2015 Level 1 Mine Emergency Exercise

North Goonyella coal mine

This publication has been compiled by the Level 1 Mine Emergency Exercise Organising Committee, Department of Natural Resources and Mines .

Preface

This report has been compiled by the organising committee for the 2015 Queensland Level 1 Mine Emergency Exercise. Each assessor involved in the exercise has also provided input relating to the component of the exercise they were examining.

The organising committee would like to thank all assessors for their input and acknowledge the cooperation and assistance of all those involved in this year's exercise.

Thanks are also extended to North Goonyella Coal Mine and Peabody Energy for participating in the exercise and providing the use of 20 self-contained self-rescuers (SCSR). Using this equipment added an extra element of realism when the scenario required the evacuation of coal mine workers.

Front cover: Level 1 Assessors reviewing briefing information at North Goonyella Coal Mine

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Abbreviations and glossary

Term	Definition
Approved standard	A safety and health standard under the repealed *Coal Mining Safety and Health Act 1925* that outlines ways to minimise the level of risk to persons arising out of coal mining operations.
AusAID	Australian Government's overseas aid program
Bord and pillar	A form of mining excavation (also called room and pillar) where roadways are driven to a pattern and pillars of coal are left to support the roof
CABA	compressed air breathing apparatus
CH_4	methane
CHPP	A coal handling and preparation plant is a facility that washes coal of soil and rock, crushes it into graded sized chunks (sorts), stockpiles grades preparing it for transport to market, and loads coal into rail cars, barges, or ships. They are also referred to as a coal preparation plant, prep plant, tippler or wash plant.
CITECT	brand name of SCADA system
CMW	coal mine workers
CO	carbon monoxide
CO_2	carbon dioxide
Continuous miner	A coal cutting machine used to develop new roadways in a mine.
CPR	cardio pulmonary resuscitation
CRO	control room operator
Crib room	A location where mineworkers eat and a meeting station for the ERZ controllers.
Cut-through (c/t)	A passage cut-through the coal, connecting two parallel headings.
DAC	An underground intercom system also referred to as the tannoy
DNRM	Department of Natural Resources and Mines
Driftrunner	A brand name for a flameproof, diesel-powered man-riding vehicle carrying up to 12 personnel
Eimco	A brand name of a flameproof mechanical loader
ERP/EMP	Emergency response plan/emergency management plan
ERZ	Explosion risk zone
ERZ controller	A mine worker responsible for safety inspections. Traditionally referred to as a 'Deputy'.
FAB	Fresh air base is a continuously monitored station for dispatch or return of rescue teams in close proximity to irrespirable zones.

Term	Definition
Face	The exposed surface of a coal deposit in the working place where mining is proceeding.
Gas chromatograph	A laboratory instrument used to analyse the composition of gas samples.
'Go line'	An assembly area on the surface where mobile plant is left after servicing and when available for use.
HMP	Hazard management plans
IAPs	An incident action plan is an approved plan developed by the incident management team (IMT) that outlines the processes and procedures to follow during an incident. It provides the logistics, operations and planning teams with clear instructions and directions.
ICS	Incident control system
IMT/ICT	Incident management team/incident control team
Inbye	A mining term for into the underground mine (away from the surface) from the point of reference
Industry Safety and Health Representative (ISHR)	A person who is appointed under section 109(1)5 of the *Coal Mining Safety and Health Act 1999* to represent coal mine workers on safety and health matters and who performs the functions and exercises the powers of an industry safety and health representative mentioned in part 8, division 2.
km	kilometre
Level 1 Mine Emergency Exercise	Mine emergency exercise to test the mine's emergency response system; to test the ability of external services to administer assistance and provide a focal point for emergency preparedness in Queensland.
Longwall	A method of mining flat-bedded deposits, in which the working face is advanced over a considerable width at one time.
m	metre
MEMS	Mine emergency management system
Mines Inspector	Statutory official employed to make examinations of and to report upon mines and surface plants for compliance with mining laws, rules, regulations, safety conditions and practices.
Mines Inspectorate	The organisation that employs Mines Inspectors
Mole	Name used to refer to the mine site representative on the organising committee for the Level 1 Mine Emergency Exercise.
MRAS	Mine re-entry assessment system
MSHA	Mine Safety Health Administration – Department of Labour, United States of America
mt	million tonnes

Term	Definition
Non-verbal communication	Method of communicating using beeps on a telephone or DAC similar to Morse code.
O2	oxygen
Outburst	An ejection of gas and coal from the solid face, where the gas is a mixture of methane and carbon dioxide.
Outbye	A mining term for out of the underground mine (towards the surface) from the point of reference.
Panel	The working of coal seams in separate panels or districts (e.g. single unit panel). A longwall face is sometimes referred to as a panel.
PED	A personal emergency device is an ultra-low frequency through-the-earth communication system used for paging. Originally developed to provide a fast and reliable method of informing underground miners of emergency situations. Due system enhancements and the ability to readily contact personnel wherever they are underground.
PJB	Brand name for a flameproof, diesel-powered man-riding vehicle carrying up to 12 personnel
Portal	The surface entrance to an underground mine
ppm	parts per million
QMRS	Queensland Mines Rescue Service
Recognised standard	A standard made for safety and health under the *Coal Mining Safety and Health Act 1999* stating ways to achieve an acceptable level of risk to persons arising out of coal mining operations
Rib	The solid coal on the side of a gallery or longwall face; a pillar or barrier of coal left for support.
RS8	Refers to *Recognised Standard 8: Conduct of mine emergency exercises*
Safegas	Brand name of a mine gas monitoring system developed by Simtars
SCADA	Supervisory control and data acquisition is software developed for monitoring and/or controlling plant and equipment
Self-contained self-rescuer (SCSR)	A respiratory device used by miners for the purpose of providing a closed-circuit limited supply of oxygen. Used during escape from mine fires and explosions.
Simtars	Safety in Mines Testing and Research Station
SMV	Brand name for a flameproof diesel-powered man-riding vehicle carrying up to 12 personnel
Stopping	A ventilation control device which stops ventilation flow through a roadway

Term	Definition
Tag board	Peg board where underground personnel place a token to indicate their presence in a section of the mine.
Undermanager	Mineworker who is in charge of the mine on a shift basis (e.g. shift supervisor).
UMM	Underground mine manager
Ventsim	Ventilation modelling software
VCD	Ventilation control device is an air door, stopping, seal or brattice
VO	Ventilation officer

Executive summary

This report is for the 2015 Queensland Level 1 Mine Emergency Exercise (the Exercise), held at North Goonyella coal mine between 7 pm on Wednesday, 7 October 2015 and 3.10 am on Thursday, 8 October 2015.

The Exercise was created as a result of a recommendation of the Queensland Mining Warden's inquiry into the explosion at the Moura No. 2 Mine in August 1994. The Warden recommended that "*Emergency procedures should be exercised at each mine on a systematic basis, the minimum requirement being on an annual basis for each mine*." (Windridge, et al, 1996).

The *Approved standard for the conduct of emergency procedures exercises* was published in 1996, outlining how mine site emergency exercises should be conducted. It included the requirement for an annual test of state-wide emergency responses, which became the Exercise. This standard was updated and reissued in 2009 as *Recognised Standard 08 Conduct of Mine Emergency Exercises* (RS08).

It has been 21 years since the Moura No. 2 disaster and five years since the Pike River disaster in November 2010. The Pike River Royal Commission has led New Zealand to adopt similar legislation regarding emergency exercises.

This year's Exercise was the 18th exercise held in Queensland.

North Goonyella mine is an underground longwall mine, approximately 160 kilometres (km) west of Mackay and the Dalrymple Bay port. It produces a high strength coking coal for export, utilising longwall top coal caving methodology. The mine produced 2.5 million tonnes (mt) of saleable coal in 2014. Mining commenced at North Goonyella in 1994 and Peabody Energy acquired the operation in April 2004.

For the purposes of the exercise, 20 assessors were onsite, in addition to representatives from Simtars, Queensland Mines Inspectorate, mines rescue services (from Queensland and New South Wales), an industry safety and health representative (ISHR) from the Construction, Forestry, Mining and Energy Union (CFMEU), a representative from the Minerals Industry Safety and Health Centre (MISHC), two personnel from DNRM Corporate Communications and mine staff from Newlands, Broadmeadow and Grasstree mines.

Objectives

The objectives for this year's scenario were developed from the requirements of RS08 and by reviewing previous Exercise reports. The objectives were to test the:

a. mine's emergency response system.
b. self-escape/aided escape and inseam response as required (including the changeover from SCSR to SCSR).
c. ability of external services to administer assistance.
d. external communications (including social media interactions and departmental communication channels).
e. mobilisation of Queensland Mines Rescue Service (QMRS), including underground deployment and establishment of a fresh air base (FAB) as applicable.
f. recovery of injured personnel.
g. location of missing personnel.

In addition, the Exercise provided a focal point for emergency preparedness within the Queensland mining industry.

Scenario

The simulation occurred at the beginning of a shift and involved an outburst in a development heading that released gas and coal debris, injured the development personnel and disrupted the development auxiliary fan ventilation.

A methane gas plug travelled into the return roadway, where an Eimco (having been on cleaning duties the previous shift) acted as an ignition source. The resulting explosion damaged ventilation overcasts and a stopping. This resulted in a short circuit of air and gases from the explosion, travelling to the longwall where coal mine workers (CMWs) had to wear self-contained self-rescuers (SCSRs) to effect an escape.

The following issues were to be addressed throughout this scenario:

- CMWs have to effect an escape wearing SCSRs in a potentially irrespirable atmosphere
- there are injured and trapped CMWs
- there is a missing CMW (the Eimco driver)
- ventilation is disrupted.

Major observations

Following their review of the Exercise and based on their own observations, assessors compiled their major observations. The full list of observations is included at the end of this report.

Major observations included:

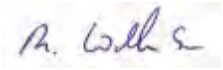
- An excellent first response by mines rescue- trained CMWs to recover the injured and trapped CMWs in 9N development. These CMWs showed leadership in the recovery of the ‘injured’ personnel.
- CMWs experienced difficulty in donning and changeover of SCSRs.
- One CMW damaged the long duration SCSR during the changeover process.
- There were issues with information transfer during the incident management team (IMT) process, particularly with communication between the control room and the operations group.
- Non-technical issues were identified that affected decision making and information transfer during the IMT process.
- There were delays in mobilising QMRS and QMRS did not deploy underground. (Objective E was therefore not achieved).
- The arrival of the industry safety and health representative (ISHR) and Mines Inspector disrupted the IMT process.
- More training and practice is required in the mine emergency management system (MEMS) process.
- Peabody corporate communications provided an excellent response to the social media events. Once they knew there was an incident they established a Social Media presence and provided the correct messaging.

Recommendations

These recommendations were collated from the suggestions proposed by each group of assessors. This approach was adopted to provide targeted, concise recommendations that the organising committee endorses, as well as providing suggested improvements for industry to consider. Some recommendations have been identified as being the same as those in previous exercises and include:

1. Continued training in the donning of SCSRs and changeover process of SCSR to SCSR.
2. All coal mines with escape systems based on SCSRs to implement changeover stations. This recommendation originally appeared as recommendation 38 in the 2001 Exercise and stated "*the introduction of changeover stations to the mine should be evaluated. This would allow verbal communications with the surface enroute and provide a place to leave injured persons if required. It also allows a safer environment for the changeover of SCSRs".*
3. The Exercise organising committee review *RS08 Conduct of Mine Emergency Exercises* to ensure that QMRS can achieve a meaningful callout and deployment as part of the Exercise process.
4. All coal mines to develop realistic Level 2 Exercises that enable the practice of the MEMS as well as utilising desk top scenarios for practising the IMT process.
5. Mines should review their systems to account for personnel during a mine emergency, particularly when people remain underground as part of the initial emergency response.
6. Develop industry standards for:
    - SCSR training as well as changeover protocols
    - The use of blind man sticks (Figure 1)
    - Non-verbal communications

The 2016 Level 1 Emergency Exercise will be held at Grasstree mine.



Martin Watkinson

Chair of 2015 Level 1 Emergency Exercise Committee

Introduction

This report is for the 2015 Queensland Level 1 Mine Emergency Exercise (the Exercise), held at North Goonyella coal mine between 7 pm on Wednesday, 7 October 2015 and 3.10 am on Thursday, 8 October 2015.

All Queensland underground coal mines are required to test their emergency preparedness by running an annual simulated emergency exercise. Each year, one mine is selected to be the focal point of the state's emergency preparedness and host for the Exercise.

The requirements for conducting mine emergency exercises are set out in *Recognised Standard 8* (RS08). A copy of RS08, along with reports of past exercises, are available through the Department of Natural Resources and Mines (DNRM) website.

North Goonyella mine is an underground longwall mine, approximately 160 kilometres (km) west of Mackay and the Dalrymple Bay port (Figure 2). It produces a high strength coking coal for export, utilising longwall top coal caving methodology. The mine produced 2.5 million tonnes (mt) of saleable coal in 2014. Mining commenced at North Goonyella in 1994 and Peabody Energy acquired the operation in April 2004.

Figure 1: Coal mine workers evacuating using blind-men's sticks

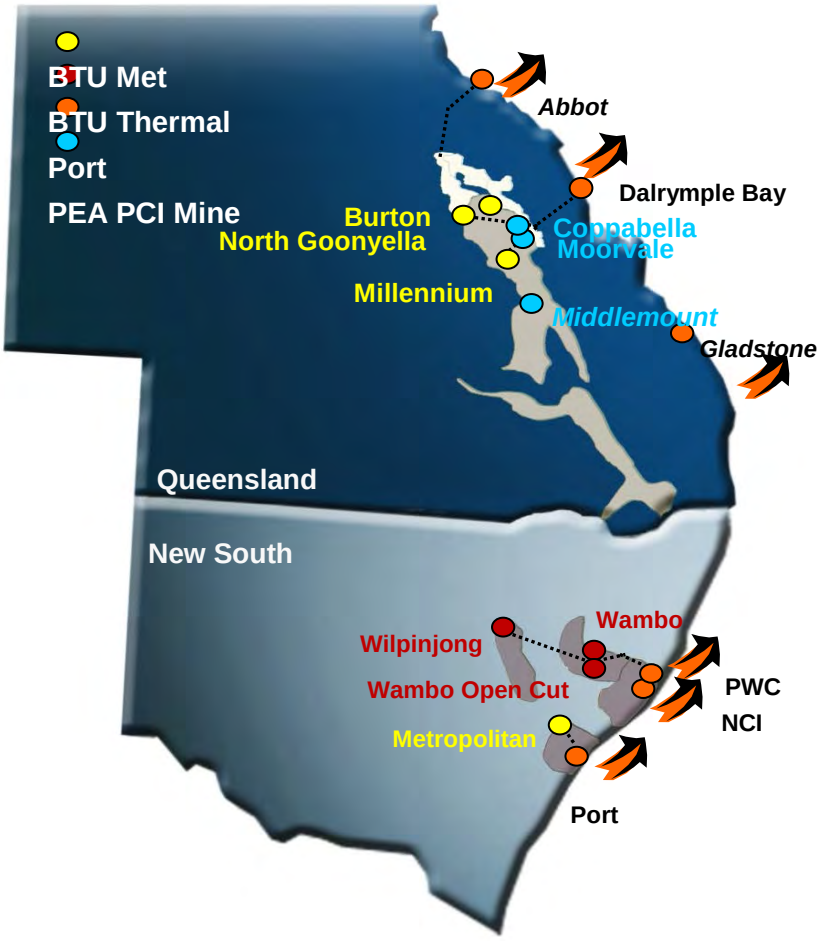


Figure 2: Location of North Goonyella Coal Mine (Source: Peabody Energy)

Objectives

The objectives for this year's scenario were developed from the requirements of RS08 and by reviewing previous Exercise reports. The objectives were to test the:

a. mines emergency response system.

b. self-escape/aided escape and inseam response as required (including the changeover from SCSR to SCSR).

c. ability of external services to administer assistance.

d. external communications (including social media interactions and departmental communication channels).

e. mobilisation of Queensland Mines Rescue Service (QMRS), including underground deployment and establishment of a fresh air base (FAB) as applicable.

f. recovery of injured personnel.

g. location of missing personnel.

In addition, the Exercise provided a focal point for emergency preparedness within the Queensland mining industry.

North Goonyella Coal Mine

North Goonyella Coal Mine is an underground longwall coal mine with a production capacity of six million tonnes per annum. Figure 3 shows the mine layout and locations referred to within this report, as well as the damaged ventilation control devices (VCDs).

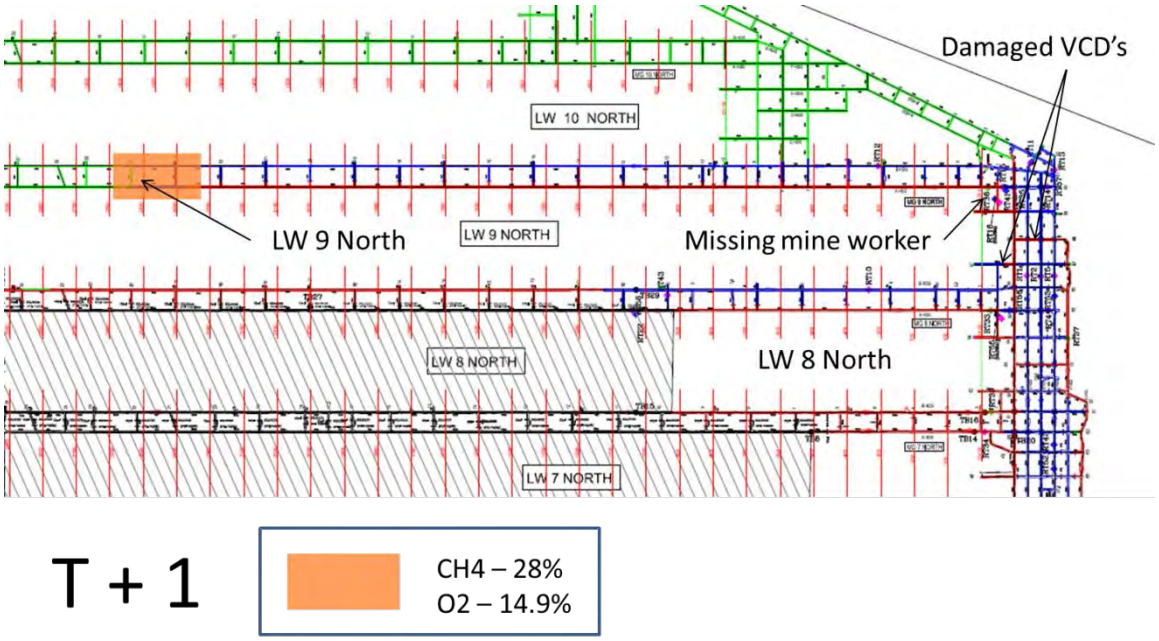


Figure 3: Plan of North Goonyella Coal Mine

Scenario

The simulation occurred at the beginning of a shift and involved an outburst in a development heading that released gas and coal debris, injured the development personnel and disrupted the development auxiliary fan ventilation.

A methane gas plug travelled into the return roadway, where an Eimco (having been on cleaning duties the previous shift) acted as an ignition source. The resulting explosion damaged ventilation overcasts and a stopping. This resulted in a short circuit of air and gases from the explosion, travelling to the longwall where coal mine workers (CMWs) had to wear self-contained self-rescuers (SCSRs) to effect an escape.

The following issues were to be addressed throughout this scenario:

- CMWs have to effect an escape wearing SCSRs in a potentially irrespirable atmosphere
- there are injured and trapped CMWs
- there is a missing CMW (the Eimco driver)
- ventilation is disrupted.

Pictures were taken of ventilation control devices (VCDs) and modified to indicate damage which could then be shown to evacuating CMWs. Assessors were also provided with a mock-up of a development heading that had subjected to an outburst, that they could use as a tool when briefing CMWs on the situation. An example of a damaged VCD is presented at Figure 4 and the prepared diagram of the development is presented at Figure 5.

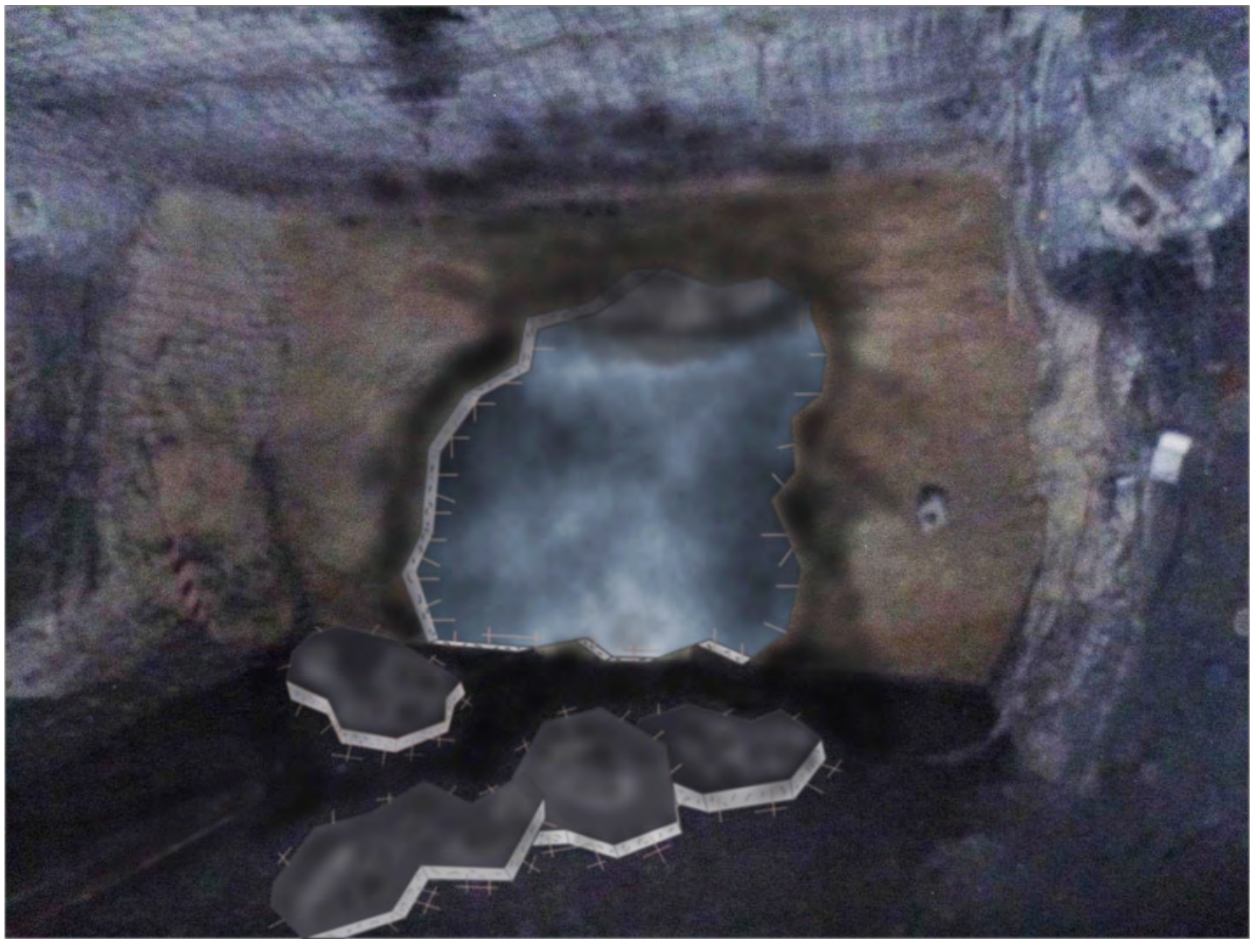


Figure 4: Damaged stopping 57 c/t Chute Road

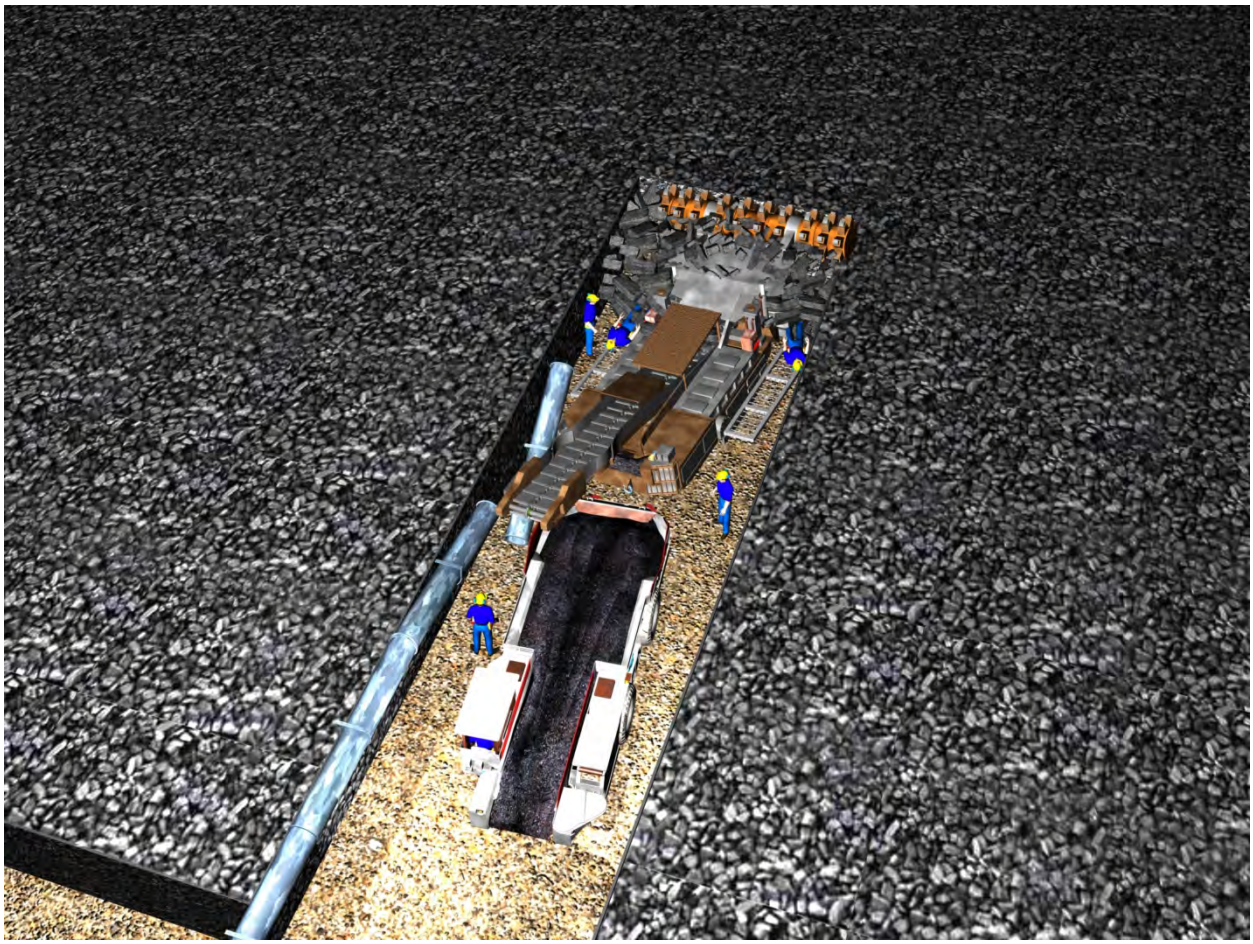


Figure 5: Development after outburst

Ventilation simulation software (Ventsim Visual) was used to model the path and concentrations of smoke and gases as they would travel around the mine from an outburst, as well as the location of the explosion. This information was then used to calibrate the Simtars program Safesim, which replicates gas data for underground fires and explosions, to generate gas data. This was presented into a duplication of the mine's gas monitoring system, giving the appearance of 'real time' gas data.

North Goonyella Coal Mine uses the Simtars program Safegas for monitoring, trending and alarming on their tube bundle gas monitoring system. This system is duplicated into the site Supervisory Control and Data Acquisition (SCADA) system CITECT and is monitored in the control room. A duplicate gas monitoring system was established in the control room and the control room operator (CRO) responded to the alarms as they were raised. One advantage of this approach is any CRO can log on using their own password and is familiar with the touch and feel of the system. The layout of the computers in the North Goonyella control room is shown in Figure 6. Note that the two screens on the right of the photograph are the exercise computers and are labelled to identify them.

A simulation was run at Simtars before the exercise to enable the preparation of briefing material for the underground assessors. The material prepared showed the spread of the gas and smoke along with an estimation of the proposed gas concentrations and was provided to the underground assessors. An example of one the sheets is shown at Figure 3.

T=1 indicates that this is one minute after the outburst, showing the methane in the roadways.

Figure 6: Computer layout in the control room

A timeline of key events and activities was recorded by all assessors and a combined exercise timeline is presented at Appendix A.

A summary of activities at each location assessed is presented in the next section of this report. Suggested solutions for improvement have been made in each section for industry to consider; where they are specific to North Goonyella they are listed as 'Mine'.

Recommendations have been collated from the suggested solutions proposed by each group of assessors. This approach has been used as a way to provide concise recommendations that the Exercise committee believes should be adopted, as well as providing a list of suggested improvements for industry to consider and validate as required.

For the purposes of the exercise, 20 assessors were onsite, in addition to representatives from Simtars, Queensland Mines Inspectorate, mines rescue services (from Queensland and New South Wales), an industry safety and health representative (ISHR) from the Construction, Forestry, Mining and Energy Union (CFMEU), a representative from the Minerals Industry Safety and Health Centre (MISHC), two personnel from DNRM Corporate Communications and mine staff from Newlands, Broadmeadow and Grasstree mines (see Appendix B for details of the assessors).

Underground assessments

8 North longwall

Assessors: Jason Hill, Nikky LaBranche, Dale Davis and Robin Bent (Video)

At 9.20 pm (T+20) when the pollutants from the explosion arrived at the longwall half, the crew was back in the last open c/t and half the crew were on the longwall.

The crew on the longwall were informed that they could smell smoke and moved to the last open c/t, adjacent to the longwall. They donned their belt-worn SCSR and the crew spread out across the c/t to put their rescuers on.

During the escape procedure, the crew stopped at 7 c/t to where they simulated changing self-rescuers (communicated in writing by the deputy) and made a phone call to the control room using non-verbal communication protocols.

One CMW pulled very forcefully on the yellow breathing bag of the rescuer, breaking the seal of the bag and causing it to only be loosely attached to the apparatus. At this point, he hadn't realised what he had done and continued with the donning procedures. It was only once he'd completely donned the apparatus and wasn't getting a seal while breathing, that he realised the self-rescuer wasn't working. He was handed another rescuer and assisted in the donning procedure by another crew member. This is visible in the video which accompanies this report. Figure 7 shows CMWs wearing SCSRs and also reduced vision glasses

Figure 7: CMWs wearing SCSR and fogged glasses to simulate reduced visibility

The crew then continued the escape on foot until crosscut 2.5, which contained the Driftrunner and SCSR cache. Whilst travelling on foot some of the areas were uneven and required grading. The 8 North team then proceeded to the place of safety at 54 c/t where the remainder of the underground CMWs had gathered.

What worked well?

- The technique for donning the short duration self-rescuer.
- Once self-rescuers were donned the group grabbed blind man's canes and moved quickly in evacuation.
- Communication between the deputy and the crew, including using his notebook for non-verbal communication.
- Some helped each other with donning the rescuer.
- Crews followed instructions, both from the deputy and the CRO.
- One of the crew helped lead one of the slower crew members out by holding the end of his blind mans' stick and leading him.

Areas for improvement

- Changeover to long duration self-rescuers was achieved but technique could be improved to reduce time taken and minimise the potential exposure to a contaminated atmosphere. One CMW damaged his long duration SCSR. This could have resulted in a **fatality** in a real event.
- Sticking together as a crew during evacuation. At one point the two halves of the crew were half a pillar apart.
- The crew never attempted to use the PJB located at the face. Walked out and used the PJB outbye.
- Clarification by the mine site as to actions of personnel once self-rescuers are donned (For example. exit the mine, access spares and carry out activities).

Suggested solutions

Mine

- Implement changeover stations. This recommendation originally appeared as recommendation 38 in the 2001 Exercise and stated "the introduction of changeover stations to the mine should be evaluated. This would allow verbal communications with the surface enroute and provide a place to leave injured persons if required. It also allows a safer environment for the changeover of SCSRs".
- Investigate going to a CABA style escape system.
- Travel roads (escape roads) need to be improved/graded.

Industry

- Undertake a systematic approach to training to ensure all employees are exposed to their roles and responsibilities in an emergency
- Ongoing training of self-rescuer donning and changeover processes.
- Provide changeover stations where escape is based upon SCSRs not CABA
- Industry standard for use of blind-men's sticks

Exercise team

- Don’t let missing personnel be seen by other CMWs during the exercise. This created some confusion later as he’d been there at the LW evacuation and the 54 c/t crib room before he disappeared as the missing man.
- More detail on the final scenario and labelling of photographs of damages overcasts

9 North longwall development

Assessors: David Carey, Snezana Bajic and Matt Koschel

At 9.00 pm an outburst occurred at the development panel, B heading face at 9 north 25-26 c/t. The face ventilation lines were damaged and the area was flooded with methane, trapping five people.

A CMW working on the platform on right side of a continuous miner sustained an upper leg injury, while another, working on the left side of the continuous miner, was trapped. A third CMW, also working on the left side of the continuous miner, sustained an arm injury. Another two CMWs were disoriented with the incident. All CMWs fitted their SCSR.

Two uninjured workers assisted the injured CMWs and they self-escaped to the last c/t with the CMW who suffered the arm injury. They informed the deputy of the incident, that the outburst occurred and that the two other people sustained injuries.

Simultaneously, another event occurred in a different part of the mine that disrupted the main mine ventilation to the development panel. Uninjured workers commenced the first response rescue operation of the two injured, workers using compressed air breathing apparatus (CABA), air bags and a stretcher. These actions were successful in extricating both uninjured and injured workers. All people were gathered together and evacuated using a personnel man transporter vehicle. The injured CMWs were evacuated to the surface and were in the medical room by 11.01 pm, while the remainder of the men were held at 54 c/t (the designated place of safety).

What worked well?

- The emergency first response.
- Use of lifting equipment and self-contained breathing apparatus.
- The uninjured CMWs were able to assess the injuries of the CMWs and provide first aid as part of the initial response.
- Handling of injured workers while loading onto stretcher for rescue.
- The allocation of resources and people was well managed.
- Positive communication between crew and CRO.
- High level of realism of the workers to the scenario.
- The leadership of the mines rescue trained worker in the first response and recovery highlights the benefits of such training.

Areas for improvement

- Ensure teams focus on information to determine actions, rather than making assumptions as to the cause of the likely event.

- Improve support from the surface in to communicate step by step process to determine the ventilation and gas events. More advice and direction from the surface experts.
- Improve communication to external support and contact external support sooner.
- Limited knowledge of the emergency response equipment and its usage. Not all crew members were trained and/or feeling confident on air bags.

Suggested solutions

Mine

- Use personal tracker system on vehicles, machines and personnel to aid decision making and resource allocation.
- Underground radios or mobile handsets for improved communication.
- Ensure more people are available for immediate patient treatment.
- Increase number and availability of personal gas monitors.
- Enhance first response training of all personnel in the mine and ensure this training includes the use of the equipment.
- Train paramedics to provide medical attention underground.
- Review process to account for personnel to improve identification of missing personnel.

Industry

- Mines should review their systems to account for personnel during a mine emergency, particularly when people remain underground as part of the initial emergency response.

Exercise team

- Better preparation for the Exercise, including gas modelling data and detailed planning of the scenario. Individual team meetings are recommended to make sure all details are gathered.
- Consider pictures with damage on areas that are damaged in scenario. Assessors could have signs ‘fixed/repaired’ on the equipment once the crew ‘fixed’ it.
- Consider signs ‘dead’ and ‘unconscious’ for people who walk into irrespirable atmospheres.

8 North longwall outbye evacuation

Assessors: Daniel White

Wilson Mining Contractors outbye of the longwall in the belt road installing monorail bolts.

What worked well?

- Use of belt-worn SCSR and changeover to long duration units at the 2.5 c/t SCSR cache.
- The damage to the overcast at the entrance to 8N Panel at B 56 ct was identified during the escape. As soon as fresh air was reached, this damage was communicated to the control room and attempts were made to rectify the damage with materials available. This first response was very positive. See Figure 8.

Areas for improvement

- The initial non-verbal communication made by this crew to the control was incorrect. There was no sign on the DAC in the belt road regarding non-verbal protocols. Once they reached the cache station, there were instructions for non-verbal communication and they started using the correct protocols.
- A lot of time wasted during non-verbal communication. When there is confusion with the CRO, it puts the underground workers under stress that they are wasting air trying to rectify miscommunication.
- Wilsons contractors were not sure of the exact location of installations around the mine. They were asked to inspect 9N belt-starter at C Hdg 60-61 ct, however they went to a different electrical installation at C Hdg 58-59 ct.

Suggested solutions

Industry

- Consider an industry standard for non-verbal communication protocols.

Exercise team

- Ensure there are sufficient assessors to cover all work groups.

Underground investigation

Assessors: Dan White, Jason Hill, Nikky LaBranche, David Carey, Snezana Bajic and Matt Koschel and Robin Bent (Video)

After the evacuation of all crews to 54 ct Deputy Cabin, a group of men went inbye to investigate. This group was led by the 9N Development Deputy and included three longwall personnel and one development person

What worked well?

- Maintaining a group of people underground to report back to the surface is very important if there is no immediate danger, a full evacuation when not all the information is available would make re-entry very difficult.
- The ERZ controllers (deputies) did a good job keeping track of who was going where with what crews, when people did leave the 54 ct crib room to re-enter and investigate.
- Debriefing form seemed to work okay.
- Personnel who evacuated to the surface were controlled and were not allowed access to their mobile phones.

Areas for improvement

- In a real event, workers who have just had to self-escape from the longwall in an environment of over 1000 ppm carbon monoxide (CO), and carry out two changeovers with long duration SCSR, should not have been involved in any investigative mission. Apart from not having a belt-worn rescuer available, they would have been at risk of CO poisoning and should have been brought to the surface for for medical checking.
- In emergency situations when personnel have evacuated to the surface in the initial response, an individual's status needs to be considered before redeployment underground (where underground deployment has been deemed safe).
- Information transfer between the surface and the 54 c/t was lacking as the ERZ controller was on the phone, then had to relay messages. A conference call ability would have allowed everyone to be involved. In a real scenario things would not have been as calm and controlled. On one occasion he was heard to say "*well you can tell them that message*"
- No one was appointed to oversee the group in 54 c/t, as deputies left the group for various missions.

Suggested solutions

Industry

- A situation can be controlled much more by maintaining a group of workers underground who can investigate, then report back to the IMT. This should only be used when there is no immediate danger to personnel.

- Have a more comfortable place for crews at the designated place of safety. The lack of seating split the crew into different areas, and it was harder to communicate. Those standing were more likely to stray away from the area.

Exercise team

- More detail required on damaged VCDs and ventilation quantities as they were repaired. Had the mine been evacuated this would not have been an issue.
- Identification tags/labels for damaged VCD's in order to minimise confusion.

Figure 8: Repaired overcast

Surface assessments

North Goonyella Coal Mine used the MEMS approach to incident management; that is forming an initial incident response with the senior mining person on site being the incident controller operating from the control room. (This was identified as the intelligence cell by the Queensland Police assessors in the 2014 Exercise report)

Once the underground mine manager arrived at site (UMM) he assumed the role of IMT leader and called the emergency response plan into action, calling on the formation of the planning, operations and logistics teams and support personnel.

The physical location of the IMT rooms is shown in Figure 9 and this created some issue with flow of information to and from the operation teams. Frustrations were evident in the control room with paperwork being taken away and then being asked for information that was contained within that paperwork.

The fact that there was an explosion was reported to the control room at 10.19 pm, this was not identified until much later in the exercise by the IMT.

Whilst an information runner was established to ease this flow of information it was evident that some frustrations still existed particularly as the initial incident controller who was now not an integral part of the operations team. At one point the IMT controller held an impromptu meeting in the room adjacent to the control room.

This was a one way flow of information with no information coming back to the control room.

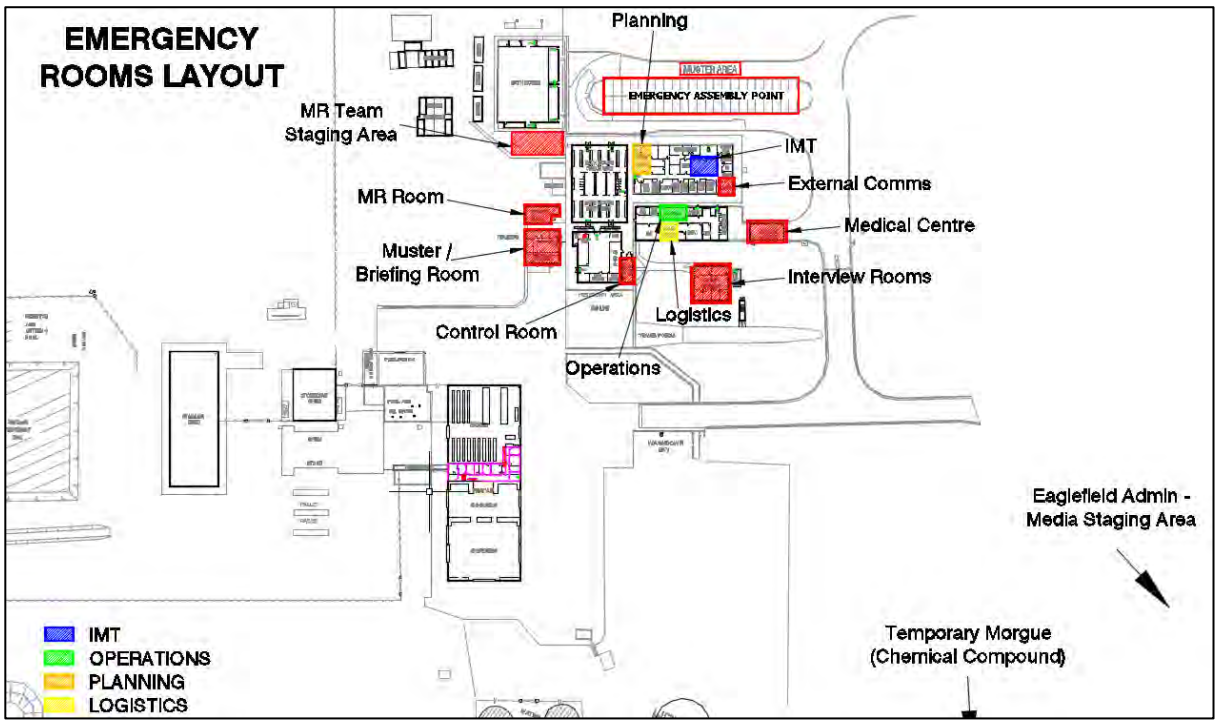


Figure 9: Location of IMT rooms

Control room

Assessor: Larry Ryan and Lauren Forrester

The initial incident was notified through a call to control room from the development panel. Outburst with two men trapped and high methane levels. The shift co-ordinator took control of situation and was initial incident controller. The shift co-ordinator briefed the UMM on arrival and continued to deal with situation in control room. The assistant CRO, shift co-ordinator and CRO dealt with the incident and co-ordinated the investigation into the cause until the Exercise concluded.

What worked well?

- Initial response from CRO and incident controller was calm and well managed.
- Having the backup of an assistant CRO to assist in the control room.
- Excellent communication between the CRO, initial incident controller and assistant CRO.
- Non-verbal communications difficulties quickly worked around by CRO.
- The security system was that all persons were stopped at the gate, a message was sent to control through radio and only personnel permitted were allowed access. This was also a record of when people got to site.
- Personnel in the control room were knowledgeable on gas monitoring (i.e. knew that sensors maxed out at 50ppm CO, 5% CH_4 and 2% CO_2).
- The North Goonyella Mines Rescue Co-ordinator was not allowed to return to site due to fatigue under direction of shift co-ordinator (he had left site after his tour and was five hours away at home).

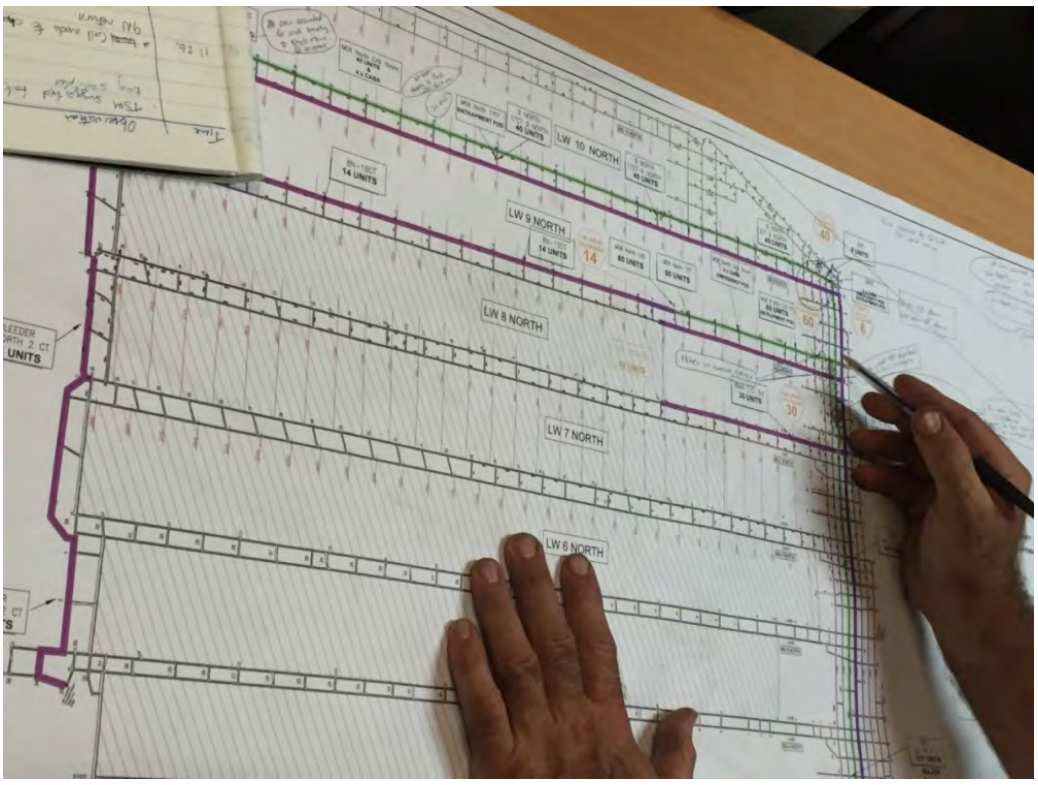


Figure 10: Mine Plan with Information detailed by the initial incident controller

- There were pre-emptive precautions being taken by the team in the control room. For example, when the assistant CRO instructed deputies to take a medical kit and stretcher when looking for missing man.
- The team in the control room worked very well together. They bounced ideas off each other, were actively problem-solving and were trying to find out the cause of incident.

Areas for improvement

- Non-verbal communication: One group of miners were using the current system of non-verbal communication, whereas the second group of miners were using the old system of non-verbal communication. This created initial confusion when the CRO was trying to gather information.
- The CRO would have benefited from having a scribe to record information in real time. It took too long for the CRO to be able to catch up (2 hours) on recording information in electronic log
- Old manual MEMS board was being used in control room by Operation Team Member and the IMT had new computer based MEMS system.
- Two way radio between control and IMT were not working, seemed to be working between other teams and IMT, just not control and IMT
- Paperwork going missing from control room (e.g. manning sheets). This was most likely caused by other people coming into control, seeing the information and then taking back to their own groups.
- The initial incident controller had not done the MEMS course.
- Nicknames caused some confusion when trying to locate people
- The location of men underground was not known and was difficult to establish
- Assumptions were being made and communicated as facts (e.g. witness statement saying that deputies stopped to fight the fire on the way out when there was no fire and the deputies did no such thing).
- Why were so many people kept underground? About 30 people were congregated at 54 ct when there was no need for them to be there. Valuable information was not passed on, as some of these people were first hand witnesses. Some had also used their belt-worn self-rescuers and were therefore potentially exposed to toxic gases and unnecessary risk.
- The control room seemed to turn into its own mini IMT due to lack of flow of information. Planning activities were also taking place with the relief CRO and shift co-ordinator. Where was the planning team?
- Initial direction was given by UMM to “get everyone out”, but this was not followed through either because he changed his mind or the shift co-ordinator in control room did not do it.
- The explosion was reported by the Deputy at 10.19 pm. The operations controller was in the room, taking notes on what was happening and rang the incident controller at 10.23 pm but did not advise of the explosion.

Suggested solutions

Mine

- Ensure all personnel who could be involved in managing an incident have received MEMS training.
- Introduce a document control system so paperwork doesn't go missing during an incident.
- Use a scribe in the control room.
- Implement a system for information transfer between IMT teams.
- Updated MEMS onsite, so old and new systems are not being used simultaneously.
- Notify all underground personnel that an incident has occurred.
- Make gas sampling equipment (pumps and gas bags) more accessible for occasions when a sample is needed in a location other than the regular ones.

Industry

- Consider developing an industry standard for non-verbal communication protocols
- Adopt personal location devices
- Use scribe for CRO
- Implement a system for cross referencing official nicknames with real names to avoid confusion when trying to account for people underground
- Use CO sensors that have a higher range.
- Introduce a real time CO sensor at the main fan. Currently if a quick plug of gas moves through, the tube bundle system may not pick it up.

Exercise team

- Implement a system for tagging during an exercise that indicates which VCDs have been repaired.
- Improve communication from underground assessors to surface team on the activities being undertaken.
- Assessors require better understanding of areas that will be damaged and their effect (e.g. air flow).
- Need to replace Deputies taken out of exercise to keep mine the mine open. This reduced the numbers of deputies to respond to the scenario.
- To avoid any confusion over missing personnel, keep 'missing' personnel separate from the reminder of the underground staff.
- Investigate the potential to use dummies for injured/missing personnel.
- Clearer communication required about who is not involved in the Exercise.
- Improve simulated environment (e.g. smoke, explosion pressure wave).
- For realism during the Exercise, ensure that anyone who cannot use a self-rescuer properly becomes an injured man.
- Recommend training for Simtars by QMRS on MRAS as to what information is required.

Incident management team (IMT)

Assessors: David Cliff and Richard Livingstone Blevins

What worked well?

- The initial information flow from the deputy in 9N to the control room was accurate and succinct.
- The IMT room was well equipped and IMT functions were able to be initiated quickly, except for the Logistics Controller who was delayed in arriving onsite and no one seemed to deputise for him.
- IMT members had separate emergency phone communications to facilitate direct communication between them and offsite.
- Communication and briefing of head office appeared to be handled well.
- Priorities were set early and the safety of personnel was clearly paramount. See Figure 11 where the IMT leader, the UMM, is briefing the SSE.

Areas for improvement

- The IMT process needs more structure and focus. There seemed to be a number of circular decision making processes occurring (e.g. should QMRS be called? Should deputies be called from camp?). There appeared to be a number of activities occurring/information being collected in the control room that the IMT were not aware of.
- Key events/information should be logged and displayed in a form that is readily accessible, particularly gas data. For example: time stamped logging gas data on a mine plan.
- Time needs to be allowed for delegated tasks to be completed.
- Incident action plans (IAPs) are an integral part of MEMS and should be implemented. These are structured action plans that identify what has to be done and by who. These are signed off by the IMT controller
- Better IMT access to mine plans and sections of the mine.
- Systematic collection of information from persons still underground.
- The mine needs to assess risk of keeping personnel underground when all the facts are not known (i.e. the fact there was an explosion).
- Communication and coordination between IMT and control room/shift undermanager.
- Review the documents and forms provided as part of the duty card kits and the ERP to see which are useful or not (e.g. personal logs, IMT Meeting agenda and minutes, meeting flowchart).

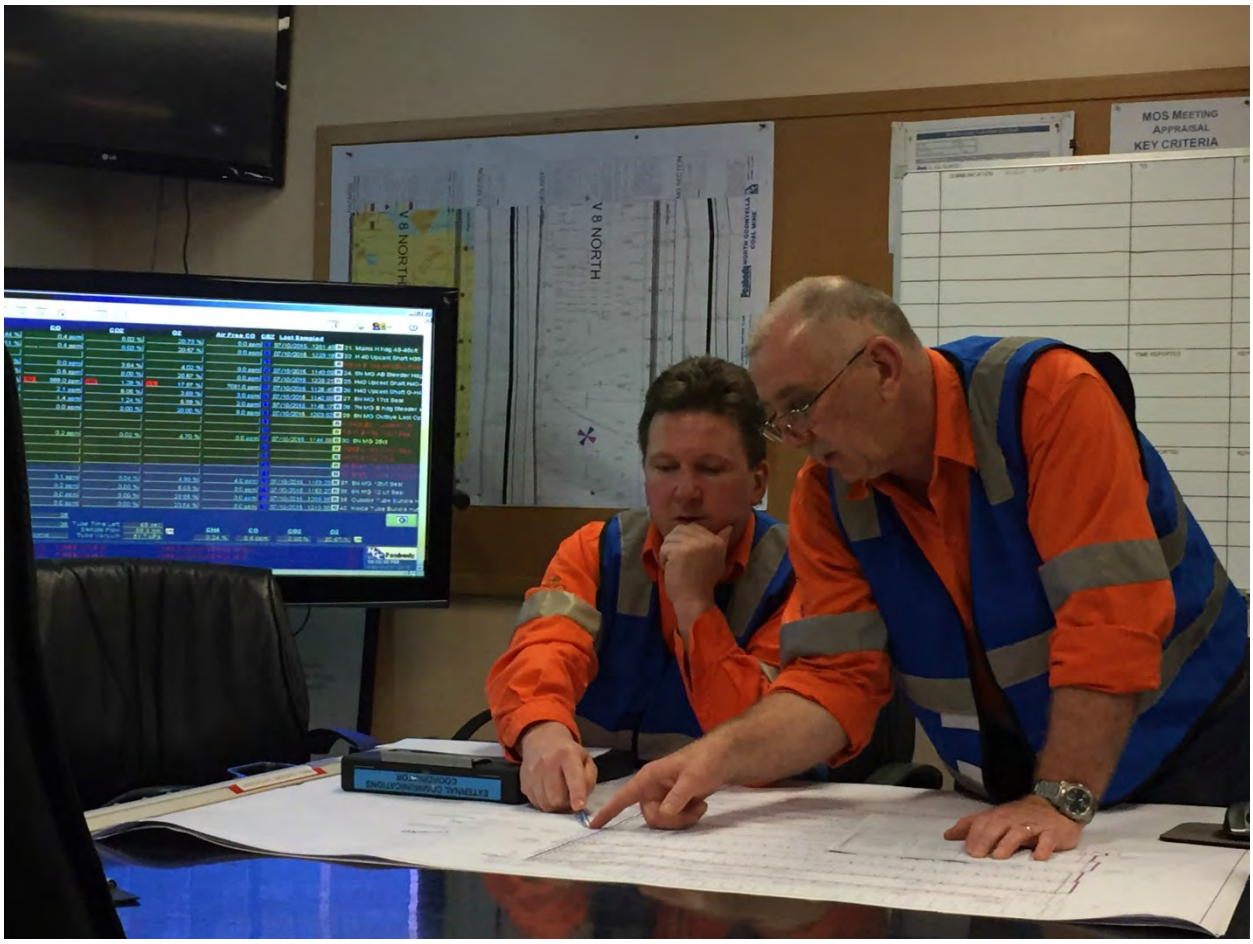


Figure 11: IMT leader (UMM) briefing the SSE on the situation

Suggested solutions

Mine

- Increased training in MEMS2 system and usage including collection and display of key event information by location, preferably graphically on mine plan.
- Key events/time board in IMT
- Use IAP process
- Improved control over communications
- More formalised decision making
- Implement IMT process more promptly

Industry

- Consider revision of recognised standard for the Exercise so that QMRS can achieve a meaningful callout and deployment as part of the Exercise process.

Exercise team

- More clarity needed over personnel who are in/not in exercise. This will avoid confusion with persons appearing in areas where they are not supposed to be (e.g. person on the EIMCO needed to stay with the machine and not observe LW evacuation).
- Ensure consistency of messages from Exercise team (e.g. ventilation quantities and status of ventilation devices) and ability for underground assessors to communicate amongst each other to confirm messages.
- Issue of limiting capacity of the mine to respond due to quarantining outbye deputies needs to be addressed.

Figure 12: IMT meeting

Logistics

Assessor: Elliott Franks and Robyn Lihou

What worked well?

- Team structure worked well and operated smoothly once everyone arrived.
- Initiation of emergency procedures executed well with the use of duty cards.
- At all stages, relatives of the injured and trapped miners were informed of the progress, which in terms of Social Media would significantly decrease the chance of a backlash.
- Peabody corporate communications was outstanding in its social media response. Once they knew there was an incident they established a Social Media presence and provided the correct messaging. This messaging included details for family members and the media to contact them off line.

Areas for improvement

- Communication from IMT of briefing results was slow to filter through to logistics.
- Contacting unaccounted staff members was slow which meant an unaccounted worker was still underground without their knowledge for some time.
- The organisation seemed slow at first, each party was slow to form, especially logistics. Maybe this was partly because of the nightshift exercise. It took a long time for staff to arrive from mine camp to take up positions.
- No real sense of urgency was witnessed.

Suggested solutions

Mine

- Login and logout procedures need review there were several personnel who had not logged out of the mine system from day shift.
- Comprehensive review of procedure of accounting for missing employees.
- Consider locating emergency teams closer together. For example, the operations room in relation to the control room (IMT, Planning, Operation, Logistics) could be situated in one building for communication benefits and efficiency of operations.
- Improve waiting times for feedback from IMT meetings.
- Appointment of deputy to start executing procedures while waiting for Logistics team leader to arrive.

Industry

- Consistent training of mine sites of emergency procedures.

Exercise team

- Review the immediate feedback after the exercise. The assessors should debrief with each other before passing feedback on to the mine. This will lead to more honest feedback.

Operations

Assessor: Russell Albury and Wade Kathage

What worked well?

- Initial response of the emergency by control and shift management went well.
- Set up of checking tag board done quickly.
- Allocation of duty cards for board, security and portal guards.
- Eventually the communication flow or briefing from control room runner back to the operations room worked well, to the extent that they had a good update ready for the team leader when he went back to his team room and was armed with information for each IMT briefing.
- MEMS structure implemented and teams observed still worked well even when direction was lacking, including communications. The operations team set up control room communication runner that fixed a large part of the poor initial information flow.
- Control room had very good information that could have been utilised much better.

Areas for improvement

- Communication between MEMS groups needs to be improved.
- IMT role should not include analysis of data.
- Ensure that the planning group have a clear focus on analysis of data and development of options while the operations team remain focussed on implementing the planning.
- Debrief of personnel and the dissemination of the information needs to be improved.
- Briefing of ISHRs and Inspectors on their arrival to be improved to avoid disruptions of the IMT process.
- There were issues with the communications from the control room which affected the effectiveness of the operations team mainly due to distance. If the operations room were relocated closer to the control room this may be improved. The control room was identified as the intelligence cell by the police assessors in the 2014 exercise. The control room is a valuable source of information which needs to be utilised for data gathering during an emergency.
- Identification of risk to workers underground was not recognised. The team was too worried about not allowing many people out of the mine in fear of people not being able to get them back underground. This also prevented better capability leaving skilled people underground. This also would have allowed better debriefing of selected key people and just as important better briefing of their tasks.
- Taking the above into account, 54 c/t could have easily been set up as a fresh air base (underground command and control centre), the undermanager could had gone down to control and the Operations Team Leader could have taken coordination charge on the surface.
- There need to be a clear first response system to get control of the emergency, with a clear cross over process to the IMT system. The undermanager in this case did well taking control at the start but did not know at what point he was to step back. He was not integrated into the operations team very well and really was not taken away from the role of underground control from the first response phase.

Suggested solutions

Mine

- Review the emergency response plan in light of this exercise and address any concerns.
- Train and practice response in the MEMS format.
- Review placement of Operations Team Room, considering that the control room is the centre of all communications and is the main hub for command and control.
- Have a clear first response system that has a clear cross over process to the IMT system
- Undermanager should be absorbed into the operations team with a clear role.
- Essential information that IMT should know about, could be sent electronically from control to operations to IMT.
- MEMS2 software to be integrated into all control teams, so that information would be centralised back at the IMT and if needed, each team can have visual access to each team's status easily.
- Management of key external stakeholders should be included in the IMT operational thinking, including utilisation of their knowledge and skills.
- Use of Mine Plans should be used much more effectively for recording information and for communication of information at all levels – IMT, IMT Sub Teams and control room. Electronic touch screens would be very useful if set up effectively.

Industry

- Ensure emergency response systems include formal debrief of witnesses and a process for analysing and using the information gained.
- Building on the above comment, skilled interviewing people should be used to ensure they know what to ask, know what is important (IMT – Operations Team) should give the interviewers priority required information.
- Each mine should use the Exercise report as a guideline for developing their Level 2 Exercise scoping the areas to test.

Exercise team

- Identify situations where the proposed exercise can be confused through misinformation or ambiguity, in the exercise planning risk assessment.
- Building on the above, have controls in place for example power is given to the exercise controller to issue clarifications directly or via confidential communications to lead assessors. This includes assessors being able to reach the exercise coordinator to get permission and content for clarification issuing.

Planning

Assessor: Ron McKenna and Brian Kelly

What worked well?

- Endeavours to understand and gather information by planning to allow decisions to be made.

- Once the team was formed with adequate resources, the teamwork of stakeholders was sound.
- Span of control good.

Areas for improvement

- Planning function was not carried out by planning team but appeared to completed by in the control room, on the run or at IMT
- Clearer definition of objectives, as there appeared to be some variation across streams as to what the objectives were
- Communications between streams could be improved, as there was confusion over which c/t overcasts were damaged, as well as how people were injured
- Improve the preparation of IMT room (e.g. white boards had to be brought in).

Suggested solutions

Mine

- Determine what processes are required for the efficient operation of emergency at the mine.
- If the MEMS, AIIMs, ICS structure is to be used, additional training and practical application is required to allow the stakeholders to be more familiar with their roles and responsibilities. Requirements for key stakeholders in an emergency should reflect as far as possible their roles and responsibilities they are undertaking on a day to day basis, which allows easier transition. Planning spent a large amount of time gathering information rather than coming up with a plan to meet their objectives. Most of planning appeared to be done in IMT and little done by the planning.
- Improve the layout of the different streams physically onsite. Ideally, Operations and Planning should be relatively close to each other to improve interaction between them.
- Room such as planning area had difficulty printing documents and material had to be placed on memory sticks to allow print at times.

Industry

- Practical simulations for Level 2 exercises.
- Pre-populating of the MRAS documents to facilitate decision making for mine re-entry by QMRS.
- Increased site familiarisation with the MRAS process.
- Conduct risk assessments on proposed actions.

Mines Rescue Response

Assessor: David Connell

QMRS was initially put on standby and then the operations manager called to site. By the time the mine requested a full mobilisation of the rescue brigade's men it was well into the exercise and a meaningful underground deployment would not have been achieved within the 12 hour shift.

The QMRS system was tested and sufficient brigades men were available for deployment by 2.19 am.

The substation was activated appropriately with equipment readied for use, duty card instructions were followed

What worked well?

- Contact with QMRS requesting deployment.
- Use of the MEMS2 software within the IMT.

Areas for improvement

- Recognise the need to request early QMRS deployment to the mine.

Suggested Solutions

Industry

- Ensure the early call out and deployment of QMRS to site during an emergency situation.

Exercise team

- Review RS08 to ensure that QMRS can achieve a meaningful callout and deployment as part of the Exercise process.

Crisis communication procedures

Assessors: Jo Clark, Paul Lynch, Lorissa McCosh and Elliott Franks

The activation of emergency response procedures and communication channels during the Exercise is central to meeting objective D of the Exercise scenario.

The assessors support the DNRM Incident Response Management team by simulating public and media interest in the emergency response. This included practical examples and advice to ensure crisis communication protocols were observed and tested appropriately during the exercise. Like the previous two years, this event included a number of components to test and provide training around managing media and social media while implementing communication emergency response procedures.

Activation of emergency response arrangements

This year's scenario occurred at night and the company activated its emergency response plan as required by its site safety and health management system in consultation with the Mines Inspectorate. The *Mines Directorate Emergency Response Communication Plan* is implemented when the Mines Inspectorate is contacted by the company, police or emergency services about a mining emergency, and the Commissioner advises senior officers and ministerial staff to activate special arrangements in support of the response.

The communication reporting processes are set out within the *Mines Directorate's Emergency Response Manual* as well as the *DNRM Mines Directorate Emergency Response Communications Plan.*

Like the previous year, this year's scenario included third party enquiries and social media reports of the emergency situation at the mine site shortly after the exercise commenced. This approach was taken to create a realistic sense of urgency and enable the provision of information about the incident to occur in real-time and scale up or down as the situation unfolded.

Notifications and briefings for all relevant personnel involved or supporting the response were done in close consultation with the IMT and the Acting Deputy-Director General Mine Safety and Health at all times. Key contacts for relaying or checking information and roles assigned throughout the simulation were discussed and reconfirmed at each key stage of testing of the communication channels and protocols.

During a real mine emergency, the key elements of the reporting process observed and used to activate the special arrangements and the nature of media and communication support required for a major incident response is as follows:

1. Mine operator reports incident to local Mines Inspectors or Regional Inspector
2. Mines Inspectors or Regional Inspector report the incident to the relevant Chief Inspector and Deputy Director-General of Safety and Health (DDG)/Commissioner for Mine Safety and Health.
3. The DDG will then inform the Director-General, Minister and other relevant areas of the department, including Corporate Communications and DNRM Media Unit.

The DDG Safety and Health or relevant Chief Inspector or nominated delegate is the single point of information during an incident and provides information to assist DNRM Media and Communications activities. Incident notification and follow-up information flows are critical

and circulated via a **dedicated** *Mine Safety and Health Incident Notice* group email address used by all three inspectorates of the Safety and Health division.

Use of social media

Social media test posts helped the scenario to demonstrate what would happen during an emergency incident of this nature. The material was designed to test the procedures of coal mine and the incident response team. Assessors monitored the use of media, social media and internet platforms during the event. A total of 14 social media alerts were posted by various social media accounts to simulate a real event.

Social media was used to generate additional pressure to validate facts quickly and demonstrate the value of clear lines of communication, identifying a key contact person for external engagement and keeping key people, including this contact person, regularly updated and informed of the situation. The key contact person will monitor and ensure accurate information is provided through external channels regularly to meet the needs of external interested parties such as the media.

The Social Media response from DNRM and the company was exemplary. Learnings from previous years were adopted to ensure clear and concise information was communicated quickly.

Use of media

The DNRM media team worked with the Mines Inspectorate and the company's corporate communications manager (noting that the mine operator is the media and communications lead in an emergency) to coordinate the timely release of information. Two proactive test media statements and responses during the event were issued by the company and DNRM.

The Corporate Communications team has multiple roles in supporting the exercise and distinguishes this explicitly in the planning phase as testing of the mine operator, practising and improving DNRM procedures. It also provides support for external communication about the public facing report on learnings/outcomes to help DNRM promote safety in mining.

What worked well?

- All parties worked through their emergency communication procedures and checklists.
- The company responded quickly to organising on-ground support to handle media and related enquiries from the public, also setting up a Facebook page to manage social media though that channel. DNRM's media responses and social media statements were integrated.
- Distribution and publishing turn-around times for media, web and social media material were monitored and expedited quickly.
- Expeditious approvals of information released by the Mine Inspectorate.
- Potential issues and briefings to inform media and communication responses were provided in a timely manner. Issues raised in social media forums were addressed.
- Detailed logs were kept of all media, social media and communication actions and observations on adherence to emergency protocols throughout the exercise. Media and communication updates were provided at key intervals.

- The wrap-up media statement on the facts of what had occurred and the outcome, made press before opening of business, limiting any inaccurate reporting on the day after the exercise.

Areas for improvement

- This year's scenario occurred at night and this added a level of complexity for communications, assessors and observers.
- The reporting processes set out within the *Mine Emergency Response Manual* as well as the *DNRM Mines Directorate Emergency Response Communications Plan* could have been better utilised and integrated to ensure that information flows remained open at all times. For example, some key stakeholders including the Director General's Office were not able to access the email updates in relation to the incident, these were forwarded by the media and communications team in some instances. Telephone contact was also used to address this during the exercise which diverted some resources and effort away from opportunities to practise simulated media and communication activity.
- The *Mine Safety and Health Incident Notice* group email system should be used at all times during an incident to ensure that all relevant stakeholders receive first hand, real time updates and minimise the risk of unverified information taking hold in media reportage or social media forums.

Recommendations

Industry

- RS08 identifies the need for possible media involvement and therefore all mine incident responders and mining companies should prepare adequate documentation/information resources to issue to the press at a time of crisis or emergency. Specific resources should be allocated.
- Consider the most appropriate provision of photographs and video footage to aid media briefings, reporting and future training with due regard to privacy considerations for individuals and their family members.

Exercise team

- All Chief Inspectors and Regional Inspectors need to use the Exercise to work through the Crisis Communications Plan for Mine Emergencies and checklists once activated.
- Social media and online media traffic will often occur publicly before an incident can be confirmed or notified. All exercise participants and DNRM assessors should be aware of the need to provide timely and ongoing information to DNRM media and communications units to assist in the preparation of external media and social media responses.
- The *Mine Safety and Health Incident Notice* group email address should be the primary email notification system used by Safety and Health staff to communicate information within the department during an incident.
- Information provided through these channels should be clear, and use non-technical terminology so that it's understood by all parties. This will save time during a real incident. Consider using a standard format for all incident notification emails and assigning an officer to scribe and populate the template advice for consistency.
- Incident notifications should include details such as: Mine operator name and where the mine is located, where onsite and when the incident occurred; what happened; what time incident was reported; what the Inspectorate is doing in response; plus information from

the mine SSE providing contact details for the company communications unit (*particularly important for incidents occurring outside business hours*).

- Key staff involved in organising the Exercise need to be designated to treat the exercise as real with respect to all procedures associated with media and communication emergency responses.
- Participants need to restate at all times during the exercise what role they are performing in that moment. Anyone assigned dual roles as observing or practising procedures must state when they are stepping into and out of a designated role. For example, if the Chief Inspector or Communication Manager is part of the testing or performing an observer role for the duration of the exercise, they also need to assign a delegate to step into their role if they are not explicitly able to fulfil their normal functions.
- The imminence of the exercise window and potential timing window could be communicated earlier (without giving the game away) to the Communications Director and Managers to enable the opportunity for more staff to rostered on in supporting roles at short notice.

Conclusions

These conclusions have been made following the review of the exercise response by the 20 assessors. They are based on the assessors' observations of the Exercise response at North Goonyella Coal Mine.

The conclusions made are as follows:

- An excellent first response by mines rescue trained CMWs to recover the injured and trapped CMWs in 9N development.
- Positive communication between 9N development crew and the CRO.
- The leadership of the mines rescue- trained worker in the first response and recovery highlights the benefits of such training.
- CMWs experienced difficulty in donning and changeover of SCSRs.
- One CMW damaged the long duration SCSR during the changeover process.
- Communication between the deputy and the crew including non-verbal utilising his notebook.
- Confusion over the non-verbal communication protocols at the mine.
- Maintaining a group of people underground to report back to the surface is very important if there is no immediate danger.
- Difficulties were observed at 54 c/t when messages that were required to be relayed to the work force were not agreed with by the underground deputies.
- There were issues with information transfer during the IMT process in particular from the control room to the operations group.
- Non-verbal communication difficulties were quickly worked around by CRO.
- Two-way radio between control and IMT were not working, seemed to be working between other teams and IMT, just not control and IMT..
- The control room seemed to turn into its own mini IMT due to lack of flow of information. Planning activities were also taking place with the relief CRO and shift co-ordinator. Where was the planning team?
- Explosion reported by deputy at 10.19 pm, Operations Controller was in the room and taking notes on what was happening, rang Incident Controller at 10.23 but did not advise of the explosion.
- The IMT room was well equipped and IMT functions were able to be initiated quickly, except for the Logistics Controller who was delayed in arriving onsite and no one seemed to deputise for him.
- IMT members had separate emergency phone communications to facilitate direct communication between them and offsite.
- Communication and briefing of head office appeared to be handled well.
- The IMT process needs more structure and focus. There seemed to be a number of circular decision making processes occurring (e.g. Should QMRS be called? Should deputies be called from camp?).
- Time needs to be allowed for delegated tasks (IAPs) to be completed.
- Communication from IMT of briefing results slow to filter through to logistics.
- Peabody corporate communications was outstanding in its social media response. Once they knew there was an incident they established a Social Media presence and provided the correct messaging. This messaging included details for family members and the media to contact them off line.
- Communication between MEMS groups needs to be improved.
  IMT role should not include analysis of data.

- Ensure that the planning group have a clear focus on analysis of data and development of options while the operations team remain focussed on implementing the planning.
- Debrief of personnel and the dissemination of the information needs to be improved.
- Briefing of ISHR's and Inspectors on their arrival to be improved to avoid disruptions of the IMT process.
- Non-technical issues were identified that affected decision making during the IMT process.
- There were delays in mobilising QMRS and QMRS did not deploy underground. (Objective E of the Exercise was therefore not achieved).
- The arrival of ISHR and Mines Inspector disrupted the IMT process.
- More training and practice is required in the MEMS process
- Simtars and QMRS were only put on standby.
- The fact that there had been an explosion was recognised early in the exercise but the information did not reach IMT.
- There was confusion over the 'missing man' due to the fact he accompanied an assessor into the longwall panel.
- Realism is difficult (e.g. cannot replicate an underground explosion).
- MEMS2 system enabled the Peabody Energy Brisbane team to follow development without requesting too many updates.
- The mine manager was the IMT leader.
- More assessors are required underground.
- More practice in IMT process/desk top exercises.

The combined list of suggested solutions for the mine industry and the exercise team are as follows:

Suggested Solutions

Mine

1. Implement recommendation 38 from the 2001 Exercise in relation to SCSRs changeover stations. This recommendation originally appeared as recommendation 38 in the 2001 Exercise and stated "*the introduction of changeover stations to the mine should be evaluated. This would allow verbal communications with the surface enroute and provide a place to leave injured persons if required. It also allows a safer environment for the changeover of SCSRs".*
2. Investigate going to a CABA style escape system.
3. Travel roads (escape roads) need to be improved/graded.
4. Use personal tracker system on vehicles, machines and personnel to help aiding decision making and resource allocation.
5. Underground radios or mobile handsets for improved communication.
6. Ensure better communication between paramedic and CRO.
7. Ensure more people are available for immediate patient treatment.
8. Increase number and availability of personal gas monitors.
9. Enhance first response training of mine workers for all personnel in the mine, including the use of the equipment.
10. Paramedic should be trained to provide medical attention underground.
11. Mines should review their systems to account for personnel during a mine emergency, particularly when people remain underground as part of the initial emergency response.
12. Stickers for helmets or small stickers for each DAC to with instructions for non-verbal communication.

13. Ensure all personnel who could be involved in managing an incident have received MEMS training.
14. Better document control system for paperwork so it doesn't go missing during an incident.
15. System for information transfer between IMT teams.
16. Notification to all underground personnel that an incident has occurred.
17. Make gas sampling equipment (pumps and gas bags) more accessible for occasions when a sample is needed in a location other than the regular ones.
18. CO sensors need to have a higher range.
19. Introduce a real time CO sensor at the main fan. Currently if a quick plug of gas moves through, the tube bundle system may not pick it up.
20. Refresher training on non-verbal communication protocols for all mine workers.
21. Scribe for control room.
22. MEMS system onsite needs to be updated so that old and new systems are not used simultaneously.
23. Increased training in MEMS2 and usage including collection and display of key event information by location, preferably graphically on mine plan.
24. Key events/time board in IMT
25. Use IAP process.
26. Improved control over communications.
27. More formalised decision making.
28. Implement IMT process more promptly.
29. Login and logout procedures need review there were several personnel who had not logged out of the mine system from day shift.
30. Procedure of accounting for missing employees needs comprehensive review.
31. Consider locating emergency teams closer together. For example, the operations room in relation to the control room (IMT, Planning, Operation, Logistics) could be situated in one building for communication benefits and efficiency of operations.
32. Long waits for feedback from IMT meetings.
33. Appointment of deputy to start executing procedures while waiting for Logistics team leader to arrive.
34. Review the emergency response plan in light of this exercise and address any concerns.
35. Train and practice response in the MEMS format.
36. Review placement of Operations Team Room, considering that the control room is the centre of all communications and is the main hub for command and control.
37. Have a clear first response system that has a clear cross over process to the IMT system.
38. Undermanager should be absorbed into the operations team with a clear role.
39. Essential information that IMT should know about, could be sent electronically from control to operations to IMT.
40. MEMS2 software to be integrated into all control teams, so that information would be centralised back at the IMT and if needed, each team can have visual access to each team's status easily.
41. Management of key external stockholders should be included in the IMT operational thinking, including utilisation of their knowledge and skills.
42. Use of Mine Plans should be much more effective for recording information and for communication of information at all levels (IMT, IMT sub-teams and control room).

Electronic touch screens would be very useful if set up effectively

43. Determine what processes are required for the efficient operation of emergency at the mine.
44. If the MEMS, AIIMS, ICS structure is to be used then additional training and practical application is required to allow the stakeholder so be more familiar with their roles and responsibilities. Requirements for key stakeholders in an emergency should reflect as far as possible their roles and responsibilities they are undertaking on a day to day basis, which allows easier transition. Planning spent a large amount of time gathering information rather than coming up with a plan to meet their objectives. Most of planning appeared to be done in IMT and little done by the planning.
45. The layout of the different streams physically on site, ideally Ops and Planning should be relatively close to each other to improve interaction between them.
46. Room such as planning area had difficulty printing documents and material had to be placed on memory sticks to allow print at times.

Industry

1. Undertake a systematic approach to training to ensure all employees are exposed to their roles and responsibilities in an emergency
2. Ensure ongoing training of self-rescuer donning and changeover processes.
3. Provide changeover stations where is escape is based upon SCSRs not CABA
4. Industry standard for use of blind-men's sticks
5. Mines should review the systems for accounting people during the mine emergency particularly when people remain underground as part of the first response.
6. Industry standard for Non-verbal communication protocols
7. When there is no immediate danger to personnel, by maintaining a group of workers underground who can investigate and report back to the IMT the situation can be controlled.
8. Have a more comfortable place for crews at the designated place of safety. The lack of seating split the crew into different areas, and it was harder to communicate. Those standing were more likely to stray away from the area.
9. Industry standard for Non-verbal communication protocols.
10. Adoption of personal location devices.
11. Provide a scribe for CRO.
12. System for cross referencing official nicknames with real names to avoid confusion when trying to account for people underground.
13. CO sensors that have a higher range.
14. Introduce a real time CO sensor at the main fan. Currently if a quick plug of gas moves through, the tube bundle system may not pick it up.
15. Consider revision of RS08 for level one exercises so that QMRS can achieve a meaningful callout and deployment as part of the Exercise process.
16. Consistent training of mine sites of emergency procedures.
17. Communications between *Mine* EMTs needs consistency and regularity.
18. Ensure emergency response systems include formal debrief of witnesses and a process for analysing and using the information gained.
19. Building on the above comment, skilled interviewing people should be used to ensure they know what to ask, know what is important (IMT – Operations Team) should give the interviewers priority required information.
20. Each mine should use the Exercise report as a guideline for developing their Level 2 Exercise scoping the areas to test.
21. Practical simulations for Level 2 Exercises

22. Pre-populating of the MRAS documents to facilitate decision making for mine re-entry by QMRS.
23. Increased site familiarisation with the MRAS process.
24. Conduct risk assessments on proposed actions.
25. Ensure the early call out and deployment of QMRS to site during an emergency situation.

Exercise team

1. Don't let missing personnel be seen by other CMWs during the exercise. This created some confusion later as he'd been there at the LW evacuation and the 54 c/t crib room before he disappeared as the missing man.
2. More detail on the final scenario and labelling of photographs of damages overcasts
3. Better preparation including gas modelling data and detailed planning of the scenario and individual team meetings to make sure all details are gathered.
4. Consider pictures with damage on areas that are damaged in scenario. Assessors could have signs 'fixed/repaired' on the equipment once the crew 'fixed' it.
5. Consider signs 'dead' and 'unconscious' for people who walk into irrespirable atmospheres.
6. Ensure sufficient assessors to cover all work groups, we were a little light on the ground to cover the small groups of contractors.
7. More detail required on damaged VCDs and ventilation quantities as they were repaired. Had the mine been evacuated this would not have been an issue.
8. Identification tags for damaged VCDs to minimise confusion.
9. VCDs repaired multiple times, need a system for tagging which locations have been fixed.
10. Improved communication from underground assessors to surface team on the activities being undertaken.
11. Assessors need better understanding of areas that will be damaged and their effect (e.g. air flow).
12. Need to replace deputies that are taken out of exercise to keep mine open, reduced their numbers straight off the bat.
13. Potential to use dummies for injured/missing personnel.
14. Clear communication on who is not involved in the exercise.
15. Try to improve simulated environment (smoke, explosion pressure wave etc).
16. For realism, anyone who cannot use self-rescuer properly becomes an injured man.
17. Training for Simtars by QMRS on MRAS on what information is required.
18. More clarity needed over personnel who are in/not in exercise. This will avoid confusion with persons appearing in areas where they are not supposed to be (e.g. person on EIMCO needed to stay with machine not observe LW evacuation).
19. Consistency of messages from exercise team (e.g. ventilation quantities and status of ventilation devices) and ability for underground assessors to communicate amongst each other to confirm messages.
20. Issue of limiting capacity of mine to respond due to quarantining outbye deputies needs to be addressed.
21. Review the immediate feedback after the exercise. The assessors should debrief with each other before passing feedback on to the mine. This will lead to more honest feedback
22. Identify situations where the proposed exercise can be confused through misinformation or ambiguity, in the exercise planning risk assessment.

23. Building on the above, have controls in place for example power is given to the exercise controller to issue clarifications directly or via confidential communications to lead assessors. This includes assessors being able to reach the exercise coordinator to get permission and content for clarification issuing.
24. Review recognised standard 08 Conduct of Mine Emergency Exercises to ensure that QMRS can achieve a meaningful callout and deployment as part of the level 1 exercise process.

Recommendations

These recommendations have been collated utilising the suggested solutions from each of the assessment areas. The suggested solutions should also be reviewed by mine sites for applicability to the mine site conditions. These recommendations have been made with the aim of providing continuous improvement to the mine and states emergency response capabilities.

1. Continued training in the donning of SCSRs and changeover process of SCSR to SCSR.
2. All coal mines with escape systems based on SCSRs to implement recommendation 38 from the 2001 Exercise and provide changeover stations *(38. The introduction of changeover stations to the mine should be evaluated. This would allow verbal communications with the surface enroute and provide a place to leave injured persons if required. It also allows a safer environment for the changeover of SCSR's)*
3. Exercise committee to review recognised standard 08 Conduct of Mine Emergency Exercises to ensure that QMRS can achieve a meaningful callout and deployment as part of the Exercise process.
4. All coal mines to develop realistic Level 2 Exercises that enable the practice of MEMS as well as utilising desk top scenarios for practising the IMT process.
5. Mines should review the systems for accounting people during the mine emergency particularly when people remain underground as part of the first response.
6. Develop industry standards for:
    a. The use of blind men's sticks
    b. Non-verbal communications
    c. Non-verbal communications
7. Enhance training of the mine workers on the first response training, for all personnel in the mine, including training in the use of the equipment.
8. More assessors are required underground to cover smaller groups of workers.
9. Increased training in MEMS2 system and usage including collection and display of key event information by location, preferably graphically on mine plan.
    a. Key events/time board in IMT.
    b. Use IAP process.
    c. More formalised decision making.
    d. Standardised briefing material for mines inspector and ISHR (utilise the information from MRAS/MEMS2).
10. Review placement of Operations Team Room, considering that the control room is the centre of all communications and is the main hub for command and control Prepare methodologies for dealing with social media in normal working times and during emergency situations.
11. Each mine should use the level 1 exercise report as a guide line for developing their level 2 exercise scoping the areas to test.
12. More detailed briefing for underground assessors.
13. Identify situations where the proposed exercise can be confused through misinformation or ambiguity, in the exercise planning risk assessment

Appendices

Appendix A: Exercise timeline

Table 1: Summary of timeline for the exercise

Location	Surface observation	Time	Underground observation	Location
		21:00	Shuttle car approaches CM outburst occurs at b heading face. 3 CMW injured and 2 disoriented	9 N b 25-26 ct
		21:06	deputy proceeded to the face to inspect; on the way to face he stopped and realised high CH4 and retreated to LOC	9N b 25-26 ct
Control Room	Call to Control from Development Crew. Reported high CH4 at miner 10, Deputy went to investigate, no contact with B hdg crew. Shift Co-ordinator directed to start entrapment procedure	21:10	9N deputy contacts control to inform them on the events; CRO instructed to set up Armoured air line with air to CM methane gas explosion (outbye)	main returns
Control Room	CO alarms in 9N dog leg.	21:12	deputy performed vent survey outbye LOC, informed 0.3m/s v and 2%CH4 and 20.5%O2	9 N 25 loc
Control Room	Development Deputy reported loss of ventilation (0.3m/s). I man injured, still accounting for others. CRO asked about CO levels, deputy reported no CO, but CH4 rising.	21:14	deputy informed CRO v DEC they lost ventilation	9 N 25 loc
Control Room	VLI crew, all 3 accounted for, no smoke in panel, will wait for Deputy for further instructions	21:16		
Control Room	Development Deputy identified outburst in 9N panel. CRO advised 50ppm CO and less than 19% O2 in dog leg, LW Crew will be sent to help	21:24		

		21:24	CMW with the upper leg injury was retrieved using stretcher by 3 CMW with CABA	9N b 25-26 ct
		21:25	8N crew donned self-rescuers	8N LW
		21:25	deputy and 2CMW loaded the injured CMWs into SMV; the CMW with the leg injury was removed from the stretcher into the back seat	9 N 25 loc
Control Room	NVC from Wilsons crew in 8N panel. Old NVC protocol being used, initial confusion, CRO adapted to old NVC protocol to communicate with crew. CRO confirmed smoke in panel, number of men in group, could not confirm location	21:30	Control attempted to contact Wilsons while they were donning their rescuers over the DAC which was located on the belt at their location.	8N A Hdg 3ct
		21:30	CMWs got the Air bags; control unit and hoses and returned to the face to attempt to rescue the trapped CMW; CMW was trapped by coal against SC rescue crew analysed the situation; used compressed air from CM, set up hoses, control unit and air bags, attempted to move SC; unsuccessful due to distance and failure to pack airbags; limited stroke of air bags	9N b 25-26 ct
		21:32	Crew changed from belt worn self-rescuer type to long duration self-rescuer. Still in last open crosscut. CMW damages long duration SCSR	8N LW-

Control Room	NVC from Wilsons, using correct NVC protocol. Shift Co-ordinator directs them to proceed to fresh air base and advise once there.	21:37	There was a delay in making contact with Control after donning as there was some non-verbal communication ongoing with the Longwall crew inbye. They contacted control using non-verbal communication over the DAC however there was confusion over the protocol, incorrect taps used for YES (3 instead of 1). Their intent was eventually understood by the CRO. They were told to go to the crib room.	8N A Hdg 3ct
Control Room	CRO commented to Shift Co-ordinator that the sensors that are over range are probably poisoned Assumption made in control room that there must be a fire in the drive head due to high CO levels and depleted O2	21:40	Deputy placed a non-verbal call on the DAC to let the CRO know that self-rescuers had been donned and the crew was heading out. The CRO informed them of a fire at the belt transfer point. The deputy wrote in his notebook and showed it to the crew to say that they were headed to the 2.5 crosscut to the next cache via the travel road.	8N
Control Room	Development Deputy advises that 2 men are going to drive head to fight fire	21:40	deputy informs CRO of the decision: 2 CMWs to leave on foot to investigate CO in drive head and pick up VLI CMWs	9 N 25 loc
		21:40	deputy informed one CMW with arm injury to get ready to leave; and CMW with the upper leg injury to stay in SAV with SCSR; 1CMW with CABA returned to face with spare CABA unit, he got DAC unit and moved it next to trapped CMW and informed him that he will have to stay until QMRS arrives	9 N 25 loc

		21:42	Wilsons contacted control again; they were told to head to fresh air but were not told where that might actually be. They were informed that the smoke appeared to be clearing in the travel road. They continued outbye via the travel road (8N MG B Hdg)	8N MG 2.5ct
Control Room	Wilsons 8N crew in fresh air, SCSR are off, overcast at 1ct identified as being damaged, Shift Co-ordinator directed them to fix it. 3 men in group	21:45	The Wilsons mining supervisor arrived in Drift runner, they met at C Hdg 56ct, realising they must be in fresh air they removed their rescuers and told their supervisor what had happened.	Mains C Hdg 56ct
		21:45	CMW with CABA returned to face with packing on their own decision to retrieve the trapped CMW	9N b 25-26 ct
Control Room	Development Deputy reported that last trapped man is out and on stretcher, all 3 injured men in vehicle, 9 total heading out	21:50	CMW used packing and 2 air bags to move SC; trapped CMW recovered and onto stretcher	9N b 25-26 ct
Control Room	Wilsons crew has patched up hole in Overcast Outbye of LW Shift Co-ordinator asked crew to go to 9N belt and report if there is a fire.	21:55	The 3 Wilsons contractors gathered some brattice and pogos from the immediate area and went patched up the overcast.	8N Belt Starter
		21:55	SMV left LOC; deputy driving, 3 injured CMWs, 3 CMWs reassuring the injured and providing the first aid	9 N 25 loc
Control Room	Operations Controller arrived,	21:57		
IMT	Mine Manager Arrived to set up IMT Room	21:57		

Control Room	UMM arrived, Shift Co-ordinator briefed UMM (IC) and Operations Controller. Heard bump, lost comms with LW face. UMM asked about injuries, 3 x reported (1 x arm laceration, 1 x leg, 1 x unknown). Wilsons reported smoke when outbye, fixed overcast, WDS crew looking for source of smoke. UMM questioned where air flow was going and gave direction to get everyone out.	21:58		
		22:05	Crew walked from last open crosscut down travel road in evacuation. During evacuation the group got separated and the first half left the second half of the crew. They got about a pillar apart before the rest of the crew realised it and waited up for them. Crew got in vehicle that was parked in the 2.5 crosscut.	8N
Control Room	UMM forming IMT, rest of duty cards issued. Photos were taken of mine map with notes from Shift Co-ordinator	22:06		
Control Room	UMM directs everyone to 54ct	22:08		
Control Room	Development crew instructed to go to 54ct with vehicle	22:10	They contacted control and reported that there was reduced ventilation and damage to D 58ct overcast. They were told to go to 54ct Deputy Cabin	54ct
Logistics	First tweet goes out on emergency	22:13		
		22:15	Wilsons x 3 and 1 x WDS arrived at 54ct	54CT
P- Room	Planning Team formed in designated room	22:18		

		22:18	9N deputy instructed 2CMWs to take 3 injured man to surface with SMV; all other CMW and deputy to stay and fight fire	54ct
Control Room	Development Deputy reported explosion at 8N drive head, Shift Co-ordinator advised to isolate power, informed deputy of location to do so Development Deputy reported that there were 30 men at 54ct, asked what they were supposed to do? Shift Co-ordinator advised that if they came out, they couldn't go back in.	22:19		
Control Room	CRO commented to Shift Co-ordinator: did explosion just happen?	22:21		
Control Room	Operations Controller had been in control room for a while, rang IC to brief him, didn't make any mention of the explosion	22:23		
Control Room	Development Deputy advised CRO how many vehicles were at 54ct, Deputy suggested that most of the 30 people in this location did not need to be here and should be sent out Deputy was asked if there was a fire, answer was No.	22:29	Still sitting in the crib room at 54 c/t. All crews have convened here and the deputies are on the DAC talking to the CRO	54 c/t
SSE Office	SSE advises Brisbane head office of the situation	22:30		
Logistics	retweets	22:42	Brisbane very slow in replying to tweets - communication	
Control Room	Talk in control room between CRO, Shift Co-ordinator and Relief CRO, looking at trends. CRO advised that real time sensors don't go above 50ppm. Troubleshooting to try and figure out what had happened. Relief CRO identified that there were two events, outburst and damaged overcast (caused by explosion?)	22:50		

Control Room SSE Office	LW Deputy phones in, has 11 men with him, told to stay put. Shift Co-ordinator asks LW Deputy to check TG gas readings Simtars put on standby	23:01	3 injured CMWs with the paramedic in the medical centre	
		23:04	Deputy thought that it was potentially the loader in the return that caused an explosion, however this was a statement he made to those in the immediate vicinity, he didn't mention this to Control in his next communication	Dips
Control Room	Miner called CRO and identifying current location of all men. 12 men at 54ct, 5 men inbye	23:15		
		23:20	Deputy contacted Control via DAC at Coffin Seal and reported the damage and missing bat bags before heading back to 54ct Deputy's Cabin	9N Inbye Coffin Seal
		23:23	Phone call informs the Deputy that bat bags have exploded in 9 N. We are still holding in the 54 c/t crib room.	54 c/t
P- Room	VO on site	23:24		
		23:30	Call with Control. Other crew is coming out. They still want LW Deputy to go to the tailgate to get a bag sample.	54 c/t
Control Room	Shift Co-ordinator and Relief CRO doing more brainstorming in control. Commented that bat bags were exploded but people where not thrown off feet. Relief CRO wanted to talk to Wilsons men for a first hand witness of what has happened. Plan made to take sampling equipment in and bring men out	23:34		

P- Room	Planning coordinator updates from IMT meeting to team members Indicated there were 3 objectives set by IMT however only explained the first and third and then they were side tracked	23:37
Logistics	Logistics team leader briefs team	23:37
Control Room	CRO contacted LW Deputy to talk to Wilsons. Wilsons stated SCSR used due to smoke, smoke coming up belt rd., smoke coming from 53ct overcast, coffin seal damaged, bat bags intact. Shift Co-ordinator getting frustrated as stories were not adding up	23:38
Logistics	5 people interviewed evacuating from the mine by safety manager:- 3 injured CMWs plus 2 others	23:43
Control Room	CRO talks to LW Deputy. Deputy has report of fire at drive head, identified that all of LW crew have used their SCSR. CRO will check what is happening with SCSR and get back to them	23:50
P- Room	Ops team leader comes to Planning room and requested VO to go to control room to discuss use of and operation of MX 4	23:58
P- Room	Planning Team unhappy with information transfer form Control Room to them planning leader request VO to attend IMT meeting to assist with explanations and clarification	23:59
Control Room	Planning Team wants updated CRO log, hasn't been updated since 21:40, CRO can only go as fast as she can	0:05
Logistics	Brisbane office notified NGC that next of kin had been contacted	0:05

Control Room	Report from Development Deputy, 10 men coming out, 13 left. Relief CRO asked for names of people staying behind. Asked if Mines Rescue will be available to rescue them if they get into trouble	0:10	Dev Deputy calls relief CRO in control room to inform him 10 are headed outside and 13 left including the two deputies. They go through the names of who is still here.	54 c/t
Control Room	Miner asked about Mines Rescue, was told to do as asked and required by Deputy. Was asked why he didn't leave with vehicle if he felt unsafe.	0:13	Call to CRO starts with ERZ controller talking to relief Controller and then puts Shift undermanager on the phone. "I'm not going into an unsafe area if he tells me to". Later heard "Is there someone upstairs with a rescue team, that's all I'm asking.	54 c/t
IMT	SSE makes statement in IMT that CO and damage to bat bags indicates an ignition.	0:22		
IMT	MR mobilised and IHSR reported to be on site	0:24		
Control Room	Mines Inspector arrives at site, went to admin building	0:24		
Control Room	Injured men are at hospital (Mackay)	0:26		
IMT	ISHR arrives in IMT	0:30		
Control Room	Operations Team Member wanting update, information transfer was tense	0:30		
Ops	9 men arrive on the surface. Deputy into T/G to confirm real time monitoring. Others to investigate 9 north	0:38		
P- Room	Still investigating and discussing causes, no real planning being conducted	0:40		
Logistics	HR Brisbane mobilised EAP about incident, two counsels mobilised and on standby	0:40		
Control Room	Shift Co-ordinator and Relief CRO working their way through the list of names	0:45		

Control Room	Shift Co-ordinator requests LW Deputy to check C, D and E hdg overcasts at 58ct and repair if required. 3 x Wilsons men to go with him. There was comment that Shift Co-ordinator would go underground to assist with repairs (idea potentially came from UMM)	0:49
Logistics	HR Brisbane have requested ERP to assist families at Mackay Hospital	0:49
	SSE Still no confirmation of accounted personnel.	0:55
Logistics	Brisbane advised that they will divert one of the ERP councils to Mackay based hospital and one remain on standby to come in	0:55
Logistics	Still confused about how many people names currently on tag board, team going through staff logins, staff gone to hospital to narrow down numbers. Big discussions as unable to account for missing people, still 14 names on tag board. 21 logged in on Cronis. Log in systems Cronis and Pegasus systems checked off against each other.	0:56
IMT	QMRS manager arrives.	1:00
Logistics	Brisbane notified mine no update available on injured parties, families on way to hospitals, opening line of communication with Mackay Hospital, Peabody still to establish presence at hospital.	1:00
SSE Office	SSE states on phone call to corporate team in Brisbane that 14 men U/G, 10 on Surface and 3 in hospital. All accounted for.	1:05
SSE Office	SSE briefs QMRS - confirms that he wants QMRS to respond. Expected time to get members to site is 1.5hours.	1:06

Logistics	Waiting on results from IMT briefing	1:10	A lot of waiting on updates from IMT Meetings	
Control Room	LW Deputy and Miner will walk inbye and the rest will stay at the tag board	1:15		
Control Room	Level 1 Chair confirmed to Relief CRO that a Miner (missing man) was part of the exercise. They had previously been told that he was not.	1:20		
Logistics	Cleaner given permission to leave site	1:20	Should be in total lockdown???	
Ops	Michael Gall MIA. Confirmed.	1:37		
		1:40	Established the name of the missing CMW. LW and Dev Crew deputies both thought he was with the other crew.	54 c/t
Logistics	Calls for some reason are being blocked and not diverted to Brisbane as planned. Reception will be manned and any calls will manually be diverted to Brisbane.	1:40		
SSE Office	SSE Communication to corporate comms- trying to workout source of CO, unconfirmed report of fire, no mention of missing person, gas readings indicate fire extinguished, 14 people U/G 12 men and 2 Deputies, beginning to organize changeover of management personnel, need to keep inputting MEMS.	1:41		
Control Room	Relief CRO and Shift Co-ordinator verbalising frustration at missing paperwork (ie. Manning sheets)	1:52		
Logistics	x 6 people overstays encountered on Pegasus - yet to be confirmed if they are off site. Firefighting equipment numbers availability reported. E.g. flat hoses, hose reals.	2:00	Real attention needs to be taken to ensure staff follow procedures in relation to login and logout of mine site.	

Ops	58 c/t inbye has been searched for missing CMW - no tag on 8Nth or 9Nth tag boards. Assumption made that he is on sumps. Now searching outbye of 58 c/t.	2:07		
Control Room	IC directs Shift Co-ordinator to send extra deputies to 9N dogleg to locate missing man	2:40		
		2:55	Walk into 9N dogleg with stretcher. Crew finds missing man who is in and out of consciousness and places him in stretcher. Three people present in crew carries him through double doors back out into 9N. Patient is placed on his stomach and strapped in to the litter.	9N Dogleg
Logistics	Level 1 Emergency Exercise called off	3:10		

Appendix B: Assessors

Russell Albury (Underground Assessor 201 Panel)

Deputy Chief Inspector of Mines

Russell has over 30 years of mining experience largely associated with underground coal.

He is a qualified and experienced underground mine manager and has worked in both New South Wales and Queensland as a mine manager.

Russell is presently employed as a Deputy Chief Inspector of Coal Mines and has been in the department for over two years.

Robin Bent

Senior AV Designer, DNRM Communications

Robin has been the videographer and photographer for the last two emergency exercises.

David Cliff (Organising Committee and IMT Observer)

Professor of Occupational Health and Safety in Mining, Minerals Industry Safety and Health Centre (MISHC) University of Queensland

David Cliff was appointed Professor of Occupational Health and Safety in Mining in 2011. His primary role is providing education, applied research and consulting in health and safety in the mining and minerals processing industry. He has been at MISHC over fourteen years.

Previously David was the Safety and Health Adviser to the Queensland Mining Council, and prior to that Manager of Mining Research at the Safety in Mines Testing and Research Station. In these capacities he has provided expert assistance in the areas of health and safety to the mining industry for over twenty six years. He has particular expertise in emergency preparedness, and fires and explosions, including providing expert testimony to the Moura No2 Warden's inquiry, the Pike River Royal Commission and the Hazelwood Mine Fire Inquiry. He has also attended or provided assistance to over 30 incidents at mines involving fire or explosion.

David has also extensive experience in providing training and education in OHS in mining to in many countries.

David Carey

CEO, Queensland Mines Rescue Service

David commenced as CEO for Queensland Mines Rescue Service in December 2014. A Mining Engineer with 37 years of experience in underground and open cut coal mining he has held roles in general management, mine planning and mine management in New South Wales, Queensland and Indonesia.

Qualifications include BE (Min) Hon, statutory qualifications as mine deputy, undermanager, coal mine manager and Qld site senior executive and an MBA in Technology Management.

He spent six years as an active mines rescue team member and gained operational and technical experience in most forms of underground coal mining both in New South Wales

and and Queensland, as well as technical and management roles in open cut coal mines in NSW, Qld and Indonesia.

David spent five years with the NSW Government as a coal mines Inspector, Senior Inspector and Area Manager leading the Extractive Industries Safety Advisory Committee and as a member of the Coal Mines Undermanager's qualifications assessor's panel.

David Connell

Regional Manager – Hunter Valley, New South Wales Mines Rescue

David is currently the NSW Mines Rescue Regional Manager for the Hunter Valley and Gunnedah regions. He has 28 years' experience in the coal mining industry and 17 years in Mines Rescue. He has been involved in several mining emergencies including Pike River, Beaconsfield and the Blakefield South incident and recovery. David is considered by many as an expert in the field of incident response and, as such, has provided assistance at a number of simulated emergencies throughout Australia and around the globe. He has also managed the standardisation of emergency response procedures across NSW coal mines to align with all other Australasian agencies and improve communication and efficiencies.

Snezana Bajic

Principle Scientific Advisor, Simtars

Snezana Bajic was appointed as Principal Scientific Advisor of Simtars in 2014. Snezana has 15 years of mining experience in Australia and overseas. She is currently in charge of the Mine Safety Technology (MST) group at Simtars, looking after the mine emergency response unit, Safegas and Camgas mine support. The team is also involved in commissioning Safegas on the new tube bundle and real time systems, as well as helping the mines maintain current.

Snezana was previously involved in industrial applications of automated mineral liberation analysers, QEMSCAN systems and other mineral processing consulting projects. She was responsible for executing projects on many mine sites in Australia, USA, Canada and Serbia.

Dale Davis

Operations Manager Southern Mines Rescue Illawarra, New South Wales

Dale has 15 years' experience in the mining industry and 11 with Mines Rescue NSW. He is currently the Operations Manager of the Southern Mines Rescue Station. The several years spent out of the industry were focused on safety, injury prevention and systems auditing including 2 years at the University of Wollongong. He has facilitated risk assessments for national and international mining organisations and participated in numerous simulated emergencies providing input into the planning, running and assessment of the events from both the industry's and Mines Rescue perspective.

Dale is also currently involved in the process of developing and implementing an ICCS as part of the emergency response systems for the NSW. mining industry.

Lauren Forrester

Analytical Chemist, Simtars

Lauren has 10 years ‘experience as an Analytical Chemist. She is currently a senior on call officer for Simtars emergency response, and has responded to the Pike River mining disaster and the Carborough Downs spontaneous combustion event. She has been installing, supporting and providing training on Camgas (Simtars Gas Chromatograph) for the past five years and has been involved in the generation of gas simulations for Level 2 emergency exercises since 2011.

Elliott Franks (Media and crisis communication procedures assessor)

Social Media Manager, DNRM

Elliott is the Social Media Manager for DNRM. Elliott has had over 15 years’ experience managing Social Media accounts and will use his expertise to simulate how the emergency would unfold on Social Media.

Jason Hill

Industry Safety and Health Representative CFMEU

Currently elected as an Industry Safety and Health Representative (ISHR)

Jason has Deputies qualifications and has been a QMRS member for 10 years.

He has taken part in six level one Exercises—three of those as an assessor, one as part of IMT and two as part of QMRS attendance.

Brian Kelly

Regional Manager Western Mines Rescue Station

Brian has 41 years mining experience with 26 of them being Mines Rescue Brigade Experience.

His previous roles included time as a Production Manager, Longwall Superintendent, Shift Undermanager and Mine Deputy.

Matt Koschel

ERZ controller Broadmeadow Mine

Matt Started in the mining industry in 2003 and commenced his underground work in 2005 as a ‘clean-skin’ miner at Broadmeadow coal mine. He has experience working in development and on the longwall as well as being a qualified shot-firer. He has three years’ experience as a deputy/ERZ controller on the longwall, in development and outbye. This is Matt’s first time as an assessor on the Level 1 Exercise.

Nikky Labranche

Principal Mining Engineer, Simtars, DNRM

Nikky LaBranche recently joined Simtars as Principal Mining Engineer in the Mine Safety Technology Group. She has ten years of experience in surface and underground coal

through her work in the United States, Colombia and Australia. Her research interests include human factors, lost-time injuries, self-escape, and built in-place shelters. During her time at Simtars, Nikky has written a *Virtual reality self-escape from underground coal* training module. Prior to her current position, Nikky has worked in various mining engineering roles for BMA Coal, NIOSH-Office of Mine Safety and Health Research and Drummond Company.

Robyn Lihou

Administration Simtars, DNRM

Robyn has been with Simtars for five years as an Administration Officer in the Mining Research and Development Centre as well as the Engineering Testing and Certification Centre. In addition to her administration duty in the Mining Research and Development Centre, Robyn also assists with research projects and has recently completed the training for the operation of the Steamexfire 300-2. She is also currently studying a Masters of Library and Information Technology studies through Queensland University of Technology to enhance research and information resources and their availability and implementation at Simtars. She is responsible for the Simtars Library which provides information for researchers and other departments within government.

Richard Livingstone-Blevins

Underground Mine Manager Grasstree Mine

Richard is a Mining Engineer by trade, whose career has spanned both New South Wales and Queensland. He has spent time in both technical and production functions, with focus on both longwall and development operations. Richard is currently working as the Underground Mine Manager at Grasstree Mine. Prior to this, he held the positions of Operations Superintendent, Compliance Superintendent, Development Superintendent, Ventilation Officer, and Mining Engineer. During this period he also spent time as a production deputy and an underground operator.

Ron McKenna

Underground Mine Manager Newlands Mine

Between 2008 and 2015 Ron has been employed as an underground mine manager by Glencore. Ron is currently UMM at Newlands and has been UMM at both of the Oaky Creek operations.

He has been involved in mining for over 60 years in both coal and metals and has been mine manager of underground and surface mines for 30 years. He spent four years as a senior inspector of coal mines based in Mackay and was instrumental in the development of the Tomlinson Boiler for the generation of inert gas for suppressing spontaneous combustion incidents in underground coal mines.

Ron was manager of Mines rescue operations for Blackwater and Moura during the period of the Box Flat, Kianga and Moura No 4 and Moura No2 mine disasters.

He was assigned by Glencore to assist in the Blakefield South Fire IMT special reference to Recovery Management, and has participated in the Pike River Mine Recovery Management Team.

Larry Ryan

Computer Systems Engineer, Simtars, DNRM

Larry has been involved in the development of Safegas, Segas Professional, Ezgas Professional, and other gas monitoring software for the coal mining fields for 15 years.

During the level 1 Exercise, Larry was involved in the running of the software simulation on the Safegas software. Larry has developed, tested, installed and commissioned the Safegas gas monitoring software at mine sites in Queensland, New South Wales, New Zealand and the United States of America.

Martin Watkinson (Chair of the Organising Committee)

Executive Mining Engineer, Simtars, DNRM

Martin is the Executive Mining Engineer based at Simtars providing technical assistance to the Australian mining industry in the fields of:

- ventilation
- gas monitoring
- emergency response
- risk management
- development of safety management plans.

He is currently involved in completing a major review on the development of and use of tube bundle gas monitoring systems.

Martin has been involved in all Level 1 Mine Emergency Exercises between 2001 and 2008 and was the Chair of the committees for the 2006, 2007, 2013 and 2014 exercises.

Between 2007 and 2013 Martin worked for Vale and Adani in senior management roles. He has provided emergency response advice and coordinated emergency exercises in Queensland, New South Wales and New Zealand.

Daniel White

(ERZ Controller) Mole

Daniel has 18 years experience in the underground coal industry and has been working at North Goonyella since 2008. Daniel studied at the University of New South Wales completing a BE (Mining) in 1998 and Grad Dip (Mine Ventilation) in 2005. He has experience across a wide range of technical and operational disciplines including, short, medium, life of mine planning, contract management, gas drainage and he has also worked as a Ventilation Officer. More recently Daniel has held operational roles as a Development Coordinator, ERZ Controller and Shift Coordinator.

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