Queensland Government
Natural Resources and Mines

Oaky Creek No. 1 Coal Mine

Level 1 Emergency Exercise

Conducted on:

Monday, 7 November 2004

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Executive Summary

A Level 1 Emergency Exercise was conducted at Oaky No. 1 Coal Mine on the 8th of November 2004. The fictitious exercise was initiated by a frictional ignition that propagated a gas explosion followed by a coal dust explosion. This destroyed ventilation structures in a localised area thus affecting ventilation in the maingate panels. The resultant shock wave, gas and dust cloud triggered an evacuation of underground personnel and a mines rescue response.

The underground escape, as triggered by signage from exercise assessors, was accomplished in a most professional and effective manner by all personnel. All personnel had restricted vision simulated with painted goggles to replicate smoke. The vast majority of personnel used some form of real Self Contained Self Rescuer (SCSR) either actual Dräger Oxyboks or CSE SR100 training units. This provided a realistic and valuable experience for mine personnel and was both well done and appreciated by escaping miners.

Upon reaching the explosion zone, the escaping miners were shown photos of explosion devastation (from Moura No. 4) such that they would appreciate the magnitude of such an occurrence but also so they could relate information back to the Management Team to assist in their responses. Personnel escaping from a mine in this type of situation are one of, if not the most valuable source of information. Clear and effective processes must be in place for this information to be captured and utilised by mine management.

The mine management response was modelled on the Incident Control System (ICS) as utilised by numerous emergency response agencies throughout the world, and particularly by the Queensland Fire and Rescue Service. This system is being evaluated by mining industry personnel and modified by QMRS for adoption in the case of mine emergency management. The mine had not had formal training in this system, but had a brief introduction to the philosophy. Management plans and duty cards had been revised in the light of ICS. Mine management responded to the exercise using this discipline – notably the allocation of Planning, Operations, Logistics and Control teams and functions. The overall aim being to diversify and delegate responsibility and management for a more successful result. Mine management are to be congratulated for having the courage to pioneer this system and demonstrate the value of the system. It worked well for this situation and was evident in assisting the management diversify their responses and take action on a number of fronts.

The mine triggered the mines rescue mutual assistance scheme via QMRS and the emergency notification process through FireCom. The mutual assistance from surrounding mines was outstanding. Teams and personnel responded from Oaky No.1, Oaky North, Central, Southern and Grasstree and all mines and mine management are to be commended and thanked for their commitment and assistance. The mines rescue response targeted extinguishing the resultant fires and searching for survivors and recovering any casualties.

In summary, the response to and management of the scenario was well done by all parties concerned and all mine personnel are to be commended for their professional and effectual approach.

David Reece
Chairman
Emergency Exercise Management Team

Definitions

Communications or Comms:	Generally used as a shortened tag for either the Communications Office or Communications Officer.
CABA	Compressed Air Breathing Apparatus
CO	Carbon Monoxide
c/t	Cut through
DC	Duty Card
ERZ	Explosion Risk Zone
FAB	Mines Rescue Fresh Air Base
FireCom	Emergency notification system provided by QF&RS in response to call out of QMRS
GAG	Jet engine used for mine inertisation
GC	Gas Chromatograph
I/C	Incident Controller
ICS	Incident Control System
IMT	Incident Management Team
LW	Longwall
MG	Maingate
PED	Personal Emergency Device
QF&RS	Queensland Fire and Rescue Service
QMRS	Queensland Mines Rescue Service
SAFEGAS	
SCSR	Self Contained Self Rescuer
SSE	Site Senior Executive
T	Commencement time of exercise
VO	Ventilation Officer

General Scenario

A frictional ignition occurs at the Sandy Creek development panel – nominally due to the continuous miner striking iron pyrites in a localised pocket of methane. This propagates into a widespread methane explosion that ultimately leads to a dust explosion within this panel. The dust explosion severely damages or destroys ventilation structures in the Sandy Creek panel and outbye as far as 22 c/t East Mains. All people (10) within the Sandy Creek panel are fatally injured due to the over-pressure.

As the shock wave travels outbye, it dislodges the manifold from one of the methane drainage holes and injures two people who are working in the 22 c/t area. The following flame front ignites the methane, burns the two people and starts a small fire at the drive head. The two fires are of small magnitude and intensity.

The damage to the stoppings and overcasts results in no ventilation flow through Maingates 24 and 25 and minimal ventilation in Sandy Creek. Ventilation short circuits into the returns at 22 c/t clearing the resultant dust and gas (CO) clouds from this area. Ventilation stagnation in the maingate panels means that there is little dust or gas in these panels. Dust and gas is experienced from 4 c/t to 1 c/t in South Mains. Ventilation is unaffected in the longwall panel and results in dust and gas moving quickly from the explosion area into the face area, affecting the ability of personnel to escape.

All personnel in the panels (LW 23 and Maingate 24) evacuate following the concussion and indication of dust and gas in the panel. They don Self Contained Self Rescuers (SCSRs) and smoke glasses and proceed outbye. At the explosion-affected area, they are shown photos of damage and debris from the explosion. After traversing the explosion-affected zone, they re-enter normal ventilation outbye 22 c/t East Mains and are free to escape unimpeded and to communicate with mine management at will. Two people from the 22 c/t East Mains area are injured by the blast but escape to the surface and are able to provide management with initial information.

As survivors escape from the mine and management gain an understanding of the situation based on mine monitoring and eyewitness accounts, they mount a search and rescue response with the assistance of the mines rescue service. The exercise terminates when all personnel - survivors and casualties, are located and a plan is implemented for the stabilisation and recovery of the mine.

Preamble

This report is divided into two main sections:

- A brief report focusing on key recommendations and observations distilled by the assessors from their interpretation of events, **and**
- A larger appendix, including details of the exercise planning and unedited comments and discussion by the assessors for more specific reflection by the site as desired.

Scope

The most prevalent and obvious source of full mine evacuation as recognised by all underground coal mine management is that of a fire in the main intakes. This has largely, and rightly, been the focus for previous level one emergency exercises. The intent for this exercise was to move away from the typical fire scenario to introduce another possible but potentially more traumatic occurrence, an explosion, that would challenge mine workers ability to observe, interpret and assess information and translate it to mine management. The destruction of mine monitoring equipment and the disappearance of a number of mine workers would also necessitate the deployment of mines rescue teams.

Objectives

The general objectives for the emergency exercise at Oaky Creek Underground Coal Mine were as follows:

- Assess reaction/interpretation of personnel to an underground explosion with the resultant disruption to ventilation.
- Full mine evacuation.
- Evacuation using vehicles, both sides of the explosion zone.
- Assess the ability of personnel to escape given limited visibility due to the presence of airborne dust.
- Use of fully functional Self Contained Self Rescuers (as opposed to training units).
- Use of incident photos for a more realistic effect and as stimulus for eyewitness feedback.
- Deployment of QMRS into irrespirable atmosphere – fire fighting, re-ventilate, search & body location, stabilise the incident site.
- Observation of the communication system between Control and IMT
- Appraise the Incident Control System for the management of an underground coal-mining emergency.

Incident Control System

It is noteworthy to provide a short introduction to the concept of the Incident Control System:

The traditional role of Incident Management Teams is to have all specialists and senior management involved in one group for gathering information, interpretation and decision making in an effort to control incidents.

The Incident Control System (ICS) was introduced by the Australian Fire Authorities Council for use by emergency service agencies to more effectively respond to emergencies as either an independent agency or to provide a common system and terminology for complementary agencies.

ICS maintains the integrity of the participating agencies' chain of command and information systems, in accordance with their legislation and policies whilst utilising capabilities of each into a cohesive emergency response.

ICS when applied at a mine breaks the former mining type IMT into smaller specialist groups of:

- Planning
- Operations and
- Logistics

under the control of the Incident Controller who is responsible for the overall incident management.

Incident Control: typically the Mine Manager, responsible for the overall approval and authorisation for actions and activities being implemented for the control of an emergency situation. Leads the formation and direction of the Incident Management Team.

Planning: responsible for the collation of incident and resource information, predictions of development of the incident scenario, development of potential solution options and a recommended solution for authorisation by the Incident Controller.

Operations: responsible for the management and supervision of workgroups and response teams such as mines rescue.

Logistics: responsible for the provision of facilities, services, materials and finance that will support the operational response.

The IMT under the ICS process then comprises the Team Leader from each of these respective groups. This promotes the IMT to the roles of decision-making and management of the incident. In addition to the above team members is the inclusion of statutory and other specialist roles eg. Site Senior Executive, NR&M Mines Inspectorate, Industry Safety and Health Representative and QMRS. The IMT would typically include – Incident Controller, Planning Team Leader, Operations Team Leader, Logistics Team Leader, Industry Safety & Health Representative, Mines Inspector and a scribe.

The introduction of an ICS requires a disciplined approach, as groups, once set up, must concentrate on their core functions, as well as timely integration of actions and communication.

There is moral, political and economic demand for the management of mine emergency incidents to be improved. It is therefore essential that the mining industry employ an effective Incident Control System such as that currently provided by the Qld Fire and Rescue Service (soon to be adapted by the QMRS for the underground coal mining industry) for the management of emergency situations.

Industry Recommendations

The following recommendations are applicable to the underground coal industry as a whole either because they are considered to be of a more universal nature or the deficiencies have been repeatedly observed at recent exercises.

Major Recommendation

There are three functions or activities that must be reinforced to the industry as being of fundamental importance in the successful management of an emergency:

1. It is critical to debrief survivors and eye witnesses as soon as practicable and transfer this information to the decision makers;
2. Gas analysis and interpretation must occur as soon as skilled personnel are available and must be conducted to a sufficient degree of detail so that it aids in good decision making – i.e. gas chromatography and the analysis and trending of ratios; and,
3. A mine must have an established, structured and comprehensive system for managing an emergency with a trained, disciplined response team. Duty Cards are not a comprehensive system; they are simply a functional aid for the overstressed cognitive processes of the human brain in the early stages of an emergency.

These three issues will be the overriding focus of all Level 1 emergency exercises in the short-term future.

General Recommendations

- All organisations should review the ICS for application in emergency incident control. Key areas of learning are: discipline in adhering to the system, limiting the span of control (i.e. no greater than five particular resources per person), clear authority in authorising plans and actions and managing the communication flow.
- Information into and out of the Communications or Control Office must be effectively and simply administered.
- Off-scale readings on the tube bundle should trigger immediate bag sample collection. There is a slow response to obtaining and analysing bag samples.
- Use QMRS cards rather than having to make up visitors' cards for rescue teams.
- Dedicated personnel need to be assigned to the debriefing of underground eyewitnesses and collation and communication of this information to the IMT.
- Mine plans are vital tools in a debriefing to allow persons to orientate themselves; they need to be available in the debriefing areas.
- Training in donning SCSRs should be conducted in vision-impaired environment.
- Correct the regional issue of inspector shortages.
- Consider the availability and use of CABA to enable verbal communications with evacuating team members.
- Utilise realistic SCSR training units as often as possible.

Mine Site, Mines Rescue and Emergency Exercise Recommendations

General

- Improve information flow back to the Communications Officer. The system needs to specifically address how communication is to flow around the site and to which particular team members.
- Communications officer to use a standard question list to gain information from those underground who are phoning in.
- The emergency phone system, provided underground, should have the handsets available underground, possibly with SCSR caches.
- Dedicated personnel need to be assigned for the debriefing, collating and communication of information from the underground eyewitnesses to the IMT.
- Incident Action Plans should be developed and documented with time and date on them to enable all persons to be briefed on current situation and for clear understanding of required actions by operational teams.
- Operational teams such as mines rescue, need an allocated, convenient location for marshalling – teams tended to find a space in the lamp area with equipment spread all over the place.
- Implement the Incident Control System (ICS) and particularly limit the span of control (five resources under the control of one person) of individuals.

Mine Monitoring Systems

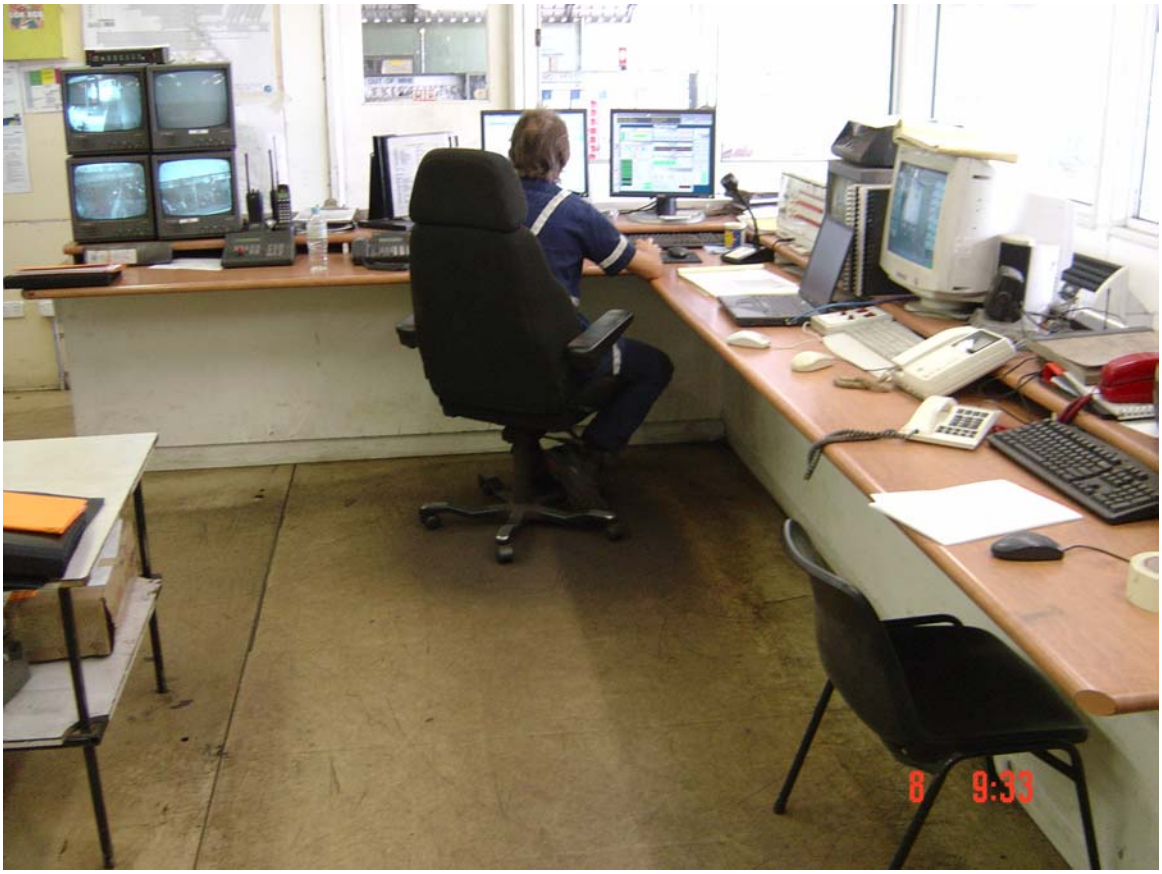
- The mine monitoring system should include a facility to print a table of the latest data for all locations with date and time of all gases and be able to export to other programs or for email. This would allow error free transfer of data to other interested persons.
- Ensure that gas chromatograph analysis of the atmosphere is undertaken as soon as practicable. Utilise Simtars or other relevant expert for additional review and verification of gas data.
- Mine monitoring systems should ensure that trend graphs include the latest data.
- Mine monitoring systems should include a label of tube numbers as well as locations – Oaky Creek mine plans only refer to monitoring points by tube number when doing trending and analysis.
- When a monitor reaches full scale, it should read “full scale”, instead of displaying a value. The value – 999, can be interpreted as actual.
- The mine monitoring system should have the ability to display trends of more than one sample point at a time.

Mines Rescue

- Use colours to identify teams instead of numbers.
- Mines rescue activities should be coordinated through the Operations team with a clear communication strategy between mines rescue teams and Operations centre, then on to the IMT and I/C.
- Mines rescue must be fully briefed on who and where people are expected to be underground.

Exercise Management Team

- Scenario and first full team meeting to be developed / held at least two months prior to the exercise to enable improved briefing of the whole team.
- Need to end the exercise on a positive note. In this instance, the discovery of fatalities at the conclusion of the exercise (that had occurred at the start of the incident, and which the mine had no control over), tended to dishearten personnel in an otherwise successful exercise.
- Quarantining of the longwall production crew due to longwall problems, though necessary, added some confusion to the communication process with personnel in that panel.
- Assessors who are proficient in the relevant area should provide some coaching of teams during the exercise for added learning opportunity.
- Team members must commit to the entire exercise including preparation and briefing so that a full appreciation of the scenario is obtained. This should include an additional meeting of the full team, i.e. two separate meetings of the full team prior to the exercise.



Observations Summary

The following listed comments have been made by the respective assessors as feedback to the mine on their systems and are the basis of the recommendations.

Communications Room

- Having 2-3 experienced Communications Officers in the Communications Office worked well.
- Information coming into the communications office was generally effectively transmitted to appropriate personnel.
- Communications Officer questioned escaping personnel, when they phoned in.
- Control and knowledge of personnel locations underground was incomplete. Contractor control is an issue, with contractors moving in and out of panels without notification. Three contractor tags were on the board for Sandy Creek at 09:00 but the contractors were on the surface.
- Having a range of emergency communications recording sheets created some confusion / duplication. Communications Office, at times, recorded information in three places, i.e. on the normal communications sheets, on Communications Officer duty cards and general record by the Communications Assistant.
- Communications Officer didn't receive feedback on decision-making from IMT or Operations, or on the actions to be taken; similarly, had little idea of what QMRS was doing.
- At 13:05 Communications advised Operations that there were two glows - one at C23 and another 100m inbye - this information seemed to get lost.
- There was, at times, a failure to recognise that full-scale gas readings could have been higher than the reading on the sensor.
- Even with off-scale readings, bag samples were not taken until requested by the Industry Safety and Health Representative (ISHR) when he arrived on site.
- Communications Officer appeared to have little direction as to what to tell the workforce when they contacted the surface.

Underground Evacuation

- Use of "real" belt worn Self Contained Self Rescuers (SCSRs) as used at the pit was a good idea. The crew believed that this was one of the most beneficial outcomes of the exercise for them.
- Donning of SCSR went well, however, many commented on the increased difficulty donning without being able to see.
- At both Production Crib Rooms, crews immediately gathered the stretcher, mine plan and long duration SCSRs. The use of the stretcher kept crew together. Crews were obviously familiar with the escape plan and the Crib Room pod was well supplied.
- Outbye contractors donned SCSRs after the air concussion (without any instruction) and made their way out of the mine.
- One of the crews attempted to go back and fight the fire at the drive head. Two men remained at the telephone at 6 c/t whilst five men investigated the fire at the drive head. This action provided useful information for the Incident Management Team (IMT), i.e. fire location, equipment required to re-establish water line and isolation valve location.

- Good leadership was exhibited by the MG24 ERZ controller.
- Crew evacuation proceeded well.
- The lack of communications equipment forced decision making from the crew themselves and heightened the level of anxiety. The crew found this to be a critical point in creating reality in the exercise.
- There were a significant number of communications ports underground but no available phones to tap into them.

Incident Management Team

- No Mines Inspector attended the Level 1 Exercise.
- No formal method in place for IMT to update any personnel joining the team (and/or at changeover). Scribes made records but it was not evident that this information was used at any time or that it was used for briefing newly arrived personnel such as the ISHR or QMRS. This information was not easily accessible to the IMT or other teams – provision needs to be made (like data projectors) for reference to information on an ongoing basis.
- Some information was missed on whiteboard update, e.g. miscount of missing personnel.
- Location of Operations Team close to Communications Office encouraged the flow of information to be channelled straight to Operations, but not always to the other teams. Additional break out rooms nearby may be advantageous. It is recognised that this will not always be possible but is nevertheless an optimum situation.
- As the mine was new to ICS, the IMT and individual team members, at times, did not have the necessary discipline to keep focused on their delegated activities. At times they strayed from their area of responsibility. This will come with training/practice.
- No trends of gas levels were put to the IMT during the whole of the exercise, only verbal presentation of the gas levels.
- Initial IMT meetings should include Team Leaders only and timing of meetings should be dependent on the resultant workload.

Incident Control System

- The ICS methodology utilising teams was largely effective and allowed the Incident Controller to focus on the incident management rather than becoming bogged down with details, as is often the case. He was able to check duty card allocation and actions, brief the Site Senior Executive on arrival and check on the progress of various activities.
- The widespread nature of the team rooms hampered some of the information flow and interaction between the teams.
- Scribes were allocated to each team and performed very effectively. An efficient system for combining and translating this information is needed.

Operations Team

- Operations Team Leader and team kept an accurate record of who was in the mine and their positions during escape.

- Operations Team Leader ensured that persons under his control who were issued duty cards understood the requirements of their allocated duties.

Planning Team

- Good direction from the Planning Team Leader, particularly in allocation of tasks and focus on key issues. This occurred despite the fact that the Planning Team Leader was a stand in, not normal Planning Coordinator.
- There was a real sense of urgency in carrying out tasks.
- Effective use of a team under Compressed Air Breathing Apparatus (CABA) sped up the re-entry and information gathering process.
- Velocity sensors underground provided good information.
- Need QMRS deployment area at Oaky No.1 surface area.
- Greater discipline needed with regard to span of control (five resources maximum). This team at times was up to 16 people, resulting in a lack of clear delegation / direction. Bystanders and observers are not warranted in such a situation.
- The Ventilation Officer (VO) needed to delegate more with regard to data collection, by having additional access to Segas and other ventilation resources.
- Improve planning room facilities; a phone and a whiteboard are vital tools.
- Access to information, an up-to-date and well-organised technical library impacts the ability of the Planning Team to make informed decisions.
- Consider the use of plasticised plans for locations and actions.
- A formal process for verifying information will remove confusion.
- Lag time for tubes impacted the timely flow of information.
- There was insufficient recognition of monitoring deficiencies. Initially, there was little recognition of the need to challenge the validity of the data from the tube bundle system.
- Too much reliance on verbal communication only, recording of information should be hard copy and emailed or networked so that confusion is avoided.

Surface Control

- Debrief of persons as they came out of the mine was not carried out in an orderly or efficient manner, especially given the criticality of the information they possessed.
- Although lots of “No Road” tape was erected around the surface, general movement of persons was not controlled or effectively marshalled.
- There was effective accounting for persons as they came out of the mine and checking off on the tag board.
- Improvement in debriefing and control of personnel on the surface is needed. Whilst the raw data download did finally occur, the opportunity for the crews to debrief on what had worked or had not worked was delayed.
- There was a lack of mine plans in debriefing areas.

- Sentry location in and around the portal was somewhat confusing with some sentries moving locations at least twice, one of which was within the range of a secondary explosion.

Mines Rescue

- Mutual assistance from Southern Colliery occurred very quickly and was backed up by the remainder of Mutual Assistance Group 3.
- Mines rescue substation was geographically removed from the operations area making direct communications difficult and less effective.
- Mines rescue search of the Sandy Creek area was fast and effective.
- Information supplied to the Operations Team was not verified in most cases.
- The deployment of rescue teams occurred 6.5 hours after initiation of incident.
- Contact number of the for Mines Rescue Operations Manager satellite phone was not supplied to the Communications Officer.
- The Mine Rescue Co-ordinator, at times, contacted the Incident Controller directly instead of contacting Operations Manager.
- FAB Controller, at times, contacted the Incident Controller directly, rather than contacting the QMRS representative.
- Less than adequate briefing of mines rescue personnel, i.e. they did not understand that there were three contractors building a stopping in the Sandy Creek panel.
- There appeared to be a “competition mentality” in the dressage and team check - this is certainly not required in this sort of situation. There is no requirement to impress assessors here.
- The first active team showed very good leadership and accuracy in passing on information.
- FAB Operations did not appear to be well organised.
- FAB duty card (No. 4) does not appear to have been formally issued.

Conclusions

Overall, the mine management team effectively controlled this simulated emergency exercise. Every aspect of the scenario was addressed, the mine was fully evacuated, the incident was correctly assessed and mines rescue teams deployed to render assistance and recover control. There were no casualties other than those sidelined at the commencement of the exercise by the Exercise Management Team as part of the scenario. The Incident Control System (ICS) as used by the management team was effectively incorporated as the primary response mechanism and has further potential, with training, for improving mine emergency management.

The mine workers at Oaky Creek Mine responded professionally to the challenge and reacted as anticipated (and as hoped). This ranged from correct assessment of the situation, rapid deployment of breathing apparatus, the initial use of vehicular transport, through to accurate interpretation of the scenario as pictorially depicted and the eventual translation of facts to management.

A specific section has been included in the mine recommendations dealing with the issue of gas monitoring. Observation of numerous recent Level 1 and Level 2 Emergency Exercises at mine sites illustrates that mine management are slow to obtain gas information, analysis and interpretation via chromatograph and ultimately ratios that will give them an understanding of what has and is happening. ***This is an area that must be seriously addressed by all mines as a matter of urgency and specifically by mine management at all levels, Mines Inspectorate, Ventilation Officers and Simtars.***

Communication and the effective debriefing of witnesses, continues to test mine emergency management teams as it is not something that is routinely performed – protocols and practice are needed. Liaison between the Communications Office and all other responsible personnel was of a high standard. The communication protocols established at the mine were sufficiently robust and in the main, personnel complied with the necessary flow of communication.

There was an excellent response from the mutual assistance mines in providing a mines rescue capability to the exercise. Some minor enhancements for mines rescue protocols have been listed in the mines rescue section of the recommendations.

Ultimately, all components of the exercise were successfully resolved by the mine personnel with external agency support.

Summary Timeline of Emergency Exercise

11:05		Longwall 23 crew felt severe air concussion. Crew "donned" rescuers after trying telephone and proceeded to crib room at 26 c/t. Unable to telephone Communications - out of service. Senior miner instructed men to pair up before donning Oxy rescuers. Crew pulled stretcher from mobile crib room & supplied with link line, plan, Oxy K Plus. No vehicle, so proceeded along travel road carrying stretcher.
		2 Eastern Mining Services (EMS) personnel at Maingate 23, 16 c/t C-D, felt a severe concussion - Decision made to head to MG23, 15 c/t Communications to find out what has happened. - Upon reaching MG23, 15 c/t Communications discover the Communications is not working and power is off to the section. Continue to walk outbye, travelling in D-Heading travel road.
		MG24 crew feel air concussion and prepare to evacuate panel. Unsuccessful attempt to contact surface Communications Office.
11:27		Communications Officer telephones Mine Manager to report an incident had occurred.
11:30		MG24 crew encountered a dust cloud at 5 c/t South Mains. Once in cloud Odalog alarm and SCSR donned. ERZ Controller tried to write a message, but men could not read. Men worked out signal system, gathered around stretcher and moved off.
		Eastern Mining Services crew, B-Hdg 1 c/t South Mains changed over to Oxy K Plus. Entered East Mains via dogleg, C-Hdg 25 c/t walk over rubble from overcast knocked down, look left and right and see a fire glow. Continue on to B-Hdg 25 c/t and viewed damaged PJB on RHS. Inspected area of PJB for injured persons, none found. One crewman signals to the other by hand for phone. They continue outbye past East Mains B-Hdg 24 to 23 c/t. At B-Hdg 23 c/t they look left and see a red fire glow. They continue on to B-Hdg 22 c/t.
11:35		2 casualties with burns arrived from outbye of Sandy Creek East in Communications Room. Communications note explosion: Mine Manager declares an emergency. Mine Manager starts handing out duty cards.
11:40		2 burn casualties taken to First Aid room.
		Incident Management Team formed with Incident Controller, Planning Officer, Operations Officer, Logistics Officer and IMT scribe assigned.
11:47		Training Co-ordinator gathers information from the burn casualties. Mines Rescue Co-ordinator telephoned Firecom to engage QMRS.
12:03		Incident Management Team telephoned Site Senior Executive on way to mine.
12:05		LW crew discovered double doors at B-Hdg 23 c/t East Mains destroyed, belt/structure destroyed, observed glow at South Mains drivehead. Fire depot destroyed. Odalog reading fresh air.
12:20		Eastern Mining Services crew arrived at Portal. Notified surface controller that 2 Eastern Mining Services crew have come out from 16 c/t MG23. This was passed on to Communications Officer via radio. Information forwarded to Operations.
12:23		LW crew, 3 crewmen investigated fire, 2 men gathered extinguishers from B-Hdg 21 c/t East Mains pump pod, proceeded inbye along belt road. One crewman searched for nearest fire depot outbye along belt (brought to nearest hydrant at 21). Found overcast down at 22 c/t, water line down & broken at 22 c/t. Viewed a glow along each belt. As they proceeded inbye, Odalog started to alarm. Further inbye Odalog read 100ppm & rising, men retreated and assessed water line (isolation point 19 c/t, require 6" gate valve to re-pressurise).
12:30		Incident Management Team meeting - information misinterpreted about 2 fires; 6 c/t East Mains and 22-23 c/t C-Hdg. No assessment of fire yet, no debrief information to IMT. Incident Controller asks that debriefs be done individually and in a group. Questioning whether there was an explosion inbye 22 c/t or do we have 2 fires. QMRS in transit, mines rescue being prepared.
		Incident Management Team - continue to evacuate people out of the mine and debrief. Look at contingency plan. Logistics Co-ordinator to check with Oaky North and other mines for amount of low expansion foam available. QMRS mobilise GAG. Need to assemble CABA fire team to attack fire from intake side.
12:48		Incident Management Team documented decisions and gave to all members. Decision 1: transport to MG24 crew. Decision 2: foam applicator and foam readied for underground transport. Decision 3: debrief MG24 crew on arrival at surface. Decision 4: contact Longwall crew - ask if there is smoke coming from outbye and if so check 6 c/t East Mains.
13:08		Eastern Mining Services crew, first person debrief interview.
13:40		QMRS Representative onsite (Security Station 1).

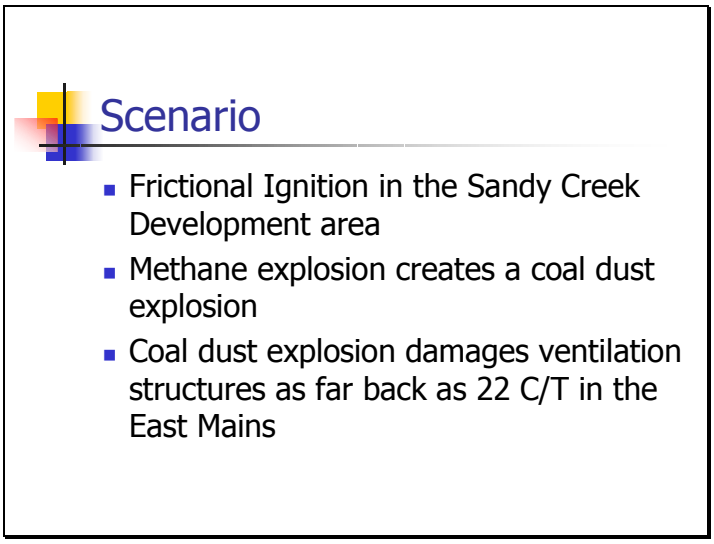
13:56		QMRS Representative has arrived on site to No.1.
14:53		Industry Safety and Health Representative requested that bag samples be collected from tube bundle system for tubes 1, 15 and 17 and analysed on the gas chromatograph.
15:30		Southern Colliery rescue team arrived onsite.
15:57		Rescue team left to go underground using CABA.
17:18		QMRS Manager debriefs the three active teams. Team 1 to fight the fire; Team 2 search and rescue; Team 3 on standby. FAB at 21/22 c/t. Gas readings low. CABA team at 23 c/t. CO 150ppm at fan. Fire depot at 18 c/t. Fire burning since 12:00 (electrical/oil maybe). FAB Controller name and assistant name. FAB phone number 535.
18:30		QMRS Team 1 found one deceased miner in crib room (lamp/rescuer number 139). Oxy K Plus cache full in crib room. Captain marked location of deceased on plan. The captain has not observed and noted a full description of the position of the deceased. Searched A11 to B11 stopping – Sandy Creek.
18:35		QMRS Team 1 found 3 deceased in SCE BC12 to 13 c/t (Rescuer numbers 230, 294, 179). CO 1200ppm. Captain marked location of deceased on plan. The captain has not observed and noted a full description of the position of the deceased.
18:50		QMRS Team 1 found 6 deceased at Face MG27 D-Hdg 1 to 2 c/t. CO 400ppm, O2 20.6%, CH4 0.03%. Called FAB, no radio contact.
19:10		IMT meeting - Rescue Team No. 1 reported to FAB confirmed 10 deceased, marked x on plan. Plan to re-ventilate Sandy Creek East to allow access by Police & Doctor. Plan to re-ventilate remainder of mine; notify families, oncoming shifts, keep all IMT notes. QMRS required over coming days to verify no residual risk, reviewed goals of IMT, counselling services available for employees, entry to mine only for essential personnel, stakeholders contacted, awaiting 3 contractors' contact details.

Appendices

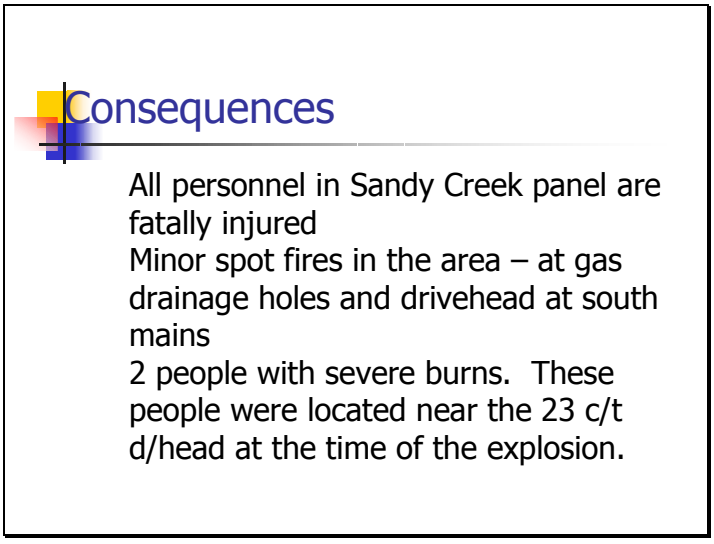
Appendix 1: General Scenario

Slide 1

Slide 2



Slide 3

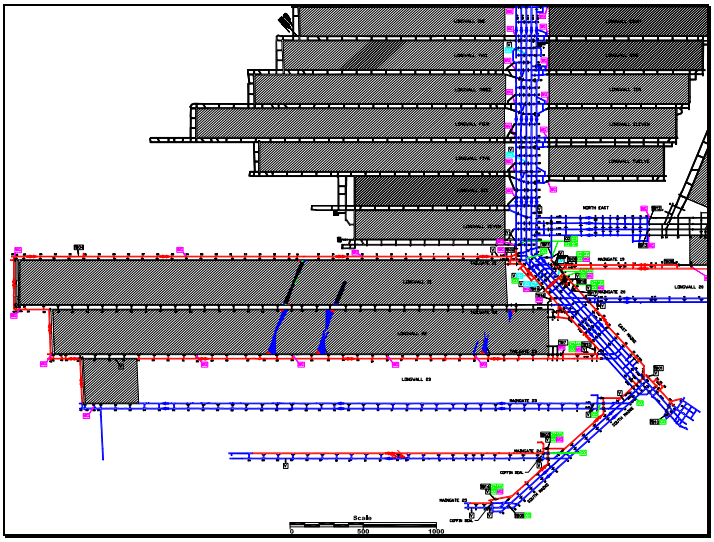


Slide 4

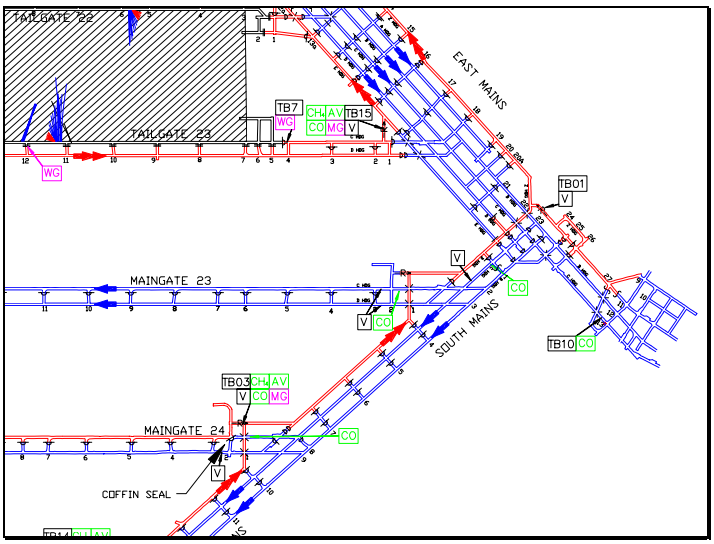
Consequences (Cont'd)

Massive destruction to all infrastructure – stoppings, overcasts, belts.
Major interruption to ventilation – no ventilation circuit in MG 24/25, minimal ventilation in Sandy Creek
Ventilation in LW 23 approximately the same due to continued integrity to TG 21 bleed and no damage to structures beyond 22 c/t

Slide 5



Slide 6



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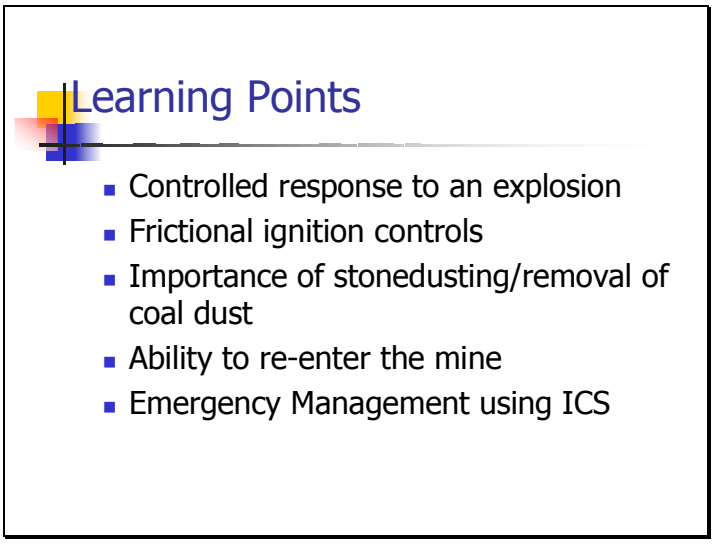

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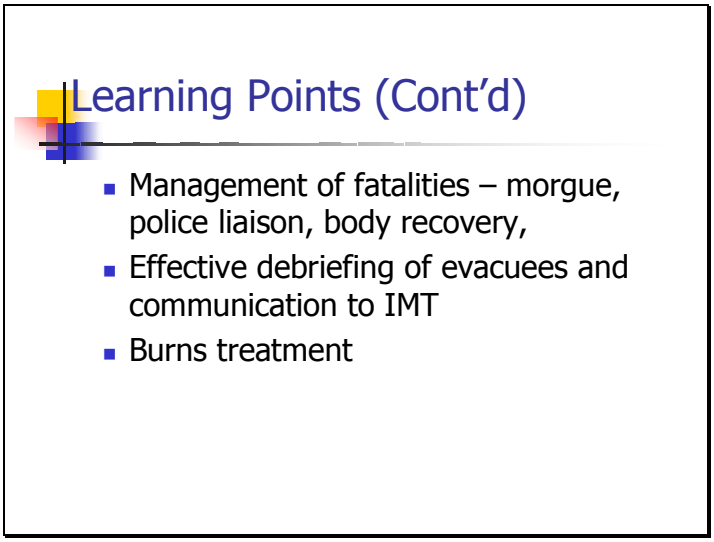

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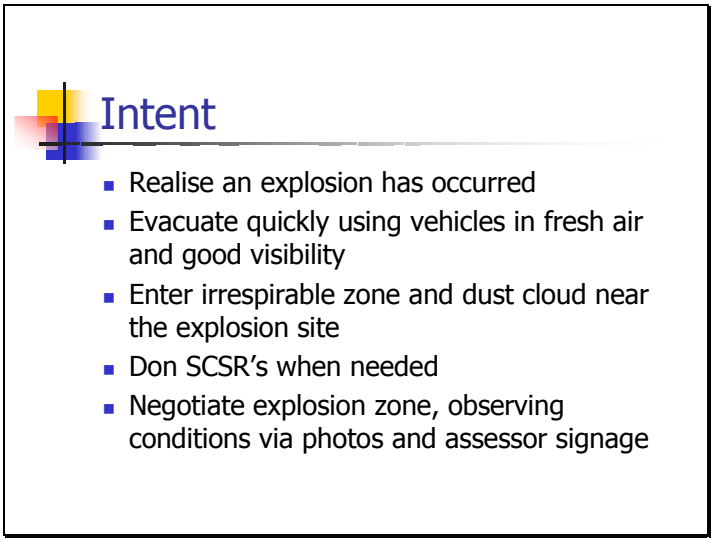


Slide 10

Intent (Cont'd)

- Evacuate to fresh air side of incident
- Remove SCSR, communicate with Control ASAP
- Escape from mine using best available method
- Mine management must initiate mine re-entry

Slide 11

Intent (Cont'd)

- Exercise **will** require mutual assistance from 2 other sites.

Slide 12

Objectives

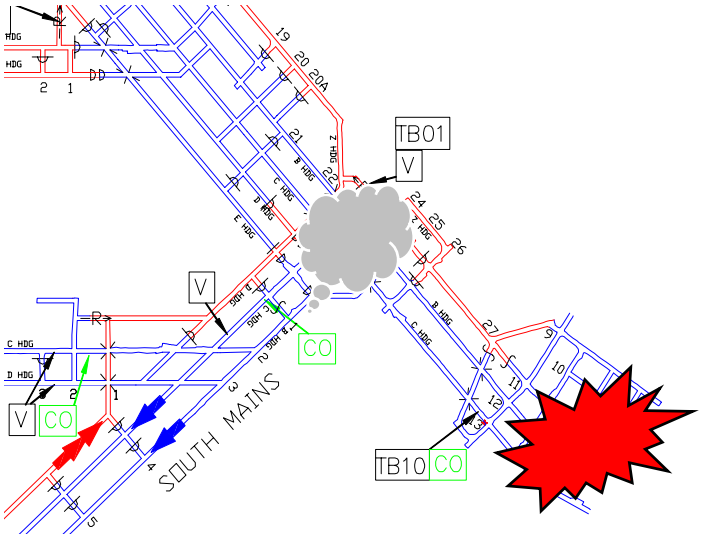
- Assess reaction/interpretation of personnel to U/G explosion
- Full mine evacuation
- Evacuation using vehicles, both sides of the explosion zone
- Visibility will be affected following the explosion due to dust – times will vary depending on the location
- Use of Self Contained Self Rescuers

Slide 13

Objectives (Cont'd)

- Use of incident photos for realistic effect
- Deployment of QMRS into irrespirable atmosphere – fire fighting, re-ventilate, search & body location, stabilise the incident site.
- Effective communication system between Control and IMT

Slide 14



Slide 15

Longwall Evacuation

- Two assessors in the panel to assist evacuation
- Mine Personnel are at LW face and M/G installing roof support
- Crews initially feel a shockwave
- Dust/smoke cloud progresses to face area after 15 min.
- Dust/smoke cloud lasts for first 15 min. of evacuation

Slide 16

Longwall Evacuation (Cont'd)

- Crew may evacuate using vehicle or on foot
- High levels (residual levels of 3-600ppm) of CO
- All personnel don SCSR's
- Explosion affected zone taped off at 1c/t South Mains
- Crews to have clear vision from this point onwards
- Assessors escort crews through the explosion zone.

Slide 17

Longwall Evacuation (Cont'd)

- Photos of damage shown to crews so that they can interpret/witness what has occurred and decide the best route of travel
- At 24 c/t E Hdg look outbye (left) and see damaged stopping and debris

Slide 18

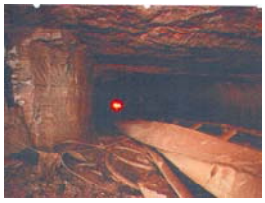
Longwall Evacuation (Cont'd)

- When at 25 c/t C Hdg East Mains, will see – collapsed overcast, a fire at the 23 c/t (outbye) drive head and flame at 26 c/t (inbye)

Slide 19

- At 25 c/t B Hdg look inbye & see PJB

- At 23 c/t look across to see orange glow from d/head fire and damaged belt structure



Slide 20

Longwall Evacuation (Cont'd)

- 22 c/t overcasts destroyed
- When outbye 22 c/t East Mains the crew are in fresh air
- Crew/IMT can decide how to evacuate from this point
- Assessor to observe debrief of crew

Slide 21

M/G 24 Evacuation

- One assessor in the panel
- Crew feel shockwave, followed by a total loss of ventilation
- Crew may travel out of panel using vehicle to 4 c/t (NB assessor to organise someone to bring vehicle through the explosion zone for later use by crew)
- Crew will encounter dust cloud and CO, just inbye of 4 c/t South Mains
- All personnel don SCSR's upon entering irrespirable atmosphere

Slide 22

M/G 24 Evacuation (Cont'd)

- Visibility clears just outbye of 1 c/t South Mains
- Explosion affected zone is taped off just outbye of 1 c/t
- Explosion assessor meets evacuating crew at 4 c/t to escort through the dust cloud and explosion zone.
- Photos of damage shown to crew so that they can interpret/witness what has occurred and decide the best route of travel

Slide 23

M/G 24 Evacuation (Cont'd)

- Photos of damage shown to crews so that they can interpret/witness what has occurred and decide the best route of travel
- At 24 c/t E Hdg look outbye (left) and see damaged stopping and debris

Slide 24

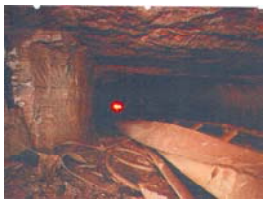
M/G 24 Evacuation (Cont'd)

- When at 25 c/t C Hdg East Mains, will see – collapsed overcast, a fire at the 23 c/t (outbye) drive head and flame at 26 c/t (inbye)

Slide 25

- At 25 c/t B Hdg look inbye & see PJB

- At 23 c/t look across to see orange glow from d/head fire and damaged belt structure



Slide 26

M/G 24 Evacuation (Cont'd)

- 22 c/t overcasts destroyed
- When outbye 22 c/t East Mains the crew are in fresh air
- Crew/IMT can decide how to evacuate from this point
- Assessor to observe debrief of crew

Slide 27

Sandy Creek Panel

- Crew to:
- Escort assessor to sites within panel area as needed
- Low visibility evacuation from panel to refuge station
- Crew to return to panel and act as casualties for QMRS response

Slide 28

Sandy Creek Assessors

- Meet evacuating MG team at 4 c/t South Mains with dust/smoke goggles
- Remove dust/smoke goggles at 1 c/t South Mains
- Show photos as listed for MG 24 evacuation
- Release the team back to their original assessor at 22 c/t East Mains.

Slide 29

Sandy Creek Assessors (Cont'd)

- Assessors to return to Sandy Creek
- Sandy Creek crew to evacuate to 6 c/t East Mains, when all other teams have evacuated
- Smoke/dust goggles to be used
- Crew to return to panel when completed and act as fatalities for mines rescue response

Slide 30

Assessor Locations

- IMT – G Dalliston, D Cliff, W Hartley
- Control – D Brady, Gavin Forsyth
- Mines Rescue – Seamus Devlin, D Thomasson
- Sandy Ck – M Watkinson R Stothard
- MG 24 – Brett Capper
- LW – Andrew Monaghan, M Carter
- General Overview – D Reece, L Kirner

Slide 31

Assessors Choreography (LW)

- Two assessors at LW face to assist with visually impaired evacuation to 22 c/t East Mains
- These assessors will assist on surface with assessing morgue, general observation and recovery as required

Slide 32

Assessor Choreography (MG 24)

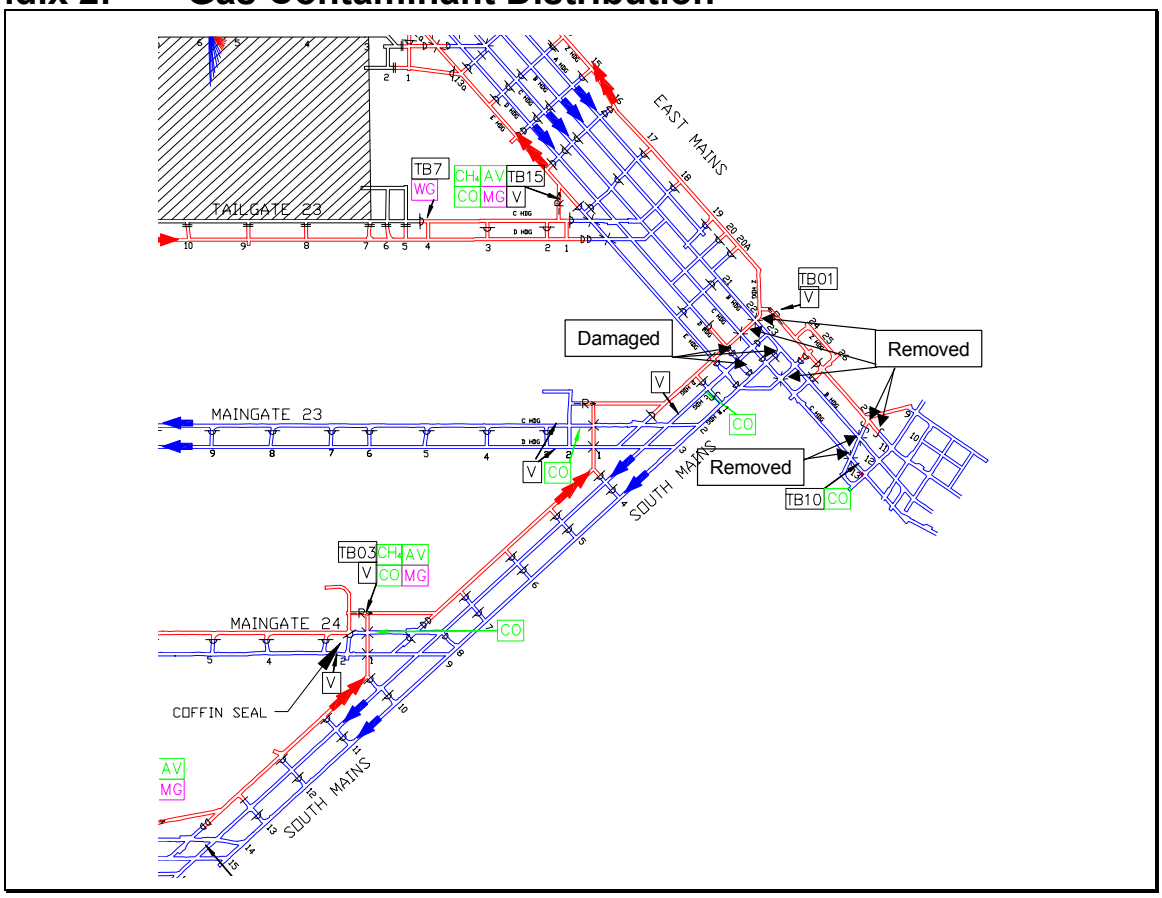
- One assessor to assist MG 24 crew to 4 c/t South Mains
- Sandy Creek assessor to assist from 4 c/t with visual impairment, out to 22 c/t East Mains
- MG 24 assessor to remain with crew until debrief is completed
- Sandy Creek assessor to return to panel

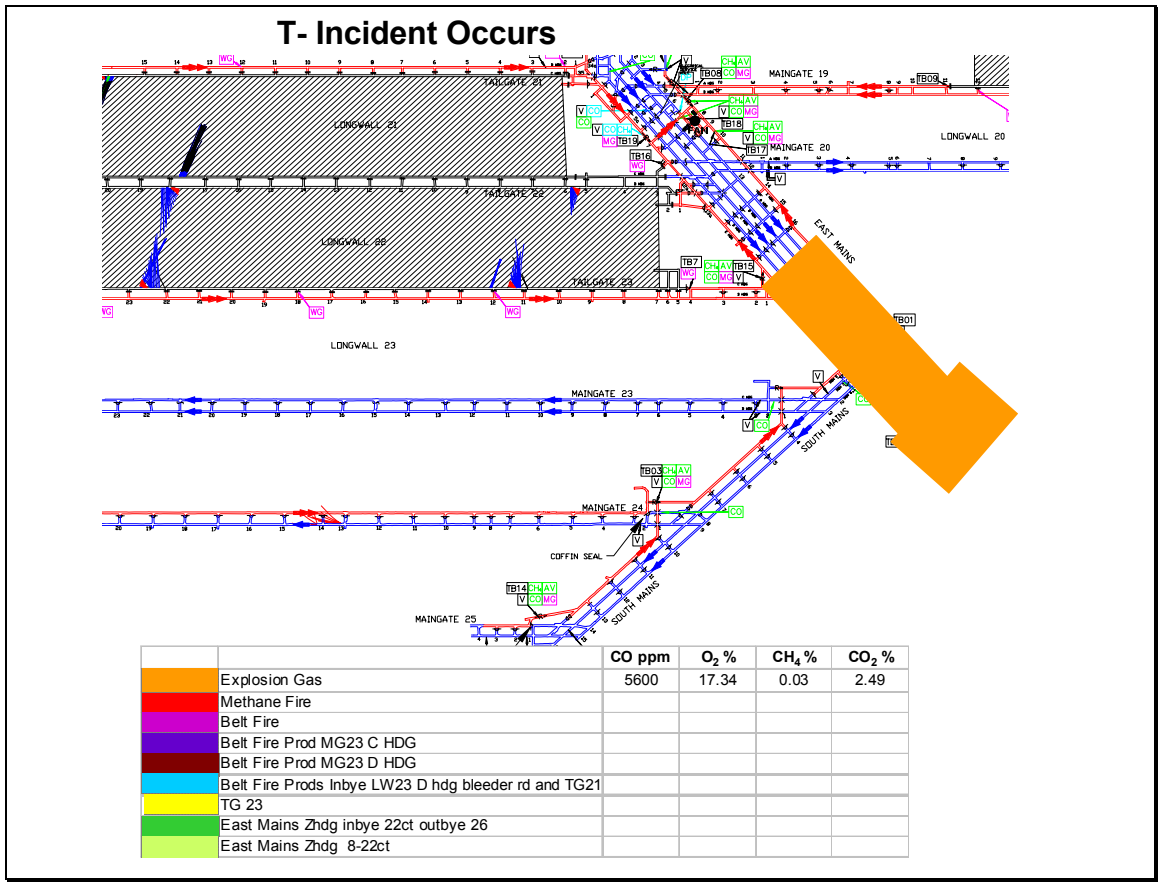
Slide 33

Assessor Choreography (Sandy Creek)

- Sandy Creek assessor to organise two burns victims
- Assist MG 24 assessor with team through explosion zone
- Evacuate Sandy Creek crew to refuge chamber
- Organise Sandy Creek crew as victims for mines rescue

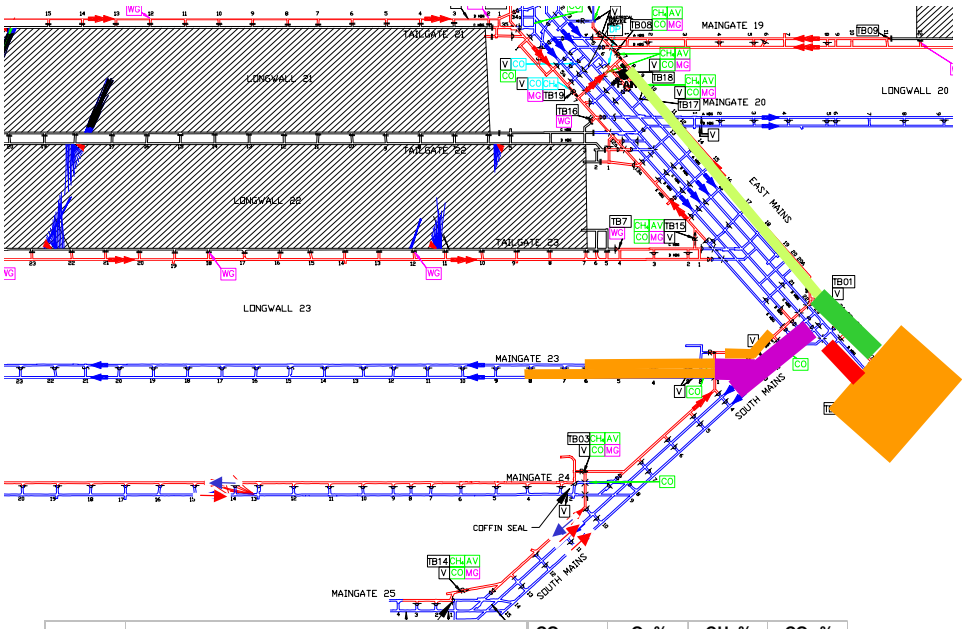
Appendix 2: Gas Contaminant Distribution





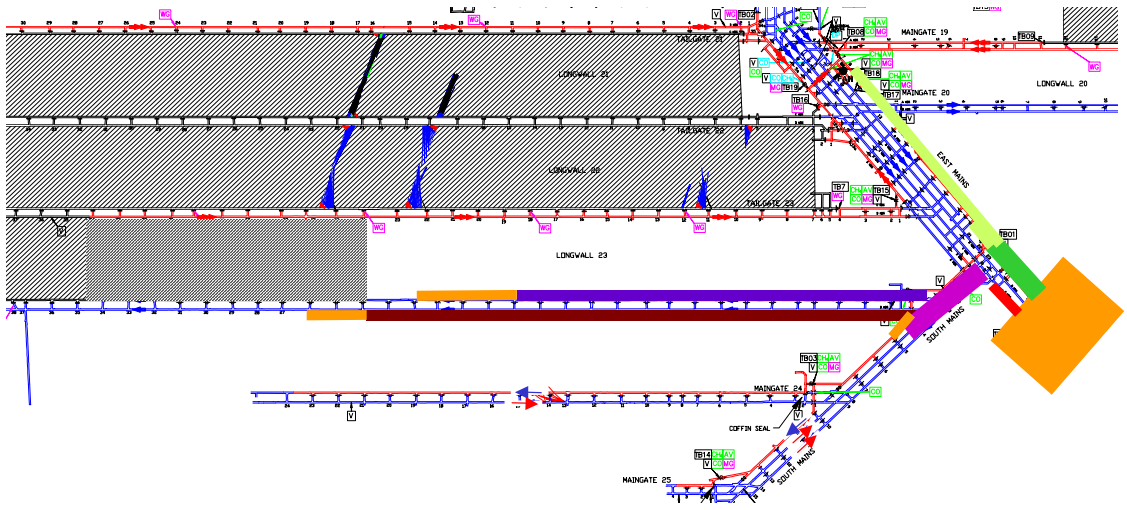
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire				
	Belt Fire				
	Belt Fire Prod MG23 C HDG				
	Belt Fire Prod MG23 D HDG				
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21				
	TG 23				
	East Mains Zhdg inbye 22ct outbye 26				
	East Mains Zhdg 8-22ct				

T+ 5 Mins



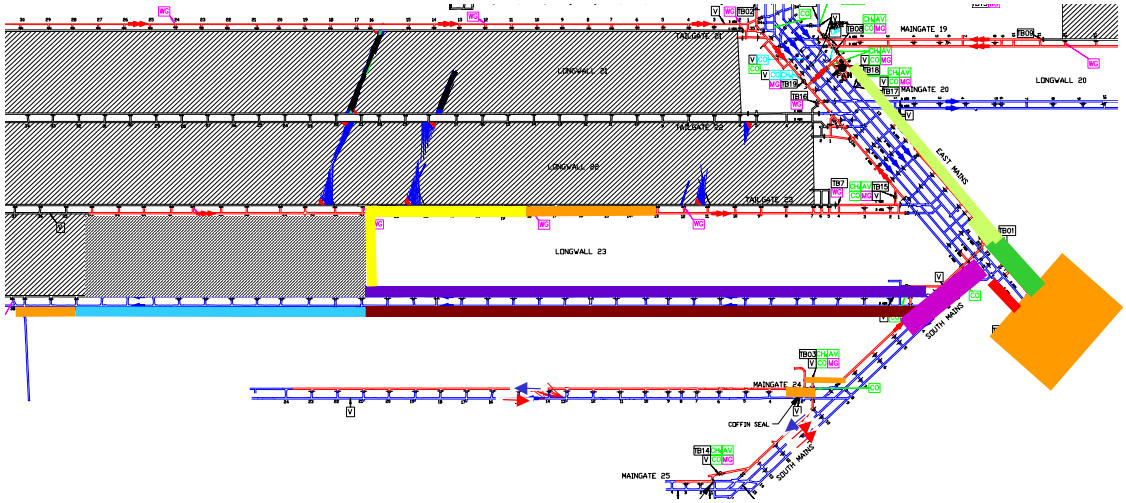
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG				
	Belt Fire Prod MG23 D HDG				
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21				
	TG 23				
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

T+ 15 Mins



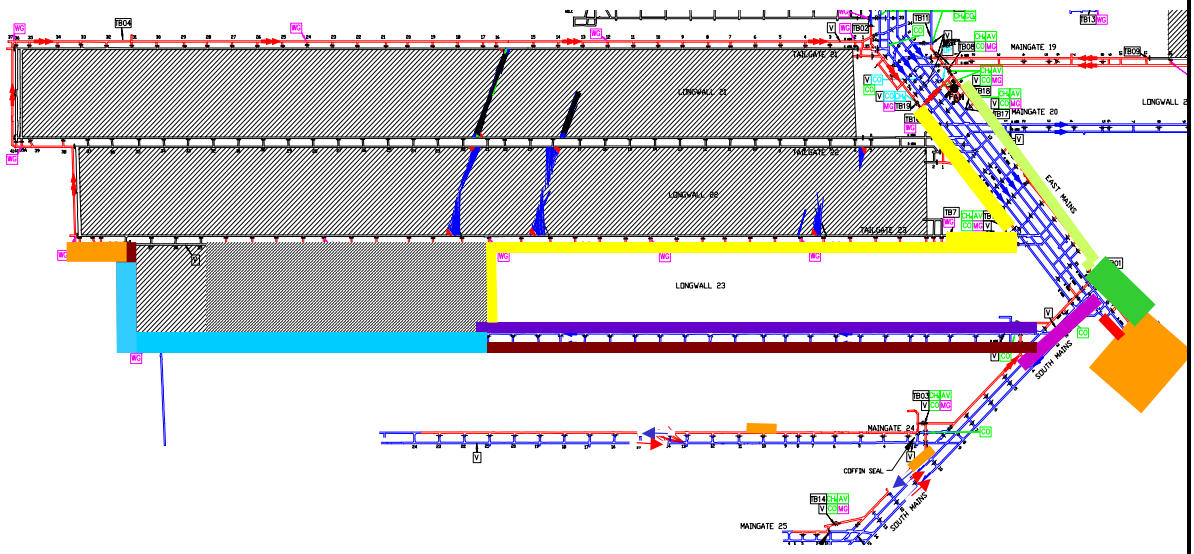
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG	653	20.5	0.01	0.28
	Belt Fire Prod MG23 D HDG	285	20.6	0.01	0.22
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21				
	TG 23				
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

T+ 30 Mins



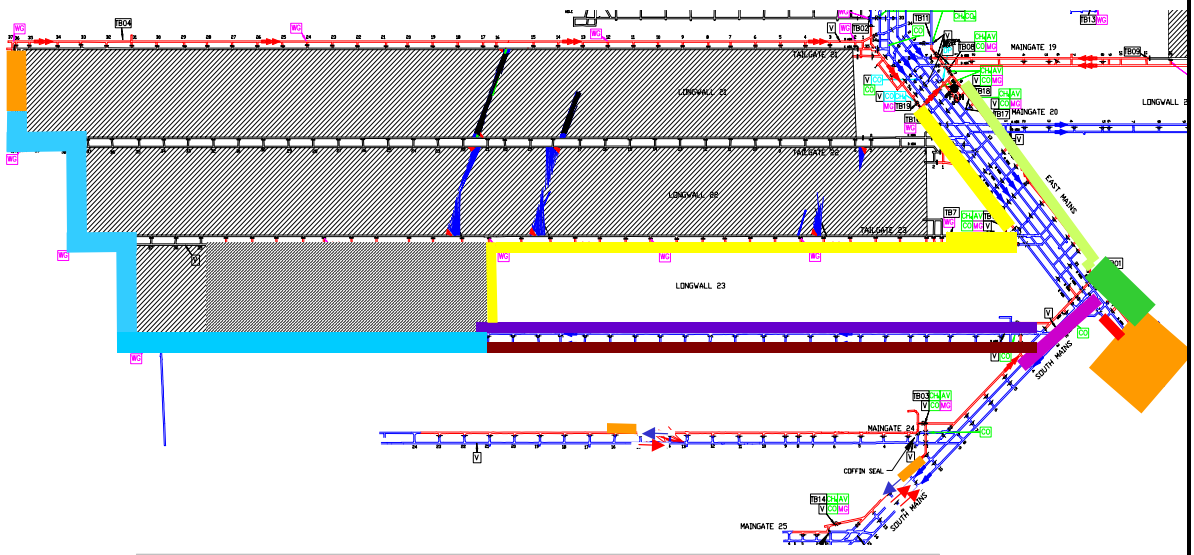
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG	653	20.5	0.01	0.28
	Belt Fire Prod MG23 D HDG	285	20.6	0.01	0.22
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21	396	20.5	0.1	0.26
	TG 23	450	20.1	0.48	0.23
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

T+ 45 Mins



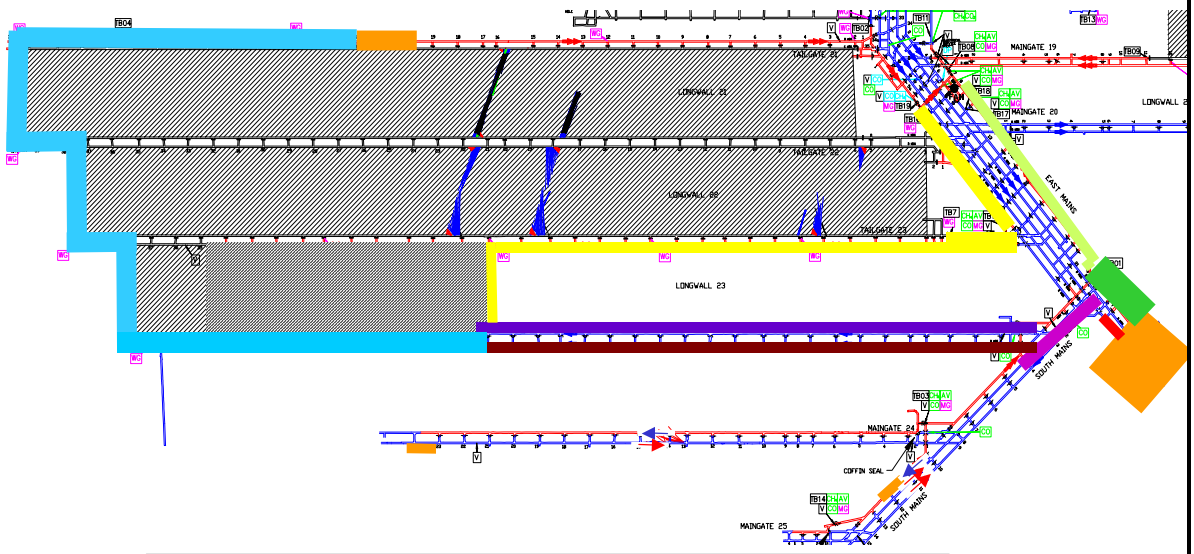
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG	653	20.5	0.01	0.28
	Belt Fire Prod MG23 D HDG	285	20.6	0.01	0.22
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21	396	20.5	0.1	0.26
	TG 23	450	20.1	0.48	0.23
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

T+ 60 Mins



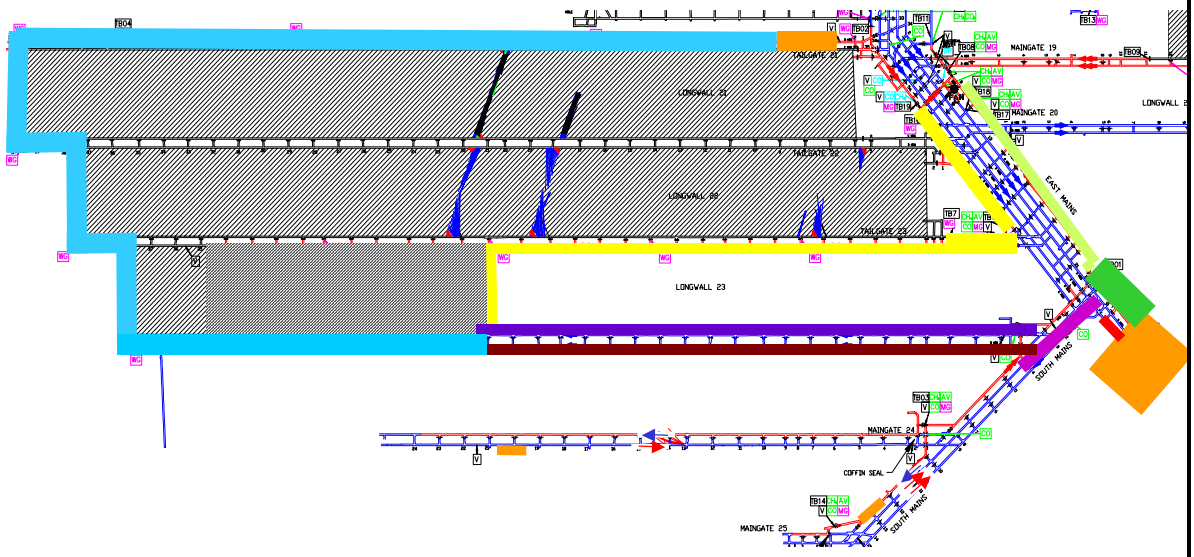
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG	653	20.5	0.01	0.28
	Belt Fire Prod MG23 D HDG	285	20.6	0.01	0.22
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21	396	20.5	0.1	0.26
	TG 23	450	20.1	0.48	0.23
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

T+ 90 Mins



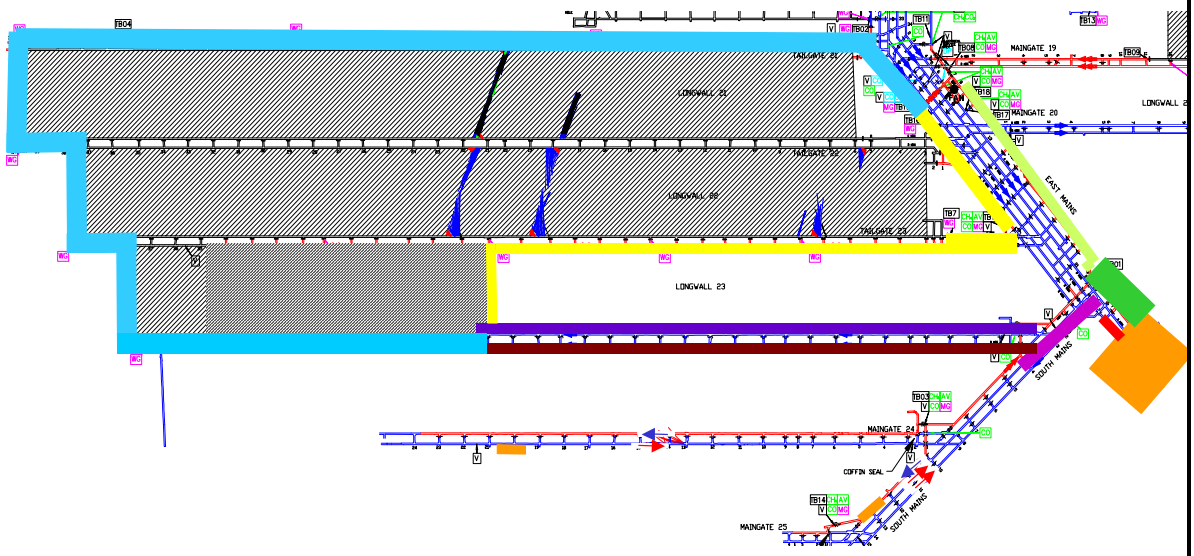
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG	653	20.5	0.01	0.28
	Belt Fire Prod MG23 D HDG	285	20.6	0.01	0.22
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21	396	20.5	0.1	0.26
	TG 23	450	20.1	0.48	0.23
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

T+ 120 Mins



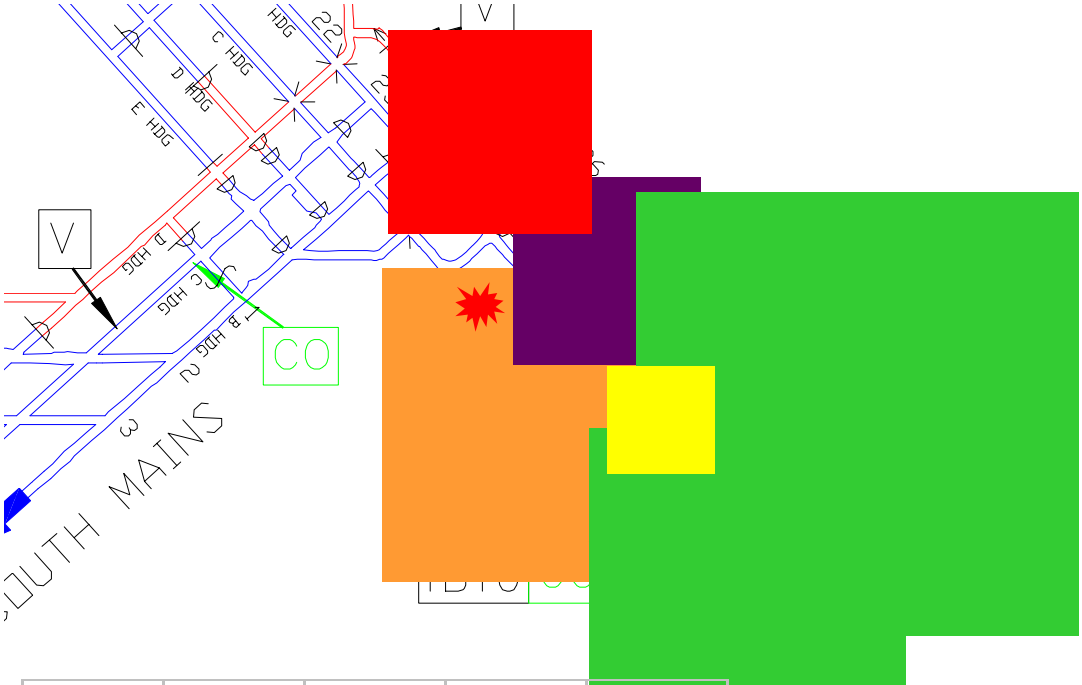
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG	653	20.5	0.01	0.28
	Belt Fire Prod MG23 D HDG	285	20.6	0.01	0.22
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21	396	20.5	0.1	0.26
	TG 23	450	20.1	0.48	0.23
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

T+ 150 Mins



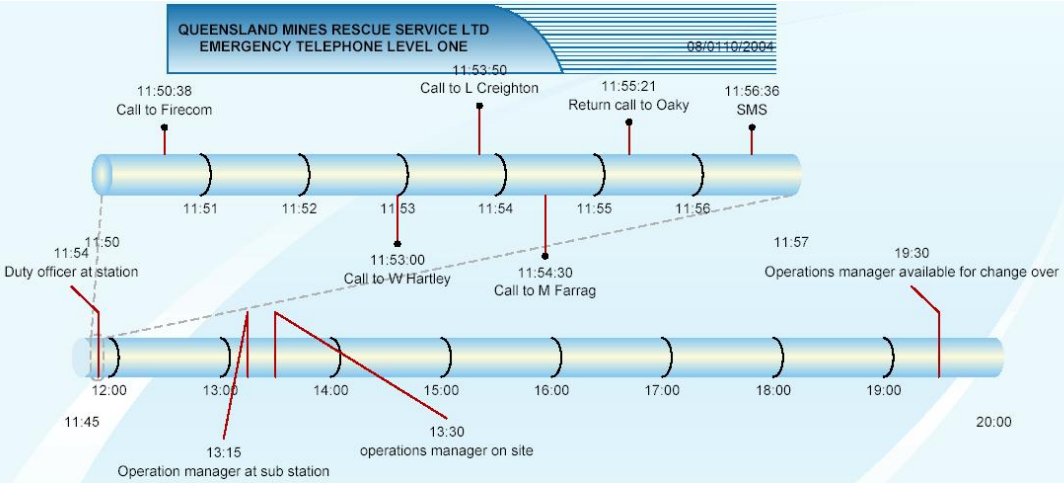
		CO ppm	O_2 %	CH_4 %	CO_2 %
	Explosion Gas	5600	17.34	0.03	2.49
	Methane Fire	3200	20.08	0.04	0.27
	Belt Fire	920	20.35	0.03	0.4
	Belt Fire Prod MG23 C HDG	653	20.5	0.01	0.28
	Belt Fire Prod MG23 D HDG	285	20.6	0.01	0.22
	Belt Fire Prods Inbye LW23 D hdg bleeder rd and TG21	396	20.5	0.1	0.26
	TG 23	450	20.1	0.48	0.23
	East Mains Zhdg inbye 22ct outbye 26	420	20.6	0.02	0.2
	East Mains Zhdg 8-22ct	56	20.7	0.06	0.12

Sandy Creek – Gas Fire (T+180min)



	CO	O_2	CH_4	CO_2
	3200ppm	20.08%	0.04%	0.27%
	240ppm	20.60%	0.03%	0.10%
	1376ppm	20.50%	0.03%	0.12%
	952ppm	20.55%	0.03%	0.11%
	1920ppm	20.40%	0.03%	0.16%

Appendix 3: QMRS Call Out Times



	Affected mine	MAG 2
Number of Team Members that contact was attempted with	40	76
Number of Team Members available	29	53
Number of Team Members NOT available	10	22
Number of Team Members NOT able to be contacted	1	1

Appendix 4: Description of the Incident Control System (ICS)

Now referred to by Queensland Fire and Rescue Service as: AIIMS – Australian Interagency Incident Management System.

Operations Officer Checklist

The Operations Officer is responsible for the management of all operations directly applicable to the primary mission. The Operations Officer activates and supervises organisation elements in accordance with the Incident Action Plan and directs its execution. The Operations Officer also directs the preparation of unit operational plans, requests or release resources, makes expedient changes to the Incident Action Plan as necessary and reports such to the Incident Controller.

- Obtain briefing from Incident Controller.
- Develop Operations portion of Incident Action Plan.
- Brief and allocate Operations personnel in accordance with Incident Action Plan.
- Supervise Operations.
- Determine need and request additional resources.
- Review suggested list of resources to be released and initiate recommendation for release of resources.
- Assemble and disassemble strike teams and task forces assigned to Operations Section.
- Report information about special activities, events, and occurrences to Incident Controller.
- Ensure safety and welfare of all personnel.
- Maintain log of activities.

Planning Officer Checklist

The Planning Officer is responsible for the collection, evaluation, dissemination and use of information about the incident and status of resources.

- Obtain briefing from Incident Controller.
- Negotiate with Operations Officer the allocation of initial attack personnel to incident positions as appropriate.
- Establish information requirements and reporting schedules for all ICS organisational elements for use in preparing the Incident Action Plan.
- Notify Logistics of Planning Section Units activated, including names and locations of personnel.
- Establish a weather data collection system when necessary.
- Supervise preparation of Incident Action Plan (See Action Planning Process Checklist).
- Assemble information on alternative strategies.
- Assemble and disassemble strike teams not allocated to Operations.
- Identify need for use of specialised resource(s).

- Perform operational planning for Planning Section.
- Provide periodic predictions on incident potential.
- Compile and display incident status summary information.
- Advise Incident Controller and Operations Officer of any significant changes in incident status.
- Provide incident traffic plan.
- Supervise Planning Section Units.
- Activate technical specialists as required.
- Prepare and distribute Incident Controller's orders.
- Provide management support to the Incident Controller.
- Prepare material for distribution of incident information to the media.
- Ensure that responsible agency information collection and reporting requirements are being met.
- Prepare recommendations for release of resources for submission to the Incident Controller.
- Ensure safety and welfare of all personnel.
- Maintain log of activities.

Logistics Officer Checklist

The Logistics Officer is responsible for providing facilities, services and material in support of the incident. The Logistics Officer participates in development and implementation of the Incident Action Plan and activates and supervises the units – within the Logistics Station.

- Obtain briefing from Incident Controller.
- Plan organisation of Logistics Section.
- Allocate work locations and preliminary work tasks to section personnel.
- Notify Planning Section of Logistics Section Units activated including names and locations of personnel.
- Assemble and brief Unit Leaders.
- Participate in preparation of Incident Action Plan.
- Identify service and support requirements for planned and expected operations.
- Provide input to and review communications plan, medical plan and traffic plan.
- Co-ordinate and process requests for additional resources.
- Review Incident Action Plan and estimate Section needs for next operational period.
- Ensure Incident Communications Plan is prepared.
- Advise on current service and support capabilities.
- Prepare service and support elements of the Incident Action Plan.
- Estimate future service and support requirements.
- Receive Demobilisation Plan from Planning Section.

- Recommend release of unit resources in conformity with Demobilisation Plan.
- Ensure safety and welfare of all personnel.
- Maintain log of activities.

ICS Action Planning Process Checklist

The checklist provides steps appropriate for use during action planning.

Checklist	Primary Responsibility
• Briefing on situation and resource status	Planning Officer
• Prepare alternative objectives and strategies	Planning Officer
• Select control objectives and strategies	Incident Management Team
• Plot control lines and Division / Sector boundaries	Operations Officer
• Specify strategies for each Division / Sector	Operations Officer
• Specify resources needed by Division / Sector	Operations Officer Planning Officer
• Specify all facilities and reporting locations	Operations Manager Planning Officer Logistics Officer
• Specify availability of facilities, materials and services	Logistics Officer
• Consider welfare, communications, medical and traffic requirements	Planning Officer Logistics Officer
• Approve Incident Action Plan	Incident Controller
• Produce approved Incident Action Plan	Planning Section
• Implement Incident Action Plan	Incident Controller Operations Officer Planning Officer Logistics Officer

Agency Representative Checklist

An Agency Representative is a person sent to an incident by an assisting or co-operating agency who has been delegated full authority to make decisions on all matters affecting that agency's participation at the incident. Agency representatives report to the Liaison Officer if that position has been filled. If there is no Liaison Officer, Agency Representatives report to the Incident Controller. There will be one (1) Agency Representative from each agency allocated to the incident.

- Check-in at the Incident Control Centre.
- Obtain briefing from Liaison Officer or Incident Controller.
- Establish working location. Advise agency personnel at the incident that the Agency Representative position has been filled.
- Attend planning meetings as required.

- Provide input on use of agency resources.
- Co-operate fully with Incident Controller and Incident Management Team on agency's involvement at the incident.
- Oversee the well-being and safety of agency personnel at the incident.
- Advise Liaison Officer of any special agency need or requirements.
- Determine if any special reports or documents are required.
- Report to agency headquarters on prearranged schedule.
- Ensure that all agency personnel and / or equipment is properly accounted for and released prior to your departure.
- Ensure that all required agency forms, reports and documents are completed prior to your departure from the incident.
- Have debriefing session with Liaison Officer / Incident Controller prior to departure.
- Maintain log of activities.

Incident Controller Checklist

The Incident Controller is responsible for incident activities including the development and implementation of strategic decisions and for approving the ordering and releasing of resources.

- Assume control and obtain incident briefing from prior Incident Controller.
- Assess incident situation.
- Conduct initial briefing.
- Activate elements of the Incident Control System.
- Conduct briefings.
- Ensure planning meetings are conducted.
- Approve and authorise the implementation of Incident Action Plan.
- Co-ordinate staff activity.
- Manage incident operations.
- Approve requests for additional resources and requests for release of resources.
- Authorise release of information to news media.
- Regularly report to the responsible agency.
- Approve plan for demobilisation.
- Ensure safety and welfare of all personnel.
- Maintain a log of activities.

Appendix 5: Ventilation and Gas Analysis Information

(as provided by Associate Professor David Cliff)

A key feature of the planning function is the identification of the nature of the incident.

What happened?

Initial reports indicated an explosion – two persons burned.

What type of explosion occurred?

No real attempt was made to identify the location or type of explosion.

The explosion must have occurred somewhere inbye 22 c/t in the Sandy Creek area. Possible sources of ignition were – electrical cables, the transformer and the continuous miner (friction ignition). Possible fuels could be either coal dust and/or methane.

Ventilation analysis

It was recognised that the ventilation inbye 22 c/t was disturbed – the implications of this were not fully explored – no doubt due in part to the pressures on the VO.

Ventilation modifications were as follows:

- Longwall 23 – no change (slight change from 55 to 45.87 m^3/sec indicated by ventilation monitoring device).
- Longwall 24 – ventilation reverses to a very small flow in opposite direction (ventilation monitoring device indicates 0.3 m/s (no indication of direction) – net air flow 5.67 m^3/sec)).
- Longwall 25 – ventilation reduces to a negligible level (ventilation monitoring device indicates 0.1 m/s – net air flow 1.51 m^3/sec).
- Ventilation through Sandy Creek – negligible.
- Rest of mine unaffected.

Gas concentration analysis

- It was important to recognise lag times either due to the tube bundle response times and/or distance from incident(s) and ventilation induced response delays, e.g. non response of tube 1 due to negligible ventilation in Sandy Creek and thus small contribution to return (Z heading).
- Explosion destroyed tube 10 and sensors in Sandy Creek – data indicated fresh air.
- CO sensors on belt full scale of 50 ppm – quickly overloaded by explosion.
- Until personnel entered Sandy Creek there was no accurate assessment of gas concentrations in this area.
- Proper interpretation relies on accurate determination of all significant gases present including particularly hydrogen. This means that the gas chromatograph must be utilised as soon as possible where ratios and indicators need to be determined.

- In addition, where monitoring is inadequate, additional monitoring should be undertaken through boreholes or other access. There is a borehole that could be used for this at 26 c/t in C-Hdg of Sandy Creek.
- Ratios such as the Jones Trickett ratio and the hydrogen to carbon ratio, when applied to the mine atmosphere outbye, a fire or explosion, can indicate the nature of the fire or explosion – provided a full accurate analysis is undertaken.

    - ***Jones Trickett Ratio***

$$JTR = \frac{(CO_2 + 0.75CO - 0.24H_2)}{C_1N_2 - O_2}$$

where: C_1 is the ratio of oxygen to nitrogen in the mine atmosphere outbye the fire/explosion. It is important to recognise whether or not the method of analysis used, separates the nitrogen from the argon or not, if not - the nitrogen concentration will include the contribution from the argon.

JT for a methane explosion / fire should be 0.5 where complete combustion occurs.
JT for a coal explosion / fire should be about 0.8-1.0 where complete combustion occurs.
JT for conveyor belting or diesel fires should be around 0.65 where complete combustion occurs.
JT for a wood fire should be around 1 where complete combustion occurs.

The major issue relating to this ratio is the need to have an accurate oxygen deficiency calculated ($C_1N_2 – O_2$). C_1 is the ratio of oxygen to nitrogen outbye the area of interest. C_1 should be determined from outbye the point of interest and not from the textbook fresh air value of 0.2649. Analysis in atmospheres close to fresh air will be inaccurate and should be undertaken with extreme caution. A deficiency of at least 0.5 is recommended before confidence can be placed in the analysis. Another issue that affects the deficiency occurs when tube bundle data is used for the calculation. The oxygen analyser calibration may be slightly out which will then be reflected in the oxygen deficiency. For tube bundles nitrogen (+argon) is determined by difference. The error in the oxygen calibration causes a complementary error in the nitrogen value.

    - ***Hydrogen to carbon ratio: This ratio reflects the ratio of hydrogen to carbon in the fuel.***

$$HCratio = \frac{(4CH_4 + 6C_2H_6 + 4C_2H_4 + 4(O_2 - CO_2 - 0.5CO))}{(CH_4 + CO_2 + CO + 2C_2H_6 + 2C_2H_4)}$$

where: the concentrations used are seam gas free eg CH_4 and C_2H_6.

HC for a methane explosion/fire should be 4 where complete combustion occurs.
HC for a coal explosion/fire should be about 1 where complete combustion occurs.
HC for conveyor belting or diesel fires should be around 2 where complete combustion occurs.
HC for a wood fire should be around 2 where complete combustion occurs.

Obviously for mixed fires/explosions the ratios will reflect this mixture. The only data point that could be used during this scenario was tube 1. Tube 10 was clearly broken and sampling fresh air, tube 17 was sampling mainly fresh air with a negligible oxygen deficiency.

Data from Tube 1.

Time and date	CH4 (%)	CO (%)	CO2 (%)	O2 (%)	N2 (%) by difference	JT	HC
Normal	0.31	0	0.090	20.57	79.03	0.246	12.57
8/11/2004 13:27	0.27	0.0999	2.53	17.08	79.76	0.632	2.35
8/11/2004 13:57	0.32	0.04202	0.3	20.32	78.72	0.541	3.49
8/11/2004 14:37	0.31	0.042	0.28	20.26	78.81	0.447	5.00
8/11/2004 15:18	0.34	0.042	0.29	20.27	78.77	0.478	4.45
8/11/2004 15:59	0.33	0.04211	0.31	20.27	78.76	0.509	3.93
8/11/2004 16:39	0.36	0.02405	0.15	20.51	78.67	0.414	5.77
8/11/2004 17:20	0.32	0.024	0.12	20.52	78.72	0.335	7.97
8/11/2004 18:00	0.34	0.024	0.12	20.54	78.68	0.362	7.12
8/11/2004 18:41	0.38	0.024	0.14	20.54	78.63	0.433	5.38
8/11/2004 19:21	0.32	0.02403	0.13	20.61	78.62	0.502	4.17

This indicates that the initial incident was from an atmosphere that was probably mixed methane and coal dust; the latter data are more consistent with methane combustion. Note that this interpretation should be treated with extreme caution as apart from the first data point, the oxygen deficiency is very small, hence the very high HC ratio numbers from 16:39 onwards. Methane has been excluded from the HC calculations as there is typically about 0.3 % in the samples from seam emissions.

Another issue that these data underline is the 137 minute lag time on this tube, i.e. events that happened approximately two hours ago are reported to the tube and reported as current.

This underlines the need to obtain data directly from the areas of interest.

The existing monitoring system was sufficient to identify that the ventilation system was substantially modified from normal; there was minimal ventilation in Sandy Creek and areas in the new longwall areas. The use of velocity sensors considerably enhanced the value of the monitoring system. Further, the monitoring data would indicate that in the Sandy Creek area there would be significant concentrations of CO (in excess of 500 ppm). It is not possible to indicate how much higher from available data. Any re-entry risk assessment must consider what the likely concentrations in Sandy creek would be and also what the cause and location of the explosion and fires were. There was no indication from available data that there was any explosion hazard in the mine, though without actually being able to sample the Sandy Creek area, it would be unwise to assume that none could exist – there were methane ranges in this area that may well have been damaged by the explosion.

The initial explosion was probably a mixed fuel explosion initiated somewhere within the Sandy Creek area. The monitoring data indicates that there must be additional events occurring after the explosion, as the return from the Sandy Creek does not return to fresh air.

An indication of the airflow from the area can be obtained by ratioing carbon monoxide concentrations at tube point 17 in comparison to the measured values obtained by the rescue team when it entered the Sandy Creek area. There was a flow of 142 m^3/sec at tube 17 and CO concentration of 30 ppm. In Sandy Creek, the rescue team detected over 1200 ppm. If Sandy Creek is the source of the CO, then it follows that the airflow out of Sandy Creek must be approximately 30/1200*142 = 3 m^3/sec.

This is probably an overestimate of the ventilation quantity, as further into Sandy Creek the concentration of CO would be expected to increase. An estimate of the volume of Sandy Creek would then tell how long it would take to purge, assuming no other sources of gas.

Appendix 6: Planning Team Comments

(as provided by Associate Professor David Cliff)

Observations

What worked well:

- Direction from Planning Coordinator – allocation of tasks, need to focus on key issues. This occurred despite the fact that the Planning Coordinator was a stand in, not normal planning coordinator.
- There was a real sense of urgency in carrying out tasks.
- In general the planning function worked well as per ICS process.
- Regular short IMT meetings – kept to schedule. Mine manager kept good focus and briefness whilst encouraging input.
- Use of duty cards as prompts – checklists.
- Use of scribes and assistants to document information and decisions.
- Use of velocity sensors to confirm airflow patterns and changes to original ventilation.
- SAFEGAS was modified to focus on areas of interest – using revised sampling regime.
- Identification of boreholes – potential supplies of fresh air and innovative communications attempts using water pipe.
- Aims of IMT were clearly and quickly identified. These were regularly revisited and reinforced.
- Proformas were utilised for risk assessments.

What needs improvement:

- Role of Ventilation Officer – only had time to keep gas monitoring data up to date – no time for other functions.
- Access to relevant technical information – detail on gas indicators, mines rescue guidelines, occupational exposure standards.
- SAFEGAS could be tailored to improve functionality compatible with Oaky Creek Operation.
- There needs to be more access to gas concentration information – additional SAFEGAS terminals.
- Understanding of tube lag times and full scale ranges of sensors when making interpretation of monitoring information.
- Use of GC early on to check accuracy of tube bundle data and expand range of gases being detected – allow use of indicators.
- Transfer of information from debrief of crews underground to planning group was inconsistent and some misinformation was received, e.g. fire in 6 c/t – appeared to come from fact that a fire reported from phone at 6 c/t. There was further confusion over whether it was east or south mains. In addition, there was a considerable delay between the debriefs occurring and the information being processed by Planning and IMT.
- Control over number of persons participating in planning meetings – on occasion up to 13 people gathered around planning table including Mine Manager and SSE.

- Inconsistency between SAFESIM screen and Oaky Creek SAFEGAS screens, e.g. button – go to tube on SAFESIM – go to last alarm.
- There was inadequate interaction between the different segments of the ICS process, e.g. Planning – Operations, Planning – Logistics.
- PED system does not allow printing of PED call log – has facility but no printer connected.
- IMT needs to devolve to planning the development of incident action plans and alternatives.
- There needs to be an appropriate system for briefing external stakeholders, such as Industry Safety and Health Representative and Mines Rescue Superintendent.

Recommendations

Data Display / Collection

- Alternative method for collecting and displaying monitoring data.
- Consider additional terminals for access to SAFEGAS – one in IMT and one in Planning area.
- Consider computer projection of mine plans etc in IMT rather than trying to focus on hard copy on table.
- There needs to be a more effective system for collecting and reporting key information – electronic means should be evaluated.

Ventilation Officer

- Appoint assistant to VO responsible for keeping monitoring information reporting up-to-date.

Information / Training

- Update mine library of relevant texts to ensure that it includes, NSW Mines Rescue Service Book – *"Emergency Preparedness and Mines Rescue"*, *"Queensland Mines Rescue Guidelines"*, Gas Interpretation text, etc.
- Additional training/refresher training on the nature of fires / explosions, the gaseous products and the effects on mine ventilation of fires and explosions.
- Consider the importance of identifying the nature and location of the fires and explosion – hence the consequences and likely mine environment, e.g. stagnant atmosphere in Sandy Creek area, air flow patterns past the fires and hence where the products of combustion would report and when.

Mine Monitoring Systems

- The mine monitoring system should include facility to print table of latest data across all locations with date and time across all gases and export to other programs and for email. This would allow error free transfer of data to other persons.
- Mine monitoring systems should ensure that trend graphs include latest data.
- Mine monitoring systems should be include label of tube number as well as location – Oaky Creek mine plans only refer to monitoring points by tube number when doing trending and analysis.
- When a monitor reaches full scale instead of displaying a value it should read full scale.
- The mine monitoring system should have the ability to display trends for more than one point at once.

ICS

- If ICS is to be followed then more training is required in the facets of its operation and implementation, including communications.
- Queensland Mines Rescue Service should to have representation in both IMT and Planning.
- Ancillary cards attached to duty card 1 relating to re-entry planning, re-entry conditions, incident controller tasks, use of mines rescue, mines rescue re-entry considerations and ongoing re-entry considerations should be vested with Planning Coordinator.

Other

- Minesite should have a list of contact details for external support centrally available.

ICS Planning Function – Duty Card Comparison

ICS Planning Officer key features:	Oaky Creek Duty Cards 2 and 2.1	Comment
Briefing on situation and resources status • Initial briefing from Incident Controller		Initial IMT meeting gave details
• Information collection process and validation	**DC2 Task 3, 4, 5, DC2.1 Task 2, 5**	No validation process was established – GC results were not checked against tube bundle – lack of time for VO to carry out this task
• Compile and display incident status summary information	**DC2 Task 2**	Data written onto mine plans, manually extracted from SAFEGAS
• Maintain log of activities		Planning scribe recorded key information
• Maintain log of allocation of resources		No log observed
• Reporting internally and externally including media	**DC 2.1 Task 1, 7**	No process was observed for systematically reporting information
Prepare incident action plan • Identify need for specialist resources and source		Basic plan done by dot points on mine plan Simtars was contacted at 1400
• Prepare periodic predictions on incident potential		No attempt was observed to assess nature of incident
Prepare alternative objectives and strategies	**DC 2.1 Task 3, 4**	Not observed
Select control objectives and strategies	**DC 2.1 Task 3, 4**	A strategy for re-entry and fire fighting was undertaken. Risk assessments for use of mines rescue teams was undertaken.
Ensure safety and welfare of all personnel		Not observed
Organise operation of planning group and supervise	**DC 2 Task 1**	PC delineated functions as per duty card
Provide management support to Incident Controller		PC attended IMT meetings
• Prepare and distribute IC orders		Not observed

Appendix 7: Incident Control System

(as provided by G Dalliston)

OBSERVATIONS

- NO MINES INSPECTORATE RESPONDED TO THE LEVEL 1 EXERCISE.
- Position of Operations Room close to Communications encouraged the flow of information to be channelled straight to Operations.
- Debrief of persons as they came out of the mine was not carried out in an orderly and efficient manner.
- As the mine was new to ICS, the IMT members did not have the discipline to keep their groups focused on their delegated activities and often strayed from within their area of responsibility.
- Scribes recorded information in an efficient manner but this information did not get displayed as critical or otherwise and was not short-listed for reporting back through IMT.
- There was no decision to take bag samples to put through the GC to determine all gas types.
- There did not appear to be any documented Action Plan which was updated at each IMT.
- No trends of gas levels were put to the IMT during the whole of the exercise, only verbal presentation of what gas levels were.
- QMRS did not have a participant in the Operations room until nearly the end of the exercise.
- Mutual assistance from Oaky North and Open Cut to allow people such as sentries to utilise their skills in other areas.
- Mines rescue mutual from neighbouring mines was excellent but directions for where they were to go on arrival at site was missing.
- The emergency response plan including communications positions was not up-to-date.
- The operations team marked on their plan where they understood incidents were but this began to be cluttered.
- Planning group did risk assessment and reported back to IMT but QMRS officer then suggested different method of work (use of CABA teams) are risk assessments necessary to deploy within QMRS guidelines or should this just be a decision for IMT to make.
- Industry Safety and Health Representative was uncomfortable at his designated role in the incident.
- Information supplied to Operations was not verified in most cases.
- The deployment of rescue teams took 6.5 hours after initiation of incident.
- Persons sent to do debrief or undertake other tasks often changed their task after they left Operations Room.

What Worked Well:

- Operations Controller and team kept an accurate log of who was in the mine and their positions during escape.
- Operations began using the white boards but gradually lapsed to only recording the time of next IMT meeting.
- Operations Controller ensured that persons under his control who were issued duty cards understood the requirements of their allocated duties.
- Duty card 3.2 Lamp Room Attendant and 3.2.1 Assistant Lamp room Attendant were well applied.

Improvement Opportunities

- Implement the concept of span of control into each section of the ICS.
- Plasticised plans or use of markers and a legend may be more appropriate in the Operations, Planning and Logistics Rooms.
- There is an opportunity to develop a set format for capture of information, which could include whether the information has been verified.
- The positioning of rooms for the Planning, Operations and Logistics Teams be set up close together and have room for sub teams.
- Look at starting the incident with all groups together (at least Planning, Operations and Incident Control) until sufficient information is available.
- Persons allocating tasks should record task allocated and when task has been undertaken.
- QMRS did not operate through the Operations Team Leader.
- Gas trending should be documented and presented to IMT.
- Tube bundle delay times are excessive.

Recommendations

- Appoint a defined debrief officer who controls debriefs and ensures relevant information is captured and passed to IMT members.
- A system should be developed for guidance or escorting mines rescue mutual response persons to their muster areas once they arrive at the site.
- Training in ICS needs to be done for various levels within the mine as persons who take up positions subordinate to the IMT members will also need to have an understanding of the system to enable the system to function smoothly.
- Incident Action Plans should be developed and documented with time and date on them to enable all persons to be briefed on current situation.
- Operations Room have access to up-to-date gas and vent readings.

Information for the team

- Assessors who are proficient in the area that they are assessing may be able to coach mine teams during the exercise where things appear to be getting out of direction.
- Team members and their organisations need to be committed to the whole exercise.
- An additional meeting with all assessors to ensure a good understanding of the roles and scenario could be worthwhile.

The traditional role of Incident Management Teams was to have all specialists and senior management persons involved in one group for gathering information, interpretation and decision making in an effort to control incidents.

The Incident Control System (ICS) is a change from that focus and was introduced by the Australian Fire Authorities Council for use by emergency services.

The developed ICS must maintain the integrity of the participating agencies' chain of command and information systems, in accordance with their legislation and policies.

The ICS is different in that it breaks the former IMT into smaller specialist groups:

- Planning
- Operations and
- Logistics
-

under the control of the Incident Controller who is responsible for the overall incident management.

The IMT is then made up of the lead person from each of these groups. This enables the IMT to undertake a decision-making and management of the incident role. The difference between outside emergency management and that at mines is the inclusion of statutory and other specialist roles, e.g. Site Senior Executive, NR&M Mines Inspectorate, Industry Safety and Health Representative and QMRS.

Planning: responsible for the collation of incident and resource information and predictions of development of the incident scenario.

Operations: responsible for the management and supervision of workgroups as delegated.

Logistics: responsible for the provision of facilities, services, materials and finance.

The introduction of an ICS requires a disciplined approach, as groups once set up must concentrate on their core functions.

There is a political and economical demand for the management of emergency incidents to be improved. It is therefore essential that industry through mines employ an effective Incident Control System for the management of emergency situations.

The purpose of an Incident Control or Management System is to provide structure and coordination in the management of emergency incident operations. It also helps to ensure the safety of all people involved by enabling the Incident

Appendix 8: Observations/Recommendations Longwall Contractors

(as provided by Mike Carter)

What needs improvement:

- Process broke down once guys hit the surface.
- Need to provide dedicated person to look after surface personnel who have just come out from underground. Suggest also for real scenario having them away from site, e.g. o/cut offices.
- Interviewers should have a plan of the mine workings when conducting an interview.
- Interview process should highlight key personnel to be interviewed first.
- Operations, Logistics and Planning to receive a brief from each other.
- Was there a back-up plan to start sending people off-site in case the emergency ran on overnight?
- What is the back-up for the PED? Is there a place for stench gas in coal mines?

** Incident Action Plan should be developed. This can be used to brief others.

What worked well:

- Clear, simple plan followed for u/g egress.
- Rescuers donned well with limited visibility.
- Covered ground in quick time.
- Interviewer followed outlined plan.
- Logistics meeting was free from clutter.
- Change-over cache stations well highlighted and easy to identify.
- Underground signage excellent and easy to follow.

Appendix 9: Exercise Timeline

Timeline		
Time		**Oaky Creek No 1**
11:05		Longwall 23 crew felt severe air concussion. Ventilation reduced to near zero. Crew "donned" rescuers after trying telephone & proceeded to cribroom at 26c/t. Unable telephone comms, out of service. Senior miner instructed men to pair up before donning Oxy rescuers. Crew pulled stretcher from mobile cribroom & supplied with link line, plan, Oxy K Plus. No vehicle so proceeded along travel road carrying stretcher.
		2 Eastern Mining Services (EMS) personnel at Maingate 23, 16 C/T C-D, felt a severe compression. - Decision made to head to MG23, 15 C/T Communications to find out what has happened. - Upon reaching MG23, 15 C/T Communications discover the Communications is not working and power is off to the section. Continue to walk outbye, travelling in D-Heading travel road.
		RS briefed the electrician and his offsider on their part in the exercise. They were working outbye when they experienced an unknown event that has caused them to suffer major burns, concussion and severe ear problems; a vehicle is available to them. RS asked their intentions.
11:07		MG24 ERZ Controller told crew to gather required equipment including stretcher, first aid kit, blind man sticks, spare Oxy K+ units, and mine emergency plan. ERZ Controller mustered and briefed men on what was known and what they were going to do.
		CO at main fan 200ppm - RT sensor. Acknowledged by Communication Officer - unable to notify outbye ERZ Controller. East Mains Z Hdg 9 to 10c/t, CO alarm 50ppm. Airflow Alarm 142.16m^3/s.
11:08		SE 05 Loop Take Up CO alarm 50ppm. Acknowledged by Communications Officer. MG23 Loop To Up C0 50ppm.
11:10		Eastern Mining Services, 13c/t MG23 smoke and dust enters airways. Crew don self rescuers, rescuers are donned quickly and efficiently and they continue outbye.
11:12		Communications Officer telephoned Ventilation Officer to advise of alarms, PED to ERZ Controllers to check.
11:15		LW23 crew searched for missing crewmember at 25c/t outbye Transformer.
11:20		LW crew found PJB TP15 at 23c/t. Crew searched for missing crewmember at 23c/t TX. Crew loaded stretcher into PJB, turned PJB around and proceeded outbye in "dust".
		MG23 C15-C16 CO 50ppm.
11:25		Communications Officer telephoned fitter to check MG23 high CO levels.
11:25		RS rang 445 from 24 cut through to inform that Goodyear and Ryan, burns victims, have left to go outbye and travel to the surface.
11:27		Communications Officer telephone Mine Manager to report an incident had occurred.
11:30		MG24 crew encountered a dust cloud at 5c/t South Mains. Once in cloud Odalog alarm and SCSR donned. ERZ Controller tried to write a message, but men could not read. Men worked out signal system, gathered around stretcher and moved off.

		Eastern Mining Services crew, B Hdg 1c/t South Mains changed over to Oxy K Plus. Entered East Mains via dogleg, C Hdg 25c/t Walk over rubble from overcast knocked down, look left and right and see a fire glow. Continue on to B Hdg 25c/t and viewed damaged PJB on RHS. Inspected area of PJB for injured persons, none found. One crewman signals to the other by hand for phone. They continue outbye past East Mains B Hdg 24 to 23c/t. At B Hdg 23c/t they look left and see a red fire glow. They continue on to B Hdg 22c/t.
		Ventilation Officer advised Communication Officer that CO sensor at fan could only read to 200ppm and others 50ppm and readings are likely to be higher.
11:31		LW crew unable to telephone surface from 21c/t telephone, unserviceable.
11:32		LW crew stopped at 11c/t cache, unable to telephone surface, no cache taken.
		7 People in Comms room including Mine Manager.
11:35		2 casualties with burns arrived from outbye of Sandy Creek East in communications room. Communications note explosion: Mine Manager declares an emergency. Mine Manager starts handing out duty cards.
11:38		2 Burns casualties arrive on surface.
11:39		Communications Officer telephone Maintenance Manager advised of emergency and to assume role of Logistics Co-coordinator.
11:40		2 Burns casualties taken to First Aid room.
		Incident Management Team formed with Incident Controller, Planning Officer, Operations Officer, Logistics Officer and IMT scribe assigned.
11:41		MG24 crew stopped at 2c/t South Mains oxy station, tried emergency button on phone and DAC, and changed SCSR's. Deputy asked all OK by writing on plan.
		LW crew stopped at 2c/t, found 2 Anderson contractors (AMS). LW crew driver possibly side breathing, he was feeling light headed. He immediately signaled for another to drive PJB.
11:43		Operations Controller instructs the Communications Officer to evacuate the mine. Incident Controller explain Communications Officer, the need to interview all persons leaving the pit and to restrict access to the communications office (was not effective).
		RS met a team coming from the MG area at one cut through. The crew were wearing rescuers and their assessor and MW with them explaining through pictures and explanation what would be the real experience in a situation. This occurred again at the overpass and the underpass. I.e., fire.
11:44		LW crew stopped at panel entry overcast (1c/t), they noticed that the overcast was damaged.
		PED to evacuate the mine, sent to all. Communications Officer recorded 22c/t East Mains explosion inbye popped ears, at 11:20 - 2 men took TP31, crew has no vehicle SCE crew.
11:47		Training Co-coordinator gathers information from the burn casualties. Mines Rescue Co-coordinator telephoned Firecom to engage QMRS.
		LW crew PED message received "Emergency (exercise) Evacuate pit"
		LW crew Changed over to Oxy K Plus at cache B Hdg 1c/t South Mains. Unable to telephone surface, unserviceable. 2 crewmen investigated belt, discovered fire outbye at drivehead.
		Eastern Mining Services crew telephoned Communications Officer from B Hdg 6c/t East Mains. Notified name of persons. the red glow along the belt, their location, the condition of the PJB down towards Sandy Creek East and that nobody was there, and that they were heading outbye from B Hdg 6c/t.

11:48		Training Co-coordinator telephoned the Communication Officer and explained the casualties are badly burnt; ears popped, and could not communicate. Requires a Doctor and Ambulance. Explained the information gathered 'East Mains 22c/t explosion'.
		Photos were shown of damaged PJBcruiser at the South Mains B25 cut through. The crew then moved to B23 and B22 where photos were shown of damaged overcast and a fire in the belt road.
11:51		Site Safety Nurse has arrived at No.1.
11:54		Burn casualties into Ambulance, and on their way to hospital.
11:55		Incident Management Team meet to discuss the information available to date and set goals of - ensure the safety of all persons, determine nature of incident, control and manage situation- prevent escalation.
11:56		Crews were met in the dip outbye of one cut through in "minerunner" vehicles. These crew members were shown the photos of GE box inbye and later, of the PJB They then moved outbye to B21.
11:59		Communications Officer advised that 4 Anderson Contractors at 17c/t B Hdg Main Dips in fresh air and heading out B Hdg.
12:03		Incident Management Team telephoned Senior Site Executive and on way to mine.
12:05		LW crew discovered double doors at B Hdg 23c/t East Mains destroyed, belt/structure destroyed, observed glow at South Mains drivehead. Fire depot destroyed. Minigas reading fresh air.
		LW crew PED received "Evacuate mine"
		These crew members then split and a number of them the moved outbye to 6 cut through, MW accompanied this team.
12:10		MG24 crew reached 6c/t East Mains and contacted surface. Gave update of what they had seen, instructed by Communications Officer to continue moving outbye, along main travel road. Observed a fire in belt road and they were not fighting the fire. The Communications Officer would send a PED if required to move back and fight fire.
		Ventilation Officer came to communication office to obtain information on fan pressures etc.
12:14		Communications Officer Assistant asking Communications Officer whether or not they were to make the decision about fighting the fire or whether that was up to Operations.
12:15		Anderson Contractors at portal. Oaky North Comms and Wash plant notified of emergency.
12:16		Senior Site Executive and Incident Controller visit Operations and ask who has come out of the mine and any info from debrief. Sandy Creek East crew still not contactable. 2 Eastern Mining Services personnel out of the mine. Longwall crew in transit and no further contact yet. Person delegated to do debriefs.
12:19		Incident Controller in communications office ensuring no one extra was in communications office and checking if Inspectorate had been notified.
12:20		Eastern Mining Services crew, arrived at Portal. Notified surface controller that 2 Eastern Mining Services crew have come out from 16c/t MG23. This was passed on to Communication Officer via radio. Information forwarded to operations.
		Communications Officer telephoned the Mines Inspector (available), Electrical Inspector (available), and Site Safety & Health Representative (available).
12:23		LW crew, 3 crewmen investigated fire, 2 men gathered extinguishers from B Hdg 21c/t East Mains pump pod, proceeded inbye along belt road. 1 crewman searched for nearest fire depot outbye along belt (brought to nearest hydrant at 21). Found overcast down at 22c/t, water line down & broken at 22c/t. Viewed a glow along each belt. As they proceeded inbye, minigas started to alarm. Further inbye Minigas read 100ppm & rising, men retreated and assessed water line (isolation point 19c/t, require 6" gate valve to re-pressurise).

12:25		LW crew, 2 men telephone Communication Officer from B Hdg 6c/t East Mains.
12:27		Communications Officer telephoned the Industry Safety & Health Representative (available).
12:28		Communications Officer Assistant isolated underground power.
		Communications Officer telephoned the Site Safety & Health Representative (available).
12:30		Incident Management Team meeting - information misinterpreted about 2 fires; 6c/t East Mains and 22-23c/t C Hdg. No assessment of fire yet, no debrief information to IMT. Incident Controller asks that debriefs be done individually and in a group. Questioning whether there was an explosion inbye 22c/t or do we have 2 fires. QMRS in transit, mines rescue being prepared.
		Incident Management Team - continue to evacuate people out of the mine and debrief. Look at contingency plan. Logistics Co-coordinator to check with Oaky North and other mines for amount of low expansion foam available. QMRS mobilise GAG. Need to assemble CABA fire team to attack fire from intake side.
12:36		Communications Officer telephoned the Industry Safety & Health Representative (answer machine).
12:37		Communications office received telephone call, LW crew going to fight fire.
12:40		LW crew, the 2 crewmen returned from 6c/t telephone. Explained to the rest of the crewmen that transport was on it down to pick them up. 5 crewmen continued outbye along travel road on foot.
12:42		Incident Management Team, Incident Controller asks Operations if they can send a transporter for MG 24 crew.
12:44		Incident Management Team discussion on where fires are and do we have a fire at 6c/t East Mains. Longwall crew would be copping smoke and CO at 22c/t C Hdg fire. Hold off on foam generator, get crew out for debrief.
12:48		Incident Management Team documented and given to all members. Decision 1, transport to MG24 crew. Decision 2, foam applicator and foam readied for underground transport. Decision 3, debrief MG24 crew on arrival at surface. Decision 4, contact Longwall crew asks if there is smoke coming from outbye and if so check 6c/t East Mains.
12:51		LW crew, 6c/t telephone Communications Officer. Relayed information re fire inbye C Hdg 22c/t, no smoke outbye, and all vent appliances inbye B Hdg 22c/t damaged. Equipment required to establish water line for fire fighting (line burst at 22c/t), isolation valve 19c/t, location of fire depot (22c/t), rescue team required to fight fire as high gas. Waited for transport, discussed handing lamps to Lampy to register at pit top.
12:56		LW crew telephoned Communication Officer, advised 2 contractors walking out and gave names, suggested use of turbex to fight fires.
		Communications Officer advised that no one exiting from underground had been debriefed.
13:01		Anderson's personnel still sitting outside, not debriefed.
13:02		Planning Co-coordinator thought there was a second fire at 6c/t East Mains. Communications Officer assured him there was no fire at that point that there was no smoke or gas outbye 22 c/t East Mains.
13:06		Information passed onto Operations, LW 23 crew reported Fire at 23c/t East Mains and 100m inbye "more of a glow then a fire".
13:08		Eastern Mining Services crew, first person debrief interview.
13:15		Incident Controller confirmed with LW crew who were at B Hdg 2c/t East Mains, that there was no fire at 6 c/t vehicle being sent down to get them.
13:16		MW and RS instruct the 10 crew members to don 7 self-rescuers while the others observe them. All members don low vision goggles and the section deputy took the lead with a "walking stick" and team lifeline and moved off.

13:17		MG24 crew on surface all accounted.
13:27		Mine Rescue Co-coordinator updating members on fire at East Mains 21 to 22c/t and not sure of fire East Mains 6c/t. Send a CABA team to investigate 6c/t. High and low expansion foam is being organised by the Fire Officer. Development Co-coordinator updating where crews are underground.
13:34		Mines Rescue Co-coordinator called Open cut Superintendent requiring help with CABA units.
		LW crew reported to Lamp room Attendant. Short discussion with Incident Controller re water line isolation point. Directed to training room for debrief.
13:35		LW crew on surface all accounted for Opps advised of this and that there had been no response from Sandy Creek.
13:38		Sandy creek crew arrived at 6 cut through under low vision goggles and 7 training self-rescuers.
13:40		QMRS Representative onsite (Security Station 1).
13:44		Communications Officer advised that were 25 men waiting in training room for last hour waiting to be debriefed.
13:45		Mines Rescue Co-coordinator taken call from Mine Manager. CABA team ready to go. Six more trainees arrived from North.
13:55		Debriefer came in and gave interview sheets for MG24 crew to fill in as a whole. One sheet per person but all together. At this time it was explained that food was coming and then they would put on some videos.
		Operations Co-coordinator informed Communications Officer 10 men unaccounted.
		CABA team has left to go to No.1.
13:56		QMRS Representative has arrived on site to No.1.
13:58		LW crew leader returned and filled out debrief form with crew, started in one-on-one debrief.
14:01		Sandy creek crew and MW and RS arrive back at the section crib room.
14:03		CO make confused for CO concentration, Real Time point 6 reported as 1432ppm and Real Time point 12 reported 1190ppm.
14:04		Communications Officer Assistant went to Ventilation Officer office to see if he had seen last alarms.
14:22		Mines Rescue Co-coordinator rings QMRS Manager at No.1 two teams of five are active.
14:25		Belt Maintenance Supervisor sent to 26c/t East Mains on the surface to tap on borehole casing.
14:32		Telephone call from Dysart Rescue Station, the rest of Mag 2 has now gone active.
14:40		Communications Officer given list of men not accounted from Sandy Creek East, to PED.
14:43		Belt Maintenance Officer reported to Communications Officer that no response from tapping on borehole
14:53		Industry Safety & Health Representative requested that bag samples be collected from tube bundle system for tubes 1, 15 and 17 and analysed on the gas chromatograph.
15:30		Southern Colliery rescue team arrived onsite.
15:55		MW received a call from 445 that a mines rescue team was about to go active but the could not indicate what was going to happen.
15:57		MW received a call from 445 D Reece that the mines rescue is to set up FAB at 22 cut through.
		Rescue team left to go underground using CABA.
16:40		Communications Officer Assistant advised that the GAG was ready to be transported message passed on to Mines Rescue Co-coordinator.
16:52		CABA team established phone 535 at 20c/t B Hdg East Mains.

17:10		IMT meeting - Rescue team #1 reported to FAB confirmed 10 deceased, marked x on plan. Plan to reventilate Sandy Creek East to allow access by Police & doctor. Plan to reventilate remainder of mine, notify families, oncoming shifts, keep all IMT notes. QMRS required over coming days to verify no residual risk, reviewed goals of IMT, counseling services available for employees, entry to mine only for essential personnel, stakeholders contacted, awaiting 3 contractor's contact details.
17:18		QMRS Manager debrief the three active teams. Team 1 to fight the fire; Team 2 search and rescue; Team 3 on standby. FAB at 21/22c/t. Gas readings low. CABA team at 23c/t. CO 150ppm at fan. Fire depot at 18c/t. Fire burning since 12:00 (electrical/oil maybe). FAB controller name and assistant name. FAB phone number 535.
17:28		A call was received at sandy creek crib room from 445, D Reece that three mines rescue teams were about to be deployed to FAB underground, one team to man FAB one team to fight the fires one team to commence a search.
17:30		Incident Controller informed Communications Officer and Assistant that CABA team had extinguished MG23 jib fire.
		MW received a call from D Reece that fires were out.
17:37		QMRS Team 1 deployed to go underground.
		Industry Safety & Health Representative suggested second fire - methane range source.
17:38		QMRS Team 3 deployed to go underground.
		MW and RS met a two man rescue team wearing CABA a t 24 cut through. Two other rescue men met at 22 cut through.
17:47		QMRS Team 1 arrived at FAB. FAB Controller informed fire out.
		21 cut through, two teams arrived at B20 cut through with BG174 suits ready for deployment and were going through briefing.
17:50		FAB telephone call to Mine Manager, fire is out. Mine Manager, CO is not dropping.
17:59		QMRS Team 2 deployed to go underground.
18:03		Teams finish briefing, one of the teams deployed to fight the fire are now changed to search and are now going under oxygen.
18:05		Further briefings undertaken by standby team.
18:07		A third mines rescue team arrived at 20 cut through FAB
18:10		The first team went active inbye. We were informed that the last arriving team was not going active at this point in time. The active team report through radio comm. very precise information.
18:12		QMRS Team 2 arrived at FAB. Route of travel of Team 1 and route marker to FAB controller.
18:15		RS Team 1 leaves FAB.
18:19		QMRS Team 1 called FAB via radio from 26c/t, collected 10 Oxy K Plus from cache.
18:20		CABA team return to surface.
18:25		QMRS Team 1 reached Irrespirable zone 60m outbye of 27c/t. 30ppm CO. Team Captain completes cylinder readings, next reading 18:40.
18:29		First team report from radio that they had reached sandy creek crib room and have found one person deceased and gave cap lamp number.
18:30		QMRS Team 1 found one deceased miner in crib room (lamp/rescuer number 139). Oxy K Plus cache full in crib room. Captain marked location of deceased on plan. The captain has not observed and noted a full description of the position of the deceased. Searched A11 to B11 stopping SCE.
18:35		QMRS Team 1 found 3 deceased in SCE BC12 to 13c/t (Rescuer numbers 230, 294, 179). CO 1200ppm. Captain marked location of deceased on plan. The captain has not observed and noted a full description of the position of the deceased.

18:37		The FAB coordinator briefed the FAB teams and the coordinator briefed IMT.
18:50		QMRS Team 1 found 6 deceased at Face MG27 D Hdg 1 to 2c/t. CO 400ppm, O2 20.6%, CH4 0.03%. Called FAB, no radio contact.
18:53		The active team reported to FAB that six persons had been found deceased at the face on the continuous miner. They could not record the cap lamp numbers, for the purpose of the exercise, the crew who had been in the section were keen to get out of the mine.
18:55		Communications Officer requested by Senior Site Executive to gather contact details for those unaccounted.
		The teams at FAB were again briefed and the IMT contacted and a report given.
19:00		Active team arrived back at FAB at 20 cut through where further briefing was given.
19:07		Incident Controller informed Communications Officer and Assistant that mines rescue had found 10 bodies.
19:08		QMRS Team 1 Captain debriefed FAB Controller.
19:25		QMRS Teams arrived on surface.
19:30		End of Exercise
19:40		QMRS Captains Reports

Appendix 10: The Emergency Exercise Management Team

David Reece

David is the Senior Inspector of Mines (Coal) with the Department of Natural Resources and Mines based in Brisbane. Some of the duties associated with this role include co-ordination of the annual Level 1 Emergency Exercise, Examiner for Statutory Qualifications - 1st and 2nd Class Certificates of Competency and Deputy's and Open Cut Examiner's Certificates of Competency, and is actively involved in industry based training and competency development committees.

David held various positions within the mining industry before joining the Department in 2002, some of which include Mine Manager at Dartbrook (NSW), Central and North Goonyella Coal Mines. These operations assisted him in gaining knowledge and experience in gassy and geologically complex mines in Queensland and New South Wales.
He holds a Bachelor of Engineering (Mining); Graduate Certificate in Mineral Resources (Risk Management); Managers and Undermanagers Certificates of Competency, Underground Mines Rescue Certificate and Certificate IV Assessor and Workplace Trainer.

Martin Watkinson

Martin is the Principal Mining Engineer at SIMTARS. He is involved in spontaneous combustion training, testing and research, mining research and consultancy and is responsible for the modelling of the scenario and running of the gas simulation programs for the emergency exercises.

Martin was employed as Technical Services Manager at North Goonyella Coal Mine, Senior Mining Engineer and Ventilation Officer at Moranbah North Coal Mine during the initial mine development and longwall installation. Prior to accepting his appointment at Moranbah North, Martin worked for International Mining Consultants for seven years, undertaking assignments in China, India, Iran, Siberia, Tanzania and Vietnam.

Darren Brady

Darren is employed as the Senior Chemist and technical expert on mine gas monitoring utilising advanced chromatography techniques at SIMTARS. Darren has worked with SIMTARS for more than ten years as a key member of the Mine Emergency Response Group that has responded to several mine explosions, fires and spontaneous combustion events.

Darren's present role involves the provision of expert technical advice in mine gas monitoring and interpretation. He travels extensively throughout Australia to assist mines with gas issues. He has developed extensive knowledge and experience in monitoring and interpretation of mine gases during emergency situations and also has extensive practical experience in mine sealing operations.

Darren was also involved in the development of the SIMTARS EZGas ultra fast gas chromatograph system and has worked with mines to functionally implement the system.

Greg Dalliston

Greg has been involved in the mining industry for 31 years, and has gained experience in numerous areas. He started his career as a Cadet Mine Manager with the Queensland Coal Association prior to working in a variety of positions within the industry, including eight years as a mine Deputy.

Greg is employed as an Industry Safety and Health Representative with the CFMEU, a position that he has held for the last eight years.

Some of the roles pertaining to this position have included:

- Participating in tripartite industry committees to develop new safety and health legislation for the Queensland coal mining industry; Member of state and national training committees for the mining industry;
- Conducting safety audits and inspections at coal mines throughout Queensland.
- Investigating serious and fatal mining accidents and assisting the Mining Warden as a reviewer into mining accidents.
- Member of Incident Management Teams at significant incidents, including the 1994 Moura No. 2 disaster;
- Conducting debriefs after incidents and providing critical incident management services; and
- Development of Manager, Undermanager and Deputy Statutory National Competency Standards, including risk management and emergency response.

Seamus Devlin

Seamus holds the position of Regional Manager – Newcastle Mines Rescue with the NSW Mines Rescue Service and has 29 years coal mining experience, including 26 years mines rescue experience.

Seamus has held various management positions in both the NSW and Queensland Mines Rescue Service for the past ten years in Dysart, Blackwater, Collinsville, Hunter Valley and Newcastle and holds an Undermanager's Certificate of Competency and a Graduate Certificate in Risk Management from Monash University.

Ron Stothard

Ron has held the position of NSW District Check Inspector – Northern District with the CFMEU since 1975 and has gained valuable knowledge and experience, including spontaneous combustion in the Greta Seam, Hunter Valley. He commenced working at Hebburn No. 2 Mine, and prior to taking up the position with the CFMEU, worked at various Hunter Valley underground mines.

Ron holds a Third Class Certificate of Competency; Mines Rescue Certificate; NSCA Certificate in Advanced Occupational Health and Safety Management; Occupational First Aid and a Certificate in Working in Confined Spaces.

Associate Professor David Cliff

Associate Professor David Cliff is currently Director of Research for the Minerals Industry Safety and Health Centre (MISHC). Prior to that he spent eighteen months as the Health and Safety Advisor to the Queensland Mining Council and over 10 years at SIMTARS, the last three as Manager, Mining Research Centre where he was responsible for directing the research effort of SIMTARS. He is actively involved in promoting the awareness of hazards in the mining industry, principally focussing on the prevention of fires and explosions and health and safety promotion. He has been actively involved in spontaneous combustion research since 1989 and has investigated a number of mines fires and spontaneous combustion episodes.

David's qualifications include a Bachelor of Science Degree (Honours) from the Monash University, a Doctor of Philosophy in Physical Chemistry from Cambridge University and post-graduate studies in Environmental Studies, Outdoor Education and Business Administration. He is a member and chartered Chemist of the Royal Australian Chemical Institute, Environmental Chemistry Section, a Member of the Combustion Institute, Member of the Safety Institute of Australia, Past President of the Queensland Branch of the Clean Air Society and a Member of the Australasian Institute of Mining and Metallurgy.

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RESEARCH INTERESTS
Fitness for duty of mine workers
Mine fires and explosions
Emergency Preparedness

RESEARCH PROJECTS
Development of a significant incident identification and evaluation system.
The Development of a borehole tool for investigating otherwise inaccessible areas in underground coal mines.
Work Breaks and Rest Periods

Wayne Hartley

Wayne is the State Manager for the Queensland Mines Rescue Service. He has an extensive background in emergency services and his earlier career in the coal industry was at Peak Downs and Goonyella Riverside Coal Mines. His experience from his fire service role as Chief Executive in Queensland, National Council membership and his role at the National Community Safety as chair included influencing the establishment of Australia's response to urban search and rescue.

Brett Capper

Graduated from the University of Queensland with a Bachelor of Engineer (Mining) Honours in 1998 and commenced as a Gradate for Shell Coal, which was later purchased by Anglo Coal.

From 1999 to 2001 worked at the Callide Open Cut Mine in the technical services section. Major roles were mine design, scheduling and business planning. In 2001 posted to Dartbrook Mine and worked as a mine technician on the production crews in both development and longwall sections. Concurrently, worked as the technical services engineer undertaking mine scheduling and planning.

After completing the Graduate Program in 2002 seconded to Anglo Coal's Kayuga project as the Project Mining Engineer. This role included managing contractors undertaking initial in-seam development and construction of the interseam conveyor drift into the Dartbrook workings as well as infrastructure construction and. scheduling for the brown fields operation and its integration into the Dartbrook Mine.

Project handover was completed in late 2003 then seconded to Anglo Coal's Moranbah North Mine initially in the role of Outbye Services Coordinator and later into the present role of Operations Engineer. During this period obtained Undermanager's Certificate of Competency and relieved in roles of Longwall Coordinator and Shift Supervisor as well as undertaking technical operational support for the mine.

David Thomasson

David commenced employment as a trainee surveyor with Queensland Electricity Board for five years, before embarking on a career within the mining industry. He has worked as a Mine Surveyor for ten years at sites such as Curragh Mine, Central Colliery, North Goonyella and now with Oaky Creek No 1. Also spending some time as contract surveyor with North Goonyella and Oaky No.1.
Valuable experiences during this time have included supervising Stone Work contracts, Surveyor in charge of Trunk Extensions, start up phase of Coppabella East project, as well as Gas Drainage, Ventilation and engineering.

Gavin Forsyth

Gavin is a Shift Undermanager responsible for Development Production with Solid Energy New Zealand at the Spring Creek Underground Coal Mine. He has had over 20 years experience in spontaneous combustion prone seams using hydraulic mining.

Gavin attended the exercise on behalf of the Solid Energy organisation who are in the process of reviewing their emergency response systems and adapting emergency response exercises into their operations.

Mike Carter

Mike is a Shift Coordinator at Grasstree Mine near Middlemount. Prior to this position he has worked as Mining Engineer at Southern Colliery and Gas Drainage Engineer at Central Colliery. He holds a degree in Mining Engineering, 1st and 2nd Class Certificates of Competency and is Mines Rescue trained.

Andrew Monaghan

Andrew is the Mine Planning Superintendent at North Goonyella Coal Mine. He has had a wide range of experience in both underground and open cut mining. Andrew has worked as an open cut mining engineer, underground miner and underground mining engineer at Oaky Creek Coal and Mining and Planning Engineer at Cook Resources. He holds a 2nd Class Certificate of Competency as well as degrees in Mining and Mechanical Engineering.

Lyn Kirner

Lyn is an Administration Officer within the Department of Natural Resources and Mines based in Brisbane and has been working in the Safety and Health Directorate for the past 18 months. During this period Lyn has performed various administrative positions, reporting to the Executive Director and the Manager Operational Services and has also assisted in the Explosives & Petroleum & Gas Inspectorates.

Lyn has held various executive level administration roles over the span of her career, including Executive Assistant to the Human Resources Director of Holden Limited, in Melbourne, during her 12 years with the organisation. During this time, Lyn was encouraged to further develop and broaden her administrative skill base, which also included extensive function management responsibilities.

Lyn's broad administrative skill base, including her extensive function/seminar management experience, has enabled her to carry out special projects, such as this role in the Emergency Exercise Management Team.