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Report to Country Fire Authority

The Morwell open-cut mine fire

12-19 October, 2006



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1. Methodology

IMSS in preparing this report used material from the following sources:

- GHD October 2006 Mine Fire Investigation Report for International Power Hazelwood
- Country Fire Authority Fire Investigation Report
- Report of the Royal Commission into the 14 February, 1944 fire
- Publicity material provided on the Internet by International Power Hazelwood
- Interviews with officers and brigade members who were involved in the firefight or commanded during its eight days' duration
- Incident Action Plans, Preliminary Incident Reports, Operational Messages
- The Fireman newspaper.

2. Disclaimer

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3. Situation

The Morwell open-cut brown coal mine is located immediately to the south of Morwell, a town with a population of some 13,500 within the Latrobe City. The city is the home of approximately 85 percent of Victoria's power generation capability. There are three major open-cut brown coal mines – Yallourn, Morwell and Loy Yang – which form a gigantic scalene triangle within central Gippsland. They mine slightly different types of coal with Morwell coal generally considered to be the most combustible.

Due to its proximity to the Hazelwood power station the mine is sometimes referred to as 'Hazelwood'. However, given that all previous CFA references have referred to its location as 'Morwell' and it is located within the Morwell Fire District, for consistency such nomenclature will be used throughout this report

The Morwell mine produces fuel for the Hazelwood Power Station. At full operation, Hazelwood supplies 25% of Victoria's base load electricity supply. The power station is adjacent to the southern face of the mine and to Energy Brix Australia, a briquette manufacturing plant and small power station to the east of the mine. The Hazelwood power station and the Morwell coal mine are owned and operated by International Power Hazelwood, a consortium comprising International Power UK and the Commonwealth Bank.

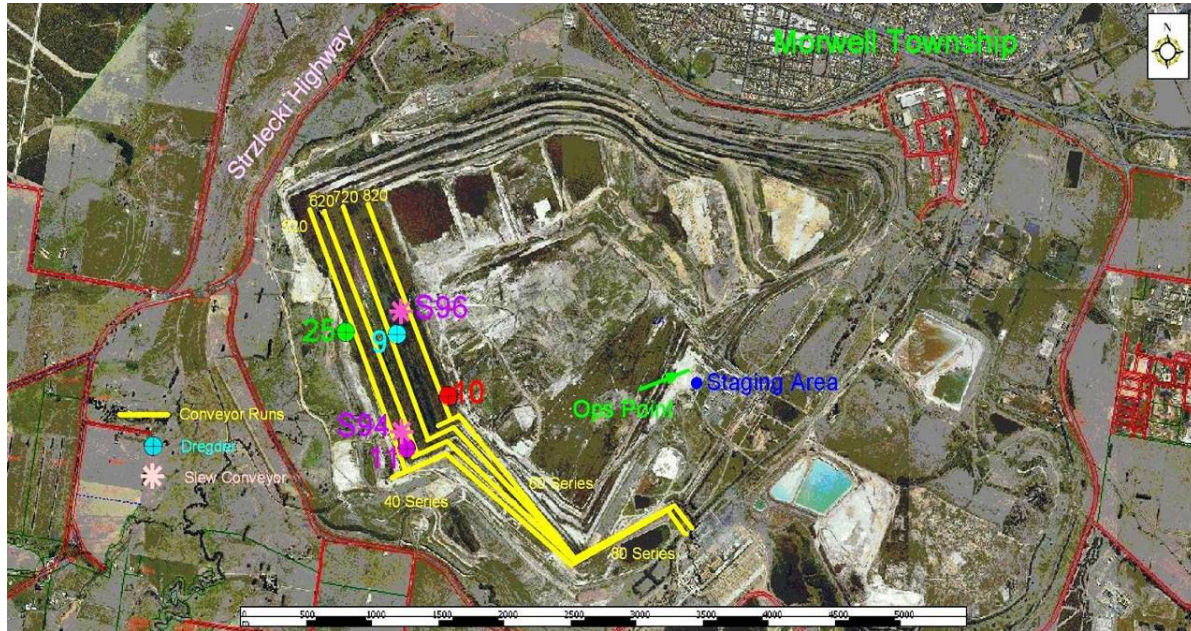
The open-cut coal mine opened in 1956 and has fed the adjacent power plant since 1964. Each year the mine produces 19 million tonnes of coal and removes five million tonnes of overburden (the layer of soil and clay above the coal seam). International Power Hazelwood has a workforce of approximately 500 employees and contractors.

The mine area exceeds 900 hectares and the site has a perimeter of 14 kilometres. The coal is located below a clay overburden – average depth 18 metres, and the coal itself has an obtainable depth of approximately 100 metres. The coal is mined using bucket wheel dredgers which remove coal from a series of levels within the mine. The operation of the dredgers is coordinated to ensure a continuous supply of coal to the power station. Additional dredgers may be removing the clay overburden from the surface of the mine, on maintenance or out of service for other reasons.

Coal is transferred to the power station 24 hours per day via a large network of conveyors with a capacity of over 2,500 tonnes per hour. These conveyors are located at the working levels of the mine and transfer the coal from the bucket wheel dredgers. A slewing conveyor (with the ability to adjust the flowing coal's direction) is brought into use if a dredger is remote from the conveyor. The coal is then moved via multiple transfer points which change the direction of the coal to the raw coal bunker at the Hazelwood power station.

Within the mine some 200 staff are employed working on various arrangements of shifts. Some essential activities are contracted to companies such as Alstrom, Belle Banne and Roche Thiess Linfox (RTL). Alstrom maintains the plant and equipment, Belle Banne is responsible for conveyor maintenance and RTL is a plant and operator company which provides earthmoving and other machines for civil works.

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General Layout of Morwell Open-cut Mine and Conveyor Belt Lines
 - CFA Fire Investigation Team

Sources: Country Fire Authority Fire Investigation Report into the Morwell open-cut mine fire of 12 October, 2006; International Power, Hazelwood documents; City of Latrobe information; GHD October 2006 Mine Fire Investigation – January, 2007.

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4. Previous major coal-mine fires

Whilst International Power Hazelwood estimates there are about 100 fires annually at the Morwell mine, the area has been struck by two major fires previously – in 1944 and 1977. Inevitably, comparisons can be made with the recent Morwell fire.

4.1 Yallourn open-cut mine – 14 February, 1944

A major bushfire swept into Yallourn on 14 February, 1944. The fire severely damaged the mine, power station and town. At that time Yallourn was the sole mine and power station in the Latrobe Valley.

In the report of the Royal Commission held into the fire, Judge Leonard E B Stretton identified his terms of reference as being to inquire into and report on:

- 1) The place of origin and the cause or causes of the devastating fires which commenced on the 14th day of February, 1944, and caused damage to the plant works, open cut workings and buildings of the State Electricity Commission at Yallourn;
- 2) (a) What measures were taken by the said Commission prior to the said fourteenth day of February, 1944, to prevent damage to the said plant, works, open cut workings and buildings and to the township of Yallourn by grass or bushfires:
(b) Were such measures adequate having regard to all the circumstances including the character of the Commission's undertaking;
- 3) What further measures, if any, should be taken to prevent a recurrence of such damage and to protect the said undertaking and the said township in the future.

He found that the fire started from a burn-off at a farm some 3 miles (5 kilometres) northwest of Yallourn. At that time timbered country extended from the farm to the fences of houses on the north and west borders of the town. It was caused by a farmer burning off. The fire spread through the bush and burning embers ignited the coal dust in the workings.

Amongst other matters, Judge Stretton found:

- There was no general plan to protect the works from bushfires
- There was confusion about who was ultimately responsible for fire prevention and suppression
- The pressure in the water reticulation system supplying the mine was inadequate and the pipe works too far from the workface to provide effective protection.

Source: Report of the Royal Commission into the fires at Yallourn on 14 February, 1944

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4.2 Morwell open-cut mine – 4 November, 1977

The next major fire occurred at the Morwell open cut mine on 4 November, 1977. The fire was described in detail in the book 'A History of the Morwell Open-cut: Its Origins and Development to June 1995' by J A Vines, published 1996 by Hazelwood Power Corp. The fire burnt until 6 November, 1977. It followed shortly after a prolonged strike and endeavours to restore plant to operating condition were considerably interrupted by the major fire.

In addition to the major involvement of State Electricity Commission personnel and plant, assistance was provided by Country Fire Authority, Royal Australian Air Force and Australian Paper Mills fire fighting resources backed by the Police and State Emergency Services.

Their prompt response to requests for support achieved a successful result without significant plant damage or major loss of generation. No significant personnel injuries occurred during the fire fighting activities over the two day period when large numbers of personnel inexperienced in open cut conditions were handling the emergency. Some minor burns, cuts and bruises; many incidents of treatment for dust and ash particles in eyes; and one incident of a fall down a coal batter but without broken limbs resulting were recorded by ambulance and first aid attendants at the site.

A review committee considered that the fire had arisen from the passage of a vehicle over the coal level. The strong winds combined with the dry condition of the coal bench due to lack of water spray coverage caused the rapid and extensive spread of the fire. Pipe reticulation of fire prevention water had not been kept up with progress of operational faces during the prolonged industrial bans and strikes from mid 1977 and significantly reduced fire protection as well as hampering fire fighting capabilities.

Major recommendations included restrictions on the use of some makes of vehicles on coal levels, modification to vehicle exhausts for travel permits on coal levels, more and better mobile tankers, provision of an emergency mobile communications unit and amplification of fire service reticulation, spray manifolds and equipment. A full report of this fire is shown in **Appendix A**.

Source: 'A History of the Morwell Open-cut: Its Origins and Development to June, 1995' by J A Vines.

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5. Pre-fire issues, including fire prevention and community safety issues

In its publicity material International Power Hazelwood identifies its safety and health strengths as:

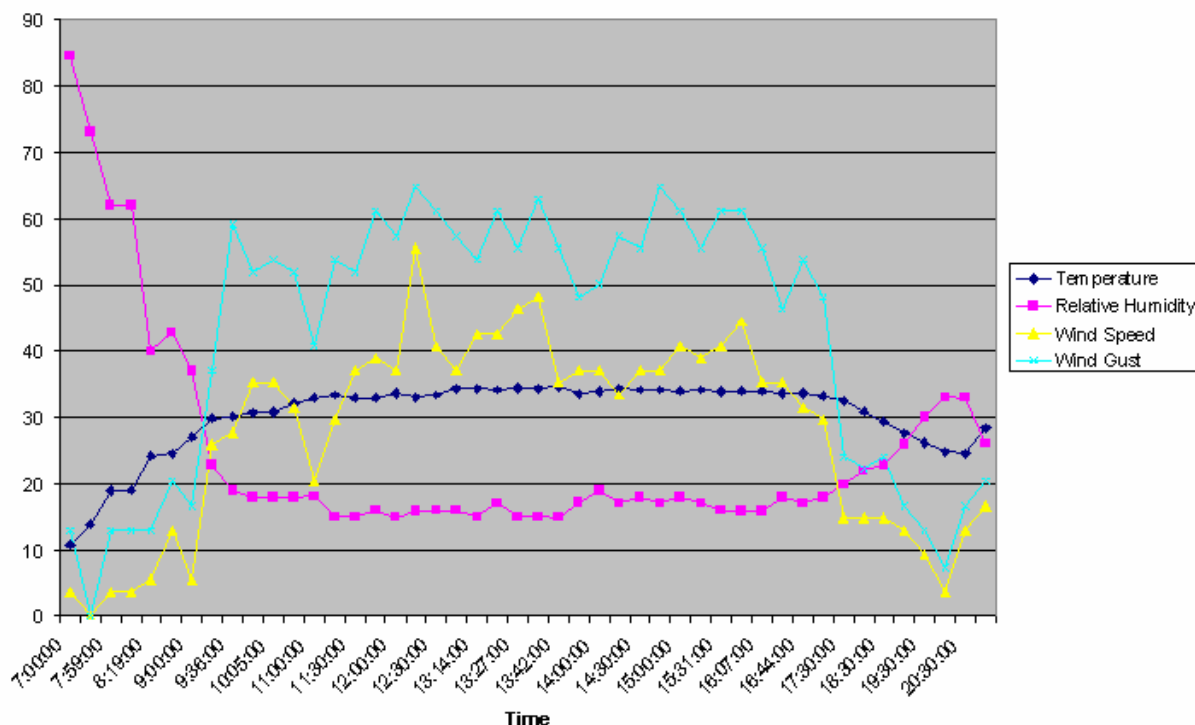
- A commitment to improving safety and health at both the corporate and site management levels. Safety innovations and strategies implemented by management have been strongly supported by the workforce.
- Open, honest, effective and consistent two-way communication between employees and contractors has increased the confidence of the workforce in communicating with management.
- A strong, positive safety culture has been achieved incrementally. Incorporation of safety culture into the responsibilities of both line management and the broader workforce has resulted in a demonstrated sense of ownership of safety issues.
- Well-developed safety management systems are implemented throughout the mine. These systems are supported by effective computer-based systems for tracking improvements, follow-up actions and audit/investigation results.
- Integration of contractors with adoption of common systems and procedures ensure consistency of safety management processes and appropriate delegation of responsibility.

The contributing factors and underlying causes leading to the fire were identified by GHD in its report to International Power Hazelwood as:

- The annual internal audit of all fire services facilities, systems and procedures as specified in the current 'Mine Safety Service Policy and Code of Practice' had not been completed.
- The Pre Summer and Fire Season Works Program including training of mine personnel and contractors was underway but had not been completed since it was before the start of the designated fire season.
- October 2006 exhibited severe weather conditions even though it was not classified as part of the fire season. (See weather observations – page 6.)
- The 'Mine Fire Service Policy and Code of Practice' definition of the Pre Summer & Fire Season Works Program designated December and January as the months in which crucial fire preparation was to be undertaken, including fire training. It did not consider current weather, fire or mine conditions.
- No formalised or predefined conditions were available for declaring a Fire Alert.
- Fire Alert processes were understood but not always fully complied with.
- Roles and responsibilities of (coal mine) Fire Services and personnel to support the Fire Services during a Fire Alert and in an incident should have been reviewed.
- Work procedures and practices within the 'Mine Fire Service Policy and Code of Practice' and the 'Fire Instructions' were not systematically reviewed or updated.
- The level of fire fighting competence varied with IPRH personnel and contractors.
- The fire had escalated by the time the fire was reported to CFA and their services became available on site.
- There were no formalised arrangements with the CFA to be put on alert for a fire.

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Latrobe Valley Weather Observations, 12th October 2006.



Weather at Morwell – 12 October, 2006

- Some CFA non-Morwell personnel did not have an understanding in fighting coal fires.
- The emergency response took too long to change from an initial reactive response into a strategic ongoing response.
- Roles, responsibilities and procedures outlined within the Emergency Response Plan were not systematically referred to during the emergency and should be more user-friendly.
- External fire pump stations PH50 and PH53 were on a single power supply and their status was not communicated to Operations.
- The interface and communication between Operations, Fire Services and Maintenance need to be reviewed in terms of fire systems, particularly in relation to the power supply for the fire pumps.
- The IPRH Emergency Response Plan, the IPRH Significant Issue Corporate Response Plan and the IP Corporate Serious Incident Procedure should be integrated.

Adapted from the GHD October 2006 Mine Fire Investigation – January, 2007.

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6. Cause of fire

The Fire Investigation Team found that the most likely point of origin of the fire was at conveyor unit 157, 852 metres from the head of Level 620. (The head is the point at which the drive motors are situated, in this case the southern most point of the conveyor or the point where coal is transferred to an other conveyor running perpendicular to it.) The remains of the idler assembly which failed were most likely transported along the conveyor. The point of origin of the actual coal fire was most probably where the heated remains of the idler assembly landed in the build-up of coal at the tail-end (that point most distant from the drive motors) of M620, close to the tail box.



Idler Assembly 157 – CFA Fire Investigation Team

The other possible causes that could not be categorically ruled out by the Fire Investigation Team but were less likely to have caused the fire were:

1. The movement of a mine maintenance vehicle along M620 conducting a conveyor inspection. This vehicle traveled between the topside fire service and the M620 conveyor. It completed a U-turn and returned along the same track. The water sprays were on at the time of this activity. It could not be determined whether this vehicle contacted with coal or caused wet coal to contact its exhaust. The vehicle is less likely to have caused the fire because it traveled along M620 at approximately 0730 and only covered $\frac{3}{4}$ of M620's length.

The Morwell open-cut mine fire, 12-19 October, 2006

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2. The movement of a contractor's semi-trailer across the coal face on M620. The truck was required to drop maintenance parts at the head end of M620. It then proceeded along the coal face to the tail end where it picked up other equipment and then left the mine. The vehicle traveled in the centre of the formation to avoid wet and boggy coal. This is a less likely cause because the fire was first identified between the fire service pipe and the conveyor.

Source: Country Fire Authority Fire Investigation Report into the Morwell open-cut mine fire of 12 October, 2006;

7. The Fire – An Overview

At 11:57 on Thursday 12 October 2006, the Morwell Fire Brigade received a call to a fire in the huge brown coal open cut mine owned by International Power Hazelwood. Whilst responding, crews from Morwell could see a large plume of white smoke emanating from the mine suggesting there was a 'going fire'.

Once on scene the initial Incident Controller, Fire Officer Shane Mynard requested 'make tankers 30' when he saw the top batter of the mine totally involved in fire. The production face of the mine measures approximately two kilometres long by five batters or levels high (each batter measured approximately 30 metres high). The fire eventually spread to a second batter.

After liaising with the mine firefighting personnel key priorities were identified:

- 1: Protect the remaining conveyor belt which fed coal to awaiting crushers and headers. The other two conveyor belts had been destroyed in the early stages of the fire and as the mine produces approximately 25 percent of the state's electricity, it was crucial that the third conveyor belt remain operational.
- 2: Prevent the fire from escaping out of the mine into neighbouring grassland. Although the grassy area was quite green the presence of coal dust meant it would burn freely in an open area fanned by the strong winds prevailing on the day.

Crews also prioritized the protection of dredger 11 (D11) which was located in the southeast corner of the mine. D11 is valued at approximately \$80 million.

Entering the mine was an issue in itself. Gradually CFA tankers made their way to the affected areas. Tankers took up to 20 minutes to travel between batters due to the winding tracks and the steep batters.

F/O Mynard measured the relative humidity on level 620 in the southwest corner of the mine approximately 20 metres from the burning coal face at 4.5 percent using a Kestrel hand-held weather meter. Strong, gusty winds were sweeping through the mine. He decided that the best way to attack the fire in the coal face was firstly to cool the coal, then apply A class foam to the area.

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Ground monitors were brought in from several sources (including Metropolitan Fire & Emergency Services Board (MFB), Esso Longford and Long Island Point (Hastings), Transfield and Australian Paper Mills). These were set up to assist with the cooling process.

In addition to tankers from Morwell (2), Traralgon, Traralgon West, Churchill and Tyers, strike teams were deployed from Regions 8, 10 and 11. Region 9 brigades while closer were committed at a number of fires in their Region including one that had threatened the Yallourn open-cut coal mine. Region 13 also provided a number of resources including a pumper from Boronia and a hose layer from Scoresby. Eventually, 46 CFA appliances were utilized.

The mine's fire service supplied six bulldozers, three graders, two tractors and six large tankers.

In the absence of firefighting helicopters on day one due to extensive wildfire activity throughout the state, successful use was made of Helimed 1, a locally based 'Air Ambulance Victoria' Bell 412 fitted with a 500 litre bucket. Two helitaks were used on days two and three.

Approximately 200 CFA firefighters were on the fireground at any one time working beside some 150 personnel from International Power Hazelwood.

Other agencies directly involved included Red Cross (catering), St. John Ambulance, Rural Ambulance Victoria, Victoria Police and State Emergency Service.

The fire eventually extended into dredger D11 and despite the best efforts of fire crews the dredger was badly damaged. However, crews were able to protect the remaining conveyor belt and ensure electricity production was maintained, although at a reduced rate.

The mixture of coal dust and water run-off created two issues. Firstly, when mixed a slurry formed which made it extremely difficult for firefighters who had to wade knee deep through it. Secondly, the coal dust on the surface of the slurry ignited several times.

The fire crews faced appalling conditions. Exhaustion and dehydration were evident on day one followed by hypothermia and several cases of carbon monoxide (CO) poisoning on subsequent days. Crews were rotated constantly during each shift. Structural protective ensembles were required to protect against the cold and large amounts of wet-weather gear were issued.

Thermal imaging cameras and infra-red equipped aircraft were used throughout the fire to detect latent hot spots.

The majority of the firefight involved difficult physical work in extreme weather conditions. More than 1,000 personnel were involved in the control of the fire before a 'stop' was declared at 17:30, 19 October, 2006. Salvage work continued for several days. Some of the damaged plant was still being repaired nine months after the fire.

In April, 2007 the CFA Fire Investigation Team estimated the total losses at nearly \$29 million. International Power Hazelwood has since estimated the damage to have been approximately \$30 million.

Source: The Fireman – 15 November, 2006.

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7.1 The Fire, 12 October, 2006 – Day 1

Severe weather conditions with increasing temperatures and winds developed on the morning of 12 October, 2006. The day was declared a day of Total Fire Ban in all districts except Gippsland. The Bureau of Meteorology recorded a maximum temperature of 35.1 °C at Morwell, the highest October temperature ever.

Weather logs recorded between 10:00 and 12:00 at the mine site showed a North to Northwesterly wind direction with speeds between 30 and 40 km/h and a temperature increasing from 30°C to 35°C.

There was a rapid decrease of relative humidity from 80% to approximately 33% between 05:00 and 09:00. It stabilised at 27% between 11:00 and 12:00.

Four bucket wheel dredgers (DR) were operating at the following locations of the mine:

- DR25 was removing overburden on level M520.
- DR11 was out of service for maintenance work at the south or 'head end of M620 with a slewing conveyor S94 attached.
- DR9 was operating on M720 with S96.
- DR10 was operating at the head end of M820, the lowest level of the mine.

Between 07:30 and 08:00 hours, in anticipation of the hot and windy day, mine personnel operated water sprays throughout the mine to suppress coal dust and reduce fire danger. Approximately every second spray was run to keep coal areas wet.

At about 09:50 the Acting Fire Services Supervisor declared a Fire Alert. The alert was communicated to the Mine Shift Production Manager and to all mine personnel in accordance with normal procedures. All spray systems were activated after the Fire Alert was declared.

At approximately 10:45 a spot fire was noticed at the tail end of the M620 conveyor. The Mine Shift Production Manager was notified of the spot fire and conducted a visual check from the Control Centre where he saw smoke from the same place. Others noticed the spot fire and smoke at the tail end at this time.

Personnel who attended the spot fire at M620 conveyor reported that the fire moved towards the head end of M620 conveyor as well as progressing to the M720 conveyor. Spot fires were also reported to have formed along the north side of Dredger 11.

At about 11:45, a call was made to all conveyor attendants and leading hands to assist with fire suppression at M620 conveyor.

At 11:50, the Mining Director was notified of the fire. He assumed the role of Emergency Commander (EC) from the Mine Shift Production Manager at 12:15 and established the IPRH Incident Control Point (ICP).

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At 11:57 the Mine Shift Production Manager, after consultation with the fire services, reported the fire to the Morwell Fire Brigade.

First Response – Morwell Fire Brigade

The Morwell watchroom received three calls of fire at 11:57. Two were for a fire at the Morwell open-cut mine and the third indicated a fire at the Yallourn mine. An immediate phone call to TRY Energy, Yallourn Fire Station confirmed there was no fire at the Yallourn mine.

The Initial response from Morwell of two tankers, supported by others from Hazelwood North and Churchill, arrived at the Morwell mine at 12:07. They were confronted by the sight of a massive fire burning on the southern coal face. Fire Officer Shane Mynard assumed the position of Incident Controller and appointed Lieutenant Pat Quinn as Operations Officer.



Dredger DR11, 12 October, 2006 – CFA Fire Investigation Team

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The initial crews experienced punishing conditions. The radiant heat from the burning vertical coal surfaces was sufficient to scorch bare skin and vehicle paintwork. Because of the winds within the mine the installed sprinklers were having difficulty making any impression on the burning coal face.

Lieutenant Pat Quinn who is employed as a supervisor with RTL at the mine and consequently is very familiar with the surroundings described a sense of total bewilderment. The sheer scale of the fire was so daunting. It required all of their training and experience for crews to be able to continue the attack.

The first Preliminary Incident Report at 12:22 from Operations Manager (O/M) Flynn indicated: 'The fire is Large and Going. There are three separate fires in the open cut.'

The Region 10 RECC was operating on this day given the extreme fire conditions that were forecast the day before. At the time of commencement of the mine fire staff had been monitoring the fire activity occurring in Region 9, anticipating a call to assist at fires there.

As requests came in for additional resources to go to the mine fire contact was made with local Group Officers in Region 10 to get strike teams moving and with the Operations Managers from the two adjoining Regions. Region 9 had fully committed its resources and Region 8 crews were assisting at a fire on the western end of Region 9 so were not able to provide any resources initially. Region 11 provided an immediate Strike Team and other resources subsequently. Additional resources were dispatched as requested.

The RECC at Sale continued to operate throughout the duration of the fire, providing support to the IMT and liaising with the SECC and other agencies during this time.

Escalation of the Fire Attack

It was immediately apparent that a large force of tankers supplemented by helitankers would be required over a number of days to control the fire given its rapid development.

At 12:30 a report advised the fire was confined within the open cut but would take significant work to hold in the cut and extinguish. A request from the Incident Controller to make tankers 30 was being worked on at that stage.

By 13:54 the situation was deteriorating rapidly. The fire was 1.5km long x 30m high on a near vertical batter. The eastern end was very hot with poor visibility. It was spreading down the remaining batters. The one dredger under threat was being protected by three tankers. The Region was trying to get ground monitors resources from other industries and local brigades.

An IMT had been established at the Morwell fire station. Operations Officer Daryl Hunter had assumed the role of Incident Controller and Fire Officer Shane Mynard was now undertaking the Operations role at the mine. Two sectors had been set up and a plan for communications was in place.

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By 14:30, 16 tankers and three support vehicles were at the mine. A dedicated Operations Point and Staging Area had been set up and Diamond Power and St. John Ambulance were providing first aid services.

A separate fire was observed on the rising conveyor to the raw coal bunker. It was extinguished before burning coal could reach the bunker and without damage to plant. Crews wearing breathing apparatus were working on, within and under Dredger 11 in a desperate effort to protect the dredger from the adjacent burning coal-face.

F/O Mynard recalls a situation of being surrounded by fire. The coal faces were burning furiously; burning coal was falling from the face and igniting fresh fires below; spot fires were igniting the grass above the mine; coal dust floating on the surface of firefighting water was alight. At this stage it was too dangerous to alight from the tankers – and then, at 14:45, the water supply from the Hazelwood power station pondage to the upper half of the mine failed!

At 14:45 F/O Mynard sent a message to the IMT:

'All CFA personnel have retreated due to conditions. I am establishing fresh tactics at the moment. Only one conveyor remains providing coal to power station and it is under threat at this time. Water supply has been lost to a number of areas. Also lost are two major head-end units on conveyors and a dredger (DR11) is under significant threat, as is a dozer.'

At 1628, O/M Flynn indicated the fire condition remained large and going. The fire now extended across the complete western face on the top batter. Fire was also extending to the northern and southern faces of the two kilometre long batter. Fire was threatening to drop to lower levels which would impact on mine production. Ground monitors were being delivered and deployed. Additional resources would be required.

There are varying estimates about how long the mine was without a firefighting water supply but the record shows it was restored at 18:00. The fire had burnt through the main cable supplying the electric pumps, shutting them down.

A change of shift for the mine employees had occurred but no one seemed to be leaving. The fire officers became very concerned about the number of IPH employees still in the mine, many with very little protective clothing and some appearing to be totally lost. F/O Mynard remembers meeting Lt. Quinn and both reported severe headaches. It is likely that the early effects of carbon monoxide (CO) poisoning were becoming evident.

In the late afternoon Deputy Chief Officer Lapsley arrived at Morwell and conferred with General Manager Schmidt, Operations Manager Flynn and Operations Officer Pettit to plan for a long term firefight.

By 18:20 the number of tankers working at the mine had grown to 26 with the Bairnsdale MCV also on site.

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18:30; O/O Hunter advised that two coal systems (damage to conveyors) had been lost. The third coal system remained operational. One bucket wheel dredger (DR11) was fully alight. The objective was to protect the third coal line that was still operational and the over burden system. People were out undertaking condition assessments.

21:23; O/O Hunter reported that the reappraisal would not be undertaken until more protective work had been completed. The aim for that night – 12/10/06 – was to protect the 820/520 level conveyors. They would then work along 720/620 level conveyors and consolidate. The 40 to 60 interchange was also to be protected. A closely integrated firefight with International Power had been developed using mine terminology to identify the sectors.

22:28; F/O Male, who had taken over as Incident Controller for the night shift, reported that several strike teams were being changed over. It was impossible to attack at some levels but crews were continuing to work through the accessible areas. At that time, crews were also protecting assets.'

2345; General Manager Peter Schmidt contacted the Divisional Emergency Response Coordinator (DERC) to have the Central Gippsland Essential Industries Group (CGEIG) convene a meeting as soon as possible on Friday, 13 October to discuss the fire's status and CFA's strategy plan, ongoing combating tactics, inter-agency cooperation and co-ordination of resources.

F/O Parker, the night shift Operations Officer, stated that all crews had been changed over by 23:52. Up to 24:00 hours work would be done to consolidate batters and to protect assets. The spread of fire had been halted. After 24:00 hours work would be done on both ends of the batters to consolidate the ends and prevent spreading, and to confine fire to the currently burning area.

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View towards Dredger DR11, Night of 12 October
Photographer unknown

7.2 The Fire, 13 October, 2006 – Day 2

The work which had commenced on the evening and night of 12 October was to continue unabated.

00:33; F/O Male was reporting that asset protection continued with good control lines established around dredgers and conveyors. Crews had started working from the head end of conveyor back to the tail. Crews were working off vehicles with hand lines. Class A foam was being used with success in tankers and monitors. The incident would be very protracted.

The Incident Resource Summary prepared at 03:40 showed that 28 tankers and 3 support vehicles were committed to fire operations within the mine and 8 tankers and 3 support vehicles were at the Staging Area. SES was providing lighting at the Staging Area.

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Before dawn, preparations were being made for helicopter use during the day. There was concern about using belly tanks for batter protection because the low flying aircraft might raise and spread burning coals. If required, they would concentrate on dredger protection. Bambi bucket carrying aircraft, flying higher, would be available for direct attack. A final decision would be made by the day shift.

05:19; F/O Male was advising that forces were still unable to access D11 dredger and any assets on that level. He hoped to be able to use aircraft in daylight for bombing of the area around the dredger but the dayshift operations officer would make the final decision. He expected the commitment of CFA resources to remain at the then current level (6 strike teams, IMT, current staging area etc). Day and night shifts would be needed for at least the next two days.

The objectives established for the day shift IMT were to:

1. Protect 40-60 Interchange for duration of incident (extremely high priority)
2. Protect 520m and 820 conveyors for duration of incident (extremely high priority)
3. Extinguish 620 and 720 batters working from head (SE corner) to tail (NW corner) and from tail to head.

It had become critical to protect the remaining working dredgers because one would not be providing coal during the six hours it would take to traverse back to its starting point. During that time the power station was reducing output to preserve coal.

09:48; Aircraft attack had commenced. The primary target at that stage was the area surrounding Dredger 11.

G/M Peter Schmidt, DCO Craig Lapsley, O/M Greg Flynn and O/O Kevin Pettit met with the full CGEIG at 11:00. A detailed strategic plan was conveyed to and discussed with all stakeholders. Options for obtaining additional resource support from other group members were discussed and evaluated. Consequence management was a dominant issue given the continuing critical threat to mining operations. The Emergency Services Commissioner was given a detailed briefing on the current situation and the potential outcome.

Expert advice from the mining industry indicated that, given the extent of the fire within the mine, control could not be achieved in less than two weeks.

In the afternoon it was reported that ground work was continuing in challenging conditions. Aircraft were being used effectively in support. Ground crews included 150 mine staff and fixed monitor systems to consolidate the good work done the previous night. Foam was greatly assisting suppression and cooling operations. Efforts continued to protect key infrastructure. Crew safety remained a high priority. Crew changeovers were being arranged for 18:00 hours.

This second day of fire attack created fresh difficulties. The cooler, still weather conditions meant that crews struggled in wet, filthy conditions battling hypothermia. Tankers struggled to make headway in the deep coal sludge which became worse as more and more water cascaded from the coal faces and batters. Some of the new design tankers with low-slung body work became bogged in the sludge.

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An information release from O/O Hunter advised that 46 CFA tankers with 200 CFA personnel and 150 International Power employees were working on asset protection and direct attack on the coal batters using 'A' class foam. Aircraft had knocked down about 100 metres of fire on the western side of the open cut.

Day crews were starting to be changed over at 18:00 hours. Night shift teams were now locating the whereabouts of hot spots throughout the mine. Fire crews would be concentrating that night on protecting the mine conveyor belts and attacking the hot spots.

A completely new problem had emerged. During the morning the St. John Ambulance first-aid officers had issued large quantities of paracetamol to firefighters and mine workers who were complaining of severe headaches. It gradually became clear that potentially deadly pockets of carbon monoxide (CO) had formed in the mine. The lengthy exposure of crews at the fire face exacerbated the danger to health. The CFA Health Support Team traveled from Melbourne and commenced monitoring of the atmosphere and also detailed medical examinations of crews coming up from the mine.

The CO levels were such that it was decided the maximum safe duration for firefighters in the mine was one hour followed by a two hour break in fresh air. A detailed report 'Health monitoring and CO exposure' was prepared by Craig Tonks, Scientific Officer and Peter Langridge, Coordinator, Health Support Team – **Appendix B**.

A Situation Report issued at 21:00 stated that ground work was continuing in challenging conditions. Personnel finishing an 8 hour shift had carboxy haemoglobin readings of 6-9% and were suffering from fatigue, headaches and nausea. The cause of their illness had been determined as an extremely high level of carbon monoxide (98-172ppm) in the mine.

Safety had become a matter of serious concern. The Incident Action Plan (IAP) prepared for the night shift included:

- Ensure all personnel working within the mine have goggles or other form of eye protection due to coal dust and ignited coal embers
- Strike Team Leaders and Crew Leaders to ensure personnel in the mine are wearing dust masks at all times
- There is a possibility of personnel falling over the edge of the batter. Crews must be made aware of this hazard
- The 820 conveyor is still in operation and poses a risk to personnel. Advise all crews of the danger of the moving conveyor belt
- The 520 conveyor is due to become operational. Advise all personnel of the dangers of this moving conveyor belt
- Be aware of traffic movements within the site. The road networks on the levels and the coal face are hazardous and require vigilance and 4x4 capability.

IMSS

7.3 The Fire, 14 October, 2006 – Day 3

The Incident Resource Summary prepared at 03:50 showed that 17 CFA tankers, one hose layer and one support vehicle, seven very large International Power tankers (26,000 to 50,000 litres) and 18 monitors were committed to fire operations within the mine. Approximately 300 CFA and 150 International Power personnel were on site. 18 tankers and one pumper were at the Staging Area. Two CFA tankers were out of service. SES continued to provide lighting at the Staging Area.

O/O Harker was advising at 04:20 of the adverse conditions in the mine. Strike teams were broken up into single resources for safer allocation of crews. It was decided to keep tankers at the batter levels (now nominated as sectors) at which they were working. To maintain greater safety and save time transferring crews to and from the tankers crews were being transported in an International Power 4x4 vehicle. This reduced travel time from 45 to 10 minutes.

05:00; O/O Harker authorized a further air attack. The plan was to attack the deep seated hot spot about half way along the 720 batter. It was also decided to continue the air attack around D11. Forward Looking Infra-Red (FLIR) scans were to begin at 11:00.



Dredger DR11 after fire damage – CFA Fire Investigation Team

IMSS

A situation report issued at the same time advised that monitoring of CO levels in the mine was continuing as was the monitoring of firefighters' carboxy haemoglobin levels. By that time, five firefighters had been injured; three from CO poisoning, one from heat exhaustion and one knee injury. They had been treated by St. John Ambulance.

O/O Hunter reported at 09:01 that a firefighter with elevated CO levels had been transported to hospital for observation. He was released shortly after midday.

11:24; Hot spots had been observed at D 11 and these were being fought with air support.

A situation report from O/O Hunter timed at 15:00 listed the fire as 'Contained'. He reported excellent work by CFA crews, International Power personnel and contractors had resulted in most of the coal face being contained. Two hot spots remained:

- The face below the 520 level under the dredger was still a problem. Construction of an access ramp allowed crews to position themselves outside the D11 exclusion zone and commence extinguishment.
- A 300 metre section on the top side of 720 level had finally been accessed. A crane monitor supported by nine tankers had extinguished all but the northern face. Monitoring of other parts of this section was continuing.

Some minor hot spots had been identified at the head end of level 640 and were being dealt with. All levels around the 40/60 interchange were being monitored but were largely extinguished. The D11 dredger was roped off as a precaution against potential collapse.

In the evening O/O Hunter advised that a flare-up had occurred at the head end of level 620 with four tankers attending. Problems were being experienced with a trough between the tail end of levels 820 and 720. An excavator was being sent into the area.

The overnight resourcing was reduced with four strike teams of two crew members per tanker. Their work was to monitor the fixed sprinklers and ground monitors. Crews would be deployed from the staging area at 30 minute intervals to reflect the reduced workload and to maintain safe exposure to CO.

7.4 The Fire, 15 October, 2006 – Day 4

A situation report released at 05:00 advised that four strike teams had worked overnight. Two tankers were patrolling level 820 which was expected to be under control by the end of the shift. Eight tankers were patrolling level 720 and five tankers were patrolling level 620 bottom with a crane monitor and excavator. It was expected both would be brought under control during the following (day) shift.

IMSS

Hot spots were still causing concern around the batter and exclusion zone surrounding dredger D11. A number of thermal imaging cameras were in operation. The Operations Point and Staging Area within the mine complex required more staff due to an array of chronic problems.

There were a number of reported injuries during the night:

- Two volunteer firefighters were treated at the staging area for high blood pressure and were sent home. They were advised to seek medical approval before returning to the fire
- One volunteer firefighter was admitted to Traralgon hospital suffering chest pain
- One volunteer firefighter developed a rash, believed to be dermatitis from coal dust
- One volunteer firefighter rolled an ankle by walking into a hole at the coal face
- One volunteer firefighter suffered a gastric upset – no discernible cause.

Atmospheric monitoring was continuing and it had been necessary to establish clothes drying rooms on site to reduce instances of hypothermia.

By morning 17 tankers, a pumper and a hose layer were working in the mine and 15 tankers were in the staging area. Nine monitors were committed with a further nine on standby. The SES lighting plants had provided illumination of the staging area throughout the night.

Lieutenant Wayne Miller suffered a compression injury to the spine at around 0830. He was transported to the Latrobe Regional Hospital in Traralgon by RAV. The injury occurred as a result of the tanker he was a passenger in dropping into a hole in the mine as it was driven across a series of deep washouts.

1800; The Office of the Emergency Services Commissioner (OESC) released a situation report which outlined the resources in place at that time:

- 32 tankers on the fireground
- 140 CFA personnel
- 105 International Power employees and contractors
- CFA Critical Incident Stress peers
- 20 atmospheric monitoring devices to measure carbon monoxide levels on the fireground
- Thermal imaging equipment
- Mobile cranes with large water spray equipment
- Mobile Communications Vehicle
- District Mechanical Officers
- Incident Management Team located at Morwell Fire Station

Support services include SES providing night lighting, St John Ambulance providing first aid support and Red Cross providing hot meals for all crews.

IMSS

The report identified that CFA had not incurred any significant asset losses at that time but there would be a significant financial impact on the Gippsland Area of CFA as a result of the fire fight, in particular in relation to personal protective clothing, respirators and other fire fighting equipment.

The fire fighting effort had required the deployment of approximately 1000 CFA personnel, both volunteer and career firefighters. The logistical requirements of this had placed a very significant strain on resources both in Gippsland Area and across other CFA Areas.

Emerging issues were the ability to maintain relief crews and the deployment of personnel at management level who had experience in open cut coal fire fighting, which is a specialist skill.

It was reported that success of this firefight was dependent on wind conditions, with high winds causing uncontrollable flare ups of the coal face.

7.5 The Fire, 16 October, 2006 – Day 5

The 05:00 situation report highlighted a difficulty with fog which was heavy enough to warrant the withdrawal of resources. Hot spots were still causing concern around the batter and exclusion zone surrounding Dredger D11 and would require more work during the day shift.

Two thermal imaging cameras were in operation. More qualified operators were needed for foot patrols for the night shift of 16/10/2006. Operators would require assistance, GPS's (for mapping hot spots) and mine supervision to be able to undertake tasks safely and efficiently.

The staging area still required significant resources to manage an array of chronic problems that were hampering crew welfare, health and operations in general.

An information release issued at 1430 identified the need to draw CFA personnel from all over the state given the protracted nature of the fire. Over 100 CFA personnel were working alongside 70 IPRH employees and associated on fire control activities. IPRH had implemented a post-fire strategy to undertake repair work immediately to get the mine back to full operation.

IPRH personnel were assisting CFA District Mechanical Offices to recommission tankers in preparation for returning to home locations. The harsh conditions in the mine had caused coal dust to infiltrate every compartment and locker, and the coal slurry to be embedded in brake drums and drive shafts. It all had to be removed in order to return the tankers to serviceable condition.

IMSS

7.6 The Fire, 17 October, 2006 – Day 6

The IAP for the day identified a forecast of higher temperatures (27°) with N/NW winds 20/30 km/h gusting to 45 by 21:00. A FLIR equipped helicopter was to fly at 09:00. It was predicted that flare ups might occur in the warmer, windy conditions. A dozer was being used to maintain tracks and this was likely to continue.

Two strike teams were patrolling day and night.

Additional DMO's were being deployed as the environment was proving very harsh on brakes.

A joint International Power/CFA information release issued during the afternoon complimented the firefighters on a magnificent job while working in a unique environment. Despite poor visibility, conditions of extreme cold during the night and heat in the day, coupled with the wet, dirt and grit, morale was high among all personnel. To support the teams of fire fighters there were regular changeovers and continual monitoring of health and well-being on site.

The critical support of agencies (including SES, St John, Red Cross and RAV) and local businesses ensured that fire fighting personnel were fed, rested, had their uniforms cleaned and any broken equipment repaired or replaced. By day 6 over 6,000 meals had been prepared and delivered on site.

7.7 The Fire, 18 October, 2006 – Day 7

In the situation report issued at 05:00 the night shift Incident Controller Ian Phillips declared the fire 'Controlled'.

A FLIR flight was undertaken during the morning which showed the fire was inactive. A meeting between CFA and IPH agreed the mine operator would take over monitoring of the site with a thermal imaging camera from 18:00.

Operations Officer Kevin Pettit advised the Mining Director that CFA would cease firefighting operations at 18:00 and withdraw and demobilise CFA resources from the fire subject to an agreed strategy being developed cooperatively.

The Mining Director, Steve Reiniets issued a Fire Mitigation Strategy:

- All personnel on site are to be vigilant for any sign of smoke and report it immediately.
- One CFA strike team on standby in Morwell for tonight and tomorrow.
- CFA Liaison Officer to be present at the Mine Control Centre with the Mine Shift Manager for tonight and tomorrow.
- Thermal imaging around mine coal levels to occur tonight and tomorrow.
- Mobile water tankers (2 off) to be manned tonight and tomorrow and to be in constant radio contact.
- All personnel are to be vigilant and to report and attend to any spot fires/smouldering areas in and around the mine.

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- All fires encountered, even once they are extinguished are to be reported to CFA for monitoring purposes.

A Region 7 crew would stay at Morwell overnight on standby. The IMT would remain operational overnight and for one more day.

The situation report issued by day shift Incident Controller Wayne Petford at 1730 declared the fire 'Safe'.

7.8 The Fire, 19 October, 2006 – Day 8

During the morning the IMT supervised the final demobilization of firefighters and their equipment. Tankers were serviced by DMO's for the return journey. Monitors were left in place until they could be removed in safety.

The IMT closed down at 12:30. After seven days, \$28,830,000 damage and thousands of firefighting hours by CFA career and volunteer firefighters working with IPH personnel the battle to control the Morwell fire was over.

The eventual damage bill was significantly less than that estimated on the first day. The total amount was not as high largely due to the damage to Dredger 11 being less than expected. The predominant costs were associated with the necessity to provide alternative methods of overburden disposal due to the loss of the dredger for almost 12 months. Overall losses were:

- Mine at 30% production for five days
- 3.5 kilometres of conveyor (structural, belt and electrics)
- 3 x traveling/jumbo hoppers
- Mobile slew conveyor electrics
- High voltage electric cable
- Bucket wheel dredger (Dredger 11)
- D8 bulldozer
- Redundancy and consequential damage (including mine plan changes and additional overburden removal by trucks until Dredger 11 returns to service)
- Generation losses.

Notably, generation losses were minimized by a decision to undertake some maintenance on plant within the power station that necessitated a reduction in power generation. While this had been planned the activities were brought forward. This decision enabled the reduced coal supply to have little effect on generation income.

Source: Director of Mining, Steve Reiniets – Presentation to Power Industry Forum, August, 2007

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8. Command and control arrangements

After the initial attack a decision was made to establish the Incident Control Centre (ICC) at the Morwell fire station. The separation of the Incident Controller at the fire station and the Operations Officer at the mine with the International Power Hazelwood Emergency Commander created some command and communication difficulties.

These were able to be resolved as the incident progressed but it meant that officers spent much time traveling between the mine and the fire station to conduct IMT discussions that normally would require only a few minutes. The IMT arrangements were:

Date	Incident Controller	Operations Officer	Planning Officer	Logistics Officer
12 October (D)	D Hunter	S Mynard	I Dunbar	B Mongan
12 October (N)	R Male	G Parker	M Willmott	B Mongan
13 October (D)	D Hunter	P Barr	I Dunbar	R Langston
13 October (N)	G Harker	S Mynard	M Willmott	J Hamment
14 October (D)	D Hunter	P Barr	I Dunbar	D Robertson
14 October (N)	G Harker	S Mynard	A Hemm	P Bullen
15 October (D)	G Ravenhall	R Male	A Hives	D Robertson
15 October (N)	G Harker	P Barr	D Harrisson	P Bullen
16 October (D)	G Ravenhall	P Hurford	K Stephens	K Ross
16 October (N)	I Phillips	P Barr	D Harrisson	P Bullen
17 October (D)	G Ravenhall	G Parker	K Stephens	K Ross
17 October (N)	I Phillips	R Male	D Harrisson	S McRoberts
18 October (D)	W Petford	G Parker	K Stephens	S O'Dwyer
18 October (N)	I Phillips	R Male	D Skinner	N French
19 October (D)	W Petford	S Mynard	P Horton	S O'Dwyer

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The strategy was to use local and mine firefighting experienced officers for fire control activities. Other officers and firefighters were brought in to provide fire cover for Morwell and Traralgon. It was a challenge to maintain an industry representative at the ICC but the mine representative provided valuable advice, particularly at critical times.

9. Brigades and other agencies in attendance

The Incident Resource Details and Strike Team records indicate that the following Brigade crews and fire fighting vehicles were in attendance for all or some of the fire.

Alberton West tanker	Moorooduc tanker 1
Bairnsdale tanker	Moorooduc tanker 2
Bairnsdale MCV	Morwell tanker 1
Beaconsfield tanker	Morwell tanker 2
Berwick tanker	Narre Warren North tanker
Boronia pumper 2	Newborough MCV
Bruthen tanker	Paynesville tanker
Bumberrah tanker	Red Hill tanker
Churchill tanker	Region 10 spare tanker 3
Cowwarr tanker	Scoresby hose layer
Gembrook tanker	Seaspray tanker
Glengarry tanker	Toongabbie tanker
Glengarry West tanker	Toorloo tanker
Gormandale tanker	Traralgon tanker
Hastings tanker	Traralgon South tanker
Hazelwood North tanker	Traralgon West tanker
Heyfield tanker	Tyers tanker
Keysborough pumper-tanker	Willung tanker
Langwarrin tanker	Willung South tanker
Loch tanker	Woodside tanker
Longford tanker	Yinnar tanker
Maryknoll tanker	Yinnar South tanker
Mornington tanker	

In addition, firefighters and officers together with brigade command vehicles from Regions 7, 8, 11, 13, 14, 22 and 24 provided support both at the mine and the Incident Control Centre.

Region 9 firefighting vehicles maintained a suppression force on the numerous fires which were burning at the same time to the north and west of the Morwell fire.

Agencies providing support included: Australian Red Cross, Latrobe City, Rural Ambulance Victoria, Saint John Ambulance, State Emergency Service and Victoria Police.

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10. Incident Issues and Lessons

An internal debrief was conducted at the Morwell fire station on 14 May, 2007. The debrief was delayed due to the complexity of significant fire activity in the summer affecting all personnel in Gippsland. It is acknowledged that this form of debrief was conducted far too late but nevertheless there were numerous issues identified including opportunities for improvement and things that went well. The issues identified can be best summarised in the following categories:

- **Planning**

This fire has shown the need for effective preplans (both emergency management agencies and sites) to be in place that complement each other and are integrated in all aspects. While they need to be comprehensive in content they also need to be usable during emergencies.

Plans need to include notification and escalation arrangements, staging area layout, logistics management, communications, and more. While components of this were effectively implemented some aspects of staging area management were slow in being addressed and caused unnecessary confusion and dissatisfaction to some personnel.

It is also recognised that the key component of planning for emergencies is the need to practice the components of the plan on a regular basis.

- **Prevention & Response**

Clearly the most effective means of ensuring that CFA and mines management do not have to deal with a similar incident in the future is to implement all measures possible to prevent them occurring. This fire has redefined the term “credible scenario” and mining operators need to ensure their preventative measures will adequately address similar incidents in the future. Equally, for CFA to effectively respond to incidents of this nature when contributing factors, such as weather, are likely to result in large scale incidents must be planned for and the initial response weighted accordingly.

The term “think big, act big” was penned during this emergency and should be utilised during all emergency prevention, preparedness, response and recovery activities.

- **Carbon Monoxide (CO)**

The most significant welfare issue experienced during the open cut fire was the exposure of crews and mines workers to large concentrations of Carbon Monoxide (CO).

This was not experienced at all times during the incident, but when identified, necessitated the immediate implementation of safety arrangements to safeguard the health and welfare of the crews involved.

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The input provided by the CFA Health Monitoring Team, CFA Medical Officer and CFA Scientific Officer was invaluable in assisting the Incident Management Team in establishing appropriate strategies and tactics for safeguarding personnel exposure to CO.

Consequently any similar fires in this environment in future will require the careful management of this now known risk. To achieve this, atmospheric monitoring must be undertaken when crews are operating in this environment. Post exposure health monitoring is also paramount but the most effective means of addressing this issue to personnel is to limit the number of people entering the area and length of time they are required to operate in this environment. Effective respiratory protection can only be achieved using breathing apparatus (self contained compressed air or long duration are the only options at this time). It is fundamental to ensure preventative strategies are in place to limit the potential for fire and then if one should occur rely on fixed suppression systems that are not labour intensive in managing their operation.

- **Incident Management Arrangements**

The effective management of large scale incidents of this nature cannot be over stated and to achieve this, a number of measures are necessary:

- **Embedding of key industry personnel in Incident Management Teams (IMT)**

The provision of key industry personnel with intimate technical knowledge of the particular site was one of the many successes of this fire. Planning was undertaken with key input on the effect of strategies and tactics on business continuity and ongoing mining operations.

On the fireground the integration of personnel with knowledge of the mine and its operations ensured that the safety of CFA crews was maintained at all times. These personnel, when in place, need to be effectively identified and their knowledge should be utilized by both incident and field command personnel.

- **Preplanned and equipped Incident Management facilities**

While this incident was managed remote from the site the need for an effective preplanned and equipped onsite Incident Management facility would have further enhanced and streamlined operations. This separation at times meant that key operations personnel were required to leave the fireground for periods during briefings, some elements of the mines recovery plan were not easily communicated and the critical linkage between the Operations Point and Incident Control Centre (ICC) was lost at other times. To ensure that this is undertaken in the future CFA, industry representatives and other emergency service organizations are currently finalizing ICC guidelines to help sites facilitate this.

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- **Media Management**

From the initial stages of this fire media was managed in a cooperative and coordinated manner with mine management. It was agreed early in the fire that CFA would limit comment to fire suppression related matters and International Power would address questions associated with mine operation and production. Once both CFA and International Power media units were established, joint media releases were distributed for the remainder of the incident.

- **Logistics**

The size and complexity of this event presented significant issues, particularly in the early stages, in meeting the logistical needs of this fire. While Municipal Emergency Management arrangements were utilised to address catering requirements, specialist needs such as wet weather clothing and rubber boots had to be arranged through local suppliers by the IMT. After initial problems in supplying some critical logistical needs local suppliers actually undertook regular trips to Melbourne to meet CFA needs and these supply issues were resolved.

- **Communications**

The integration of emergency agency and on site communication systems is critical to ensure effective transfer of crucial information to and from command and control personnel at all levels. The challenge of integrating several independent radio systems into one will require further work but in the interim effective communications plans are necessary and need to be documented and distributed amongst agencies, site management and contractors.

- **Firefighting Infrastructure**

This fire demonstrated that neither CFA nor the mine had adequate numbers of ground monitors for use in this instance. However, through local mutual aid arrangements, established through long term networking and relationships established by CFA Region 10 Operational staff, the Regional Emergency Coordination Centre was able to source a dozen or more high volume monitors to assist firefighters from a variety of local and state industries including ESSO, Australian Paper and Transfield.

- **Thermal Imaging Technology**

Thermal imaging technology in the form of handheld units was used extensively during the fire. This permitted more efficient use of personnel to focus on key areas during the overhaul period of the fire. Airborne units, although utilized, had a number of limitations beyond the first 2 days and required missions to be flown at specific times for best effect.

IMSS

- **People and Relationships**

One of the fundamental reasons for the success of this operation was that personnel from both CFA and the mine knew one another. These relationships had been established over many years and are a credit to the local Fire Officers and mine personnel. During the fire these relationships ensured that information was exchanged freely and decisions were reached together and implemented without further question. An acceptance of each others unique range of skills and knowledge was respected and in the truest sense, trust was maintained between all parties during the operation.

11. Lessons for future fires

The debrief process identified a number of areas for improvement which can be used to form the basis of an annual audit/review mechanism.

In addition, the GHD report to International Power Hazelwood (**Appendix C**) highlighted a range of issues which need to be resolved in conjunction with Country Fire Authority.

12. Conclusions

The major fire of 12 October, 2006 and subsequent days like its predecessors of 1944 and 1977 had a real and potential impact on the state's electricity generation capability from brown coal production.

It is a tribute to the Morwell Fire Brigade officers and members – both career and volunteer – and to the brigades who supported Morwell that the fire was so successfully controlled. Business continuity was maintained throughout the period of the fire. Nevertheless, the enormous level of damage (estimated at \$28,830,000 by the CFA Fire Investigation Team in April, 2007) the disruption to productivity, the direct suppression costs and the many thousands of unpaid hours by volunteer brigade members reinforces the need to ensure mechanisms are in place to prevent (so far as possible) or minimize the spread of fire.

The conundrum that faces both the managers of the three mines and the Country Fire Authority is that while the extreme fire danger from igniting brown coal is recognized, the rarity of major fires inevitably leads to a sense of complacency and a reluctance to involve outsiders.

Unless a major improvement in cooperation and openness between the mines (especially the Morwell mine) with Country Fire Authority occurs with regular meetings, joint training and exercises, it is likely an event with the severity of the October, 2006 fire will be repeated.

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Appendix A

Major fire – 4-6 November, 1977

Shortly after termination of the maintenance workers long strike, the endeavours to restore plant to normal operating conditions were considerably interrupted by a major fire which commenced on Friday 4 November 1977 and continued until 6 November, 1977.

The fire was first noticed as a relatively normal fire outbreak on the north end of No 3 coal level initiated apparently by the passage of a vehicle across the coal level causing coal dust particles on the exhaust or hot engine components to fall as ignited coal onto a dry area on the coal bench. Weather conditions were hot, with very strong winds. Fire protection sprays had been in operation throughout the morning. However, fire service pipelines in the immediate area of the fire outbreak were not in their planned or normal position or configuration due to maintenance resources not being available to keep installations in phase with the excavated coal faces during the maintenance workers bans and strikes of the previous few months.

The fire outbreak was noticed and attended to promptly by a fire patrol attendant about 1155 hours. At this stage, the fire area covered a few square metres of surface only. However, water pipelines in service in the area were too remote for spraying the outbreak area. At this same time, a fire outbreak on No 8 Level, detected earlier, was being extinguished by fire service personnel including the Fire Service Officer, Charles Strong, and mobile fire fighting resources had been concentrated in this area. The Manager, Coal Production, Jack Vines, who had left the fire extinguishing activities on No 8 Level and was inspecting fire spray covering of upper coal levels had noticed the second outbreak and had alerted the Coal Production Superintendent, Ian Runge, by phone of the need for additional personnel at site of the fire outbreak on No 3 Level.

By about 1215, about six personnel including the Morwell Open Cut Fire Service Officer and a Fire Service Foreman were attempting to control the spread of the fire, now of about 150 square metres in extent, with hoses and knapsack sprays, but the remote location of water mains restricted hose efficiency and the number of available connections.

By about 1225, the Engineering Services Fire Services Supervisor, Alec Bremner, with one tanker arrived on request of the Coal Production Superintendent, followed by a second tanker immediately after.

By about 1240, about 40 personnel with experienced supervisory staff were at the site of the fire. At about 1245, abnormal wind gusting above 75 kilometres per hour with rapid changes in direction almost simultaneously dispersed the fire widely up and down adjacent coal batters to other areas which were also sparsely provided with fire service pipelines or sprays. Various emergencies arose from 1300 hours onwards and more personnel and equipment were called upon for fire fighting. 11 Dredger and M225 conveyor were strongly threatened and 1000 metres of electricity supply cable burnt out before this area was under temporary control. 3 Dredger, M216 conveyor and 120B3 dragline although upwind of the fire area were constantly under threat from falling ash dispersed in swirling updrafts from the lower levels, igniting loose coal dust on this plant. Protection was maintained throughout the day and night on this plant by continuous vigilance and hosing activities.

IMSS

Fire fighting support was received from the Country Fire Authority and the Australian Paper Mills fire fighting personnel and mobile fire tankers. The Royal Australian Air Force at Sale was requested at about 130 hours to assist and provided over 140 personnel with mobile tankers and command vehicles on site by 1725 hours – personnel were “on parade” at Sale immediately before break-off for weekend leave when the call for assistance was received through the State Emergency Service arrangements. The RAAF personnel provided a vital and disciplined group throughout the evening and night time fire fighting on various levels and batters of the open cut.

The Regional group of the State Emergency Service provided personnel and equipment. The Gippsland Regional Police Superintendent provided assistance and traffic arrangements and maintained contact and a presence on site for the role of Emergency Co-ordinator if needed.

Serious danger occurred to 9 Dredger through mid afternoon. Its power supply cable was burnt out, and several hundred metres of M245 conveyor belting and control wiring were destroyed by the fire. Further spread of the fire along the belt was mitigated by using a dozer to break through and separate the continuous conveyor belt. By about 1700 hours, the danger situation to this dredger appeared to be under control by personnel continuously hosing throughout the machine.

By about 1530, in spite of the extensive number of personnel now on site, the fire had spread to the lower levels of the open cut. 19 and 21 Dredgers were now both under threat, and spread of the fire to all conveyor plant on the Eastern and Southern batters appeared imminent.

19 Dredger was completely surrounded by fire around its crawler system, around its ladder on the face, and fires broke out in the buckets, chutes and conveyors. The fire in this area was held at bay only by assiduous fire fighting for several hours, with the adjacent coal face in flames and frequent spot fires throughout the machine.

21 Dredger was perhaps the most highly threatened, as ignited coal particles from the bench above the dredger and from the adjacent coal face initiated many small fires in coal dust on the exposed structure and conveyors. Critical fire fighting on and around this dredger continued under extreme threat until 1900 hours with up to 50 men with tanker support located at the machine.

From about 1555 hours, almost coincident power supply failures to major pumping stations occurred due to power cables being burnt both by the fire, and by lightning strikes in the turbulent storm conditions.

By about 1630 hours, the fire had spread eastwards along all northern coal batters below No 2 level, had caused burning of further power cables with resultant power outages

By about 1830 hours, there were about 600-700 personnel directly involved in fire fighting within the open cut.

IMSS

At about 1830 hours, a wind direction change occurred which temporarily relieved the emergency before reverting back some two hours later to its original North West direction but with abated strength.

Fire fighting continued throughout the night. Light rain and reduced wind strength reduced the hazard by 1000 hours on the following day but with many areas still on fire and susceptible to further spread if strong winds re-occurred.

By 1800 hours on Saturday, the activity had changed to one of continuous patrol and extinguishing of small fires as the effect of initial water suppression wore off.

Over 1400 SEC personnel were directly involved in the fire activity during the fire period. The CFA tankers withdrew progressively from 1330 hours on Saturday with five units remaining overnight until early Sunday morning.

All APM tankers withdrew progressively between 0940 hours and 1700 hours on the Saturday.

The major RAAF force withdrew at about 1700 hours while the RAAF fire units withdrew at 0700 hours on Sunday 6th.

Throughout the fire emergency, overall management of the fire fighting and allocation of fire fighting resources was carried out by the senior management of Coal Management Production Department with the willing and effective cooperation of all the various parties involved. Fire fighting personnel were supplied by all SEC Latrobe Valley departments. Services from transport, stores, catering and security groups from these departments were of invaluable assistance during the fire fighting and monitoring stages. In particular, the mobile tankers of the CFA, APM, RAAF and those of the Latrobe Valley open cuts and the Engineering Services Department Fire Services were essential fire fighting units as power outages reduced the reliability of pumped water supplies throughout the open cut.

A review committee was established by the Commission with Jack Vines as Chairman, and Ray Greenwood and Harvey Norris as members, to review aspects of the outbreak and control of the fire and to make recommendations. The committee submitted its report in June 1978.

The committee considered that the fire had arisen from the passage of a vehicle over the coal level. The strong winds combined with the dry condition of the coal bench due to lack of water spray coverage caused the rapid and extensive spread of the fire. Pipe reticulation of fire prevention water had not been kept up with progress of operational faces during the prolonged industrial bans and strikes from mid 1977 and significantly reduced fire protection as well as fire fighting capabilities.

Major recommendations included restrictions on the use of some makes of vehicles on coal levels, modification to vehicle exhausts for travel permits on coal levels, more and better mobile tankers, provision of an emergency mobile communications unit and amplification of fire service reticulation, spray manifolds and equipment. The overall concepts of fire protection and fire fighting arrangements as previously established as satisfactory.

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During the fire fighting activities of this incident, the Coal Production Superintendent, Ian Runge, received dedicated support from all sections of his operations and maintenance personnel, with supervisory personnel taking appropriate initiatives with respect to fire fighting application and plant damage prevention as each emergency arose in scattered locations throughout the open cut. Excellent co-operation from large numbers of personnel in fire fighting and support activities from Engineering Services Department, Area Administration Department and shift personnel from Power Generation Department was effectively utilized. The CFA, RAAF, APM fire fighting resources backed by the Police and State Emergency Services organisations in response to requests for support were promptly and assiduously applied in successfully combating the fire without significant plant damage or major loss of generation. No significant personnel injuries occurred during the fire fighting activities over the two day period when large numbers of personnel inexperienced in open cut conditions were handling the emergency. Some minor burns, cuts and bruises; many incidents of treatment for dust and ash particles in eyes; and one incident of a fall down a coal batter but without broken limbs resulting were recorded by ambulance and first aid attendants at the site.

Extract from 'A History of the Morwell Open-cut: Its Origins and Development to June, 1995' by J A Vines.

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Appendix B



Carbon monoxide Exposures Morwell Open Cut Mine

October 2006

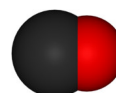
Craig Tonks
Scientific Officer

Peter Langridge
Coordinator, Health Support Team



Properties of Carbon monoxide

- Carbon monoxide:** chemical formula is **CO**
- Colourless, odourless & tasteless gas
- Molecular Weight: 28 amu
- Molecular Weight of Air: 29 amu
- Relative Vapour Density of CO (Air = 1): 0.96
- Similar weight and density to air means that if the area is poorly ventilated, CO does not dissipate**
- CO can sit in "pockets" or "balloons" in poorly ventilated areas
- CO can be extremely high in one area and be completely absent in another



Toxicology

- CO** attaches to Haemoglobin (**Hb**) in red blood cells
- The role of **Hb** is to **carry oxygen (O₂)** through the blood stream to body tissues
- CO has a "binding affinity" to Hb, **240 times** greater than O₂
- CO contamination through inhalation prevents oxygen attaching to Hb reducing O₂ distribution to tissues
- This may result in significant adverse health consequences depending on the level of CO contaminant in our blood



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 **COHb and Health Effects**

% COHb	Symptoms and Medical Consequences
1-2	Environmental exposure and some metabolic breakdown. No symptoms.
5	Mild headache (frontal lobe). Heavy smokers can have as much as 2.8 – 3.4% COHb - Smokers at Morwell averaged 9% "baseline" COHb.
10	Mild to strong headache (frontal lobe).
20	May cause ischemic chest pain or tightness and may induce angina/heart attack
25	Nausea and serious headache. Fairly quick recovery after treatment with oxygen and exercise
30	Symptoms intensify. Potential for long term effects especially in the case of infants, children, the elderly, victims of heart disease and pregnant women.
45	Unconsciousness
50+	Death

 **CO Concentration Over Time and Health Effects**

PPM CO	Time	Symptoms and Medical Consequences
30	8 hours	Maximum exposure recommended by NOHSC in the workplace over an eight hour period.
200	2-3 hours	Mild headache, fatigue, nausea and dizziness.
400	1-2 hours	Serious headache-other symptoms intensify. Life threatening after 3 hours.
800	45 minutes	Dizziness, nausea and convulsions. Unconscious within 2 hours. Death within 2-3 hours.
1600	20 minutes	Headache, dizziness and nausea. Death within 1 hour.
3200	5-10 minutes	Headache, dizziness and nausea. Death within 1 hour.
6400	1-2 minutes	Headache, dizziness and nausea. Death within 25-30 minutes.
12,800	1-3 minutes	Death

 **Findings at Morwell**

Medical:

- Increased Blood pressures (average 157/100)
- COHb ranged from 12 – 20%
- Oxygen saturation not a usable measure under CO exposure
- Frontal lobe headache (First Aid Treatment "Panadol")
- Irrational and aggressive behaviour
- Increased heart rates

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Findings at Morwell

Reading taken on the date of 13th October after CO Monitoring undertaken

Time	Sys BP	Dia BP	HR	O2	Co Breath	Comments
1800	170	98	75	97	14.4	
1800	160	108	95	96	12.8	
1800	152	104	103	97		0700hrs 17ppm 3.3%
192	118	83	97	18		206/112, 168/90 O2 given 11/2 Hrs
152	108	86	96	13.8		
162	102	86	97	16.4		
155	104	85	97			
1347	160	100	91	96		
1350	180	95	87	88		
1350	170	100	93	95		
1351	180	120	87	97		
172	112	111	96	12		
140	102	105	99	14.4		
156	82	90	98			
1920		120	97	12.8		
1920	144	90	90	97		
1920	130	90	83	98		
157	100	89				

Findings at Morwell

Average Observations Taken at end of work periods:

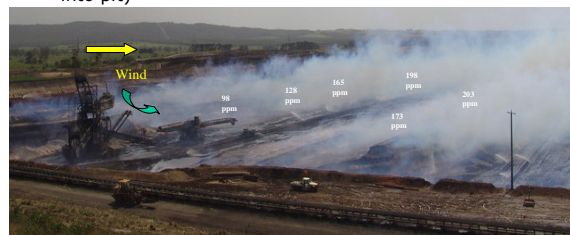
Time	Sys BP	Dia BP	HR	O ₂	COHb	Comments
Thur	139	86	88	95		Temp 31.5 RH 18% NW-NNE 41-65
Fri	157	100	89	97	12	Temp 26 RH 51% SW 28
Sat	137	84	75			



Findings at Morwell

Atmospheric Monitoring:

- High levels of CO in Air
- Wind direction (trapping and directing smoke and gas into pit)



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Plan

- ❑ Peter Langridge and OM Vince Bosua discussed the findings with Craig Tonks
- ❑ **CO in air was 4 to 6 times the Occupational Exposure Standard**, therefore exposure duration needed to be reduced accordingly
- ❑ Recommendation to minimise exposure to CO: **1 hour work time followed by 2 hours rest** as a starting point
- ❑ Any members showing **COHb of 5%** or more to be given Oxygen and more than 2 hours rest period.
- ❑ Continue monitoring and adjust work duration according to results

Actions:

- ❑ Crew changeover at 1 hour work intervals
- ❑ P2 masks to be used and changed over at 1 hour intervals
- ❑ Continued atmospheric monitoring throughout pit
- ❑ All crew members to be monitored on exiting the pit

(results Table 2 & 3)



Health Monitoring

Health monitoring:

- ❑ Assess levels of blood CO (CoHb)
- ❑ Health Issues
- ❑ Assess and advise on First Aid treatment




Outcome

- ❑ **Significant reduction in the following:**
 - Frontal Lobe Headaches
 - Aggressive and irrational behaviour
 - Blood Pressure
 - Heart Rates
 - Blood CO and;
 - No further hospitalisations associated with CO exposure

OHP's prepared by Craig Tonks, Scientific Officer and Peter Langridge, Coordinator, Health Support Team – See page 18.

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Appendix C

Recommendations made by GHD in their Incident Investigation Report of January, 2007 to International Power Hazelwood:

1. In July of each year, a plan should be developed for the upcoming fire season based on weather predictions and mine conditions. Note that with the current conditions, a fire season may need to be designated from October to March.
2. An annual audit of the fire system should be undertaken prior to the start of the fire season in accordance with the fire season plan (Refer to Recommendation 1). The audit should review all aspects of the fire service facilities, systems and procedures. This should include hardware, documentation (eg. Emergency response plans), fire pumps and electrical supply, spray coverage of coal levels and fire fighting training, etc.
3. Predefined conditions should be identified to assist in determining whether a Fire Alert should be declared. The criteria should not be based solely on CFA Total Fire bans as the CFA criteria includes factors relating to conditions that are not applicable to an open-cut mine. These conditions should include ranges in temperature, humidity, wind direction or speed that can define 'severe weather conditions'.
4. Fire Alert processes are understood but are not always fully complied with. As the Fire Alert is a critical control to prevent fires, the procedures including roles and responsibilities should be reviewed, updated, reiterated and enforced for mine personnel.
5. Roles and responsibilities of Fire Services and personnel to support Fire Services during a Fire Alert and an incident should be reviewed. The review should cover the responsibilities and tasks required by the Fire Services Group including the Fire Services Officer, Supervisor and Operators for the normal daily tasks, during a Fire Alert and during an incident. The review should also cover which mine personnel or contractors would provide a valuable and effective resource to support Fire Services during a Fire Alert and an incident dependent on their roles and responsibilities. For instance, utilising the maintenance crew for additional fire spotting after a Fire Alert has been declared.
6. Interface and communications between Operations, Fire Services and Maintenance needs to be reviewed in terms of fire systems, particularly in relation to the power supply for the fire pumps.
7. Roles, responsibilities and procedures outlined in the IPRH Emergency Response Plan should be reviewed and rewritten utilising a checklist approach so that each person undertaking an emergency role can confirm that they are undertaking their key activities.
8. In a significant fire, each coal level should be treated as a fire zone and a Zone leader allocated after consultation with the CFA.

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9. Once it has been determined that there is a significant fire, all supervisors should return to the ICP for a briefing and to undertake a role of co-ordinating the fire teams. A co-ordinated approach to fighting fires is more effective than just large numbers of fire fighters.
10. The ICP should continue to be established as a special facility separate from normal operations or mine activities. The ICP should have available all essential equipment required for an emergency response, that is easily and quickly accessible; and able to be transported to any onsite facility. This equipment may be available as a mobile 'kit'.
11. IPRH should consider notifying the CFA immediately once a spot fire has been reported and verified on site. The CFA remains on alert for a nominated amount of time (eg: 15 minutes). Within this time frame they must receive further notification from the site that the fire has been extinguished otherwise they will send out an initial response crew in anticipation that the fire has escalated and requires their assistance. This practice is undertaken at other mines in the Latrobe Valley.
12. The IPRH Significant Issue Corporate Response Plan and the IP Corporate Serious Incident Procedure should be reviewed and updated to ensure there are no discrepancies and the IPRH Emergency Response Plan should be consistent with the IPRH Significant Issue Corporate Response Plan.
13. Work procedures and practices within the 'Mine Fire Service Policy and Code of Practice' and the 'Fire Instructions' should be systematically reviewed and updated.
14. Whilst it should be recognized that the priority is to ensure that sufficient water is used to control the spread of fires, particularly to ensure no burning coal is transferred to the power station, mine operators should be trained to understand the effects of excessive water transferred to the power station.
15. The use of thermal imaging cameras and other technology in the detection of faulty idlers should be investigated for their application and used where appropriate.
16. The use of thermal imaging cameras was effective during the fire fighting and should be considered as well as other technology for wider use in spotting fires within the mine.
17. A procedure for dealing with Carbon Monoxide (CO) during fire fighting, including the use of CO monitors, should be developed since personnel safety is a major responsibility and concern in fighting coal fires.
18. Whilst the efforts of all mine, contractor and CFA personnel are highly commended in their assistance with the fire fighting, it should be emphasized and reinforced to all personnel that no job is so important that they should take excessive risks.

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19. Allocating IPRH operations staff to CFA strike teams during a fire should be included within IPRH procedures (eg. Emergency Response Plan and/or Fire Instructions) and reinforced so that it becomes normal practice.
20. To ensure the ongoing efficient operations of the mine are not compromised over the long term as a result of the fire incident, a detailed risk analysis should be carried out to assess the life cycle impact of the fire on maintenance costs and longevity of the mine infrastructure assets.

Source: GHD October 2006 Mine Fire Investigation, Incident Investigation Report, January 2007.

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