Complete summary report after blasting as required by law and site procedures.

CONTEXT OF RISK ASSESSMENT

- □ Regulation requirements
- □ Other activities in the area
- □ Associated tasks
- □ Site layout
- □ Property in non-safety zone
- □ Internal property damage
- □ Power lines, underground services
- □ All weather conditions
- □ Timing of activity
- □ Safety equipment needed
- □ Visitors and contractors
- □ Uneven surfaces
- □ Vehicle suitability
- □ Operator competence
- □ Delays in charging / firing
- □ Neighbours
- □ Traffic/ Speed limits
- □ Restricted areas / Signs
- □ Face / ground conditions
- □ Geology
- □ Off-spec drilling, lost holes
- □ Oversize
- □ Toe
- □ Backbreak
- □ Airblast, Vibration
- □ Evacuation areas, Road blocks

The Risk Assessment process can be either Orica's or Hanson's. It must be agreed upon and communicated to both parties.

IMPLEMENTATION PLANS

The following plans and responsibilities have been identified and must be executed:

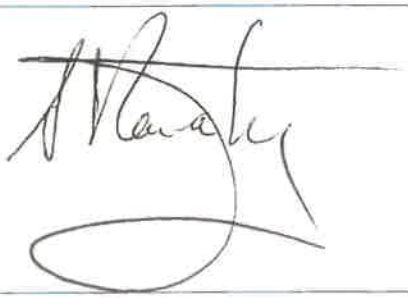
ACTIONS	**PERSON**
Obtain necessary permits/notifications	Hanson
Conduct explosives awareness TBT (as requested)	Orica TSR
Review Blast Designs as required	Orica TSR
Design, load and fire the blasts	Orica
Conduct Vibration and Overpressure Monitoring when requested by QM/SSE	Orica SF
Video the blasts	Orica SF
Advise neighbours of blasting (where required)	Hanson
Advise providers of services adjacent to the blast of blasting	Hanson
Prepare a written blast clearance plan with sentry locations marked	Hanson and Orica
Provide good quality clean 10-20mm aggregate for stemming as required for each blast	Hanson
Provide appropriate cover material if blasts require extra cover for any reason	Hanson
Provide bunding, signage and flagging for demarcating blast area	Hanson and Orica
Provide an appropriately prepared bench for desired blast area	Hanson
Site specific procedure for misfire management	Orica
Provide Blast Guards for each blast where necessary	Hanson
Drill blastholes to specified design	Driller/Hanson
All personnel involved in Risk Assessment meeting to sign off	ALL

STANDARD OPERATING PROCEDURES

BLAST MANAGEMENT REQUIREMENT	REFERENCE DOCUMENT
Layout plan of the blast including drilling pattern and hole depths.	Job Pack / SIS / SSOP-04
Detonation sequence/effective charge mass per delay (MIC)/powder factor.	Job Pack / SIS / SSOP-01, 04, 05
Type of explosive to be used and quantity required.	Job Pack / SIS / SSOP-04
Method of initiation.	Job Pack / SIS / SSOP-05
Type of firing equipment and procedures.	Job Pack / SIS / SSOP-35, 37
Explosive loading and charging procedures.	Job Pack / SIS / SSOP-04 & SSOP-21 to SSOP-33
Explosive storage and handling procedures.	SSOP-06, 07
Security procedures for the site and the blast, including explosives.	SSOP-06, 07, 08, 09
Proposed dates and times of blasting.	SSOP-01
Cessation of explosive-related activities during electrical storms.	SSOP-14
Misfire management system.	SSOP-41
Post blast assessment and inspection procedures.	SSOP-40
Provision for post-blast comments.	SSOP-40
Signature spaces for the plan author, shotfirer and person who approves the plan.	SSOP-01
Drill records and logs	Job Pack

BLAST RECORDS	
Details of the blast should be taken and maintained, including but not limited to the following:	
Environmental conditions at the time of the blast.	SSOP- 43
Monitoring equipment including type, serial number and location.	SSOP-34, 43
Details of measurements recorded during the blast.	SSOP-34, 43
Details of flyrock.	SSOP-40, 43
Details of incidents and complaints.	SSOP-40, 43
Comment on the results of the blast.	SSOP-40, 43
Proposed modification to the blast plan for future shots.	SSOP-40, 43

DEVELOPMENT SIGN OFF

NAME	POSITION	SIGN
Stephen Kenworthy	Sancrox Quarry Manager Site Quarry Manager Responsibility	
Robert Kearney	Orica Kurri Kurri Plant Supervisor Operational Responsibility	
Scott Blair	Orica Technical Services Technical Services Responsibility	
Brenden Wood	Orica Territory Manager Overarching Operational Responsibility	

APPENDIX A - ORICA RISK ASSESSMENT

BLASTING RISK ASSESSMENT TABLE

L (Likelihood) X C (Consequence) = R (Risk)

Likelihood of Occurrence	Potential Consequences					
	5 Notable	10 Significant	15 Highly Significant	20 Serious	25 Very Serious	30 Catastrophic
Almost Certain	Level II	Level II	Level I	Level I	Level I	Level I
Very Likely	Level III	Level II	Level II	Level I	Level I	Level I
Possible	Level III	Level III	Level II	Level II	Level I	Level I
Unlikely	Level IV	Level IV	Level III	Level III	Level II	Level I
Very Unlikely	Level IV	Level IV	Level IV	Level IV	Level III	Level II
Extremely Unlikely	Level IV	Level IV	Level IV	Level IV	Level IV	Level III

POTENTIAL LIKELIHOOD

6	Almost Certain	The event will almost definitely occur.
5	Very Likely	A common occurrence. The event is expected to occur in most circumstances.
4	Possible	Event will probably mostly occur - known to have happened in similar situations.
3	Unlikely	The event could occur but not expected.
2	Very Unlikely	The event may occasionally occur at some time but rarely
1	Extremely Unlikely	The event may occur only in exceptional circumstances.

- Note that the risk estimations and "weightings" are subjective and based on the experience and interpretation of those persons contributing to the study. For matters relating to blasting technology and design this is mostly provided by the writer of this report.

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ORICA INTERNAL HAZARD MANAGEMENT TABLE

Risk	Who Signs Off	Type of Investigation
Level IV	Shotfirer / Supervisor	Site visit, sign off note in job pack
Level III	TS Blasting Engineer	Site visit, report in job pack
Level II	Snr TS Engineer / Project / Business Mgr.	Site visit, Risk report in job pack
Level I	Must be reduced	Cannot accept work

POTENTIAL CONSEQUENCE EXAMPLES

	Notable	Significant	Highly Significant	Serious	Extremely Serious	Catastrophic
Safety & Health	1 Minor Injury	Single MTI	Single LWC or Multiple MTI	Permanent disability or Multiple LWC	Single Fatality	Multiple Fatality
Environment	Very Minor pollution	Minor Local pollution	Evident Pollution local concern	Significant Local pollution	Major Local pollution	Extremely Severe pollution
Reputation and Image	Minor issue 1 complaint	Local issue 10 complaints	Local media 100 complaints	Regional or state media	National media coverage	Headlines, corporate damage
Services / Business Interruption	Minor re-connection required	Minor temporary loss of resource	Short-term supply loss of major resource	Medium term supply loss for major resource	Long term loss of production and/or major resource	Permanent loss of production and/or major resource
Business Liability	>$5000	>$50,000	>$200,000	>$1m	>$15m	>$50m

BLASTING RISK EVALUATION GUIDE (ISEE)

The Journal of Explosives Engineering, July/ August 2000

This is fundamental best practice when managing concerns through blasting

Concern	Primary Impacts	Controls
Flyrock	Damage and Injury	Pre-qualification requirements, blasting controls (blast mats-burden requirements) stemming requirement blast plan reviews, and inspection work.
Structural damage to buildings	Damage claims, work delays or suspension	Pre-qualification requirements, blasting controls, blast plan submittals and reviews, careful inspection of work, public education, effects monitoring and pre, blast condition surveys.
Damage to rock slopes and final excavation walls	Rock fall, remedial slope repairs, work disruption	Evaluate in situ condition of slopes and install additional support is needed. Develop blasting controls and carefully monitor the work.
Damage to buried pipes and utilities	Unrealistic restrictions or total ban on blasting	Pre-qualification requirements, blasting (controls, blast plan submittals and reviews, careful inspection of work, effects monitoring and blasting effects evaluation study by expert.
Startled people	Complaints	Inform neighbours before each blast.
Damaged water wells or aquifers	Blasting prohibition or project delays	Blasting controls, pre-blast / post blast inspections, effects monitoring and blasting effects evaluation study by expert
Environmental Impacts or other Animal Effects	Disapproved EIS, blasting prohibition or delays	Blasting controls, pre-blast and/or post blast inspections, and blasting impacts and mitigation study by expert.
Work or business disruption	Financial damage claims and/or organised opposition to the work	Public education, blasting controls, monitoring and schedule blasting during non-working hours.
Contractual Claims and Legal Actions	Financial damages	*Owners and Engineers:* Have appropriate experts review contract documents and specifications. Prepare pre-qualification requirements to ensure personnel can perform the work, and carefully inspect and document all non-conforming work. *Contractors:* Carefully evaluate all available documents-including all geotechnical information, attend pre-construction meetings, document all efforts to conform and barriers to conformance

Blasting Job Safety & Risk Assessment Form – Hanson Sancrox Quarry						Date 25/04/2020			
Event or Activity	**Potential Hazards & Effects**	**L**	**C**	**R**	**Possible Elimination Measures**	**Responsibility/ Comments**	**L**	**C**	**R**
Design Blast	Poor Blast Design may lead to safety, environmental or productivity problems (fly rock, vibration, misfires, hard digging).	5	15	75	Blasts designed according to SIS. If class of blast increases to Class 4 and above, Tech Services Rep is engaged for design and loading review. Adopt design measures to reduce the risk of misfires, fly rock and vibration.	Orica Surveyor to conduct blast survey, including face profiling and designate correct class of blast for review responsibilities. Orica SSOP's	2	10	20
Work Conditions	Poor light conditions or reduced visibility, resulting in slip, trips and falls. Traffic interactions	5	15	75	Quarry operating within daylight hours only Minimal fog or mist on site Adverse weather conditions (rain, wind)	Hanson Sancrox management in conjunction with Orica blast crew	3	10	30
Establish Safe Work Area	Benches not prepared adequately.	5	15	75	Hanson to establish benches with sufficient drainage to enable MMU access. If it is raining it will be necessary to ensure road access for MMUs, this may require sheeting the road.		3	10	30

Blasting Job Safety & Risk Assessment Form – Hanson Sancrox Quarry						Date 25/04/2020			
Event or Activity	**Potential Hazards & Effects**	**L**	**C**	**R**	**Possible Elimination Measures**	**Responsibility/ Comments**	**L**	**C**	**R**
Establish safe work area	Danger of falling Working around large earth moving equipment.	5	15	75	Use of 2m rule when working near crests. Ensure all blast areas are clearly marked and signed before loading commences	Orica SF to confirm adequacy of controls before starting work. TMP and Orica SSOP	1	10	10
Mark Out Pattern	Mark out holes in wrong place Marks may get moved or lost	5	5	25	Orica to use adequately trained survey personnel. Hanson to ensure drill area is barricaded to all mine vehicles	Orica SSOP	3	5	15
Drill Blast holes	Holes drilled to wrong depth or in wrong place – fail to achieve grade. Holes blocked after drilling or redrills not remedied – poor fragmentation People drive over drill pattern and block holes	3	10	30	Holes to be drilled to design, all holes to be dipped and checked by Orica SF before charging. All holes to be protected with a plug (bag or hat). Drill area to be demarcated with signs or flagging	Orica SF Driller Driller / Hanson	1	10	10

Blasting Job Safety & Risk Assessment Form – Hanson Sancrox Quarry						Date 25/04/2020			
Event or Activity	**Potential Hazards & Effects**	**L**	**C**	**R**	**Possible Elimination Measures**	**Responsibility/ Comments**	**L**	**C**	**R**
Secure Worksite	Other activities or people in work area may interfere, hot work while loading or near stored explosives may cause unplanned explosion. Snap, Slap, Shoot of Excel™ initiation system	3	20	60	No other trades, activities or machines to be working in Blast area while explosives loading activities are underway. Blast area appropriately signed and demarcated before loading commences. No vehicles on shotplan unless separate risk assessment completed. Sources of ignition controlled	Orica SF and Crew Orica SSOP TMP	1	20	20
Select Blast Time	Blast time not correct causing rushing	5	10	50	Blast times to be agreed between Shotfirer and Hanson (Mon-Fri between 9am and 3pm)		1	10	10
Transport Explosives to worksite	Interaction between Orica SF vehicle and other vehicles – collision, fire, explosion	3	25	75	Orica personnel to contact site personnel via two-way when driving in quarry. Vehicle with explosives signs displayed appropriately Site Traffic Management Plan	Orica SSOP Hanson Sancrox Quarry Traffic Management Plan (TMP)	1	25	25
Store Explosives at worksite	Theft, Loss	3	25	75	Explosives to remain under control of SSAN (Sensitive Security Ammonium Nitrate cleared Orica person or locked in Vehicle. Daily reconciliation of quantities used. Theft or loss to be reported.	Orica SSOP	1	25	25

Blasting Job Safety & Risk Assessment Form – Hanson Sancrox Quarry						Date 25/04/2020			
Event or Activity	**Potential Hazards & Effects**	**L**	**C**	**R**	**Possible Elimination Measures**	**Responsibility/ Comments**	**L**	**C**	**R**
Set out Stemming	Stemming in wrong place or not enough will cause blast delay and excessive fatigue	5	5	25	Orica Shotfirer to ensure sufficient stemming is available and set out to Orica requirements.	Hanson to supply 10-20mm aggregate and loader to place it.	1	5	5
Check and Load Blast holes	Incorrect quantity of explosives loaded – vibration / fragmentation problems Explosives blocked in blast hole – fly rock / air blast.	5	15	75	Orica Shotfirer responsible for ensuring correct quantity is loaded and reconciled. Exclusion zone. Work area must be free of standing water. Prepare contingency for dealing with blocked holes (extra false burden and machine to place it). Face profiling to determine false burden. If profiling detects deviation,	Orica SF and crew Orica SSOP Orica and Hanson, separate risk assessment required if placing false burden with machinery near loaded holes.	2	10	20
Stem Blast	Insufficient stemming – fly rock and air blast. Damage to initiation system – misfire.	4	20	80	Shotfirer to dip all holes before stemming. Use experienced personnel to ensure correct quantity of stemming in each hole. Appropriate exclusion zone executed. Orica Shotfirer or engineer to supervise.	Orica Shotfirer and SSOP Blast controller	2	10	20

Blasting Job Safety & Risk Assessment Form – Hanson Sancrox Quarry						Date 25/04/2020			
Event or Activity	**Potential Hazards & Effects**	**L**	**C**	**R**	**Possible Elimination Measures**	**Responsibility/ Comments**	**L**	**C**	**R**
Tie Up Blast holes	Incorrect initiation sequence may cause excessive vibration. Missed connection will cause misfire.	5	15	75	Orica Shotfirer to follow SIS or obtain review from Orica TSE. The Orica Shotfirer is to inspect shot as per Orica SSOPs, this is to be carried out in conjunction with a designated Blast Controller Electronic Blasting Systems (EBS) will require the Hanson supervisor to visually see the Hardware pre-blast report	Hanson and Orica Orica SSOP	2	10	20
Clear Blast Area	Failure to clear could result in death or injury	4	25	100	Hanson and Orica to develop blast clearance plan and brief blast sentries.	Hanson and Orica	1	25	25
Fire Blast	Breakdown in blast clearance – personnel in area	4	20	80	Written blast clearance plan required. Personnel and machines to be cleared beyond specified clearance zones. Sentries at all entrance points.	Blast Controller to ensure blast area is secured prior to handing site over to Orica SF	1	20	20
Fire Blast	Vibration from blasting without control may cause nuisance or damage	4	15	60	Control Charge Weight. Monitor vibration.	Orica SSOP's	1	10	10

Blasting Job Safety & Risk Assessment Form – Hanson Sancrox Quarry						Date 25/04/2020			
Event or Activity	**Potential Hazards & Effects**	**L**	**C**	**R**	**Possible Elimination Measures**	**Responsibility/ Comments**	**L**	**C**	**R**
Fire Blast	Overpressure from blasting without control may cause nuisance or damage	4	10	40	Ensure adequate face burdens and stemming. Use good quality stemming. Monitor airblast. Blast during designated times and under suitable environmental conditions		1	10	10
Fire Blast	Flyrock (from blasting without control) within blast clearance area may cause damage to equipment or infrastructure	4	15	60	Ensure adequate face burdens and stemming. Use good quality stemming. Treat exceptions according to SSOP.		2	10	20
Fire Blast	Flyrock (from blasting without control) outside blast clearance area may cause damage, injury or death.	4	25	100	Ensure adequate face burdens and stemming. Use excellent quality stemming. Clearance zone per Appendix G. Prepare written blast clearance plan.	Orica Shotfirer to prepare blast clearance plan (flyrock Calculation)	1	25	25
Fire Blast	Harm or discomfort from post blast fumes	4	10	40	Identify post Blast fume, Notification to all personnel of fume cloud and direction of tracking Achieve blast optimisation Correct oxygen balance during manufacturing of bulk explosives Minimise sleep time of explosives Minimise water ingress within the explosive column	Orica Blast crew to ensure best on bench practises. Hanson to ensure bench prep for blast optimisation. Hanson to report to regulators if fume leaves site or personnel are exposed	2	10	20

Blasting Job Safety & Risk Assessment Form – Hanson Sancrox Quarry						Date 25/04/2020			
Event or Activity	**Potential Hazards & Effects**	**L**	**C**	**R**	**Possible Elimination Measures**	**Responsibility/ Comments**	**L**	**C**	**R**
Fire Blast	Poor fragmentation/toe may lead to low productivity	4	15	60	Ensure that blasting parameters are implemented to manage fragmentation and environmental requirements.	SSOP's	4	15	60
Check for misfires	Misfires pose a high threat to drillers, excavator operators and future users of spoil	3	20	60	Where excavator operator does not hold relevant qualifications, train operator to identify misfires and what to do if found. Hanson to contact Orica if any misfires are found. Orica Shotfirer to follow directions in SSOP for handling misfires. Misfire Flowchart is to be followed (see Appendix C)	Orica to conduct TBT for operators	1	10	10
Review WMS					This WMS is to be reviewed every 12 months or as deemed appropriate				

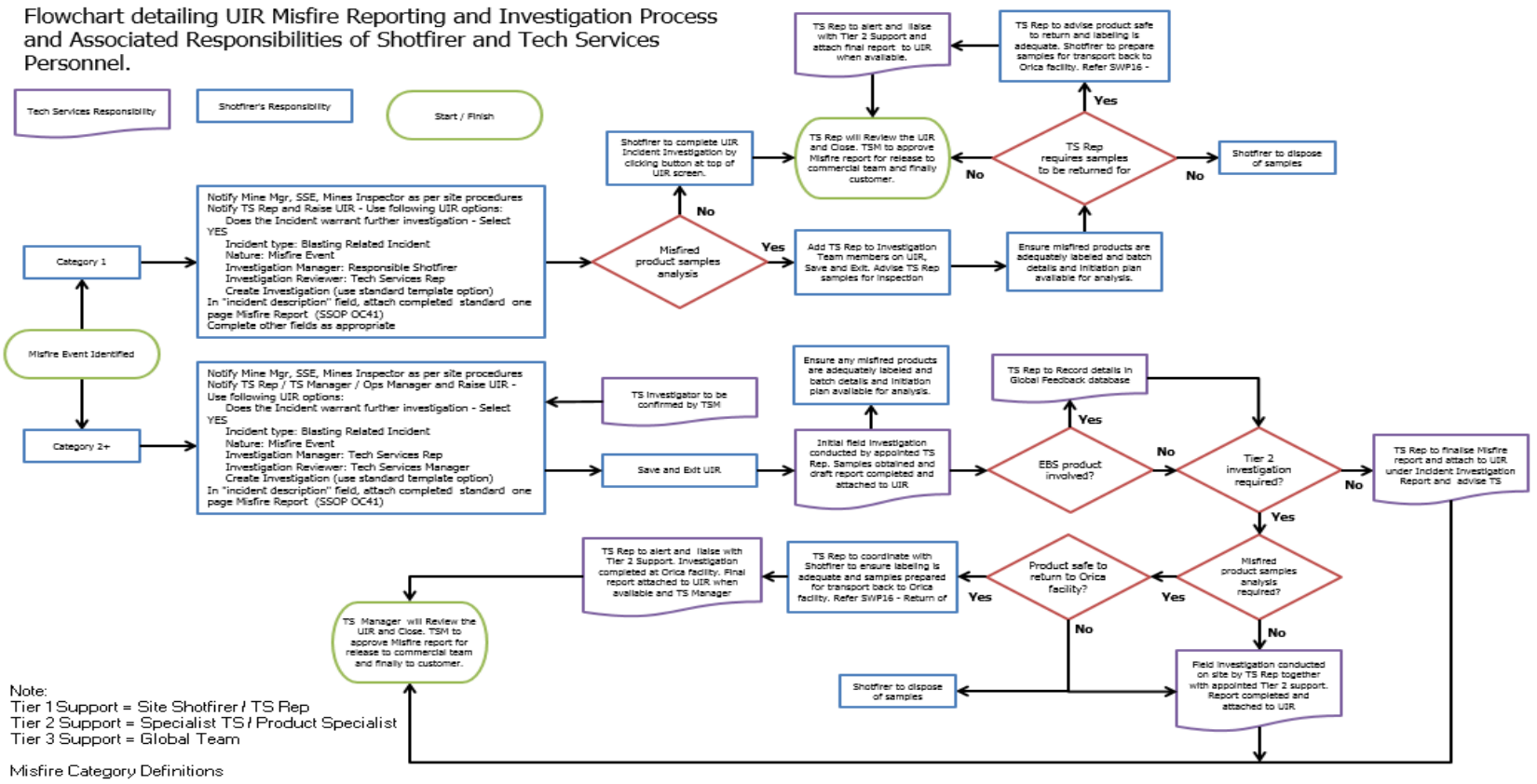
APPENDIX B - SITE SPECIFIC PRE-BLAST FIRING CHECKLIST

The following page contains a checklist used to highlight actions specific to the site that are to be completed during loading and before each firing.

Pre-Blast Checklist	By	Completed	Comments
Minimum 1 day before loading			
Neighbours notified	Hanson		
Stemming onsite, ready to place	Hanson		
Day of the blast (start of shift)			
Neighbours notified of blasting if required	Hanson		
Blast Clearance plan in place	Hanson & Orica		
30 minutes before the blast			
Blast Guards report to Blast Controller	Hanson		
Arm Monitors	Orica		
Setup video	Orica		
Begin clearing the area of personnel	Hanson		
15 minutes before the blast			
Blast guards to be at guard position	Hanson		
Orica begin retreat to firing point	Orica		
Blast Controller meet Orica at firing point (or remain in radio contact at known location)	Hanson & Orica		
After the blast			
Inspect blast	Orica		
Confirm blast has been fired and give the all clear	Orica		

APPENDIX C – MISFIRE FLOW CHART

The following page contains a flow chart of the preferred methodology for dealing with a misfire



Note:
Tier 1 Support = Site Shotfirer / TS Rep
Tier 2 Support = Specialist TS / Product Specialist
Tier 3 Support = Global Team

Misfire Category Definitions

Cat 1 (Minor) - Can be resolved by the shotfirer with the blast guards in place. UIR is raised with investigation managed by shotfirer and reviewed by local TS Engineer.

Cat 2: (Significant) Results in blast being delayed to the point it cannot be refired within the permissible blast window, e.g. major surface shutdown, unsafe to fire or product found during excavation. Engineer and reviewed by TS Manager. UIR is raised with investigation managed by local TS

Cat 3 (Serious) – Requires considerable time and effort to recover, resulting in significant delay causing a major disruption to the mining cycle. UIR is raised with investigation managed by experienced TS Engineer nominated by TS Manager and reviewed by TS Manager. Resolution process may be managed by the Commercial Manager.

Cat 4 : (Catastrophi Unrecoverable misfire situation resulting in a potential significant consequential loss to OMS. UIR is raised with investigation managed by nominated TS Engineer and reviewed by TS Manager. Resolution process may be managed by Level 4 management.

APPENDIX D - INCIDENT REPORTING

NAME	POSITION	CONTACT DETAILS
Stephen Kenworthy	Quarry Manager	stephen.kenworthy@hanson.com.au – 0428 896 029
David Boyd	Quarry Supervisor (Statutory Manager)	david.boyd@hanson.com.au – 0438 465 291
Brenden Wood	Territory Manager (ORICA)	brenden.wood@orica.com - 0412 108 571
Robert Kearney	Plant Manager (ORICA)	robert.kearney@orica.com – 0447 891 290
Scott Blair	Technical Services (ORICA)	scott.blair@orica.com - 0403 367 833

APPENDIX E – BLAST CALL PROCEDURE

SHOTFIRER

- **Shotfirer: Carry out radio check over the UHF (CH30) with blast controller and blast guard**
- *Blast Guard: Confirm monitor in position and ready with sentry*
- **Shotfirer: "Blast Controller, confirm you are in position and the quarry is clear"**
- *Blast Controller: "Quarry is all clear" or "quarry is not clear please wait". If clear, Quarry siren sounded 3x 5 second blasts.*
- **Shotfirer: "Attention all personnel, there will be a blast in the main pit @ (blast location and level) in 1 minute, please maintain radio silence until the shot is fired and the all clear is given, radio discipline may be release in case of an emergency**
- **Shotfirer: Start warning siren – sound for 30 seconds**
- **Shotfirer: "Firing the blast in 10 seconds"**
- **Shotfirer: 10,9,8,7,6,5 (radio silence with radio disengaged)**
- **Shotfirer: "Firing the blast now" – wait 2 seconds with radio disengaged)**
- **Shotfirer: "The blast has been fired, please maintain radio silence until the all clear has been given".**
- **Shotfirer: "Blast Controller, the blast has been inspected and found to be safe (if area is unsafe report through immediately) you may resume work in the pit"**
- *Blast Controller: Inform operators to return to work and monitor sentry to return to the quarry.*

*If there are any reasons to stop the shot, immediately call **"ABORT, ABORT, ABORT"**, once everything is all clear to proceed, the blast control and blast firing process **MUST** be started again.*

BLAST GUARD

- *Shotfirer: Carry out radio check with blast guard and monitor sentry*
- **Blast Guard: Confirm monitor in position and ready with sentry**
- *Shotfirer: "Blast guard, confirm you are in position and the quarry is clear"*
- **Blast Guard: "Quarry is all clear" or "quarry is not clear please wait"**
- *Shotfirer: "Attention all personnel, there will be a blast in the main pit @ (blast location and level) in 1 minute, please maintain radio silence until the shot is fired and the all clear is given, radio discipline may be release in case of an emergency*
- *Shotfirer: Start warning siren – sound for 30 seconds*

- *Shotfirer: “Firing the blast in 10 seconds”*
- *Shotfirer: 10,9,8,7,6,5 (radio silence with radio disengaged)*
- *Shotfirer: “Firing the blast now” – wait 2 seconds with radio disengaged)*
- *Shotfirer: “The blast has been fired, please maintain radio silence until the all clear has been given”.*
- *Shotfirer: “Blast guard, the blast has been inspected and found to be safe (if area is unsafe report through immediately) you may resume work in the pit” Quarry siren sounded 1x 10 second blast*
- **Blast Guard: Inform operators to return to work and monitor sentry to return to the quarry.**

APPENDIX F- BLAST EVENT CHECKLIST

Blast Event Checklist
AUSQC&NZ Blast Documentation

Blast Details

Shot No.		Customer	
Firing Date		Quarry / Site	
Firing Time		Location / Pit	
Exclusion Start Time		Blast Controller	
UHF / Radio Channel		Shotfirer	

Morning of Blast

Check Item	Initial on completion	Date / Time
Time of blast and exclusion zone agreed with Quarry/Site Manager or relevant customer personnel		
Blast boards and/or signage updated with blast times		
Environmental monitoring locations and installation personnel selected		
Exclusion zone inspected for at-risk items such as equipment and services. Customer advised as required		
Blast Guard meeting held to discuss guard locations and blast procedure. Use aerial photograph where possible to ensure all potential access routes covered.		

Blast Guarding Plan

No.	Blast Guard Name	Blast Guard Mobile Number	Blast Guard Location	Trained*
1				▫ Yes
2				▫ Yes
3				▫ Yes
4				▫ Yes
5				▫ Yes

*Note. All blast guards to be trained in relevant blast guarding requirements and responsibilities prior to taking position.

AUSQC&NZ Blast Event Checklist.en.frx Page 1 of 2 ORICA

Blast Event Checklist
AUSQC&NZ Blast Documentation

Clearance and Pre-firing Checks (Guide only, use where no site-specific checks available)

30 minutes prior to blast

Check Item
Blast Controller to broadcast blast type, time and location
Blast guards to be sent to agreed positions
Exclusion zone cleared of people and equipment
Check positive radio communications with all guards

10 minutes prior to blast

Blast Controller/Shotfirer to broadcast time until blast and location
Shotfirer to conduct roll call of blast guards confirming that they are in position and area is secured
ExelTM Initiation – connect lead in line and run to firing position
Electronic Initiation – complete programming and circuit testing, arm blast box
Confirm all monitors installed and monitoring commenced
Confirm to blast controller that blast is ready to fire

Countdown to blast

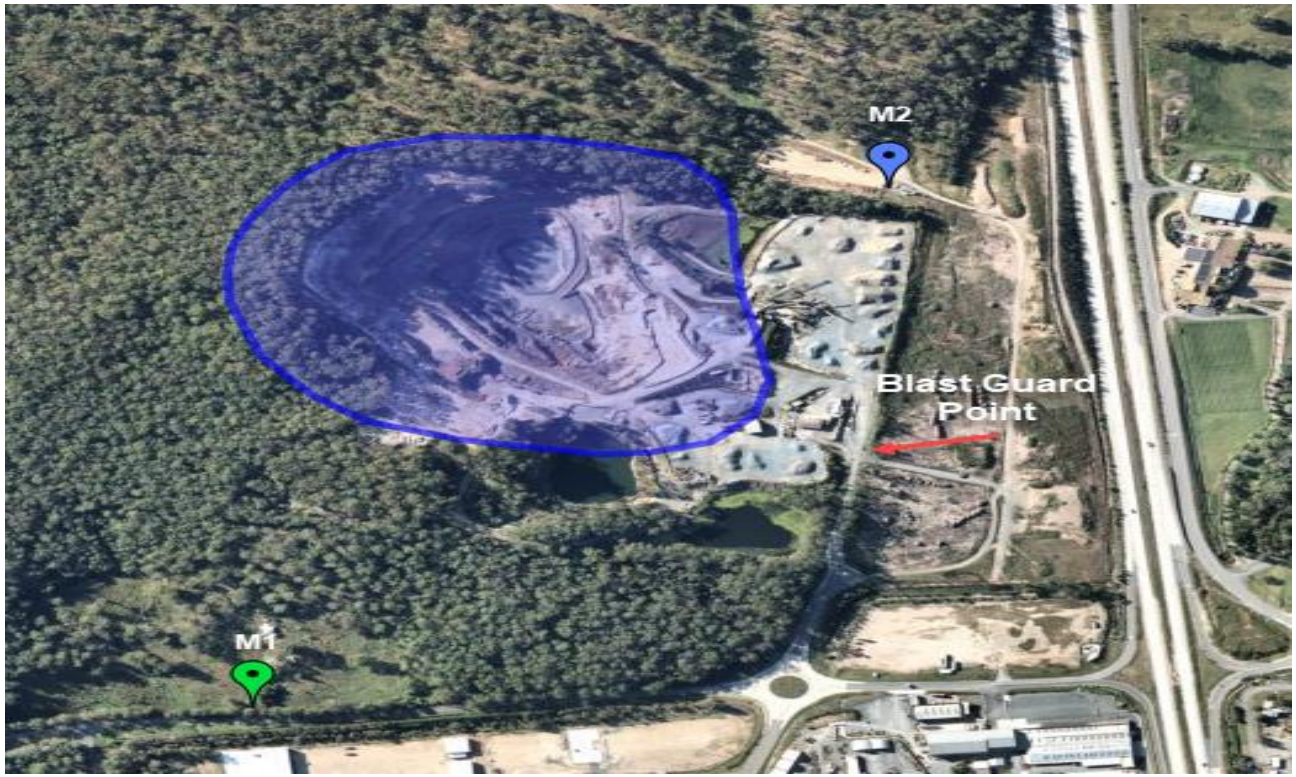
At 3 minutes to blast, sound audible warning siren of 3 short blasts
At 2 minutes to blast, call Shotfirer to call for radio silence and broadcast shot location and "2 minutes till shot is fired"
At 1 minute to blast, sound audible warning siren for 1 minute
Complete final visual inspection of blast area from firing position prior to firing
Connect ExelTM lead in line to initiating device
Broadcast "15 seconds to firing"
When countdown complete, fire the blast

Immediately after blast

Wait for minimum 2 minutes after ExelTM shot, or 5 minutes after Electronic shot, then inspect blast for performance and misfires.
If no misfires, give "all-clear" advice to blast controller, and stand down all blast guards
If misfires present, assess risk and follow site misfire procedures

AUSQC&NZ Blast Event Checklist.en.frx Page 2 of 2 ORICA

APPENDIX G – BLAST CLEARANCE AND BLAST GUARD MAP



The current Blast Clearance map is based upon calculations running off 300m perpendicular from each exposed face as well as 50m horizontal trajectory from the rear of each exposed face.

APPENDIX H – EXPLOSIVES CONTROL PLAN

An *Explosives Control Plan* has been prepared in accordance with Schedule 2, section 4 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* and aims to address the criteria set out from the below extract from the Regulation.

4 Explosives Control Plan

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

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

UNINTENDED OR UNCONTROLLED DETONATION

a) The potential for unintended or uncontrolled detonation of explosives

There are a number of key scenarios Orica has identified where there is potential for unintended or uncontrolled detonation of explosives, as per below. For each of these scenarios the key control measures for risks to health and safety are covered by Orica's SSOPs (referenced below). In addition to this the site specific Blast Management Plan in conjunction with the job specific Risk Assessment, Toolbox Talk and Traffic Management Plan (stored in Blast IQ online interface).

1. Transportation
    - SSOP-OC-07 Transporting Explosives to & from Magazine
    - SSOP-OC-08 Resolving and Reporting Stock Discrepancies
    - SSOP-OC-11 Maneuvering Vehicles Around the Blast

In the event of an emergency onsite or in transit the Emergency Procedure Guides in both the Mobile Manufacturing Unit (MMU) and Shotfiring Vehicles (SFV) should always be referenced. These guides will help to determine the hazards, personal protective equipment and correct emergency response for those goods if they are involved in the fire situation in conjunction with Customer Site Emergency Plan.

2. Misfire
    - SSOP-OC-09 Identifying and Managing Blast Hazards
    - SSOP-OC-10 On Bench Hazards
    - SSOP-OC-33 Tie In
    - SSOP-OC-37 Connect Blast Initiation
    - SSOP-OC-38 Firing the Blast
    - SSOP-OC-41 Handling Misfires
    - SSOP-OC-42 Misfire Documenting Responsibilities

3. Poor Handling Practices
    - SSOP-OC-01 Tools for Managing the Blast Process
    - SSOP- OC-08 Resolving and Reporting Stock Discrepancies
    - SSOP-OC-30 Problems when Loading
    - SSOP-OC-32 Disposal of Explosives
    - SSOP-OC-36 Blast Guard Duties

4. Equipment Maintenance
    - Orica utilizes the SAP Redbook Maintenance System

5. Hot and Reactive Ground
    - SSOP-OC-09 Identifying and Managing Blast Hazards
    - SSOP-OC-10 On Bench Hazards
6. Lightning
    - SSOP- OC-14 Lightning

CHARACTERISTICS OF EXPLOSIVES, PLACE OF USE AND PHASES OF USE

(b) the characteristics of relevant explosives and the purposes for which they are to be used,

(c) the characteristics of the places in which the explosives are to be used,

(d) the full set of phases for the use of relevant explosives such as the charging and firing phases,

The characteristics of relevant explosives and the purposes for which they are to be used are covered in Orica's Technical Data and Safety Data Sheets and can be found online http://www.oricaminingservices.com/au/en/page/markets/quarry. Products regularly used on site include:

- Centra™ Gold
- Centra™ Gold ES
- Centra™ Gold GT System
- Exel™ Connectadet™ Detonators
- Exel™ Millisecond Detonators
- Centra™ Gold GT System
- Pentex™ H Booster
- uni tronic™ 600 Detonator

To ensure that relevant explosives are used in the charging and firing phases Orica utilizes a Blast Design approval process through our Blast IQ online interface. This is covered in the below SSOPs: The basic phases in sequence are survey, design, markout, boretrack and dip holes, design loading and initiation, charge/fire.

- SSOP-OC- 2 Blast Class Definitions
- SSOP-OC- 3 Blast Class Responsibilities
- SSOP-OC- 4 Blast Load Designs
- SSOP-OC- 5 Initiation and Design

POTENTIAL FOR DETERIORATION

The potential for deterioration of explosives at Sancrox poses a low risk, due to the nature of load, tie and shoot in a short timeframe usually within 1 working day. This presents a low risk for bulk emulsion products to deteriorate, given they are freshly manufactured for immediate use and are loaded and fired in a short timeframe.

Deterioration of explosive accessories such as downlines and surface connectors are managed with appropriate storage, stock rotation and use by date protocols.

Deterioration due to dynamic ground conditions, such as ground water or silt are covered in the blast design process to identify any potential and will be covered in the job specific risk assessment.

(e) the potential for explosives to deteriorate,

Monitoring and control for the deterioration of explosives is covered in the below SSOPs:

- SSOP-OC- 6 Magazines
- SSOP-OC-32 Disposal of Explosives

POTENTIAL FOR THEFT OR MISUSE OF EXPLOSIVES

The potential for theft or misuse shall be controlled by the job specific JSERA and the Orica SSOP's. the shotfirer shall maintain under control of all explosives on the blast site at all times and operates under the Orica SSOP. The shotfirer shall also prevent unauthorized access to explosives, blast site and equipment.

Reconciliation of all explosives takes place before firing and the blast is not fired until all explosives have been accounted for.

(f) the potential for the theft or misuse of explosives,

All incidents that involve a discrepancy in the reconciliation of explosive stock, either at the blast site or at the magazine are covered in the below SSOPs. These also cover the process of reconciling, stocktaking and reporting suspected loss or theft of explosives.

- SSOP-OC- 6 Magazines
- SSOP- OC-08 Resolving and Reporting Stock Discrepancies

POTENTIAL FOR FLY ROCK

(g) the potential for the ejection of fly rock or other material as a result of the detonation of an explosive.

Key control measures to eliminate the ejection of fly rock or other material as a result of the detonation of an explosive is assessed at all stages of the blast cycle. This includes the initial design, quality control (i.e. boretraking and face profiling), loading practices and finally exclusion zones and firing. The following SSOPs summarize the control measures to ensure a safe and efficient blast outcome:

- SSOP-OC-4 Blast Load Design
- SSOP-OC-5 Initiation and Design
- SSOP-OC-21 Check Blast Loading Design
- SSOP-OC-30 Problems when Loading
- SSOP-OC-35 Shotfirers Pre-firing Planning Meeting
- SSOP-OC-36 Blast Guard Duties

PROCEDURES FOR INSPECTING, REPORTING, ISOLATING AND DISPOSAL OF DETERIORATED OR DAMAGED EXPLOSIVES AND HANDLING OF MISFIRES

(a) the procedures for inspecting, reporting, isolating and disposing of deteriorated or damaged explosives,

(b) the procedures for finding, recovering and disposal of explosives that misfire,

Once a blast has been fired to ensure the area is clear of explosive product or deteriorated/damaged explosives the below SSOPs are followed.

- SSOP-OC-40 Post Blast Inspection

In the event of a misfire the below SSOPs summarise key steps taken to report, isolate and dispose (if safe to do so) and are also described in this BMP and risk assessment.

- SSOP-OC-32 Disposal of Explosives
- SSOP-OC-41 Handling Misfires
- SSOP-OC-42 Misfire Documenting Responsibilities

INSPECTION, TESTING, REPORTING AND MAINTAINANCE OF EQUIPTMENT

(c) the inspection, testing, reporting and maintenance procedures in relation to the equipment used at the mine for manufacturing, storing, transporting and delivering explosives,

Orica utilizes SAP Redbook Maintenance System to inspect, test and report maintenance related tasks associated with the manufacturing, storing, transporting and delivering explosives.

STORAGE AND TRANSPORT OF EXPLOSIVES AT THE QUARRY

No explosives or explosives precursors are stored on site, other than the explosives and explosive accessories brought to site for immediate use for each individual blast event. All unused explosives or explosive precursors will be returned to Orica's licensed magazines off site upon job completion.

(d) the procedures and equipment used in storing and transporting explosives at the mine,

Transportation of explosives products to the mine/ quarry is covered under Orica's License to Transport and controlled under the following SSOPs.

- SSOP-OC-07 Transporting Explosives to & from Magazine
- SSOP-OC-08 Resolving and Reporting Stock Discrepancies
- SSOP-OC-11 Maneuvering Vehicles Around the Blast

ACCOUNTING FOR EXPLOSIVES

(e) the procedures used for the accounting of explosives at the mine,

For explosive product control onsite and in the event of a discrepancy in explosive products on site Orica personnel will follow the below SSOPs:

- SSOP-OC- 6 Magazines
- SSOP- OC-08 Resolving and Reporting Stock Discrepancies

In addition to these procedures, the shotfirer will have an IE/HE issues log, with recorded amounts of explosive accessories taken to site, counted and recorded amounts returning to Orica magazines and reconciled against design amounts required for each individual blast.

REGISTER OF LICENSES

(f) the arrangements for the keeping of a register identifying persons who are licenced under the *Explosives Act 2003* to transport, use, store or handle

explosives at the mine,

(g) the procedures for ensuring that any person transporting, using, storing or handling explosives at the mine has any licence necessary under the *Explosives Act 2003*,

Orica maintains training records and licensing register for each employee which is monitored and updated monthly. Individual Unsupervised Handling Licensing (UHL) is provided to site on induction and updates provided as required. A person shall not commence any work identified in Orica's SSOPs without completing the required training and receiving appropriate appointment.

This document also provides details of suitably licensed personnel nominated to be shotfirer's for this site (refer pg. 14, Responsible Persons). It outlines the type of license and expiry date of the license.

Hi-Quality may also implement a system of monitoring of licenses held and expiry dates, such as the site induction process.

Copies of licenses/qualifications all personnel expected to conduct work at Hi-Quality Menangle have been provided to site.

CONSULTATION AND CO-OPERATION

(h) the procedures in relation to consultation and co-operation to ensure that any transportation, use, storage or handling of explosives at the mine is conducted

safely and in accordance with any conditions attached to the licence under which that transportation, use, storage or handling takes place.

Orica holds the following licensing against the Kurri Kurri Technical Centre and relevant vehicles to ensure that any transportation, use, storage or handling of explosives at the mine is conducted safety and in accordance:

- License to Manufacture Explosives XMNF100002
- License to Transport XTRN10012

The following operating procedures ensure these activities are conducted safely and in accordance with any conditions attached to licensing. A person shall not commence any work identified in this procedure without completing the required training and receiving appropriate appointment.

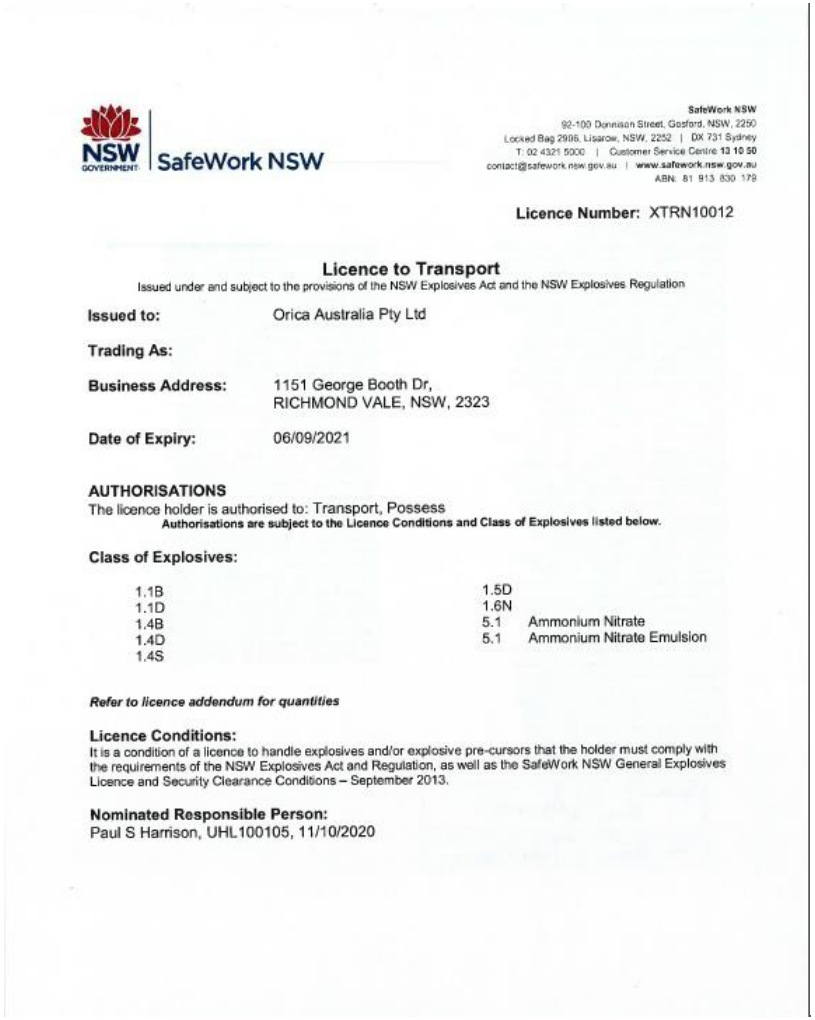
- SSOP-OC-06 Magazines
- SSOP-OC-07 Transporting Explosives to and from Magazines
- SSOP-OC-08 Resolving and Reporting of Stock Discrepancies

Copies of the relevant licenses can be found in this document.

In conjunction with the above procedures set out, attached in *Appendix J,* is a job by job specific JSERA used each time blasting activities take place on site and can be amended on a case by case basis as the shotfirer, blast crew and site representatives undertake each blast operation.

APPENDIX I – RELEVANT LICENSES

LICENSE TO TRANSPORT AND MANUFACTURE



NSW GOVERNMENT | SafeWork NSW

SafeWork NSW
92-100 Donnison Street, Gosford, NSW, 2250
Locked Bag 2906, Lisarow, NSW, 2252 | DX 731 Sydney
T: 02 4321 5000 | Customer Service Centre 13 10 50
contact@safework.nsw.gov.au | www.safework.nsw.gov.au
ABN: 81 913 830 179

Licence Number: XTRN10012

Licence to Transport

Issued under and subject to the provisions of the NSW Explosives Act and the NSW Explosives Regulation

Issued to: Orica Australia Pty Ltd

Trading As:

Business Address: 1151 George Booth Dr,
RICHMOND VALE, NSW, 2323

Date of Expiry: 06/09/2021

AUTHORISATIONS

The licence holder is authorised to: Transport, Possess

Authorisations are subject to the Licence Conditions and Class of Explosives listed below.

Class of Explosives:

1.1B	1.5D	
1.1D	1.6N	
1.4B	5.1	Ammonium Nitrate
1.4D	5.1	Ammonium Nitrate Emulsion
1.4S		

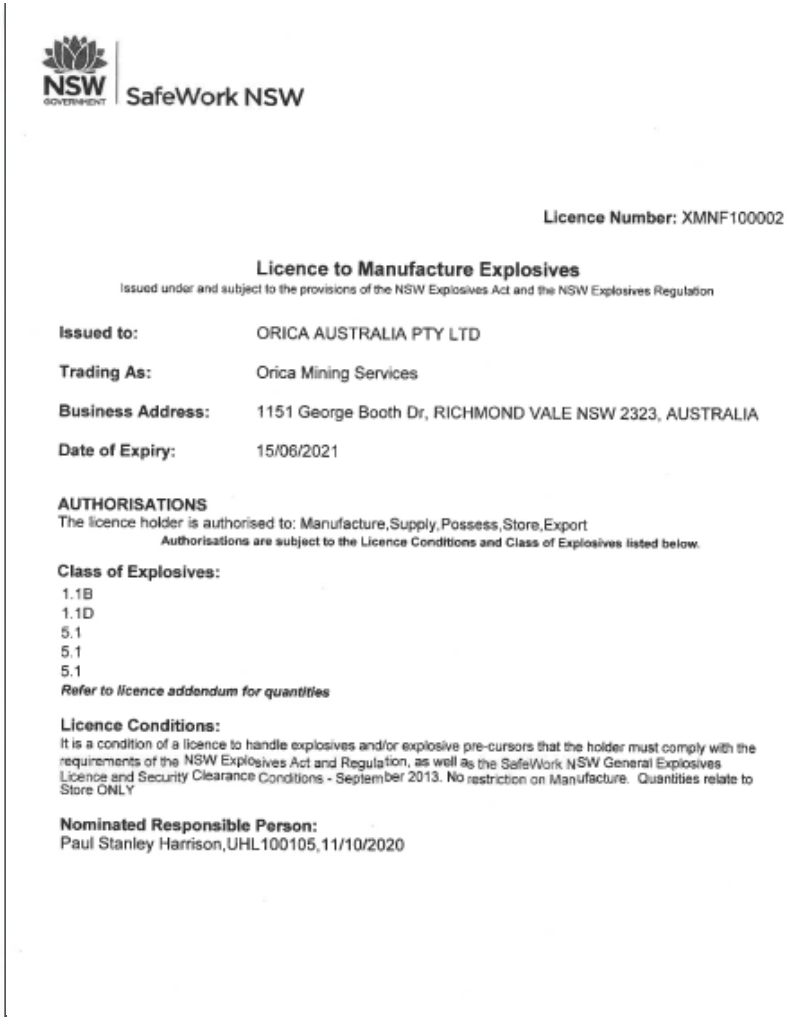
Refer to licence addendum for quantities

Licence Conditions:

It is a condition of a licence to handle explosives and/or explosive pre-cursors that the holder must comply with the requirements of the NSW Explosives Act and Regulation, as well as the SafeWork NSW General Explosives Licence and Security Clearance Conditions – September 2013.

Nominated Responsible Person:

Paul S Harrison, UHL100105, 11/10/2020



NSW GOVERNMENT | SafeWork NSW

Licence Number: XMNF100002

Licence to Manufacture Explosives

Issued under and subject to the provisions of the NSW Explosives Act and the NSW Explosives Regulation

Issued to: ORICA AUSTRALIA PTY LTD

Trading As: Orica Mining Services

Business Address: 1151 George Booth Dr, RICHMOND VALE NSW 2323, AUSTRALIA

Date of Expiry: 15/06/2021

AUTHORISATIONS

The licence holder is authorised to: Manufacture,Supply,Possess,Store,Export

Authorisations are subject to the Licence Conditions and Class of Explosives listed below.

Class of Explosives:

1.1B
1.1D
5.1
5.1
5.1

Refer to licence addendum for quantities

Licence Conditions:

It is a condition of a licence to handle explosives and/or explosive pre-cursors that the holder must comply with the requirements of the NSW Explosives Act and Regulation, as well as the SafeWork NSW General Explosives Licence and Security Clearance Conditions - September 2013. No restriction on Manufacture. Quantities relate to Store ONLY

Nominated Responsible Person:

Paul Stanley Harrison,UHL100105,11/10/2020

LICENSE TO STORE

NSW GOVERNMENT | SafeWork NSW

Licence Number: XSTR100077

Licence to Store Explosives

Issued under and subject to the provisions of the NSW Explosives Act and the NSW Explosives Regulation

Issued to: ORICA AUSTRALIA PTY LTD

Trading As: Orica Mining Services

Business Address: 1151 George Booth Dr, RICHMOND VALE NSW 2323, AUSTRALIA

Date of Expiry: 13/06/2022

AUTHORISATIONS

The licence holder is authorised to: Possess,Store

Authorisations are subject to the Licence Conditions and Class of Explosives listed below.

Class of Explosives:

1.1B
1.1D
1.4B
1.4S
5.1

Refer to licence addendum for quantities

Licence Conditions:

It is a condition of a licence to handle explosives and/or explosive pre-cursors that the holder must comply with the requirements of the NSW Explosives Act and Regulation, as well as the SafeWork NSW General Explosives Licence and Security Clearance Conditions - September 2013.

Nominated Responsible Person:

Paul Stanley Harrison,UHL100105,11/10/2020

APPENDIX J – JOB SAFETY AND ENVIRONMENT RISK ASSESSMENT SHOTFIRING

The following job specific JSERA has been developed to control the hazards associated with the explosives control plan. It is the responsibility of the shotfirer to complete this and amend if necessary if items become not applicable or new hazards present themselves on a case by case basis.

Completion of these is required for every blast and are stored in the Orica job pack and on BlastIQ™for each blast job number.

Risk Assessment Worksheet

Risk Assessment Number:	1	**Date of Assessment:**	1/05/2020	**Review Date:**	
Site/Location:	Hanson Sancrox Quarry NSW				
Activity/Situation:	ROG Services				
Facilitator:	Scott Blair	**Position:**	Technical Advisor (South East Aust Metals & Quarries)		

Team Member:	**Position:**
Jonathon Keller	Technical Services Advisor
Scott Blair	Technical Services Advisor
Cameron Ingles	Blast Technician

Objectives:

1. Orica to provide Rock On Ground service for Hanson Snacrox Quarry
2.

Inherent Risk- No Controls Applied					**Controls Applied & Residual Risk**							
No.	**Hazards or Effects Identified**	**C**	**L**	**Risk**	**Controls**	**C**	**L**	**Risk**	**Residual Risk**	**C**	**L**	**Risk**
1: Arrive at Site	Unauthorised site access - Fatigued	Medium	Unlikely	Level IV	1. Sign in 2. Complete Induction 3. Complete fatigue management training 4. Refer to specific JSERA's for fatigue management and surveying	Low	Rare	Level IV				
2: Operator loads MMU in OMS plant, shotfirer loads vehicle, surveyor loads vehicle	1. Manual Handling 2. Equipment failure 3. Slip/ Trip/ fall, Line of fire, equipment damage, Over loading/ spills, 4. Pump failure rollover	Medium	Unlikely	Level IV	1. Wear correct PPE, Wear dust masks where advised of Silica 2. Assess work area, Eye's on path 3. Obey traffic rules for plant 4. Refer to specific JSERA's listed a. Vehicles in plant b. Load MMU c. The use of TRAM system d. Loading from ANE tank 5. Consider reduced loads on sloped shots 6. Refer specific JSERA for Magazine 7. Warm up	Low	Unlikely	Level IV				
3: Drive to and on Hanson Sancrox site	collision with haulage and or other heavy construction equipment or persons	High	Possible	Level II	1. Operator to make call on UHF radio advising access (channel 30) 2. Drive to conditions (eg; slow down when wet) 3. Eyes on path	Low	Unlikely	Level IV				
4: Plan process of charging the blast	1. Slip / Trip / Fall 2. Personnel perform unsafe acts being unaware of hazards 3. Open face 4. Unathorised access to blast area	Low	Possible	Level III	1. Assess work area, Eyes on path 2. Put blast signs in position, use bunding, cones if needed for delination of area 3. Conduct Toolbox talk with shot-firer and blast crew as well as JSERA 4. Ensure TMP (Traffic Management Plan) is reviewed or conducted prior to loading	Low	Unlikely	Level IV				

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General

Risk Assessment Worksheet

					5. Windrow/bund in place and a 2mdemarcation line is painted on the ground							
5: Plan process of charging the blast	Fatigue, Working on site in high temperatures.	Medium	Possible	Level III	1. Controls when tempratures are greater than 35 degrees a. Minimum 8 litres of cool water per person per day consumed over the day b. Additional amount of at least 600ml of electrolyte replacement liquid c. At least 1 break where the entire crew stops for approx 20 minutes and consume food and water in either a shaded enviroment or air conditioned vehicles d. LV's to be left running to provide a cool enviroment for those needing a break (parked fundamentally stable) e. Shot-firer or most senior member to review controls with Sancrox QM and have them sign onto a risk assessment as proof of acceptance of these additional controls	Low	Unlikely	Level IV				
6: Operate / Manoeurve MMU on bench	1. Driving over HE / IE on bench causing potential snap, slap and shoot event 2. Collision with personnel and / or equipment 3. Soft edges, low wall / high wall	High	Possible	Level II	1. all operators to complete "Control & Manoeuvre of Vehicles on Bench" training 2. Inspection of work area prior to comencement 3. Layout HE / IE not in the potental path of the MMU 4. Use spotters when reversing 5. Use spotters whenever necessary 6. Give way to machinery 7. Make positive contact (visual or verbal) with other equipmentprior to moving 8. Refer to specific JSERA "Driving and Op[erating on Bench" 9. Refer to specific JSERA's "Working near mine equipment" and "Working at Heights"	Low	Unlikely	Level IV				
7: Prime holes	1. Slip / Trip / Fall on uneven ground 2. Manula handling of IE and HE	Low	Unlikely	Level IV	1. Warm up 2. Eyes on path Stay alert 3. Place utilise "Quarrysafes 4. IE / HE out of path 5. Complete manual handling training	Low	Unlikely	Level IV				
8: Manufacture and deliver product according to design via auger	1. Extended auger boom coming into contact with other equipment or personnal 2. Manual handling 3. Driving over HE / IE on bench	Medium	Possible	Level III	1. Ensuire all HE / IE is out of the path of the MMU 2. Use spotters when reversing 3. Use spotters whenever necessary 4. Refer to specific JSERA's "Driving and Operating on Bench", "Working at Heights" 5. Check area prior to moving boom 6. Stay alert	Low	Unlikely	Level IV				

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General

					7. Retract boom when moving near other equipment and or personnal						
9: Manufacture and deliver product according to design via hose	1. Slip / Trip / Fall on uneven ground 2. Manual handling	Medium	Possible	Level III	1. Eyes on path 2. Stay alert 3. Complete "Hose handling" training 4. Complete "Manual handling" training 5. Regular rotation of job	Low	Unlikely	Level IV			
10: Stemming Blast Holes	1. Manual Handling 2. Equipment failure 3. Slip / Trip / Fall 4. Detonation by friction, impact, static and heat 5. Sympathietic detonation 6. Missfire 7. Fly rock- M1 motor way	High	Possible	Level II	1. Warm up and stretch 2. PPE 3. Eyes on path 4. Dip holes after loading to ensure coorect product height 5. Controlled aplication of stemming material to in hole 6. Ensure enough stemming material (burden) is applied to each hloe to reduce fly rock	Low	Unlikely	Level IV			
11: Tie up blast	1. Manual Handling 2. Slip / Trip / Fall on uneven ground 3. Missfire	Medium	Possible	Level III	1. Warm up and stretch 2. PPE 3. Eyes on path	Low	Unlikely	Level IV			
12: Excel Tie-up	1. Manual Handling 2. Slip / Trip / Fall on uneven ground 3. Missfire	Medium	Possible	Level III	1. Warm up and stretch 2. PPE 3. Eyes on path 4. Trained personnel 5. Follow approved tie-up plan and any deviations recorded and reported to shotfirer and Orica Tech services 6. Practices aline with SSOP's	Low	Unlikely	Level IV			
13: Electronic scanning and connecting	1. Manual Handling 2. Slip / Trip / Fall on uneven ground 3. Missfire	Low	Possible	Level III	1. Warm up and stretch 2. PPE 3. Eyes on path 4. Trained personnel 5. Follow approved tie-up plan and any deviations recorded and reported to shotfirer and Orica Tech services 6. Practices aline with SSOP's 7. Test detonators for leakage and errors and record results	Low	Unlikely	Level IV			
14: Blast Area Clearance	1. Loss of communication with Blast controller and blast guards at time of Blast 2. People entring the exclusion area after clearance has been conducted	High	Unlikely	Level III	1. Test all communication equipment at blast controller meeting 2. Blast guards to be in poisition before blast controller final sweep 3. Where possible shot-firer to initiate blast from a adventage point to visually see blast area	Low	Unlikely	Level IV			
15: Fire blast and hand site back to Hanson	1. Injury to perrsonnel or public and equipment due to fly-rock 2. Injury to perrsonnel or public and equipment due to vibration 3. Injury to perrsonnel or public and equipment due to post blast fume	Very High	Possible	Level II	1. Dip holes after loading to ensure coorect product height 2. Controlled aplication of stemming material to in hole 3. Ensure enough stemming material (burden) is applied to each hloe to reduce fly rock 4. Ensure front row holes have the	Low	Unlikely	Level IV			

Risk Assessment Worksheet

					appropiate burden or have been loaded to accomidate for non-ideal burdens 5. Ensure M.I.C. and tie-up or not inducing excessive vibration 6. Ensure product loaded is within malufactures speifications 7. Ensure the timing allows for optimun relief throughout the shot 8. Follow SSOP's							
16: Blast Clearance	1. Post blast gasses 2. Ground movement 3. Exposed Crest	Low	Possible	Level III	1. Re-entre blast area after the statuary time outlined in the SSOP 2. No personel to walk over broken ground as per SSOP's 3. Ensure a 2m distance from the exposed crest at all times	Low	Unlikely	Level IV				

Control Effectiveness Check

Must be completed for all hazards with an inherent risk score of Level 2 or less and for all hazards with a residual risk score of Level 3 or less. Controls are considered adequate if ALARP can be demonstrated.

Hazard No.	Inherent Risk Score	Residual Risk Score	Are there any Engineering/ Substitution Controls? Y/N	ALARP		Are these controls adequate? Y/N	Control Effectiveness (Y/N)				Are Controls Effective? Y/N	Any Critical or Major Controls?	Comments/ Improvements (Must be completed if any questions are answered "N")
				What else can be done to reduce the risk?	Why can't it be done?		Are Controls Dependable?	Are Controls Practical?	Can controls be monitored?	Is there adequate workforce involvement?			

Risk Assessment Worksheet

SHES Consequence Matrix: *Determine the consequence of the hazard occurring using the matrix below*

SHES CONSEQUENCE MATRIX					
	Safety & Health	Environment	Community & reputation	Legal compliance	Property damage
Critical	Multiple fatality	> 6 month impact	Prolonged global media	Loss of licence to operate	> A$20M
Very High	Single fatality	3 – 6 months impact	Global media	Suspension of licence to operate	> A$10M
High	Lost workday	> 1 month impact	National media	Major fine	> A$1.0M
Medium	Medical treatment	> 1 week impact	Regional media	Minor fine	> A$ 0.5M
Low	First Aid	< 1 week impact	Local media	Official caution	> A$0.1M

SHES Likelihood Matrix: *Determine the likelihood of the hazard occurring using the matrix below*

SHES LIKELIHOOD MATRIX	
Almost Certain	- Expected to occur during task / activity; - Would occur within a year.
Likely	- Likely to occur during task / activity; - Would occur within 10 years.
Possible	- May occur during task / activity; - Will occur once in the life of the facility.
Unlikely	- Unlikely to occur during task / activity; - Has occurred somewhere in the world.
Rare	- Highly unlikely, but possible to occur during task / activity; - Could theoretically occur.

SHES Risk Rating: *Plot the consequence and likelihood on the following matrix to determine the SHES risk rating*

	Low	Medium	High	Very High	Critical
Almost Certain	Level II	Level II	Level I	Level I	Level I
Likely	Level III	Level II	Level II	Level I	Level I
Possible	Level III	Level III	Level II	Level II	Level I
Unlikely	Level IV	Level IV	Level III	Level III	Level II
Rare	Level IV	Level IV	Level IV	Level IV	Level III

Risk Assessment Worksheet

Action Plan

Must be completed for all controls that have not yet been implemented or have been identified as requiring improvement.

All actions must be raised in Enablon

No.	Action Required	Person Responsible	Due Date	Enablon Action Number

Review/Approval

Name:	
Position:	
Signature:	

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