Level 1 Mine Emergency Exercise 2016

Grasstree coal mine

November 2016

Queensland Government

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

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Abbreviations and glossary

Term	Definition
Approved standard	A standard made for safety and health under the repealed Coal Mining Safety and Health Act 1925 stating ways to achieve an acceptable level of risk to persons arising out of coal mining operations.
Bord and Pillar	Another name for 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
CPR	Cardio pulmonary resuscitation
CH4	Methane
CITECT	Brand name of SCADA system
CO	Carbon monoxide
CO2	Carbon dioxide
CHPP	Coal handling and preparation plant is a facility that washes coal of soil and rock; crushes it into graded sized chunks (sorting); stockpiles grades preparing it for transport to market; and (more often than not) loads coal into rail cars, barges, or ships. They can also be referred to as a coal preparation plant, prep plant, tippler or wash plant.
CMW	Coal mine workers
COB	Change over bay
Continuous miner	Coal cutting machine used to develop new roadways in a mine.
Crib room	Location where mineworkers eat and a meeting station for the ERZ controllers.
CRO	Control room operator
CSE	Brand name of a self-contained self-rescuer with a rated duration of 40 minutes
Cut-through (c/t)	A passage cut through the coal, connecting two parallel headings.

Term	Definition
DAC	Underground intercom system also referred to as the tannoy.
Deputy	Safety supervisor who makes statutory inspections not referred to as an ERZ controller in Queensland regulation.
DNRM	Department of Natural Resources and Mines
Driftrunner	Brand name for a flameproof diesel powered man-riding vehicle carrying up to 12 personnel.
Eimco	Brand name of a flameproof mechanical loader
EMP	Emergency management plan (interchangeable with ERP)
ERP	Emergency response plan (interchangeable with EMP)
ERZ	Explosion risk zone
ERZ controller	Mine worker responsible for safety inspections traditionally referred to as a Deputy.
Face	The exposed surface of a coal deposit in the working place where mining is proceeding.
Fresh Air Base (FAB)	A continuously monitored station for dispatch or return of rescue teams in close proximity to irrespirable zones.
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	Incident action plans. Plans developed by the IMT and signed off so that each of the teams, logistics, operations and planning have clear direction.
ICS	Incident Control System
IMT	Incident Management Team (term is interchangeable with ICT)
Inbye	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

Term	Definition
	exercises the powers of an industry safety and health representative mentioned in part 8, division 2.
Level 1 mine emergency exercise	State level mine emergency exercise to test the mine's emergency response system; test the ability of external services to administer assistance and provide a focal point for emergency preparedness in the state.
Longwall	A method of mining flat-bedded deposits, in which the working face is advanced over a considerable width at one time.
Mines Inspector	Official employed to make examinations of and to report upon mines and surface plants for compliance with mining laws, rules and regulations, safety methods
Mines Inspectorate	The organisation who control the mines inspectors
MEMS	Mine emergency management system
MRAS	Mine re-entry assessment system
MSHA	Mine Safety Health Administration, United States of America - Department of Labour
Mole	Name used to refer to the mine site representative on the organising committee for the level 1 mine emergency exercise.
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	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.
Personal Emergency Device (PED)	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.

Term	Definition
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.
Safegas	Brand name of a mine gas monitoring system (developed by Simtars).
SCADA	Supervisory control and data acquisition. Software for monitoring and/or controlling plant and equipment.
Self-contained self-rescuer (SCSR)	A respiratory device used by miners for the purpose of escape during mine fires and explosions. It provides the wearer a closed-circuit supply of oxygen for periods of time usually less than 1 hour.
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.
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 (i.e. shift supervisor).
Ventsim	Ventilation modelling software
VCD	Ventilation control device an air door, stopping, seal or brattice.
VO	Ventilation Officer. Person responsible for coordination of all ventilation related activities at the mine including running a computer base ventilation modelling system.

Preface

This report has been compiled by the 2016 Level 1 Emergency Exercise Organising Committee (the Committee) with input provided by each of the assessors involved in the exercise. Assessors have provided an account of their part of the exercise for this report.

The Committee would like to thank all assessors for their input and acknowledge the co-operation and assistance of all those involved in the 2016 Level 1 Mine Emergency Exercise In addition, the Committee would also like to thank Grasstree Mine and Anglo American for participating in the exercise and providing (with assistance from Ausdac) 130 self-contained self-rescuers for use during the exercise, adding to the reality of the experience for evacuating coal mine workers.

Level 1 Assessors before underground deployment

Executive summary

This report relates to the 2016 Level 1 Mine Emergency Exercise (the Exercise) held at Grasstree Mine between 7 am and 5 pm on Sunday 13 November 2016. Grasstree Mine is an underground longwall coal mine located approximately 26 km east of Tieri, 250 km south-west of Mackay, in Central Queensland (Figure 1).

The Queensland Mining Warden's inquiry into the explosion at the Moura No. 2 Mine in August 1994 recommended, "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).

In December 1996, the Approved Standard for the Conduct of Emergency Procedures Exercises was published. This approved standard was updated and issued as *Recognised Standard 8 Conduct of Mine Emergency Exercises* (RS8) in June 2009. It provides guidelines for conducting mine site emergency exercises, including the requirement to test state-wide emergency responses by holding an annual Exercise.

It is 22 years since the Moura No 2 disaster (August 1994), and six years since the Pike River disaster (November 2010). The Pike River Royal Commission led New Zealand to adopt similar legislation regarding emergency exercises.

Since 1998, 19 Level 1 Mine Emergency Exercises have been held in Queensland.

Nineteen assessors took part, with representatives from Simtars, the Queensland Mines Inspectorate, Mines Rescue (Queensland and New South Wales), an industry safety and health representative (ISHR) from the Construction, Forestry, Mining and Energy Union (CFMEU), Minerals Industry Safety and Health Centre (MISHC), the Department of Natural Resources and Mines (DNRM) Corporate Communications and mine staff from Ensham, Broadmeadow, Grosvenor, Kestrel Mines and George Fisher mine.

Objectives

By using the requirements of RS8 and by reviewing previous exercise reports, the objectives of the Exercise were to test:

- the mine's emergency response system, particularly the ability to form an incident management team (IMT) on a weekend.
- self-escape/aided escape and inseam response as required including the changeover from self-contained self-rescuers (SCSR) to SCSR and the use of change over bays (COBs).
- mobilisation of Queensland Mines Rescue Service (QMRS) including deployment underground, and establishing a fresh air base (FAB) as applicable.
- how installed systems and procedures were managed to locate missing personnel.
- off-site communications response on a weekend for incident respondents, including QMRS, Mine Rescue, the Inspectorate, Simtars and Anglo Corporate Communications.
- and to provide a focal point for emergency preparedness in the state.

Scenario

The scenario for the exercise occurred at 8 am with a friction fire quickly developing on the loop take up (LTU) on conveyer No 7 (CV0007). Pollutants from the fire quickly spread into the development headings. In order for smoke and pollutants to get into the intake of the longwall, it was assumed that a ventilation stopping was damaged on the previous night shift and not reported. High CO levels quickly reached the development crews and the longwall crews who had to effect a self-rescue using SCSRs and smoke goggles to simulate an environment of low-visibility. Crew had to stop at the COBs along the way to change SCSRs during their escape. Three contractors working outbye at a drill stub in 907 maingate (MG) were selected to be the missing personnel for Mine Rescue to locate, once the fire had been controlled. While the contractors were free to make their own decision on which route they would take, however, they were instructed by the Exercise team to go inbye into the mains development roadways and wait for QMRS. The mine has a Northern Lights Technology (NLT) personnel locator system installed, which was to be tested to assist QMRS in identifying the possible location of the missing coal mine workers (CMWs) and establish a search route.

This scenario presented the following issues to be addressed:

CMWs had to effect an escape wearing SCSRs and undertake a changeover in a COB

- there are missing CMWs
- formation of an IMT on a weekend with reduced staffing levels
- callout and communication systems on a weekend (mine personnel, QMRS, Inspectorate ISHR and Simtars)
- disrupted ventilation.

Major observations

The major observations listed were made by reviewing the 19 assessors observing the Exercise response. The full list of observations is included at the end of this report.

Major observations included:

- The overall assessor consensus was the site management of the Exercise using the EMQnet software was a success. The system was very useful and site staff demonstrated proficiency in its use.
- The underground CMWs showed they had benefitted from additional training in the donning and changeover of SCSRs.
- An exercise participant was able to get 2hrs 25 mins out of his CSE self-rescuer, 25 mins of walking and 2 hrs at rest. This man has experience as a diver, but had never worn a live SCSR before.
- CMWs who were current or former QMRS members showed leadership at critical parts of the response. This shows the training QMRS provide personnel is invaluable and can be applied to a range of situations.
- The QMRS substation is remote from mine site activities and has limited communications available.It is noted that in a real-time emergency onsite, the mine

would need to deploy alternative communication systems to overcome these limitations.

- The firefighting response was well organised and coordinated once the QMRS trained explosion risk zone (ERZ) controller arrived to oversee the activity.
- Some limitations were noticed with the performance of the NLT system.

Recommendations

All mine sites and other agencies involved in mine emergency incident response should review the recommendations and utilise them in the gap analysis and periodic review of their emergency response systems as well as audit tool prompts and checklists.

Important recommendations from the exercise for the industry emergency response include:

- Industry to evaluate funding for the purchase of an emergency winder, proposed by QMRS.
- Ensure regular training in the donning of SCSRs and changeover process of SCSR to SCSR is continued.
- Review the design and location of COBs using technical documentation on their design, construction and placement.
- Industry to review the applicability of the EMQ net system or other equivalent system that interfaces with MRAS, Safegas and other gas monitoring systems.
- Industry to develop and update firefighting protocols for evacuating mine workers, detailing training capability and minimum equipment requirements, clothing and breathing equipment.
- DNRM to convene workshops on emergency rescues to validate/consolidate exercise recommendations and identify specific recommendations requiring industry-wide action.

The 2017 Level 1 Emergency Exercise will be held at Broadmeadow underground coal mine.

Martin Watkinson

Chair of 2016 Level 1 Exercise Committee

Figure 1 Location of Grasstree Mine

Introduction

This report relates to the 2016 Exercise held at Grasstree Mine between 7 am and 5 pm on Sunday 13 November 2016. Grasstree Mine is an underground longwall coal mine located approximately 26 km east of Tieri, 250 km south-west of Mackay, in Central Queensland (Figure 1).

All Queensland underground coal mines are required to test their emergency preparedness by running simulated emergency exercises annually. This requirement was a recommendation of the Warden's inquiry into an explosion at Moura No. 2 Underground Mine on 7 August 1994 in which 11 miners died. One mine is selected to be the focal point of the state's emergency preparedness and is the host for the Exercise.

The requirements for conducting mine emergency exercises are set out in *Recognised Standard 8, Conduct of Mine Emergency Exercise*, which along with reports of recent exercises, is available on the DNRM website at www.dnrm.qld.gov.au.

Objectives

The objectives of the exercise were set using the requirements of the recognised standard and reviewing previous exercise reports. The objectives set were to test:

- the mine's emergency response system, particularly the ability to form an incident management team (IMT) on a weekend. Many senior staff commute from Brisbane on a weekly basis.

- self-escape/aided escape and inseam response as required including the changeover from self-contained self-rescuers (SCSR) to SCSR and the use of change over bays (COBs).
- mobilisation of Queensland Mines Rescue Service (QMRS) including deployment underground, and establishing a fresh air base (FAB) as applicable.
- installed systems to locate missing personnel.
- off-site communications response on a weekend, including QMRS, Mine Rescue, the Inspectorate, Simtars and Anglo Corporate Communications.
- and to provide a focal point for emergency preparedness in the state.

Grasstree underground coal mine

Grasstree is a longwall coal mine with three continuous miner development places. The mine achieved an annual run-of-mine (ROM) tonnage of over 10 Mt in 2015. The mine operates at a depth of cover around 400 m. Grasstree is gassy, technically challenging and practices both pre and post mining methane drainage. There is a co-generation plant on the surface that produces 32MW of electricity. Figure 2 sets out for the longwall layout of the mine.

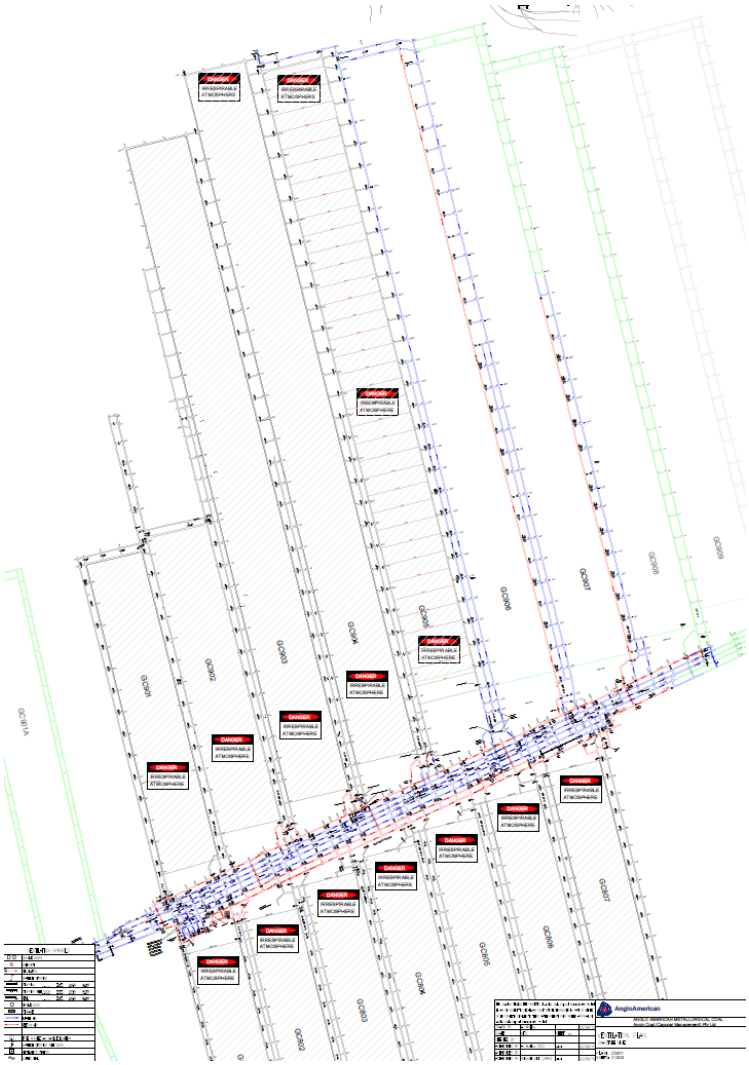

Figure 2 Longwall Layout at Grasstree Mine

Scenario

The scenario for the exercise occurred at 8 am with a friction fire quickly developing on the loop take up (LTU) on conveyer No 7 (CV0007). Pollutants from the fire quickly spread into the development headings. In order for smoke and pollutants to get into the intake of the longwall, it was assumed that a ventilation stopping was damaged on the previous night shift and not reported. High CO levels quickly reached the development crews and the longwall crews who had to effect a self-rescue using SCSRs and smoke goggles to simulate an environment of low-visibility. Crew had to stop at the COBs along the way to change SCSRs during their escape. Three contractors working outbye at a drill stub in 907 maingate (MG) were selected to be the missing personnel for Mine Rescue to locate, once the fire had been controlled. These contractors were free to make their own decision on which route they would take, however for the sake of the exercise they were instructed to go inbye into the mains development roadways and wait for QMRS. The mine has a Northern Lights Technology (NLT) personnel locator system installed, which was to be tested to assist QMRS in identifying the possible location of the missing coal mine workers (CMWs) and establish a search pattern.

This scenario presented the following issues to be addressed:

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- callout and communication systems on a weekend (mine personnel, QMRS, Inspectorate ISHR and Simtars)
- disrupted ventilation.

The mine's ventilation simulation was utilised to predict the possible spread of fire contaminants from the source location. Plans were prepared for the underground assessors which indicated the contaminated air locations and the approximate predicted arrival. (Figure 3).

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. Recommendations for improvement have been made in each section for industry to consider; where they are specific to Grasstree are listed as 'Mine'.

Appendix C contains reference material from the assessors on recommendations to assist in the running of Level 1 exercises.

Nineteen assessors took part, with representatives from Simtars, the Queensland Mines Inspectorate, Mines Rescue (Queensland and New South Wales), an industry safety and health representative (ISHR) from the Construction, Forestry, Mining and Energy Union (CFMEU), Minerals Industry Safety and Health Centre (MISHC), the Department of Natural Resources and Mines (DNRM) Corporate Communications and mine staff from Ensham, Broadmeadow, Grosvenor, Kestrel Mines and George Fisher mine. Appendix B contains details of the assessors.

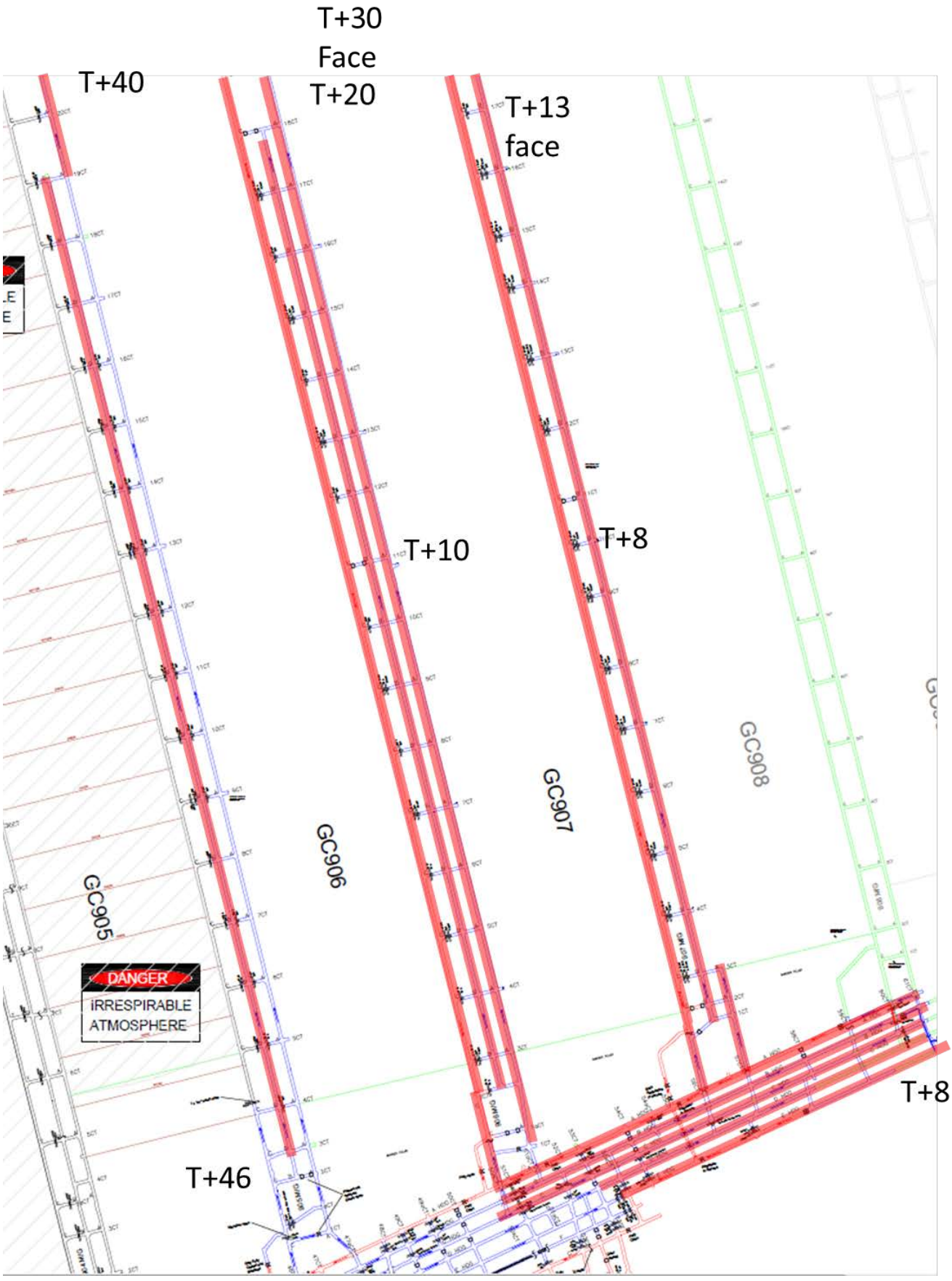

Figure 3 Fire site and spread of pollutants from the fire

Underground assessments

906 Longwall

Assessors: Peter Herbert, Levi Laurie and Robin Bent (Video)

The longwall crew were notified of smoke and irrespirable conditions due to fire while at their crib room. The crew donned their SCSR and proceeded on foot to their nearest COB (17A c/t) where they made their first SCSR change over. They proceeded to the next COB (7A c/t) on foot for next change over. Communication with CRO confirmed that fresh air was their next target which they were able to reach with the use of last SCSR. All personnel were successfully evacuated the underground environment within three hours.

CMWs were assessed on their ability to don SCSR; their change over process in COB; the evacuation process on foot to fresh air; teamwork; communication; and site procedures.

The deputy of the crew made an initial decision to go inbye of the longwall to the downcast shaft where they would have been in fresh air and would not have needed to evacuate under SCSRs. This was a logical decision however, had the belt fire become unmanageable, evacuation of the CMWs via the shaft would have had to be undertaken. There is currently no emergency winder available in Australia to undertake this task.

The second decision was to take the available transport. For the purposes of the exercise the crew was asked requested to walk to test out the COB protocols.

At no time was an alert received from the control room and no emergency evacuation was sounded over the DACs. Smoke in the panel was communicated 20 minutes after the start of the fire at LTU CV 007.

The deputy communicated with the control via telephone in the COB and before departing the inbye crib room. Some difficulties were encountered with the non-verbal communications at the tag board.

One of the expired SCSRs was damaged on opening. (Figure 4)

Figure 4 Damaged SCSR

What worked well?

- Communication between team members when they were aware that an exercise would be on.
- CMWs checked on each other. (Figure 5)
- The lead team member evacuated at a good pace and was checking the team as he walked.
- Concise and controlled leadership from the deputy.
- When travelling on foot, crews formed single file, maintained physical contact, used candy canes to maintain contact with wall, tapping pipes when reaching cut through.
- Walking pace was consistent and efficient but did not overly exert any crew member. Road conditions were good for safe and efficient travel by foot.
- Communication with the crew was good, once they had reached the surface. This included tag board requirements, first aid treatment and a debriefing process.
- Excellent attitude from crew in embracing the Level 1 incident.

Areas for improvement

- No evacuation broadcast underground.
- Regular headcounts during evacuation process.
- Regular gas monitoring checks whilst evacuating.
- Regular gas monitoring in COB's.
- Non-verbal communication between control and deputy at underground tag board.
- Contractors not trained to the same level as Grasstree Mine personnel in the operation of the COB.
- The team could have maintained better discipline after they had removed their SCSR and smoke goggles in fresh air.

Figure 5 CMWs checking each other on donning SCSR

906 Longwall outbye (Undermine Contractors)

Assessors: Martin Watkinson

The Undermine Contractors travelled to their work site in their diesel transporter. After conducting their pre-start slams and safety checks they commenced deployment to their work location. At 8.10 am, as the team was entering the conveyor road, they were informed of smoke coming from outbye. The supervisor instructed all of the crew to don their SCSR. The team then gathered together and proceeded outbye at a slow pace in their vehicle.

The crew then stopped at 7 c/t COB. The supervisor took his SCSR off on entering the COB and assumed it was fresh air. The rest of the crew were more cautious in their approach and undertook a change-over, assuming the air was contaminated.

The supervisor contacted the control room and was instructed to proceed outbye collect their tags from the tag board then proceed to the COB at 47A in the mains. The next contact was to be made in the next COB as the air was contaminated at the tag board.

The COB was well constructed and contained a white board, with the supervisor leaving information for any inbye crews as they evacuated. The COBs are between the intake and the homotropal conveyor road and whilst the compressed air pressurisation system was activated on entering there is a chance that some contaminated air could have entered the COB. None of the crew had a gas monitor. If crews undertake changeovers, assuming that the air is not contaminated, there is a danger from the cumulative effects from carbon monoxide poisoning.

Two of the goggles within the old SCSRs had deteriorated and broken. The crew kept in hand contact whilst walking and effected the donning and changeover with little difficulty.

On arrival at 47A COB the supervisor contacted control and was instructed to evacuate to pit bottom and await further instruction. Two Grasstree CMWs still in the COB questioned why they still had to stay. On discussion with the Undermine CMWs it was identified that they had not undertaken any detailed fire-fighting training unlike the Grasstree staff.

On arrival in pit bottom the supervisor contacted control and was instructed to send the team out of the mine. He was to remain and conduct a sweep of the area to evacuate personnel to the surface and he would be relieved by a Grasstree deputy.

On the surface the area was cordoned off with the team meeting together to account for team members. They were asked if they had anything to report and said no. It was only after they were prompted had they seen smoke that they realised they had information to provide.

Debrief was conducted and the team was requested not to get their mobile phones.

Grasstree mine has the capability to disable mobile phone coverage on site. This was not done during the exercise.

What worked well?

- SCSR donning and change over.
- Using vehicle to evacuate.
- Linking when outside of vehicle.
- Surface security and accounting for personnel when they arrived at the surface.

Areas for improvement

- Assuming fresh air in COB.
- Pressure differential across COB walls.

907 Development

Assessors: Scott Barker and Snezana Bajic

At 8.13 am the 907 development crew were suppling the miner in B heading. A member of the crew at the start of the shift had been sent to bring the pipe trailer from the outbye section of the panel into the face area. As a result, this individual was not present at the start of the incident.

At 8.13 am the assessors informed the crew that they could smell fire and that the panel was becoming smoky. The ERZ controller immediately pulled out his gas detector and asked what the gas levels were. The assessors explained it was off-scale CO, less than 19% O2 and 1.49% CO2. ERZ controller was surprised by the dramatic levels at which the gasses had changed and explained that the gas detector has alarm levels set and that fire smell would have been a much early indicator that the gas levels provided. In order to test a mine's emergency response in the Exercise, it is assumed that a principal hazard management plan has failed and there was no early warning.

The ERZ controller then communicated the incident with the control room operator (CRO) via the DAC at the miner and proceeded as per the emergency evacuation procedure to the crib room. The ERZ controller used the first response CABA suit as this enabled him to communicate with his crew whilst evacuating. These first response suits are useful, however there is no recharge system in place nor the ability to 'buddy' a person off the suit should they encounter difficulties.

There were no inbye vehicles to use for evacuation.

The crew then proceeded to evacuate outbye changing their SCSR at the COBs. The COB's are pressurised using the mines compressed air supply. This COB was situated between the intake roadway and the homotropal belt road and has a pressure differential across it, as do many others in the mine.

Grasstree mine staff conducted their SCSR changeovers assuming that the air was contaminated. This is the way they are trained.

At the outbye end of the panel the crew came across a CMW who had a sign which said no signs of life. This person had not worn his nose clip.

The camera at the tag board was not working. Figure 6 is a working camera still from 906 MG tag board.

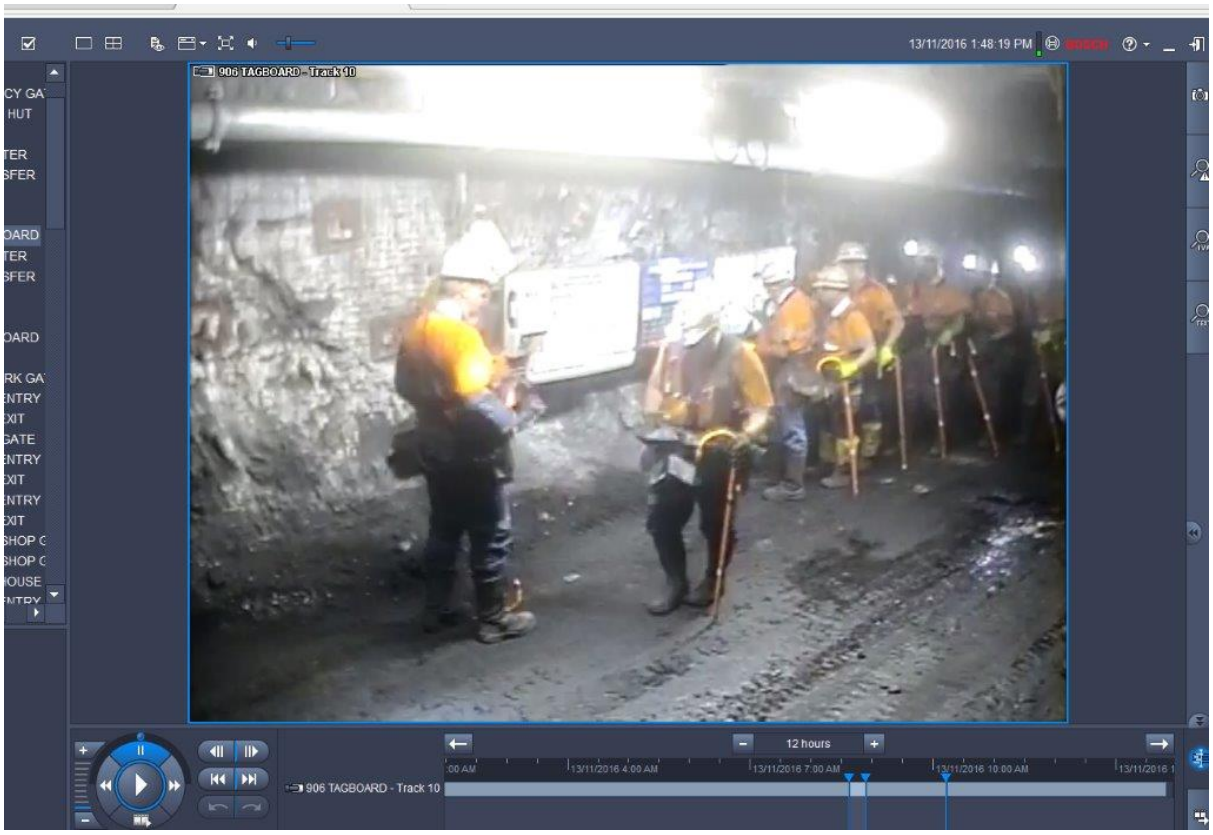

Figure 6 CMWs at 906 tag Board (underground fixed camera)

What worked well?

- The emergency response process followed by the crew and the way the ERZ controller managed his crew.
- Ability for the ERZ controller and one other to wear a CABA suit in the initial phase of the evacuation. This allowed for them to set a plan with the crew, to calm everyone down and provide a full update to the CRO and then explain the plan to the crew.
- Strong ERZ controller leadership and leadership from the QMRS trained personnel ensured a rapid and well controlled response from the crew.
- COBs were positively pressurised. For purposes of the exercise and to allow crew members to practise their change over process assessors pretended that it was irrespirable.
- Primary egress signage provided clear pathway for crews to follow.
- Non-verbal communication was clear and direct. CRO responded quickly to the non-verbal and must have been using location based information to ask the correct questions to the ERZ controller quickly establishing that they were the MG907 development crew and then providing clear direction.
- QMRS training for two of the personnel helped because they were very advanced in their processes of donning/checking and directing the crew.
- Surface process of providing medical assessment/debrief/counselling/area for crew to wait and provision of water and food was done very well.
- Use of actual rescuers made for realistic changeover process – crews appreciated being able to use this system for training.

Areas for improvement

- Use of SCSRs over long distances put an obvious burden on personnel and made communications more difficult. Where these systems are in place the COBs are a control to assist in the changeover and communication as long as they are positively pressurised and not contaminated.
- The person who had been ‘made unconscious’ by the assessor for not wearing a nose clip confused the messaging into the IMT because the person did not follow the instructions of the assessors and claimed that he had ‘no signs of life’. This led to a message being given to the Inspectorate of a fatality
- The vehicle at start of MG907 looked like it was ‘crashed’. This was reported during the debrief. This assumption was made because of the way it was parked. CMW’s should always use a vehicle for escape whenever possible. IMT later found out that this was parked by a responder to the fire.

907 Outbye VLI contract crew (missing men)

Assessors: Rodney Graves and Peter Cornford

Scenario was a fire on CV007 LTU. The conveyor has just been extended and a VCD is damaged. CO levels over 6000ppm, Carbon Dioxide 1.5% with oxygen down to 18.7%

At 8.15 am (T+15) when the smoke from the ‘fire’ arrived at the 7c/t drillers.

The crew heard nonverbal communications over DAC. At which point the crew contacted control via nonverbal communications (no SCSR on) and informed to don ‘their belt-worn’ SCSR and retreat to 3c/t COB. The crew went into travel road in a group and donned SCSR. Crew checked each other over prior to commencing evacuation.

There was no evacuation message received throughout the exercise.

During the evacuation the crew hugged the chain pillar rib line and only used 1 light on low beam to simulate poor visibility. Crew checked each over out at 4-5 c/t to see if everyone was ok.

The crew then continued the escape on foot until to 3 c/t COB SCSR cache. Once inside, the atmosphere was read prior to removing SCSR to communicate to control. Told to evacuate via D heading mains on primary escape-way to pit bottom under SCSR. The crew discussed the plan and donned new SCSR.

There was an ERZ controller in 3c/t COB but no discussion with crew held. Phone rang and CRO instructed ERZ controller to go with crew under SCSR to Pit bottom. ERZ controller donned SCSR.

Nose clip of SCSR was off on ERZ controller. Crew asked if everyone was right to go and all confirmed yes. Outside COB the crew confirmed everything was okay. ERZ controller was placed unconscious outside 3c/t COB in a toxic atmosphere.

The crew was evacuated out of 907 panel to tag board. The tags were removed and the number tag (13) of the person left was recorded on the board and in a note book.

There was no communication with control.

The PJB was at panel entry, the crew checked that that it could be used to drive to pit bottom.

For the scenario the crew took a left turn and travelled inbye to 59 c/t A-B heading and became lost.

What worked well?

- The technique for donning the SCSR.
- Once self-rescuers were donned the group quickly evacuated.
- Communication between the VLI supervisor and the crew including non-verbal utilising his note book.
- Good standard escape-way signage underground.
- VLI crew had a good understanding of escape-way.
- Small group work well together.
- Change over to SCSR and each person checked each other over.
- Confirmed everyone was okay as progressed out escape-way.
- Use of vehicle parked at panel entry to escape instead of walking out was identified.
- An exercise participant was able to get 2hrs 25 mins out of his self-rescuer, which included 25 mins of walking and 2 hrs of rest. This man has experience as a diver, but had never worn a live CSE before. When resting he held the CSE away from his body in his fingers and commented later that this decreased the inhalation temperature noticeably.

Areas for improvement

- One CMW (ERZ controller) didn't place nose clip on after donning SCSR. This could have resulted in a fatality in a real event.
- No one used candy canes to run along rib line and keep people together
- No one had a light on in PJB while travelling to receive PED messages
- Should have checked over ERZ controller at 3 c/t COB prior to leaving. Potentially could have dragged ERZ controller back into COB, or at least put his nose clip on and called control. In COB was 'fresh air', where they left him was an irrespirable atmosphere.
- At 3c/t COB there was no communications between ERZ controller and VLI crew until leaving.
- No PED messages were received in cuthrough at 59 A-B mains but received PEDs in D heading travel road.
    - 10.00 am call control urgent
    - 11.30 am self-escape via D heading fresh air 53c/t
    - 2.30 pm QRMS on way.

907 Development loop take up

Assessors: Brian Kelly

Two Grasstree CMWs were working in the loop take up area for 907 conveyor belt. The timing from Ventsim indicted that the polluted air from the 'fire' would reach them in around 3 minutes. Once informed of the smoke the CMWs donned their SCSR and used non-verbal communications with the control room to. One of the CMWs was a former QMRS team member and his training and experience was evident. During the evacuation to 47 A COB they used a short length of fibreglass rib-dowel as a blindmen's stick to assist in their evacuation outbye of the fire. On arrival at 47A COB they contacted the CRO and were instructed to wait for further instructions.

Another crew evacuating from 906 entered the COB and were instructed to evacuate to the surface. One of the two grasstree CMWs asked the question of control why they could not evacuate as well.

The mines recue trained CMW knew that the air outside and in the COB would be clean due to his knowledge of ventilation and the location of the fire. Neither of the CMWs had a gas monitor and there was no gas monitoring inside the COB.

What worked well?

- Self-escape.
- Non-verbal communications.
- Improvised use of blind man sticks.
- QMRS trained personnel leading and taking control.

Areas for improvement

- Decision making around self-escape vs fighting fire. For example:
    - Can CMW's who have evacuated wearing a SCSR fight a fire?
    - Where does the new SCSR come from?
    - Are they suitably trained and attired?
    - Evacuation notifications for site including notifications to surface personnel when site has emergencies.

Mains development

Assessors: Sally Wallis and Nikky LaBranche

The mains crew assembled at the crib room and were briefed on the requirements for the exercise. They proceeded to their work areas and were informed of smoke arriving at 8.08 am. The crew returned to the crib room, donned their SCSR and self-escaped to fresh air outbye of the fire. The team was very proficient at SCSR donning.

The deputy took the CABA from the first response unit and used it to communicate with his crew during the evacuation. There is no recharge facility underground nor do the CABA suits have a buddy mask to assist any CMW who is having difficulties with his SCSR.

During the evacuation the team came across a CMW in a Driftrunner. He was instructed to park the Driftrunner at the end on 907 MG and accompany the evacuation. (This is the vehicle that was later reported as crashed).

The team quickly and efficiently made it outbye the fire. Once outbye they removed their SCSRs and commenced the fire-fighting activities.

There was no evacuation alert received from the surface control room.

What worked well?

- The mains crew was very proficient in donning their self-rescuers and helped and checked each other.
- The EZR controller gave very clear directions and sought confirmation from crew that they knew what was happening.
- The escape was quick and orderly. The deputy took regular gas readings so they knew when they hit fresh air.
- Mains crew was very efficient in fighting the fire and realistically would have had fire out. The crew was told the fire kept going for the sake of the exercise. The crew gained experience on the hoses and Turbex.

Areas for improvement

- Crew stopped to fight the fire, but didn't ensure they had another self-rescuer on them after they had used theirs.
- There was no mine wide call to alert everyone to the incident.
- The second Turbex was not inspected before it was sent down and found to be unusable underground. There was a miscommunication about what was wrong with the second Turbex. The crew reported up that the gauze was missing, but the message was relayed that it didn't have the proper fittings. Would this have been a real incident and new parts needed to be sourced they may not have been looking for the right parts.

Figure 7 CMW evacuating using Blindmen's sticks

Fire-fighting response

Assessors: Chris Stebbeings, Sally Wallis Nikky LaBranche

At 8.10 am a mains development fitter was returning the hot seat vehicle back to the panel. He was informed at 53a c/t B to D belt underpass he could smell smoke. The fitter immediately parked the vehicle and made contact with control to warn them that he can smell smoke on the DAC at the 53ac/t D – E heading fuel pod. The CRO asked him to go and investigate the source of the smoke/smell outbye. A belt man operating an LHD on their way to install belt into 907MG belt (CV907) pulled up immediately behind the fitter's vehicle. The fitter warned the belt man that he could smell smoke and that the CRO had asked him to investigate.

At 8.17 am the fitter and belt man arrived at the CV007 drive head. When they got to the loop take up (LTU) located in C heading 49a – 50c/t they were informed they could see flames coming from the LTU and there was rubber and coal on fire. The CMW's immediately treated the fire with fire extinguishers, they were informed that the flame was too large for the extinguishers to have an effect. At 8.23 am the belt man contacted control on the CV007 belt starter phone located at 49ac/t DE heading by dialling the emergency extension 555 whilst the fitter started locating a fire depot to get fire hoses. Further personnel returning hot seat vehicles started to arrive and assist with fighting the fire.

The initial setup of fire lines was rushed and although the crew had the branch piece they did not install it in the line which they later had to retreat and isolate water to install for the jet nozzle. The hoses were not laid out neatly and although they had the water onto the fire quickly, there were trip hazards and would have been issues if the team had to move forward a distance to fight the fire. Hoses would have tangled.

At 8.37 am an ERZ controller arrived to with a man transporter. He was the 906MG outbye ERZ controller who had been sent to investigate a high CO alarm by the CRO. At 8.40 am personnel cleared the road of the man transporters as a LHD had arrived from outbye with a QDS fire station.

The Mains development crew arrived at 8.47 am. The ERZ controller was mine rescue trained and immediately made an impact on the structure and instruction on the fire-fighting effort. He organised a 2nd team fighting the fire from the B heading side of the LTU, activated the deluge system on the belt, isolated the belt and contacted control for permission to setup a Turbex foam generator. After getting confirmation from IMT that the Turbex could be used the Turbex was running at 9.25 am through a temporary stopping installed at between C and D headings in 49ac/t.

The fire-fighting effort was to a high standard and was aided significantly by the presence of a mines rescue trained person. From the moment he arrived at the scene he gave direction and confidence to the 19 personnel immediately, parallel tasking crews on hoses, rotating personnel, communication information, organising more fire equipment and the setup of the Turbex.

After the fire was considered 'under control' at 12.25 pm an assessor went to 47A c/t BC heading COB where the FAB was to be established and assessed the setup of FAB and the rescue of 3 missing VLI workers in the GTE mains between 51 and 61c/t B heading. At 12.37 pm IMT informed the Mains ERZ controller that 2x mines rescue team would be deployed in 20mins. The mines rescue teams did not arrive until 2.07pm and when they did they arrived with the FAB controller and lost a further 20 mins waiting for FAB to be established. This seemed slow and the team captains were frustrated to be waiting around.

Assessors travelled inbye with the QMRS team (Team 1) conducting the search of B heading to 61c/t. Team 2 was sent out at the same time to search a different area for the missing men. The teams travelled in 1st gear searching the c/t's to the stoppings as they proceeded inbye. At 50a c/t B heading the captains were informed that the doors at CV906 belt maintenance station were damaged between BC heading beyond repair and that there was approximately 600ppm of CO coming into B heading. At 15.13 the rescue team reached 59c/t B heading in the mains development panel and located the 3 missing VLI employees. Team 2 found the unconscious person outside the COB, brought him inside the COB and packaged the patient for transport. QMRS used a 'new' SCSRs on the unconscious CMW and did not use the Carevent apparatus.

What worked well?

- CRO gave quick direction for the first responder to investigate the source of the smoke smell.
- First responders quickly identified belt drive heads as likely source of fire.
- QDS fire station arrived to the fire site quickly within 25mins of the belt notifying the CRO there was a fire on the CV007 LTU.
- Mines rescue trained personnel made a considerable difference in the direction and confidence of the fire crews at the fire site.
- NLT system gave the rescue members a zone to search and locate the missing CMW's. Without it they possibly would have taken longer to give that search brief at locate missing miners.

Areas for improvement

- Competency based fire training or proficiency for all coal mine workers for the use of firefighting equipment to mine rescue team member level. This would assist personnel in firefighting and general familiarity of the equipment such as the Turbex, basic setup of fire hoses and hand signals. (1x Turbex and a mini Turbex were sent in during the exercise with missing parts. Personnel with basic knowledge would have known they were not fit to use and send in).
- Delays setting up FAB. Rescue could have sent FAB into setup, personnel were already around that area and underground. This lost about 20.mins.
- Further improvements and installation of NLT wi-fi network to increase phone reception and narrow down area for tracking personnel

Recommendations underground

Mine

- Issue evacuation communication alerts.
- Signage in COB clearly outlining change over procedure (ie gas testing before removing SCSR, contact Control, exiting procedure etc).
- Install gas monitoring in each COB as all personnel evacuating may not have a gas monitor with them.
- Evaluate each COB for differential pressures and possible flows when the access door is open.
- Ensuring contractors and staff have the same level of emergency training and in firefighting including all staff used in the IMT. (To avoid issues with the Turbex).
- Ensure non-verbal communication is standardised.
- Provide training in gas monitoring to contract supervisors and issue them with a gas monitor.
- Repair the travel road into MG907 where water had ruined the road made egress difficult and slowed the team.
- CABA systems are an obvious advancement providing the ability for communications and more proficient first response.
- Further improvements and installation of NLT Wifi network to increase phone reception and narrow down area for tracking personnel.

Industry

- Decision to be made ASAP on the funding of the emergency winder proposal prepared by QMRS.
- Review the design of COBs. Possibly not to be between intake and return to avoid possible air contamination inside the COB. (Useful reference material Trackemas JD et al April 2015).
- Use of cameras, phones, DACs, non-verbal communications, emergency management.
- Encourage more personnel to undertake QMRS training or QMRS to provide advanced emergency response training and firefighting including the use of low expansion foam and Turbex for general CMWs.
- Ongoing training SCSR donning and changeover processes.
- Light on one person in PJB while travelling to received PED messages.
- Install gas monitors in COB.
- Notification mechanisms for site for emergency evacuation. (PED or DAC).
- Review of fight or flight strategies.
- Make sure your contractors are trained in emergency procedures for your mine.
- QMRS and mine sites to conduct more rescue deployments and establishment of FAB’s underground. Feedback that MRAS was completed efficiently, yet rescue teams did not arrive at the selected FAB location for an hour after IMT said they were being deployed and when they arrived FAB had not been established even though personnel were underground still fighting the fire on CV007.

Surface assessments

Grasstree uses the MEMS system for emergency response. The recordkeeping and planning is all undertaken in EMQnet a digital based system that allowed the senior management personnel who were in Brisbane to remain in contact and receive up-to-date status information. The system is used routinely for mine site planning activities and had a major role in coordinating all the activities of the recent longwall recovery from 905 and the installation on 906 face line.

There is a dedicated incident management room a planning logistics and operations room. Figure 8 shows the location of the rooms and the control room. The QMRS muster room is several hundred metres away from this area (Figure 12).

All of the surface assessors and the underground assessors who witnessed the operation of the EMQnet system were very impressed by the operation and span of control it enabled as well as the ability for detailed record keeping. One assessor commented that this was the best run IMT he had seen in 19 exercises. Grasstree and Anglo coal are commended on their adoption of this system for emergency response and everyday mine planning. There is no doubt that the fact the system is being used for everyday planning activities that this contributed to the success of the system in managing the mines emergency response.

The system was also used to send remote briefings to the mining inspector and the ISHR. During the initial contact with the mines inspector it was identified that a response would be needed from an inspector of coal mines, not the duty officer. Some confusion was experienced as it was at first thought this was a level 2 exercise. Due to time constraints the inspector and the ISHR did not travel to site. The objective of testing the weekend call out was achieved.

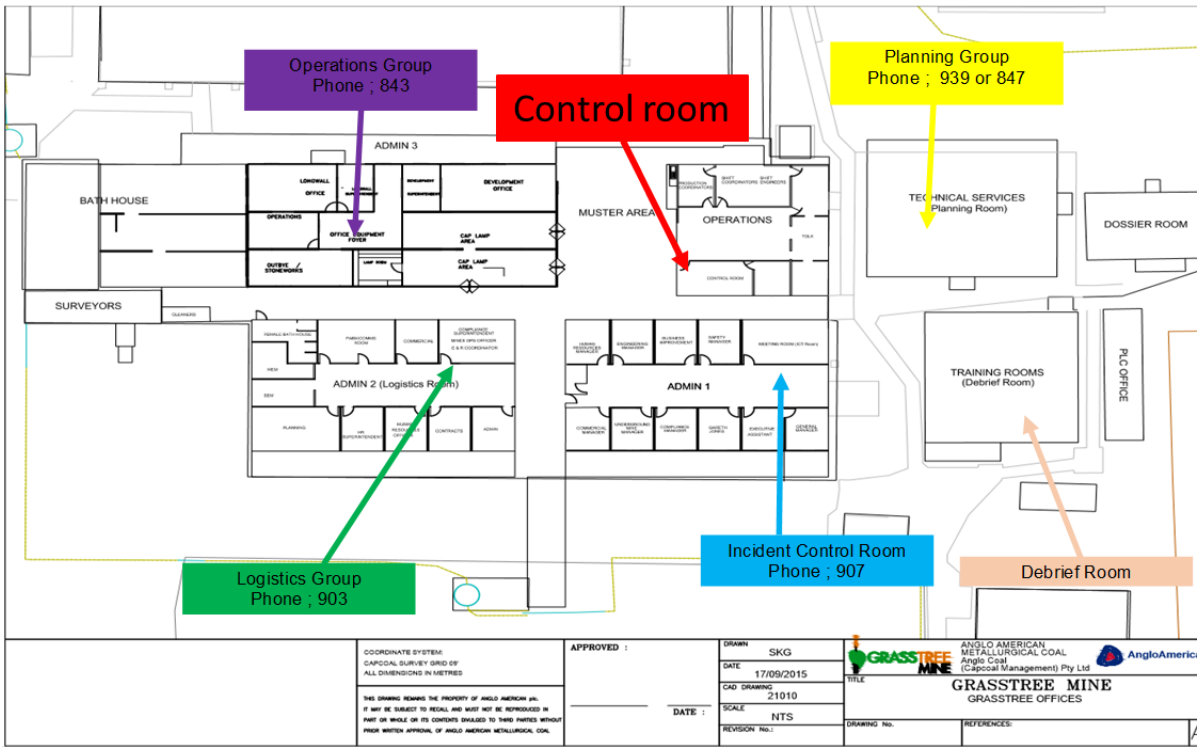

Figure 8 IMT Room Layout at Grasstree

Control room

Assessor: Larry Ryan, Inga Usher Sharon Jones

A duplicate of the Grasstree mine gas monitoring system was established in the control room. The CRO was briefed on the system and all time had to keep an eye on the real Grasstree monitoring system should any alarm occur which merited investigation. The advantage of this approach is password access and other functionality is very similar to the normal gas monitoring system at the mine.

The gas alarms in the area of the 907 LTU started to occur at 8.02 am. The alarms were acknowledged by the CRO and an ERZ controller sent to investigate. Once the situation was identified as a serious incident, the backup CRO was called in and a scribe requested.

The backup CRO was responsible for the gas monitoring and auxiliary duties while the CRO contacted the crews underground to evacuate. There was no general evacuation alert sent via the PED or over the DAC. The scribe used EMQ and together with the undermanager the team worked well to manage the emergency situation.

The NLT system was used to locate and track the progress of the CMWs out of the mine via their primary escape way. The underground cameras were also used to check the tag boards and confirm when the CMW had passed.

Non-verbal communication was used on numerous occasions due the high gas values.

Initially, the Control Room believed that there was only one missing CMW but quickly realised that there were multiple. When it became evident that multiple CMWs were missing, the NLT system and cameras were used to try and locate them. Unfortunately the NLT was providing false positives in that CMWs were seen to be ‘teleporting’ when in fact they were in a stationary location.

News of a CMW with ‘no signs of life’ was passed to the Control Room and attempts continued to find and reconcile the remaining missing CMWs.

The tag board/NLT reconciliation was carried out numerous times in an attempt to work out who was missing.

The Tube Bundle system was used to introduce gas samples to the GC which was run by the GC analysists.

What worked well?

- Controller worked well to manage the various communication inputs, priorities, told people to go away, whilst stepping back and reflecting on the situation.
- The CRO, backup CRO, Scribe and undermanager worked well as a team.
- CRO and scribe were mine rescue trained which led to a knowledgeable response to all the situations presented.
- Non-verbal communication was clear, quick and any misunderstandings were quickly resolved.
- The underground cameras were an asset and used to check tag board and location of CMWs.
- The NLT system was an asset and used to locate and track the progress of the evacuation.
- EMQ was an asset and the scribe was using it extensively to document and share the data across the site.

- There was no loud DACs in the control room.
- There was limited access to the control room (possibly due to being Sunday).

Figure 9: Multiple phone conversations and crowded operating conditions in control room

Areas for improvement

- There was no underground evacuation PED or DAC message sent out, however each group of CMWs were contacted on an individual basis.
- The tag board/NLT reconciliation was carried out numerous times in an attempt to work out who was missing.
- The NLT IDs were tied to the Cap Lamp Number, which are assigned to a mine worker, when caps lamps get shared from the same shift the numbers don't appear to be able to be reassigned, this caused some confusion as to who was underground, and paper logs had to be consulted.
- The CMW who didn't have a nose clip on while wearing his SCSR was assumed to be deceased by his colleagues.
- The mobile phones underground didn't appear to be working.
- The control room was noisy, multiple conversation, which destroyed the flow and considered process of managing the emergency situation. Figure 9
- The NLT system was teleporting CMWs when in fact they were stationary.
- Gate Security was notifying the Control Room every time that someone entered the mine site and when told to go to Logistics unfortunately the additional radio channel was not working hence, gate security were told to stay with the Control Room channel.

- The gas chromatograph (GC) was not calibrated even though this is standard procedure for it to be done every day.
- The duty card holders were wearing vests but most of the vests were not labelled.
- GC operators were in the Tube Hut and were removed from the flow of information, they were continually seeking information on their next course of action. There was no EMQ system in the TB room, this would have been useful for the GC operators. Their line of communication was through the Planning Team.
- Whilst the cameras on the tag boards were valuable, their quality was not quite up to the task (being able to rotate, zoom etc would be beneficial as well).
- One camera was not working on 907 tag board

Incident management team (IMT)

Assessors: David Cliff

What worked well?

- The IMT process assisted by EMQnet overall worked very well. This was the best IMT operation that has been observed in 19 Level 1 exercises.
- The web-based control system worked well, offsite communication of key information was possible in real time, including to Brisbane office, mines inspectors and ISHR.
- Use of conference call to Brisbane office linked to EMQnet to include in IMT meetings.
- Even though the event occurred on a Sunday, the web system allowed for full interaction of key staff who were offsite.
- IMT meetings were scheduled and regular and kept on task and quick, without loss of functionality.
- The IMT team were practised in using the EMQnet system as it was currently being used to manage the longwall issues.
- Underground video cameras were utilised to check the status on panel tag boards and video records were replayed at key locations in an attempt to locate missing persons.
- During the initiation of the incident site staff activated EMQnet without waiting for senior management to arrive onsite – minimising delays.
- Personnel on surface were updated regularly on the status of the incident.
- Ventilation was being modelled and potential ventilation changes to control the situation and allow rescue were evaluated.
- The NLT tracking system was effective in monitoring the location of most personnel, though there were some reception black spots.
- Site personnel had filled out all available components of MRAS prior to arrival of QMRS on site, minimising deployment time.

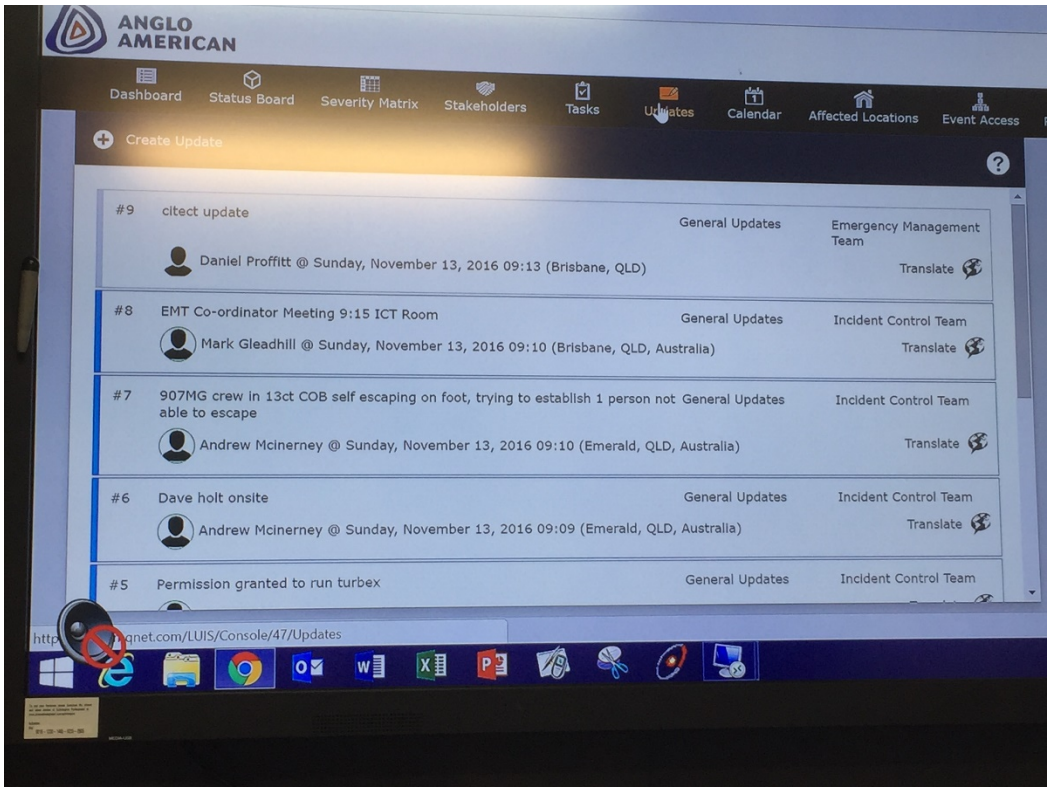

Figure 10 EMQnet Screen showing updates and screen capture of CITECT gas monitoring system

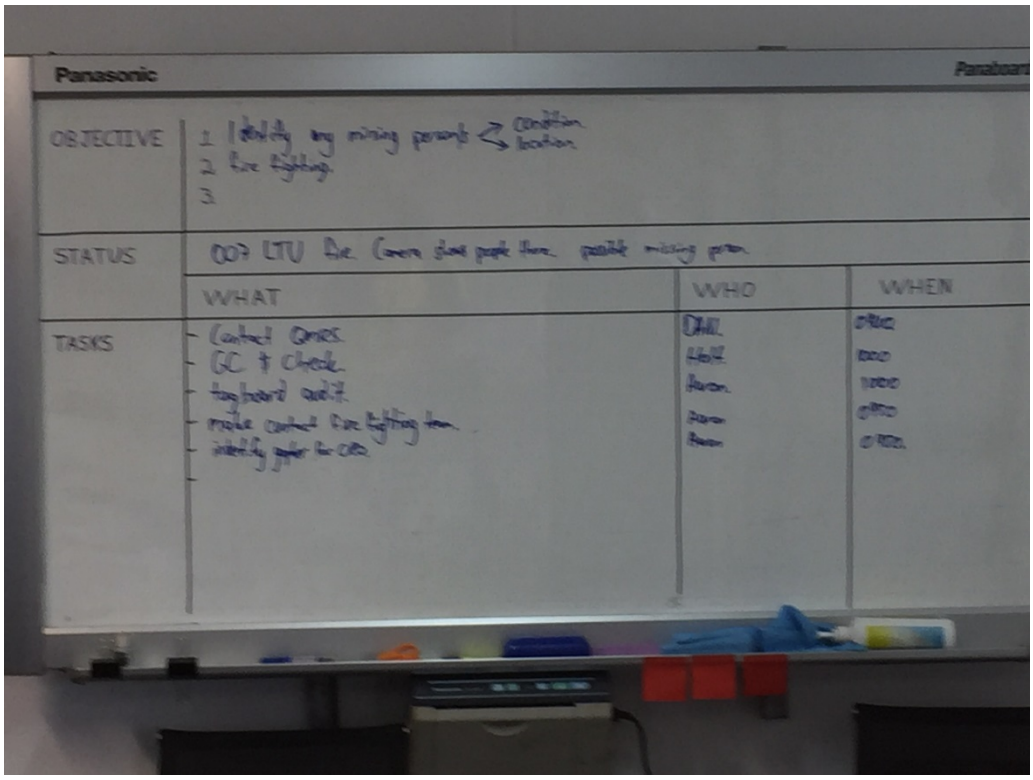

Figure 11 Whiteboard being used for setting objectives and assigning key tasks

Areas for improvement

- The initiation of the incident caused the control room to be full of people with multiple phone conversations occurring at once (Figure 9).
- A number video cameras were out of service including one key location (907 MG).
- More use could have been made of touch screens in the IMT to identify and track the situation as well as assist QMRS in rescue operations.
- Some inconsistencies between the tag board and the NLT system were found.
- If possible the EMQnet system should be tailored to suit the emergency situations likely to be found at the mine, this includes:
    - Quick filtering of update information
    - Quick identification of personnel emails
    - Better print functionality
    - EMQnet should run in correct time zone (not daylight saving time).
    - Consider dedicated screens that track personnel status underground (missing persons etc) and gas status
    - Integration with MRAS
- There are black spots for the NLT communication system and tracking system in the mine that could be removed.
- It would be advantageous to educate key external agencies in the operation of EMQnet so that when an incident occurs they are prepared and know what to expect and what can be accessed remotely. This may affect the way that they choose to respond.
- It was not evident that key IMT accessed their duty cards. They did appear to discharge their key responsibilities in any case.
- Under conditions of minimal manning especially of professional staff, consideration should be given to automatically calling out QMRS and other key personnel for support rather than waiting for the arrival of senior staff to make the decisions.
- The use of EMQnet obviates the need to use a number of the forms listed in the draft emergency response manual and this alternative should be clearly outlined in the manual. The white board was used in lieu of any formal incident action plan. (Figure 11)
- The draft Emergency Response Management Plan should be reviewed for typographical and logic errors (reference to competencies in section 8 refers to section 7 but should be section 5). Training requirements should be linked to roles in Incident management.
- Site should have ready capacity to assess explosibility of atmospheres and compare to QMRS re-entry guidelines.

Logistics

Assessor: David Carey

Logistics team formed at 8.50 am with three personnel initially available. As senior people arrived at site roles relieved and handed over. Team sourced required firefighting implements and supplies, ensured surface infrastructure remained functional, arranged food as required, ensured security resources were allocated to all site access points and that medical and support resources were available as required. Team coordinator attended all IMT meetings. Team utilised EMQ communications to update and remain aware of required actions.

What worked well?

- EMQ software system kept all functional groups informed and allowed actions to be updated and status shared in real time. Ability to update individual and groups offsite in real time reduced distractions to site based IMT members.
- Team members remained calm and actioned all requests as quickly as could be done
- Recognition of limitation of real time sensors to 50ppm for CO.
- IMT functioned well. All communications conducted well with each person given time to speak and all remained calm over duration of event. Clear leadership provided to team and team brought back to task whenever an issue started to create a distraction.
- Mine monitoring systems, both visual camera based and tracking technology provided good status update information from underground
- Technology deployed in IMT room allowed a high level of information sharing and ideas discussion to occur in relatively short timeframes.
- Site security managed well and welfare of people deployed to site security given a very high priority by logistics team.

Areas for improvement

- Team functionality suffered when positions changed and no one in the team had mines rescue / firefighting knowledge as to what was actually being requested for provision to support underground activities
- A number of Logistics activities were being conducted outside of the logistics team by other functional areas and individuals acting outside of functional teams. This created some confusion and double up of requests or actions during the process of the event
- Absence of scheduled calibration of mine chromatograph prevented detailed gas analysis at site. Adequate information was available from tube bundle systems on this occasion but could have been significant
- Acceptance that apparent ‘real’ position information from tracking technology needs to be questioned rather than accepted if it doesn’t make sense
- Information sharing technology needs to be able to sort actions by functional areas and status (complete or open) so as to assist event progress.
- Information provided from underground was not always entered into communication system exactly as delivered from underground. Also need to resist interpreting information and making assumptions as to meaning of information until confirmed e.g. missing ERZ Controller was first reported as ‘showing no signs of life’ to IMT, not as deceased.

Operations

Assessor: Stephen Woods

The operations team was made up of four personnel with a number of runners between debrief and control and a number of persons assigned to the tag board and top of shaft security and site security. The operations team was established early in the exercise and personnel placed on the security of the tag board. Turbex machines as back up and fire aid foam was sourced early in the exercise. Communications lines set up early and scribe updated regularly EMQ system.

What worked well?

- EMQ appears to work well for communications with outside agencies and keeps all parties involved informed of the updates. This prevents unnecessary phone calls to ICT or control which can cause distractions.
- Early source of equipment for first responders and phones for rescue teams, information from debriefs was invaluable.
- Face to face communications between QMRS and operations appeared to work well with questions asked and answered at the time of communications

Areas for improvement

- Tag board consolidation took some time to sort out which caused some delays in identifying how many persons were underground at the time of the exercise.
- Turbex units in unserviceable conditions on surface of the mine.
- Some mistakes made entering data into EMQ e.g. MR team numbers, people not marked in boxes as receiving the information requires a check box to be ticked

Planning

Assessor: Ron McKenna

The planning team consisted of the site personnel along with additional planning provided by the ventilation officer (VO) who was in Brisbane. Some issues were identified in the contacting of Simtars, as the callout service did not send the page through properly. This was done by the VO who did not realise that it was a paging service. After the initial failure the VO contacted the paging number again and Simtars responded by providing remote advice and mobilising two gas chromatographs and the mobile laboratory.

What worked well?

- The initial site response and establishing the planning group.
- Offsite communications to the VO in Brisbane and the use of EMQnet.
- MRAS documentation pre-filled out.
- Ventilation changes were suggested but rejected by the site base personnel.
- The fact that CMWs were fighting the fire enabled ongoing support/planning to be done.
- Simtars remote support once notified.

Areas for improvement

Regular calibration of the site gas chromatograph is required.

Call out of Simtars, issues with how the message bank operated.

Mines Rescue Response

Assessor: John Hart and Brian Kelly

The QMRS recue room is situated outside of the immediate Grasstree office area and all attending officers were sent to this location. (Figure 12). Once it was decided to deploy QMRS underground they had to be transported by bus with their equipment to the mine where the team captains were briefed on the tasks allocated on deployment. The briefing took place in a room at the back of the development office (Figure 8).

There was very little communication between the rescue teams and the operations managers due to the distances involved. Once rescue team member arrived they commenced the preparation of suits to facilitate a trouble free deployment.

Some comments were made by mine site personnel and assessors on the deployment time for QMRS. Grasstree staff had pre-prepared the MRAS forms for mine re-entry. Once the decision had been made to deploy mines rescue the following had to be completed:

- The MRAS forms had to be completed.
- A signed off deployment sheet was required with allocated tasks.
- QMRS teams had to be transported from the muster area.
- The team captains had to be briefed.
- The captains had to brief their teams and the teams had to deploy underground.
- The FAB had to be established before teams could go live under oxygen.

All of these activities take time to complete. A rescue team cannot be deployed without the due process being followed.

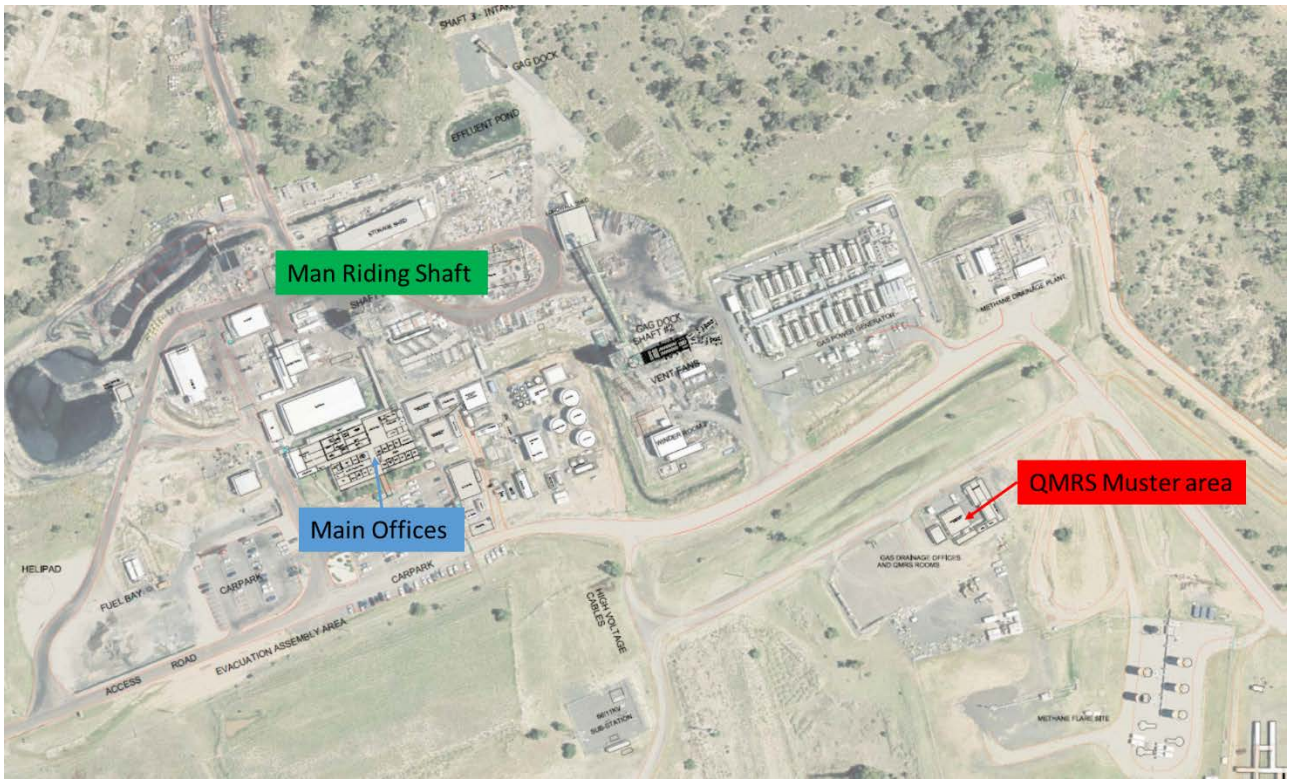

Figure 12 Plan Showing Location of QMRS Muster Area

What worked well?

- Operations manager was very methodical in the way he managed the process of deployment of the mines rescue teams.
- Used MRAS to get a full understanding of the UG conditions and circumstances.
- Maintained QMRS protocols in regard to Task Management and Permit to Enter
- Good communication with ICT and operations
- Updated QMRS offsite management regularly.
- Change-over of operations managers carried out once the teams had been deployed UG and exercise well under control.
- Brigade preparation of gear
- Brigade teamwork
- Captain control

Areas for improvement

- Difficult for outside personnel to determine who is who in the incident control team due to the tabards being used
- Clarify rescue personnel response capability when they have just escaped from a mine using SCSR. Ie can they still be used as part of QMRS response?
- Briefing of captains was conducted in a small room.
- Location of briefing, should team go to persons making brief or briefers go to teams?

- Some time wasted getting teams and gear to shaft then delayed setting gear up again and waiting shaft at to go.

Recommendations surface

Mine

- If possible the EMQnet system should be tailored to suit the emergency situations likely to be found at the mine, this includes:
    - Quick filtering of update information
    - Quick identification of personnel emails
    - Better print functionality
    - EMQnet should run in correct time zone (not daylight saving time).
    - Consider dedicated screens that track personnel status underground (missing persons etc) and gas status
    - Integration with MRAS
    - EMQ software having a running summary of the event and response
- Shift changeover information handover would be easier
- WIFI underground for connection to EMQ and mobile communication
- Review the appropriateness of the duty cards.
- Consider appropriate competencies for Logistics Coordinator and team members in the allocation of these roles. Role is more than just expenditure of financial resources. Absence of mine operational and mine emergency response knowledge created delays and confusion at times and whilst resolved could have been be avoided.
- Standardise site tabards with Australian Standards
- Site contact details to be in rescue shed and possibly relevant information from EMQnet
- Review the location of QMRs shed. If this cannot be re-located consider a muster area for QMRS closer to the shaft where they can wait with their equipment before briefing and deployment.

Industry

- Explore wider application of EMQnet or similar programs for emergency management.
- The provision of and to be included in the EMQ program data assisted outside agencies:
    - QMRS to keep abreast of the situation in real time.
    - QMRS to explore potential integration of EMQnet with MRAS
    - The addition of ISHR and Inspectorate and Simtars in this program as outside agencies that may need briefing and to keep abreast of information whilst travelling to site.

    - May be useful in circumstances where police ambulance and fire brigade are required to attend the mine
- WIFI U/G for connection to EMQ and mobile communication
- Introduction of a standard for non-verbal communication.
- CRO competencies to be identified.
- Cameras on all tag boards underground.
- Whiteboard underground next to tag board so CMW can leave messages etc.
- Mines rescue to review training so that a person exposed to extended high carbon monoxide levels is provided with appropriate oxygen therapy as early as possible
- Review the locations and standards in Rescue Rooms.
- Test the callouts for Simtars and Inspectorate when the emergency number is being used.
- Simtars to check the question list used by the message bank.

Conclusions

These conclusions have been made following the review of the exercise response by the 19 assessors. They are based on the assessor's observations of the exercise response at Grasstree.

The overall consensus was the site management of the exercise using the EMQnet software was a success. The system was very useful and site staff demonstrated proficiency in its use.

The underground CMWs showed that they had benefitted from additional training in the donning and changeover of SCSRs.

An exercise participant was able to get 2hrs 25 mins out of his self-rescuer, which included 25 mins of walking and 2 hrs of rest. This man has experience as a diver, but had never worn a live CSE before. When resting he held the CSE away from his body in his fingers and commented later that this decreased the inhalation temperature noticeably.

There were some issues noted with the out of service SCSRs namely that one of them was damaged; and several goggles had deteriorated.

CMWs who were current or ex QMRS brigade's men again showed leadership at critical parts of the response. The advantage of having QMRS trained personnel cannot be over stated.

There were some issues identified in contacting Simtars and the Mines Inspectorate.

No general evacuation message was sent to underground personnel, whilst the surface alarm was sounded.

The QMRS subs station is remote from mine site activities and has limited communications available.

Some staff thought that the QMRS deployment was slow, however they are not fully familiar with QMRS deployment protocols.

Some CMWs assumed that the air in a COB would be clear. The COBs are well designed but are situated between an intake roadway and a homotropal conveyor belt road and thus have a pressure deferential across them. (It was a recommendation from the 2007 Level 1 exercise that grasstree install COBs to assist in SCSR evacuations).

The firefighting response was well organised and coordinated once the QMRS trained ERZ Controller arrived.

A fatality was reported to the ISHR and Inspector before this had been confirmed.

Recommendations

These recommendations have been made with the aim of providing continual improvement in the mines and States emergency response capability. Information is provided at Appendix C on issues to consider when running Level 1 type exercises.

The recommendations have not been ranked in any order of priority. All mine sites and other agencies should review the recommendations and should utilise them in the gap analysis of their emergency response systems as well as audit tool prompts.

Mine

- Issue evacuation communication alerts.
- Signage in COB clearly outlining change over procedure (ie gas testing before removing SCSR, contact Control, exiting procedure etc).
- Install gas monitoring in each COB as all personnel evacuating may not have a gas monitor with them.
- Evaluate each COB for differential pressures and possible flows when the access door is open.
- Ensuring contractors and staff have the same level of emergency training and in firefighting including all staff used in the IMT. (To avoid issues with the Turbex).
- Ensure non-verbal communication is standardised.
- Provide training in gas monitoring to contract supervisors and issue them with a gas monitor.
- Repair the travel road into MG907 where water had ruined the road made egress difficult and slowed the team
- CABA systems are an obvious advancement providing the ability for communications and more proficient first response.
- Further improvements and installation of NLT Wifi network to increase phone reception and narrow down area for tracking personnel.
- Possible review of the EMQnet system to be tailored to suit the emergency situations likely to be found at the mine, this includes:
    - Quick filtering of update information
    - Quick identification of personnel emails
    - Better print functionality
    - EMQnet should run in correct time zone (not daylight saving time).
    - Consider dedicated screens that track personnel status underground (missing persons etc) and gas status
    - Integration with MRAS
    - EMQ software having a running summary of the event and response
    - Shift changeover information handover would be easier
    - Wi-fi underground for connection to EMQ and mobile communication
- Review the appropriateness of the duty cards.
- Consider appropriate competencies for Logistics Coordinator and team members in the allocation of these roles. Role is more than just expenditure of financial

resources. Absence of mine operational and mine emergency response knowledge created delays and confusion at times and whilst resolved could have been be avoided.

- Standardise site tabards with Australian Standards
- Site contact details to be in rescue shed and possibly relevant information from EMQnet
- Review the location of QMRs shed. If this cannot be re-located consider a muster area for QMRS closer to the shaft where they can wait with their equipment before deployment.

Industry

- Decision to be made ASAP on the funding of the emergency winder proposal prepared by QMRS.
- Review the design of COBs. Possibly not to be between intake and return to avoid possible air contamination inside the COB. (Useful reference material Trackemas JD et al April 2015)
- Use of cameras, phones, DACs, no speak communications, emergency management.
- Encourage more personnel to undertake QMRS training or QMRS to provide advanced emergency response training and firefighting including the use of low expansion foam and Turbex for general CMWs.
- Ongoing training SCSR donning and changeover processes.
- Light on one person in PJB while travelling to received PED messages
- Install monitors in COB
- Notification mechanisms for site for emergency evacuation. (PED or DAC or?)
- Review of fight or flight strategies
- Keep practicing SCSR donning and changeovers.
- Make sure your contractors are trained in emergency procedures for your mine.
- QMRS and mine sites to conduct more rescue deployments and establishment of FAB's underground. Feedback that MRAS was completed efficiently, yet rescue teams did not arrive at the selected FAB location for an hour after IMT said they were being deployed and when they arrived FAB had not been established even though personnel were underground still fighting the fire on CV007.
- Explore wider application of EMQnet or similar programs for emergency management.
- The provision of and to be included in the EMQ program data assisted outside agencies:
- QMRS to keep abreast of the situation in real time.
- QMRS to explore potential integration of EMQnet with MRAS
- The addition of ISHR and Inspectorate and Simtars in this program as outside agencies that may need briefing and to keep abreast of information whilst travelling to site.

- May be useful in circumstances where police ambulance and fire brigade are required to attend the mine
- WIFI underground for connection to EMQ and mobile communication
- Introduction of a standard for non-verbal communication.
- CRO competencies to be identified.
- Cameras on all tag boards underground.
- “Whiteboard” underground next to tag board so CMW can leave messages etc.
- Mines rescue to review training so that a person exposed to extended high carbon monoxide levels is provided with appropriate oxygen therapy as early as possible
- Review the locations and standards in Rescue Rooms.
- Test the callouts for Simtars and Inspectorate when the emergency number is being used.
- Simtars to check the question list used by the message bank.

Appendix A: Exercise timeline

Table 1: Summary of timeline for the exercise

Location	Surface Observation	Time	Underground Observation	Location
		8:00	Fire starts CV007 LTU	L/W crib
Control	CO alarm - CRO call to outbye ERZC to contact control, 25ppm CO at 906 Dogleg	8:04		
		8:05	smoke at LTU 907	907 LTU
		8:05	Message over DAC - high CO 906 dogleg. Personnel sent to inspect	L/W crib
Control	High CO alarm E hdg return station 12, roadheader crew reporting smelling smoke	8:08	Mains Crew informed that they smell smoke. They called CRO to inform them of the conditions and that they were heading back to the crib room.	Mains Roadheader
		8:13	Undermine contractors informed of smoke in roadway	16 CT LW
			Crew smell smoke / - ERZC instructed crew to don rescuers	MG907 Face
			200ppm CO. The group donned their self-rescuers. ERZC donned CABA 1 SCSR failed during donning process	Mains crib room
control room	Non- verbal communication from 907 panel	8:15	CRO told crew to go via primary escapeway - escape via vehicle if possible	MG907 Face - B heading
		8:17	Personnel arrived at CV007 drivehead and got out to inspect it and seen that the LTU was on fire	49a - 50c/t C hdg
control room	CRO informed DL 907 leaving panel via vehicle	8:18	Deputy called CRO with CABA	907 MG
		8:20	LW Observer escalated "You can smell smoke", CO levels going up.	L/W crib
Control	Call to control, small fire on Loop Take up of 007 belt, attempting to extinguish, 2 men fighting	8:22	Crew had piled into drifty and rearranged the excess people to the best possible fit. They were prepared to drive out with an overloaded drifty. Assessors interjected and made the crew continue the escape on foot.	907 MG

Location	Surface Observation	Time	Underground Observation	Location
		8:24	LW crew SCSR donned successfully	L/W crib
Control	Surface alarm sounded, phone call out of available management personnel initiated by text call out system	8:25	907 LTU team in COB at 47 A	47A COB
Muster area	MSO distributing duty cards to available people; Surface Marshall and Muster Area Control allocated	8:27	ERZC uses white board to inform crew 'ready to go'.	L/W crib
		8:29	Crew observed signage / wind chimes and entered 907 Crib Room	907 Crib room
		8:30	ERZC organised crew. Used a white board to communicate	907 Crib room
			3x CMW began rolling out hoses to fight fire from hydrant and fire depot	fire site
			Crew head out. ERZC advises crew by whiteboard COB at 17CT not 25CT	LW Team
Muster area	CMW's sent to the surface tag board Duty cards from logistics handed out	8:31	DAC to CRO - no answer - ERZC to the emergency pod to grab a CABA suit.	907
Muster area Bernie Lambly - sent CMW's to the surface tag board	Surface presentation to CMW's - smoke and fire underground fire-fighting taking place at 49 cut through and 1 man is missing	8:33	All crew completed a changeover to rescuer. Two men (ERZC and QMRS trained personnel) were wearing CABA.	907
		8:35	CRO provided all details of fire to ERZC. ERZC then relayed all the information that was delivered by the CRO with included location of the fire, egress route.	907
		8:35	27c/t Crew in single file, using walking sticks well	LW Team
		8:38	Crew stopped by assessor and fitted with smoke goggles	LW 26 CT
		8:39	Stopped @ ERZC Inspection board - ERZC wrote "10 men left panel on foot + time" ERZC noting all details in his book.	907 B heading 16ct
Logistics room	Seccurity departed for front gate	8:40	A LHD operator arrived with QDS fire station and dropped at 49ac/t C - D hdg	49ac/t C - D hdg

Location	Surface Observation	Time	Underground Observation	Location
		8:42	Mains crew reached fresh air at 49 c/t and took off their self-rescuers.	49A c/t D
		8:44	Undamine contractors enter 47A COB	47A COB
		8:44	Found loader @ 15CT B hdg said would put as many men on the loader and drive out on the loader instead of walk (Assessor said not to use loader for exercise as against mine transport rules)	907 B heading 15ct
Tag Board	CMW checking tags against sheets	8:45	LW Crew walking 2 abreast. Road in excellent condition	23A c/t
		8:46	Mains crew arrive at the CV007 drive head. Deputy took over and coordinated fire effort.	CV007 LTU (Fire site)
Breezeway	Operations Co-ordinater given out Logistics team initial meeting;	8:50	COB has wind chimes and green flashing light as well and normal signage. ERZC contacted CRO and provided the update from the crew (said that he would be going onto SCSR from now on).	907 B heading 13ct
UM office	Listings don't line up with tags on surface boards	8:53	LW Crew pass 19 CT	LW 19 CT
		8:57	Crew into 17 CT COB Wind chime couldn't be heard due to air pump	LW 17 CT
Ops Room	Focus on missing underground CMWs unsure of mines rescue status	9:00	ERZC checks CO in COB using gas detector. rehydrate and change SCSR	17 CT COB
		9:02	907 LTU crew leave COB to evacuate to surface	47A COB
		9:02	Crew all obtained candy canes and left 13ct COB **note assessor checked COB integrity - the COB was breathing out (not in) **	907 B 13c/t COB
		9:05	Communication to the crew - fire at 49c/t, continue self-escape thru primary escapeway.	LW 17A c/t COB
Top of shaft	caution tape to guide all CMW's to tag board and will collect relevant information regarding debrief situation - if they have pertinent information	9:07		
		9:09	VCD construction at 49C-D in prep for turbex.	Fire Site

Location	Surface Observation	Time	Underground Observation	Location
ICT Room	Production manager on site and assumed IC role; first IMT meeting; Fire at 47CT 007 LTU; CO recognised as off scale on real time monitors; 1st Objective set as to confirm missing people, 2nd Objective set as to put out the fire; EMQ set up and running; tasks allocated and next meeting set at 9:50	9:11	LW crew preparing to leave COB. Crew member left L/W evacuation note on map.	17A c/t COB
		9:13	Contacted CRO from DAC using non-verbal communication. CRO quickly established that it was 907 Dev crew and assisted with providing information and told to continue with the plan along primary escapeway.	907 B heading 10ct
		9:14	The fire crews were told to pull back in preparation for the startup of the turbex.	Fire Site
ICT room	Update given to ICT members. Tasks updated. Fire U/G, CO spreading, 45C/t C heading offscale CO, missing person, camera at 907 underground tag board is u/s, need to identify any missing personnel, fire-fighting to continue, L/W crew on way to fight fire, 3 rescue personnel on surface, Next meeting at 09.50	9:15		
		9:21	Stopped at tell-tale board wrote "10 men on foot direction arrow and time"	907 B heading 7 - 9ct
Muster point	907 LTU crew on the surface	9:25	Mains ERZC called CRO and requested more Fire Aid foam and to keep it coming	49ac/t D - E hdg
		9:26	906MG outbye ERZC conducted head count of all personnel and rung through to control to inform them of all personnel who were at the fire site	49ac/t D - E hdg
ICT	QMRS notified	9:28		
debrief	Interview with CMW from U/g undertaken by BL smoke visible at 51 C/T	9:29		
QMRS	Alerts call sent to QMRS management group and initial call out of team members	9:30		

Location	Surface Observation	Time	Underground Observation	Location
		9:35	LW Crew arrives at 7Ac/t COB. Deputy gas tested before crew took off SCSR	7A c/t COB
Logistics Room	HR manager, informed Logistics team she had contact Corporate Affairs	9:36	ERZC spoke with IC. They will send drinking water for men. Keep men there and rotate through jobs. More foam on way.	fire site
		9:37	Arrive at 3/ct COB & changed over safely.	907 B 3c/t
		9:38	Assessor applies smoke tube. Maybe slight ingress of gas in. ERZ checks Gas detector. Assessor advises fresh air. Persons remove goggles and rescuers	LW 7 c/t COB
Ops Room	Made phone call to fire site asked about air and water supply, information about missing persons, any obstructions in roadways, PGD status, Is development ERZC on own or is there other deputies with him at the site and transport locations.	9:40	Crew briefed on some of the facts about the foam. The foam displaces oxygen. Curtain is put up to contain the foam to the area needed to fill the entry and to keep people with respiratory protection out.	Fire Site
Logistics Room	Commercial Manager arrived on site and assumes Logistic Coordinator			
Ops Room	Debrief informs to operations and reported smoke inbye of 51 c/t	9:41		
Ops Room	ISHR notified of incident by SSE SSHR on shift. VO and SSE in Brisbane organising charter flight	9:47	Deputy communicated that Control indicated that they should get to fresh air on this leg and may find 2 people on way out. Fresh air in D.	LW 7A c/t COB
		9:49	Crew left the COB at 3ct	907 B 3c/t
		9:49	LW crew. Deciding whether to take extra rescuer. Proposed to take an extra rescuer to get outbye of fire site. Issues with opening SCSR and damaging one SCSR	7A c/t COB
ICT room	ERZ Controller missing - Last seen 906 tag board node 2 x VLI also unaccounted for QRMS notified and on route. Used Turbex on fire. SSE and VO join vie telephone conf	9:50		
		9:56	Reached tag board 907 - did a personnel count. ERZC took tags off board and handed to each person.	907 A tag board

Location	Surface Observation	Time	Underground Observation	Location
		9:58	ERZC Contacted CRO - confirmed that they were at the tag board. Confirmed that "CMW" tag was only tag left on the tag board. Plan was to go to D heading (instead of remain in B heading) because D heading was fresh air. This was confirmed twice and understood by ERZC.	907 A tag board
		10:00	ERZC and crew can across drift runner GMT007 at Mains intersection. ERZC assessed this but because he knew that fresh air was just at 53a did not think it was worth while using it.	B heading Mains 907 turn off.
		10:05	Ran out of high expansion foam at the fire site.	49ac/t C - D hdg
Logistics Room	Call from gate security, first Oaky Creek rescue people arrived at gate	10:08	At underpass 53a c/t - Assessor told ERZC that smoke had reduced significantly - gas levels reduced.	Underpass at 53a c/t Mains
		10:13	D heading 53a - Gas checked - told fresh air - ERZC told crew to don rescuers but plug them and keep them on their person. ERZC then used phone to call CRO at D 53a	907 Crew D 53a c/t
		10:13	Non-verbal communication with Control was not effective. Control asked 4 times whether the board had been cleared (confirmed Deputy was using correct non-verbal signals)	LW tag board
		10:15	907 Crew arrived at fire site - vehicles were ready for them to be brought to pit bottom.	50ct D heading Mains
Muster area	2 CMW's going back underground to take more fire aid down	10:15	LW Crew leave tag board.	Tag Board
		10:20	907 crew passed the fire site and kept escaping outbye. They did as the mains deputy if the situation was under control and he confirmed that it was.	Fire Site
		10:24	Second drifty left with 907 crew towards pit bottom.	50ct D heading mains

Location	Surface Observation	Time	Underground Observation	Location
ICT Room	ICT update - setting up another Turbex - 1 VLI CMW inbye - sourcing more high expansion foam - 906 underground tag boards are clear - 2 MR guys onsite -ERZC is missing. CMW at 3C/T 907 no signs of life reported appears to be missing ERZC.3 x VLD people missing	10:30		
		10:59	LW ERZC calls control to advise all crew at pit bottom	pit bottom
Ops Room	Task logistics with extra fire aid from Oaky and Turbex	11:00	IMT:- let the teams know there was more foam at pit bottom. Personnel were bringing that to the fire site along with more help and bottled water	49a c/t D - E hdg
		11:02	LW Reach surface, gates at bathroom entrance and tag board	
Logistics Room	QMRS ops manager arrived on site	11:04		
Logistics Room	Call from front gate, 2 x rescue team members arrived on site	11:05		
ICT	Update from ICT updates QMRS ops manager Fire location & description of area, locating on camera (found not to be working) 9 mines rescue people on site at sub station, CABA and SR in use by UG personnel	11:06		
Ops Room	Debrief forms state that drift runner 007 appears crashed at 57	11:07		
Logistics Room	QMRS emergency response trailer arrived at front gate with QMRS equipment technician		CRO to Deputy, Turbex enroute. More foam is currently being sources from Oaky North and Grasstree west.	Fire Site
Medical building	Long wall group came to be assessed. All checked. One person slightly distressed by wearing SCSRs received treatment.	11:10		
ICT Room	3 CMW's missing - 8x MR personnel onsite- media liaison is HR manager - Simtars can be onsite in 3.5 hours -Mines Inspector notified loss of life Set up MRAS Search Fire fighting team - Next meeting at 12.15. Mines inspector can be on site in 3.5 hrs	11:15	GMT015 and GMT013 arrived with 12 drums of foam solution and another Turbex.	49c/t D hdg

Location	Surface Observation	Time	Underground Observation	Location
		11:20	It was determined that the Turbex that was sent down couldn't be used. It was one that had been modified for a dust suppression purpose on the LW.	Fire Site
Planning	QMRS ops manager and Planning controller Is there anything happening UG that would affect the mines rescue team being deployed. Plan provided with all details of the fire location and missing people. Requested gas data so can be put through the mines rescue gas matrix. Gas samples taken from tubes 5 & 6 at 4 Shaft, east and west sides. Note: limited people on site who can run the data	11:22		
Ops Room	2nd Turbex U/S no fittings reported to operations fire team	11:30	Outbye ERZC arrived in GMT019 and delivered a mini Turbex. (Mini Turbex is also no good, another device used for dust suppression on LW not fire-fighting. It also had no fitting)	49c/t D hdg
Planning	Planning group start to prepare MRAS information	11:35		
		11:45	ICT called UG for update. Advised Mines Rescue onsite. OB ERZC has gone to B 50 to investigate missing men.	fire site
		11:46	Crew member told deputy that he had heard that there were 3 contractors unaccounted for.	Fire Site
Planning	Ops manager updated: Identified phone number in fire area and Generated a report from MRAS for each of the teams	11:51		
Planning	Discussed possibility of reducing ventilation but agreed that this would change the gas data being used to determine explosibility. Discussed the best place to set up a FAB	12:00	Mains ERZC rang IMT to inform them that fire is getting controlled, the Turbex is still running and there was a crew in C hdg fighting the fire also.	49ac/t D - E hdg

Location	Surface Observation	Time	Underground Observation	Location
		12:11	CRO to Deputy, more drums on the way. Drifty locations were checked. Our crew had 13 and 17. Deputy clarified the drifty was parked up and not crashed. The oxygen levels are coming up and the real-time is still at 50 ppm.	Fire Site
ICT	Tag board 33 persons in mine 28 real as 5 persons escaped from GTW. MR ready to go after task sheets and explosibility Ops Manager specifically discussed deployment, the explosibility matrix & FAB location 2 teams ready to go & 3rd team near ready discussed update of MRAS Reviewed mine plan for location of FAB	12:15		
		12:24	ERZC rung ICT. Deputy reported fire smouldering and under control.	Fire Site
ICT	Decision made to deploy teams Ops manager to develop task sheet and re-entry Permit to allow teams to go UG search plan to be developed	12:28		
		12:37	IMT rang and informed that two mines rescue teams were being deployed in 20mins and FAB was going to be the 47ac/t B - C hdg COB	49ac/t D - E hdg
ICT	Update Fire teams being sent out of mine review of objectives	12:45		
		12:50	ICT to Deputy. Mines rescue still upstairs, have someone go check gas at 48 and see what levels they actually have.	Fire Site
Planning	Task sheet and permit to enter completed	13:03		
		13:09	Machine doors badly damaged 110ppm CO	50A B-C

Location	Surface Observation	Time	Underground Observation	Location
Text Message	Text Message from ISHR 13:00 hours - 3 QRMS teams ready to deploy. FAB to be set up at 47 C/T. Fire largely under control. Teams to search for 3 missing and check condition of presumed dead deputy. UMM Uhr on site approx. 12.30 gas not trending to explosive range approx.. 15% of LEL.	13:14	CRO called with a message from IMT that the ERZC and CMW are not to go inbye and search for the personnel in B hdg	49ac/t D - E hdg
ICT Room	IMT meeting, still to deploy mines rescue	13:17		
ICT	QMRS permit signed by ICT Confirmed search pattern	13:18		
Ops	Rescue teams briefed by operations	13:32		
Ops Room	2 rescue teams in cage	13:50	Call to mains deputy: 2 mines rescue teams in cage now. Meet them at 47A COB By Hdg. Another call followed shortly after that the heat gun was on it's way.	Fire Site
		14:07	GMT015, GMT019 and GMT012 man transporters arrived at 47ac/t B - C hdg COB with mines rescue teams and FAB controllers ~Captains had a handover with Mains ERZC controller	47ac/t B hdg
		14:20	~FAB controller reported issues with mobiles to IMT ~Captain was frustrated with the amount of time taken to setup FAB. Why couldn't FAB have been setup prior to teams arriving? This would have reduced time to get Team 1 away by approximately 20mins	47ac/t B - C hdg
Ops Room	Phone call 851 FAB 843 Confusion communications through control room	14:24	Rescue team "Team 1" in vehicle waiting. Captain speaking to FAB controller ~FAB controller moved FAB into COB due to communication issues.	47ac/t B hdg
		14:27	Team 1 declared leaving time to be 14:25 as their departure time and planned to return by 16:25.	47ac/t B hdg

Location	Surface Observation	Time	Underground Observation	Location
		14:35	Call to IMT to indicate FAB still having communications issues. Asked and there was no update on nodes where the three missing miners were last seen. Team two is setting up radio communications.	47A COB
		14:41	Captains checked completed. Captain phoned FAB to advise of change in atmosphere at 50c/t B hdg. He let FAB know they have coupled up and are going to keep driving inbye searching.	50c/t B hdg
ICT room	Communication using NLT scratched. Next meeting 3.30pm Team 1 at 50 CT B Hdg Team 2 leaving FAB to search	14:44	MR Team 2 leader relayed that they were to set up the wired radio comms due to the difficulty with the phones.	47A COB
		15:00	Contacted FAB for an update on mobile phone. ***Captain gave wrong information. GMT007 was at 57c/t not 56c/t and damaged doors allowing CO ingress into B hdg were at 50ac/t not 50c/t*** ~Continued inbye	57 - 58c/t B hdg
		15:03	MR Team 2 briefing. Decided to stay on phones and didn't finish running out radio wire. Donned masks at 15:04.	47A COB
		15:05	MR Team 1 call to FAB. They have arrived at the crib room.	47A COB
		15:13	Team reached 59c/t and found 3x missing VLI personnel unconscious but breathing. Team started carrying out checks on casualties	59c/t B hdg
		15:21	Rescue team members donned rescuers on unconscious personnel	59c/t A - B hdg
		15:37	MR Team 2 Arrived at COB to find an unconscious person just steps outside of the COB. The team pulled him into the COB to fresh air and did an assessment on him. Assessor informed them he had a weak pulse. Three team members prepared the stretcher. Patient was placed in the stretcher and strapped in. Team took his boots and socks off. A self-rescuer was placed on him. T	907 COB

Location	Surface Observation	Time	Underground Observation	Location
		15:56	Patient was loaded into drifty. Team took their BG4 air readings before getting into vehicle.	907 COB
Ops Room	QMRS Team 2 no contact past the response time	16:07		
		16:12	Vehicle arrived back to FAB. Information was relayed to IMT that the unconscious person had been packaged and MR was heading out of the mine with him. At that point the exercise was called off.	907 COB
	Exercise closed by Incident Controller	16:13	IMT called and told FAB controller that the Level 1 exercise was over	47ac/t B hdg
Training Rooms	Workforce debrief	16:30		

Appendix B: Assessors

Snezana Bajic | Principle Scientific Advisor Simtars

Snezana has 15 years of mining experience in Australia and overseas. She is currently head of the Mine Safety Technology (MST) group at SIMTARS, looking after mine emergency response unit, Safegas and Camgas mine support.

Scott Barker | Technical Services Superintendent Grosvenor

Scott is a Mining Engineer who completed his studies at the University of Queensland. He has worked in underground coal mining for 9 years at Newlands, Oaky No1 and Oaky North, Kestrel, Moranbah North and Grosvenor mines as production and development coordinator and superintendent roles.

Robin Bent | Senior AV Designer, DNRM

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

David Carey | CEO, Queensland Mines Rescue Service

David commenced as CEO for QMRS in late 2014. A Mining Engineer with 38 years of experience in underground and open cut coal mining he has held roles in general management, mine planning and mine management in NSW, QLD 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.

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 has been Professor of Occupational Health and Safety in Mining since 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 SIMTARS, providing 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.

Peter Cornford | Regional Manager Newcastle Mines Rescue Station

Peter started in the NSW coal industry in 1979 as an apprentice electrician and has since worked as a tradesman, Deputy, Undermanager, Ventilation Engineer, in project management and Health and Safety at various operations in the northern NSW coal fields.

After 30 years working in the UG coal industry in NSW Peter took up a position with Coal Services in 2009 auditing the training of the NSW coal industry. In 2013 he transferred to Mines rescue as Regional Manager for the mines rescue station at Newcastle.

Rodney Graves | Compliance Superintendent Broadmeadow

Rodney started his career in mining as an apprentice fitter in 1996 and subsequently worked at various underground mines. From 2001 he undertook multiple roles at Kestrel mine Compliance Supt, Development Co-ordinator/ ERZC, Production ERZC until 2011 when he moved to Crinum as an undermanager. In 20115 Rodney transferred to Broadmeadow in his current role.

John Hart | Mine Manager Ensham Underground

John has 41 years industry experience as a Surveyor, Deputy, Undermanager, Manager & SSE in NSW and Qld.

Peter Herbert | Senior Inspector of Mines Electrical

Peter Herbert is a Senior Inspector of Mines Electrical with the Safety and Health division of the Department of Natural Resources and Mines Queensland. He has been an Inspector for over 12 years. He has previously been employed in the mining industry for 26 years

Sharon Jones | Senior Administration Officer Simtars

Sharon has been at Simtars for 10 years and was responsible for the coordination of all activities to prepare and organise the other 18 assessors to ensure the efficient running of the exercise

Nikky Labranche | Principal Mining Engineer Simtars

Nikky LaBranche recently joined Simtars as Principal Mining Engineer. She has ten years experience in surface and underground coal through her work in the US, 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.

Ron McKenna | Underground Mine Manager

Between 2008-2015 Ron was 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 both coal and metals and has been mine manager of underground and surface mines for 30 years. He spent 4 years as a senior inspector of coal mine 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 No 2 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

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 Mine Emergency Exercise, Larry was involved in the actual 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, NSW, New Zealand and the USA.

Christopher Stebbeings| Mining Coordinator at Grasstree Mine

Chris has 13 years underground experience in the Bowen Basin and Illawarra coal fields. Christopher was the site 'mole' for the exercise and coordinated the site preparation for the running of the exercise

Inga Usher | Inga Usher Analytical Chemist Simtars

Inga Usher has 15 years' experience in instrumentation through working as an Analytical Chemist, mostly with GC's. Inga was part of the Simtars response to the Pike River Mine explosion in New Zealand (2010) and the Carborough Downs spontaneous combustion event in the Bowen Basin (2012). She is a signatory for NATA gas analysis reports and trainer for the Simtars Gas Chromatographer course and for the certified Advanced Spontaneous Combustion Course.

Martin Watkinson (Chair of the Organising Committee) | Executive Mining Engineer, Simtars

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 and developing 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 the 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.

Appendix C Things to consider when organising an Emergency exercise

Recognised Standard 8 defines that an audit approach should be taken in developing the scenario for a level 1 exercise. The time frame available for the exercise is one shift.

The standard requires the underground deployment of QMRS. Given that this will take a minimum of 4 hours only certain elements of the mine's and States' emergency response system can be checked every year.

Previous recommendations have been made to split the underground deployment of QMRS away from the level 1 exercise. This would enable a full test and interaction of ISHR, Inspectorate at the site IMT meetings and a separate underground deployment could be conducted with deployment sheets and MRAS completed thus not delaying the underground deployment.

This section is a list of actions to consider when running a level 1 type exercise:

- Create operational reason for limiting Deputies escape plan choices ie vehicles etc.
- Observers to follow Mines Rescue deployment all the way from the surface. These should have mines rescue experience
- Assessors need to be very clear instructing personnel when they become unconscious as part of the Exercise provide signs to these personnel to make sure the message is received by future teams.
- Person who was made un-conscious had to wait for a long time and had no access to water.
- Map showing CO levels at various times of the exercise to allow crew to be updated through – ensure that c/t numbers can be seen.
- Simtars to provide gas chromatograph data in the same format that the mine would receive it rather than by paper.
- Have interactions such as social media, ISHR inspectorate to pressure decision makers.
- Direct contact number for underground assessors to surface exercise controller to deliver information on unexpected changes. When something in the scenario changes this would allow all to be involved in the variations. a
- In addition to the 1 hour individual briefings the day before the exercise a full briefing should be held so all assessors are familiar with other parts of the scenario. This will help clarify the objectives and identity possible responses from CMWs and can provide observations to the crew they are assessing should they end up in other locations.
- Assessment team should label items with physical observations, like if there are doors open or vehicles crashed, so if other crews walk by they know what they see.
- Record the control room activity with either sound or video
- Assessors to keep track of personnel going to retrieve gas samples from the tube bundle system.
- Have reduced visibility CABA masks in addition to the smoke goggles for those wearing SCSRs.

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