

T + 20

Queensland Level 1 Emergency Exercise

Crinum Coal Mine

23 July 2003



Queensland Government
Natural Resources, Mines and Energy

TABLE OF CONTENTS

INDUSTRY REPORT	3
EXECUTIVE SUMMARY.....	4
PLANNING AND CONDUCT OF EMERGENCY EXERCISE	5
SCOPE	6
OBJECTIVES	6
INDUSTRY RECOMMENDATIONS.....	7
CONCLUSION	9
MINE REPORT	10
SCENARIO	11
SUMMARY OF INCIDENT RECOMMENDATIONS.....	12
SUMMARY OF FINDINGS	16
CONTROL ROOM OPERATIONS	18
<i>GAS CHROMATOGRAPH RESULTS</i>	<i>22</i>
INCIDENT MANAGEMENT TEAM	23
<i>INCIDENT MANAGEMENT TIMELINE</i>	<i>28</i>
MINES RESCUE – SURFACE	34
SURFACE OPERATIONS	36
<i>SURFACE OPERATIONS TIMELINE.....</i>	<i>37</i>
ESCAPE OF OUTBYE ELECTRICIAN	41
<i>ELECTRICIAN FROM 51 CUT-THROUGH, 'D' HEADING TIMELINE</i>	<i>42</i>
MAINGATE 12 CREW.....	43
MAINGATE 11 OUTBYE	47
MAINGATE 11 PANEL CREW	49
MAINGATE 11 PANEL CREW – REFUGE CHAMBER.....	51
MAINGATE 11 OUTBYE PANEL AND REFUGE FINDINGS.....	55
<i>MAINGATE 11 REFUGE CHAMBER TIMELINE.....</i>	<i>57</i>
INCIDENT SITE	60
APPENDIX 1 – THE EMERGENCY EXERCISE TIMELINE	63
APPENDIX 2 – CRINUM MINE PLAN	71
APPENDIX 3 – EMERGENCY EXERCISE POLLUTANT FLOWS.....	72
APPENDIX 4 – THE EMERGENCY EXERCISE TEAM.....	78

INDUSTRY REPORT

This section of the report is specifically targeting industry application.

EXECUTIVE SUMMARY

The Level 1 Simulated Emergency Exercise conducted at Crinum Mine was initiated by a collision between a Driftrunner that was transporting an acetylene cylinder and an Eimco loader that was cleaning under a conveyor belt and crossing the normal transport route. This collision caused the acetylene cylinder to rupture and ignite diesel in a container on the Eimco and ultimately the surrounding coal. A segregation door between intake transport road and intake conveyor belt road had been left open to facilitate cleaning of the belt drivehead; this allowed contaminants from the fire to spread throughout all intake roadways and thereby affect all areas and personnel in the mine.

Management responded swiftly and ordered the evacuation of all personnel, following a quick appraisal of the situation. The Emergency Management Plan (EMP) for the mine was invoked triggering assistance from surrounding mines, the Queensland Mines Rescue Service and volunteers as well as Industry Safety and Health Representatives and Mines Inspectorate.

Escape of personnel (including contractors, employees and visitors) proceeded in accordance with the EMP. All levels of escape apparatus available at the mine were utilised and assessed. Personnel near the main headings escaped quickly using transport if available and walking if not. Painted jockey goggles (with two levels of tint) were utilised for all personnel to simulate reduced visibility. Personnel in the more distant panels utilised the mine's refuge chambers in order to group, gather information and prepare for escape. The majority of personnel escaped from the mine using their own means and the Self Contained Self Rescuers provided. One crew of mineworkers began fighting the fire on arrival at the location but abandoned attempts when it appeared that they were not successfully combating the fire.

Employees and visitors in the Maingate 11 panel (the most remote section of the mine) remained in the refuge chamber for the duration of the event, and have, in effect, been left there to be recovered by other means at a later time. These personnel elected to remain as a response to both their previous training and the notion that they were safer in the known environment than the unknown into which they were travelling. Mines rescue brigade members entered the mine in an attempt to fight the fire but were unsuccessful due to ineffective equipment and the apparent threat of acetylene cylinder explosion in the fire zone.

The Incident Management Team addressed the combined problems of ensuring the evacuation, gaining information and an understanding of what had occurred so that they could formulate appropriate responses, managing and maintaining control of the mine at all times and communicating with various stakeholders throughout the process, including a very distraught group of people within the refuge chamber underground.

The final situation at the mine at the completion of the exercise was:

- A coal fire still burning at 31 cut-through, 'A' Heading,
- 5 people in a refuge station at 17 cut-through, Maingate 11,
- All mines rescue personnel evacuated from the mine,
- All other personnel safely evacuated from the mine,
- Indicator gases from the fire showing flammable gas levels just below the 80% LEL,
- The GAG inertisation unit at the mine being set up at the portal.

PLANNING AND CONDUCT OF EMERGENCY EXERCISE

Acetylene Cylinder Explosion

It is not unknown for acetylene bottles to explode and partially disintegrate, leaving extensive damage and fire in its wake, due to a range of initiating events. In 1993, an explosion occurred in Sydney causing the death of a truck driver who was simply unloading acetylene cylinders. Fragments were found up to 200 metres away. The explosion was related to the failure of a seamless carbon steel cylinder. There is little information regarding these types of events due to the severity of impact and the resultant lack of witnesses. Experimentation in laboratory conditions is similarly hazardous. It has been found that for an acetylene cylinder to rupture (other than ignition scenarios) only two factors need to coincide – imperfections in the porous mass that fills and inhibits the gas within the cylinder and a low energy impact (small fraction of a joule) at the same location as the porous mass imperfection. This can be further exacerbated by heat, either externally or internally due to the characteristics of the gas itself.

There have been recorded events of ignition and flame external to an acetylene bottle in an uncontrolled manner at a number of mines.

Collision

Collisions between mobile vehicles at Crinum and other underground coal mines are not a rare occurrence. Acetylene bottles are transported in a range of vehicles throughout the mine to the designated work area.

Rationale Behind This Incident

A driftrunner carrying an acetylene bottle to the underground workshop has been left in the sun on the surface whilst the tradesman prepares materials and equipment to go underground. A risk assessment for the intended job has been carried out and all other procedures have been conducted in accordance with the site procedures. The tradesman drives inbye via 'A' Heading to 31 cut-through where a collision occurs with an Eimco EJC 130 that pulls out of a cut-through in front of him. The resulting collision causes the acetylene cylinder to impact against the rack of the utility. At the point of impact on the cylinder the porous mass in the cylinder is flawed (cracked) with a resulting pooling of acetylene. The cylinder explodes, fatally injuring the driver of the driftrunner, and trapping the Eimco driver in the cabin of the machine where he is engulfed by the ensuing fire.

The fire is initially fuelled by diesel from drums carried on the Eimco and coal dust raised into suspension. There is not sufficient combustible content for self-propagation but it does burn with some intensity. The fire eventually spreads to the adjacent ribs where the stonedust has been removed due to the concussion. This fire spreads along the roadway and into the cut-through. The door has been left open in the cut-through allowing an air path and resultant path for the fire. This flow path also facilitates smoke egress in 'B' and 'C' Headings. The first indication of this event is a minor initial spike in CO at the nearest monitoring point.

SCOPE

The intent of this exercise was to appraise the mine's initial and un-aided response mechanisms to an emergency situation requiring evacuation of personnel and control of the incident. The mine will be assessed in accordance with its Emergency Management Plan. This includes the ability to gain mutual assistance from adjacent mines, Queensland Mines Rescue Service and other external expert providers as appropriate. It does not require the actual attendance of these organisations but does require an indication of ability to attend and expected time of arrival at the site. The actual attendance and performance of these organisations will be tested at a later date.

OBJECTIVES

The higher-level objectives for this particular exercise were as follows –

- Assess the use and full operation of refuge chambers, including the surface air compressor and its timely delivery;
- Observe the underground emergency response capabilities with non-mining personnel;
- Audit the self-escape of individuals without the aid of appropriate equipment;
- Fire-fighting knowledge, capabilities and responses;
- Testing of "visually-impaired" object detection device;
- Determine the level of knowledge of acetylene and cylinder characteristics;
- Assess the decision-making protocols and observe the hand-over protocols that enable around the clock coverage; and
- Communication systems.

Some of these objectives are peculiar to Crinum Coal Mine (refuge chamber and object detection device) and a few other operations. The remainder are applicable to all Queensland underground coal mines.

Other objectives are more general and are covered within the audit tools. For instance, the use of Self Contained Self Rescuers (SCSR's), knowledge of escape routes and the escape procedure, use of and effectiveness of duty cards and mines rescue callout protocols and mutual assistance.

INDUSTRY RECOMMENDATIONS

- As a general recommendation the 'Emergency Preparedness Course' as presented by NSW Mines Rescue Service, or similar, provides training in a range of areas of deficiency that have been revealed in this and previous exercises. This is particularly relevant to gas analysis interpretation, fire-fighting, escape protocols and situation awareness.
- There is a further need to establish a clear organisational structure for the management of an emergency, including information gathering techniques, decision making processes and communication mechanisms. These are available within professional emergency services organisations and should be reviewed and considered for adaptation to the mining environment.
- There is insufficient awareness and knowledge of the situation and what is really occurring prior to evacuating the mine. The mere fact of the Level 1 Exercise occurring at the mine almost triggers an evacuation before a scenario has been established. This is counterproductive to all concerned and is not what would happen in reality.
- The use of 'blind man' sticks strategically located throughout the mine can assist personnel who have to evacuate on foot – even if it is just to get them to a lifeline.
- Access to a fresh air 'changeover station' or 'communication station' located a short distance from the working parts of a mine will substantially increase the ability to successfully evacuate.
- Access to transport in an emergency has obvious advantages and should be considered in every Emergency Management Plan.
- The ability of the Crew Leader to communicate to his or her crew and the surface is very advantageous and needs to be considered in an emergency plan. Escape units are currently available that allow this.
- Fire-fighting training needs to include location of outbye equipment and the use of low-expansion foam. It is probable that an underground fire will be extinguished by a person using a fire extinguisher (if detected early enough) – if it is not however; use of water alone may be difficult to extinguish an intense and extensive fire. The location and use of low-expansion foam should be included in training sessions.
- Communications between the Incident Management Team and 'eye witness' personnel from underground needs to be accurate. Consideration should be given to defining the communication flow in an emergency to prevent the 'informal' channels developing during an incident.
- Debriefing of personnel that have evacuated the mine has a critical role that may not be recognised in Emergency Response Plans. Important pieces of information may be available and not identified, delaying decisions by Incident Management Teams.
- Greater emphasis and diligence must be placed on gathering information and understanding, as far as possible, of what is actually happening, who is affected and what equipment is required. This will come from witnesses, rescue teams, gas monitoring and other mine monitoring. This will then flow onto the quality of decisions made and actions taken.
- The Incident Management Team must not become isolated from events. There must be an area of refuge for decision-making and discussion, but the IMT itself must circulate in order to gather information and assess how events and actions are progressing.

- ✦ Training in the donning of SCSR's should include reference to how hard you need to pull the initiation starter and training units should be assessed to see if it is possible to increase force required to start the starter, if possible.

CONCLUSION

Crinum Coal Mine management and workforce responded in a professional and effective manner to the simulated emergency situation that they were faced with. The standard of response is a credit to the organisation and is also acknowledged and appreciated by the Emergency Exercise Management Team.

The following conclusions are drawn in response to the initial exercise objectives:

- The refuge chambers provided an effective and practical safe haven for personnel who were unable to escape. The issue of whether or when to leave a chamber will provide grist for further discussion.
- The evacuation system and the workforce application provided a secure and thorough process for attending to non-mining personnel.
- The majority of underground personnel (except those in the most inbye section – five in total who remained in the refuge chamber) evacuated the mine quickly and safely. Individual workers were also observed to safely escape, though this will depend on an individual's level of knowledge of the mine and clear thinking on the day.
- Fire fighting capabilities were somewhat deficient though it must be recognised that industry focus is primarily on safe escape with control as a secondary consideration. This is not always appropriate, as even low-level control such as closing a ventilation door would assist others to escape.
- The "visually impaired" object detection device was reported to provide good feedback to the user and assisted with the safe traversing of roadways. This device is slightly larger than two AA cell batteries with a small vibrator, that functions when within 1 – 4m of an object, depending on the setting.
- Knowledge of acetylene cylinders and gas characteristics in the general mine workforce and mines rescue trainees is low and requires broad education.
- Hand-over protocols were adequately addressed and complied with by mine management.
- Decision-making protocols were of a traditional nature and not appropriate for emergency situations. Naturalistic or Dynamic Decision Making, as practiced by professional emergency organisations, offshore oil rigs management and defence forces should be utilised for mine emergencies.
- Communication hardware functioned effectively however; human interaction and alternate communication channels compromised this process.

MINE REPORT

This section of the report is applicable for Crinum Mine use and specifically covers extensive details of the full simulation.

SCENARIO

On Wednesday, 23 July 2003 at 11:31 am at Crinum Coal Mine, a collision occurred between an Eimco Loader and a PJB at 31 cut-through, 'A' Main Headings.

The PJB was carrying an acetylene cylinder that exploded on impact due to a flaw in the porous mass within the cylinder. This resulted in the drivers of both vehicles sustaining fatal injuries.

A fire resulted due to the ignition of diesel fuel being carried on one of the vehicles. This fire spread to both vehicles and the surrounding coal.

A double-door segregating 'B' and 'C' Headings had inadvertently been left open to facilitate the cleaning process under the conveyor belt. This allowed thick smoke and irrespirable atmosphere to spread throughout 'A', 'B' and 'C' Headings of the Main Headings. Ultimately contaminating the whole mine inbye of 31 cut-through.

This initiated the Crinum emergency response management system.

SUMMARY OF INCIDENT RECOMMENDATIONS

Control Room Operations

- There needs to be a Duty Card for the Gas Chromatograph Operator.
- There is a need for real time monitors in the egress.
- Additional support is needed for Control Room Operators.
- The holder of Duty Card 21 should be trained in taking bag samples out of the tube bundle system.
- The assistant for Duty Card 1 should not be Duty Card 2.
- There is a need to clarify who disseminates information and improvement of communications between the Control Room and the Incident Management Team.

Incident Management Team

Resources

- Allocate a dedicated scribe as part of the Incident Management Team to keep track of information, discussions, communications and decisions made.
- Allocate a dedicated role to manage the telephone communications to and from the Incident Management Room. This would increase key IMT personnel focus on incident management.
- The removal of the IMT phones to an area adjacent to the IMT should be evaluated as this may also reduce interruptions to the IMT function.
- The Incident Management Room needs to be central enough to allow close contact but sufficiently remote to facilitate effective meetings.

Roles

- Evaluate the Duty Card responsibilities of the Ventilation Officer given the value to the IMT process of the Ventilation Officer in addition to his ventilation responsibilities.
- Examine the current Duty Card 24 roles and responsibilities to ensure that they are appropriate for the effective operation of the IMT in light of the experience gained during this exercise. Areas of particular concern include maintaining adequate focus on key issues and progressing decisions and actions.

Situation Awareness

- Greater emphasis and diligence must be placed on gathering information and understanding, as far as possible, of what is actually happening, who is affected and what equipment is required. This will come from witnesses, rescue teams, gas monitoring and other mine monitoring. This will then flow onto the quality of decisions made and actions taken.

- The Incident Management Team must not become isolated from events. There must be an area of refuge for decision-making and discussion, but the IMT itself must circulate in order to gather information and assess how events and actions are progressing.

Decision Making

- Improve the structure of the decision making processes without unnecessary formality.
- Ensure that all personnel are aware of the ground rules for effective IMT operation prior to an incident being initiated.

Communications

- Establish a structured communication process and responsibilities for use during an incident, particularly the aspect of gaining information from eye-witnesses. It is important that the IMT is fully and accurately briefed on all issues including underground communications and debriefing information.
- Agree on the method of communication / data capture, then practice so that it becomes the way that it is done in an incident. White boards and a data projector were available for use, but both were under utilised.

Gas Analysis and Interpretation

- Gas analysis via the chromatograph must be obtained as early as possible to facilitate adequate information, and therefore, decision making.
- Improve familiarity with gaseous products of fires and various materials.
- Increase awareness of the limitations of the various types of monitoring systems.

Documentation

- The Duty Card system should be reviewed to evaluate the documentation requirements.
- Standardise and structure the documentation of all aspects of the IMT process including effective collection of documentation.

Mines Rescue Operations

- The phone available in the rescue room needs provision to ring STD or mobile numbers.
- Determine and allocate a more practical marshalling area for mines rescue teams. There were no provisions for trainee's to sit and rest whilst awaiting instructions to go underground.
- All instructions from the Incident Management Team should be in a written format – verbal instructions are often misinterpreted.
- Mines Rescue Trainee response numbers need to be looked at – is there sufficient numbers to respond to an incident with 12-hour rosters, people living away from town, etc.

- Duty Card 13 has no provision for this person to commence calling for assistance from adjacent mines if unable to fulfil initial requirements. If Duty Card 13 is instructed to ready two teams and is unsuccessful from his own mine he currently has to seek permission to engage assistance from other mines.
- Emergency contact numbers should be included in this Duty Card to allow for assistance for any additional mines rescue equipment needed for an incident to be called.

Surface Compressor/Refuge Chamber Operations

- The system for availability of compressors and generators for refuge chambers needs to be assessed for its effectiveness.
- Compressor air quality checks must be periodically conducted prior to air being delivered to the refuge chamber.
- Accurate signage must be provided for surface locations.

Mineworker Escape

- Walking canes ('blind man' sticks) should be provided for all escaping personnel at strategic locations.
- Changeover stations of some description should be incorporated in areas where there are groupings of workers. These assist with communication, calming of personnel and provide a less pressured environment in which to think and plan an escape strategy.
- An effective method of communication needs to be developed for personnel wearing breathing apparatus.
- Better understanding of fire fighting foams and the system of application is needed.
- A thorough debriefing of all eyewitnesses must be conducted as soon as possible to gain valuable information.

Refuge Chamber Operation

- Conduct familiarisation sessions for all personnel on the workings of various functions available within the refuge chamber, for example, where to activate air supplies, the operation and use of the CABA air supply, etc.
- Supply plans of a scale that enables personnel to read and identify details.
- Establish communication to and from the refuge chamber through a centralised contact point.
- Noise levels inside the refuge chamber should be monitored and decreased where possible, as continual exposure appears to have psychological effects on persons in the refuge chamber.
- Alternative storage locations should be examined for the Long Duration Oxygen units within the refuge chamber, for example, under the seating.

Underground Fire Fighting

- Mine ventilation must be considered when fighting underground fires. The first mine crew who attempted to fight the fire had to obtain equipment from the belt road depot which required moving through ventilation doors. These doors were left open when the crew evacuated the area, which would have changed the course of the ventilation circuit. There is a need to communicate the requirements for ventilation control to the workforce during refresher training as required by the Fire Management Plan.
- The industry, in general, needs to become familiar with the hazards associated with the use of acetylene cylinders, as well as the specific requirements for gas cylinders, underground, for the purpose of fire control. It was observed that very little is known about the characteristics of acetylene cylinders in an emergency underground.
- Audits of fire fighting equipment at depots and stations must be carried out with the resultant equipment replenishment as required. Equipment was missing from the surface fire station when sought for use in the emergency underground.
- Mines need to improve the level of skill in the area of tactical and strategic fire control methods. This requires a higher level of skill of the nominated Fire Officer for the mine and a flow on to the training of employees in fire fighting methods. There have been substantial changes made in the way fire fighting is conducted – this has not translated to the underground coal sector.
- Mines Rescue personnel must adhere (within reason) to instructions issued from the Incident Commander.

SUMMARY OF FINDINGS

1. Failure of one of the Crinum 30-minute Fenzy units – a leak where the breathing bag connects around the valve box. This type of failure is uncommon and will require further investigation.
2. There was an inability of the ERZ Controller to communicate with the crew and / or surface after leaving the refuge chamber. An escape unit that allows communication, for example, CABA set for the crew leader would be beneficial.
3. The crew focussed on 'self-escape' and whilst there is nothing wrong with this, there were some things that could have been done to assist other person's in the mine. Looking for outbye personnel while travelling in a vehicle and closing the open doors at 31 cut-through could have substantially increased the potential for other personnel to successfully escape.
4. Communications from 'eye witnesses' to Control and then to IMT is critical. The communication will always take place but it is the quality that will change in each case. It needs to be remembered that the person giving the information needs to ensure that the person receiving the information fully understands all messages. Terminology or slight word changes may change a person's perception of the meaning.
5. Fire-fighting training needs to include location equipment and the use of low expansion foam. It is probable that an underground fire will be extinguished by a person using a fire extinguisher, if it is not however, use of water alone will be difficult to extinguish something that is still burning. The location and use of low expansion foam would be a relatively simple addition to the current training regime.
6. The system for personnel tagging was quite sound – could this be developed further to assist in locating personnel quicker in the case of an incident? This may help in understanding the cause of the incident (where was everyone at the time) and evacuating people from certain locations.
7. The lack of accurate information in the first 30 minutes of the incident was telling, especially later on after the mine was evacuated. The most critical time in managing a mine fire is the first 30 minutes. Our lack of experience in fighting actual fires and learnings from these events is a point worth discussion. How do we train to achieve this level of knowledge?
8. The evacuation plan was not followed when rescuers were donned on the first notification of 100 ppm CO at 32 cut-through, 'C' Heading. Then further on when the mine was evacuated and personnel were allowed to enter the mine in transports to pick up evacuating crews. This may be due to the mindset that this is an exercise and the objective is to evacuate the mine to the surface?
9. Leaks in the compressed air piping need to be repaired as to reduce the noise level within the refuge chamber.
10. Alternative storage locations should be examined for the Long Duration Oxygen units within the refuge chamber, for example, under the seating.
11. Personnel were adequately trained in the donning of the belt worn Fenzy's and in the locations of the refuge chambers.
12. The pace at which the crew was able to proceed when wearing self-rescuers and 'heavy smoke' goggles was most impressive – the use of white walking sticks appeared to greatly assist.

13. The changeover from SSR 30's to SSR 90's was accomplished effectively but a number of persons did not get the SCSR starters to activate and thought they were ineffective until shown by assessors that they needed to pull harder.
14. The method of indicating the place at which to move into the intake roadway to get to the refuge chamber ("wind chimes and boom net") worked well.
15. The lifeline provisions appeared to work well but feedback from the crew whilst wearing the 'heavy smoke' goggles indicated that they were unable to distinguish between the yellow and white reflective droppers – the droppers were, however, visible.
16. Access to the refuge chamber – no differentiation between door handles to the man door and the main door. Differentiation may assist in selecting the correct door.
17. Mine workers assumed that the atmosphere was not contaminated on entering the refuge chamber and took their SCSR's off when hearing compressed air running.
18. The space inside the refuge chamber appeared 'tight' for more than some 6 or 7 personnel. Equipment was not stored out of the way e.g. long duration oxygen units were laid out on the bench in the refuge which got in the way of persons using the refuge for long periods of time and the seating was uncomfortable after a period of time. Leaks in the compressed air piping need to be repaired as to reduce the noise level within the refuge chamber.
19. Communication to the refuge chamber by way of DAC and "wobbler" phone were difficult to hear at times, but in addition to the mine phone there were three different systems of communication available from the refuge. The phone was able to connect to outside, which in the case of a real emergency, could cause result in some difficult situations.
20. The 'whistle warning' for the mine air supply faces directly up – this promotes an ideal trap for dirt / moisture that may have contributed to the failure of the warning during the use of the refuge chamber during this exercise.
21. Refuge crew had a lot of time to consider the issues but this was with the varied and limited information that they were given or had sought out. They were able to get information from a number of sources including – Borehole Station, Control, Surface Controllers office, Mines Rescue Coordinator and the IMT. This could be a problem as some of the information may not be correct or verified or if particular sections of the incident control do not pass on regular information.
22. Persons in the refuge chamber had a vested interest in devising ways to escape and at times we waste some of our valuable resources. Consideration should be given to communication to and from the refuge chamber to capture some of these ideas.

CONTROL ROOM OPERATIONS

Assessors: Martin Watkinson & Darren Brady

RECOMMENDATIONS

1. There needs to be a Duty Card for the Gas Chromatograph Operator.
2. There is a need for real time monitors in the egress.
3. Additional support is needed for Control Room Operators.
4. The holder of Duty Card 21 should be trained in taking bag samples out of the tube bundle system.
5. The assistant for Duty Card 1 should not be Duty Card 2.
6. There is a need to clarify who disseminates information and improvement of communications between the Control Room and the Incident Management Team.

OBSERVATIONS

- On acknowledgement of first alarm, the Shift Controller was called to the Control Room and advised within one minute. The alarm of 100 ppm CO at C32 was then conveyed underground by PED almost immediately. The Underground Mine Manager was paged to contact control and arrived within a couple of minutes on the initial CO alarm. As CO levels continued to increase the Control Room Operator quickly observed and commented when the displayed CO concentrations reached 200 ppm – this meant that the sensor was off scale and that the true value could be higher.
- Nature and cause of the incident was very quickly, but incorrectly, deduced with no one voicing any opposition to the likely cause of the CO contamination. This deduced cause was used to determine the best means of egress. This initial deduction of the event remained with many as still present throughout the entire exercise, even after the true cause had been identified.
- Movement from the Control Room, the initial place of collection of those involved, to the IMT room prior to the Incident Management Team forming (preparation of the room was initiated through duty cards and requests from the Underground Mine Manager and the Ventilation Officer), took place within 30 minutes of the advised evacuation. From this time onwards access to the Control Room was kept to a minimum.
- Diverting external calls from the Control Room, other than those initially advised to the Telephone Operator was a very effective way of minimising an unnecessary overload of communications.
- Under the Duty Card System, Duty Card 1 appoints a person to assist in the handling of communications. In this case Duty Card 2 was the assistant, but not necessarily the best choice – someone just as a scribe / runner also assisting when inundated with different communications channels may be better suited.
- A lot of communications were actually handled by Duty Card 2, not Duty Card 1 and may be better to increase the communications work of the Monitoring Room Co-ordinator as this is their every day role they are used to handling a high volume of communications.

This may minimise decisions being made and passed on without going through the Incident Management Team. Monitoring Room Officers are a channel for communication that is required. Information needs to get through to the Incident Management Team. Maybe consideration should be given to sending a copy of notes to the Incident Management Team for review. Maybe too much workload taken away from the person best equipped to handle it.

- The acknowledgment of alarms by the Ventilation Officer, although decreases the workload of the Monitoring Room Co-ordinator, maybe compromises input from the Ventilation Officer in the Incident Management Team.
- Contacting persons as per internal emergency contact list occurred rapidly.
- Tube bundle point 13 was the first tube bundle point to indicate a problem with a carbon monoxide concentration acknowledged at approximately 12:32 pm. This follows advising underground personnel to exit the mine via this Heading. At approximately 12:52 pm a PED message was sent to advise all inbye of here that they should go to a refuge chamber.
- Although the likelihood of a second fire being present after the identification of the real incident was rated as highly unlikely this information was not conveyed to the control room with information leaving the control room still inferring that there was a second fire.
- The authorised vehicle going down to pick up the Maingate 12 crew at pit bottom (at the request of the crew) via 'C' Heading – when Portal Security checked with Control it was quickly realised that the vehicle had gone to the wrong portal and was instructed to travel via 'C' Heading. Good checking in place averted what could have been a big problem.
- Maybe another Duty Card required for the Gas Chromatograph Operator (could be Controller until back up arrives). Bag samples in this scenario were being collected every 15 minutes from just one location, with a run taking about 4 minutes to produce results, however, if sampling regime increased to several sample locations this places a big demand on Duty Card 1 effectively taking them out of the role of Duty Card 1.
- A bag sample was not taken from the tube bundle system from Tube 13, A39 until over an hour and a half after the point went into alarm. This limited the information on explosibility of the mine atmosphere. The person designated to collect the bag sample had never taken a bag sample before and needed to be instructed in the procedure to do so. However, in saying this, the procedure on taking a bag and displayed in the tube bundle hut is very clear with excellent pictures and instructions and the sample was collected correctly.
- Running of the bag samples was done in a very professional manner with thorough checking of each analysis with all channels checked for peak identification and integration.
- Gas results from analysis of bag samples collected were given directly to the Maingate 11 crew in the refuge chamber via the Control Room. Immediately after doing this Duty Card 1 questioned whether that information should come from the Control Room or via the Incident Management Team.
- Comments by Duty Card 1 that it would be a very different situation if the same scenario had of happened on night shift. Almost immediately the Shift Co-ordinator was in and advising / assisting. Followed by the Underground Mine Manager and Ventilation Officer.
- Very quickly Duty Card 1 realised that the readings for CO on the real time monitoring system were off scale and therefore could be higher than those being read.
- A decision was made very early with regards to means of egress. Need to consider real time monitoring for all possible means of egress to provide immediate information on best way out.

- Got mind set very early where problem was which was initially incorrect and for some this “problem” existed throughout the entire exercise even after identifying the true incident.
- Duty Card 1 did an excellent job running gas samples, all channels were checked for peak identification and integration.
- Data generated from gas chromatograph given to the Incident Management Team as printouts in reality could be copied as a Segas Professional file, saving issues with the Ventilation Officer entering data again in the Incident Management room. ***Note: during the exercise the data generated by the gas chromatograph was not really the correct results, if the analysis of the was bag provided correct results reflecting the status of the mine at the time of the sampling were supplied.***
- There is a need to clarify who disseminates information.
- On one occasion a phone call to the 101 extension was missed. This phone was that being used by external parties organising mines rescue personnel and supplies. The audible ring tone on this phone was low.
- Lots of external resources put on stand-by – were they ever taken off stand-by?
- Persons entering the Control Room were very effectively kept to a minimum.
- Initially the Control Room informed that all REB employees were out of the mine. Were later advised that three REB employees were unaccounted for and still in the mine. Only one of these had a PED which messages were sent requesting them to contact Control – no reply was received. It was quickly identified by Duty Card 1 that the three missing persons could be in the vehicle.
- Should significant PED messages, such as instructing evacuation, be sent at least twice after some time break to overcome problems with lamps off when travelling in vehicles?
- Good support / mutual assistance in place with neighbouring mines with regards to mines rescue personnel, standby gas analysis (gas chromatograph) and fire fighting supplies.
- Duty Card 2 (Shift Controller) spent the majority of his time in the Control Room when his duty card stated that he would operate from the Shift Services Co-ordinators office. He also assumed the role as telephone assistant for Duty Card 1 and was not necessarily the right person for the job. A better person could be utilised for information recorder / transfer only – that is no decision-making needed.
- Unsure whether the information given to Control was being passed on in full to the Incident Management Team.
- Duty Card 21 (Monitoring Systems Co-ordinator) had good knowledge on the fixing of the monitoring system but limited knowledge on the operation of Safegas software. He completed all tasks required of him in his duty card but this could be extended to include some operational support such as the collection of bag samples. When the bag samples were required to be collected the person collecting them needed to be instructed in the procedure to do so.
- Duty Card 10 (Lamp Room Attendant) ensured that the Lamp Room was well secured. Obtaining information on who was still underground was delayed and may have been due to the non-involvement of the longwall crew and the underground Assessors. No observation was made of tagging any lamps, but as they would all have been unaffected the requirement for this is questionable.

CONCLUSIONS

- ✦ Timing of the exercise changed the workload / demand on Duty Card 1 and could have been a lot different if, for example, the situation occurred on night shift. Not the same response from Underground Mine Manager, Ventilation Officer, etc. There may be issues with handing out high level duty cards.
- ✦ Good support / mutual assistance in place with neighbouring mines with regards to mines rescue personnel, standby gas analysis and fire fighting supplies.
- ✦ Got a mine set very early where problem was which was initially incorrect and for some this “problem” existed throughout the entire exercise even after identifying the true incident and the likelihood of the fire at the transformer dismissed by the Incident Management Team.

GAS CHROMATOGRAPH RESULTS

Component (%)	Tube 13 A39 Bag 1 23/7/03 2:11 pm	Tube 13 A39 Bag 2 23/7/03 2:54 pm	Tube 13 A39 Bag 3 23/7/03 3:16 pm	Tube 13 A39 Bag 4 23/7/03 3:31 pm	Tube 13 A39 Bag 5 23/7/03 3:42 pm	Tube 13 A39 Bag 6 23/7/03 3:58 pm	Tube 13 A39 Bag 7 23/7/03 4:14 pm	Tube 13 A39 Bag 8 23/7/03 4:29 pm	Tube 13 A39 Bag 9 23/7/03 4:45 pm	Tube 13 A39 Bag 10 23/7/03
Hydrogen	2.05	2.300	2.2812	2.1812	2.0814	2.0721	2.0681	2.0659	2.0553	2.0573
Oxygen	8.18	8.0500	8.0411	8.0512	8.0312	8.0321	8.0711	8.1121	8.1042	8.1242
Nitrogen	77.9045	77.7020	77.7271	77.7259	77.8134	77.7893	77.7893	77.6358	77.6358	77.5459
Methane	0.135	0.1260	0.1222	0.1078	0.1055	0.1050	0.1055	0.1045	0.1053	0.1057
Carbon Monoxide	3.1	3.0500	3.0460	3.1033	3.1078	3.1068	3.1092	3.1102	3.1112	3.1172
Carbon Dioxide	8.6	8.7200	8.7311	8.7811	8.8111	8.8451	8.8542	8.9912	8.9921	9.0003
Ethylene	0.030	0.0280	0.0242	0.0239	0.0241	0.0260	0.0255	0.0254	0.0244	0.0248
Ethane	0.022	0.0240	0.0271	0.0256	0.0255	0.0236	0.0242	0.0249	0.0256	0.0246

Component (%)	Tube 2, E1-2, Bag 10 23/7/03, 4:48 pm
Hydrogen	1.1329
Oxygen	13.2912
Nitrogen	78.9040
Methane	0.0573
Carbon Monoxide	1.7056
Carbon Dioxide	4.8923
Ethylene	0.0078
Ethane	0.0089

INCIDENT MANAGEMENT TEAM

Assessors: David Cliff & Russell Uhr

RECOMMENDATIONS

Resources

- Allocate a dedicated scribe as part of the Incident Management Team to keep track of information, discussions, communications and decisions made.
- Allocate a dedicated role to manage the telephone communications to and from the Incident Management Room. This would increase key IMT personnel focus on incident management.
- The removal of the IMT phones to an area adjacent to the IMT should be evaluated as this may also reduce interruptions to the IMT function.

Roles

- Evaluate the Duty Card responsibilities of the Ventilation Officer given the value to the IMT process of the Ventilation Officer in addition to his ventilation responsibilities.
- Examine the current Duty Card 24 roles and responsibilities to ensure that they are appropriate for the effective operation of the IMT in light of the experience gained during this exercise. Areas of particular concern include maintaining adequate focus on key issues and progressing decisions and actions.

Situation Awareness

- Greater emphasis and diligence must be placed on gathering information and understanding, as far as possible, of what is actually happening, who is affected and what equipment is required. This will come from witnesses, rescue teams, gas monitoring and other mine monitoring. This will then flow onto the quality of decisions made and actions taken.
- The Incident Management Team must not become isolated from events. There must be an area of refuge for decision-making and discussion, but the IMT itself must circulate in order to gather information and assess how events and actions are progressing.

Decision Making

- Improve the structure of the decision-making processes without unnecessary formality.
- Ensure that all personnel are aware of the ground rules for effective IMT operation prior to an incident being initiated.

Communications

- Establish a structured communication process and responsibilities for use during an incident, particularly the aspect of gaining information from eye witnesses. It is important that the IMT is fully and accurately briefed on all issues including underground communications and debriefing information.
- Agree on the method of communication / data capture, then practice so that it becomes the way that it is done in an incident. White boards and a data projector were available for use, but both were under utilised.

Gas Analysis and Interpretation

- Gas analysis via the chromatograph must be obtained as early as possible to facilitate adequate information, and therefore, decision making.
- Improve familiarity with gaseous products of fires and various materials.
- Increase awareness of the limitations of the various types of monitoring systems.

Documentation

- The Duty Card system should be reviewed to evaluate the documentation requirements.
- Standardise and structure the documentation of all aspects of the IMT process including effective collection of documentation.

OBSERVATIONS

Resources

- The room was well equipped. There were plenty of whiteboards. A current mine plan was displayed on the wall.
- The room was remote from other surface activities and the control room. This appeared to cause some communication difficulties.
- In general, the use of electronic projection of the mine environment monitoring system was effective.
- The Incident Management room contained two phones as well as network connections.
- Runners were sourced from the contractors on the surface.
- The Incident Management Team were unable to divert incoming external phones calls to the switchboard.
- There were adequate copies of mine plans, but access was limited.

Roles – Duty Cards

- The appointment of the assistant to the Underground Mine Manager (not the Technical Assistant) was effective in initiating Duty Card 17, freeing up the Underground Mine Manager for the incident management process.

- The participation of the Ventilation Officer in the IMT process reduced his ability to focus on ventilation and gas analysis issues, however, he was an important contributor to the IMT. The Ventilation Officer reported updated gas concentration data to the rest of the IMT as he received it. The Ventilation Officer did ensure that surface facilities were monitored for irrespirable gases. *(Duty Card 18 requires the appointment of a competent person to monitor and report on the gas levels through the monitoring system, this role was assumed by the Ventilation Officer himself).*
- The Facilitator's role was assumed by several IMT members during the incident, including the Ventilation Officer, Underground Mine Manager and Site Senior Executive, depending on the issue and who was the proponent. *(Duty Card 24 specifies that the Facilitator should co-ordinate the recording of all information entering and leaving the IMT room – this was not always evident. He did initiate the co-ordination of the changeover of IMT members and did ensure that the IMT remained aware of gas concentration changes).*
- In general, the IMT maintained integrity and co-opted other persons as appropriate. However, these persons should have left the IMT once their role relevance had concluded.
- The Technical Assistant did not appear to execute the full requirements of his Duty Card, for example, maintain the Underground Mine Manager log or draft the regular briefing notes – on several occasions this function was carried out by the Facilitator. In addition to this occasion, briefings of the Site Senior Executive were carried out by several other people.

Decision Making

- In general, decision-making did not follow any formal process.
- The Facilitator did not establish ground rules or maintain the integrity for decision-making.
- Typically an idea was proposed and agreement was sought. Generally this was not a documented process. The lack of documentation reduced the ability to objectively identify the issues and evaluate options.
- For major issues, the Underground Mine Manager actively sought agreement from all IMT members.
- There was never overt conflict within the IMT, however, divided views did emerge that could have been reconciled.
- The lack of formality in decision-making contributed to delays in making decisions.
- The Facilitator did attempt to identify goals and maintain focus on them during the course of the incident.
- It appeared that decision-making was most effective when the IMT consisted of only the core members.
- The decision-making process did not identify data acquisition requirements and additional needs.
- Prior to the IMT formally convening, the Facilitator wrote up basic rules for the IMT to follow but never publicised them – similarly a white board labelled 'parking lot' was not used.
- The Underground Mine Manager initiated brainstorming for dealing with priorities, but then did not revisit them with the IMT.

NB from Exercise Coordinator – decision-making in emergency situations is markedly different to normal decision-making processes. There is generally no time for proposing and assessing options and so on. There is a greater requirement for clear information, accurate appraisal of the situation, clear and positive actions based on a combination of facts and experience and all lead by the Incident Commander. This is not the time for courteous committee interaction and management protocols.

Documentation and Data Recording

- There did not appear to be any systematic process for collecting or recording key information, decisions or actions. For example, debriefing records were not being forwarded to the IMT until the Underground Mine Manager specifically requested them.
- Some whiteboard information was printed or photographed.
- There was no time log of the incident event.
- Manual data entry of the gas chromatograph results was required. This resulted in several temporary mistranslations of information.
- In general, tracking of personnel underground was adequate, though the probable location of the three missing persons was not identified until well into the incident. There was some difficulty in separating assessors from personnel participating in the exercise.
- It provide difficult to identify what vehicles were underground or which might have been involved in the incident. This was particularly true for vehicles being used by contractors.
- The Mine Principal Hazard Management Plans were not accessed.

Communications

- The IMT were not aware of the communications occurring outside the IMT, particularly between Control and underground.
- The IMT did not establish clear communication protocols. Some written instructions were issued and some events were logged, but not all.
- For several hours IMT were not aware that Blackwater Mines Rescue Station had responded to the incident.
- Answering of the phone was very disruptive to the IMT process – this did not appear to be any one persons responsibility.
- Attempts were made to provide regular briefings to all workers. (*Duty Card 8 specifies briefing notes be prepared every 20 minutes – on occasion over three hours had elapsed between notes being issued*).
- IMT did not automatically receive copies of the debriefings in a timely manner.
- Communications between the IMT and the Mines Rescue Co-ordinator were inadequate.

Gas Analysis and Interpretation

- Insufficient recognition was made of the limitations of the continuous monitoring system and the potential for gas concentrations to significantly exceed full-scale readings. No cognition was made of the locations of the sample points and potential for damage or misreading.

- The absence of methane in the mine atmosphere was interpreted as an indication of non-explosibility of the atmosphere – supported by the “999” ppm CO. There needs to be greater familiarity with the products of various types of mine fires.
- Early recognition would have precipitated use of the gas chromatograph significantly earlier than it was used.
- There was no recognition within the IMT that there were ignition sources underground outside the fan area – mine electricity was still active.
- Data entry and interpretation difficulties were encountered in using SEGASPRO. In generating graphs execution errors appeared. On several occasions current data could not be trended without exiting the program and restarting it.
- More attention could have been paid to the geographical spread of gas concentrations throughout the mine and delay times in the gas analysis compared to being present in the mine, tube lag, tube cycle time and gas chromatograph analysis all caused delays.

Refuge Bay

- The IMT did make detailed analysis of the situation of the personnel in the refuge bay.
- The IMT were cognisant of the difficulties being faced by the personnel within the refuge bay and likely feeling of those persons.
- The IMT carried out an informal assessment of the risks that they faced if attempting to exit the mine.
- The dichotomy between keeping the refuge chamber fully informed and “spooking” them caused considerable difficulty within the IMT. This was not helped by information being passed to the refuge bay directly by the Control Room without the knowledge of the IMT.

INCIDENT MANAGEMENT TIMELINE

TIME	LOCATION	EVENT	COMMENTS
11:31	Control Room	Incident Initiation.	
11:42	Control Room	Audible siren commenced.	
11:43	Control Room	Duty card initiation commenced.	
11:46	Control Room	<ul style="list-style-type: none"> White board details of duty card holders completed. Underground Mine Manager instigated IMT and informed Mines Inspector (who was already on site) of incident. 	<ul style="list-style-type: none"> Fire at boot end of trunk 1 belt Offscale CO Mine evacuation in progress Crews driving out.
11:47	IMT	IMT convened but not yet in designated room.	
11:50	IMT	Underground Mine Manager informed that acetylene cylinder had been taken down the pit.	
11:52	IMT	<ul style="list-style-type: none"> Underground Mine Manager arranged for two people to go down the pit and investigate incident. Person under Underground Mine Manager delegation performing duty card calls – state wide emergency. 	Statewide emergency was vague – no idea of what a coal mine was – phone line was of poor quality
11:55	IMT	<ul style="list-style-type: none"> Underground Mine Manager briefed on people in refuge chamber, crew coming out from Maingate 12 will try to find the fire site. Acetylene cylinder assumed to be in workshop at 44 cut-through. Ventilation Officer raised the issue of smoke throughout the mine – focus on real time sensors, tube bundle put on hold to focus on Maingate 10 return in Control Room – used SPRO to trend. Access to Control Room restricted and guarded. 	
11:58	Duty Card 17	Call made to Mines Rescue Superintendent at Blackwater.	
12:00	Duty Card 17	Call made to Industry Safety and Health Representative. Will arrive in 45 minutes.	
12:05	Duty Card 17	Call made to both Site Safety and Health Representatives for their involvement.	
12:07	Duty Card 17	Call made to Site Senior Executive and message regarding incident left.	Confirmed later.
12:08	IMT	Two persons ready to go underground. Underground Mine Manager ordered fire-fighting pod to be readied.	
12:10	Duty Card 17	All appropriate calls completed.	
12:15	IMT	<ul style="list-style-type: none"> IMT Room set up for SEGAS by IMT Facilitator. Duty Card 24 started to layout various whiteboards – ground rules. 	
12:17	IMT	Underground Mine Manager updated IMT about Maingate 11 boot end.	
12:18	IMT	<ul style="list-style-type: none"> Mines Inspector asked if anyone has seen the fire. Underground Mine Manager announced that Maingate 12 crew were going to stop on the fresh air side of the fire and inspect. Expected them to be at the belt transfer of 32 cut-through by now (they were in a vehicle). Maingate 11 crew accounted for and exiting the mine. 	

TIME	LOCATION	EVENT	COMMENTS
12:22	IMT	Underground Mine Manager started to define his own goals. Facilitator interrupted to set up the goals of the group.	
12:23	IMT	Ventilation Officer arrives and updates IMT very briefly.	
12:25	IMT	Discussions held over Maingate 12 crew not out of the mine, what gas readings and communications were available. <i>(IMT Facilitator answers the phone – initial discussion regarding sending someone from the surface to inspect the fire – conversation then stopped).</i>	
12:28	IMT	Underground Mine Manager noted that an acetylene cylinder had been taken underground. Group returned to surface discussions and formed a plan to investigate.	<ul style="list-style-type: none"> Decision making process very brief and not exhaustive – risk assessment? Underground Mine Manager driving process, but sought consensus.
12:32	IMT	<ul style="list-style-type: none"> Ventilation Officer received first tube bundle data – A49 cut-through contaminated. Underground Mine Manager discussed the significance of acetylene. Ventilation Officer commented on CO : CO2 ration – not seals. Discussion on stopping doors may be open / down sending smoke into A Heading. 	
12:36	IMT	Underground Mine Manager sends Ventilation Officer to get a plan of the area for the investigation group.	
12:37	IMT	<ul style="list-style-type: none"> Ventilation Officer answered the phone and was informed that there was a vehicle on fire at A30 cut-through. IMT all stopped and did not send crew. Ventilation Officer stated the fire was at 31 cut-through boot-end. <i>Assessor asked to confirm if it was real.</i> 	
12:38	IMT	Site Senior Executive requested 12:45 update in his office.	
12:42	IMT	Ventilation Officer updated information – smoke in 33 cut-through: assume on fire and crew is fighting vehicle fire.	
12:43	IMT	Ventilation Officer removed second fire as unlikely.	
12:44	IMT	Questions were asked about what we know about fire / oxy acetylene – this focussed the group. This was enough to decide that fire-fighting may be a high risk – pull back to high expansion foam.	
12:46	IMT		<i>Facilitator has not said anything for 20 minutes. Not focussing the group.</i>
12:46	IMT	Confirmation received that no-one from underground was out yet.	
12:50	IMT	<ul style="list-style-type: none"> Underground Mine Manager updated situation – too big to fight rib on fire, it is a mines rescue job. Industry Safety and Health Representative arrives in IMT – no formal briefing given. 	
12:51	IMT	<ul style="list-style-type: none"> Underground Mine Manager asked Mines Rescue Co-ordinator to prep for high expansion foam fire-fighting. Site Senior Executive formally updated on situation and told that no-one underground was out of the mine. 	

TIME	LOCATION	EVENT	COMMENTS
12:55	IMT	Underground Mine Manager initiated listing on whiteboard of who is where and referred to estimated time to escape from prepared plan.	
12:58	IMT	<ul style="list-style-type: none"> All persons in IMT looking for information – status of people and mines rescue response. First communiqué to troops prepared. 	<i>IMT Facilitator acting as scribe – has not activated ground rules.</i>
13:00	IMT	Ventilation Officer answers call from refuge chamber – held five people who were told to sit tight.	
13:02	IMT	<ul style="list-style-type: none"> Ventilation answers phone. Underground Mine Manager is writing list of names on whiteboard – focussed on names and where. 	
13:06	IMT	Phone call made to refuge chamber to confirm details.	<i>IMT stopped giving full details of situation to prevent alarm.</i>
13:08	IMT	Underground Mine Manager leaves room to find names of persons in underground crews.	
13:10	IMT	IMT consists of Mine Manager, Mines Inspector, Site Senior Executive, Technical Assistant and no Facilitator – discussion continued on fire-fighting.	
13:11	IMT	Underground Mine Manager updating the Dysart Mines Rescue Superintendent about response.	<i>Underground Mine Manager believes there has been no response from Blackwater Station.</i>
13:13	IMT	<ul style="list-style-type: none"> Facilitator focussed group on goals – queried adequacy of information. Ventilation Officer responded that transformer is an unknown fire – but unlikely. Some discussion held about segregation breach at approximately 31 cut-through – double doors mentioned. 	
13:20	IMT	Mines Rescue Co-ordinator given a broad scope of what is ahead. 11 people on site and four on their way. Fire fighting plan is being scoped as a group and authorised. He confirmed the gas detection and left IMT at 13:30.	
13:30	IMT	<ul style="list-style-type: none"> Site Senior Executive asked if anyone had assessed the fire yet. Underground Mine Manager stops and answers the questions. Many people leave IMT – only the core left. Decent discussions on actions start. 	<i>Good verbal briefing from memory.</i> <i>There was some confusion due to assessors / visitors out of the exercise in determining status of underground numbers.</i>
13:40	IMT	Maingate 12 Deputy briefs IMT on his observations of fire – coal and rib.	
13:42	IMT	Underground Mine Manager requested a Tricketts Ratio to determine nature of fire. Ventilation Officer informs IMT that Tube 13 is in a steady state – no CH ₄ , 10% O ₂ , CO 1000ppm. Fire is as big as it gets – now will just spread along the ribs.	<i>Underground Mine Manager never received the requested Tricketts Ratio information.</i>
13:50	IMT	<ul style="list-style-type: none"> Ventilation Officer and Underground Mine Manager held a discussion on gas at the request of the Mines Rescue Co-ordinator using only tube and real time data. Non-explosive atmosphere. Mines Rescue Co-ordinator's query of CO% was enough to prompt a bag sample for this area. 	<i>Ventilation Officer did not recognise the significance of full scale tube CO – 999ppm could be much higher.</i>
13:55	IMT	<ul style="list-style-type: none"> IMT Facilitator – second general briefing prepared. Mines Inspector requested that the GAG be mobilised. 	

TIME	LOCATION	EVENT	COMMENTS
14:00	IMT	<ul style="list-style-type: none"> Discussed relief for Industry Safety and Health Representative and Mines Inspector. Underground Mine Manager getting REB Contractor update – Superintendent + 1 man on hose branch. 	<i>Spending effort to determine where the 3 REB guys might be going.</i>
14:07	IMT	Phone call from Dulcie – confusion over authorisation of PJB Ferry car driver.	
14:10	IMT	<ul style="list-style-type: none"> All off-site people notified eg., Centrecare, Police, Hospital. Mines Rescue Co-ordinator gave an update on Team 1 going underground and Team 2 on surface. Blackwater mines rescue about 20 minutes away with 6 drums of foam. Discussion held on explosibility – still based on tube bundle data. Ventilation Officer told Mines Rescue Co-ordinator – don't do anything yet ventilation wise until a risk assessment is done; reiterated that levels no where near explosive. 	<i>Site Senior Executive came for personnel update then stayed in IMT room. Had no involvement until some discussion on triggers about access to the site / withdrawal.</i>
14:20	IMT	Facilitator started to re-focus group on priorities and goals – discussion moves to triggers for evacuation (driven by explosibility though they don't think explosive).	
14:30	IMT	Discussion about regular update to refuge chamber – to control their stress levels.	<i>No times or responsibilities set.</i>
14:35	IMT	Discussion about to focus on search and possible ventilation changes.	
14:38	IMT	<ul style="list-style-type: none"> Underground Mine Manager requests details of crew debriefs (<i>no debriefs had yet arrived in IMT room</i>). Ventilation Officer answered phone to confirm that GAG would be mobilised in 90 minutes and arrive about 16:00. 	
14:40	IMT	First signs of relaxation, maybe because of steady state situation and first time that most information has arrived.	
14:45	IMT	Ventilation Officer receives first bag samples from GC – Tube 13.	<ul style="list-style-type: none"> <i>No urgency – straight to SEGAS to plot.</i> <i>Notes 2% H₂ – not good.</i> <i>IMT not focussed on gas in return of fire – Mines Rescue Co-ordinator is.</i>
14:50	IMT	Problem with Cowards and gas sample but Ventilation Officer intuitively recognises that it is > 50% LEL.	
14:52	IMT	<ul style="list-style-type: none"> Communications to fire site and rescue team and high expansion foam job. Ventilation Officer orders another immediate bag from Tube 13. 	<i>Poor communications link.</i>
14:55	IMT	Ventilation Officer sums up bag sample data – approaches 80% LEL.	<i>Ventilation Officer recommends evacuation of fire crew – no one backs up the decision.</i>
15:00	IMT	Ventilation Officer makes decision to withdraw mines rescue personnel.	<i>Nodded agreement from others.</i>
15:05	IMT	<ul style="list-style-type: none"> Discussion held about what information to relay to refuge chamber. Blackwater Mines Rescue Superintendent arrives and asked for a gas update. 	<i>Mines Rescue Superintendent not briefed on any other issues.</i>

TIME	LOCATION	EVENT	COMMENTS
15:10	IMT	Site Senior Executive enters IMT for an update. Facilitator updates him outside the IMT with the news on explosibility.	
15:15	IMT	IMT learns that refuge chamber crew know that the gas concentrations are approaching explosive limit.	
15:20	IMT	<ul style="list-style-type: none"> Underground Mine Manager contacts refuge chamber to reassure of actions and for them to stay put. Ventilation Officer returns to IMT with 2nd GC sample. 	
15:25	IMT	Mines Rescue Co-ordinator instructed by Underground Mine Manager to go underground and fight the fire – information from Bag 2 realised and order countermanded. (<i>Ventilation Officer made this decision</i>).	
15:32	IMT	Discussion on fire gases near the ignition source. Ventilation Officer raised fall of roof and recirculation issue – suggested reducing ventilation then discounted the idea.	
15:35	IMT	GC Bag 3 reported – same as previous results.	
15:40	IMT	Mines Rescue Team 1 Captain reported that he closed double door but smoke was still coming back against ventilation.	
15:45	IMT	<ul style="list-style-type: none"> Underground Mine Manager and Ventilation Officer – all decisions are heading towards using the GAG or vehicle escape. Site Senior Executive enters IMT and informs that next of kin have been notified. 	
15:55	IMT	<ul style="list-style-type: none"> IMT collecting facts together to tell the refuge chamber of situation and options for escape or stay – recommended to stay. 	<i>Ventilation Officer detailed risks – good stone dusting, diesel unlikely to operate and will have to walk four pillars; gases stable and ventilation normal.</i>
16:00	IMT	<ul style="list-style-type: none"> Underground Mine Manager contacted refuge chamber and reassured crew of situation. Bag 5 came in and Ventilation Officer entered the results in SEGAS. 	
16:05	IMT	Ventilation Officer summarised existing GC data – steady.	
16:06	IMT	<ul style="list-style-type: none"> Underground Mine Manager stated that doors were open at 30 cut-through. Facilitator became involved and re-focussed group again on the three goals – fire; refuge and missing persons. Facilitator initiates brainstorming using the options to attack the fire – on job and GAG using positive and negative listing. 	<i>At this time the Site Senior Executive became the Facilitator.</i>
16:15	IMT	<ul style="list-style-type: none"> Discussion continues whilst on the phone to the refuge chamber – information could be heard by person in the refuge chamber – especially the negatives. Group decision to use the GAG – positives and negatives inconclusive. 	
16:20	IMT	Underground Mine Manager sums up the data – stable < 80% LEL. Seems keen to put rescue teams back into fight the fire. Only the Ventilation Officer is against this decision. – they are safer in the refuge chamber – he cannot guarantee the stability of the fire, especially roof fall.	
16:25	IMT	Ventilation Officer checks real time sensors but does not observe that 'C' Heading sensors are reading fresh air.	<i>Information is submerged in a mass of data.</i>

TIME	LOCATION	EVENT	COMMENTS
16:30	IMT	Gas sample 7. Mines Rescue Superintendent asks why the smoke is backing up 'C' Heading. Missed fact that it is now fresh air – did not refer back to the monitoring.	
16:35	IMT	There are now 11 people in the IMT room all involved in brainstorming – (@ rescue team, 1 Mines Rescue Coordinator, Site Senior Executive, 5 IMT, DC8 and DC24).	<i>No Ventsim done during the day. Recognised that use of GAG would require a ventilation change.</i>
16:38	IMT	Bag 7 arrives as before. IMT settles on GAG only.	
16:42	IMT	Mines Rescue Co-ordinator ordered to get the second GAG on site.	
16:45	IMT	See issue as whether refuge chamber crew would listen to advise and stay. Group decided to give them all the information.	
16:50	IMT	Underground Mine Manager updates the refuge chamber – including gas concentrations and frankly tells them to stay or die. Told them if they leave the refuge chamber they had no chance of reaching the surface.	
17:00	IMT	<ul style="list-style-type: none"> Maingate 12 crew informed the Underground Mine Manager that they would stay in the refuge chamber. Facilitator wants a briefing out to site before GAG is started. 	
17:05	IMT	GAG commencement order given.	
17:08	IMT	Decide to put remote tube down to monitor the GAG – to use Mines Rescue Co-ordinator's Maihaks.	
17:10	IMT	Underground Mine Manager / Site Senior Executive to do a briefing of the site.	
17:17	IMT	<ul style="list-style-type: none"> Regroup from briefing – focus on what are the next actions – Ventsim for 1 fan and reduced Q for GAG. Gas monitoring for change in situation of mine ventilation. GAG operations – TARP on GAG off. 	
17:25	IMT	Ventilation Officer makes first statement of 'C' Heading is clear and fully segregated. Plans for location and actions at fire and persons retrieval from refuge.	

MINES RESCUE – SURFACE

Assessor: Steve Bullough

RECOMMENDATIONS

1. The phone available in the rescue room has no provision to ring STD or mobile numbers – this should be available in this area.
2. Determine and allocate a more practical marshalling area for mines rescue teams. There were no provisions for trainee's to sit and rest whilst awaiting instructions to go underground.
3. All instructions from the Incident Management Team should be in a written format – verbal instructions are sometimes misinterpreted.
4. Mines Rescue Trainee response numbers need to be looked at – is there sufficient numbers to respond to an incident with 12-hour rosters, people living away from town, etc.
5. Duty Card 13 has no provision for this person to commence calling for assistance from adjacent mines if unable to fulfil initial requirements. If Duty Card 13 is instructed to ready two teams and is unsuccessful from his own mine he currently has to seek permission to engage assistance from other mines.
6. Emergency contact numbers should be included in this Duty Card to allow for assistance for any additional mines rescue equipment needed for an incident to be called.

OBSERVATIONS

- Duty Card 13 – Mines Site Co-ordinator was issued in a timely manner and he was in total control of this area at all times.
- The Mines Site Co-ordinator immediately commenced calling out rescue trainees as soon as directed to by the Incident Management Team. For those people who were unable to be contacted, messages were left on answering machines advising them of the incident and asked them to contact the mine as soon as they received the message.
- The Mines Site Co-ordinator was in constant contact with the Surface Controller and the Incident Management Team providing updates and seeking additional information. He commenced preparing underground rescue equipment and sourced additional assistance from mine site rescue trained personnel to assist.
- The Incident Management Team were advised by the Mine Site Co-ordinator that he was unable to acquire two active teams from the Crinum personnel available and was instructed to contact Kestrel Coal Mine to seek their assistance. Kestrel responded immediately, providing four men from the mine and contacting four more in Emerald who responded accordingly.
- All equipment was ready for use prior to the instructions given to proceed underground, including high expansion foam making equipment. Two underground man transporters and a MPV were under his control at all times.

- All trainee's that responded were made fully aware of any information the Mines Site Co-ordinator received and the hazards that could be encountered.
- The Mines Site Co-ordinator remained in constant contact with the Blackwater Superintendent by phone, providing information that was made known to him until his arrival on site.
- When it became known that stocks of high expansion foam may be insufficient the Mines Site Co-ordinator advised the Incident Management Team and commenced ringing neighbouring mines for assistance in providing additional foam if possible – both Kestrel Coal Mine and Oaky No. 1 Coal Mine offered to provide more foam.
- The Mines Site Co-ordinator handled himself and the situation at a very high standard, and it is undoubtable that his experience as a rescue trainee himself assisted him in this situation. He was constantly seeking and providing information, reassuring all trainee's and had excellent control of this area.

SURFACE OPERATIONS

Assessor: Bruce McKinnon

RECOMMENDATIONS

1. The system for availability of compressors and generators for refuge chambers needs to be assessed for its effectiveness. The review needs to consider points 1 – 4 of the below stated observations and the learnings and observations of the Duty Card holders involved in the exercise.
2. Compressor air quality checks must be periodically conducted prior to air being delivered to the refuge chamber.
3. Accurate signage must be provided for surface locations.

OBSERVATIONS

- No immediate availability of second or third compressors and generators from designated suppliers of this equipment is of concern if more than one refuge chamber is needed to be utilised long term. (*Duty Card 19, relief and replacement discussed alternatives for sourcing compressors and generators from Gregory Mine and exploration drillers on-site*).
- Signage to boreholes and huts at access gate was damaged and pointing in the wrong direction.
- After-cooler not available in borehole shed as required.
- No utilisation of appropriate vehicle to access borehole area (boreholes are located on a blacksoil plain) and vehicle not appropriate to deal with unforeseen circumstances that arose (sourcing of alternate after-cooler).
- Quality of surface delivered air by compressors at the borehole were not checked prior to that air being connected to the refuge chamber. The only quality check was conducted by someone in the refuge chamber who had a portable gas measurement instrument.
- Persons involved in surface infrastructure checks that involve proximity to portal areas were observed to be not wearing SCSR's. The requirement for these people to be wearing SCSR's is referenced in Duty Card 3.

SURFACE OPERATIONS TIMELINE

TIME	LOCATION	EVENT	COMMENTS
11:39	Control Room	Underground Mine Manager and Shift Services Co-ordinator in Control Room when Control Room Operator reports "trunk 2 belt transformer CO sensor is recording 200 ppm".	
11:41	Control Room	Underground Mine Manager instructs activation of emergency siren.	
11:42	Control Room	PED message sent "High CO Trunk 2 Belt Tranny".	
11:43	Control Room	Control Room Operator sends message that "This is a mock emergency, high CO".	
11:45	Control Room	<ul style="list-style-type: none"> Underground Mine Manager calls for mine evacuation. Control Room Operator creates and sends PED message "Evac mine primary egress". 	
11:46	Lamp Room	People assembling in Deputies cabin for allocation of duty cards.	
11:47	Deputies Cabin	Primary duty cards and satchels being handed out.	
11:49	Lamp Room	Underground Mine Manager informs Mines Inspector (who was on site conducting an inspection) of the emergency and that he would like him to participate in the IMT.	
11:49	Deputies Cabin	Shift Controller handing out duty cards and satchels.	<i>There is no panic in the room, but no information or known details were being given out on the incident with the duty card satchels as required in duty statement 4 of Duty Card 2.</i>
11:50	Surface	Underground Controller realises that only two rescue trained personnel are available on surface and that he is one of them. Starts making arrangements for his duty card to be taken over by someone else.	
12:01	Surface	Duty Card's 6 & 7 observed to be carrying out their respective duty card nominated tasks in a calm and controller manner.	
12:03	Control Room	Control Room advised by radio that the front gate was now closed and secured.	
12:05	Surface	Underground Controller relieved of duty and conducts competent handover, he now joins rescue personnel.	
12:10	Surface	Duty Card 6 reports to Shift Controller that all his duty card tasks are completed and all reviewed systems are in good order and in place.	
12:12	Surface	Duty Card 7 reports to Shift Controller that all his duty card tasks are completed and all reviewed systems are in good order and in place.	
12:15	Surface	<ul style="list-style-type: none"> Duty Card 19 – Refuge Station Co-ordinator now becomes the focus – it was ascertained from the holder that a replacement for his duties had been contacted and was coming to site. Duty Card 19 had made contact with suppliers and that Supplier 1 had no compressor available for immediate delivery but they did have a generator. Supplier 2 had a compressor and generator available which was being sent to site. 	<p><i>At 12:35 Supplier 1 advised that they had two compressors on standby – 1 in Mackay and 1 in Blackwater.</i></p> <p><i>At 14:20 Supplier 1 had a second compressor and generator available – these items were requested to be sent to site.</i></p>

TIME	LOCATION	EVENT	COMMENTS
12:23	Surface	Debrief station set up and operating.	
12:28	Lamp Room	IMT Facilitator is the only name not filled in on duty card board.	
12:29	Lamp Room	Duty Card 19 requests keys from Control Room so that he could access the refuge chamber huts and boreholes and advised that his replacement was on his way to site.	
12:32	Surface	Duty Card 19 attempts to obtain written authorisation to go to the refuge chamber boreholes and huts.	
12:34	Surface	Duty Card 19 obtains authorisation for refuge chamber borehole access, then collects electrical tradesman from standby labour pool and advised Duty Card 6 – Maintenance Superintendent that he has one of his tradesmen.	
12:42	Surface	Duty Card 19 departs for the borehole hut and leaves instructions with front gate sentries that the replacement for Duty Card 19 is to be directed to travel to the borehole hut for Maingate 11, 17 cut-through and that the compressor vehicle is being delivered by Flexihire should also go in the same direction.	
12:48	Surface	Arrived at access gate for borehole huts, sign for borehole direction is damaged and pointing in the wrong direction.	
12:49	Surface	Confusion regarding the sign is sorted out and the map that was supplied as part of the duty card satchel was utilised.	
12:51	Surface	Arrived at borehole hut.	
12:52	Surface	<ul style="list-style-type: none"> Initial contact is made with refuge chamber, electrician verifies solar power feed to refuge chamber is operating. Duty Card 19 verifies with people in refuge chamber that all communications to chamber are working and also verified number, health and names of people in refuge chamber. 	
12:56	Surface	Duty Card 19 realises that duty card also called for a fitter to be present to assist in mobilisation of compressor and aftercooler, at this point it is discovered that aftercooler is missing from hut.	
13:04	Surface	<ul style="list-style-type: none"> Duty Card 19 call Control and passes on information about numbers, health and names of people in refuge chamber. Control advises that Duty Card 19 replacement has arrived and is coming out to the borehole huts. 	
13:06	Surface	Relief Duty Card 19 arrives on site and a handover of information takes place.	
13:09	Surface	<ul style="list-style-type: none"> Relief Duty Card 19 also realises that aftercooler is not present in borehole hut. Both Duty Card 19's now start planning on how to get another aftercooler – this is made more difficult as no appropriate vehicle is available for transport of the aftercooler unit. Decision made to borrow a 4WD Ute from the exploration drillers that were fortuitously working in the same general area. Relief Duty Card 19 and electrician leave to borrow the Ute and hopefully source another aftercooler for use. 	

TIME	LOCATION	EVENT	COMMENTS
13:17	Surface	Refuge chamber contacts shed regarding availability of air from surface.	
13:20	Surface	<ul style="list-style-type: none"> Compressor and generator arrive at front gate of mine. Duty Card 19 advised by radio, and passes on directions on how to get to borehole sheds via radio to front gate sentries. 	
13:23	Surface	<ul style="list-style-type: none"> Aftercooler arrives at borehole shed. Duty Card 19 contacts Control to change names on duty card board. Work commences on setting up of hoses and aftercooler. Refuge Chamber contacts borehole shed for instructions on how to activate refuge chamber bottled air supply. 	
13:27	Surface	<ul style="list-style-type: none"> Setting up of borehole site continues. Planning done on the run for positioning of aftercooler, compressor and generator and this planning takes into account wind direction and noise levels from machines. 	
13:29	Surface	<ul style="list-style-type: none"> Compressor and generator arrive on borehole site, No fitter has arrived on site or has as yet been organised. Relief Duty Card 19 now starting to co-ordinate work. 	<i>Good teamwork is in evidence as set up continues on compressor.</i>
13:34	Surface	Compressor unloaded and refuge chamber contacted to let them know current progress on set up of compressor and generator.	
13:37	Surface	Relief Duty Card 19 contacts Control to put a Fitter on standby.	
13:39	Surface	Compressor started and tested for delivery of air, main delivery hose hooked up and flushed, main delivery hose hooked up to aftercooler and aftercooler flushed and then hooked up to borehole.	<i>No tests on quality of air that was being delivered by compressor were carried out prior to supply being connected to borehole.</i>
13:40	Surface	<ul style="list-style-type: none"> Air supply ready for use by refuge chamber. Refuge Chamber contacted and given instruction on how to receive air from the surface. 	
13:42	Surface	Refuge Chamber reports that air is flowing and that oxygen reading is 20.9% measured on minigas.	
13:43	Surface	Work starts on setting up Genset.	
13:49	Surface	<ul style="list-style-type: none"> Genset started and hooked up to power lead. Duty Card 19 contacts refuge chamber to verify power connection – refuge chamber reports that no power is on and electrician starts fault finding. 	
13:51	Surface	Power problem sorted and power onto chamber confirmed.	
13:54	Surface	Call to Control to confirm that air and power is now hooked up and working.	
13:55	Surface	Duty Card 19 started organising provision of water, refuelling of machines and manning of surface.	
14:03	Gate Sentry	Gate Sentries observed to be following protocols as set out in their duty cards.	
14:21	Muster Area	Duty Card 3 – Surface Controller and Duty Card 4 – Underground Controller involved in information exchange.	

TIME	LOCATION	EVENT	COMMENTS
14:25	Muster Area	Duty Card 7 – Electrical Engineering manager observed to be checking status of systems that are his responsibility on duty card.	
14:26	Muster Area	Portal sentries in place and outfitted with SCSR's.	<i>Other people in proximity to portals were not wearing SCSR's.</i>
14:52	Muster Area	Duty Card 3 – Surface Controller involved in organising fire fighting depots for portals and readying GAG docking facilities.	
15:04	Muster Area	<ul style="list-style-type: none"> QMRs Superintendent in Control Room with Duty Card 13 – Mines Rescue Sub-Station Controller and receives word that rescue personnel are being withdrawn. QMRs Superintendent and Duty Card 13 move to IMT room to consult with IMT on withdrawal of rescue teams – IMT brings both up to date on the situation. QMRs Superintendent now effectively becomes part of IMT. 	

ESCAPE OF OUTBYE ELECTRICIAN

Assessor: Seamus Devlin

On Wednesday, 23 July 2003 I was originally assigned to assess the escape capabilities of current underground contractors at Crinum Mine in a simulated mine emergency. The contractors were unable to be located in the part of the mine that had been indicated. Whilst conducting the search for them I came across a mine electrician who was in the process of carrying out his normal duties in restoring power to Maingate 11 panel.

The electrician was accompanied to Maingate 11 drivehead area and was informed that an incident had occurred outbye, smoke was advancing towards him and his visibility was imminently reduced.

The PED message to indicate the start of the simulated emergency was not received on either the electrician's or assessor's PED due to travelling in a PJB.

The electrician responded by promptly donning his oxygen SCSR and indicating his intention to travel directly to 'A' Heading and escape via the primary escapeway.

On entering 'A' Heading the electrician had his vision reduced to simulate heavy thick smoke. Prompting was given to the electrician to advise that the conditions in 'A' Heading were getting progressively worse.

Travel speed was very slow (eight minutes for two pillars) due to the low visibility and the disadvantages of not having a 'blind man' stick. Well secured and reasonably tidy ribs and roadways still present a major hazard to pedestrians relying on rib contact for guidance.

On calculating the time required to reach the 90 minute SCSR cache at 38 cut-through the electrician determined that he would have to travel to 'D' Heading and utilise the lifeline escape system.

Access to the return system was negotiated through 48 cut-through.

Whilst walking through 48 line of cut-through's a vehicle drove outbye in 'B' Heading, slowed upon seeing the persons light but continued without stopping.

Extremely good travel time was achieved in the return by using the lifeline (the lifeline is in good condition and walking conditions are generally very good) allowing the electrician to reach the 90 minute cache in 34 minutes with the unit still producing breathable air.

No attempt was made at this point to check the adjoining intake roadway for status. The electrician decided (not incorrectly) to don a 90 minute unit and continue to the 25 cut-through line (next cache) and then check the intake.

Some difficulty was encountered in trying to identify cut-through numbers due to lack of standard positioning.

The electrician continued to 25 cut-through and entered 'C' Heading via the man doors. Fresh air was evident on entering the intake. He removed his self rescuer and made contact with surface control.

He was then instructed to go to 'B' Heading and exit the mine on foot.

CONCLUSION

The person assessed showed an excellent knowledge of the mine, escape system and escape apparatus. His decision-making in changing headings would have saved his life and re-inforces the effectiveness of travel on a lifeline when visibility is severely reduced.

This does not mean that return roadway travel should take precedence over the primary escapeway, but does emphasis the vastly improved travelling speed when using a lifeline in low visibility.

Valuable information could have been extracted from the electrician on contact with Control after exiting the mine, for example:

- How did you escape?
- How long did it take?
- Is the roadway easily travelled?
- What is your physical status?
- Do you recommend this escapeway?
- Why did you leave the primary escapeway?

This information could well have assisted IMT in their deliberation and decisions for escape options for inbye personnel. It became evident at this time (12:51 pm) that inbye personnel had escaped by using two different escape ways.

ELECTRICIAN FROM 51 CUT-THROUGH, 'D' HEADING TIMELINE

TIME	EVENT	COMMENTS
		<ul style="list-style-type: none"> ▪ Travel speed of 10 pillars in 13 minutes. ▪ Cut-through markers not easily seen by electrician – too high and not in standard position. ▪ Thirty-minute SCSR still providing adequate breathable atmosphere at 34 minutes.
12:22	Actual 30-minute SCSR converted to open circuit and left in mouth of underground electrician. Carried actual 90-minutes SCSR.	
12:42	<ul style="list-style-type: none"> ▪ Arrived at 25 cut-through cache. ▪ Indicated he would take another SCSR. ▪ Indicated he was going to access 'C' through man door to determine state of atmosphere. 	Underground electrician was looking for large cache site sign (yellow) – sign was not visible due to being positioned parallel to heading rather than at right angles.
12:45	Into 'C' Heading – air clear.	Man doors very hard to slide.
12:51	Contacted Control and advised to exit the mine via 'B' Heading on foot. No transport to enter the mine.	Very little, if any, information gathered from underground electrician, eg, how did you get out? Where from? Conditions? State of health? etc.
12:55	PED Message: "Fire on PJB 'A' hdg – gas cylinder"	
12:57	PED Message: "Go to refuge"	
13:15	PED Message: "If walking contact control"	
13:17	Rang Control and advised to travel to 'C' Heading, 1 cut-through for pick-up by transport.	
13:37	Electrician arrived on surface – reported to Duty Card 5.	
13:40	Emergency procedures debrief by Duty Card 4.	

MAINGATE 12 CREW

Assessors: Peter Baker & Randall Freeman



RECOMMENDATIONS

1. Walking canes ('blind man' sticks) should be provided for all escaping personnel at strategic locations.
2. Refuge chambers / changeover stations of some description should be incorporated in all panels where there are groupings of workers. These assist with communication, calming of personnel and provide a less pressured environment in which to think and plan an escape strategy.
3. An effective method of communication needs to be developed for personnel wearing breathing apparatus.
4. Include the use of foams in the fire-fighting training.
5. A thorough debriefing of all eyewitnesses must be conducted as soon as possible to gain valuable information.

OBSERVATIONS

- The ERZ Controller's control of the crew – when visibility decreased he counted the men as they walked past him and then tailed the crew in an attempt to ensure that all men evacuated successfully.
- The use of 'blind man' sticks was very effective in allowing a safe rate of travel at 2.3 km/hour in zero visibility along the travelling road. The noise of the sticks on the rib was a positive guide and a comfort when the 'train' was broken.
- The use of the refuge chamber as a 'fresh air' changeover stations / communication centre was instrumental in the efficient evacuation of the crew.
- There was effective use of transport as a means of travel in an emergency – transports are generally kept in the panel for this purpose.

- Donning procedures of SCSR's were well rehearsed and evacuation methods were well understood.
- Whilst the fire-fighting attempt was unsuccessful, the crew were willing to attempt to extinguish the fire and gained valuable information at the incident site for later use by the IMT.

FINDINGS

1. Failure of one of the Crinum 30-minute Fenzy units – a leak where the breathing bag connects around the valve box. This type of failure is uncommon and will require further investigation.
2. There was an inability of the ERZ Controller to communicate with the crew and / or surface after leaving the refuge chamber. An escape unit that allows communication, for example, CABA set for the crew leader would be beneficial.
3. The crew focussed on 'self-escape' and whilst there is nothing wrong with this, there were some things that could have been done to assist other person's in the mine. Looking for outbye personnel while travelling in a vehicle and closing the open doors at 31 cut-through could have substantially increased the potential for other personnel to successfully escape.
4. Communications from 'eye witnesses' to Control and then to IMT is critical. The communication will always take place but it is the quality that will change in each case. It needs to be remembered that the person giving the information needs to ensure that the person receiving the information fully understands all messages. Terminology or slight word changes may change a person's perception of the meaning.
5. Fire-fighting training needs to include location equipment and the use of low expansion foam. It is probable that an underground fire will be extinguished by a person using a fire extinguisher, if it is not however, use of water alone will be difficult to extinguish something that is still burning. The location and use of low expansion foam would be a relatively simple addition to the current training regime.
6. The system for personnel tagging was quite sound – could this be developed further to assist in locating personnel quicker in the case of an incident? This may help in understanding the cause of the incident (where was everyone at the time) and evacuating people from certain locations.
7. The lack of accurate information in the first 30 minutes of the incident was telling, especially later on after the mine was evacuated. The most critical time in managing a mine fire is the first 30 minutes. Our lack of experience in fighting actual fires and learnings from these events is a point worth discussion. How do we train to achieve this level of knowledge?
8. The evacuation plan was not followed when rescuers were donned on the first notification of 100 ppm CO at 32 cut-through, 'C' Heading. Then further on when the mine was evacuated and personnel were allowed to enter the mine in transports to pick up evacuating crews. This may be due to the mindset that this is an exercise and the objective is to evacuate the mine to the surface?

MAINGATE 12 ESCAPE

Maingate 12 crew consisted of 8 members (ERZ Controller and 7 production employees). Mining at the time of the incident was not taking place – the crew were in the process of flitting miner.

The crew were made aware of the incident at 11:40 am with a PED message stating *"100 ppm CO at C32"*.

The crew assembled at the cribroom at 2 cut-through and donned 30 minute belt worn Fenzy units at 11:42 am.

The Crinum units (straight off the employee's belts) were initiated and five 'out of date' Kestrel units were utilised. One of the Crinum units failed during the donning process (there was a substantial leak at the valve box) – obviously unacceptable in any circumstances.

There were no communications with the Control Room at this point and no information was heard across the DAC. The crew loaded 60 minute SCSR's into the transportation (which was located at the cribroom) and left the panel at 11:48 am.

Light smoke started to enter the panel and another PED message was received stating *"Evacuate primary egress"* at 11:49 am.

The crew arrived at the refuge chamber (located two pillars outbye the cribroom) at 11:50 am. The refuge chamber was utilised as a 'fresh air changeover station' and proved to be a very effective tool. The chamber was initiated, the crew entered and the ERZ Controller tested the atmosphere (using a mini-gas monitor) before telling the crew that they could remove their 30 minute SCSR.

The ERZ Controller then contacted Control via the telephone and received as much up-to-date information as was available at that stage (gas readings but no indication as to why). He then discussed the situation with the crew, including escape routes and segregated roadways, and then instructed the crew to don 60 minute SCSR's. At 11:58 am the crew left the refuge chamber wearing 60 minute units and carrying one extra each. Escape was made in the PJB via the primary escape route (travelling road).

On route, the crew noticed a cap lamp in a cut-through, slowed down but made the assumption that the person was not involved in the exercise. The lamp actually belonged to an outbye electrician who was escaping on foot alone. The event highlights the need for crews in machines to assist people who are not.

At 12:03 pm the crew had reached 45 cut-through when they encountered very dense smoke. With visibility reduced to near zero, the PJB was abandoned (instructed to by the assessor for safety reasons) and the crew continued on foot along the primary escape route (travelling road).

The crew had taken with them conduit 'blind man' sticks from the crib room and these allowed the crew to proceed at a good walking pace (approximately 2.3 km/hour). Other benefits of the 'blind man' sticks was to allow the crew to walk more than a metre from the rib (therefore allowing safe passage past protruding rib bolts, fire hydrants, etc), and the noise of the sticks on the rib gave everybody an indication on the whereabouts of each other. This was particularly comforting in no visibility with no communications.

The crew came out of the zero visibility when they made it to the outbye side of 31 cut-through at 12:27 pm. The ERZ Controller assessed the situation (atmosphere reading and smoke direction) and instructed the crew to remove their SCSR's – the crew at this stage still had a 60 minute SCSR on their shoulder.

The ERZ Controller then split the crew to complete a number of tasks – contact Control and investigate the cause of the smoke. One of the crew notified Control of their location and the men involved. The vehicle fire was discovered at 31 cut-through, 'A' Heading. This information was also passed onto Control. This occurred at approximately 12:34 pm and preparation to fight the fire commenced.

The ERZ Controller had the DAC at 30 cut-through, 'C' Heading manned.

Two crew members travelled inbye from 30 cut-through, 'C' Heading to investigate the 'fire on the belt road'. As they approached 31 cut-through, 'C' Heading intersection, the crew members were notified by the assessor that they could not reach the intersection due to 'dense smoke'.

These men then retreated to the DAC at 30 cut-through, 'C' Heading. The ERZ Controller then notified the Control Room of the situation at 31 cut-through, 'C' Heading, i.e. dense smoke at C31 – could not pass.

During this time hoses were obtained from a fire depot in the belt road (29 – 30 cut-through, 'C' Heading) and connected to a fire hydrant outbye 30 cut-through, 'B' Heading. There were insufficient hoses to allow two lines to reach the fire – the fire-fighting effort was therefore one hose to the fire site.

Water was put onto the fire at 12:43 pm. This was considered due to the necessity to use that one line as a fog nozzle for protection of the fire fighters, therefore, not allowing a 'jet' attack for fire-fighting.

The crew assessed the size of the fire and the minimal success of their initial attack and retreated. Water was turned off at 12:47 pm. The ERZ Controller notified Control via the DAC at 30 cut-through, 'C' Heading of the fire fighting situation. At 12:48 pm the ERZ Controller informed his crew that there was possibly an oxy acetylene cylinder in the vehicle that was on fire and a decision was made to leave the fire and evacuate the mine.

On reaching 26 cut-through, the crew moved from 'B' Heading to 'C' Heading. The crew then evacuated via 'C' Heading because of concerns of the oxy acetylene cylinder exploding.

On reaching the bottom of the belt drift, the ERZ Controller notified Control of their location and requested transport. The transport arrived at approximately 1:25 pm. The crew reached the surface at 1:32 pm, all were accounted for and the ERZ Controller was debriefed by a Crinum employee.

This whole crew had been eye-witnesses to the event underground (the only eye witnesses) and the information they had as a group was critical to ongoing decision-making (especially in IMT). More thorough 'hot' debriefing would have been advantageous at this point.

MAINGATE 11 OUTBYE

Assessor: Mark Donghi



OBSERVATIONS

I was initially given the task of assessing the actions of the contractor workforce underground in relation to the simulated exercise. I left the surface at 10:30 am to be transported to a location in the Mains at which contractors were working.

After travelling to several locations in the Mains we were unable to locate any contractors at the workplaces. A decision was then made to enter Maingate 11 to assist with the assessment of the crew.

On entering Maingate 11, we travelled to the cribroom. The crew were in the process of finishing crib and returning to the face. They were awaiting the re-powering of the panel by the Outbye Electrician. Once the panel was re-powered, the Outbye Electrician left the panel with an assessor accompanying him. I remained in Maingate 11 cribroom awaiting the start of the exercise.

At 11:34 am I received a PED message stating that the exercise would commence T = 1131 hours. The Outbye Deputy was located at 20 cut-through, 'A' Heading pumps and a PED message informed him of 100 ppm CO at 32 cut-through, 'C' Heading. The Outbye Deputy decided to don his belt worn Fenzy and commenced walking outbye along 'A' Heading, Maingate 11. The donning of the Fenzy was conducted in a proficient manner. Difficulty was encountered with activating the self-starter on the unit. At no stage did the Outbye Deputy attempt to contact Control to obtain additional information nor to share any information. The Outbye Deputy positioned himself on the block side of the roadway and walked outbye.

At 11:50 am the Outbye Deputy entered the refuge chamber at a niche just outbye of 17 cut-through, Maingate 11. Once inside the refuge chamber, the Outbye Deputy turned on a valve to bring mine compressed air into the refuge chamber. Once the mine compressed air was entering the refuge chamber the Outbye Deputy decided to remove his Fenzy.

Once the Outbye Deputy had removed his Fenzy he contacted Control via the mine phone located inside the refuge chamber. The Outbye Deputy stated his name, location, the PED message he had received, the number of personnel in the refuge chamber, his mode of transport and the status of the environment outside the refuge chamber.

At 11:54 am the Outbye Deputy informed Control that he was remaining inside the refuge chamber. To conserve his caplamp battery he decided to turn his lamp to low beam.

The Outbye Deputy displayed a good knowledge of the mine compressed air supply and the CABA air supply for the refuge chamber. At 12:12 pm he commenced flicking through the documentation located on the table within the refuge chamber to further familiarise himself.

At 12:21 pm the Outbye Deputy started to wonder about the Maingate 11 crew, which were located inbye of him at the commencement of the exercise. He believed that the crew should have been at the refuge chamber by this time.

At 12:34 pm the Outbye Deputy phoned Control and asked for an update of the situation. He was informed that there was a vehicle fire at 31 – 32 cut-through, 'A' Heading in the Mains resulting in 'A' Heading being full of smoke, 'B' Heading being clear and that the rest of the pit was full of smoke. He was also informed that there was a transformer fire at 33 cut-through, 'C' Heading. Armed with this information, the Outbye Deputy decided to remain in the refuge chamber as there was enough air, water and food. He was also comforted by the fact that there was communication available with the surface and that Control was aware of his location.

MAINGATE 11 PANEL CREW

Assessors: Greg Dalliston & Mike Downs



OBSERVATIONS

As part of the exercise, Mike Downs – Regional Inspector of Mines, Caroline Morrissey – Queensland Mining Council (visitor) and Greg Dalliston – Industry Safety and Health Representative, CFMEU arrived at Crinum Coal Mine at 7:30 am under the pretext of being visitors. Their purpose was to examine the Maingate 11 faceline being widened and taking photographs of the refuge chambers.

The exercise commenced with initiation of the incident at 11:31 am at which time the crew of five, plus the Section Deputy, were returning to the face after restoring the power which had been lost from a trip back to the section transformer.

A PED message was received at 11:35 am stating “100 ppm CO at C32” and as the Deputy was gathering his crew a crew member smelt smoke which resulted in a heating being identified at the Maingate 11 conveyor boot end.

The exercise was suspended in the panel until the heating was hosed down and brought under control. During this time Control was contacted via the DAC and a message was received to leave the Deputy and another mineworker at the heating scene. On ensuring that the site was safety the Deputy responded to the PED message of “*emergency emergency contact control*” and phoned Control and was told that 100 ppm CO and Maingate 11 monitor not picking anything up. A decision was made as to who would remain in the panel to do fire watch and who would continue with the exercise. As the Deputy was taken out of the exercise, the Assessors allowed the Deputy to pass on the information he had on the exercise to the other members. It was agreed that a mineworker who could use a mini-gas would take the instrument from the continuous miner and the remainder of the crew (four in total) and one visitor would continue with the exercise.

At 12:21 pm (50 minutes after initiation of the exercise) the crew of four discussed how they would exit the mine. At 12:25 pm the crew were shown a sign “*Hazy smoke entering work area*” and the crew indicated they would don their belt worn self-contained self-rescuers. They were handed 30 minute Fenzy SCSR’s and a set of lightly hazed smoke goggles.

Donning of the SCSR's was done in a proficient manner with the exception that three members believed that their SCSR had not self-started and they began breathing into the SCSR mouthpieces to get them started. The other two members whose SCSR's had not started tried to pull the bag up again and they successfully started.

The Crew set off in a PJB from 22 cut-through transformer, 'A' Heading and made their way to the crib room at 21 cut-through, 'A' Heading where they decided to access the cache and change to 60 minute SCSR's.

At this time they were shown a sign ***"thick black smoke entering work area, zero visibility"*** and were provided with dark smoke goggles. Two members changed to their real 30-minute SCSR, one changed to a real 60-minute SCSR unit, and the final person changed to an exercise supplied 30-minute SCSR unit. The crew attempted to communicate using written notes and soon realised that with limited vision this was not an option.

The crew then took walking canes from the cache and proceeded through the man door in 21 cut-through, 'A – B' Heading and along the belt road, holding the back of the persons belt in front of them with the leader using a cane and the 'mini-guide'. All other crew members were using canes.

The crew then travelled along the road using canes to feel the belt and one member counted the DAC's by feeling them with his cane. At 17 cut-through they reached the "wind chimes" and boom net in the belt road – indicators for the Refuge Chamber, situated in the intake side, outbye to 17 cut-through. The crew then proceeded through the trap door and located the lifeline. This lifeline was used to assist the crew to walk to the Refuge Chamber.

Escapeway conditions were clean and level thus allowing the crew to travel this distance at a very good pace, even in very limited visibility. They covered 5 ½ pillars in approximately 13 minutes.

The Maingate 11 crew arrived at the refuge chamber at 12:49 pm. On entering the refuge chamber all members of the crew, plus one visitor removed their Fenzy's. This decision was made as they had heard the mine compressed air on entering the refuge chamber. Once settled, the crew utilised the Outbye Deputy to obtain additional information on the situation. From this stage on there were four crew members, the Outbye Deputy and a visitor in the refuge chamber.

MAINGATE 11 PANEL CREW – REFUGE CHAMBER

Assessors: Greg Dalliston, Mark Donghi & Mike Downs



OBSERVATIONS

The Maingate 11 crew arrived at the 17 cut-through refuge chamber at 12:49 pm and removed their SCSR's immediately on entry (*when asked by an assessor why they made that decision, they replied that they heard the mine compressed air entering the refuge*). There was no indication that any gas readings were taken.

An Outbye Deputy was already in the refuge chamber and he gave an update on the latest information that he had received some 15 minutes prior to them arriving at the chamber.

A crew member reported the names of persons that were now in the refuge chamber to the surface of the borehole, (*Deputy, 4 crew members and 1 visitor*), and received a message that they were still to use the mine compressed air and a compressor was being sourced from town.

At 12:56 pm the group in the refuge chamber gathered around a mine plan (which was already in the chamber) and discussed where the smoke would most likely be and began to make plans to walk out 'E' Heading using a lifeline.

At 1:01 pm the refuge chamber tried to contact the Incident Management Team using the DAC and found that this only communicated with the station at the top of the borehole. The Deputy then rang Control by phone and asked for an update on the situation and a CO make in 'B' Heading, Maingate 11. The replay received was that Control would get IMT to ring the refuge chamber.

At 1:07 pm the crew in the refuge chamber were instructed by IMT to stay in the refuge environment – outside bad; fire teams cannot get to PJB as acetylene cylinder is in the back of it; transformer fire still unconfirmed; CO readings >1000ppm on real time and tube bundle monitors. Crew are to stay in refuge chamber and IMT will get back to them.

The refuge chamber informed the borehole station at 1:23 pm that they had lost the mine compressed air and were changing to CABA supply. All refuge members changed into CABA full-face system efficiently and assisted the visitor.

When the mine compressed air stopped there is supposed to be a whistle that activates. This did not happen.

At 1:32 pm a request came from Control to confirm the names of persons within the refuge chamber as cap lamp No. 255 had not yet been accounted for.

The borehole station notified the refuge chamber via the DAC at 1:41 pm that the compressors were ready to supply air via the borehole. Gas readings were taken by mini gas and when the reading showed that the atmosphere was not contaminated, all persons removed their CABA face masks.

People in the refuge chamber were now considering all known information and looking at the mine plan to work out their escape route to the surface.

The refuge chamber contacted Control at 2:20 pm for an update as they had received no further contact from IMT. They were informed that a rescue team had left the surface for the fire site, three people were still unaccounted for and the GAG had been mobilised.

At 3:02 pm the refuge chamber again contacted Control and were told that the rescue team had been withdrawn and they were provided with the latest gas readings that indicated H₂ for the first time. Readings received were recorded by the Deputy –

- O₂ – 8%
- CO – 3%
- H₂ – 2.05%

Crew are now beginning to express concern at the lack of information being passed through to them from IMT actions to either assist them in escaping from the mine or if aid was coming to them. The crew have worked out that there must be coal burning if H₂ is now present and that the fire must be getting bigger as the higher hydrocarbons were now becoming evident.

At 3:14 pm the crew contacted the borehole station requesting an update on gas readings and where the readings were being taken from. They also queried why rescue was withdrawn and if rescue was being redeployed.

The visitor to the mine was encouraged by the crew in the refuge chamber to discuss her feelings in regards to leaving the refuge chamber and walking through the smoke to the surface. The visitor asked what the risks of staying were compared to the risks associated with going to the surface. The crew explained what conditions would be like and what other escape resources were on route. The visitor had a preference of staying in the refuge chamber if it was the safest option, but would listen to the crew's considerations. The visitor suggested that they ask the surface as there might be conditions that they were not aware of, and would also like to practice SCSR change-over as the crew had indicated that it would be one of the biggest risks.

The noise of the compressed air as it was being forced into the refuge, together with the fact that there was not much room to stretch out and the seats were beginning to become uncomfortable, was beginning to affect people. (There were two assessors inside the refuge chamber as well as the 5 crew members and a visitor).

At this time there appeared to be two positions being expressed by crew members – one being to walk out and the other to stay in the chamber until instructed by the IMT.

The crew showed a good understanding of the mine escape systems and also displayed logical risk management and decision making processes. Discussions were kept calm even though urgency was beginning to show.

The Underground Mine Manager contacted the refuge chamber at 3:20 pm and spoke with the Deputy regarding actions now being considered and advised the crew to stay in the refuge chamber while the IMT reassessed the situation. The rescue team had been withdrawn because readings were approaching 80% LEL (*QMRS protocols for withdrawal*). Meanwhile the other crew members in the refuge were continuing to discuss the hazards related to leaving the chamber and proceeding to the surface.

Discussions on hazards existing outside the refuge chamber were discussed and written down. The potential effects to the refuge chamber in the event of an explosion at the fire site were also discussed and questions were asked as to the effect of the GAG on the refuge chamber. An agreed decision was made to wait until the next report was received from the IMT and the crew reminded each other of the need to consider the visitor in any actions undertaken.

At 3:36 pm the crew contacted the borehole station and asked where the gas readings were from and what readings were at 'F' Heading, Maingate 11. The person at the borehole station would not give an answer but would get IMT to contact them. The refuge chamber were told **not** to contact IMT, that IMT would contact them when needed.

There was now a noticeable decline in morale in the refuge chamber.

There was a suggestion from a crew member to work out how many SCSR's they would need and to start practising change-over with some of the remainder. Discussions were also held on a possible transformer fire and it was suggested that a decision should be made on leaving the refuge chamber.

The crew asked the Deputy to contact the surface and ask them to notify their families that they would be late.

At 3:43 pm the crew contacted the office on the surface to find out what was going on. The reply received was that "they" think that a door is open and not a transformer fire near the fire site, will have report soon.

The crew looked at the mine plan and discussed that if the door near the transformer, 33 cut-through, 'B' to 'C' Heading was closed then 'C' Heading should return to fresh air and they could get out in good visibility.

One crew member stated his concern with the IMT response on the provision of information and asked that they ring the IMT and speak directly to the Underground Mine Manager.

The refuge chamber contacted the IMT at 3:58 pm where the Underground Mine Manager asked the person on the phone to put the Deputy on (*this was not accepted well by the crew*). The crew requested the rescue team to close the door at 33 cut-through so they could get out along 'C' Heading. After the phone call the following report was given to the crew by the Deputy –

- IMT not prepared to send rescue team down to close the door;
- Still close to 3% H₂, i.e. 80% LEL;
- IMT advised to walk out as it will take approximately 4 hours.;
- Take up to two hours to set up the GAG; and
- 12 hours to extinguish the fire.

At 4:11 pm the refuge chamber again contacted Control and asked to speak directly to the Mines Rescue Coordinator. Control gave them a direct number. The Deputy contacted the Mines Rescue Coordinator, on behalf of the crew, and challenged why the doors were not being closed.

Two crew members indicated that they were prepared to take extra SCSR's and had worked out a route of travel to check doors along 'C' Heading and close the doors at 33 cut-through, then contact Control to notify the refuge chamber when this had been done.

At 4:48 pm the IMT informed the refuge chamber that mines rescue will not be coming – too risky, new gas levels known and smoke now coming out of both fans. The Underground Mine Manager reiterates that the crew are to stay in the refuge chamber; Centrecare counselling services are available if anyone would like to talk to them over the phone.

At 5:03 pm the underground section of the exercise was terminated.

Assessors Note: *It is important to note that the Maingate 11 crew start time for this exercise was 50 minutes after initiation (up until they met with the Outbye Deputy at the Maingate 11 refuge chamber) due to a belt heating that needed to be addressed.*

MAINGATE 11 OUTBYE PANEL AND REFUGE FINDINGS

Assessors: Greg Dalliston, Mark Donghi & Mike Downs



RECOMMENDATIONS

1. Conduct familiarisation sessions for all personnel on the workings of various functions available within the refuge chamber, for example, where to activate air supplies, the operation and use of the CABA air supply, what to do on entering a refuge chamber and when to take the SCSR off, etc.
2. Supply plans in cache and refuges of a scale that enables personnel to read and identify details.
3. Establish communication to and from the refuge chamber through a centralised contact point. Consideration to time lapses between communications should consider the length of time that people have been or are expected to be in the refuge chamber.
4. Training in the donning of SCSR's should include reference to how hard you need to pull the initiation starter and training units should be assessed to see if it is possible to increase force required to start the starter, if possible.
5. Noise levels inside the refuge chamber should be monitored and decreased where possible as continual exposure appears to have psychological effects on persons in the refuge chamber.
6. Alternative storage locations should be examined for the Long Duration Oxygen units within the refuge chamber, for example, under the seating.

FINDINGS

- Leaks in the compressed air piping need to be repaired to reduce the noise level within the refuge chamber.
- Alternative storage locations should be examined for the Long Duration Oxygen units within the refuge chamber, for example, under the seating.

- Personnel were adequately trained in the donning of the belt worn Fenzy's and in the locations of the refuge chambers.
- The crew performed extremely well under all conditions – both during panel evacuation and when in the refuge chamber.
- The pace at which the crew was able to proceed when wearing self-rescuers and 'heavy smoke' goggles was most impressive – the use of white walking sticks appeared to greatly assist.
- The changeover from SSR 30's to SSR 90's was accomplished effectively but a number of persons did not get the SCSR starters to activate and thought they were ineffective until shown by assessors that they needed to pull harder.
- The method of indicating the place at which to move into the intake roadway to get to the refuge chamber ("wind chimes and boom net") worked well.
- The lifeline provisions appeared to work well but feedback from the crew whilst wearing the 'heavy smoke' goggles indicated that they were unable to distinguish between the yellow and white reflective droppers – the droppers were, however, visible.
- Access to the refuge chamber – no differentiation between door handles to the man door and the main door. Differentiation may assist in selecting the correct door.
- Mine workers assumed that the atmosphere was not contaminated on entering the refuge chamber and took their SCSR's off when hearing compressed air running.
- The space inside the refuge chamber appeared 'tight' for more than some 6 or 7 personnel. Equipment was not stored out of the way e.g. long duration oxygen units were laid out on the bench in the refuge which got in the way of persons using the refuge for long periods of time and the seating was uncomfortable after a period of time. Leaks in the compressed air piping need to be repaired as to reduce the noise level within the refuge chamber.
- Communication to the refuge chamber by way of DAC and "wobbler" phone were difficult to hear at times, but in addition to the mine phone there were three different systems of communication available from the refuge. The phone was able to connect to outside, which in the case of a real emergency, could cause result in some difficult situations.
- The 'whistle warning' for the mine air supply faces directly up – this promotes an ideal trap for dirt / moisture that may have contributed to the failure of the warning during the use of the refuge chamber during this exercise.
- Refuge crew had a lot of time to consider the issues but this was with the varied and limited information that they were given or had sought out. They were able to get information from a number of sources including – Borehole Station; Control, Surface Controllers office, Mines Rescue Coordinator and the IMT. This could be a problem as some of the information may not be correct or verified or if particular sections of the incident control do not pass on regular information.
- Persons in the refuge chamber had a vested interest in devising ways to escape and at times we waste some of our valuable resources. Consideration should be given to communication to and from the refuge chamber to capture some of these ideas.

MAINGATE 11 REFUGE CHAMBER TIMELINE

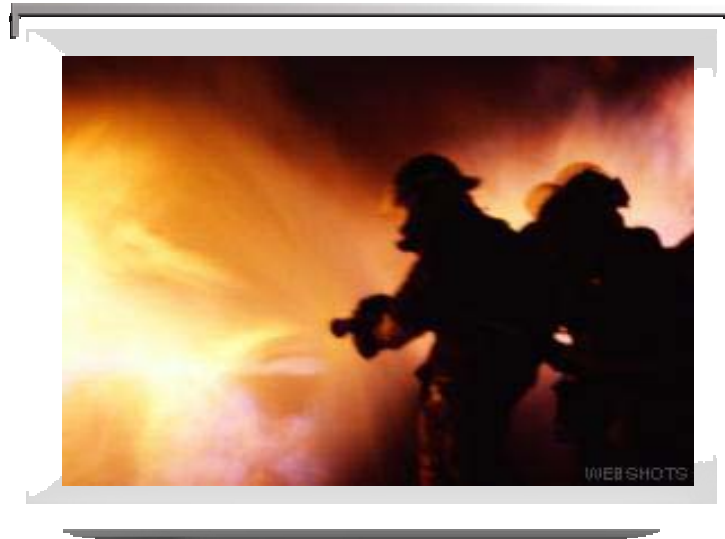
TIME	LOCATION	EVENT	COMMENTS
11:38	Underground	PED message received at 11:47 am "Mock Ex high CO Trunk 2 Tranny.	
11:42	Underground	Located Outbye Deputy at 20 cut-through, 'A' Heading, Maingate 11.	
11:44	Underground	Fenzy donned by Outbye Deputy at 20 cut-through, 'A' Heading, Maingate 11.	
11:45	Underground	Outbye Deputy dons light hazy smoke goggles.	
11:50	Refuge Chamber	Outbye Deputy enters Maingate 11 refuge chamber, 17 cut-through, 'A' Heading.	
11:52	Refuge Chamber	Outbye Deputy phone Control from refuge chamber.	
11:54	Refuge Chamber	Outbye Deputy decides to remain in refuge chamber.	
12:15	Refuge Chamber	Compressor availability confirmed for refuge chamber – no back-ups available at short notice.	
12:21	Refuge Chamber	Outbye Deputy in 17 cut-through Maingate 11 refuge chamber started to wonder where Maingate 11 crew were.	
12:34	Refuge Chamber	Outbye Deputy contacts Control via phone from refuge chamber for update.	
12:49	Refuge Chamber	<ul style="list-style-type: none"> Maingate 11 crew enter 17 cut-through refuge chamber. Message sent to all PED's "Mock Ex fire PJB gas cyl A 30" 	<i>PED message received at 12:55</i>
12:50	Refuge Chamber	Message sent to PED's "all inbye A 30 go to refuge".	<i>PED message received at 12:57</i>
12:51	Refuge Chamber	Contact from surface to Maingate 11 refuge chamber via "wobbler" phone.	
12:56	Refuge Chamber	Maingate 11 crew looking at mine plan to work out direction of smoke. Planning to walk out 'E' Heading using lifeline.	
13:00	Refuge Chamber	Maingate 11 crew attempting to contact Control via DAC – unsuccessful.	<i>DAC only reached to the top of the borehole.</i>
13:01	Refuge Chamber	Member from Maingate 11 crew phone Control for update – asked for CO make in 'B' Heading.	
13:07	Refuge Chamber	<ul style="list-style-type: none"> IMT phones Maingate 11 refuge chamber – informed them to stay, environment bad. Deputy informed IMT that tranny fire unconfirmed. CO off-scale. 	
13:15	Refuge Chamber	Received PED message "if walking, contact Control".	
13:23	Refuge Chamber	Maingate 11 refuge chamber informed refuge chamber borehole person – have lost pit compressed air.	
13:24	Refuge Chamber	Maingate 11 crew changed from pit compressed air to CABA air supply – donned full face masks.	
13:26	Refuge Chamber	Refuge chamber informed that compressors have been dispatched from town.	
13:32	Refuge Chamber	Request from Control for names in Maingate 11 refuge chamber and are looking to locate Lamp 225.	<i>Lamp 225 hadn't been racked – unsure where he was.</i>
13:35	Refuge Chamber	Control rang to verify names of personnel in Maingate 11 refuge chamber.	

TIME	LOCATION	EVENT	COMMENTS
13:41	Refuge Chamber	<ul style="list-style-type: none"> DAC call from borehole to refuge chamber – ready to send air down. Check completed on oxygen level by minigas. Air supply change conducted. 	
13:42	Refuge Chamber	Pit compressed air and CABA air supply turned off.	
13:46	Refuge Chamber	Surface borehole shed contacted refuge chamber via DAC to check that all is fine with the air supply from the surface.	
13:48	Refuge Chamber	Light check conducted in Maingate 11 refuge chamber – didn't work.	
13:52	Refuge Chamber	Lights now on in Maingate 11 refuge chamber.	
13:53	Refuge Chamber	Checks on quantity of potable water in refuge chamber.	
14:18	Refuge Chamber	Refuge chamber contacted refuge hut for information.	<i>Refuge chamber should have contact Control.</i>
14:20	Refuge Chamber	Refuge chamber phoned Control for information. Told that rescue team has left the surface, three people missing and that the GAG has been mobilised.	
14:27	Refuge Chamber	Surface phoned refuge chamber to find out where the PJB was.	
14:36	Refuge Chamber	Refuge chamber contacted refuge hut to see how things were at the top of the borehole.	
15:02	Refuge Chamber	Maingate 11 refuge chamber contacted Control for update. Told that mines rescue had been withdrawn, given up-to-date gas concentrations.	<i>Hydrogen was highlighted for the first time in the gas concentrations given.</i>
15:08	Refuge Chamber	Refuge chamber expressed great concerns over what was happening in relation to the gas readings and rescue team removal.	
15:14	Refuge Chamber	Contact made with borehole shed – borehole shed asked to contact Control and find out update on gas readings and where the sample was being taken from – also queried mines rescue withdrawal.	
15:17	Refuge Chamber	Maingate 11 crew gave the visitor the opportunity to discuss her feelings in relation to leaving the refuge chamber and walking out.	
15:20	Refuge Chamber	Underground Mine Manager contacts Maingate 11 refuge chamber to reassure actions and told them to stay put.	<i>Discussions on escape continued in the refuge chamber.</i>
15:25	Refuge Chamber	Members of Maingate 11 crew questioning why they shouldn't leave the refuge chamber.	
15:30	Refuge Chamber	Refuge chamber crew attempting to determine what other tube bundle points could be sampled to obtain more information.	
15:32	Refuge Chamber	Refuge chamber received information from borehole shed regarding where the tube bundle sample was obtained – 39 cut-through, 'A' Heading. Asked if sample could be obtained from 'F' Heading, Maingate 11.	
15:36	Refuge Chamber	<ul style="list-style-type: none"> Borehole shed contacted refuge chamber – have no answers. Told not to contact IMT – they will contact you when necessary. 	<i>Morale decline in refuge chamber.</i>

TIME	LOCATION	EVENT	COMMENTS
15:37	Refuge Chamber	Maingate 11 crew start talking about conducting changeover training with the visitor in preparation to leave the refuge chamber and walk out.	
15:42	Refuge Chamber	Signs of splitting in crew – some members adamant that they were staying in refuge chamber, other adamant that they were walking out.	
15:44	Refuge Chamber	One crew member in refuge chamber takes offence to IMT response in regards to information being forwarded.	
15:48	Refuge Chamber	Plan mapped out on leaving refuge chamber – belief that escape would be made down 'C' Heading.	
15:52	Refuge Chamber	Maingate 11 refuge chamber contacted Control for gas readings in 'C' Heading.	
15:58	Refuge Chamber	<ul style="list-style-type: none"> IMT asked crew to stay in refuge chamber; they are not sending down mines rescue to close the door; it will take 2 hours to set up GAG and 12 hours to extinguish the fire. Underground Mine Manager told the crew not to walk out – this would take 4 hours. 	
16:07	Refuge Chamber	Crew members are upset about mines rescue not being sent down the pit to close the door.	
16:11	Refuge Chamber	Refuge chamber contacted Control wanting to speak directly with the Mines Rescue Co-ordinator.	<i>Control provided the refuge chamber with the direct phone number to contact.</i>
16:13	Refuge Chamber	Refuge Chamber contacted the Mines Rescue Co-ordinator – challenged why the doors weren't being closed at outbye 31 cut-through.	
16:15	Refuge Chamber	Two crew members want to leave the refuge chamber and close the door on their way out of the pit.	
16:18	Refuge Chamber	Discussion between crew members on walking out of the pit.	
16:43	Refuge Chamber	Refuge chamber contacted Control for an update – asked if other crew were still in the pit and told no, and informed that mines rescue were suiting up to go underground.	
16:48	Refuge Chamber	IMT informed crew that mines rescue were not coming – too risky. New gas levels known and smoke coming out of both fans.	<i>Underground Mine Manager reiterates that crew was to stay in refuge chamber and were told that Centrecare would talk to them if requested.</i>
17:03	Refuge Chamber	Underground Mine Manager contacts Maingate 11 crew to inform them that the underground component of the exercise has been terminated.	

INCIDENT SITE

Assessors: Wayne Hartley & Ron Stothard



RECOMMENDATIONS

1. Mine ventilation must be considered when fighting underground fires. The first mine crew who attempted to fight the fire had to obtain equipment from the belt road depot which required moving through ventilation doors. These doors were left open when the crew evacuated the area, which would have changed the course of the ventilation circuit. There is a need to communicate the requirements for ventilation control to the workforce during refresher training as required by the Fire Management Plan.
2. The industry, in general, needs to become familiar with the hazards associated with the use of acetylene cylinders, as well as the specific requirements for gas cylinders, underground, for the purpose of fire control. It was observed that very little is known about the characteristics of acetylene cylinders in an emergency underground.
3. Audits of fire fighting equipment at depots and stations must be carried out with the resultant equipment replenishment as required. Equipment was missing from the surface fire station when sought for use in the emergency underground.
4. Mines need to improve the level of skill in the area of tactical and strategic fire control methods. This requires a higher level of skill of the nominated Fire Officer for the mine and a flow on to the training of employees in fire fighting methods. There have been substantial changes made in the way fire fighting is conducted – this has not translated to the underground coal sector.
5. Mines Rescue personnel must adhere (within reason) to instructions issued from the Incident Commander.

OBSERVATIONS

The Fire Incident Site Assessors examined the areas around 30, 31 and 33 cut-throughs of 'A', 'B' and 'C' Headings and observed the following –

- Trap doors existed in 30 and 31 cut-throughs between 'C' Heading (conveyor belt roadway) and 'D' Heading (return roadway).
- A fire depot equipped according to the 'Fire Management Plan' was located approximately 30 metres outbye of 30 cut-through in 'C' Heading. A fire hydrant was also located in this area.
- Doors located at 30 cut-through between 'B' Heading and 'C' Heading were closed.
- A fire depot was located in 33 cut-through on the 'B' Heading side of the cut-through, and a telephone (504) was also located here.

The Fire Incident Site Assessors received a PED message at approximately 11:35 am to signal the commencement of the exercise.

The Assessors then confiscated two machines, an EIMCO 913 and a drift runner transporter and set-up the incident site to represent a major collision at the intersection of 31 cut-through and 'A' Heading. The impact of the vehicles was significant, crushing the acetylene cylinder and several drums of diesel being transported on the driftrunner that resulted in an extensive explosion. The two drivers of these vehicles were fatally injured as a result.

The fire rapidly developed, spreading to the ribs and roof of the mine and escalation of this fire was measured in relation to fire-fighting efforts. It was discovered that a third person was with the equipment when the incident occurred.

At 11:40 am a PED message was received "100 ppm CO".

A mine crew and a Deputy, a total of eight people, wearing self-contained self-rescuers (SCSR's) and using guide sticks reached 31 cut-through at 12:27 pm. It was noted that this crew were from Maingate 12 section. The crew moved outbye of 31 cut-through, 'B' Heading where an accompanying Assessor informed them that they were now in fresh air. The Deputy took control of the team and instructed the crew to remove their SCSR's and set aside the guide sticks.

They enquired and were informed that Control had been notified that the crew were now fighting the fire.

At approximately 12:40 pm the crew entered 'C' Heading from 'B' Heading, via 30 cut-through and equipped themselves with fire-fighting gear (hoses and equipment) from the fire depot located in 'C' Heading outbye of 30 cut-through. The water supply was from the hydrant at 30 cut-through, 'B' Heading and was adequate for the purpose.

A crew member was stationed at the 30 cut-through, 'C' Heading intersection DAC as instructed by the Deputy. At approximately 12:47 pm the crew member advised that the Deputy was contacting Control because the fire was 'out of control'. At 12:50 pm the Deputy came over to his crew and announced that an acetylene cylinder was involved and that it could blow.

At approximately 12:51 pm the Deputy directed his team to abandon the fire site and start heading outbye.

Relevant PED messages received were –

- 12:55 pm – *'gas cylinder fire at A30'*
- 12:57 pm – *'all inbye to go to refuge'*
- 1:15 pm – *'if walking, contact Control'*

It was observed that there was significant confusion over the information received relating to the incident site. It was noted that the first fire-fighting crew had left one of the doors (of a set of double roadway doors) open between 'B' and 'C' Headings, 30 cut-through, and the longwall crew had left for the surface abandoning all equipment.

At approximately 2:13 pm, three vehicles were observed travelling inbye and stopped just inbye of 29 cut-through, 'B' Heading. Two men from the vehicles moved forward to examine the Heading. The vehicles consisting of an MPV, a drift runner maintenance vehicle and a Toyota troop carrier were moved to just outbye of 30 cut-through, 'B' Heading intersection.

At 2:20 pm mines rescue team members moved into 30 cut-through towards 'A' Heading when the FAB brigadesman called out to him that he hadn't been briefed on what the team was going to do. The time was recorded at 2:28 pm and the Mines Rescue Captain and his team retreated to the FAB and carried out the briefing. The FAB did not have the "emergency roll" with them.

From approximately 2:23 pm, the mines rescue team were moving the foam generators up to 30 cut-through, 'B' to 'A' Headings setting up equipment just back from the intersection. There appeared to be a problem with setting up the turbex generator because the shroud was missing from the equipment (this allows the collapsible duct to be installed on the smaller HiEX generator).

There was no serious attempt made to improvise in connecting this ducting or locate the Turbex. An attempt was made to use the smaller HiEX generator but this was unsuccessful and the foam pooled in the intersection and started to run back outbye of the 30 cut-through 'A' Heading intersection because of the grade of the roadway. This placed, what little foam was generated, some 80 metres from the fire. The incorrect, perceived risk of the acetylene cylinder exploding was a significant factor in the decision making process.

Around 3:00 pm the mines rescue emergency telephone was observed to be connected from the 27 cut-through, 'B' Heading connection and the telephone was set up in 29 cut-through, 'B' to 'C' Headings. At 3:04 pm Control contacted the Mines Rescue Captain and at approximately 3:06 pm the Captain was told to withdraw to the surface and bring as much gear with them as possible. The FAB team member passed this information onto the Assessors.

Contact was made with Control by the Assessors for an update and were advised that they have a bag sample and have indicated to mines rescue that the gas samples are stabilising and indicated that the non-explosive situation existed. Control also said that a second bag sample will indicate the same information and they were waiting to see what mines rescue decide to do.

Approximately two minutes later at 5:10 pm, the Fire Incident Site Assessors were advised that the underground exercise had been terminated and organised transportation for the operators and themselves to return to the surface.

APPENDIX 1 – THE EMERGENCY EXERCISE TIMELINE

LOCATION	EVENT	TIME	LOCATION	EVENT
		11:31	Control Room	Commencement of Incident
Underground	PED message received at 11:40	11:33	Control Room	Message sent to all PEDs "Mock Emergency, 100 ppm CO C 32"
		11:35	Control Room	Control Representative realised 100 ppm from monitoring system at 32 'C' Heading
Underground	PED message received at 11:47	11:38	Control Room	Message sent to all PEDs "Mock Emergency, High CO Trunk 2 Tranny"
		11:39	Control Room	Audible siren commenced
		11:41	Control Room	DAC message sent "This is a mock emergency. High CO"
Underground	<ul style="list-style-type: none"> Outbye Deputy located at Maingate Maingate 12 crew assembled at crib room and donned SCSR 	11:42		
Underground	<ul style="list-style-type: none"> PED message received at 11:49 Smoke sighted by electrician at Longwall 11 drivehead – donned SCSR 	11:43	Control Room	Message sent to all PEDs "Evacuate Primary Egress"
Underground	Fenzy donned by Outbye Deputy at Maingate 11, 'A' Heading, 20 cut-through	11:44	Control Room	Underground Mine Manager issued instruction to evacuate primary egress
		11:47	Control Room	<ul style="list-style-type: none"> Initiated internal notification process Message sent to all Deputies "Mock Emergency. Control Control asap"
Underground	Maingate 12 crew leave panel in PJB	11:48	Control Room	Mines Inspector (on-site) informed of emergency. Requested to participate in IMT
Underground	<ul style="list-style-type: none"> Outbye Deputy enters refuge chamber, Maingate 11, 'A' Heading, 17 cut-through Maingate 12 crew enter refuge chamber, 0 – 1 cut-through 	11:50	UMMs Office	Relief Underground Mine Manager briefed by the Underground Mine Manager so he could go home. Reminder that acetylene bottle was underground.
Underground	Underground electrician reaches 50 cut-through, 'A' Heading on heavy smoke.	11:51		
Underground	Outbye Deputy phones Control from refuge chamber.	11:52	Control Room	Surface siren sounded again.
Underground	Outbye Deputy decides to remain in refuge chamber.	11:54		
Underground	Message received at 12:00.	11:55	Control Room	Message sent to all Deputies "Mock Emergency. Contact Control asap"
Underground	Maingate 12 crew left refuge chamber.	11:58		
Underground	Underground electrician changed from 'A' Heading to escape to 'D' Heading.	11:59	Control Room	<ul style="list-style-type: none"> Message sent to Outbye Deputy "Emergency, Emergency, contact Control" Message sent to Maingate 11 Deputy. "Emergency, Emergency, contact Control" Recognition that two possible fire sources exist.
Underground	Maingate 12 crew encounter heavy smoke at 45 cut-through and abandon PJB.	12:03		

LOCATION	EVENT	TIME	LOCATION	EVENT
		12:05	Control Room	Rescue Co-ordinator instructed by IMT to prepare two teams to go underground.
Underground	Outbye Deputy passed 31 cut-through evacuating mine down 'B' Heading.	12:06		
Underground	Outbye Deputy entered 'D' Heading.	12:07		
		12:15	Mines Rescue	Compressor availability for refuge chamber confirmed.
		12:17	Control Room	IMT established in appropriate room. Facilitator set ground rules and established the room.
Underground	Outbye Deputy in 17 cut-through refuge chamber, Maingate 11 – started to wonder where Maingate 11 crew were.	12:21		
		12:25	Control Room	<ul style="list-style-type: none"> Ventilation Officer took over responsibility for acknowledgement / actioning of alarms. CO alarms at shaft.
			IMT	<ul style="list-style-type: none"> Ventilation Officer enters IMT. IMT discussion regarding re-entering mine for investigation. Tentative decisions made and action plans formed.
			Rescue	<ul style="list-style-type: none"> Six confirmed rescue trainees making their way to site. Rescue Co-ordinator notified Shift Co-ordinator to request assistance from Kestrel.
Underground	Maingate 12 crew under guide sticks, low visibility at 31 cut-through. Crew now outbye fire and in good visibility.	12:27		
		12:28	IMT	Relief Underground Mine Manager prepared to act on IMT decision to investigate fire site.
		12:32	IMT	Ventilation Officer determines that 'A' Heading, 49 cut-through is 1000ppm at Tube 13.
Underground	Maingate 12 crew at 'B' Heading, 30 cut-through. Two crew members sent to 'A' Heading, 30 cut-through to investigate fire.	12:33		
Underground	<ul style="list-style-type: none"> Outbye Deputy contacted Control via phone from refuge chamber for update. Maingate 12 crew split. Four crew members setting up fire fighting gear and two members checking fire in 'C' Heading. 	12:34	Control Room	Received call from Maingate 12 crew from 'C' Heading, 30 cut-through. Identified vehicle fire at 'A' Heading, 31 cut-through and requested assistance for fire-fighting asap.
Underground	Two Maingate 12 crew members inspecting fire in 'C' Heading reached 31 cut-through and were restricted by heavy smoke. Retreated to 'C' Heading, 30 cut-through and notified Control.	12:36		
		12:37	Control Room	Control advised IMT of vehicle fire.
			IMT	Decision made to retract search team – not enough information available on situation.
		12:38	Rescue	Mines rescue equipment being prepared for use underground.
		12:38	IMT	Site Senior Executive enters IMT – requested updated in his office at 12:45.

LOCATION	EVENT	TIME	LOCATION	EVENT
		12:40	Rescue	Rescue Co-ordinator verifies rescue team from Kestrel. Eight men available with two stand-by teams available in Blackwater.
			Control Room	Industry Safety and Health Representative arrives on site.
		12:42	IMT	Ventilation Officer delivers first summary on ventilation situation.
Incident Site	<ul style="list-style-type: none"> Fire fighting commenced in 'A' Heading. Realisation of extent of fire. 	12:43	IMT	<ul style="list-style-type: none"> IMT verify that acetylene cylinder in PJB 12. Ventilation Officer removes issue of belt fire. Now focussing on one fire only.
		12:45	IMT	<ul style="list-style-type: none"> IMT opinion that acetylene cylinder too high risk for fighting fire in 'A' Heading. Team to pull back and commence high expansion foam. Relief Underground Mine Manager asked questions regarding fire and acetylene cylinder – re-focussed group and made decision to stop fire fighting.
			Rescue	Rescue Co-ordinator still assuming there is a transformer fire.
Incident Site	<ul style="list-style-type: none"> One member from Maingate 12 crew instructed by Deputy to stay by DAC at 30 cut-through intersection. Fire crew decides that fire is out of control – water off and withdraw. Crew within 6 meters of fire. 	12:47		
		12:48	Control Room	Deputy from Maingate 12 advised by Control of acetylene cylinder in vehicle. Reported that fire is "big", mines rescue is required and crew is evacuating.
Incident Site	Maingate 12 crew evacuate. Deputy informed crew that acetylene cylinder "could blow".	12:49	Control Room	Message sent to all PEDs "Mock Exercise – fire PJB, gas cylinder, A 30"
Underground	<ul style="list-style-type: none"> Maingate 11 crew enter refuge chamber at 17 cut-through, Maingate 11. PED message received at 12:55 			
Underground	PED message received at 12:57.	12:50	IMT	<ul style="list-style-type: none"> IMT updated from underground – fire too big, this is a mines rescue job. Industry Safety and Health Representative arrives in IMT room.
			Control Room	<ul style="list-style-type: none"> Advised that Outbye Electrician at 25 cut-through in clear visibility and leaving mine on foot. Message sent to all PEDs "all inbye A 30 go to refuge"
Underground	Underground electrician arrives at 25 cut-through cache. Access 'C' Heading and contacts Control by DAC. Told to travel to surface via 'B' Heading – no transport available.	12:51		
Refuge Chamber	Surface contacted refuge chamber in Maingate 11, 17 cu-through via "wobbler phone".			
		12:52	IMT	Underground Mine Manager notifies Rescue Co-ordinator to prep for high expansion foam fire fighting.
			Surface	Maingate 11, 17 cut-through refuge chamber borehole on surface being prepped.

LOCATION	EVENT	TIME	LOCATION	EVENT
		12:53	Control Room	Maingate 12 crew notified Control that eight men walking out 'C' Heading, 22 cut-through due to acetylene cylinder.
		12:55	IMT	Underground Mine Manager uses a prepared plan to estimate walk out times for each crew underground out of the mine.
Refuge Chamber	Maingate 11 crew in refuge chamber looking at mine plan to work out direction of smoke. Planing to walk out 'E' Heading using lifeline.	12:56	Rescue	Refuge Chamber Co-ordinator discovers after-cooler for refuge chamber was missing.
		12:58	IMT	Underground Mine Manager realises he has incomplete information to prepare briefing for Site Senior Executive.
			Control Room	Kestrel advise Control Room that five mines rescue members on route.
Refuge Chamber	Maingate 11 crew in refuge chamber attempting to contact Control via DAC – unsuccessful. DAC only to top of borehole.	13:00	IMT	IMT learns that Maingate 11 refuge chamber contained Maingate 11 crew and Outbye Deputy.
			Control	Lamproom attendant advised that there are 44 people underground.
		13:01		
Refuge Chamber	Crew in Maingate 11 refuge chamber contacted Control for update – asked for CO make in 'B' Heading.	13:02	IMT	IMT focussing on whereabouts of underground personnel.
Refuge Chamber	Deputy informed IMT – tranny fire unconfirmed. CO off-scale.	13:07	IMT	IMT contacted Maingate 11 crew in refuge chamber – informed them to stay, environment bad.
		13:08	IMT	Underground Mine Manager leaves IMT to assist in identification of missing persons.
		13:10	IMT	IMT commences fire fighting discussion.
Underground	PED message received at 13:15.	13:11	Control Room	Message sent to all PEDs "mock exercise, if walking contact Control"
		13:14	Rescue	Team and equipment ready to go underground to fight fire.
		13:15	IMT	Ventilation Officer still undecided on status of tranny fire and mentions double doors in 'B' to 'C' Heading.
			Control Room	Maingate 12 crew contact Control for vehicle to exit mine.
		13:20	Rescue	Rescue Co-ordinator informed IMT of readiness of rescue team – still thinking "tranny fire".
			IMT	Rescue Co-ordinator given broad scope of incident. Fire fighting plan developed and authorisation given. Rescue Co-ordinator asked for gas and explosibility levels. Informed – not explosive.
		13:23	Surface	Maingate 11 refuge chamber crew informed refuge chamber borehole person – have lost pit compressed air.
		13:25	Control Room	Whereabouts of REB underground still unconfirmed.

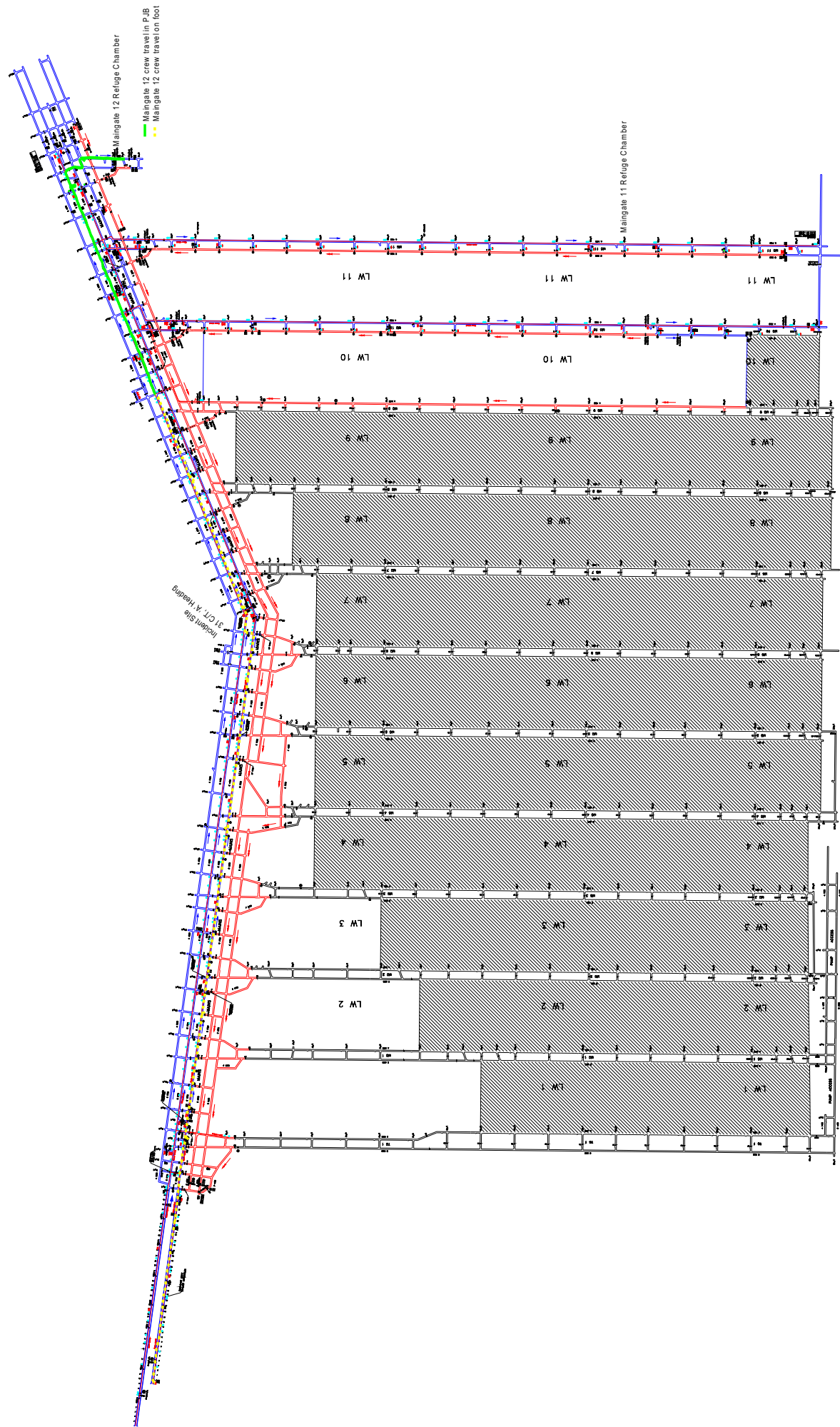
LOCATION	EVENT	TIME	LOCATION	EVENT
		13:26	Control Room	Message sent to driver of EIMCO "mock emergency, contact Control" Message was received.
		13:30	Rescue	Rescue team briefed. Dangers outlined on acetylene cylinder, possible strata failure and location of vehicles given.
		13:31	Control Room	Ventilation Officer identifies two visitors unaccounted for.
Refuge Chamber	Maingate 12 crew arrive on surface.	13:32		
		13:33	Control Room	Message sent to Deputy, Maingate 11 "call Control asap"
Refuge Chamber	Control rang to verify names of personnel in Maingate 11 refuge chamber.	13:35		
Underground	Underground Electrician arrived on surface.	13:37		
		13:40	IMT	Maingate 12 Supervisor briefs IMT on observations of fire site.
Refuge Chamber	DAC call from borehole to refuge chamber – ready to send air down. Check done on oxygen level by minigas and air supply change conducted.	13:41		
		13:44	Control Room	Message sent to driver of EIMCO "mock emergency, call Control" Message received.
Refuge Chamber	Status check of refuge chamber air supply conducted.	13:46	Rescue	Rescue team instructed by Rescue Co-ordinator to put suits on and prepare to go underground.
Refuge Chamber	Light check conducted in Maingate 11 refuge chamber – light didn't work.	13:48	IMT	Rescue Co-ordinator enters IMT to query CO concentration. Ventilation Officer and Underground Mine Manager reassure that concentration not explosive. This prompts request for bag sample.
Refuge Chamber	Lights on in Maingate 11 refuge chamber.	13:52		
Refuge Chamber	Checks on quantity of potable water conducted in Maingate 11 refuge chamber.	13:53		
		13:55	IMT	<ul style="list-style-type: none"> Missing people identified as REB – uncertain as to location or if involved in vehicle incident at fire site. Mines Inspector requested mobilisation of GAG.
		13:58	Control Room	Message sent to REB "mock emergency, call Control"
		14:00	Rescue	First mines rescue team dispatched underground. Two FAB personnel sent underground.
		14:05	Control Room	<ul style="list-style-type: none"> Bag sample collected. Message sent to REB "call asap"
		14:07	Control Room	Message sent to REB "mock emergency, call Control"
		14:10	Rescue	Rescue Co-ordinator instructed to contact Kestrel for more high expansion foam.
Incident Site	Mines rescue team and 3 vehicles arrive at 29 cut-through, 'B' Heading.	14:16		
		14:17	Control Room	Discussion held on using DAC to check other refuge chambers to ascertain if crews were in there.

LOCATION	EVENT	TIME	LOCATION	EVENT
Refuge Chamber	Refuge Chamber contacted Control for information. Told rescue team left surface, 3 people missing and GAG being mobilised.	14:20	IMT	Facilitator re-focuses group – set priorities / goals. Triggers established by Ventilation Officer for evacuation of fire fighting teams based on explosibility.
Incident Site	Mines rescue observed door open at 30 cut-through and closed door.	14:26		
		14:30	IMT	IMT group discussion – how often and what to tell Maingate 11 refuge chamber due to stress levels.
Incident Site	Mines rescue crew laying out high expansion foam units in 30 cut-through. Instructed not to enter 'A' Heading due to projectiles that may come from explosion area.	14:34	Control Room	First bag sample analysed.
		14:35	IMT	Discussion on possible search plan and talk about major ventilation changes.
		14:37	Rescue	GAG officially placed on standby by Rescue Co-ordinator. IMT under the belief that GAG will be on site in 1 ½ hours.
Incident Site	High expansion foam unit – no cowling. Team choose to replace with second smaller unit.	14:43		
Incident Site	Small foam unit in use. Foam discharging outbye 30 cut-through running back down roadway.	14:45	IMT	First GC report given to IMT.
			Rescue	8 drums of foam available from Kestrel.
Incident Site	FAB constructed in 'B' Heading, 29 cut-through. Phone communications in place.	14:50	IMT	Ventilation Officer determines atmosphere heading towards 80% LEL – need to evacuate fire crews.
		14:52	Control Room	Message sent to driver of EIMCO "mock emergency, call Control" Message received.
			IMT	Ventilation Officer orders immediate bag sample from tube bundle 13.
		14:54	Control Room	Bag sample collected.
Incident Site	<ul style="list-style-type: none"> Mines Rescue Captain contacts Control with update on fire site. Mines Rescue Team at 'A' Heading abandon high expansion foam and proceed to fight fire with water. 	14:55	Rescue	Blackwater Superintendent arrives on site with back-up equipment.
			IMT	Ventilation Officer recommends evacuation from earlier 80% LEL indication. No decision made.
		15:00	IMT	Ventilation Officer proposes to withdraw mines rescue personnel.
			Rescue	Mines Rescue Co-ordinator received message to evacuate teams from underground – mission to be aborted.
Refuge Chamber	Maingate 11 crew in refuge chamber contacted Control for update. Told mines rescue had been withdrawn, given up-to-date gas concentrations – highlighted hydrogen for first time.	15:02		
Incident Site	Mines rescue fire fighting team told to evacuate pit – they abandoned equipment and took the phone.	15:05	IMT	IMT review quality and quantity of information to be passed onto Maingate 11 crew in refuge chamber.

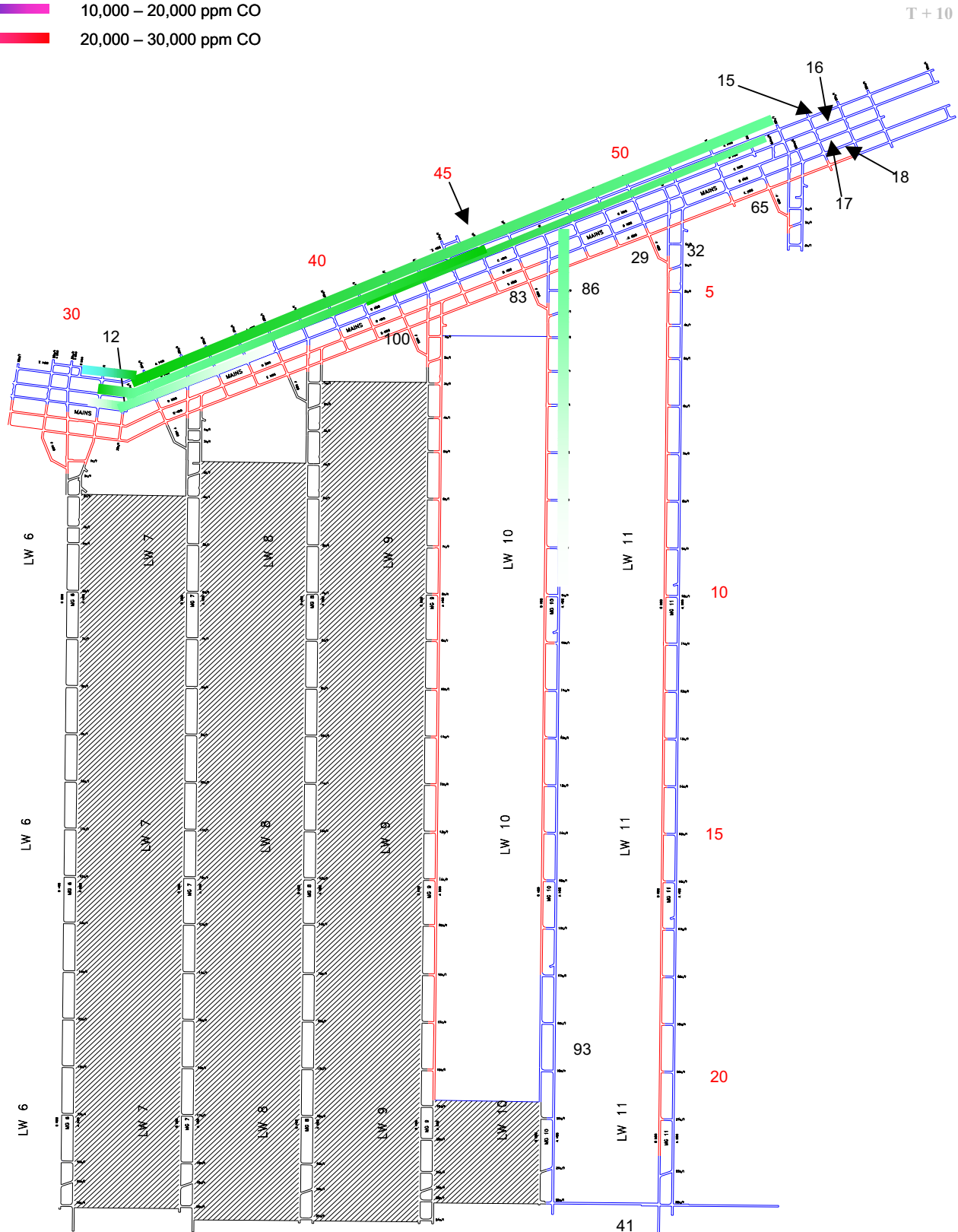
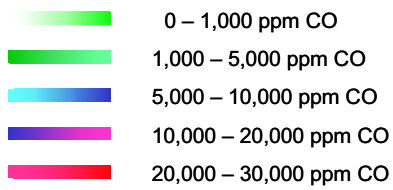
LOCATION	EVENT	TIME	LOCATION	EVENT
Refuge Chamber	Crew in Maingate 11 refuge chamber expressed great concerns over what was happening – gas readings / rescue team removal.	15:08		
		15:13		IMT learns that Maingate 11 refuge chamber being briefed on situation by other people.
Refuge Chamber	and queried mines rescue withdrawal.	15:14		
		15:15	Rescue	ordinator, Mines Rescue Co-ordinator and IMT.
		15:16	Control Room	Third bag sample collected. All samples similar.
		15:20		Mines rescue fire fighting team arrive back on surface and are briefed by Rescue Co-ordinator.
			IMT	<ul style="list-style-type: none"> Underground Mine Manager contacts Maingate 11 refuge chamber to reassure crew of actions being taken and told them to stay put. Discussions on escape continued in refuge chamber. Second GC sample results arrive in IMT room.
Refuge Chamber	Members of Maingate 11 crew questioning why they shouldn't leave refuge chamber.	15:25		Rescue Co-ordinator given direction to go underground and fight fire based on incorrect information.
Refuge Chamber	Refuge Chamber personnel attempting to determine what other tube bundle points could be sampled to obtain more information.		Rescue	Mines rescue teams told to collect gear and prepare to go underground. IMT deliberating whether or not to send teams underground.
Refuge Chamber	information from surface of boreholes.	15:32	IMT	IMT discussion on fire gases near ignition source – possible ventilation reductions and fall of roof.
			Control Room	Bag samples taken every 15 minutes from Tube 13.
		15:35	IMT	GC sample #3 confirms no basic change in conditions.
Refuge Chamber	Borehole shed contacted refuge chamber – have no answers on what was happening. Told refuge chamber not to phone IMT – IMT would contact them when needed. Morale decline in refuge chamber	15:36		
		15:40		Mines Rescue Team 1 Captain told IMT that the door has been closed at segregation stopping and smoke was still coming back against ventilation.
Refuge Chamber	chamber.	15:42		
Refuge Chamber	One member from Maingate 11 crew refuge chamber takes offence to IMT response in regards to the information being / not being forwarded.	15:44		
		15:45	IMT	escape.
Refuge Chamber	Maingate 11 crew mapped out a plan for leaving refuge chamber – belief that escape could be made down 'C' Heading.			
Refuge Chamber	Maingate 11 refuge chamber contacted Control for gas readings in 'C' Heading.	15:52		

LOCATION	EVENT	TIME	LOCATION	EVENT
		15:55		Group discussion on getting statement ready for recommendation for Maingate 11 crew to stay in refuge chamber.
Refuge Chamber	IMT asked Maingate 11 crew to stay in refuge chamber. Not sending mines rescue to close door. Would be two hours to set up GAG and 12 hours to extinguish fire. UMM told crew not to walk out – would take four hours.	15:58		
		16:04	Rescue	Dysart Mines Rescue Station rang – enquiring if assistance was needed and a contact number was left.
		16:06	IMT	Incident Management Team Facilitator re-focuses group on confirming goals. Commenced brainstorming of fire fighting options (positives / negatives).
Refuge Chamber	Crew member in Maingate 11 refuge chamber contacted QMRS Co-ordinator to challenge why doors weren't being closed outbye 31 cut-through.	16:13		
Refuge Chamber	Two crew members want to leave refuge chamber and close the door on their way out of the pit.	16:15		
Refuge Chamber	11 refuge chamber on walking out of the pit.	16:18		
		16:20		Underground Mine Manager reconsiders fighting fire.
		16:30		Gas sample #7 results received. Similar to previous results.
		16:35		11 persons are now in the IMT room – all involved in brainstorming of fire fighting options.
		16:38	IMT	Incident Management Team made decision based on 80% LEL – GAG the only way to fight the fire.
Refuge Chamber	Refuge Chamber contacted Control for update. Asked if other crews were still in the pit – told no. Informed that QMRS were suiting up to go underground.	16:43		
		16:45	IMT	Group discussion – will Maingate 11 crew in refuge chamber stay if told the GAG is being utilised.
Refuge Chamber	<ul style="list-style-type: none"> IMT informed crew that QMRS not coming – too risky. New gas levels known and smoke coming out both fans. UMM reiterates that crew were to stay in the refuge chamber. Maingate 11 crew informed that Centrecare would talk to them if they requested it. 	16:48		
		17:00	IMT	IMT informed that Maingate 11 crew would stay in the refuge chamber.
Refuge Chamber	UMM contacted Maingate 11 crew in refuge chamber to state that the underground component of the exercise has been terminated.	17:03		
		17:05	IMT	Order given to start GAG on full ventilation system.
		17:10	IMT	Development of action plans for fighting fire using GAG, including ventilation modification, additional gas monitoring needs, data analysis, personnel retrieval, downscaling of emergency and recovery of mine.
		17:45	IMT	Desktop exercise terminated.

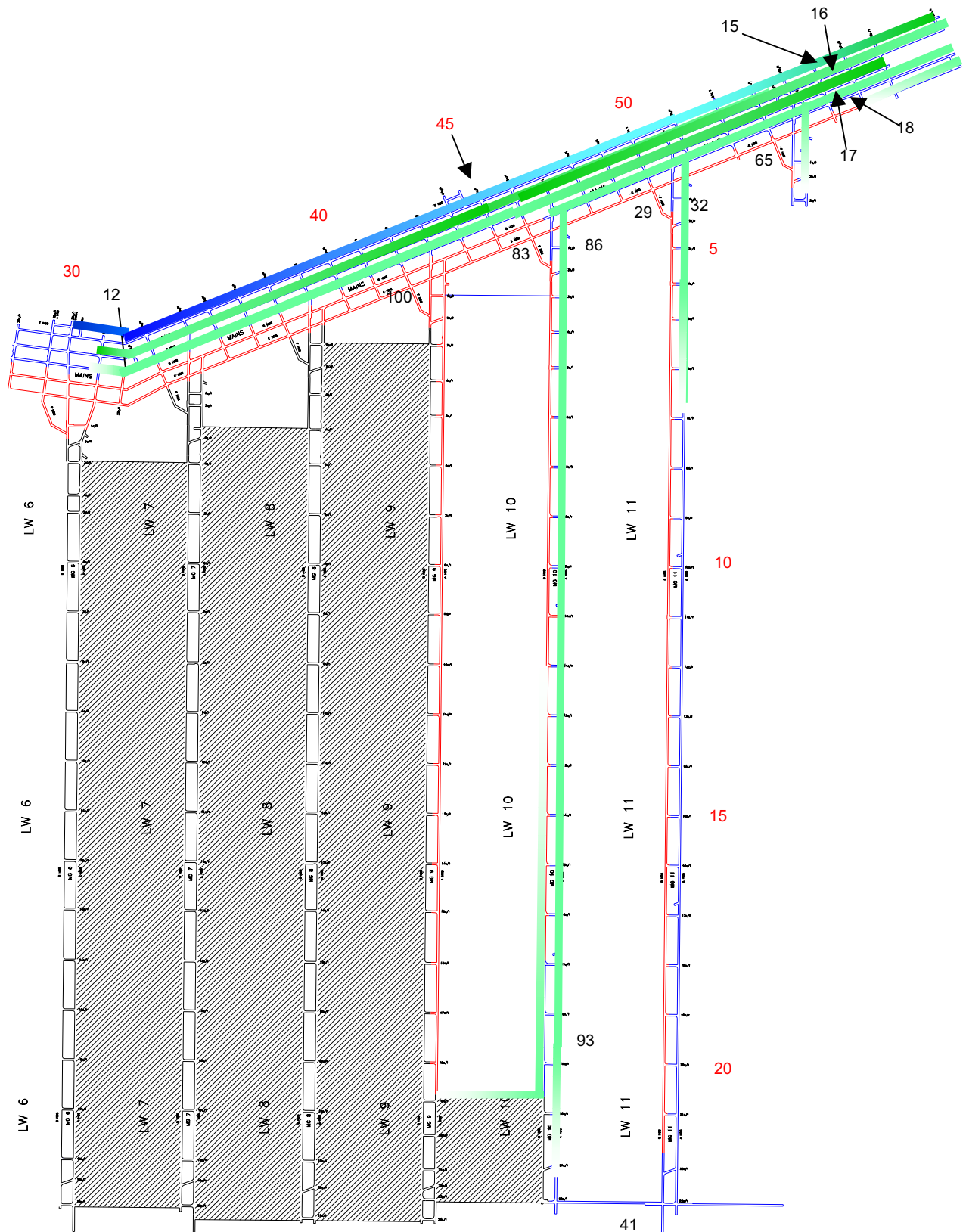
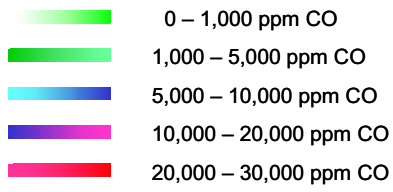
APPENDIX 2 – CRINUM MINE PLAN

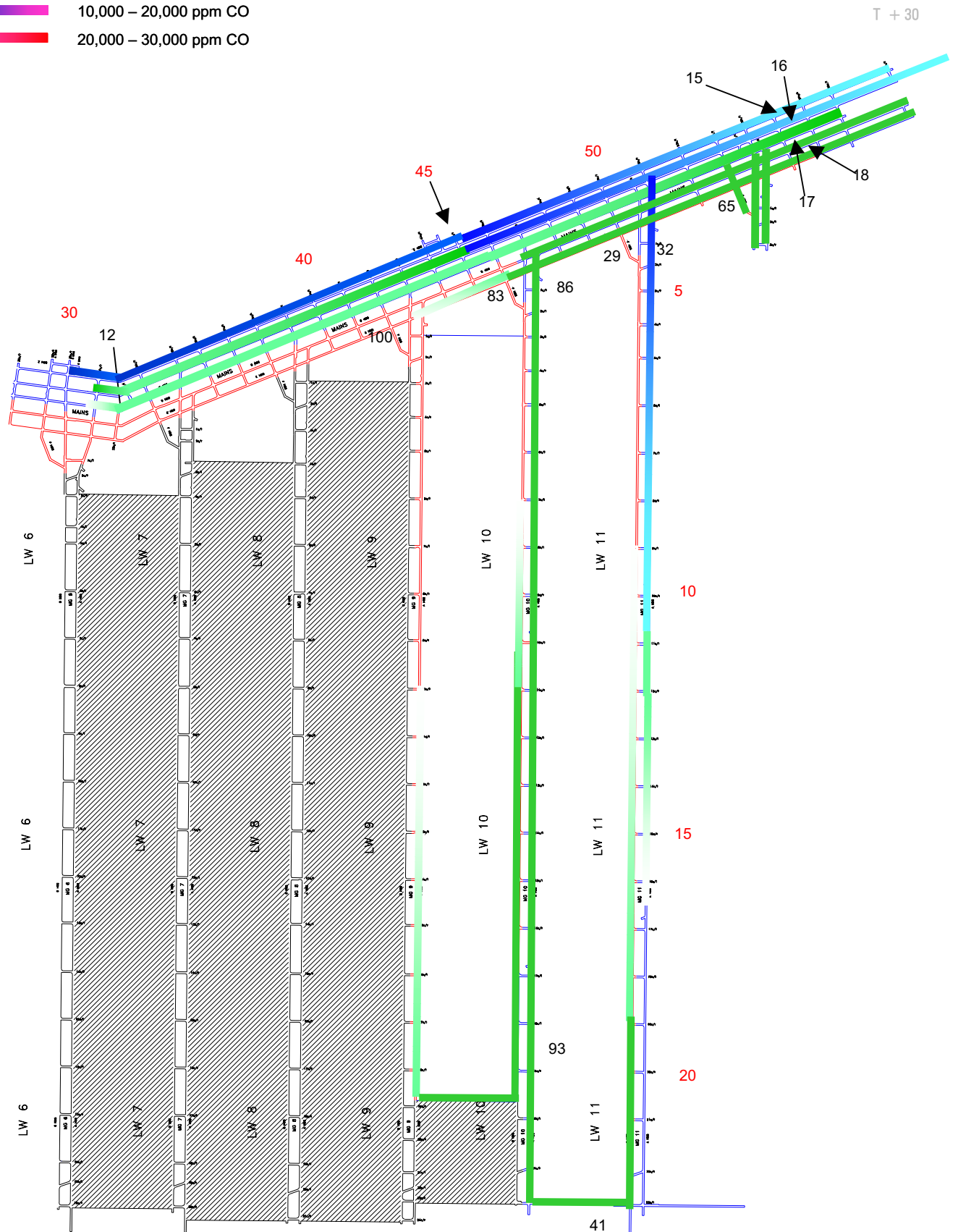
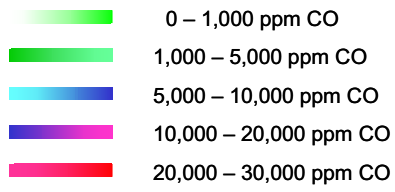


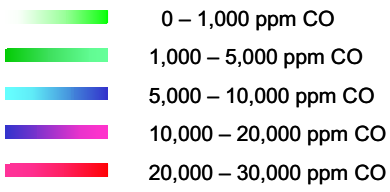
APPENDIX 3 – EMERGENCY EXERCISE POLLUTANT FLOWS



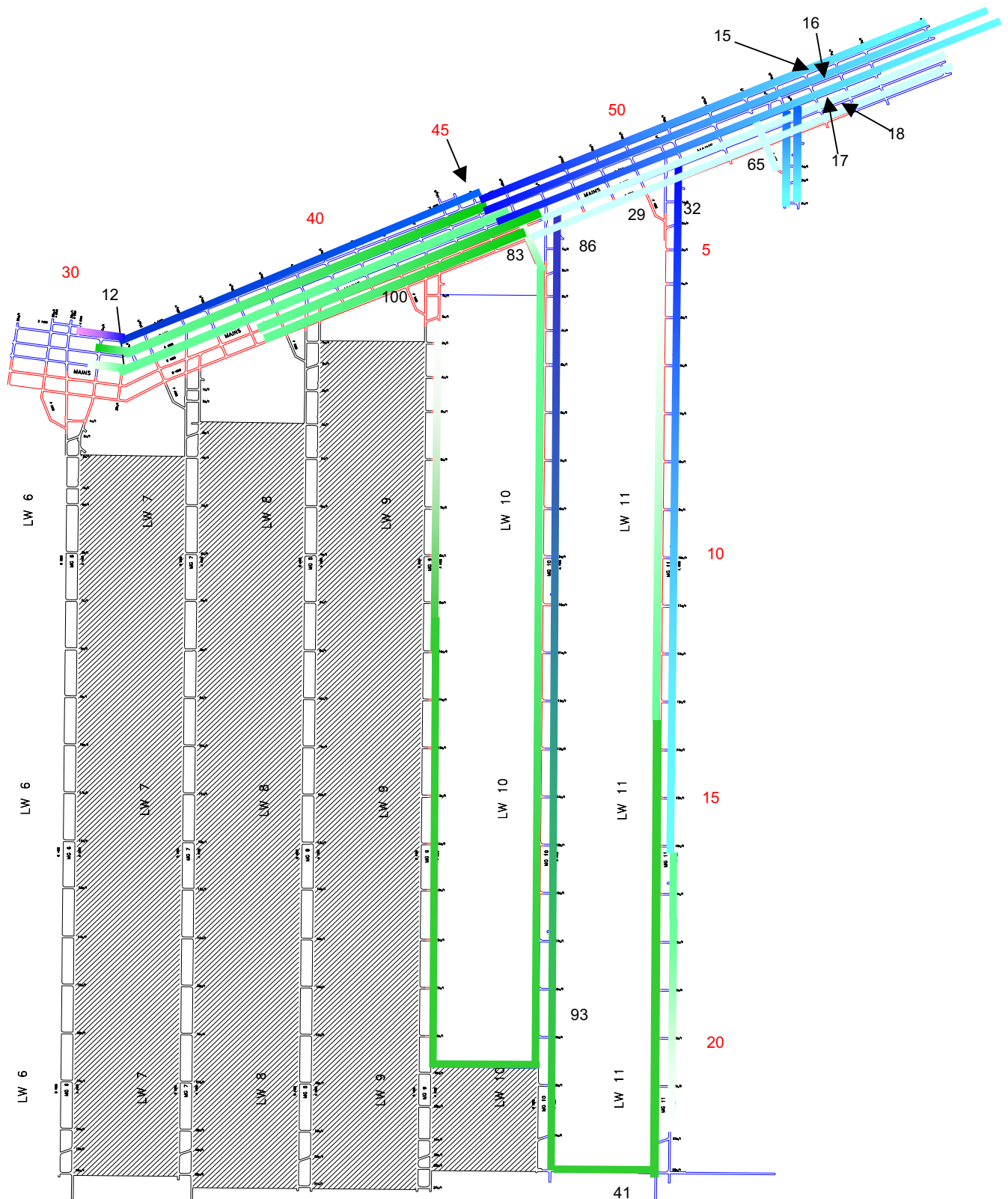
T + 20

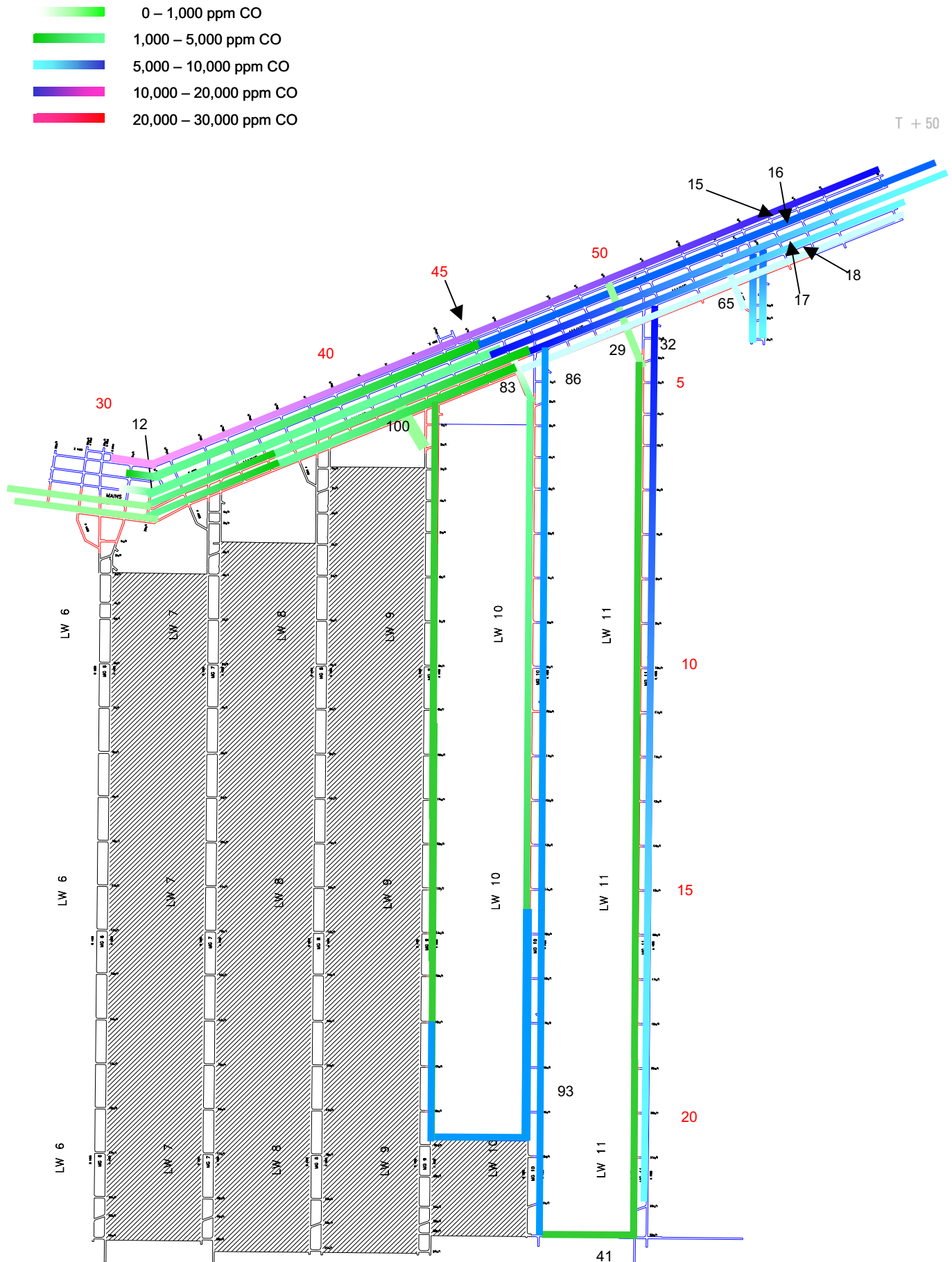


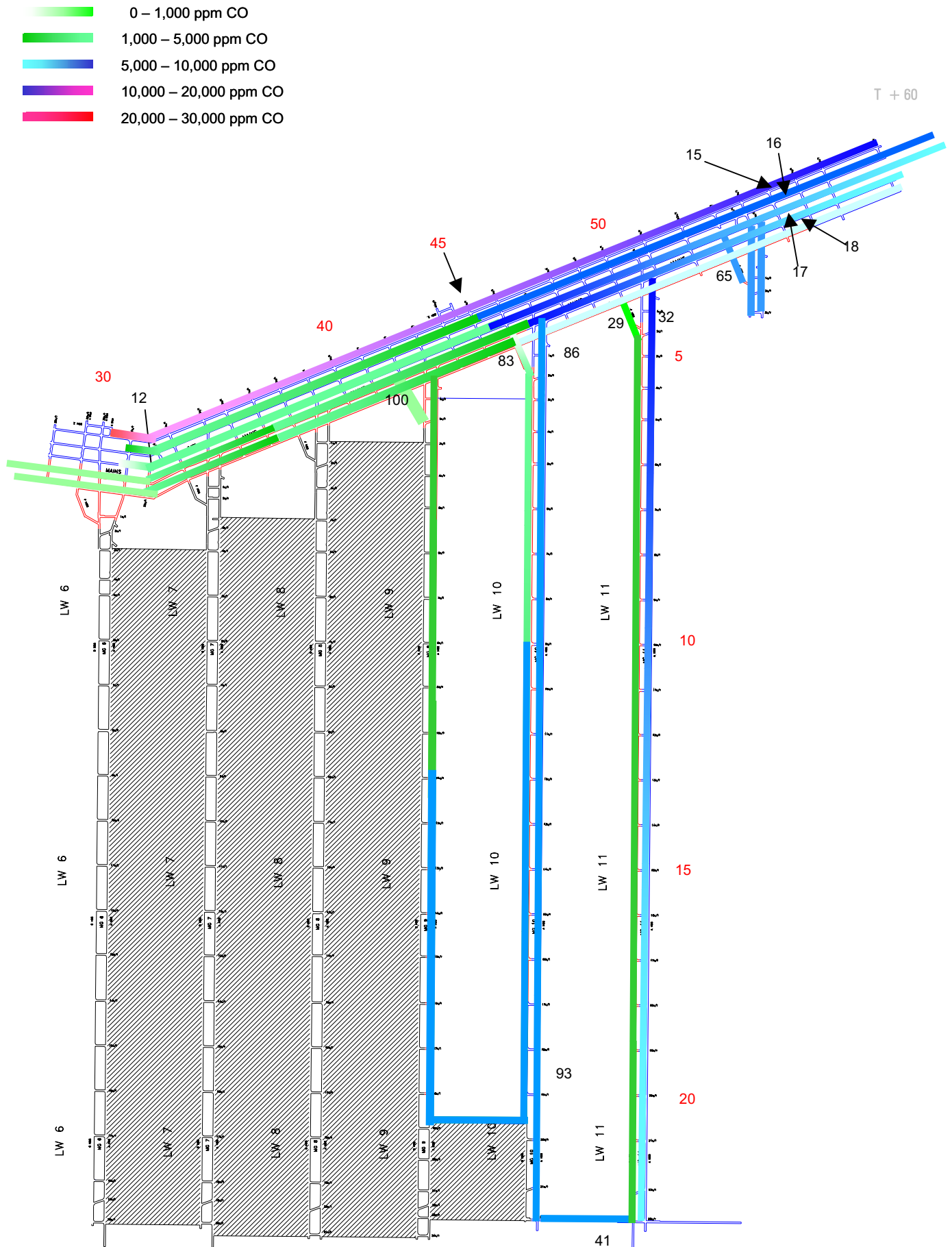




T + 40







APPENDIX 4 – THE EMERGENCY EXERCISE TEAM

David Reece

David is the Senior Inspector of Mines (Coal) with the Department of Natural Resources, Mines and Energy based in Brisbane. Some of the duties associated with this role include the coordination of the annual Queensland Level 1 Emergency Exercises; Examiner for statutory qualifications - 1st, 2nd, 3rd Class Certificates of Competency and Open-cut Examiners, and is actively involved in the industry based training and competency development committees.

David held various positions before joining the Department in 2002, some of which include Mine Manager, Dartbrook Colliery, NSW and Mine Manager for Central and North Goonyella Coal Mines which have allowed him to gain knowledge and experience in dealing with gassy and geologically complex mines in Queensland and New South Wales.

David holds a Bachelor of Engineering (Mining); Graduate Certificate in Mineral Resources (Risk Management); Managers and Undermanager Certificates of Competency; Underground Mines Rescue Certificate and a Certificate IV Assessor and Workplace Trainer.

Greg Dalliston

Greg has been involved in the mining industry for 30 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 which 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.

Peter Baker

Peter is currently employed by the NSW Mines Rescue Pty Limited as Manager – Southern Mines Rescue Station. He commenced working in the mining industry in 1980 and has held various positions, including Undermanager-In-Charge and Relief Manager. He assisted in the development of emergency procedures at Appin and Tahmoor Collieries and audits mine site emergency plans in his current role.

Peter has been in mines rescue since 1986 and was appointed Captain in 1988. Whilst a trainee, he represented the station as Competition Team Captain at the Australian Underground Championships. Peter holds a Master of Business and Technology Degree; a Mining Engineering Degree; Coal Mining Third, Second and First Class Tickets; Underground Mines Rescue Certificate; Train the Trainer Certificate and delivers the CMOB Emergency Preparedness Course.

David Cliff

Associate Professor David Cliff is currently the 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 mine 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; 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.

Martin Watkinson

Martin is currently 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 which 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.

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.

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.

Mike Downs

Mike graduated from the Royal School of Mines, Imperial College, London in 1974 and commenced work with the National Coal Board in the northeast area. After gaining his First Class Certificate of Competency in 1976 Mike worked as a Deputy, Overman, Fore-Overman and Acting Undermanager in various mines in Durham that employed a range of mining techniques, until emigrating to Australia in 1977.

Mike commenced as a Deputy in the western district of New South Wales and progressed through line management positions to become Colliery Manager at the Invincible Colliery during its period of longwall operations. After completing an MBA at Cranfield University in 1988, Mike then joined Thyssen as Operations Manager for the UK (south) before returning to Australia as Mine Manager at Oaky Creek No. 1 Coal Mine.

Mike later joined BHP Coal as Principal Development Engineer – Underground Coal, and then spent a period of time contracting activities for Barclay Mowlem before accepting the position as Manager, Safety and Health – Central Region with the Department of Natural Resources and Mines and Energy based in Rockhampton. Mike is responsible for the co-ordinated service delivery for the Mining, Explosives and Petroleum & Gas Inspectorates.

Russell Uhr

Russell entered the Queensland underground coal mining industry in 1985 as an operator in the Ipswich coalfield. Since 1988 he has performed various technical and operational roles within the MIM coal operations, including Mining Engineer, Undermanager, Development Co-ordinator, Longwall Superintendent, Acting Mine Manager, and is currently the Operations Superintendent at Oaky North Coal Mine.

Russell holds a Mining Engineering qualification, Bachelor of Business (Operations Management), Second Class Certificate of Competency, Mines Rescue Proficiency and is a mines rescue competition team member.

Steve Bullough

Steve is currently the Shift Co-ordinator for Crinum Coal Mine. He has an extensive mining background, having worked underground for 28 years in varying roles from miner through to Deputy at coal mines throughout Queensland and New South Wales. Steve is currently a board member for the Queensland Mines Rescue Service and has been an Assessor for the Blackwater District mines rescue competitions for the past 7 years.

Mark Donghi

Mark began his career in the mining industry as a Cadet Mine Manager in 1981 and during his 22 years experience has gained valuable mining knowledge from working at numerous Queensland coal mines in various positions. Some of these positions have included Survey Assistant; Machine-man Miner; Coal Sampler; Senior OH&S Co-ordinator; Senior Safety Advisor; Control Room Operator; Senior Contracts Advisor; Senior Compliance Engineer and Project Manager – Drivage Project.

Mark is currently the Senior Compliance Engineer for Kestrel Coal Mine.

Randall Freeman

Randall holds the position of Mine Manager for German Creek Southern Colliery and has 21 years experience in coal mining throughout both Queensland and New South Wales, 19 of those for the underground coal mining industry. Randall started in the industry as a Cadet Mine Manager and after graduation started work as a coal miner, tackling several roles in the industry until becoming a Mine Manager in 1996. Randall holds a Diploma in Mining Engineering and a Degree in Business.

Bruce McKinnon

Bruce has been an Engineering Inspection Office with the Department of Natural Resources, Mines and Energy since August 1997 and is based in the Mackay office. He has considerable experience and vast knowledge in the mining area. Some of the positions Bruce held include:

- Heavy Equipment Fitter at Bougainville Copper;
- Heavy Equipment Fitter and Maintenance Supervisor at Hamersley Iron WA Paraburdoo;
- Original Equipment Manufacturer Representative for Orenstien & Koppel and Team Leader of a maintenance group delivering a care and maintenance contract for fleets of O&K RH 200 450 tonne hydraulic face shovels at Porgera Gold Mine;
- Contract Supervisor to the Heavy Equipment Workshop at Blair Athol Coal Mine; and
- Facilities Manager at Northpoint TAFE assuming the responsibility for work group safety and health accountabilities.